SHIRDI SAI ELECTRICALS LTD 25+ Years

INDOSOL SOLAR PRIVATE LIMITED

INDO TECH TRANSFORMERS LIMITED
A subsidiary of Shirdi Sai Electricals Limited

SSEL GROUP
CARBON FOOTPRINT REPORT

FY 24-25

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ESG Department

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ABBREVIATIONS

Abbreviations	
AC	Air Conditioning
ACT	Assessing low Carbon Transition
AI	Artificial Intelligent
AP	Andhra Pradesh
AR	Assessment Report
BRSR	Business Responsibility and Sustainability Report
C	Category
CBAM	Carbon Border Adjustment Mechanism
CCA	Climate Change Agreement
CDP	Carbon Disclosure Project
CFD	Climate-related Financial Disclosure
CH4	Methane
CII	Confederation of Indian Industry
CNG	Compressed natural gas
CO2	Carbon Dioxide
COP	Coefficient of Performance
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CRC	Carbon Reduction Commitment
CRD	Climate Related Disclosures
CRGO	Cold Rolled Grain Oriented Steel
CSA	Corporate Sustainability Assessment
CSDDD	Corporate Sustainability Due Diligence Directive
CSRD	Corporate Sustainability Reporting Directive
DEFRA	Department for Environment Food and Rural Affairs
DEI	Diversity, Equity, Inclusion
DG	Diesel Generator
DJSI	Dow Jones Sustainability Indexes
e.g.,	Example
EF	Emission Factors
EHS	Environment, Health, and Safety
EI	Emission Intensity
ELV	Emissions Limit Values
EPA	Environmental Protection Agency
EPR	Environmental Permitting Regulations
ESG	Environmental Social Governance
ESOS	Energy Savings Opportunity Scheme
ETS	Emissions Trading Scheme
EU	European Union
EV	Electric Vehicle
FO	Furnace Oil
FY	Financial Year
GHG	Green House Gas
GRI	Global Reporting Initiative
GWP	Global Warming Potential
HDV	Heavy Duty Vehicle
HFC	Hydrofluorocarbon
HSD	High Speed Diesel
HVAC	Heating, Ventilation, and Air Conditioning
ICAO	International Civil Aviation Organization
IEC	International Electrotechnical Commission
IFRS	International Financial Reporting Standards
INDO TECH	Indo Tech Transformers Limited
IoT	Internet of Things
IPCC	Intergovernmental Panel on Climate Change
IPCC SR15	IPCC Special Report on Global Warming of 1.5°C
ISO	International Organization for Standardization
ISPL	Indosol Solar Private Limited
ISSB	International Sustainability Standards Board
kg	Kilogram
km	Kilometre
kVA	Kilo Volt Ampere
L	litre
LCA	Life Cycle Assessments
LDV	Light Duty Vehicle
LED	Light-emitting diode

LLP	Limited Liability Partnership
LPG	Liquefied Petroleum Gas
MCPD	Medium Combustion Plant Directive
MCR	Mandatory Carbon Reporting
MDV	Medium Duty Vehicle
MS	Mild Steel
MSCI	Morgan Stanley Capital International
MVA	Mega Volt Ampere
MW	Megawatt
N/A	Not Applicable
N2O	Nitrous oxide
NF3	Nitrogen trifluoride
NFRD	Non-Financial Reporting Directive
Nos	Numbers
NSF	National Sanitation Foundation
OHS	Occupational Health and Safety
OIP	Oil Impregnated Paper
OLTC	On-Load Tap Changer
PAS	Publicly Available Specification
Pax-km	passenger-kilometre
PCR	Product Category Rules
PFC	Perfluorocarbon
PPA	Power Purchase Agreement
ppb	Parts per billion
ppm	Parts per million
PRC	People's Republic of China
PSR	Product-Specific Rules
PV	Photovoltaic
RE	Renewable Energy
REC	Renewable Energy Certificates
RMB	Chinese yuan
RoHS	Restriction of Hazardous Substances
RTCC	Remote Tap Changer Control
S&P	Standard & Poor's
SAF	Sustainable Aviation Fuel
SAP	Systems Applications and Products in Data Processing
SASB	Sustainability Accounting Standards Board
SBTi	Science Based Targets initiative
SDG	Sustainable Development Goals
SEBI	Securities and Exchange Board of India
SEC	Securities and Exchange Commission
SECR	Streamlined Energy & Carbon Reporting
SF6	Sulphur hexafluoride
SFC	Specific Fuel Consumption
SFRD	Sustainable Finance Disclosure Regulation
Sl.no	Serial Number
SOP	Standard Operating Procedure
SSEL	Shirdi Sai Electricals Limited
t	Tonne
T&D	Transportation and Distribution
TC	Technical Committee
TCFD	Task Force on Climate-related Financial Disclosures
tCO2e	Tonne of Carbon Dioxide equivalent
TG	Telangana
TN	Tamil Nadu
TNFD	Task Force on Nature-related Financial Disclosures
TPT	Transition Plan Taskforce
ts	short ton
UK	United Kingdom
UL	Underwriters Laboratories
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
UNSDG	United Nations Sustainable Development Group
UOM	Unit of Measurement
UP	Uttar Pradesh
UPS	Uninterruptible Power Supply
U.S	United State
U.S. SEC	U.S Securities and Exchange Commission
USA	United States of America
USD	United States Dollar
VCS	Voluntary Carbon Standards
WEEE	Waste from Electrical and Electronic Equipment
WRI	World Resources Institute
WTT	Well-To-Tank
WWF	World-Wide Fund for Nature
YoY	year over year

1. INTRODUCTION

Sustainability and ESG (Environmental, Social, Governance) considerations are critical components of modern business strategy, particularly in the manufacturing sector. While Environmental Sustainability frameworks address the need to balance economic growth with environmental protection, they also build the resilience of an organization by creating an awareness on the adverse effects of activities that deplete the raw material sources or actions that cause irreversible changes in the ecosystem. This paves the way to implement processes, whereby the natural resources of the planet are responsibly utilized and replenished.

Sustainability in manufacturing focuses on reducing the environmental impact of production processes while maintaining economic viability. This encompasses energy efficiency, waste reduction, circular economy practices, and the use of sustainable materials. Manufacturers are increasingly adopting cleaner production technologies, such as renewable energy integration, carbon capture systems, and water recycling.

Figure 1 Sustainability – For A Greener Future

1.1 ESG Framework in Manufacturing

The ESG framework goes beyond environmental concerns to include social and governance aspects:

- Environmental: Reducing greenhouse gas (GHG) emissions, adopting renewable energy, and minimizing waste.
- Social: Ensuring worker safety, diversity, equity, inclusion (DEI), and community engagement.
- Governance: Enhancing transparency, ethical decision-making, and stakeholder accountability.

These frameworks also ensure people in the value chain are treated fairly and business maintains transparency of economic and governance processes.

1.2 Recent ESG Trends

Recent ESG Trends and advancements in sustainability and ESG in manufacturing include:

1. **Decarbonization Initiatives**: Governments and industries are setting aggressive net-zero emissions targets. Manufacturers are investing in low-carbon technologies, such as electric vehicles, hydrogen fuel cells, and energy-efficient equipment.
2. **Circular Economy Models**: Companies are adopting closed-loop systems that emphasize recycling, remanufacturing, and waste-to-energy processes. For instance, innovations in material recovery and 3D printing support resource efficiency.
3. **Digital Transformation**: Industry 4.0 technologies, including IoT, AI, and blockchain, are enabling manufacturers to optimize supply chains, monitor emissions, and ensure traceability of materials for greater accountability. Industry 5.0 has an upgraded vision to build on three core principles: human-centricity, sustainability, and resilience, ensuring that technology benefits both the environment and society.
4. **Green Financing**: Access to green bonds and sustainability-linked loans is incentivizing manufacturers to adopt ESG-aligned projects. Financial markets increasingly favour companies with robust ESG performance.
5. **Regulatory and Reporting Standards**: Governments worldwide are implementing sustainability regulations. Standards like the Global Reporting Initiative (GRI) and International Sustainability Standards Board (ISSB) are gaining prominence. While U.S. SEC has ended climate risk disclosure rules, companies will still have to comply with state's climate disclosure laws, where applicable, and international climate-related disclosure requirements.
6. **Consumer and Stakeholder Pressure**: Growing consumer demand for sustainable products and pressure from investors are driving manufacturers to prioritize ESG integration.
7. **Global Action Against Greenwashing:** Governments worldwide are cracking down on misleading sustainability claims. The EU's anti-greenwashing consumer protection framework, FTC's updated Green Guides, and similar measures in the UK, India, and Australia now demand verifiable proof. This shift ensures that sustainability is backed by accountability, not just marketing.

1.3 Challenges and Opportunities

While the transition to sustainable practices poses challenges such as high initial costs, technological barriers, and supply chain complexities, it also offers significant opportunities. Companies adopting ESG strategies can improve operational efficiency, enhance brand reputation, and gain a competitive edge in a rapidly evolving market.

By embedding sustainability and ESG into core manufacturing practices, businesses can not only meet regulatory and societal expectations but also secure their long-term resilience and success in a resource-constrained world.

1.3.1 ESG Regulations in 2025

2025 witnessed major shifts in ESG regulations, shaped by both progress and pushback. Investors are under pressure to navigate shifting rules by demanding stronger data integrity and credible sustainability practices. Across key jurisdictions, regulators are both **tightening and re-calibrating** ESG rules. Companies face regulatory uncertainty, while these shifts could lead to green-hushing and increased compliance costs for businesses, especially listed companies.

In the Corporate Sustainability Reporting Directive (CSRD) for the European Commission, for example, the scope of companies required to report has been significantly relaxed (increasing the employee/turnover thresholds) while deadlines are being deferred. At the same time, supply-chain due-diligence laws like the Corporate Sustainability Due Diligence Directive (CSDDD) and upcoming materials-traceability rules (e.g., for batteries) are coming into force.

This means that the "S" and "G" in ESG are gaining increased regulatory weight alongside the "E". It means that the double materiality assessment must be dynamic — not once-and-done, but continuously monitored. Flexibility needs to be built into the reporting infrastructure, retain sight of jurisdictional nuance (Europe vs. India vs global supply chains), and push early on value-chain disclosures & assurance frameworks so that transformer/solar manufacturing business stays ahead of the curve.
In India, the Securities and Exchange Board of India (SEBI) is amending its disclosure regime under the Business Responsibility and Sustainability Report (BRSR) to introduce green-credit disclosures, value-chain reporting, and the option of "assessment or assurance" instead of only assurance. Meanwhile, ESG-rating agencies are under closer scrutiny with clearer rules on transparency and methodology.

India — SEBI / BRSR

Status & key changes (2025): SEBI updated the Business Responsibility & Sustainability Report (BRSR) to introduce green-credit disclosures, allow assessment or assurance (instead of mandatory assurance) for core disclosures, and eased value-chain disclosure thresholds / timelines. Some value-chain disclosures were deferred/staggered.

Effective / timing: Changes announced in early 2025; phased application across FY reporting cycles (FY2024-25 and later for some items).

European Union — CSRD / CSDDD (Omnibus debates in 2025)

Status & key changes (2025): The Commission's 2025 "omnibus" proposals sought to narrow CSRD scope and delay/dial-back certain due-diligence and taxonomy timelines; proposals remain subject to Parliament & member-state negotiation, so the landscape is fluid. Regulators are simultaneously pushing higher-quality reporting and more enforceable due diligence in supply chains.

Effective / timing: Negotiations through 2025; companies should track final text and delegated acts for exact compliance dates.

United States — SEC climate-rule developments (2025)

Status & key changes (2025): The SEC voted in March 2025 to end its defense of the climate-related disclosure rules amid litigation and political pushback; rule implementation is uncertain and litigation-driven. This has left a patchwork of federal/regional expectations and investor demands.

Effective / timing: Implementation is paused/contested in courts; companies should not assume a stable federal mandate yet.

China — evolving mandatory disclosure framework (2025)

Status & key changes (2025): Chinese authorities (MOF / CSRC) rolled out trial/basic sustainability disclosure standards and pilots for mandatory ESG disclosures for listed companies; standardisation efforts continue toward a unified system.

Effective / timing: pilot/phase-in approaches announced in 2024–25; broader harmonisation planned over coming years.

1.3.2 Accounting Physical Climate Risk

Figure 2: Climate Risk - Wildfires

- The frequency and intensity of extreme weather events underscore the need to address physical climate risks.
- Financial markets are now recognizing the significant macroeconomic consequences of these calamities.
- Investors are conducting location-based risk assessments to identify vulnerable assets and mitigate potential losses.
- Rising insurance premiums and properties becoming uninsurable in high-risk areas could disrupt real estate markets.
- These escalating physical risks make climate-related considerations vital for diversified investors moving forward.

1.3.3 Action in Transition Investing

Figure 3: Transition Investing

- Transition investing will focus on delivering measurable outcomes rather than just setting decarbonization targets.
- Frameworks like TPT and SBTi will provide benchmarks for effective transition plan disclosures.
- Investors will ensure companies align with climate goals through governance improvements and supply chain management.
- Investments in climate risk mitigation and adaptation strategies will rise, particularly in green technology and infrastructure.
- As resilience and adaptation become key priorities, opportunities in sustainable investments will increase in future.

1.3.4 Carbon Markets at a Turning Point

Figure 4: Carbon Market

- 2025 is set to be a transformative year for carbon markets, driven by higher integrity and expanding demand.
- The market is shifting towards high-quality carbon credits, with growing demand for robust projects.
- Standards like the Integrity Council' s Core Carbon Principles will help ensure higher credibility in carbon credits.
- New mechanisms, such as the Paris Agreement Crediting Mechanism, CORSIA will formalize and expand the carbon market.

- The potential value of carbon credits will increase, presenting opportunities for businesses and investors to meet climate goals.
- India has finalized eligible project types under Article 6.4. of UNFCCC by operationalizing its domestic Carbon Credit Trading Scheme (CCTS), with approved methodologies and Ministry of Environment, Forest and Climate Change (MoEFCC) as the primary regulatory body.

1.4 Climbing the ESG Ladder Through ISOs

Figure 5 Climbing the ESG Ladder

The International Organization for Standardization (ISO) announced the launch of the IWA 48:2024 in Nov 2024 in COP29 which provides guidance on environment, social, and governance principles - a new set of guidance aimed at enabling companies globally to improve ESG integration, performance, measurement and reporting.

IWA stands for International Workshop Agreement, which is a type of ISO standard. It is developed through a workshop process that is faster than the normal ISO committee process. An IWA is used for the sector to develop clear rules on an issue. It enables a more rapid response to requirements for standardization.

The new principles are being released, according to ISO, as companies face increasing ESG scrutiny and a substantial increase in ESG regulations, including the EU's CSRD, the UK's Modern Slavery Act, and the ISSB's IFRS S1 and S2 disclosure requirements, while sustainability reporting continues to suffer from inconsistencies and variations across different jurisdictions, company sizes and sectors, with the guidance aimed at enabling more consistent reporting. ISO said that the principles are applicable to organizations ranging from small businesses to multinational corporations, as well as ESG consultants, academia, research institutions, and NGOs.

According to ISO, the new principles are designed to support management of ESG performance, improve measurement and reporting under existing disclosure frameworks to enable consistency, comparability, and reliability of ESG reporting and practices globally, facilitate interoperability by aligning with existing reporting standards, and promote global consistency, to enable clear communication of

sustainability efforts. ISO said that the guidance will provide a structure to help organizations integrate existing ESG requirements, establish KPIs, and assess maturity in their ESG practices.

To achieve global sustainability standards under E, S, & G there are several ISO certifications already developed and used, by following which over the period of 3 to 5 years an organization can claim advanced inroads as per the UN Sustainable Development Goals. Below are given the 17 UN SDGs:

Figure 6: UN Sustainable Development Goals

In order to release a Sustainability Report based on GRI principles and submit data to global assessment agencies, like the DJSI assessment done by S&P Global, we need to ensure all 17 UN SDG are ticked by our activities.

E,S,G	Sustainability Report (GRI Based)	Sustainability reporting has no set format, but broadly involves disclosure of a company's environmental, social, and governance (ESG) goals and communicating the company's progress and efforts to reach those goals.	
E,S,G	ESG Assessment (S&P Global - DJSI)	1. The S&P Global Corporate Sustainability Assessment (CSA) is a questionnaire-based process that evaluates a company's sustainability performance. 2. The CSA score is measured on a scale of 0–100, with 100 representing the maximum score.	

Table 1: ESG Reporting and Assessment

And the following three tables 2, 3 & 4 give the ESG Road Map through ISOs and other global certifications so that once we enter this journey, we will be at constantly incremental stages of ESG adherence.

Table 2: Environment Related ISOs & Other Global Certifications

ESG Road Map			
ESG	**Description of the Certificates**	**Requirements**	**UN SDG linkage**
E	ISO 14001: Environmental Management Systems **Certificate Validity:** SSEL, Kadapa - 11.11.2024 SSEL, Naini - 12.07.2027 Indotech, Kanchee-31.12.2026	1. Environment Policy, Objectives and Targets. 2. Environmental Performance Monitoring and Documentations. 3. Environmental Impact Assessment. 4. Compliance obligations record. 5. Emergency preparedness and response. 6. Operational control. 7. Review Commite and Continuous Improvement.	
E	ISO 14064: Greenhouse Gases	1. GHG Inventory. 2. Accurate measurements, Record keeping and Reporting. 3. Emission reduction projects. 4. Third party audit/verification.	
E	ISO 14067:2018 :Greenhouse gases — Carbon footprint of products	1. Define the scope 2. Gather data 3. Calculate the carbon footprint of the product 4. Verify the results and communicate the results.	
E	ISO 14040/14044: Life Cycle Assessment (LCA)	1. Goal and Scope definition. 2. Life Cycle Inventory Analysis (LCI) 3. Life Cycle Impact Assessment (LCIA) 4. Life Cycle Interpretation Note : LCA done for 2 products - Name & Date	
E	ISO 50001: Energy Management Systems	1. Develop an Energy Management Plan(After energy audit completion). 2. Document and Implement the plan. 3. Perform an internal audit. 4. Undergo an external audit.	
E	ISO 14046: Water Footprint	1. Identify the scope 2. Develop a water footprint assessment 3. Conduct a third-party audit	
E	ISO 14068-1:2023 (Known as PAS 2060 untill 2025) : Climate change management — Transition to net zero	1. Commitment to achive Carbon Neutrality. 2. Select subject and boundary 3. Quantify GHG emissions and removals 4. Create a carbon neutrality management plan 5. Reduce and remove GHG emissions 6. Offset 7. Report 8. Claim	
E	ISO 14015:2022 : Environmental management — Guidelines for environmental due diligence assessment	1. Define the Scope 2. Environmental Aspects 3. Environmental Issues 4. Risk Assessments 5. Reccommendations 6. Documentation 7. Verification	

Table 3: Social Related ISOs & Other Global Certifications

ESG Road Map			
ESG	**Description of the Certificates**	**Requirements**	**UN SDG linkage**
S	ISO 45001: Occupational Health and Safety **Certificate Validity:** SSEL, Kadapa - 11.11.2024 SSEL, Naini - 12.07.2027 Indotech, Kanchee-31.12.2026	1. Plam for implementation. 2. Plan for emergency 3. Ensure compliance 4. Conduct a gap analysis 5. Investigate Incidents 6. Maintain training records 7. Undergo regular audits 8. Continuously improve.	
S	ISO 26000:2010 Guidance on Social Responsibility	ISO 26000 is not a certification standard. It is a guidance standard that provides principles and frameworks for organizations to integrate social responsibility into their operations, policies, and practices. This can help demonstrate their commitment to social responsibility and sustainability, but it does not provide a formal certification.	
S	ISO 30415:2021 Human Resource Management – Diversity and Inclusion	1. Implementation of a diversity management model and measurement of the level of integration of gender equality principles in procedures 2. Demonstration of a commitment to valuing diversity and promoting inclusion in the workplace 3. Compliance with the ISO 30415 standard, including documentation and commentary 4. Evidence of ongoing commitment to diversity, equity, and inclusion.	
S	ISO 20400:2017 Sustainable Procurement	1. Develop a sustainable procurement policy and strategy aligned with the standard. 2. Implement sustainable procurement practices throughout the organization and supply chain. 3. Establish metrics and targets to measure and improve sustainable procurement performance. 4. Conduct internal audits and assessments to ensure conformance to the standard.	
S	SA 8000	1. Companies must provide a safe and healthy work environmen 2. Companies must pay employees a living wage that meets all minimum legal standards 3. Companies must not discriminate against employees based on race, caste, national origin, religion, disability, gender, sexual orientation, union membership, or political affiliation 4. Companies must protect the rights of workers to form and join trade unions and to bargain collectively 5. Companies must not engage in corporal punishment, mental or physical coercion, or verbal abuse of workers.	

Table 4: Governance Related ISOs & Other Global Certifications

ESG Road Map			
ESG	**Description of the Certificates**	**Requirements**	**UN SDG linkage**
G	CII GreenCo Rating	1. Employee welfare initiatives 2. Supply chain associates' welfare initiatives 3. Community welfare initiatives 4. Workplace Safety 5. Environmental Sustainability Efforts Beyond the Fence. 6. Innovation	
G	ISO 9001: Quality Management Systems **Certificate Validity:** SSEL, Kadapa - 11.11.2026 SSEL, Naini - 12.07.2026 Indotech, Kanchee-16.09.2025	1. Top Management Commitment 2. Adequate resources 3. Employee Competence 4. Process Management 5. Quality planning 6. Product Service and Design 7. Customer complaint resolutions 8. Corrective actions 9. Documentation and Internal audits 10. Continuous Improvement	
G	ISO 31000:2018 Risk Management	1. ISO 31000 certification is not available, but organizations can demonstrate their competence in risk management by implementing a risk management process based on ISO 31000 principles and integrating it into their key business processes. Individuals can pursue certification through alternative standards or organizations offering risk management certifications. 2. The PECB (Professional Evaluation and Certification Board) offers certification in ISO 31000 risk management, which demonstrates an individual's competence in establishing and implementing a risk management framework based on ISO 31000.	
G	ISO 27001:2022 Information Security Management	1. Establish an Information Security Management System (ISMS) 2. Conduct a risk assessment 3. Develop security policies and procedures 4. Implement risk management processes 5. Review the ISMS's effectiveness 6. Communicate and train employees on the ISMS 7. Perform internal audits	
G	United Nations Global Compact (UNGC)	1. Commit to meeting fundamental responsibilities in the areas of: Human rights, Labor, Environment and Anti-corruption. 2. Publicly express support for the UNGC and its principles. 3. Implement the principles in our operations and business practices. 4. Report annually on our progress and actions taken to implement the principles.	
G	ISO 37001: Anti-Bribery Management Systems	1. Anti-Corruption policy 2. Appoint Compliance Manager 3. Employee training 4. Due diligence 5. Financial controls	
G	ISO 37301:2021 Compliance Management Systems	1. Compliance policy 2. Compliance culture 3. Competence, communication, and awareness 4. Policies, procedures, and controls 5. Due diligence	

1.5 Overview of the scopes

A carbon footprint study is a systematic analysis of the total Green-House Gas (GHG) emissions generated by an organization's activities, including manufacturing, energy usage, transportation, and supply chain operations. This study measures emissions in **carbon dioxide equivalents (CO_2e)**, covering various GHGs such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), Hydrofluorocarbon (HFCs), Perfluorocarbons (PFCs), Sulphur Hexafluoride (SF_6) and Nitrogen trifluoride (NF3).

- **Scope 1 (Direct emissions)**:
  Emissions from operations that are owned or controlled by the reporting company. Examples: Emissions from stationary combustions, Mobile Sources (Owned Vehicle), Refrigeration/AC equipment use, Fire suppression and Purchased gases.
  Scope 1 emissions considered for our organization is shown in below table 1.

Scope 1	
1	Company Owned Vehicles
2	Refrigerant top up
3	CO2 used for refilling into fire extinguisher
4	Gas mixture used in welding (Argon + Carbon dioxide)
5	Acetylene (used in Brazing, Cutting)
6	LPG used in Brazing, Cutting
7	LPG used in Canteen
8	Diesel used in DG sets
9	Biomass used in Canteen (Carbon Neutral)
10	Fuel used in Thermic Fluid Heater

Table 5: Scope 1 Emissions Considered

- **Scope 2 (Indirect emissions)**:
  Emissions from the generation of purchased or acquired electricity, steam, heating, or cooling consumed by the reporting company.
  Examples: Use of purchased electricity, steam, heating, or cooling.

Scope 2	
1	Power obtained from GRID
2	Purchased DG Power
3	Purchased Cooling

Table 6: Scope 2 Emissions Considered

- **Scope 3 (Indirect emissions):**
  All indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.
  Examples: Cradle-to-gate emissions of purchased goods and services, emissions from use of sold products etc.,

  Scope 3 has 15 categories as mentioned in table 3 and the highlighted categories are considered for emission accounting.

Scope 3			
Category	**Upstream**	**Category**	**Downstream**
C1	Purchased goods and Services	C9	Downstream Transportation & Distribution
C2	Capital goods	C10	Processing of sold products
C3	Fuel & Energy related Activities	C11	Use of Sold products
C4	Upstream Transportation & Distribution	C12	End of life treatment of sold products
C5	Waste Generation	C13	Downstream Leased assets
C6	Business Travel	C14	Franchises
C7	Employee Commute	C15	Investments
C8	Upstream leased assets		

Table 7: Scope 3 Emissions Considered (Highlighted)

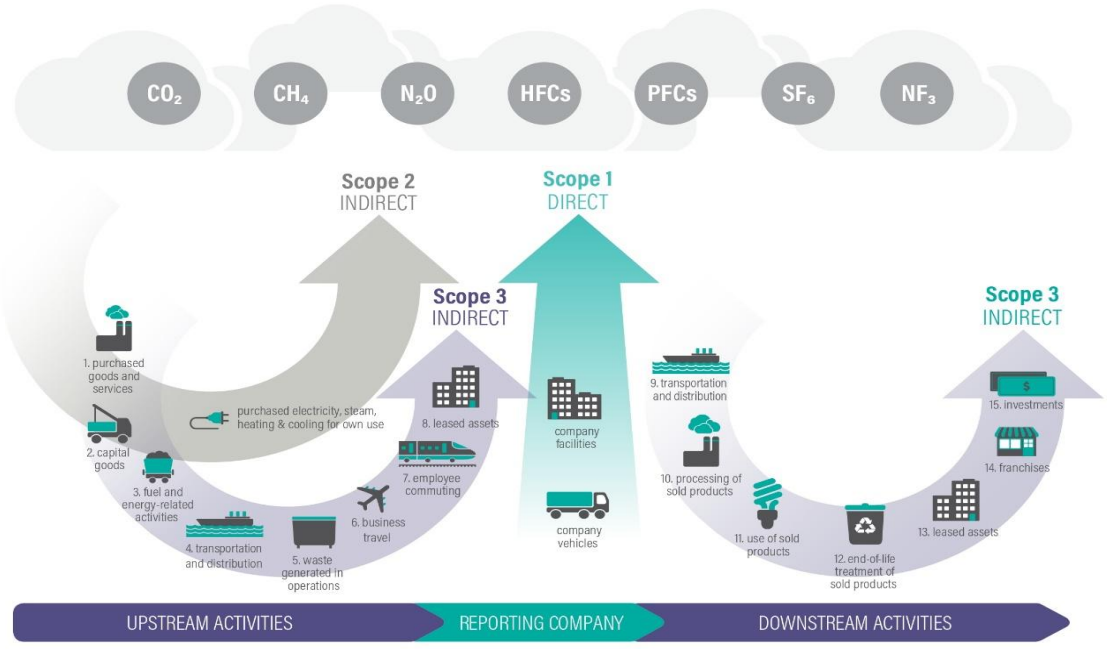


Figure 7: Scope and Emissions across value chain

1.6 Methodology for Calculating Carbon Footprint in tCO2e

1. **Data Collection**: Gathering data on Scope 1, Scope 2 and Scope 3 emissions.
2. **Emission Calculation**: Using standardized protocols such as the Greenhouse Gas Protocol or ISO 14064 to calculate emissions from the collected data.
3. **Analysis and Reporting**: Analysing the results to identify key areas of emission and opportunities for reduction. Reporting the findings in accordance with industry standards.

A carbon footprint study helps organizations:

1. **To Quantify their Carbon Emissions**: This provides a clear picture of where emissions are coming from.
2. **Identify Reduction Opportunities**: By understanding their emission sources, companies can make targeted efforts to reduce their carbon footprint.
3. **Comply with Regulations**: Many governments have implemented emission reduction targets, and a carbon footprint study can help organizations ensure compliance with these policies.

4. **Build Sustainable Business Practices**: Consumers, investors, and governments increasingly demand that companies operate in an environmentally responsible manner.

1.7 Financially Measurable and Quantifiable Benefits

1. **Cost Savings through Energy Efficiency**
    - **How it works**: A carbon footprint study helps organizations and individuals understand where and how energy is being consumed. By pinpointing high-energy-use areas, they can target improvements more effectively. By optimizing energy consumption (e.g., using energy-efficient machinery, reducing waste, and upgrading facilities), organizations can lower energy costs.
    - **Example**: A manufacturing plant switching to LED lighting or improving insulation can reduce electricity consumption by 20-30%, directly translating into reduced utility bills resulted in reduced emissions.
    - **Benefit**: Tangible cost reductions and increased profitability.
2. **Reduction in Operational Costs**
    - **How it works**: Reducing emissions often involves cutting down on unnecessary waste, improving resource management, and reducing the consumption of raw materials.
    - **Example**: A company adopting a lean manufacturing process can reduce material waste, cutting both costs and carbon emissions.
    - **Benefit**: Reduced material costs and lower waste disposal fees.
3. **Carbon Credits and Financial Incentives**
    - **How it works**: Many governments and carbon trading systems offer incentives for reducing emissions. By lowering their carbon footprint, companies can earn carbon credits, which can be sold or traded in carbon markets.
    - **Example**: A company that invests in renewable energy can earn carbon credits that can be sold, generating revenue.
    - **Benefit**: Direct financial gain from carbon credits or tax benefits from government programs promoting lower emissions.
4. **Regulatory Compliance and Avoidance of Fines**
    - **How it works**: Many countries are implementing carbon pricing mechanisms, emissions trading schemes, and stricter regulations on GHG emissions. A carbon footprint study helps organizations stay compliant with these regulations, avoiding penalties.
    - **Example**: In the European Union, non-compliance with emissions targets can lead to heavy fines. A carbon footprint study ensures organizations meet the regulatory thresholds.
    - **Benefit**: Avoidance of legal fees, penalties, and potential shutdowns.
5. **Enhanced Supply Chain Efficiency**
    - **How it works**: By assessing the emissions generated throughout the supply chain, organizations can identify inefficiencies in sourcing, manufacturing, and logistics.
    - **Example**: A company identifying and sourcing raw materials from low-carbon suppliers or using more efficient transportation can reduce both emissions and supply chain costs.
    - **Benefit**: Streamlined operations, reduced transportation and sourcing costs, and a more resilient supply chain.

1.8 Non-Financial Measurable Advantages

1. **Improved Corporate Reputation and Brand Value**
    - **How it works**: Consumers are becoming more conscious of environmental sustainability, and companies that reduce their carbon footprint often receive positive recognition. A carbon footprint study demonstrates a commitment to sustainability.
    - **Example**: Companies like Unilever and Patagonia have gained significant market share and brand loyalty by being recognized as environmentally responsible.
    - **Benefit**: Enhanced corporate image, increased customer loyalty, and differentiation from competitors.
2. **Attracting Eco-conscious Consumers and Investors**
    - **How it works**: Investors and consumers are increasingly aligning their decisions with sustainability goals. By actively reducing carbon emissions, companies attract eco-conscious investors and customers who prioritize environmental responsibility.
    - **Example**: Tesla's focus on reducing its carbon footprint has made it highly attractive to both sustainability-focused investors and customers.
    - **Benefit**: Increased market value, stronger investor interest, and a larger customer base.
3. **Employee Morale and Retention**
    - **How it works**: Employees, particularly younger generations, value working for environmentally responsible companies. A carbon footprint study can lead to programs that engage employees in sustainability efforts.
    - **Example**: Google offers employees incentives for using electric vehicles and participating in sustainability initiatives, improving employee satisfaction.
    - **Benefit**: Higher employee morale, improved retention rates, and a more motivated workforce.
4. **Future-proofing Against Environmental Risks**
    - **How it works**: Climate change can lead to resource shortages, extreme weather, and other disruptions. A carbon footprint study helps organizations adapt to these changes by focusing on sustainable practices that reduce environmental risks.
    - **Example**: A company that relies on water-intensive processes might reduce water usage in anticipation of future water shortages.
    - **Benefit**: Reduced vulnerability to climate-related risks, such as resource scarcity and supply chain disruptions.
5. **Sustainability Leadership and Innovation**
    - **How it works**: Companies that take the lead in reducing emissions often drive innovation. A carbon footprint study pushes organizations to find new ways to reduce emissions, which can result in technological advancements.
    - **Example**: IKEA's commitment to reducing its carbon footprint led to innovations in sustainable furniture design and renewable energy usage.
    - **Benefit**: Positioned as a leader in sustainability, driving innovation and influencing industry trends.

6. **Enhanced Stakeholder Relationships**
    - **How it works**: Stakeholders, including customers, employees, suppliers, and regulators, are increasingly concerned with environmental performance. A carbon footprint study shows a company's commitment to addressing climate change, improving trust and relationships with stakeholders.
    - **Example**: A company reporting a successful carbon reduction strategy to shareholders may receive stronger support and advocacy.
    - **Benefit**: Stronger stakeholder trust and long-term relationship building

1.9 Climate Change: The result of increasing GHG emissions

As the world becomes more conscious of climate change, industries are under increasing pressure to manage their environmental impact. Climate change refers to significant shifts in global temperatures and weather patterns over time. While Earth's climate has naturally fluctuated over millions of years, the current phase of change is largely driven by human activities.

Human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, with global surface temperature reaching 1.1°C above pre-industrial level (1850–1900) in 2011–2020. Global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate.

Human-caused climate change is already affecting many weather and climate extremes in every region across the globe. This has led to widespread adverse impacts on food and water security, human health and on economies and society and related losses and damages to nature and people. Vulnerable communities who have historically contributed the least to current climate change are disproportionately affected.

Climate change represents an urgent and potentially irreversible threat to human societies and the planet. In recognition of this, the overwhelming majority of countries around the world adopted the Paris Agreement in December 2015, the central aim of which includes pursuing efforts to limit global temperature rise to 1.5°C

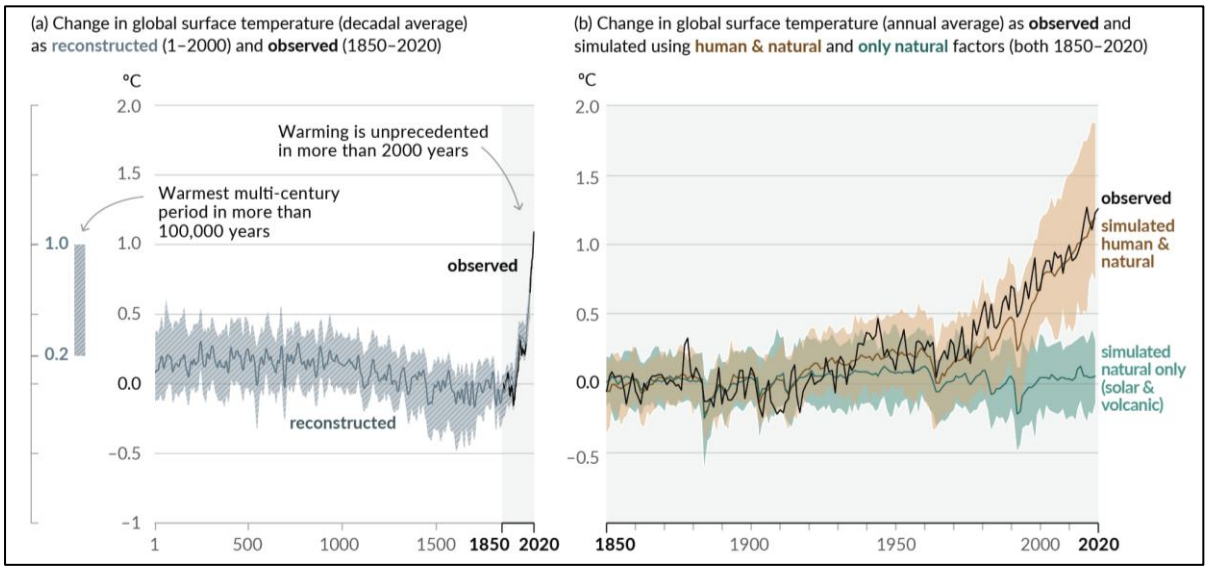


Figure 8: Changes in Global Surface Temperatures Relative to 1850-1900

2. GHG ACCOUNTING FRAMEWORK AND METHODOLOGY

GHG Accounting Framework & Methodology refers to the standards, principles, and processes used to measure and report an organization's greenhouse gas (GHG) emissions. This accounting is essential for companies, governments, and organizations that are working towards climate goals, emissions reductions, or sustainability. It allows entities to track their emissions accurately and transparently.

The most widely accepted framework is provided by the Greenhouse Gas Protocol (GHG Protocol), developed by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). The GHG Protocol divides emissions into three scopes and provides methods for calculating and reporting emissions in each.

In 2016, 92% of Fortune 500 companies responding to the CDP used GHG Protocol directly or indirectly through a program based on GHG Protocol. It provides the accounting platform for virtually every corporate GHG reporting program in the world.

2.1 GHG accounting and reporting principles

Relevance:
Ensure the GHG inventory appropriately reflects the GHG emissions of the company and serves the decision-making needs of users – both internal and external to the company.

Completeness:
Account for and report on all GHG emission sources and activities within the chosen inventory boundary. Disclose and justify any specific exclusions.

Consistency:
Use consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series.

Transparency:
Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.

Accuracy:
Ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable assurance as to the integrity of the reported information.

These principles are intended to underpin all aspects of GHG accounting and reporting. Their application will ensure that the GHG inventory constitutes a true and fair representation of the company's GHG emissions. Their primary function is to guide the implementation of the GHG Protocol Corporate Standard.

2.2 GHG Protocol Corporate Standard

The GHG Protocol Corporate Standard provides standards and guidance for companies and other types of organizations preparing a GHG emissions inventory. It covers the accounting and reporting of the seven greenhouse gases covered by the UNFCCC/Kyoto Protocol.

The standard and guidance were designed with the following objectives in mind:

- To help companies prepare a GHG inventory that represents a true and fair account of their emissions, through the use of standardized approaches and principles.
- To simplify and reduce the costs of compiling a GHG inventory
- To provide business with information that can be used to build an effective strategy to manage and reduce GHG emissions.
- To provide information that facilitates participation in voluntary and mandatory GHG programs.
- To increase consistency and transparency in GHG accounting and reporting among various companies and GHG programs.

Both business and other stakeholders benefit from converging on a common standard. For business, it reduces costs if their GHG inventory is capable of meeting different internal and external information requirements. For others, it improves the consistency, transparency, and understandability of reported information, making it easier to track and compare progress over time.

2.3 Greenhouse Gas Accounting Terminology

1. Greenhouse Gases (GHG)
2. Global warming Potential (GWP)
3. Tonnes of Carbon Dioxide Equivalent (tCO2e)
4. Emission Factors (EF)
5. Activity Data
6. Boundary

2.3.1. Greenhouse Gases

GHGs trap heat radiated from the sun in the atmosphere, warming the planet's surface. Many GHGs occur naturally in the atmosphere, but their increase in concentration from human activities has altered the earth's radiative balance. The GHG Protocol, Corporate Accounting and Reporting Standard covers the accounting and reporting of seven GHGs covered by the Kyoto Protocol which is:

1. Carbon dioxide (CO2)
2. Methane (CH4)
3. Nitrous oxide (N2O)
4. Hydrofluorocarbons (HFCs)
5. Perfluorocarbons (PFCs)
6. Sulphur hexafluoride (SF6)
7. Nitrogen trifluoride (NF3)

2.3.2. Global Warming Potential

GHGs released into the atmosphere have different radiative effects depending on the unique qualities of the gas. The factor describing the radiative forcing impact of one unit of a given GHG relative to one unit of CO2 is known as the Global Warming Potential (GWP).

Since the amount of warming a gas cause over a given period (normally 100 years) varies, GHG emission calculations must account for the GWP of each gas. GWP is an index with CO2 having an index value of 1. The GWP for all other GHGs refers to the amount of warming they cause compared to CO2. For instance, the radiative forcing impact of one unit of methane (CH4) is 27 times more powerful than one unit of CO2.

The GHG Protocol and the majority of accounting standards use GWP values established by the Intergovernmental Panel on Climate Change (IPCC). The IPCC updates GWP values as scientific understanding develops and the sixth assessment report, AR6, contains the most recent values. The complete list of GWP values relative to CO2 is provided by the GHG Protocol.

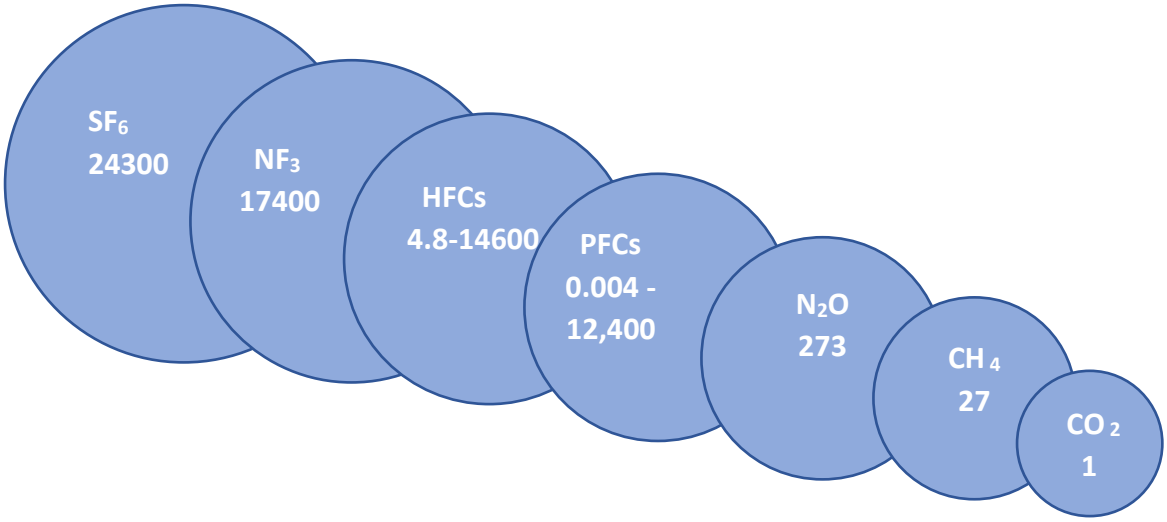


Figure 9: The Global Warming Potential of IPCC recognized GHGs

2.3.3. Tonnes Carbon Dioxide Equivalent (tCO2e)

Tonnes Carbon dioxide equivalent (tCO2e) is the standard unit used to compare and account for emissions from various GHGs based on their global warming potential. For instance, Figure 9 illustrates that CO2 has a GWP of 1 and CH4 (methane) has a GWP of approximately 27 (on a 100-year time horizon). Therefore, for every tonne of CH4 emitted, an equivalent of 27 tonnes of CO2 would be emitted. Since one tonne of a particular GHG is not the same GWP as one tonne of another, this standard unit is a simple way to normalize and express GHGs as an equivalent of tCO2.

2.3.4. Emission Factor

An emission factor is a value used to estimate the emissions of pollutants or greenhouse gases (GHGs) from a particular source or activity. It represents the average emission rate of a pollutant for a given quantity of activity, fuel consumption, or production. Emission factors are typically expressed as the mass of emissions per unit of activity, making it easier to calculate emissions for various processes without direct measurements.

Eg: kgCO2/tonne or kgCO2/kVA or kgCO2/ton-km etc.,

Emission Factors converts activity data into GHG emissions. Based on choice of emission factor, methodology employed to calculate emissions is categorized into Tier 1, Tier 2, and Tire 3. These tiers are based on the level of complexity, accuracy, and data specificity involved in calculating emissions. They are commonly used in IPCC guidelines for GHG inventories and other environmental reporting frameworks, with Tier 1 being the most basic and Tier 3 being the most advanced.

Comparison of the Tiers:

Tier	Data Source	Accuracy	Complexity	Example
Tier 1	Global or regional default emission factors (IPCC or international databases).	Low	Simple	2.68 kg CO_2/litre of diesel (global average).
Tier 2	Country-specific or region-specific emission factors based on local data.	Medium	Moderate	2.65 kg CO_2/litre of diesel (India country-specific).
Tier 3	Uses site specific data, such as engineering models/ continues emissions monitoring system (CEMS) etc, and is the most detailed tier	High	Complex & most accurate	2.60 kg CO_2/litre of diesel (facility-specific, measured).

Table 8: Emission Factor - Tier Comparison

2.3.5. Activity Data

Activity data refers to quantitative information that represents the extent or magnitude of human activities that result in emissions or removals of greenhouse gases (GHGs). It is a critical input used in calculating emissions or removals by applying emission factors. Essentially, activity data measures the scale of an activity that generates emissions (or absorbs CO_2), such as the amount of energy consumed (fuel, electricity etc.,), kilometers traveled, or tons of material processed.

How Activity Data is Used:

Activity data is combined with emission factors to estimate GHG emissions.
The basic formula is:

Emissions = Activity Data × Emission Factor/ GWP

Sources of Activity Data:

Activity data is often sourced from a wide range of records and systems, including:

- Fuel purchase records: For fuel consumption data.
- Utility bills or energy meters: For energy use data.
- Vehicle logs or GPS systems: For transportation-related data.
- Production logs: For industrial or agricultural production data.
- Waste management records: For data on waste generation and treatment.
- National statistics or databases: Provided by government agencies.

Importance of Activity Data:

- Accuracy of Emission Estimates: Accurate and detailed activity data is essential for producing reliable emission estimates. Poor or incomplete activity data can lead to significant errors in GHG inventories.
- Compliance and Reporting: For organizations and countries reporting to frameworks like the Kyoto Protocol, Paris Agreement, or voluntary GHG programs, the quality of activity data is vital for meeting regulatory and reporting requirements.
- Tracking Performance: Activity data allows organizations to track their emission trends over time, assess the effectiveness of emission reduction measures, and set targets.

Challenges with Activity Data:

- **Data Availability:** In some cases, specific data on activities may not be readily available, particularly in developing regions.
- **Data Accuracy:** Inaccurate or incomplete records can lead to errors in emission calculations.
- **Consistency:** Data needs to be collected consistently across years or reporting periods for reliable trend analysis.

2.3.6. Boundary

- **Organizational Boundaries:**
  These determine which operations, facilities, or units within a company are included in GHG accounting.
  Two approaches are used:
  - **Equity Share Approach:** GHG emissions are accounted for based on the organization's equity share in an operation.
  - **Control Approach:** Organizations account for 100% of GHG emissions if they have control over the operations.

- **Operational Boundaries:**

  These define which activities and emissions sources are included under Scope 1, Scope 2 and Scope 3.
  - **Scope 1:** Direct emissions from sources that are owned or controlled by the company (e.g., fuel combustion, company vehicles).
  - **Scope 2:** Indirect emissions from the generation of purchased electricity, steam, heating, and cooling consumed by the reporting entity.
  - **Scope 3:** All other indirect emissions that occur in the value chain (e.g., supply chain, product use, waste disposal).

2.4 Methodology Used

2.4.1 Organizational Boundaries

The organization boundary and list of companies included in this study are shown in below figure.

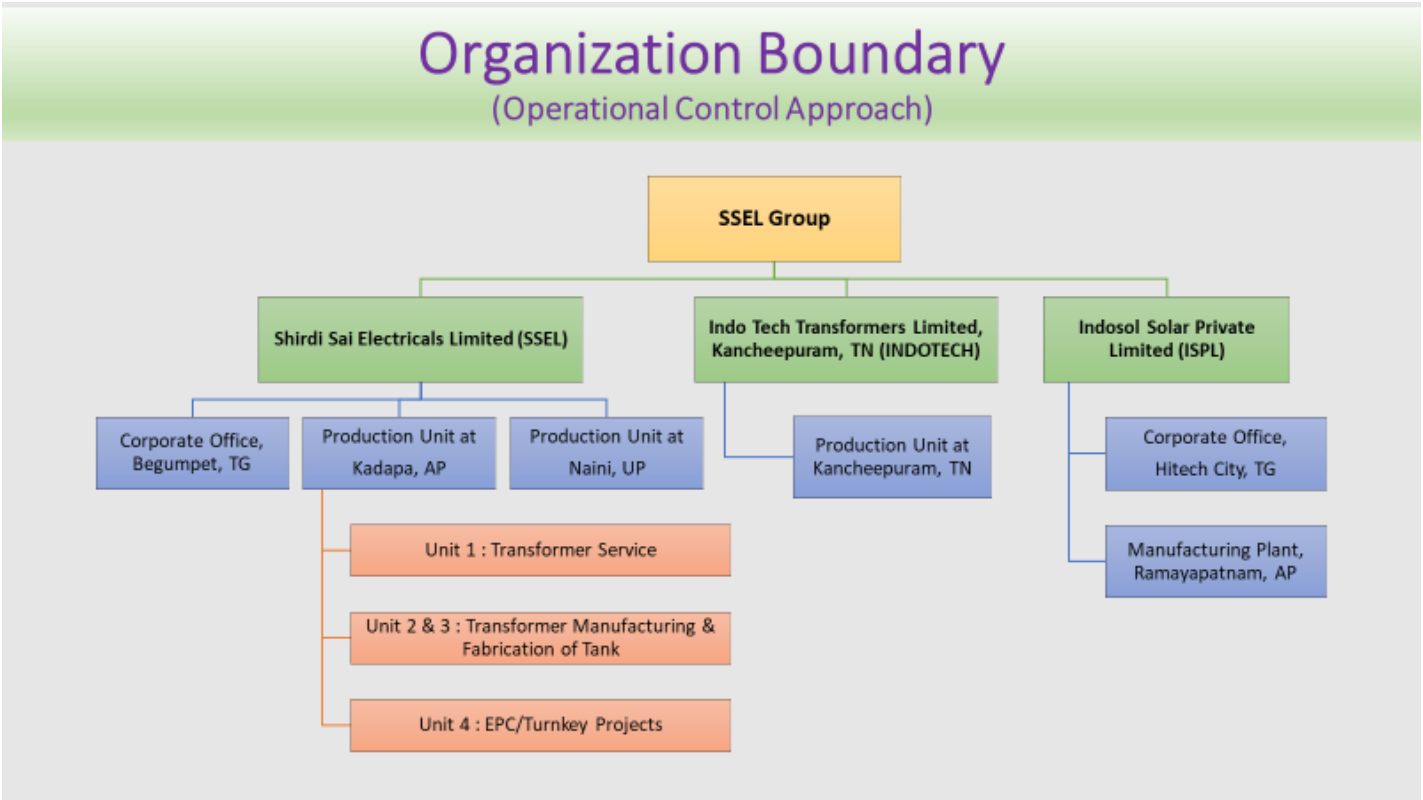


Figure 10: Organization Boundary

2.4.2 Operational Boundaries

The Scope considered under the operational boundary are shown in below table.

SSEL Group Companies Carbon Footprint Operational Boundaries - FY 2024-2025									
Sl. No	Description	Site Name							
		SSEL, Corporate Office	SSEL-Unit 1, Kadapa	SSEL-Unit 2 & 3, Kadapa	SSEL-Unit 4, Kadapa	SSEL, Naini	INDOTECH, Kancheepuram	INDOSOL, Corporate office	INDOSOL, Ramayapatnam
Scope 1									
1	Company Owned Vehciles	X	X	✓	X	✓	X	X	✓
2	Refrigerant top up	✓	✓	✓	X	✓	✓	✓	✓
3	CO2 used for refilling into fire extinguisher	X	✓	✓	✓	✓	✓	X	✓
4	Gas mixture used in welding (Argon+Carbon dioxide)	X	X	✓	X	X	X	X	X
5	Acetylene (used in Brazing, Cutting)	X	X	✓	X	✓	✓	X	X
6	LPG used in Brazing, Cutting	X	✓	✓	X	X	X	X	X
7	LPG used in Canteen	✓	X	✓	X	X	X	X	✓
8	Diesel used in DG sets	X	X	✓	X	✓	✓	X	✓
9	Biomass used in Canteen (Carbon Neutral)	X	X	✓	X	X	X	X	X
10	Fuel used in Thermic Fluid Heater	X	X	X	X	✓	✓	X	X
11	Fuel used in other process	X	X	X	X	X	X	X	✓
Scope 2									
1	Net Power consumed from GRID	✓	✓	✓	✓	✓	✓	✓	✓
2	Purchased DG Power	X	X	X	X	X	X	✓	X
3	Purchased Cooling	X	X	X	X	X	X	✓	X
Scope 3									
1	C3 - Fuel & Energy related Activities	✓	✓	✓	✓	✓	✓	✓	✓
2	C4 - Upstream Transportation & Distribution	X	X	✓	✓	✓	✓	X	✓
3	C5 - Waste Generation	X	✓	✓	✓	✓	✓	X	✓
4	C6 - Business Travel	✓	X	✓	X	✓	✓	✓	X
5	C7 - Employee Commute	✓	X	✓	X	✓	✓	✓	✓
6	C9 - Downstream Transportation & Distribution	X	X	✓	✓	✓	✓	X	X

Table 9: Operational Boundary

2.4.3 Data Collection

Scope 1 & 2 Questionnaire and Scope 3 questionnaire were prepared and shared to all SSEL Group Companies to collect the primary activity data along with the supporting reference documents and the same has been cross verified with entries made in the SAP, Purchase order, Electricity bills available online. Table 15 shows the activity data collected from Apr'24 to Mar'25.

Scope 1 & 2 Activity data collected

Scope 1 & 2 Activity Data -FY 24-25 (H1+H2)										
S.No	Emission Source	UOM	SSEL Corporate office	SSEL Kadapa Unit 1	SSEL Kadapa Unit 2 & 3	SSEL Kadapa Unit 4	SSEL Naini	Indotech	ISPL Corporate office	ISPL , Ramayapatnam
Scope 1										
1	LPG (used in Brazing, Cutting)	kg	0	38	8512	0	0	0	0	0
2	Acetylene (used in Brazing, Cutting)	kg	0	0	812	0	363	1361	0	0
3	Diesel used in DG sets	litres	0	0	60809	0	6963	34750	0	71132
4	Company Owned Vehicles (Fuel operated forklift, dozer, Fire tender, Cars, Buses, Ambulance, Excavators, any vehicles to shuttle									
	Diesel (Car, buses, Ambulances)	litres	0	0	84458	0	0	0	0	17841
	Petrol (Car, buses, Ambulances)	litres	0	0	210	0	0	0	0	82
	Diesel (hydras, tractor cranes, forklifts tractors)	litres	0	0	65700	0	16676	0	0	20918
	Petrol (hydras, tractor cranes, forklifts tractors)	litres	0	0	0	0	0	0	0	0
5	LPG used in Canteen	kg	95	0	37278	0	0	0	0	4978
6	Biomass used in Canteen (Wood)	kg	0	0	94567	0	0	0	0	0
7	Refrigerant used/refilled									
	R 22	kg	32	0	25	0	32	0	0	15
	R 32	kg	0	0	26	0	0	0	0	3
	R 410 A	kg	35	0	25	0	0	0	0	0
	R 134A	kg	0	0	0	0	90	0	0	186
8	CO_2 used for refilling into fire extinguisher	kg	0	0	333	0	55	0	0	0
9	Gas mixture used in welding (Argon+Carbon dioxide)	kg	0	0	187987	0	0	0	0	0
10	Fuel used in Thermic Fluid heater								0	0
	Furnace Oil	kg	0	0	0	0	0	198640	0	0
	Biomass	t	0	0	0	0	647.19	0	0	0
	HSD	litres	0	0	0	0	0	0	0	0
11	Fuel used in Other Process	litres	0	0	0	0	0	0	0	0
Scope 2										
1	Net Power consumed from GRID	kWh	65234	144350	16996112	69135.00	4E+06	2210882	146157	876170
2	Renewable energy export to GRID	kWh	0	0	83103	0	0	357284	0	0
3	Renewable energy consumption (On Site)	kWh	0	0	1306265	0	0	0	0	0
4	Purchased DG Power	kWh	0	0	0	0	0	0	474	0
5	Purchased Cooling Capacity	kWh	0	0	0	0	0	0	426770	0

Table 10: Scope 1 & 2 Activity data (FY 24-25)

Scope 3 Activity data collected:

We have collected the Scope 3 activity data for 6 categories namely category 3 fuel and energy related activities, category 4 upstream transportation and distribution, category 5 waste generation, category 6 business travel, category 7 employee commuting and category 9 downstream transportation and distribution.

2.4.4 Assumptions and Limitations

SSEL Corporate Office:

- **The electricity bill for the SSEL corporate office for FY 24-25 (H1) is not available in legible manner** except for Aug'24. Only the month-wise payment details are available. Based on the Aug 2024 electricity bill, we determined the unit price as ₹11.60/kWh and calculated the electricity consumption for FY 24-25 (H1) as 35406 kWh. **In H2 data Oct 2024 electricity bill is not available instead amount paid is available**. Based on the Nov'24 to Mar'25 electricity bill, we determined the unit price as ₹11.95/kWh and calculated the electricity consumption for Oct'24 (5938 kWh).

- In Scope 3, we have taken 3 categories only, which is category 3, 6 & 7. Remaining categories are not relevant to corporate office.

- **Under Scope 3, Category 6 (business travel), train and bus travel data were not included due to the unavailability of data**. For Air travel wherever data was available the distance flown was not calculated as crow flies but with knowledge of stopover and via routes.

- For Scope 3, Category 7 (employee commute), a common survey was conducted for both the SSEL corporate office and the ISPL corporate office on Jul'24. A total of 30 out of 70 employees from the SSEL corporate office participated. Based on this, we extrapolated the emissions for the remaining employees.

ISPL Corporate Office:

- Since ISPL corporate office purchase DG Power and Cooling for office space it will come under scope 2. Only split ACs are under scope 1, and during FY 24-25, no refrigerant top-up was done. Cooking for employees are outsourced and induction stove were used in pantry. Therefore, the Scope 1 emissions for the ISPL corporate office are zero.

- Under Scope 2, to calculate the purchased DG power and cooling capacity, we assumed the Diesel Generator generate 3 kWh electricity per liter of diesel consumed, and the Coefficient of Performance (COP) of the chiller is 2.842 (Output kWh / Input kWh) for emission calculations.
- In Scope 3, we have taken 3 categories only, which is category 3, 6 & 7. Remaining categories are not relevant to corporate office.

- **Under Scope 3, Category 6 (business travel), train and bus travel data were not included due to the unavailability of data.**

  For Air travel wherever data was available the distance flown was not calculated as crow flies but with knowledge of stopover and via routes.

- For Scope 3, Category 7 (employee commute), a common survey was conducted for both the SSEL corporate office and the ISPL corporate office. A total of 75 out of 92 employees from the ISPL corporate office participated. Based on this, we extrapolated the emissions for the remaining employees.

SSEL Unit 1, Kadapa:

- No CO2 refilling was done in any of the fire extinguishers during the period from Apr'24 to Mar'25.

- Under Scope 3, Category 4 (Upstream T&D) and Category 9 (Downstream T&D): Logistics for the service unit are managed solely by Unit 2. So, the activity data received from Units 2+3 Kadapa includes this activity data, and due to the complexity of separating it, the associated emissions are included in Units 2+3 Kadapa emissions.

- Under Scope 3, Categories 6 (Business Travel) and 7 (Employee Commuting), the activity data received from Units 2+3 Kadapa includes unit 1 and unit 4, Kadapa data, and due to the complexity of separating it, the associated emissions are included in Units 2+3 Kadapa emissions.

- As a first, we have commenced gathering breakup of waste material that has been reported under scope 3 category 5 - under Waste Generation in Operation. In H1, the cotton waste and cotton hand gloves waste generated in site was utilized in the process for heating purpose. In H2 Copper and Aluminum waste were generated and same is sent to recycling vendor and the associated emissions were calculated and accounted under this category.

SSEL Unit 2 & 3, Kadapa:

- Under Scope 3 Category 4 (Upstream T&D), the site team has input value as 1kg per unit of any item irrespective of different units of measurement such as kg, liters, meter, square meter, cubic meter, ton, roll, bag, set. The actual weight of any single/unit of item has not been captured in SAP nor maintained by the stores department except bulk weight in case of some very specific items. A few examples of SAP entry are captured below.

		FY 24-25 (H1)			
Material no	Material Name	Actual received qty		Conversion	
		Values	UOM	Values	UOM
18	Cable ties	86,500	Nos	78	Tonne
24	Clamping Ring	826997	Nos	827	Tonne
55	Gaskets (ZEROLEAK)	278259	Nos	278.26	Tonne

Material no.	Material Name	FY 24-25 (H2) Actual qty received Values	UOM	Conversion Values	UOM
10	**SSE seal stickers**	**52,800**	**Nos**	**52.8**	**Tonne**
20	**Nylon Ring**	**19,000**	**Nos**	**19**	**Tonne**
70	**Non-Adhesive Cotton Tapes 25 mm**	**56000**	**Nos**	**56**	**Tonne**

Table 11: Example of Unit Conversion used

Hence, in order to place on record the actual weight of the upstream materials, strenuously researched data was compiled based on an online search giving specific names and variants of all the 8000+ unique materials and capturing their weight as given in their websites/sales brochures. This exercise was carried out by the ESG department spending almost 200 manhours resulting in the below brief from the analysis of data compiled.

Sr. No.	Weight per unit (kg)	Percentage
1	x>50	0.12%
2	50>x≥25	0.06%
3	25>x≥10	0.38%
4	10>x≥5	0.57%
5	5>x≥1	50.89%
6	1>x≥0.5	16.84%
7	0.5>x≥0.25	3.09%
8	x<0.25	28.05%

Table 12 Approximate weights of items per unit

The total weight of 6,07,46,295 items was calculated by the ESG team using the above research which totals to 80,729 tonnes. However, as the distance travelled details for 5.6% of this weight was not available, emissions data was calculated on 76,175 tonnes only.

Reporting sanctity has to be maintained for input values even at micro levels to arrive at reporting which can stand the test of third-party verification and certifications. This regularly being communicated for implementation to the location teams for implementations.

SSEL Unit 4, Kadapa:

- This unit does not have any split AC, HVAC system, Combustion activities. The site has 4 fire extinguishers which have not been refilled with CO2 this year. Company owned vehicle, canteen facility is a part of Unit 2 & 3 data, so the scope 1 emissions for this unit is zero.

- Under Scope 3, Category 6 (Business Travel), the 61 employees of unit 4 use their own vehicles to commute to various work locations as needed. Due to the non-availability of this data and the minimal emissions resulting from this

activity, we have excluded this category for Unit 4. **We have asked unit 4 to maintain this data henceforth, even if minimal travel happens under this category.**

- Under Scope 3, Category 7 (Employee Commute), the activity data received from Units 2+3 Kadapa includes this information, and due to the complexity of separating it and small number of employee count, the associated emissions are included in Units 2+3 Kadapa emissions.

SSEL Naini:

- Under Scope 3, Category 6 (Business travel), Only air travel was included in H1 data. Train, car and bus travel data were not included due to the unavailability. However, air, train and bus travel data were provided in H2.

  For Air travel, wherever data was available the distance flown was not calculated as crow flies but with knowledge of stopover and via routes. **The emission is calculated based on the limited data received from site team.**

- Under Scope 3, Category 4 (Upstream T&D), only seven major raw materials purchase details are provided for emission calculations: Copper, CRGO, Diesel, Insulation, MS tank, Yoke clamp, and Transformer oil. This data has considered sufficient to go ahead with emission calculations.
  Uniformity of reporting needs to be implemented and henceforth entire raw material purchase data will be provided similar to data provided by Unit 2&3 Kadapa.

INDO TECH, Kancheepuram:

- Under Scope 3, Category 4 (Upstream T&D), only ten major raw materials are considered for emission calculations: Copper, CRGO, Tank, Radiator, Oil, OLTC, Marshalling box/RTCC, OIP & RIP Bushing, and Insulation. This data has considered sufficient to go ahead with emission calculations as accounts for 80% emissions.

- In the case of some materials where value was mentioned in quantity (nos), ESG team has calculated the weight assuming the approximate average weight of the goods and converted the same into tonnes.

  Uniformity of reporting needs to be implemented and henceforth entire raw material purchase data will be provided similar to data provided by Unit 2&3 Kadapa.

ISPL, Manufacturing Plant, Ramayapatnam:

- **Reference document for R22 Refrigerant refilling qty of 18 kg is not yet received so data has been accepted based on report from EHS department.**

- Under Scope 3, Category 6 Business Travel: All air travels done by the employees are accounted under ISPL Corporate office. The distance flown was not calculated as crow flies but with knowledge of stopover and via routes.

Train and bus travel data were not included due to the unavailability. **Location team has been intimidated that the data for other modes of business travel also needs to documented and provided for emission calculations.**

2.4.5 Global Warming Potential Used

GHGs released into the atmosphere have different radiative effects depending on the unique qualities of the gas. The factor describing the radiative forcing impact of one unit of a given GHG relative to one unit of CO2 is known as the Global Warming Potential (GWP).

Since the amount of warming a gas cause over a given period (normally 100 years) varies, GHG emission calculations must account for the GWP of each gas. GWP is an index with CO2 having an index value of 1. The GWP for all other GHGs refers to the amount of warming they cause compared to CO2. For instance, the radiative forcing impact of one unit of methane (CH4) is 27 times more powerful than one unit of CO2.

The GHG Protocol and the majority of accounting standards use GWP values established by the Intergovernmental Panel on Climate Change (IPCC). The IPCC updates GWP values as scientific understanding develops and the sixth assessment report, AR6, contains the most recent values. The complete list of GWP values relative to CO2 is provided by the GHG Protocol which is shown in table 13. Currently we are using AR6 values starting from FY24-25.

Major GHG Gases	Chemical Formula	AR5 (GWP Values)	AR6 (GWP Values)
Carbon dioxide	CO_2	1	1
Methane – non-fossil	CH_4	28	27
Methane – fossil	CH_4	30	29.8
Nitrous oxide	N_2O	265	273
Hydrofluorocarbons	HFCs	<1 to 12400	<1 to 14600
Perfluorocarbons	PFCs	<1 to 11100	<1 to 12400
Sulfur hexafluoride	SF6	23500	24300
Nitrogen trifluoride	NF_3	16100	17400

Table 13: IPCC Global Warming Potential (GWP) values relative to CO2

Global Warming Potentials				
S.No	**Emission Source**	**Emission Factors**	**UoM**	**Source**
8	R- 22	1960	kg CO2e/kg	IPCC (AR6)
9	R- 32	771	kg CO2e/kg	IPCC (AR6)
10	R- 410	2255.5	kg CO2e/kg	IPCC (AR6)
11	R-134a	1530	kg CO2e/kg	IPCC (AR6)

Table 14: Global Warming Potentials (GWP) values of refrigerants used for calculations

2.4.6 Emission Factor Used

The following emission factors are considered for the emission calculations.

Emission Factors				
Scope 1 & 2				
S.No	**Emission Source**	**Emission Factors**	**UoM**	**Source**
1	Diesel/HSD	2.925	kgCO2e/l	GHG Protocol - 2025
2	LPG Consumption	2.992	tCO2e/t	GHG Protocol - 2025
3	FO/Residual fuel oil	3.143	kgCO2e/l	GHG Protocol - 2025
4	Petrol	2.303	kgCO2e/l	GHG Protocol - 2025
5	CNG/Natural Gas	2.701	tCO2e/t	GHG Protocol - 2025
6	Acetylene	3.380	kgCO2/kg	Derived
7	Biomass (Wood- Non-CO2)	0.143	kgCO2e/kg	GHG Protocol 2025
8	Grid Electricity 2023-24 (v20)	0.727	tCO2/MWh	Central Electricity Authority of India
Scope 3				
Category	**Emission Source**	**Emission Factor**	**UOM**	**Source**
C3	Petrol	0.6066	kgCO_2e/Ltr	DEFRA -2025
	Biomass	0.0304	T CO_2e/T	DEFRA -2025
	Diesel	0.6241	kgCO_2e/Ltr	DEFRA -2025
	LPG	0.3493	kgCO_2e/kg	DEFRA -2025
	FO	0.7149	kgCO_2e/Ltr	DEFRA -2025
	Acetylene	4.4334	kgCO_2e/kg	IPCC (AR6)
	Grid electricity WTT	0.1675	TCO_2e/MWh	WRI
	Electricity T&D 2023-24	19.16	%	India Climate & Energy Dashboard
	Grid Electricity 2023-24 (v20)	0.727	tCO2/MWh	Central Electricity Authority of India
	Refrigerant - R22	4.2600	kgCO2e/kg	MDPI
	Refrigerant - R32	10.0100	kgCO2e/kg	MDPI
	Refrigerant - R410A	10.3500	kgCO2e/kg	MDPI
	Refrigerant - R134A	10.4800	kgCO2e/kg	MDPI
C5	Copper (Recycle)	0.1800	t CO2/ts	EPA – 2025
	Aluminium (Recycle)	0.0400	t CO2/ts	EPA – 2025
	Food Waste (Feeding to livestock)	0.0670	t CO2/ts	EPA – 2025
	Mixed Paper (Winding Core Paper) (Recycle)	0.0700	t CO2/ts	EPA – 2025
	Mixed Metals (Empty Oil Barrels, MS Scrap etc.,)	0.2300	t CO2/ts	EPA – 2025
	Mixed Electronics	0.0200	t CO2/ts	EPA – 2025
	Corrugated Containers (Recycle)	0.1100	t CO2/ts	EPA – 2025
	CRGO	0.1100	t CO2/ts	EPA – 2025
	Structural Steel	0.0400	t CO2/ts	EPA – 2025
	Cotton Hand Gloves (Incineration)	0.0047	t CO2/t	DEFRA -2025
	Paint Tins Waste (Incineration)	0.0047	t CO2/t	DEFRA -2025

	Rubber	0.0047	t CO2/t	DEFRA -2025
	Process Waste, Residues and sludge (Landfill)	0.5205	t CO2/t	DEFRA -2025
	Used/Spent Oil (Recycle)	0.0047	t CO2/t	DEFRA -2025
	Repair job - used / Spent oil	0.0047	t CO2/t	DEFRA -2025
	Waste & Residues containing oil	0.0047	t CO2/t	DEFRA -2025
	Spent Solvent	0.0047	t CO2/t	DEFRA -2025
	General Waste	0.0047	t CO2/t	DEFRA -2025
	Wood	0.0047	t CO2/t	DEFRA -2025
	Discarded container	0.0047	t CO2/t	DEFRA -2025
C6	Air	Default	kg CO2/pax-km	ICAO Tool
	Rail	0.0078	kg CO2e/pax-km	India GHG Program
	Road - Car - Petrol Sedan <1600 cc	0.1530	kg CO2e/km	India GHG Program
	Road - Car - Diesel MUV <2500 cc	0.2160	kg CO2e/km	India GHG Program
	Road - bus	0.0152	kg CO2e/pax-km	India GHG Program
	Auto	0.1322	kg CO2e/pax-km	India GHG Program
	Maxi Van	0.226	kg CO2e/pax-km	India GHG Program
C7	Car-Sedan(<1600CC)	0.1410	kg CO2e/km	India GHG Program
	Motorcycle(<135CC)	0.0356	kg CO2e/km	India GHG Program
	Bus	0.0152	kg CO2e/pax-km	India GHG Program
	Rail	0.0078	kg CO2e/pax-km	India GHG Program
C4 & C9	Road - LDV(<3.5T)	0.0877	kg CO2e/ton-km	India GHG Program
	Road - MDV(<12T)	0.0741	kg CO2e/ton-km	India GHG Program
	Road - HDV(>12T)	0.0615	kg CO2e/ton-km	India GHG Program
	Rail	0.0100	kg CO2e/ton-km	India GHG Program
	Air	1.0990	kg CO2e/ton-km	DEFRA -2025
	Sea- Bulk Carrier cargo ship	0.0035	kg CO2e/ton-km	DEFRA -2025

Table 15: Emission Factor used for calculations

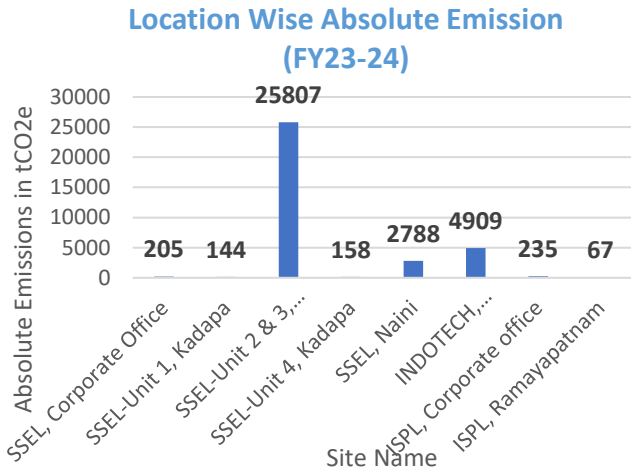
3. Brief Recap of Sustainability in SSEL Group

A groupwide Carbon Footprint Baseline Study was conducted for the year 2023-24 and the Report was released in October 2024. In the SSEL Group Carbon Footprint Baseline Study FY23-24 (henceforth called as Baseline Study), we have listed out Emission reduction opportunities including cost reduction under chapter 4, 4.2 & 4.4 (SSEL Group Carbon Footprint Baseline Study - FY23-24 by ESG Department.pdf). The respective owners of process in each of the Transformer plant locations at SSEL Kadapa & Naini and Indo-tech Kancheepuram are to study the suggestions, and workout implementation processes. In case any support is required not only the ESG department but external experts/consultant can be reached to strategically implement the Emission reduction plan.

Some more highlights from the Baseline study are:

3.1 Location Wise Absolute Emission Intensity

Location wise absolute emission and Emission Intensity of transformer manufacturing plant are shown in figure 11 & 12 Respectively. For complete information and data of Scope 1, 2 & 3 Emissions of each location and Transformer business related comparative Emissions, you may refer to Chapter 3 (SSEL Group Carbon Footprint Baseline Study - FY23-24 by ESG Department.pdf).



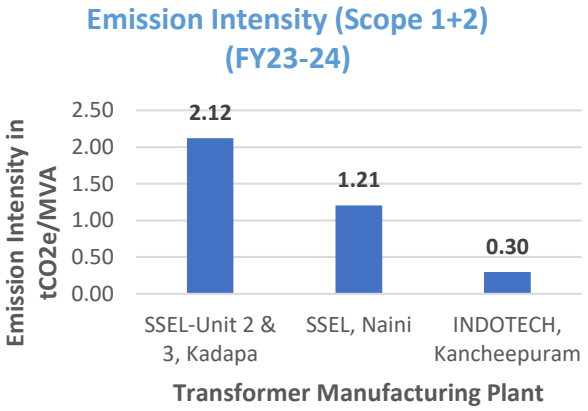


Figure 11: Location Wise Absolute Emission in tCO2e *Figure 12: Emission Intensity of Transformer Manufacturing Plant*

3.2 Recommendation Resulting in Emission & Cost Reduction

Under Emission reduction we have worked out two reduction suggestion which include the financial implications, Investment, ROI and footprint reduction specifics.

3.2.1 Switch from 3-ton Diesel Fork lift to Electric Fork lift

The first suggestion is with respect to 15 nos. diesel run forklift in Unit 2&3 Kadapa which currently accounts for 134 tCO2e under scope 1, i.e., approximately 8.95 tCO2e per forklift. If they are converted to renewable electricity run forklift, we reduce not just GHG emission to zero from 134 tCO2e but also save on fuel by Rs.3,01,437 per year after the payback period of 4.3 years with an initial investment of Rs. 13 Lakhs. It is pertinent to note here that at the rate of 304 working days per

year, each of the 15 forklift runs on an average only for 2 h 45 minutes per day, however we have 15 forklift operators on our rolls.

SSEL's Naini plant has one diesel forklift, and replacing it with an electric forklift powered by renewable energy, with an investment of Rs. 12.65 lakhs, will reduce GHG emissions from 6.94 tCO2e to zero. Additionally, it will result in fuel savings of Rs. 2,11,825 per year after a payback period of 5.97 years.

Given below in table 16 are the details of the same.

Cost Reduction - Switch from 3-ton Diesel Fork lift to Electric Fork lift			
Description	**UOM**	**SSEL Unit 2&3 Kadapa**	**SSEL Naini**
One Diesel Forklift (FY 23-24)			
Operating hour	h/year	835	648
Diesel consumption	L/year	3339	2590
Diesel Cost@Rs.97/L for Kadapa & Rs.88.51 for Naini	Rs/year	323889	229241
GHG Emission	tCO2e	8.95	6.94
1. Proposed Conversion - Electric Forklift Powered by Grid Electricity			
Electricity Consumption	kWh/annum	10017	7770
Electric Cost @Rs.5.85 for Kadapa & Rs.7.1 for Naini	Rs/year	58601	55167
Total Investment (CAPEX Electric forklift)	Rs	1106000	1106000
GHG Emission	tCO2e	7.17	5.56
Annual Net Saving on fuel	**Rs/year**	**265289**	**174074**
GHG Emission Reduction	**tCO2e**	**1.78**	**1.38**
Payback Period	**Year**	**4.17**	**6.35**
ROI	**%**	**23.99**	**15.74**
2. Proposed Conversion - Electric Forklift Powered by Renewable Electricity			
Capacity (Capacity = No of Module *550 wp) 9 module / 256 sq.ft for Kadapa & 7 module / 186 sq.ft for Naini	kW	5	4
Roof top Solar Power (PV Cost + Invertor + Installation)	Rs	194166	158909
Maintenance cost / instead of fuel	Rs/year	22452	1264909
Total Investment (CAPEX Electric forklift + Roof top Solar + Maintenance)	Rs	1300166	1264909
Annual Net Saving on fuel	**Rs/year**	**301437**	**211825**
GHG Emission Reduction	**tCO2e**	**8.95**	**6.94**
Payback Period	**Year**	**4.31**	**5.97**
ROI	**%**	**23.18**	**16.75**

Table 16: Costing for switching from current Diesel forklift to Electric forklift + Renewable power

An example of cost reduction is worked out in detail in the table 16. This is with respect to 15 nos. diesel run forklift in Unit 2&3 Kadapa which currently accounts for 134 tCO2e under scope 1, i.e., approximately 8.95 tCO2e per forklift. If they are converted to renewable electricity run forklift, we reduce not just GHG emission to zero from 134 tCO2e but also save on fuel by Rs.3,01,437 per year after the payback period of 4.3 years with an initial investment of Rs. 13 Lakhs. It is pertinent to note here that at the rate of 304 working days per year, each of the 15 forklift runs on an average only for 2 h 45 minutes per day, however we have 15 forklift operators on our rolls.

SSEL's Naini plant has one diesel forklift, and replacing it with an electric forklift powered by renewable energy, with an investment of Rs. 12.65 lakhs, will reduce GHG

emissions from 6.94 tCO2e to zero. Additionally, it will result in fuel savings of Rs. 2,11,825 per year after a payback period of 5.97 years.

3.2.2 Modification of DG set to run on dual fuel

The second suggestion is modification of DG set to run on dual fuel. As shown in table 17, modification of DG set to run on dual fuel can be reduced about Rs.20 Lakhs/annum, Rs.1.34 Lakhs/annum and Rs.7.21 Lakhs/annum in unit 2&3 Kadapa, SSEL Naini, and Indo Tech respectively as per our current expenditure, while investing approx. Rs.6.6 Lakhs for Dual Fuel Kit per DG set. Also, GHG emission reduction of 37 tCO2e, 5.18 tCO2e and 18.82 tCO2e respectively. To further reduce GHG emission, switch to Biogas or Biofuel based on availability for up to 80 to 90 % emission reduction.

Costing - DG Set Modification (Dual Fuel DG set)				
Description	**UOM**	**Unit 2&3 Kadapa**	**Naini**	**Indo Tech**
Before Modification				
Diesel Consumption	L/year	71360	9910	36000
Diesel Cost @ Rs.97/L for Kadapa, Rs.88.51/L for Naini and Rs. 93/L for Indo Tech	Rs/year	6921954	877134	3348000
GHG Emission	tCO2e	191.25	26.56	96.48
After Modification				
Diesel (35.8 MJ/L) Consumption	L	21408	2973	10800
CNG (50 MJ/kg) Consumption (70 % of diesel is replaced with CNG)	kg	35766	4967	18043
Diesel Cost @ Rs.97/L for Kadapa, Rs.88.51/L for Naini and Rs. 93/L for Indo Tech	Rs/year	2076586	288381	1047600
CNG Cost @ Rs.79/L for Kadapa, Rs.91.5/L for Naini and Rs. 87.5/L for Indo Tech	Rs/year	2825499	454471	1578780
Total Fuel Cost	Rs/year	4902085	742852	2626380
GHG Emission from Diesel	tCO2e	57.37	7.97	28.94
GHG Emission from CNG	tCO2e	96.57	13.41	48.72
Total GHG Emission	tCO2e	153.94	21.38	77.66
No of DG set	Nos.	9	2	4
Cost of Dual Fuel Kit	Rs	5400000	1200000	2400000
Cost of Dual Fuel Kit installation	Rs	540000	120000	240000
Total Investment	Rs	5940000	1320000	2640000
Cost Savings	**Rs/year**	**2019869**	**134282**	**721620**
Emission Reduction	**tCO2e**	**37.30**	**5.18**	**18.82**
Payback Period	**Year**	**2.94**	**9.83**	**3.66**
ROI	**%**	**34.00**	**10.17**	**27.33**

Table 17: Costing for DG set modification to run on dual fuel

The Maharashtra States Pollution Control Board has made it mandatory to convert for all Diesel Generators to Dual Fuel (Gas and Diesel) or retrofit them with an Emission Control Device (RECD). Some other state pollution control board also made it mandatory to convert DG set to run on dual fuel, which is Gujarat, Karnataka & Goa.

As shown in table 17, modification of DG set to run on dual fuel can be reduced about Rs.20 Lakhs/annum, Rs.1.34 Lakhs/annum and Rs.7.21 Lakhs/annum in unit 2&3 Kadapa, SSEL Naini, and Indotech respectively as per our current expenditure, while investing approx. Rs.6.6 Lakhs for Dual Fuel Kit per DG set. Also, GHG emission reduction of 37 tCO2e, 5.18 tCO2e and 18.82 tCO2e respectively. To further reduce GHG emission, switch to Biogas or Biofuel based on availability for up to 80 to 90 % emission reduction.

3.3 Scope Wise Recommendation for Emission Reduction

3.3.1 Scope 1 recommendation

Table 18: Emission Reduction Recommendations Under Scope 1

Sl.No	Site Name	Focus Area	Recommendations	Expected emissions reduction in tCO2e
1.	SSEL Unit 2 & 3, Kadapa	Company owned vehicle and Canteen Facilities	1. Outsource non-core activities such as Company owned transport used for Employee commute & Logistics activities and Canteen facilities to 3rd party venders.	432
		Forklift	Replace diesel forklift with Electric forklift powered by Renewable Energy.	134.25
		DG Set	1. Modify DG set to run on dual fuel or biodiesel or biogas or other biofuels. 2. Improve combustion efficiency by commencing the performance study.	37.25
2.	SSEL, Naini	Forklift	Replace diesel forklift with Electric forklift powered by Renewable Energy.	6.94
		DG Set	1. Modify DG set to run on dual fuel or biodiesel or biogas or other biofuels. 2. Improve combustion efficiency by commencing the performance study.	5.31
		Thermic Fluid Heater:	1. Improve combustion efficiency by commencing the performance study. 2. Reduce heat losses with proper insulation.	8.24

			3. To **achieve zero emissions** - If budget allows the highly recommended solution would be switching to electricity from renewable energy source to heat the thermic fluid heater.	
3	INDO TECH, Kancheepuram	DG Set	1. Modify DG set to run on dual fuel or biodiesel or biogas or other biofuels. 2. Improve combustion efficiency by commencing the performance study.	19.30
		Thermic Fluid Heater:	1. Improve combustion efficiency by commencing the performance study. 2. Reduce heat losses with proper insulation. 3. Switch the fuel from furnace oil to biomass 4. To **achieve zero emissions** - If budget allows the highly recommended solution would be switching to electricity from renewable energy source to heat the thermic fluid.	345.22
Total Scope 1 Emission Reduction per annum at current production output				**988 tCO2e**

3.3.2 Scope 2 recommendations

Table 19: Emission Reduction Recommendations Under Scope 2

Sr. No.	Site Name	Focus Area	Recommendations	Expected emissions reduction
1.	SSEL Unit 2 & 3, Kadapa (Approximate emission Reduction will be 3696 tCO2e)	Energy Efficiency	Conduct detailed energy audit and machinery efficiency study based on which generally 20 to 30 % energy conservation can be implemented.	2957 tCO2e @ 20% reduction
		Onsite Renewable Energy generation (Solar)	1. Clean panels regularly to remove dust, dirt, and debris that can block sunlight. 2. Ensure proper orientation and tilt angle and use solar tracking system. 3. Increase the capacity of onsite renewable energy generation (Currently Unit 2 & 3 Kadapa plant has the total of 2 MW rooftop solar power generation).	Even if 5% Renewable Energy (RE) addition happens totally against all these four options reductions of 739
		Offsite Renewable	Generate electricity from renewable energy in offsite and wheeling it.	

		Energy generation		tCO2e can be achieved.
		Offset Mechanism options	1. Purchase of renewable energy certificates (RECs) 2. Purchase renewable energy through power purchase agreement (PPAs) 3. Purchase renewable energy directly from the generator through open access policy.	
		Carbon Credits	1. Invest in projects that significantly reduce emissions can generate carbon credits under various carbon market mechanisms. 2. Tree plantation/afforestation and registration of project under voluntary carbon standards (VCS) – VERRA – Gold standards etc., for carbon credits. 3. Installation of Carbon capture technology.	
2.	SSEL, Naini (Approximate emission Reduction will be 218 tCO2e)	Energy Efficiency	Conduct detailed energy audit and machinery efficiency study based on which generally 20 to 30 % energy conservation can be implemented. As Naini plant has shown reduced scope 2 emission already it might be result of inherited efficiency practices, hence assumption of 10 to 15 % reduction is taken in this case.	145 tCO2e @10% reduction
		Onsite Renewable Energy generation	Explore the rooftop solar power generation or any other kind of solar power farming.	Even if 5% Renewable Energy (RE) addition happens totally against all these four options reductions of 73 tCO2e can be achieved.
		Offsite Renewable Energy generation	Generate electricity from renewable energy in offsite and wheeling it.	
		Offset Mechanism options:	1. Purchase of renewable energy certificates (RECs) 2. Purchase renewable energy through power purchase agreement (PPAs) 3.Purchase renewable energy directly from the generator through open access policy.	
		Carbon Credits	1. Invest in projects that significantly reduce emissions can generate carbon credits under various carbon market mechanisms.	

			2. Tree plantation/afforestation and registration of project under voluntary carbon standards (VCS) – VERRA – Gold standards etc., for carbon credits. 3. Installation of Carbon capture technology.	
3	INDO TECH, Kancheepuram (Approximate emission Reduction will be 218 tCO2e)	Energy Efficiency	Conduct detailed energy audit and machinery efficiency study based on which generally 20 to 30 % energy conservation can be implemented. As INDO TECH has shown reduced scope 2 emission already, so the expected emission reduction range will be minimum **5 to 15 %**	145 tCO2e @ 10% reductions
		Onsite Renewable Energy generation	Explore the rooftop solar power generation or any other kind of solar power farming.	Even if 5% Renewable Energy (RE) addition happens totally against all these four options reductions of 73 tCO2e can be achieved.
		Offsite Renewable Energy generation	1. Indo Tech already has offsite wind mill plant capacity of 450 kW/day at Thirunelveli. Recommend further increase this wind mill capacity and wheeling it. 2. Explore other source of renewable energy power generation in offsite and wheeling it.	
		Offset Mechanism options	1. Purchase of renewable energy certificates (RECs) 2. Purchase renewable energy through power purchase agreement (PPAs) 3. Purchase renewable energy directly from the generator through open access policy.	
		Carbon Credits	1. Invest in projects that significantly reduce emissions can generate carbon credits under various carbon market mechanisms. 2. Tree plantation/afforestation and registration of project under voluntary carbon standards (VCS) – VERRA – Gold standards etc., for carbon credits. 3. Installation of Carbon capture technology.	
Total Scope 2 Emission Reduction per annum at current production output				**4132 tCO2e**

3.3.3 Scope 3 Recommendations

Table 20: Emission Reduction Recommendations Under Scope 3

Sl. No	Scope 3 Category	Focus Area	Recommendations
1.	C3 - Fuel and Energy-Related Activities (not included in Scope 1 or 2)	Renewable Energy Contracts	Secure renewable energy for the entire value chain by working with energy providers, not just for direct operations but also encouraging suppliers to adopt renewable energy sources.
		Energy Efficiency Programs	Collaborate with suppliers to improve energy efficiency in their operations, providing training or incentives for adopting low-energy production technologies.
2.	C4 - Upstream Transportation and Distribution	Logistics Optimization	Optimize shipping routes, consolidate shipments, and use larger loads to reduce the number of trips. This helps reduce fuel consumption and emissions.
		Low-Emission Transport	Shift to low-carbon transportation modes such as electric trucks, rail, or sea freight wherever possible. Work with logistics partners that offer green transportation options.
		Local Sourcing	Source raw materials, components, and sub-assemblies from suppliers closer to the manufacturing plant to reduce the carbon footprint from transportation.
3.	C5 - Waste Generated in Operations	Waste Minimization	Implement lean manufacturing techniques to minimize material waste in the production process. Recycle scrap metals, insulation materials, and other production by-products.
		Circular Economy Initiatives	Establish take-back or recycling programs for transformer components that reach the end of their useful life. This reduces waste and recycles valuable materials.
		Packaging Optimization	Reduce packaging material use, and switch to recyclable or reusable packaging materials for both inbound and outbound goods.
4.	C6 - Business Travel	Virtual Collaboration	Minimize business travel by increasing the use of virtual meeting tools for collaboration with suppliers, clients, and internal teams.

		Sustainable Travel Policies	Implement a company-wide sustainable travel policy that prioritizes low-emission transportation options (e.g., trains over flights, electric vehicles over fossil-fuel-based vehicles).
5.	C7 - Employee Commuting	Telecommuting Options	Provide flexible work-from-home policies to reduce emissions from commuting.
		Carpooling and EV Adoption	Encourage carpooling and the use of electric vehicles (EVs) among employees. Provide EV charging stations at company facilities.
		Public Transport Incentives	Offer incentives for employees who use public transportation or adopt other sustainable commuting options like cycling or walking.
6.	C8 - Downstream Transportation and Distribution	Green Distribution Networks	Partner with distribution companies that prioritize the use of low-emission vehicles or carbon offset programs. Encourage customers to opt for lower-emission shipping options.
		Demand Forecasting	Improve demand forecasting to reduce the need for express or air freight, which tends to have higher emissions than other shipping methods.
		Reverse Logistics	Implement systems for customers to return used transformers for recycling or refurbishment, minimizing waste and transportation emissions associated with product disposal.

3.4 Target Setting for SSEL Group Companies

Long term target:

- To become a carbon neutral company by 2040 with respect to only scope 1+2.
- To reduce scope 3 emission by 50% from a 2023 base year by 2030 (EU has a target of reducing net GHG emission by at least 55% by 2030 and India has a target of the entire economy to be net zero by 2070)
- To become a net zero company by 2060
- Reach RE100 status by 2035

Short term target:

Based on above long term targets the roadmap for short term target can be modeled as below for a 3-year period and review, course correct in 2027.

- Reduce Scope 1+2 absolute emission by 5 % annually from a 2023 base year.
- Reduce Scope 3 absolute emission by 3 % annually from a 2023 base year.
- Increase renewable energy share by 5 % annually from a 2023 base year.

3.5 Other Highlights of Baseline Study

The Baseline study touches upon various important sustainability and ESG related aspects that have to be incorporated into the ESG journey where our commitment is to match global ask on Environmental Social and Governance adherences and to be recognized as a sustainability leader. The other highlights in the Baseline study are as follows:

- Data Gathering as per Global reporting templates
- Energy & Emissions - Standards
- Global ESG Related Framework & Standards
- ESG impact on Solar PV business
- Country Wise GHG Emissions Linked Regulations
- ESG Assessments & Agencies
- Peer Performance and ESG Scores
- Leadership in Sustainability Practices by Peer

Refer the below report link for more details:

SSEL Group Carbon Footprint Baseline Study - FY23-24 by ESG Department.pdf

4. RESULT AND ANALYSIS (FY24-25)

4.1 GHG Emissions Calculation

Figure 13 The GHG Emission Formula for emissions calculation

To calculate **tCO_2e (tonnes of CO_2 equivalent)** for a given material or activity, the formula used is:

tCO2e = Activity data × **Emission Factor (EF) / Global Warming Potential (GWP)**

Either GWP or **EF** is used in the calculation of tCO2e. The logic is as below:

- **Emission Factor (EF):** EF already includes the effect of all greenhouse gases (CO_2, CH_4, N_2O, etc.), converted into CO_2e using their **GWPs**. So, it is directly multiplied with activity data. For example, litres of diesel × EF (kg CO_2e/litre).

- **GWP (Global Warming Potential):**
  If the emissions are **broken down by individual gases** (say CO_2, CH_4, N_2O separately), then each gas mass (in tonnes) must be multiplied by its GWP, then sum them:
  $tCO2e=\Sigma(\text{Mass of gas } i \times GWP_i)$

So, while using standard emission factors (from IPCC, DEFRA, GHG Protocol, etc.), the calculation is Emission Factor × activity data. No separate GWP step is needed, because the EF already accounts for GWPs. And while doing direct gas-level calculation (like from process emissions or fugitive gases), then GWP values are directly used and summed up to give tCO2e.

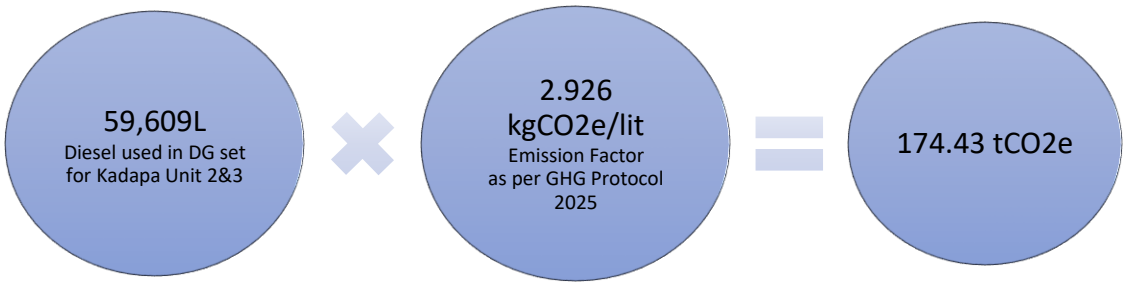


Figure 14: GHG emissions calculation example

4.2 SSEL Group Absolute Emissions for the FY24-25

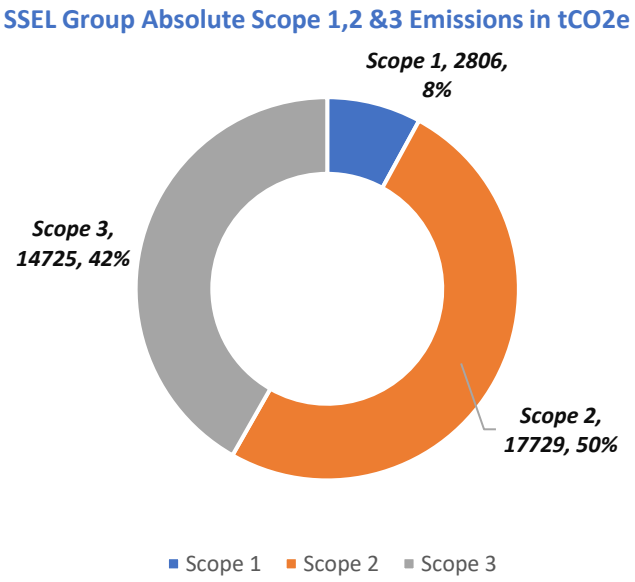


Figure 15: SSEL Group Absolute Scope 1,2 &3 Emissions

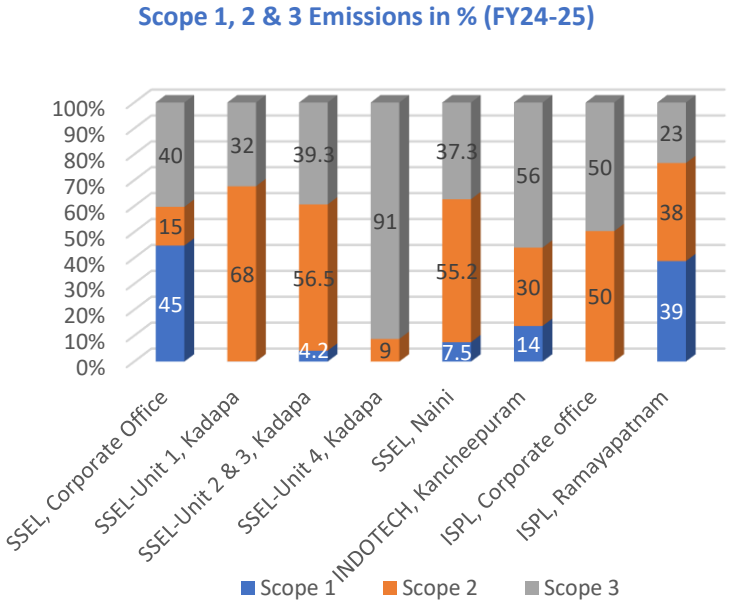


Figure 16: Scope 1, 2 and 3 emissions in %

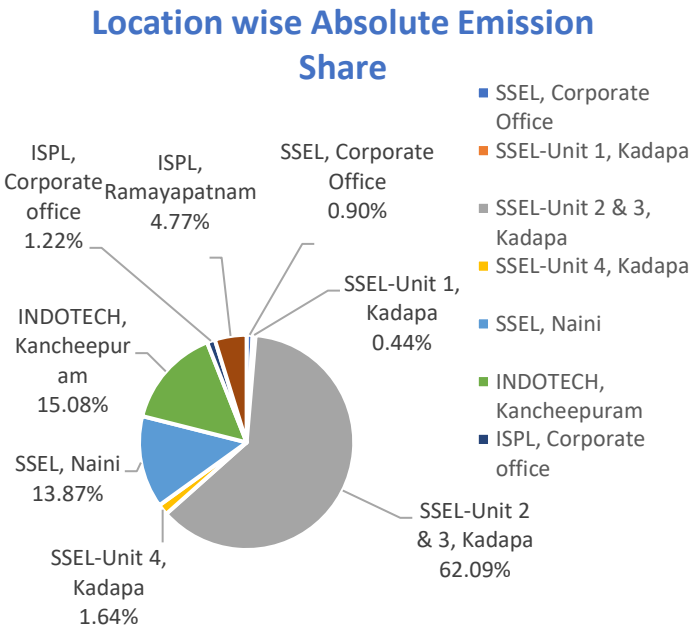


Figure 17: Location Wise Absolute Emission Share

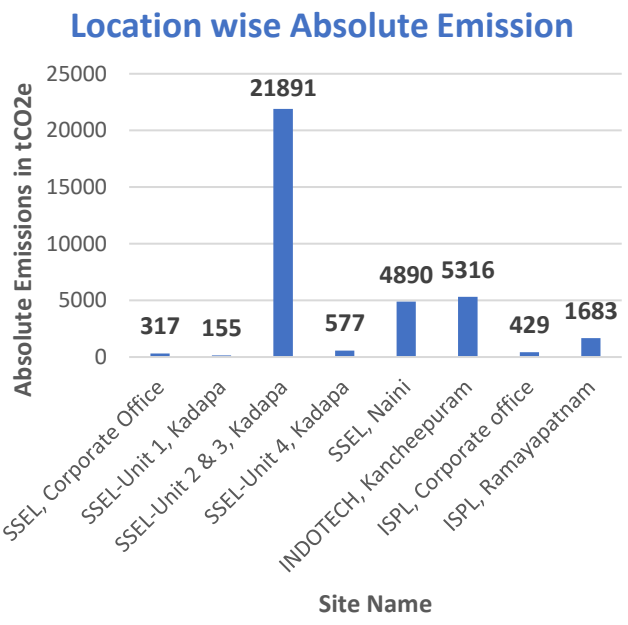


Figure 18: Location Wise Absolute Emission in tCO_2e

SSEL Group Companies Carbon Emissions - FY 2024 -2025							
			tCO2e				
Sr. No.	Company Name	Site Name	Scope 1	Scope 2	Scope 3	Total	Absolute Emission
1	SSEL	SSEL, Corporate Office	142	47	128	317	27831
2		SSEL-Unit 1, Kadapa	0	105	50	155	
3		SSEL-Unit 2 & 3, Kadapa	916	12365	8611	21891	
4		SSEL-Unit 4, Kadapa	0	50	527	577	
5		SSEL, Naini	364	2700	1826	4890	
6	INDO TECH	INDO TECH, Kancheepuram	731	1608	2977	5316	5316
7	ISPL	ISPL, Corporate office	0	216	213	429	2112
8		ISPL, Ramayapatnam	653	637	393	1683	
	Total		**2806**	**17729**	**14725**		**35259**

Table 21: Site Wise Absolute Emissions

- As shown in figure 15, The SSEL Group companies' absolute emission for scope 1, scope 2 and scope 3 is **2806 tCO2e, 17729 tCO2e and 14725 tCO2e** respectively and the total is **35259 tCO2e**.
- Figure 16 shows the location wise scope 1, 2 & 3 emissions share in percentage.
- From figure 17, the highest absolute emission share is from SSEL Unit 2 & 3 Kadapa, accounting for **62.09%**.
- Figure 18 shows the location wise absolute emissions in tCO2e
- Table 21 shows the company wise/site wise absolute emissions, the SSEL, INDO TECH and ISPL has the absolute emission of **27831 tCO2e, 5316 tCO2e and 2112 tCO2e** respectively.

4.2.1 Scope 1 Emissions

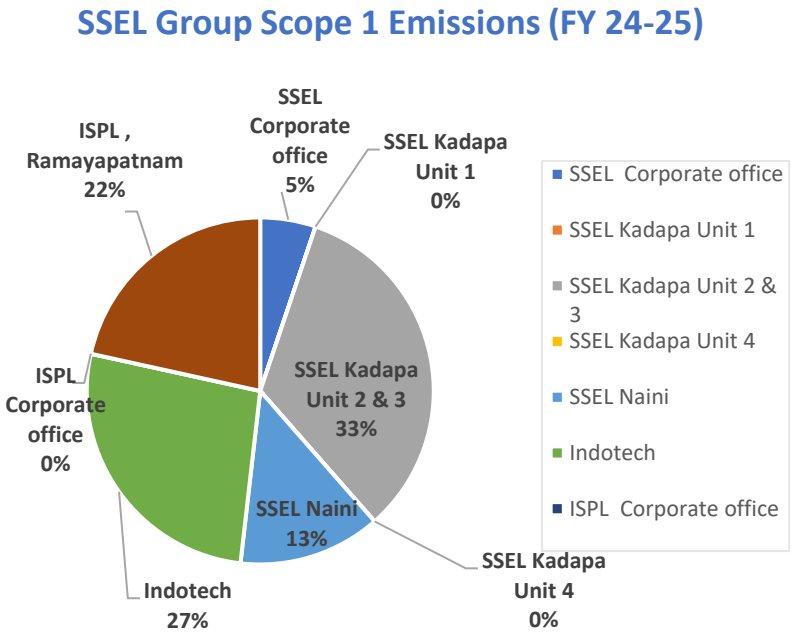


Figure 19: Plant wise scope 1 emissions percentage

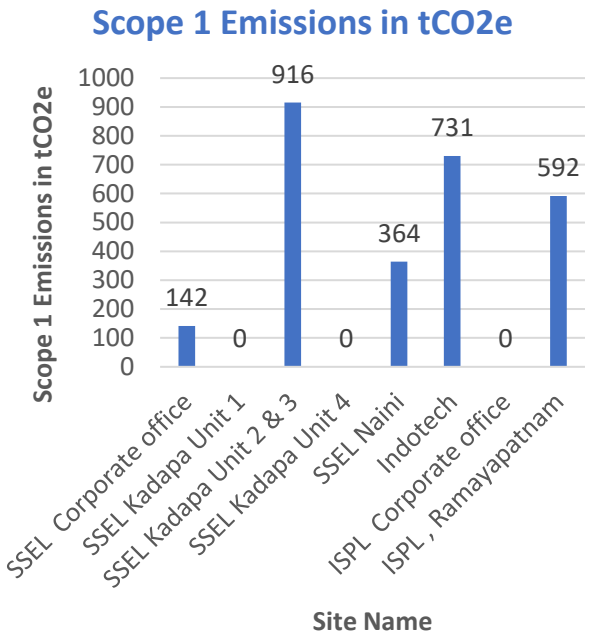


Figure 20: Plant wise scope 1 emissions in tCO2e

Scope 1 Emissions in tCO2e										
S.No	**Emission Source**	**SSEL Corporate office**	**SSEL Kadapa Unit 1**	**SSEL Kadapa Unit 2 & 3**	**SSEL Kadapa Unit 4**	**SSEL Naini**	**Indotech**	**ISPL Corporate office**	**ISPL , Ramaya patnam**	**Total**
1	LPG (used in Brazing, Cutting)	0.00	0.11	25.47	0.00	0.00	0.00	0.00	0.00	**25.58**
2	Acetylene (used in Brazing, Cutting)	0.00	0.00	2.74	0.00	1.23	4.60	0.00	0.00	**8.57**
3	Diesel used in DG sets	0.00	0.00	177.89	0.00	20.37	101.65	0.00	208.09	**508.00**
4	Company Owned Vehciles									**0.00**
	Diesel (Car, buses, Ambulances)	0.00	0.00	247.07	0.00	48.78	0.00	0.00	52.19	**348.04**
	Petrol (Car, buses, Ambulances)	0.00	0.00	0.48	0.00	0.00	0.00	0.00	0.19	**0.67**
	Diesel (hydras, tractor cranes, forklifts tractors)	0.00	0.00	192.20	0.00	0.00	0.00	0.00	0.00	**192.20**
	Petrol (hydras, tractor cranes, forklifts tractors)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
5	LPG used in Canteen	0.28	0.00	111.55	0.00	0.00	0.00	0.00	14.90	**126.73**
6	Biomass used in Canteen (Wood)	0.00	0.00	13.56	0.00	0.00	0.00	0.00	0.00	**13.56**
7	Refrigerant used/refilled									**0.00**
	R 22	62.72	0.00	49.65	0.00	62.72	0.00	0.00	29.40	**204.49**
	R 32	0.00	0.00	19.66	0.00	0.00	0.00	0.00	2.31	**21.97**
	R 410 A	78.94	0.00	56.39	0.00	0.00	0.00	0.00	0.00	**135.33**
	R 134A	0.00	0.00	0.00	0.00	138.39	0.00	0.00	284.58	**422.97**
8	CO_2 used for refilling into fire extinguisher	0.00	0.00	0.33	0.00	0.06	0.00	0.00	0.00	**0.39**
9	Gas mixture used in welding (Argon+Carbon dioxide)	0.00	0.00	18.80	0.00	0.00	0.00	0.00	0.00	**18.80**
10	Fuel used in Thermic Fluid heater									**0.00**
	Furnace Oil	0.00	0.00	0.00	0.00	0.00	624.37	0.00	0.00	**624.37**
	Biomass	0.00	0.00	0.00	0.00	92.80	0.00	0.00	0.00	**92.80**
	HSD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Total		**142**	**0**	**916**	**0**	**364**	**731**	**0**	**592**	**2744.47**

Table 22: Emission source wise scope 1 emissions in tCO2e

4.2.2 Scope 2 Emissions

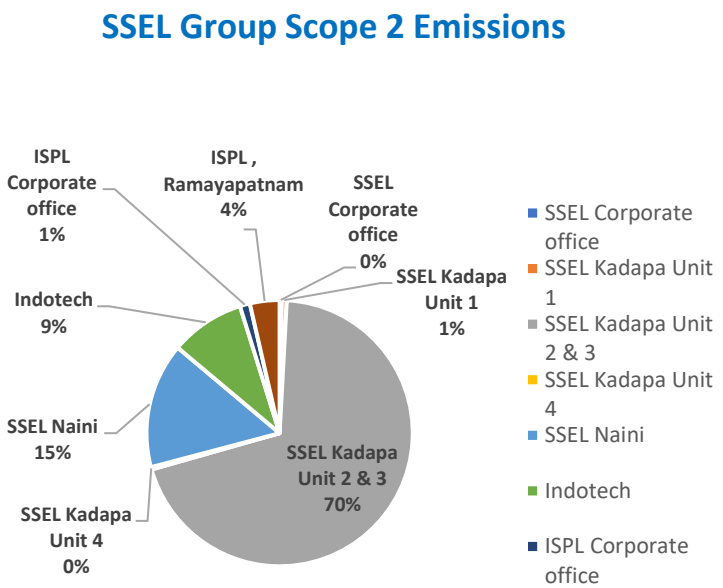


Figure 21: Plant wise scope 2 emissions percentage

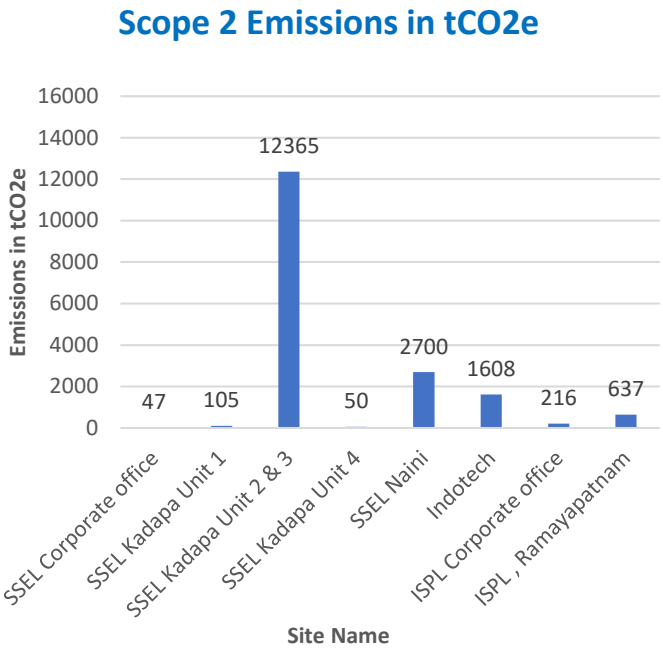


Figure 22: Plant wise scope 2 emissions in tCO2e

Scope 2 Emissions in tCO2e										
Sr. No	**Emission Source**	**SSEL Corporate office**	**SSEL Kadapa Unit 1**	**SSEL Kadapa Unit 2 & 3**	**SSEL Kadapa Unit 4**	**SSEL Naini**	**Indo Tech**	**ISPL Corporate office**	**ISPL Ramayapatnam**	**Total**
1	Net Power consumed from GRID	47	105	12365	50	2700	1608	106	637	**17619**
2	Purchased DG Power Diesel Consumption	-	-	-	-	-	-	0.46	-	**0.46**
3	Purchased Cooling Electricity Power Consumption	-	-	-	-	-	-	109	-	**109**
Total		**47**	**105**	**12365**	**50**	**2700**	**1608**	**216**	**637**	**17729**

Table 23: Emission source wise scope 2 emissions in tCO2e

4.2.3 Scope 3 Emissions

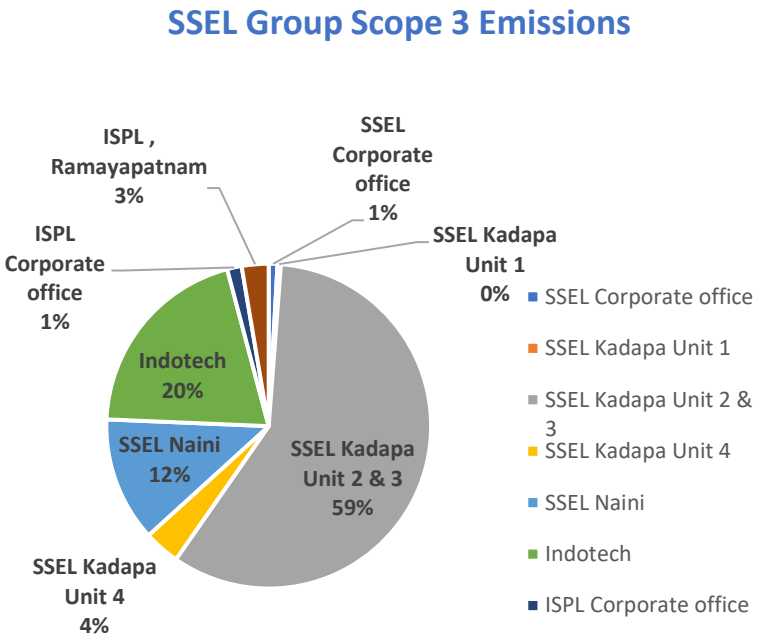


Figure 23: Plant wise scope 2 emissions percentage

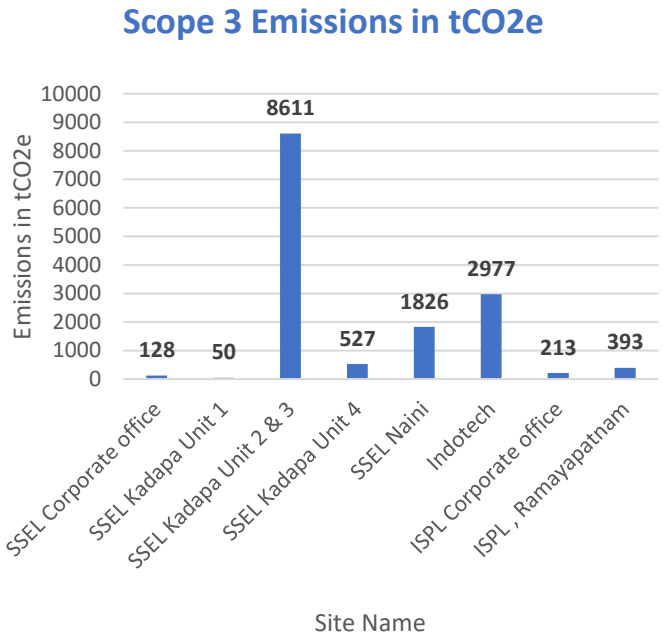


Figure 24: Plant wise scope 2 emissions in tCO2e

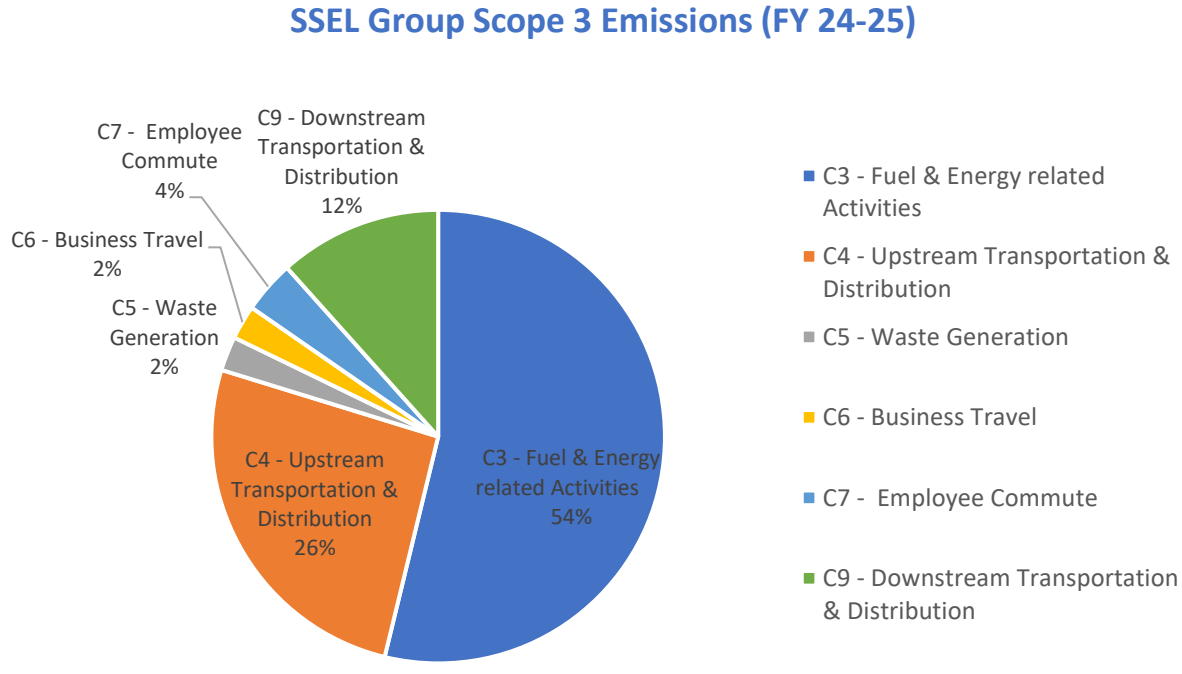


Figure 25: Category wise scope 3 emissions percentage

Scope 3 Emissions in tCO2e										
S.No	Emission Source	SSEL Corporate office	SSEL Kadapa Unit 1	SSEL Kadapa Unit 2 & 3	SSEL Kadapa Unit 4	SSEL Naini	Indotech	ISPL Corporate office	ISPL , Ramayapatnam	Total
1	C3 - Fuel & Energy related Activities	20.55	44.31	5380.81	21.22	1175.90	848.17	91.02	339.33	**7921**
2	C4 - Upstream Transportation & Distribution	-	-	2343.85	375.18	240.01	859.34	-	3.82	**3822**
3	C5 - Waste Generation	-	5.88	237.14	12.45	39.10	65.69	-	-	**360**
4	C6 - Business Travel	68.72	-	107.64	-	20.40	75.59	85.96	0.00	**358**
5	C7 - Employee Commute	38.49	-	181.90	-	64.94	180.27	35.90	50.08	**552**
6	C9 - Downstream Transportation & Distribution	-	-	359.18	118.32	285.99	947.91	-	-	**1711**
Total		**128**	**50**	**8611**	**527**	**1826**	**2977**	**213**	**393**	**14725**

Table 24: Emission source wise scope 3 emissions in tCO2e

4.2.4 Analysis

SSEL Corporate Office:

- The main Scope 1 emission source in corporate office is LPG usage and refrigerant refilling into AC system for which the emission is 0.28 tCO2e & 141.6 tCO2e respectively. The total scope 1 emission have increased due to refilling of AC with refrigerant in FY24-25.
- Food cooking is outsourced but LPG is used in office pantry which has shown reduction in usage in FY24-25
- Under Scope 2 tCO2e has reduced from 61.76 tCO2e in FY23-24 to 47.46 tCO2e
- Business Travel contributing more emissions in scope 3 which is 68.72 tCO2e (54%) out of total emissions of 127.77 tCO2e. This is 141% higher than base year emissions as only 5 months data was available in FY23-24.
- Employee commute contributing more emissions in scope 3 which is 38.49 tCO2e (30%) out of total emissions of 127.77 tCO2e. the data used for employee commute calculation is same as FY23-24.
- Majority of the employees (53%) are using two wheeler to commute to office.

ISPL Corporate Office:

- The only scope 1 emission source for the ISPL corporate office is the refrigerant usage. During the reporting period no refrigerant refilling is done so the scope 1 emission for this office is zero.
- Food cooking is outsourced and induction stove is used in office pantry.
- We are purchasing DG power and Cooling Capacity from 3rd party for our ISPL office space, so this emission source falls under Scope 2. The purchased cooling accounts for 109 tCO2e which is 50.4% of total Scope 2 emissions of ISPL Corporate Office.
- Scope 2 emissions are contributing most to the overall emissions, which is 216.01 tCO2e (50%) out of 428.90 tCO2e. Scope 2 emissions for FY24-25 have

increased by 66.5% from base year due to increase in number of employees. The number of employees has increased from 89 in FY23-24 to 142 in FY24-25, which is a growth of 60%.

- The emissions from employee commute in FY23-24 was 23 tCO2e. However, due to study of employee commute not being done for FY24-25, a 60% growth is being taken up pro-data on the FY23-24 study. So, emission from employee commute in FY24-25 is 35.90 tCO2e.
- Emissions due to business travel was 85.96 tCO2e, which is 40% of the total scope 3 emissions. This is 145% higher than FY23-24's 31.45 tCO2e as only 5 months data was available.

Manufacturing Plant: ISPL Ramayapatnam

- The Solar PV production did not begin during the reporting period.
- Scope 2 emissions are contributing more to the overall emissions for this site. Which is 637.41 tCO2e (38%) out of 1683.49 tCO2e.
- The major emission source in Scope 3 emissions is from category 3 fuel and energy related activities which accounts 339.33 tCO2e (86%) out of total scope 3 emission of 393.23 tCO2e.
- In FY24-25 Scope 3 Category 4 (Upstream transportation and distribution) accounted for 3.82 tCO2e from road transport. However, this emission was higher in FY23-24 at 26.91 tCO2e as there was only international upstream data.

Manufacturing Plant: SSEL Kadapa Unit 2&3

- Under scope 1, CO2 refilling has risen by 32% from 247 kg in FY 23-24 to 332.5 kg in FY 24-25 due to leakage of CO2 from faulty equipment.
- The emissions due to diesel used in cars, buses and ambulances increased from 116.32 tCO2e in FY23-24 to 247.55 tCO2e in FY24-25 due to more clients and vendor meetings related travels/vehicle usage.
- Kadapa has scope 2 emissions of 12365 tCO2e, highest among all the other units due to higher grid electricity consumption. This is due to activities such as tank fabrication and use of Thermic Fluid Heater. However, FY24-25 scope 2 emission is 16.36% less than FY 23-24.
- Scope 3 category 3 (Fuel and Energy related activities) emissions for Kadapa Unit 2&3 was 5380.81 tCO2e, highest among the scope 3 emissions. It has decreased by 10% from FY23-24 emissions of 5959.86 tCO2e.

Service Unit: SSEL Unit 1 Kadapa:

The absolute emission and energy intensity of SSEL Unit 1 Kadapa is shown in below table 25.

Description	Current year FY24-25	Base year FY23-24	UOM
Transformer Serviced	154.66	113.97	MVA
Absolute emission (Scope 1+2)	105.13	103.24	tCO2e
Absolute emission (Scope 1+2+3)	155.32	144.34	tCO2e
Emission intensity (Scope 1+2)	0.68	0.91	tCO2e/MVA
Emission Intensity (Scope 1+2+3)	1.004	1.27	tCO2e/MVA

Table 25: SSEL Unit 1, Kadapa Absolute Emission & Energy Intensity (FY24-25)

It is noticed that there is approximately 36% increase in MVA of transformers service. Against this the absolute emissions have increased by 1.8% in scope 1+2 and around 7.6% only in scope 1+2+3. The majority of emissions come from grid electricity consumption in scope 1+2. The emission from Scope 3 Category 5 increased from 0.73 tco2e in FY23-24 to 5.88 in FY24-25 as Rubber gloves, Copper, and Aluminum waste data was additionally provided which was not provided in FY23-24.

Project Unit: SSEL Unit 4 Kadapa:

The absolute emission and energy intensity of SSEL Unit 4 Kadapa is shown in below table 26.

Description	Current year FY24-25	Base year FY23-24	UOM
Production	2955	4251*	tonne
Absolute emission (Scope 1+2)	50.30	41.36	tCO2e
Absolute emission (Scope 1+2+3)	**577.45**	158.09	tCO2e
Emission intensity (Scope 1+2)	0.02	0.01	tCO2e/t
Emission intensity (Scope 1+2+3)	0.20	0.04	tCO2e/t

Table 26: SSEL Unit 4, Kadapa Absolute Emission & Energy Intensity (FY24-25)

*On reverification in the context of FY24-25 data there appeared to be miscalculations of this production number. As this number does not pertain to transformer business, no correction being taken up w.r.t reported numbers.

Manufacturing Plant: SSEL Naini

- SSEL Naini's highest scope 1 emissions are due to refrigerant usage at 201.11 tCO2e, which is 87% higher than previous year's 107.36tCO2e FY23-24.
- Emissions due to use of thermic fluid heater was 92.8 tCO2e, a significantly lower value than previous year's 164.8 tCO2e as only wood briquettes were used in FY24-25. Wood briquettes have a lower emission factor, which is 0.143 kgCO2/kg versus 2.926 kgCO2/liter for HSD. In FY24-25 647.19 tons of wood briquettes were used versus 53,800 Liters of HSD and 137.13 tons of wood briquettes.
- It is mention worthy that despite increase in production from 1459MVA in FY23-24 to 4044MVA in FY24-25, the use of diesel in DG sets was reduced from 9910 liters to 6963 liters respectively. This is due to reduction in power cuts and increased uninterrupted power supply at Naini.
- There was an increase in grid electricity consumption from 2028.9MWh to 3710.8MWh from FY 23-24 to FY24-25.
- Downstream transport and distribution accounted for 285.99 tCO2e in FY24-25, highest among its scope 3 emissions, which is 149.7% higher than 114.53 tCO2e in FY23-24.
- Emissions from Scope 3 category 5 (Waste Generated in Operations) reduced from 52.42tCO2e to 38.57 tCO2e. This is because site team had sold 147 tonne of mixed metal scrap which was left after company acquisition from GE in FY23-24. The scrap copper has increased from 32.5 tonnes to 69.1 tonnes, however the CRGO Scrap has reduced from 23.1 tonnes to 10.3 tonnes.
- Emissions from Scope 3 category 7 (business travel) also increased from 3.78tCO2e in FY23-24 to 20.39tCO2e in FY24-25. There is a considerable increase in air travel in this year.

Manufacturing Plant: Indo Tech Kanchipuram

- As production in Indo Tech increased from 6933MVA to 7767MVA, the fuel and grid electricity consumption also increased.
- Furnace oil used in Thermic Fluid Heater caused 624.37 tCO2e in FY24-25, an 85.5% of total scope 1 emissions. Its fuel consumption has increased from 167.2 tons in FY23-24 to 198.6 tons in FY24-25.
- Scope 2 emissions of Indo Tech in FY24-25 is 1608.40 tCO2e from grid electricity consumption. This grid electricity consumption has increased from 2030.3MWh in FY23-24 to 2210MWh in FY24-25.
- In FY 24-25, Scope 3 Category 4 (Upstream Transport and Distribution) and Category 9 (Downstream Transport and Distribution) caused emission of 859.34 tCO2e and 947.91 tCO2e respectively. Together, these two categories account for a 60.7% of the total scope 3 emissions.

4.3 SSEL Group Transformer Manufacturing Business Emission (FY 24-25)

The table 27 shows the overall emission profile of the SSEL Group transformer manufacturing business.

Sr. No.	Descriptions	UOM	Current year FY24-25
1.	Absolute Emissions (Scope 1+2)	tCO2e	18674
2.	Absolute Emissions (Scope 1+2+3)	tCO2e	31353
3.	Emission Intensity (Scope 1+2)	tCO2e/MVA	1.01
4.	Emission Intensity (Scope 1+2+3)	tCO2e/MVA	1.73

Note: SSEL Group Total Transformer Production = 18556 MVA

Table 27: SSEL Group Transformer Manufacturing Business Emission (FY24-25)

4.3.1 Absolute Emission

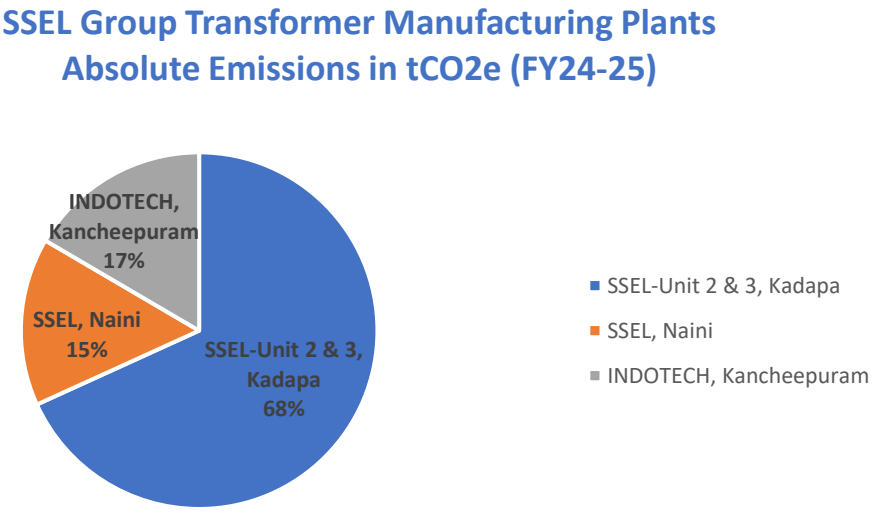


Figure 26: Transformer Manufacturing Plant Wise Absolute Emissions (FY24-25)

SSEL Group Transformer Manufacturing Plant Wise Absolute Emissions					
Company Name		SSEL		INDOTECH	
Site Name		SSEL-Unit 2 & 3, Kadapa	SSEL, Naini	INDOTECH, Kancheepuram	Total
Scope 1	tCO2e	916	364	731	**2011**
Scope 2		12365	2700	1608	**16673**
Scope 3		8611	1826	2977	**13414**
Total		**21891**	**4890**	**5316**	**32097**
Group Total			**32097**		

Table 28: SSEL Group Transformer Manufacturing Plant Wise Absolute Emission (FY24-25)

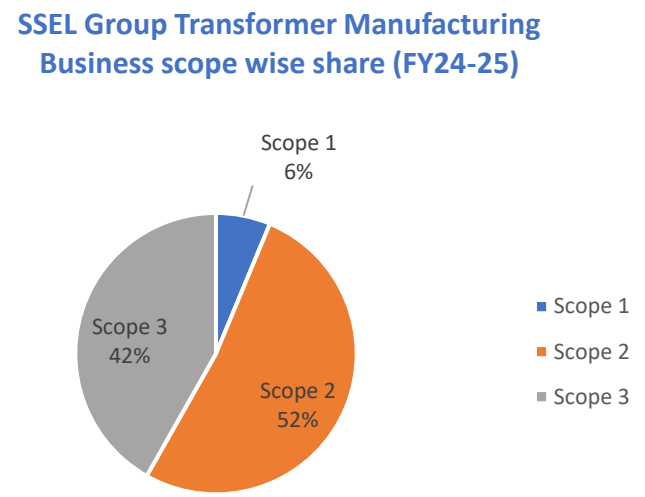


Figure 27: Transformer Manufacturing Business Scope Wise Emission Share (FY24-25)

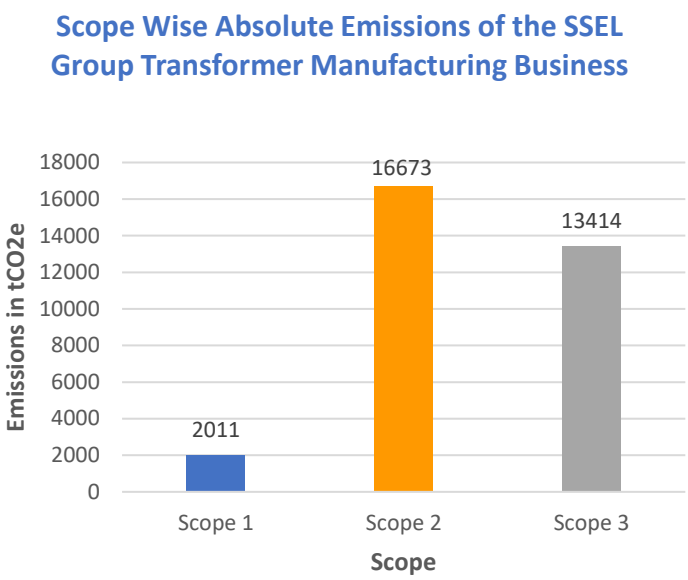


Figure 28: Transformer Manufacturing Business Scope Wise Absolute Emission (FY24-25)

Table 28 shows the absolute emission of the transformer business unit namely, SSEL 2 &3 Kadapa, SSEL Naini and Indo Tech Kancheepuram as **21891 tCO2e, 4890 tCO2e and 5316 tCO2e** respectively and the total SSEL Group Transformer Business absolute emission is **32097 tCO2e**.

4.3.2 Emission Intensity (EI)

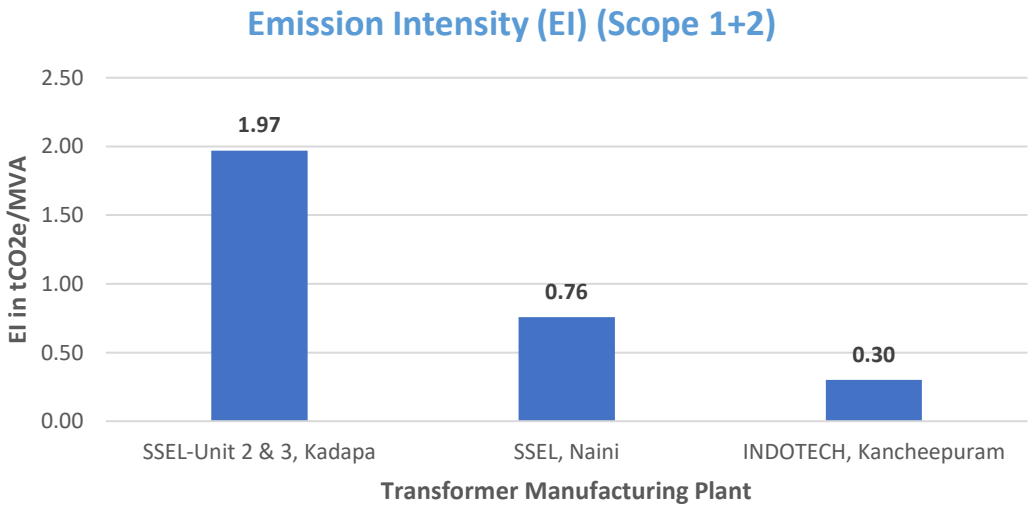


Figure 29: Emission Intensity of Transformer Manufacturing Plant (FY24-25)

Emission Intensity of SSEL Group Transformer Manufacturing Plant					
Company Name		**SSEL**		**INDO TECH**	
Site Name		**SSEL-Unit 2 & 3, Kadapa**	**SSEL, Naini**	**INDO TECH, Kancheepuram**	**Total**
Production	MVA	6745	4044	7767	18556
Scope 1		916	364	731	2011
Scope 2	tCO2e	12365	2700	1608	16673
Scope 3		8611	1826	2977	13414
Emission Intensity (Scope 1+2)					
Total (Scope1+2)	tCO2e	13280	3064	2339	18683
FY24-25	**tCO2e/MVA**	**1.97**	**0.76**	**0.30**	**1.01**
FY23-24	**tCO2e/MVA**	**2.12**	**1.21**	**0.30**	**1.23**
Emission Intensity (Scope 1+2+3)					
Total (Scope1+2+3)	tCO2e	21891	4890	5316	32097
FY24-25	**tCO2e/MVA**	**3.25**	**1.21**	**0.68**	**1.73**
FY23-24	**tCO2e/MVA**	**3.51**	**1.91**	**0.71**	**2.13**

Table 29: SSEL Group Transformer Manufacturing Plant Wise Emission Intensity (FY24-25)

EI or intensity ratio is the GHG impact per unit of production or unit of economic value (e.g., tCO2e emissions per MVA production or tCO2e per revenue in dollars). Many industries, particularly manufacturing, utilities, and energy, calculate their emission intensity using just Scope 1 and 2 emissions as it offers a clear, operationally-focused view of emissions that the company can control and reduce in the near term. When calculating EI, the choice of which emissions scopes to include (Scope 1+2 versus Scope 1+2+3) depends on the context, the standards followed, and the industry requirements.

Emission Intensity (EI) can be reported based on production/manpower/built up area and also on revenues. In industries where several products are manufactured the EI is measured as per sales. Also, when comparing we need to compare only the EI based on scope 1+2 calculation and if scope 1+2+3 is taken into account it needs to be all 15 categories or corresponding categories of scope 3 which the peer has disclosed.

Since companies can directly influence their energy use and fuel consumption, both of which fall under Scope 1 and 2, EI is often calculated separately for Scope 1+2 only. Another set of EI calculation is also done taking into consideration Scope 1, 2 & 3. However, the EI against Scope 1+2 is considered sufficient for regulatory and reporting purposes under frameworks like the Greenhouse Gas Protocol (GHG Protocol) and CDP (Carbon Disclosure Project). But, many sustainability frameworks, such as the Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB), encourage or require reporting on Scope 3 for full transparency. Investors and stakeholders are pushing for companies to include Scope 3 emissions to evaluate total climate risk.

Table 29 shows EI in tCO2e per MVA production ranging from **0.30 to 1.97 (Scope 1+2) and 0.68 to 3.25 (Scope 1+2+3)** in three different locations.

4.3.3 Comparative Analysis

The EI (FY24-25) (refer table 29 above) when compared to annual baseline FY 23-24 is:

- Unit 2&3 SSEL Kadapa shows improved EI from **2.12 to 1.97 tCO2e/MVA**
- SSEL Naini shows improved EI from **1.21 to 0.76 tCO2e/MVA**
- Indo Tech shows no change in EI, remaining constant at **0.30 tCO2e/MVA**

The same is reflected in the Specific Electricity Consumption (refer table 30 below) where:

- Unit 2&3 Kadapa shows improved Specific Electricity Consumption from **3.01 to 2.73 MWh/MVA**
- SSEL Naini shows improved Specific Electricity Consumption from **1.39 to 0.92 MWh/MVA**
- Indo Tech shows slightly improved Specific Electricity Consumption from **0.37 to 0.33 MWh/MVA**

It is noteworthy that Unit 2&3 of Kadapa has reduced consumption of electricity for production which is shown in improved specific electricity consumption. And added to this, their share of renewable energy has improved from 7 % to 8 % resulting in reduced EI. There has also been a reduction of emissions 5.2 tco2e in scope 1 due to biomass used in canteen one more emission reduction factor under scope 1 has been 10+ tCO2e in gas mixture used in welding (Argon+Carbon dioxide)

At Naini, production has recorded a 177% increase compared to the base year. However, the EI and Specific Electricity Consumption have both shown a reduction of 0.45 tCO2e/MVA and 0.47 MWh/MVA respectively. Under scope 1 emissions Naini plant as shown marked reduction in Thermic fluid heater where HSD has been completely replaced with wood briquettes. Refrigerant refill/top-up has also reduced in FY24-25 compared to base year. Additionally, diesel used in DG set also shown huge reduction comparatively due to improved grid power supply.

Indo-Tech does not show much variation in EI but improved Specific Electricity Consumption from 0.37 to 0.33. It indicates that electricity is being consumed more efficiently with the increase in production.

SSEL Group Transformer Manufacturing Business Electrical Energy Consumption (FY 24-25)						
Sl. No	Description	UOM	Site Name			Total
			SSEL Kadapa Unit 2 & 3	SSEL Naini	Indo tech	
1	Production	MVA	6745	4044	7767	18556
	FY 23-24	**MVA**	**7363**	**1459**	**6933**	**15755**
2	**Specific Electrical Energy Consumption**	**MWh/MVA production**	**2.73**	**0.92**	**0.33**	**1.33**
	FY23-24		**3.01**	**1.39**	**0.37**	**1.70**
3	Total Electricity Consumption	MWh	18385	3711	2568	24664
4	From Grid	MWh	16996	3711	2211	22918
5	From Solar (Including Wheeling)	MWh	1389	0	0	1389
6	From Wind (Including Wheeling)	MWh	0	0	357.284	357.284
7	**% Grid FY24-25**	**%**	**92%**	**100%**	**86%**	**93%**
	% Grid FY23-24		**93%**	**100%**	**80%**	**92%**
8	**% RE FY24-25**	**%**	**8%**	**0%**	**14%**	**7%**
	% RE FY23-24		**7%**	**0%**	**20%**	**8%**

Table 30: SSEL Group Transformer Manufacturing Business Electrical Energy Consumption (FY24-25)

4.3.4 Reduction Opportunities for Transformer Business

As seen table 29 above Emission Intensity is the least for Indo tech which is 0.30 tCO2e (scope 1+2) for 7767MVA production and 5316 tCO2e absolute emission (scope 1+2+3)
For SSEL Naini Emission Intensity is 0.76 tCO2e (scope 1+2) for MVA 4044 production and 4890 tCO2e absolute emission (scope 1+2+3)
For SSEL Kadapa Emission Intensity is 1.97 tCO2e (scope 1+2) for MVA 6745 production and 21891 tCO2e absolute emission (scope 1+2+3).
Under each of the scopes 1,2, and 3 several reduction opportunities can be implemented sharing good practices internally. A few are listed below.

Under Scope 1 and 2:

- **Tank Fabrication:** SSEL Kadapa Unit 2 & 3 includes emissions from in-house tank fabrication (Unit 3), whereas the other two plants, SSEL Naini and Indo Tech, purchase tanks from vendors, and hence Kadapa plant has higher

absolute emissions as well as emission intensity. The outsourcing of tank fabrication would move emission of Kadapa unit 3 from scope 1 to scope 3.

- **Employee Commute:** SSEL Unit 2 & 3 has company-owned vehicles for employee commute, whereas SSEL Naini and Indo Tech have outsourced this service. As a result, 247.55 tCO2e emissions were added to the Scope 1 emissions of Unit 2 & 3 Kadapa, while these emissions were excluded from Scope 1 in SSEL Naini and Indo Tech. Similarly, outsourcing employee commute and reduction of company owned vehicles can move emissions from scope 1 to scope 3
- **Canteen Facility:** Both SSEL Naini and Indo-Tech have outsourced their canteen facilities, whereas SSEL Unit 2 & 3 Kadapa has an in-house canteen. This resulted in an additional 111.54 tCO2e emissions being added to the Scope 1 emissions of Unit 2 & 3 Kadapa. Here too, outsourcing canteen facility can move emissions from scope 1 to scope 3

- Under Scope 2 emissions, SSEL Unit 2 & 3 Kadapa has higher emissions, and Indo Tech has lower emissions which is 12365 tCO2e and 1608 tCO2e respectively. Whereas SSEL Naini has 2700 tCO2e. Since scope 2 emissions are related to purchased electricity, to provide a clearer understanding, the table 30 shows the electrical energy consumption of each plant along with their renewable energy share.
- SSEL Kadapa uses an electric thermic fluid heater, while Indo Tech and SSEL Naini use non-electric (fuel-based) thermic fluid heaters. In Naini the use of wood Briquettes has reduced 44% of their emission compered their baseline. A similar switch to wood briquettes can reduce scope 2 emissions.
- Due to the adoption of Renewable Energy (RE), SSEL Kadapa mitigated 1010.07 tCO2e, and Indo Tech mitigated 259.74 tCO2e. In terms of RE share, Indo Tech has a higher share compared to SSEL Kadapa, at 14% and 8%, respectively. SSEL Kadapa can increase its share of RE to reduce its carbon footprint further. SSEL Naini can also reduce emissions by adding RE either through solar or any other source.
- Several scope 1 emissions can be converted to scope 2 and ultimately can be emission free if source of electricity is from RE. For example, company owned vehicles forklifts can be converted from fossil fuel to electricity-which is sourced from solar or any other RE energy source.
- The specific electrical energy consumption for SSEL Kadapa, SSEL Naini, and Indo Tech is 2.73, 0.92, and 0.33, respectively. A lower value indicates higher efficiency. By improving the efficiency of plant operations and machinery, we can further reduce this specific electrical energy consumption as well as the associated emissions.

4.4 SSEL Group Renewable Energy Share

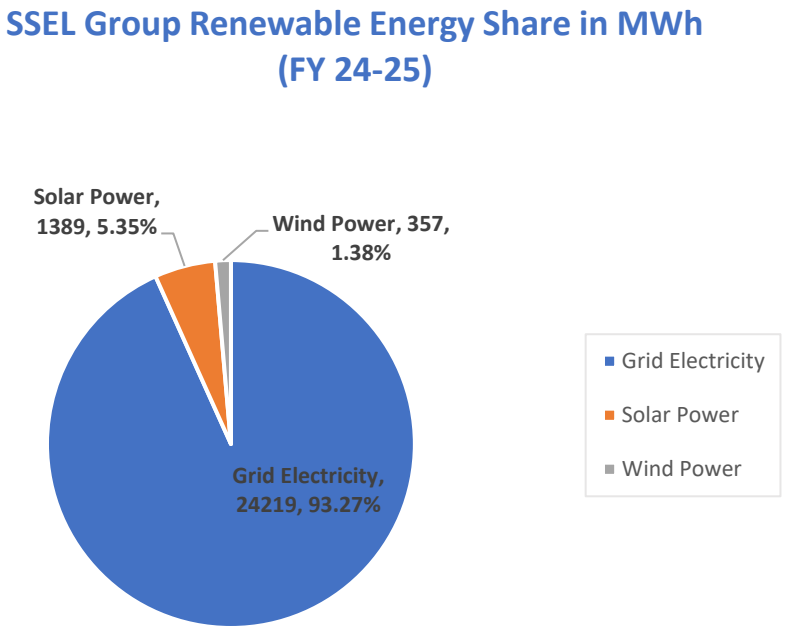


Figure 30: SSEL Group Renewable Energy Share (FY24-25)

SSEL Group Electrical Energy Consumption in MWh (FY 24-25)							
Sl.No	**Site name**	**Total Electricity Consumption**	**From Grid**	**From Solar (Including Wheeling)**	**From Wind (Including Wheeling)**	**% Grid**	**% RE**
1	SSEL Corporate office	65	65	0	0	100%	0%
2	SSEL Kadapa Unit 1	144	144	0	0	100%	0%
3	SSEL Kadapa Unit 2 & 3	18385	16996	1389	0	92%	8%
4	SSEL Kadapa Unit 4	69	69	0	0	100%	0%
5	SSEL Naini	3711	3711	0	0	100%	0%
6	Indo Tech	2568	2211	0	357	86%	14%
7	ISPL Corporate office	146	146	0	0	100%	0%
8	ISPL, Ramayapatnam	876	876	0	0	100%	0%
Total		**25965**	**24219**	**1389**	**357**	93.27%	6.73%

Table 31: SSEL Group Transformer Manufacturing Business Electrical Energy Consumption (FY24-25)

The SSEL Group's renewable energy share is 6.73 %, with solar power contributing 5.35 % and wind power contributing 1.38 % The remaining 93.27 % of the SSEL Group's electrical energy consumption relies on grid electricity.

4.4.1 Increasing Significance of Scope 3

Scope 3 emissions are indirect greenhouse gas (GHG) emissions that occur outside of an organization's direct control. They are also known as value chain emissions. They are emissions from activities that occur before and after a product is delivered or consumed.

Scope 3 emissions are the result of activities from assets not owned or controlled by the reporting organization, but that the organization indirectly affects in its value chain. An organization's value chain consists of both its upstream and downstream activities.

An organization can reduce scope 3 emissions by working with their suppliers to reduce emissions and they can include carbon reduction requirements in procurement processes.

Scope 3 emissions and regulatory reporting:

Significant portion of emissions:

Scope 3 emissions often encompass the largest portion of a company's overall greenhouse gas emissions, making their disclosure critical for a complete picture of environmental impact.

Increased regulatory focus:

Regulatory bodies are increasingly requiring companies to report on Scope 3 emissions, particularly in the context of environmental, social, and governance (ESG) reporting frameworks.

Value chain analysis:

Reporting on Scope 3 emissions forces companies to analyze their entire value chain, including upstream (suppliers) and downstream (product use) activities, identifying potential areas for emissions reduction.

Investor pressure:

Investors are increasingly demanding detailed Scope 3 disclosure to assess a company's climate change related risks and opportunities.

GHG Protocol Standard:

The Greenhouse Gas Protocol provides a standardized framework for calculating and reporting Scope 3 emissions, which helps ensure consistency across companies.

Examples of regulations incorporating Scope 3 reporting:

- EU Corporate Sustainability Reporting Directive (CSRD): Requires most large companies to report on Scope 3 emissions.
- Task Force on Climate-related Financial Disclosures (TCFD): Encourages companies to disclose climate-related information, including Scope 3 emissions when material.

4.4.2 Scope 3 in SSEL Group – Measurement, Data Deficiency and Bridging Gaps

The Scope 3 emissions of SSEL Kadapa, SSEL Naini, and Indo Tech are 8611 tCO2e, 1826 tCO2e, and 2977 tCO2e, respectively.

- **Category C3 (Fuel- and Energy-related Activities):**

  In this category, we account for fuel and energy-related emissions not included in Scope 1 or Scope 2. This includes upstream emissions of purchased fuels (extraction, production, and transportation of fuels consumed by the company) and upstream emissions of purchased electricity (extraction, production, and transportation of fuels consumed in the generation of electricity, steam, heating, and cooling). Due to higher fuel and electricity consumption at SSEL Kadapa, Scope 3 Category 3 emissions are higher compared to the other two manufacturing units. Which is 5380.81 tCO2e for SSEL Kadapa, 848.17 tCO2e and 1175.90 tCO2e for Indo Tech and SSEL Naini respectively.

- **Category C4 (Upstream Transportation and Distribution):**

  The difference in emissions under this category is due to the variation in inward materials accounted for by each plant. SSEL Kadapa accounted for all inward materials received in FY24-25, whereas SSEL Naini accounted for only seven major raw materials, and Indo Tech accounted for ten major raw materials which accounts for major inward materials. Emissions under this category for SSEL Kadapa unit 2&3, Indo Tech, and SSEL Naini are 2343.85 tCO2e, 859.34 tCO2e, and 240.01 tCO2e, respectively.

  Bridging Gaps: Uniformity of reporting needs to be implemented; hence entire raw material purchase data has to be provided by all locations similar to data provided by Unit 2&3 Kadapa and classify the purchase data into production-related products & non-production-related products.

  All plants need to pay attention to convert values from different UOM to Metric Ton values by selecting appropriate conversion values.

- **Category C5 (Waste Generated in Operations):**

  The difference in emissions is due to the quantity of waste generated at each manufacturing plant. SSEL Kadapa generated 1359.2 tons of waste, while SSEL Naini and Indo Tech generated 254.5 tons and 536.1 tons of waste, respectively. Emissions under this category for SSEL Kadapa, Indo Tech, and SSEL Naini are 237.14 tCO2e, 65.59 tCO2e, and 39.10 tCO2e, respectively.

  Bridging Gaps: Separate data must be maintained for hazardous and non-hazardous waste. The uniformity of data should also be maintained as some scrap materials from FY23-24 were not reported in FY24-25.

  Under non-hazardous waste separate data to be maintained on a daily basis for food waste and its disposal methods, including the transportation mode for disposal, distance travelled and process of Recycling – Composting, Biogas etc.,

  Other non-hazardous waste disposal like, plastic, packaging materials, paper, wood etc., to be maintained on a monthly basis.

- **Category C6 (Business Travel):**

  The difference emission due to the mode of transportation used by the employees. SSEL, Kadapa has higher emissions (107.63 tCO2e), while SSEL Naini has the lowest emissions (20.39 tCO2e), and Indo Tech has 75.59 tCO2e. Air travel contributes the most to emissions in this category.

  Bridging Gaps: All mode of employee transport needs to be included. As of now we are receiving only Air travel details. These data also need to be maintained location/unit wise. Only SSEL Kadapa has provided complete data whereas SSEL Naini and Indo tech provided partial data.

  Business partners site visit if sponsored by SSEL Group needs to be captured separately.

- **Category C7 (Employee Commuting):**

  The difference in emissions is due to the number of employees at each plant and the mode of transportation used to commute. Emissions under this category for SSEL Kadapa, Indo Tech, and SSEL Naini are 181.90 tCO2e, 180.27 tCO2e, and 64.94 tCO2e, respectively.

  This is an annual data gathering activity and it needs to be done in the month of March every year as per the template sent by the ESG team.

- **Category C9 (Downstream Transportation and Distribution):**

  The difference in emissions is due to the weight of the final products, the distance from the manufacturing site to the client location, and the mode of transportation used. Emissions under this category for Indo Tech, SSEL Kadapa, and SSEL Naini are 947.91 tCO2e, 359.18 tCO2e, and 285.99 tCO2e, respectively.

Note: For FY25-26, we have started collecting "Category 1: Purchased Goods and Services" data for our businesses. Furthermore, we are exclusively doing "Category 2: Capital Goods" emission calculations for Shuchi Alloys, Kadapa and ISPL, Ramayapatnam.

Figure 31: Power Transformer

4.5 Emission Reduction Recommendations for SSEL Group As per FY 23-24 SSEL Group Carbon Footprint Baseline study

4.5.1 Under Scope 1

Sl.No	Site Name	Focus Area	Recommendations	Expected emissions reduction in tCO2e
1.	SSEL Unit 2 & 3, Kadapa	Company owned vehicle and Canteen Facilities	1. Outsource non-core activities such as Company owned transport used for Employee commute & Logistics activities and Canteen facilities to 3rd party venders.	432
		Forklift	Replace diesel forklift with Electric forklift powered by Renewable Energy.	134.25
		DG Set	1. Modify DG set to run on dual fuel or biodiesel or biogas or other biofuels. 2. Improve combustion efficiency by commencing the performance study.	37.25
2.	SSEL, Naini	Forklift	Replace diesel forklift with Electric forklift powered by Renewable Energy.	6.94
		DG Set	1. Modify DG set to run on dual fuel or biodiesel or biogas or other biofuels. 2. Improve combustion efficiency by commencing the performance study.	5.31
		Thermic Fluid Heater:	1. Improve combustion efficiency by commencing the performance study. 2. Reduce heat losses with proper insulation. 3. To **achieve zero emissions** - If budget allows the highly recommended solution would be switching to electricity from renewable energy source to heat the thermic fluid heater.	8.24
3	INDOTECH, Kancheepuram	DG Set	1. Modify DG set to run on dual fuel or biodiesel or biogas or other biofuels. 2. Improve combustion efficiency by commencing the performance study.	19.30
		Thermic Fluid Heater:	1. Improve combustion efficiency by commencing the performance study. 2. Reduce heat losses with proper insulation. 3. Switch the fuel from furnace oil to biomass 4. To **achieve zero emissions** - If budget allows the highly recommended solution would be switching to electricity from renewable energy source to heat the thermic fluid.	345.22
Total Scope 1 Emission Reduction per annum at current production output				**988 tCO2e**

Table 32: Emission Reduction Recommendations Under Scope 1

4.5.2 Under Scope 2

Sl.No	Site Name	Focus Area	Recommendations	Expected emissions reduction
1.	SSEL Unit 2 & 3, Kadapa (Approximate emission Reduction will be 3696 tCO2e)	Energy Efficiency	Conduct detailed energy audit and machinery efficiency study based on which generally 20 to 30 % energy conservation can be implemented.	2957 tCO2e @ 20% reduction
		Onsite Renewable Energy generation (Solar)	1. Clean panels regularly to remove dust, dirt, and debris that can block sunlight. 2. Ensure proper orientation and tilt angle and use solar tracking system. 3. Increase the capacity of onsite renewable energy generation (Currently Unit 2 & 3 Kadapa plant has the total of 2 MW rooftop solar power generation).	Even if 5% Renewable Energy (RE) addition happens totally against all these four options reductions of 739 tCO2e can be achieved.
		Offsite Renewable Energy generation	Generate electricity from renewable energy in offsite and wheeling it.	
		Offset Mechanism options	1. Purchase of renewable energy certificates (RECs) 2. Purchase renewable energy through power purchase agreement (PPAs) 3. Purchase renewable energy directly from the generator through open access policy.	
		Carbon Credits	1. Invest in projects that significantly reduce emissions can generate carbon credits under various carbon market mechanisms. 2. Tree plantation/afforestation and registration of project under voluntary carbon standards (VCS) – VERRA – Gold standards etc., for carbon credits. 3. Installation of Carbon capture technology.	
2.	SSEL, Naini (Approximate emission Reduction will be 218 tCO2e)	Energy Efficiency	Conduct detailed energy audit and machinery efficiency study based on which generally 20 to 30 % energy conservation can be implemented. As Naini plant has shown reduced scope 2 emission already it might be result of inherited efficiency practices, hence assumption of 10 to 15 % reduction is taken in this case.	145 tCO2e @10% reduction
		Onsite Renewable Energy generation	Explore the rooftop solar power generation or any other kind of solar power farming.	Even if 5% Renewable Energy (RE) addition happens totally against all these four
		Offsite Renewable Energy generation	Generate electricity from renewable energy in offsite and wheeling it.	

		Offset Mechanism options:	1. Purchase of renewable energy certificates (RECs) 2. Purchase renewable energy through power purchase agreement (PPAs) 3.Purchase renewable energy directly from the generator through open access policy.	options reductions of 73 tCO2e can be achieved.
		Carbon Credits	1. Invest in projects that significantly reduce emissions can generate carbon credits under various carbon market mechanisms. 2. Tree plantation/afforestation and registration of project under voluntary carbon standards (VCS) – VERRA – Gold standards etc., for carbon credits. 3. Installation of Carbon capture technology.	
3	INDOTECH, Kancheepuram (Approximate emission Reduction will be 218 tCO2e)	Energy Efficiency	Conduct detailed energy audit and machinery efficiency study based on which generally 20 to 30 % energy conservation can be implemented. As INDOTECH has shown reduced scope 2 emission already, so the expected emission reduction range will be minimum **5 to 15 %**	145 tCO2e @ 10% reductions
		Onsite Renewable Energy generation	Explore the rooftop solar power generation or any other kind of solar power farming.	Even if 5% Renewable Energy (RE) addition happens totally against all these four options reductions of 73 tCO2e can be achieved.
		Offsite Renewable Energy generation	1. Indotech already has offsite wind mill plant capacity of 450 kW/day at Thirunelveli. Recommend further increase this wind mill capacity and wheeling it. 2. Explore other source of renewable energy power generation in offsite and wheeling it.	
		Offset Mechanism options	1. Purchase of renewable energy certificates (RECs) 2. Purchase renewable energy through power purchase agreement (PPAs) 3. Purchase renewable energy directly from the generator through open access policy.	
		Carbon Credits	1. Invest in projects that significantly reduce emissions can generate carbon credits under various carbon market mechanisms. 2. Tree plantation/afforestation and registration of project under voluntary carbon standards (VCS) – VERRA – Gold standards etc., for carbon credits. 3. Installation of Carbon capture technology.	
Total Scope 2 Emission Reduction per annum at current production output				**4132 tCO2e**

Table 33: Emission Reduction Recommendations Under Scope 2

4.5.3 General Recommendations Under Scope 3 emissions

Sl. No	Scope 3 Category	Focus Area	Recommendations
1.	C3 - Fuel and Energy-Related Activities (not included in Scope 1 or 2)	Renewable Energy Contracts	Secure renewable energy for the entire value chain by working with energy providers, not just for direct operations but also encouraging suppliers to adopt renewable energy sources.
		Energy Efficiency Programs	Collaborate with suppliers to improve energy efficiency in their operations, providing training or incentives for adopting low-energy production technologies.
2.	C4 - Upstream Transportation and Distribution	Logistics Optimization	Optimize shipping routes, consolidate shipments, and use larger loads to reduce the number of trips. This helps reduce fuel consumption and emissions.
		Low-Emission Transport	Shift to low-carbon transportation modes such as electric trucks, rail, or sea freight wherever possible. Work with logistics partners that offer green transportation options.
		Local Sourcing	Source raw materials, components, and sub-assemblies from suppliers closer to the manufacturing plant to reduce the carbon footprint from transportation.
3.	C5 - Waste Generated in Operations	Waste Minimization	Implement lean manufacturing techniques to minimize material waste in the production process. Recycle scrap metals, insulation materials, and other production by-products.
		Circular Economy Initiatives	Establish take-back or recycling programs for transformer components that reach the end of their useful life. This reduces waste and recycles valuable materials.
		Packaging Optimization	Reduce packaging material use, and switch to recyclable or reusable packaging materials for both inbound and outbound goods.
4.	C6 - Business Travel	Virtual Collaboration	Minimize business travel by increasing the use of virtual meeting tools for collaboration with suppliers, clients, and internal teams.
		Sustainable Travel Policies	Implement a company-wide sustainable travel policy that prioritizes low-emission transportation options (e.g., trains over flights, electric vehicles over fossil-fuel-based vehicles).
5.	C7 - Employee Commuting	Telecommuting Options	Provide flexible work-from-home policies to reduce emissions from commuting.
		Carpooling and EV Adoption	Encourage carpooling and the use of electric vehicles (EVs) among employees. Provide EV charging stations at company facilities.

		Public Transport Incentives	Offer incentives for employees who use public transportation or adopt other sustainable commuting options like cycling or walking.
6.	C8 - Downstream Transportation and Distribution	Green Distribution Networks	Partner with distribution companies that prioritize the use of low-emission vehicles or carbon offset programs. Encourage customers to opt for lower-emission shipping options.
		Demand Forecasting	Improve demand forecasting to reduce the need for express or air freight, which tends to have higher emissions than other shipping methods.
		Reverse Logistics	Implement systems for customers to return used transformers for recycling or refurbishment, minimizing waste and transportation emissions associated with product disposal.

Table 34: Emission Reduction Recommendations Under Scope 3

Assuming 3 % reduction in Scope 3 emission will result in **422 tCO2e** emission reduction for the SSEL Group Transformer Manufacturing Business.
It is very important that we commence measurement of scope 3 emissions of all applicable 15 categories because EI can be disclosed as per scope 1+2 or scope 1+2+3. But while doing the latter it is important to include all applicable categories under scope 3.
Even for peer comparison inclusion of all categories under scope 3.

For transformer business applicable categories are C1 Purchased goods and Services, C2 Capital goods, C10 Processing of sold products, C11 Use of Sold products, C12 End of life treatment of sold products. We need to gather information on applicability of categories C8 Upstream leased assets, C13 Downstream Leased assets, C14 Franchises, C15 Investments.

4.5.4 General recommendation to reduce other scope 3 emissions

1. Category 1: Purchased Goods and Services

- Material Sourcing: Prioritize the use of recycled or sustainably sourced materials such as copper, steel, and insulation materials, which are key components in transformers.
- Supplier Sustainability: Engage with suppliers to ensure they are adopting energy-efficient manufacturing processes and low-carbon energy sources in their operations.
- Eco-friendly Components: Partner with suppliers to develop and procure more energy-efficient and longer-lasting components like high-efficiency cores and advanced insulation.

2. Category 2: Capital Goods

- Low-Carbon Machinery: Invest in manufacturing equipment and infrastructure that are energy-efficient, durable, and use renewable energy where possible.
- Sustainable Facility Design: Ensure manufacturing facilities and capital assets are built and maintained with sustainability in mind, incorporating renewable energy systems and waste-reducing technologies.

3. Category 8: Upstream Leased Assets

- Energy-Efficient Leases: Ensure that leased assets, such as office spaces or warehouses, meet high energy-efficiency standards. Work with landlords to install renewable energy sources like solar panels on leased buildings.
- Sustainable Asset Management: Ensure any leased manufacturing equipment is energy-efficient and regularly maintained to minimize energy consumption and emissions.

4. Category 10: Processing of Sold Products

- End-of-Life Treatment Programs: Develop and promote programs that help customers properly recycle or refurbish transformers at the end of their life to minimize environmental impacts.
- Product-as-a-Service Models: Consider offering transformers on a service or leasing model, where you retain control over end-of-life processing, ensuring products are disposed of sustainably.

5. Category 11: Use of Sold Products

- Energy-Efficient Design: Design transformers with high energy efficiency to reduce the operational emissions from electricity loss during use. Use advanced materials and technologies to minimize core and copper losses.
- Demand-Side Management: Work with customers to optimize transformer sizing and load management to ensure that transformers are operating at optimal efficiency.
- Smart Grid Integration: Design transformers to be compatible with smart grid technologies, enabling more efficient energy distribution and reducing emissions associated with electricity consumption.

6. Category 12: End-of-Life Treatment of Sold Products

- Take-Back Programs: Implement take-back or recycling programs for transformers that have reached the end of their useful life. This ensures that materials like copper, steel, and insulation are recovered and recycled.
- Recycling Partnerships: Partner with specialized recycling companies to ensure proper disposal and recovery of valuable materials from transformers, minimizing landfill waste and the emissions associated with raw material extraction.

7. Category 13: Downstream Leased Assets

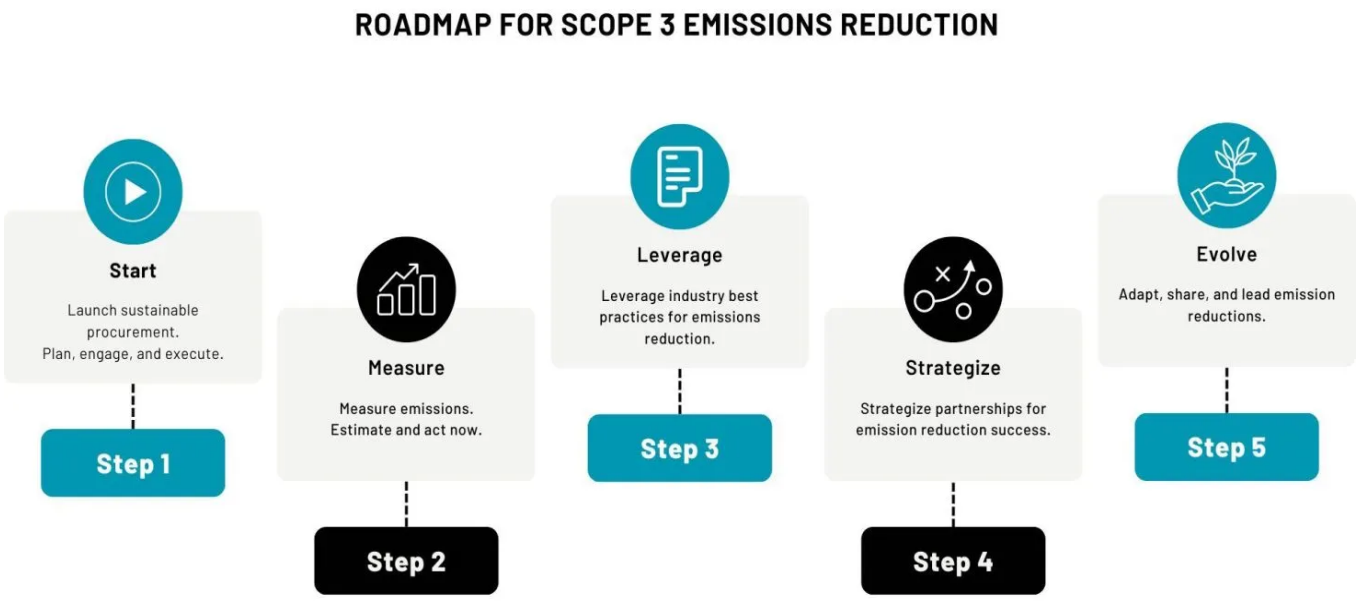
- Energy-Efficient Leasing Options: Offer energy-efficient transformers to customers on a leasing basis. This ensures that the latest, most efficient models are in use and that the products can be managed at end-of-life by the manufacturer for recycling or refurbishment.
- Renewable Energy Integration: Encourage customers leasing transformers to use renewable energy sources, reducing operational emissions associated with the electricity flowing through the transformers.

8. Category 14: Franchises

- Sustainability Standards for Franchisees: If the company operates franchises, set stringent environmental performance standards for them, particularly regarding energy use, waste management, and sourcing of materials.
- Franchise Training: Provide training and tools to franchisees to help them reduce their emissions, including using energy-efficient products and optimizing their supply chains.

9. Category 15: Investments

- Sustainable Investment Strategies: For any investments in external businesses, prioritize those with strong environmental, social, and governance (ESG) practices.
- Green Innovation Funding: Invest in green technologies and companies that focus on developing more sustainable transformer materials, designs, and manufacturing processes.



4.6 Emission Reduction Road Map – Where we start

The table 35 below shows the plan for reduction of scope 1, scope 2 and scope 3 emissions for transformer business taking the FY23-24 baseline.

UOM: tCO2e

Site Name	Unit 2&3 Kadapa		Naini		Indotech		Total Reduction
	From	To	From	To	From	To	
Scope 1	817	214	306	286	642	277.48	**988**
Scope 2	14783	11087	1453	1235	1454	1236	**4132**
Scope 3	10207	9901	1029	998	2848	2763	**422**
Reduction	25807	21202	2788	2519	4944	4276	
Total Reduction	**4605 (18%)**		**269 (9.6%)**		**668 (13.5%)**		**5542**

Table 35: Expected Emission Reduction

	UOM	Unit 2&3 Kadapa		Naini		Indotech	
		FY23-24	**FY24-25**	FY23-24	**FY24-25**	FY23-24	**FY24-25**
Production	MVA	7362	6745	1459	4044	6933	7767
Scope 1	tCO2e	817	916	306	364	642	731
Scope 2	tCO2e	14783	12365	1453	2700	1454	1608
EI (Scope 1+2)	tCO2e	2.1	1.97	1.21	0.76	0.30	0.30
Reduction in EI	tCO2e		**0.15**		**0.45**		**Unchanged**
Reduction in EI	%		7%		37%		0%
Scope 3	tCO2e	10207	8611	1029	1826	2845	2977
EI (Scope 1+2+3)	tCO2e	3.51	3.25	1.91	1.21	0.71	0.68
Total Reduction in EI	tCO2e		**0.26**		**0.70**		**0.03**
Reduction in EI	%		8%		37%		4%

Table 36: Comparison of FY24-25 emissions and EI with baseline year FY23-24

As shown in Table 35, the total targeted emission reduction for the transformer manufacturing business under Scope 1, Scope 2, and Scope 3 is 988 tCO2e, 4132 tCO2e, and 422 tCO2e, respectively, totaling 5542 tCO2e.

Location wise this total of 5542 tCO2e reduction can be broken up as 4605 tCO2e for SSEL Kadapa unit 2&3, 269 tCO2e for SSEL Naini and 668 tCO2e for Indo tech which is 18%, 9.6% and 13.6% respectively.

To compare emissions reduction with baseline year, EI is being compared and not absolute emission numbers as there is an increase/decrease in production MVA.

Location- Target	Scope 1+2 Reduction in EI	Scope 1+2+3 Reduction in EI	Increase in RE
SSEL Kadapa unit 2&3	**0.15**	**0.26**	**+1% (solar)**
SSEL Naini	**0.45**	**0.70**	**No RE**
Indotech	**Unchanged**	**0.03**	**-6% (wind) due to maintenance issues**

Table 37: EI Reduction in FY24-25

The reduction in emissions in FY24-25 calculated basis Emission Intensity is as follows

SSEL Kadapa

- In FY23-24 under scope 1+2, the EI in unit 2&3 SSEL Kadapa was 2.12 tCO2e for an MVA of 7362.
- In FY24-25 the scope 1+2 emission was 916+12365 respectively totaling to 13281 tCO2e for an MVA of 6745 in this year
- Hence though the absolute reduction in emission is 2319 tCO2e against the planned 4299 tCO2e, the EI is 1.97 tCO2e in FY24-25 which is reduction in EI of 0.15 against the planned reduction of 0.57 tCO2e reduction in EI against the FY23-24 EI Scope1+2 of 2.1 tCO2e.
- Similarly scope 1+2+3 reduction in emissions planned from the baseline of FY23-24 over 3 years is 4605 (18% of total emissions/0.38 tCO2e reduction in EI from 2.12 tCO2e EI in FY23-24).
- **And in FY24-25 the emissions of scope 1+2+3 is 21891 against 25807 of baseline year FY23-24. The actual reduction is 3916 in total emissions translating to 15.17% and reduction in EI 0.26 tCO2e.**
- **So, the reduction delivered in scope 1+2+3 in terms of EI is 0.26 tCO2e reduction against the planned 0.38 tCO2e over 3 years.**

SSEL Naini

- EI in unit SSEL Naini in FY23-24 was 1.21 tCO2e under scope 1+2.
- The reduction in emissions over a period of 3 years under scope 1+2 was planned to be 238 tCO2e which is 13.5% reduction of emissions in FY23-24.
- With 13.5% reduction, the EI should be 1.04 tCO2e, (a reduction of 0.16 EI) in scope 1+2.
- In FY24-25 the scope 1+2 emission is 364+2700 respectively totaling to 3064 tCO2e for an MVA of 4044 in this year
- **Hence though there is an increase in absolute emissions under Scope 1+2 by 1305 tCO2e against the planned 13.5% reduction which is 238 tCO2e, due to increase in production from 1459 MVA in FY23-24 to 4044 in FY24-25, the EI is 0.76 tCO2e in FY24-25. This is a reduction of an EI of 0.45 when compared EI of 1.2 tCO2e in FY23-24.**
- Similarly scope 1+2+3 reduction in absolute emissions planned is 269 (9.6% of absolute emissions/0.12 tCO2e reduction in EI).
- **And in FY24-25 the emissions of scope 1+2+3 is 4890 against 2788 of previous year, but due to the huge production increase from 1459 MVA in FY23-24 to 4044 in FY24-25 the EI has effectively reduced to 1.18 tCO2e from 1.91 tCO2e in the previous year, which is a reduction of 37% against planned 9.6%**

Indotech

- EI in unit Indotech in FY23-24 was 0.30 tCO2e under scope 1+2 for an MVA of 6933.
- The reduction in Absolute numbers under scope 1+2 was planned to be 583 tCO2e which is 28%.
- when 28% reduction is achieved the EI will be 0.22 tCO2e, that is a reduction of 0.08 EI in scope 1+2

- In FY24-25 the scope 1+2 emission totals to 2339 tCO2e (2096 in FY23-24) for an MVA of 7767 in this year
- **Hence though there is an increase in absolute emissions by 243 tCO2e the EI remains unchanged at 0.30 tCO2e for Scope 1+2**
- Similarly, scope 1+2+3 reduction in emissions planned is 668 (13.5% of absolute emissions/0.1 tCO2e reduction in EI).
- And in FY24-25 the emissions of scope 1+2+3 is 5316 against 4944 of previous year.
- **Though there is an increase of absolute emissions by 372 tCO2e, the EI is 0.68 tCO2e in FY24-25 when compared to 0.71 tCO2e in FY23-24 which is noticeable reduction for Scope 1+2+3.**

4.7 Target Setting for SSEL Group Companies

Post the FY 23-24 data for footprint was successfully Published and baseline established, the roadmap for reduction strategy was planned under two broad categories.

Long term target:

- To become a carbon neutral company by 2040 with respect to only scope 1+2.
- To reduce scope 3 emission by 50% from a 2023 base year by 2030 (EU has a target of reducing net GHG emission by 55% by 2030 and India has a target of reducing carbon emissions by 50% by 2030 and for the entire economy to be net zero by 2070)
- To become a net zero company by 2060
- Reach RE100 status by 2035

Short term target:

Based on above long term targets the roadmap for short term target can be modeled as below for a 3-year period and review, course correct in 2027.

- Reduce Scope 1+2 absolute emission by 5 % annually from a 2023 base year.
- Reduce Scope 3 absolute emission by 3 % annually from a 2023 base year.
- Increase renewable energy share by 5 % annually from a 2023 base year.

5. GHG EMISSION REDUCTION OPPORTUNITIES

5.1 General GHG Mitigation Opportunities

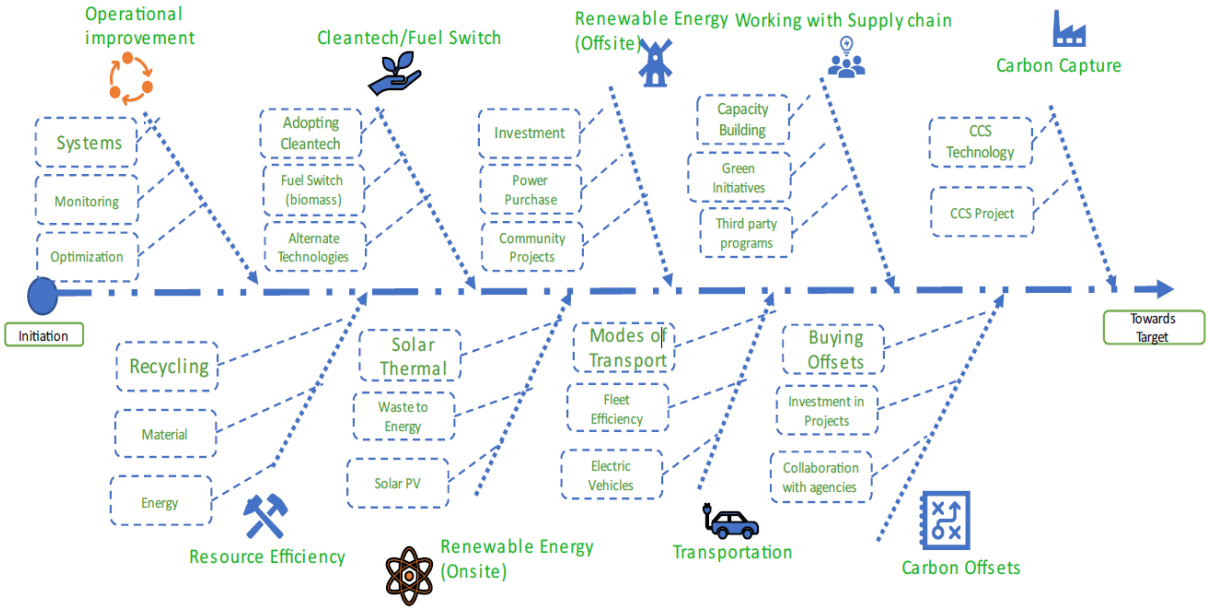


Figure 32: GHG Mitigation Opportunities

5.2 Additional Tips for Energy Efficiency

Over and above all the reduction opportunities that were given in the baseline study Chapter 4 (SSEL Group Carbon Footprint Baseline Study - FY23-24 by ESG Department.pdf), the below may be noted and awareness created around these Energy Efficiency tips to enhance the Emission reduction in our operations.

Electricity:

- Optimise the tariff structure with utility supplier
- Schedule your operations to maintain a high load factor
- Shift loads to off-peak times if possible.
- Minimise maximum demand by tripping loads through a demand controller
- Stagger start-up times for equipment with large starting currents to minimize load peaking.
- Use standby electric generation equipment for on-peak high load periods.
- Relocate transformers close to main loads.
- Set transformer taps to optimum settings.
- Disconnect primary power to transformers that do not serve any active loads
- Consider on-site electric generation or cogeneration.
- Export power to grid if you have any surplus in your captive generation
- Check utility electric meter with your own meter.
- Shut off unnecessary computers, printers, and copiers at night.

Motors:

- Properly size to the load for optimum efficiency. (High efficiency motors offer of 4-5% higher efficiency than standard motors)
- Use energy-efficient motors where economical.
- Use synchronous motors to improve power factor.
- Check alignment.
- Provide proper ventilation
  (For every 10°C increase in motor operating temperature over recommended peak, the motor life is estimated to be halved)
- Check for under-voltage and over-voltage conditions.
- Balance the three-phase power supply.
  (An Imbalanced voltage can reduce 3-5% in motor input power)
- Demand efficiency restoration after motor rewinding. (If rewinding is not done properly, the efficiency can be reduced by 5-8%)

Drives:

- Use variable-speed drives for large variable loads.
- Use high-efficiency gear sets.
- Use precision alignment.
- Check belt tension regularly.
- Eliminate variable-pitch pulleys.
- Use flat belts as alternatives to v-belts.
- Use synthetic lubricants for large gearboxes.
- Eliminate eddy current couplings.
- Shut them off when not needed.

Fans:

- Use smooth, well-rounded air inlet cones for fan air intakes.
- Avoid poor flow distribution at the fan inlet.
- Minimize fan inlet and outlet obstructions.
- Clean screens, filters, and fan blades regularly.
- Use aerofoil-shaped fan blades.
- Minimize fan speed.
- Use low-slip or flat belts.
- Check belt tension regularly.
- Eliminate variable pitch pulleys.
- Use variable speed drives for large variable fan loads.
- Use energy-efficient motors for continuous or near-continuous operation
- Eliminate leaks in ductwork
- Minimise bends in ductwork
- Turn fans off when not needed.

Blowers:

- Use smooth, well-rounded air inlet ducts or cones for air intakes.
- Minimize blower inlet and outlet obstructions.
- Clean screens and filters regularly.
- Minimize blower speed.
- Use low-slip or no-slip belts.

- Check belt tension regularly.
- Eliminate variable pitch pulleys.
- Use variable speed drives for large variable blower loads.
- Use energy-efficient motors for continuous or near-continuous operation.
- Eliminate ductwork leaks.
- Turn blowers off when they are not needed.

Pumps:

- Operate pumping near best efficiency point.
- Modify pumping to minimize throttling.
- Adapt to wide load variation with variable speed drives or sequenced control of smaller units.
- Stop running both pumps add an auto-start for an on-line spare or add a booster pump in the problem area.
- Use booster pumps for small loads requiring higher pressures.
- Increase fluid temperature differentials to reduce pumping rates.
- Repair seals and packing to minimize water waste.
- Balance the system to minimize flows and reduce pump power requirements.
- Use siphon effect to advantage: don't waste pumping head with a free-fall (gravity) return.

Compressors:

- Consider variable speed drive for variable load on positive displacement compressors.
- Use a synthetic lubricant if the compressor manufacturer permits it.
- Be sure lubricating oil temperature is not too high (oil degradation and lowered viscosity) and not too low (condensation contamination).
- Change the oil filter regularly.
- Periodically inspect compressor intercoolers for proper functioning.
- Use waste heat from a very large compressor to power an absorption chiller or preheat process or utility feeds.
- Establish a compressor efficiency-maintenance program. Start with an energy audit and follow-up, then make a compressor efficiency-maintenance program a part of your continuous energy management program.

Compressed air:

- Install a control system to coordinate multiple air compressors.
- Study part-load characteristics and cycling costs to determine the most-efficient mode for operating multiple air compressors.
- Avoid over sizing-match the connected load.
- Load up modulation-controlled air compressors. (They use almost as much power at partial load as at full load.)
- Turn off the back-up air compressor until it is needed.
- Reduce air compressor discharge pressure to the lowest acceptable setting. (Reduction of 1 kg/cm² air pressure (8 kg/cm² to 7 kg/cm²) would result in 9% input power savings. This will also reduce compressed air leakage rates by 10%)
- Use the highest reasonable dryer dew point settings.
- Turn off refrigerated and heated air dryers when the air compressors are off.

- Use a control system to minimize heatless desiccant dryer purging.
- Minimize purges, leaks, excessive pressure drops, and condensation accumulation. (Compressed air leak from I mm hole size at 7 kg/cm² pressure would mean power loss
- equivalent to 0.5 kW) Use drain controls instead of continuous air bleeds through the drains.
- Consider engine-driven or steam-driven air compression to reduce electrical demand charges.
- Replace standard v-belts with high-efficiency flat belts as the old v-belts wear out.
- Use a small air compressor when major production load is off.
- Take air compressor intake air from the coolest (but not air conditioned) location. (Every S°C reduction in intake air temperature would result in 1% reduction in compressor
- power consumption) Use an air-cooled aftercooler to heat building makeup air in winter.
- Be sure that heat exchangers are not fouled (e.g. with oil).
- Be sure that air/oil separators are not fouled.
- Monitor pressure drops across suction and discharge filters and clean or replace filters
- promptly upon alarm.
- Use a properly sized compressed air storage receiver. Minimize disposal costs by using lubricant that is fully demulsible and an effective oil-water separator.
- Consider alternatives to compressed air such as blowers for cooling, hydraulic rather than air cylinders, electric rather than air actuators, and electronic rather than pneumatic controls.
- Use nozzles or venturi-type devices rather than blowing with open compressed air lines.
- Check for leaking drain valves on compressed air filter/regulator sets. Certain rubber-type valves may leak continuously after they age and crack.
- In dusty environments, control packaging lines with high-intensity photocell units instead of standard units with continuous air purging of lenses and reflectors.
- Establish a compressed air efficiency-maintenance program. Start with an energy audit and follow-up, then make a compressed air efficiency-maintenance program a part of your continuous energy management program.

Chillers:

- Increase the chilled water temperature set point if possible.
- Use the lowest temperature condenser water available that the chiller can handle. (Reducing condensing temperature by 5.5°C, results in a 20-25% decrease in compressor power consumption)
- Increase the evaporator temperature
  (5.5°C increase in evaporator temperature reduces compressor power consumption by 20- 25%)

- Clean heat exchangers when fouled. (1 mm scale build-up on condenser tubes can increase energy consumption by 40%)
- Optimize condenser water flow rate and refrigerated water flow rate. Replace old chillers or compressors with new higher-efficiency models.

- Use water-cooled rather than air-cooled chiller condensers.
- Use energy-efficient motors for continuous or near-continuous operation.
- Specify appropriate fouling factors for condensers.
- Do not overcharge oil.
- Install a control system to coordinate multiple chillers.
- Study part-load characteristics and cycling costs to determine the most-efficient mode for
- operating multiple chillers.
- Run the chillers with the lowest operating costs to serve base load.
- Avoid oversizing-match the connected load.
- Isolate off-line chillers and cooling towers.
- Establish a chiller efficiency-maintenance program. Start with an energy audit and follow- up, then make a chiller efficiency-maintenance program a part of your continuous energy management program.

HVAC (Heating/Ventilation/Air Conditioning):

- Tune up the HVAC control system.
- Consider installing a building automation system (BAS) or energy management system (EMS) or restoring an out-of-service one.
- Balance the system to minimize flows and reduce blower/fan/pump power requirements.
- Eliminate or reduce reheat whenever possible.
- Use appropriate HVAC thermostat setback.
- Use morning pre-cooling in summer and pre-heating in winter (i.e. - before electrical peak hours).
- Use building thermal lag to minimize HVAC equipment operating time.
- In winter during unoccupied periods, allow temperatures to fall as low as possible without freezing water lines or damaging stored materials.
- In summer during unoccupied periods, allow temperatures to rise as high as possible without damaging stored materials.
- Improve control and utilization of outside air.
- Use air-to-air heat exchangers to reduce energy requirements for heating and cooling of outside air.
- Reduce HVAC system operating hours (e.g night, weekend).
- Optimize ventilation.
- Ventilate only when necessary. To allow some areas to be shut down when unoccupied, install dedicated HVAC systems on continuous loads (eg. computer rooms).
- Provide dedicated outside air supply to kitchens, cleaning rooms, combustion equipment, etc. to avoid excessive exhausting of conditioned air.
- Use evaporative cooling in dry climates.
- Reduce humidification or dehumidification during unoccupied periods.
- Use atomization rather than steam for humidification where possible.
- Clean HVAC unit coils periodically and comb mashed fins.
- Upgrade filter banks to reduce pressure drop and thus lower fan power requirements. Check HVAC filters on a schedule (at least monthly) and clean/change if appropriate.
- Check pneumatic controls air compressors for proper operation, cycling, and maintenance.
- Isolate air-conditioned loading dock areas and cool storage areas using high-speed doors or

- clear PVC strip curtains.
- Install ceiling fans to minimize thermal stratification in high-bay areas.
- Relocate air diffusers to optimum heights in areas with high ceilings.
- Consider reducing ceiling heights.
- Eliminate obstructions in front of radiators, baseboard heaters, etc. Check reflectors on infrared heaters for cleanliness and proper beam direction.
- Use professionally-designed industrial ventilation hoods for dust and vapor control.
- Use local infrared heat for personnel rather than heating the entire area.
- Use spot cooling and heating (e.g. use ceiling fans for personnel rather than cooling the entire area)
- Purchase only high-efficiency models for HVAC window units.
- Put HVAC window units on timer control.
- Don't oversize cooling units. (Oversized units will "short cycle" which results in poor humidity control.)
- Install multi-fuelling capability and run with the cheapest fuel available at the time.
- Consider dedicated make-up air for exhaust hoods. (Why exhaust the air conditioning or heat if you don't need to?)
- Minimize HVAC fan speeds.
- Consider desiccant drying of outside air to reduce cooling requirements in humid climates.
- Consider ground source heat pumps.
- Seal leaky HVAC ductwork.
- Seal all leaks around coils.
- Repair loose or damaged flexible connections (including those under air handling units).
- Eliminate simultaneous heating and cooling during seasonal transition periods.
- Zone HVAC air and water systems to minimize energy use.
- Inspect, clean, lubricate, and adjust damper blades and linkages.
- Establish an HVAC efficiency-maintenance program. Start with an energy audit and follow- up, then make an HVAC efficiency-maintenance program a part of your continuous energy management program

Cooling towers: for future use at Indosol

- Control cooling tower fans based on leaving water temperatures.
- Control to the optimum water temperature as determined from cooling tower and chiller performance data.
- Use two-speed or variable-speed drives for cooling tower fan control if the fans are few Stage the cooling tower fans with on-off control if there are many
- Turn off unnecessary cooling tower fans when loads are reduced.
- Cover hot water basins (to minimize algae growth that contributes to fouling),
- Balance flow to cooling tower hot water basins.
- Periodically clean plugged cooling tower water distribution nozzles.
- Install new nozzles to obtain a more-uniform water pattern.
- Replace splash bars with self-extinguishing PVC cellular-film fill
- On old counterflow cooling towers, replace old spray-type nozzles with new square-spray ABS practically-non-clogging nozzles.
- Replace slat-type drift eliminators with high-efficiency, low-pressure-drop, self- extinguishing, PVC cellular units.

- If possible, follow manufacturer's recommended clearances around cooling towers and relocate or modify structures, signs, fences, dumpsters, etc. that interfere with air intake or exhaust.
- Optimize cooling tower fan blade angle on a seasonal and/or load basis. Correct excessive and/or uneven fan blade tip clearance and poor fan balance.
- Use a velocity pressure recovery fan ring
- Divert clean air-conditioned building exhaust to the cooling tower during hot weather.
- Re-line leaking cooling tower cold water basins.
- Check water overflow pipes for proper operating level.
- Optimize chemical use,
- Consider side stream water treatment.
- Restrict flows through large loads to design values.
- Shut off loads that are not in service.
- Take blowdown water from the return water header.
- Optimize blowdown flow rate.
- Automate blowdown to minimize it.
- Send blowdown to other uses (Remember, the blowdown does not have to be removed at the cooling tower. It can be removed anywhere in the piping system.)
- Implement a cooling tower winterization plan to minimize ice build-up
- Install interlocks to prevent fan operation when there is no water flow.
- Establish a cooling tower efficiency-maintenance program. Start with an energy audit and follow-up, then make a cooling tower efficiency-maintenance program a part of your continuous energy management program.

Lighting:

- Reduce excessive illumination levels to standard levels using switching, delamping, etc. (Know the electrical effects before doing delamping)
- Aggressively control lighting with clock timers, delay timers, photocells, and/or occupancy sensors
- Install efficient alternatives to incandescent lighting, mercury vapor lighting, etc. Efficiency (lumens/watt) of various technologies range from best to worst approximately as follows: low pressure sodium, high pressure sodium, metal halide, fluorescent, mercury vapor, incandescent.
- Select ballasts and lamps carefully with high power factor and long-term efficiency in mind Upgrade obsolete fluorescent systems to Compact fluorescents and electronic ballasts
- Consider lowering the fixtures to enable using less of them
- Consider daylighting, skylights, etc.
- Consider painting the walls a lighter colour and using less lighting fixtures or lower wattages.
- Use task lighting and reduce background illumination.
- Re-evaluate exterior lighting strategy, type, and control. Control it aggressively.
- Change exit signs from incandescent to LED.

DG sets:

- Optimise loading
- Use waste heat to generate steam/hot water /power an absorption chiller or preheat process or utility feeds.
- Use jacket and bead cooling water for process needs
- Clean air filters regularly
- Insulate exhaust pipes to reduce DG set room temperatures
- Use cheaper heavy fuel oil for capacities more than IMW

Buildings:

- Seal exterior cracks/openings/gaps with caulk, gasketing, weatherstripping, etc.
- Consider new thermal doors, thermal windows, roofing insulation, etc.
- Install windbreaks near exterior doors.
- Replace single-pane glass with insulating glass.
- Consider covering some window and skylight areas with insulated wall panels inside the building.
- If visibility is not required but light is required, consider replacing exterior windows with insulated glass block.
- Consider tinted glass, reflective glass, coatings, awnings, overhangs, draperies, blinds, and shades for sunlit exterior windows.
- Use landscaping to advantage.
- Add vestibules or revolving doors to primary exterior personnel doors.
- Consider automatic doors, air curtains, strip doors, etc. at high-traffic passages between conditioned and non-conditioned spaces. Use self-closing doors if possible.
- Use intermediate doors in stairways and vertical passages to minimize building stack effect.
- Use dock seals at shipping and receiving doors.
- Bring cleaning personnel in during the working day or as soon after as possible to minimize lighting and HVAC costs.

Water & Wastewater:

- Recycle water, particularly for uses with less-critical quality requirements.
- Recycle water, especially if sewer costs are based on water consumption.
- Balance closed systems to minimize flows and reduce pump power requirements.
- Eliminate once-through cooling with water.
- Use the least expensive type of water that will satisfy the requirement.
- Fix water leaks.
- Test for underground water leaks. (It's easy to do over a holiday shutdown.)
- Check water overflow pipes for proper operating level.
- Automate blowdown to minimize it.
- Provide proper tools for wash down-especially self-closing nozzles.
- Install efficient irrigation.
- Reduce flows at water sampling stations.
- Eliminate continuous overflow at water tanks.
- Promptly repair leaking toilets and faucets.
- Use water restrictors on faucets, showers, etc.

- Use self-closing type faucets in restrooms.
- Use the lowest possible hot water temperature.
- Do not use a heating system hot water boiler to provide service hot water during the cooling season - install a smaller, more-efficient system for the cooling season service hot water
- If water must be heated electrically, consider accumulation in a large insulated storage tank to minimize heating at on-peak electric rates.
- Use multiple, distributed, small water heaters to minimize thermal losses in large piping systems.
- Use freeze protection valves rather than manual bleeding of lines.
- Consider leased and mobile water treatment systems, especially for deionized water.
- Seal sumps to prevent seepage inward from necessitating extra sump pump operation.
- Install pre-treatment to reduce TOC and BOD surcharges.
- Verify the water meter readings. (You'd be amazed how long a meter reading can be estimated after the meter breaks or the meter pit fills with water!)
- Verify the sewer flows if the sewer bills are based on them

Furnaces:

- Check against infiltration of air: Use doors or air curtains
- Monitor O, /CO/CO and control excess air to the optimum level
- Improve burner design, combustion control and instrumentation.
- Ensure that the furnace combustion chamber is under slight positive pressure
- Use ceramic fibres in the case of batch operations
- Match the load to the furnace capacity
- Retrofit with heat recovery device
- Investigate cycle times and reduce
- Provide temperature controllers
- Ensure that flame does not touch the stock

Miscellaneous:

- Meter any unmetered utilities. Know what is normal efficient use. Track down causes of deviations.
- Shut down spare, idling, or unneeded equipment.
- Make sure that all of the utilities to redundant areas are turned off including utilities like compressed air and cooling water.
- Install automatic control to efficiently coordinate multiple air compressors, chillers, cooling tower cells, boilers, etc.
- Renegotiate utilities contracts to reflect current loads and variations
- Consider buying utilities from neighbors, particularly to handle peaks
- Leased space often has low-bid inefficient equipment. Consider upgrades if your lease will continue for several more years
- Adjust fluid temperatures within acceptable limits to minimize undesirable heat transfer in long pipelines.
- Minimize use of flow bypasses and minimize bypass flow rates Provide restriction orifices in purges (nitrogen, steam, etc.).
- Eliminate unnecessary flow measurement orifices.
- Consider alternatives to high pressure drops across valves
- Turn off winter heat tracing that is on in summer.

6. GLOBAL CONTEXT

Since the release of the Intergovernmental Panel on Climate Change (IPCC) "Global Warming of 1.5°C" report in 2018 which positioned the efforts of the private sector as integral to ensure that global warming stays within the 1.5°C limit, reporting frameworks, voluntary and mandatory, have grown to facilitate the integration of sustainability into organizations' strategies and to guide them towards greater transparency for their stakeholders.

There are more than 30 voluntary environmental reporting frameworks that companies can use. It is therefore difficult to determine which ones are the most appropriate.

Below are a few of the important such frameworks that we run into on a regular basis:

6.1 Energy & Emissions - Standards

Standard	GHG Protocol	An internationally credible methodology for the calculation of Scopes 1, 2 & 3 emissions which can be used in mandatory and voluntary reporting frameworks
	ISO 14064	An internationally credible standard for the calculation of Scopes 1, 2 & 3 emissions which can be used in mandatory and voluntary reporting frameworks
	ISO 14068-1:2023	An internationally recognized voluntary standard for carbon neutrality, ISO 14068-1:2023 replaced PAS 2060 and provides requirements through which companies can demonstrate and certify achievement of carbon neutrality.
	ISO 50001	An international energy management standard which assists in implementing a continual improvement approach to energy efficiency
	ISO 14001	ISO 14001 is an internationally agreed and recognized standard for Environmental Management Systems
	Net-Zero Standard	New Net-Zero Standard from the Science-Based Targets initiative (SBTi), considered global best practice for companies setting net-zero strategies
	Net Zero Guidelines	The Net-Zero Guidelines, published by the ISO, establish a standardization framework based on 12 guidelines to help companies achieve net-zero emissions
	ACT Initiative	The ACT (Assessing low Carbon Transition) initiative offers several sector-specific methodologies to assess the extent to which an organization has a strategy aligned with the decarbonization trajectories of its sector

Figure 33: Energy & Emission related Standards

6.2 Sustainability Related Framework & Standards

Sustainability	Environment, Social and Governance	SDG	17 UN environmental, social and economic goals with 169 associated targets that companies can voluntarily demonstrate that they are contributing to
		Ecovadis	An online sustainability framework that provides performance ratings for companies within global supply chains
		GRI	An internationally recognized and comprehensive framework for sustainability reporting, with standards covering economic, environmental, and social topics, providing requirements, recommendations, and guidance for disclosures
	Investor-led	ISSB Standards	A set of recommendations to assist companies in better accounting for climate-related risks in their financial and mainstream disclosures. In 2023, the ISSB published two standards to facilitate the risks & opportunities reporting of any company's value chain. ISSB and IFRS Foundation now monitoring of progress for climate-related disclosures as TCFD has been disbanded.
		TNFD	Global science-based initiative that develops and delivers risk management and disclosure frameworks for organizations to report and act on evolving nature-related issues
		DJSI	Published indices of the top 10% of companies who respond to a questionnaire covering Economic, Environmental and Social issues
		CDP	One of the largest international, investor-led sustainability reporting frameworks. It is voluntary, but companies can be asked to respond by their stakeholders
		RE100	The Renewable Energy 100 initiative brings together major companies that want to source 100% of their energy from renewable energy sources by 2050
		EV100	Global initiative promoted by the Climate Group to bring together companies that are committed to electrifying their owned and contracted fleets
	Legislation	CSRD	As of 2025, the EU's CSRD is set to gradually extend ESG reporting to thousands of large companies, though proposed threshold changes may reduce the total number from the originally planned 50,000.
		EU Taxonomy	A regulatory classification system under which companies may define which of their economic activities are environmentally sustainable
		CFD	The Companies (Strategic Report) (Climate-related Financial Disclosure) (CFD) Regulations were implemented from April 2022 in United Kingdom.

Figure 34: Sustainability related framework

We have elaborated below a few of the important frameworks and standards which we need to commence/renew/improve upon and include the newer additions in the series. While some are specifically related to energy or environment, certain others are evolving frameworks in a global and national (Indian) context, the adherence to which is not just important but increasingly mandatory to be accepted as a partner or vendor.

ISO 14000 Series:

- ISO 14001 (Environmental management systems) "provides requirements with guidance for use that relate to environmental management systems. Other standards in the ISO 14000 series focus on specific approaches such as audits, communications, labelling and life cycle analysis, as well as environmental challenges such as climate change".

- Within the ISO 14000 series, a notable standard is ISO 14067 (Carbon footprint of products), which provides guidance and requirements on the carbon footprint reporting for a product while following life cycle assessments (LCAs) as specified in ISO 14040 and ISO 14044.
- Aligned with the Greenhouse Gas (GHG) Protocol and compatible with most GHG programs, the ISO 14064 series gives specifications for the quantification, monitoring and validation/verification of greenhouse gas emissions, while ISO 14067 specifies the principles, requirements and guidelines for quantifying and reporting the carbon footprint of products.

IEC 63366:

IEC 63366, published on June 2025 in TC 111 (Environmental standardization), is intended to provide common rules for the LCA of electrical and electronic products. It will be used as a template for product committees (like TC 82) to develop their own LCA standards with product-specific rules (PSRs)/product category rules (PCRs). TC 111 has published IEC 63366 as a horizontal publication, which means two things:

- For LCA practitioners, this horizontal standard shall be applied when there is no PSR standard; LCA practitioners can use the applicable requirements and adapt requirements according to the specific product or product group/product family applied.
- For product committees, this horizontal standard shall be used as a starting point for developing their PSR standard. If a PSR standard is available, it will take precedence over this horizontal PCR standard.

Some examples where countries/regions are mandating stronger compliance to ESG requirements include (but are not limited to):

Corporate Sustainability Reporting Directive (CSRD):

- The European Union in 2023 commenced the enforcement of its Corporate Sustainability Reporting Directive (CSRD), which provides updated guidance on the rules concerning the social and environmental information that companies (across different sectors and industry) must report. The main objective of this legislation is to provide investors/stakeholders with information they require on how people and the environment are impacted by the operational activities of firms in which they would invest financially and/or identify opportunities arising from climate change and other sustainability issues. Companies that are subject to the CSRD are obliged to report on their ESG compliance according to European Sustainability Reporting Standards.

Carbon Border Adjustment Mechanism (CBAM):

- The EU's Carbon Border Adjustment Mechanism (CBAM) is the EU's tool to put a fair price on the carbon emitted during the production of carbon intensive goods that are entering the EU, and to encourage cleaner industrial production in non-EU countries.

- CBAM will apply in its definitive regime from 2026, while the current transitional phase lasts between 2023 and 2025. The CBAM will initially apply to imports of certain goods and selected precursors whose production is carbon intensive and at most significant risk of carbon leakage: cement, iron and steel, aluminium, fertilisers, electricity and hydrogen.
- Carbon leakage occurs when companies based in the EU move carbon-intensive production abroad to countries where less stringent climate policies are in place than in the EU, or when EU products get replaced by more carbon-intensive imports.
- If the production of transformers involves significant greenhouse gas (GHG) emissions, and if these emissions are not already accounted for in the exporting country's carbon pricing system, these could fall under CBAM in the future, particularly if the mechanism's scope expands to include finished electrical equipment.

Australia's Treasury Law:

- In August 2024, Australia has also passed an amendment to its Treasury Law which requires large and medium-sized firms, starting in 2025, to disclose climate related risks and opportunities – in tandem with GHG emission reporting. Australia is also planning to establish a Net Zero Economy Authority that will provide support to workers in the energy sector with access to skills development opportunities as well as guiding new investors towards net zero transformation avenues.

UAE Sustainable Finance Regulatory Framework:

- As the host country for COP 28 in 2023, the UAE announced USD 30 billion pledge to support the development of clean energy projects globally. During the UAE's recent COP presidency, the Abu Dhabi Global Market implemented its own sustainable finance regulatory framework which provides guidance and regulations on ESG disclosures by companies which engage in this market.

6.3 ESG impact on Solar PV business

- Closely tied to the **EU CSRD**, the Waste from Electrical and Electronic Equipment (WEEE) Directive 2012/19/EU applies the principle of extended producer responsibility. This principle requires manufacturers to ensure their operational responsibilities also cover management of the post-consumer stage to ensure national/EU recycling and/or recovery targets are met (EU Commission, 2024b; EUROPEN, 2015). Solar PV panels, inverters and charging stations are covered under this legislation.
- The **US Federal Regulation Acquisition** FAR 23.108 includes requirements for PV modules and inverters, recognizing the EPEAT ecolabel to meet government sustainability goals through federal procurement of solar energy in construction and power purchase agreements (PPAs) via EPEAT- SOLAR PV SUPPLY CHAINS: TECHNICAL AND ESG STANDARDS FOR MARKET INTEGRATION 152 registered PV modules and inverters (United States Government, 2024). While the US federal government is not yet a significant

purchaser of PV modules and inverters, it procures a significant amount of PV-generated electricity via PPAs.

There are also several PRIVATE ESG STANDARDS AND SERVICES:

- The Global Electronics Council has established the Electronic Product Environmental Assessment Tool (EPEAT) Ecolabel for the electronics sector. This includes PV modules.
- Used by private and public buyers globally since 2006, the EPEAT Ecolabel relies on transparent, multi-attribute, life-cycle based ESG criteria developed by industry stakeholders (ANSI/NSF/UL)
- To ensure the high technical and sustainable quality of products, many purchasing entities are starting to require or prefer the presence of the EPEAT Ecolabel. For example, in the United States EPEAT is currently the only approved ecolabel for PV modules and PPAs in the US Environmental Protection Agency's Recommendations of Specifications, Standards and Ecolabels for Federal Purchasing (Global Electronics Council, 2024).

Climate change mitigation	Sustainable use of resources	Reduction of chemicals of concern	Corporate ESG performance
• Manufacturing energy efficiency • GHG emissions in manufacturing • LCA and disclosure of cumulative energy demand and global warming potential • Carbon footprint	• Recycled content • Design for recycling • Product take back and responsible recycling • Disclosure of recovery and recycling achievement • Material recovery targets • Efficient water uses in manufacturing	• Restricted substances in product – RoHS[7], REACH[8], halogenated substance • Substance inventory and disclosure • Alternatives assessment	• Social performance and audits • Worker and health safety • Environmental management system • Responsible material sourcing • Hot spot identification and leadership compared to industry

Figure 35: The ESG adherences required under EPEA

6.4 Tracking Country Wise and per Capita GHG Emissions

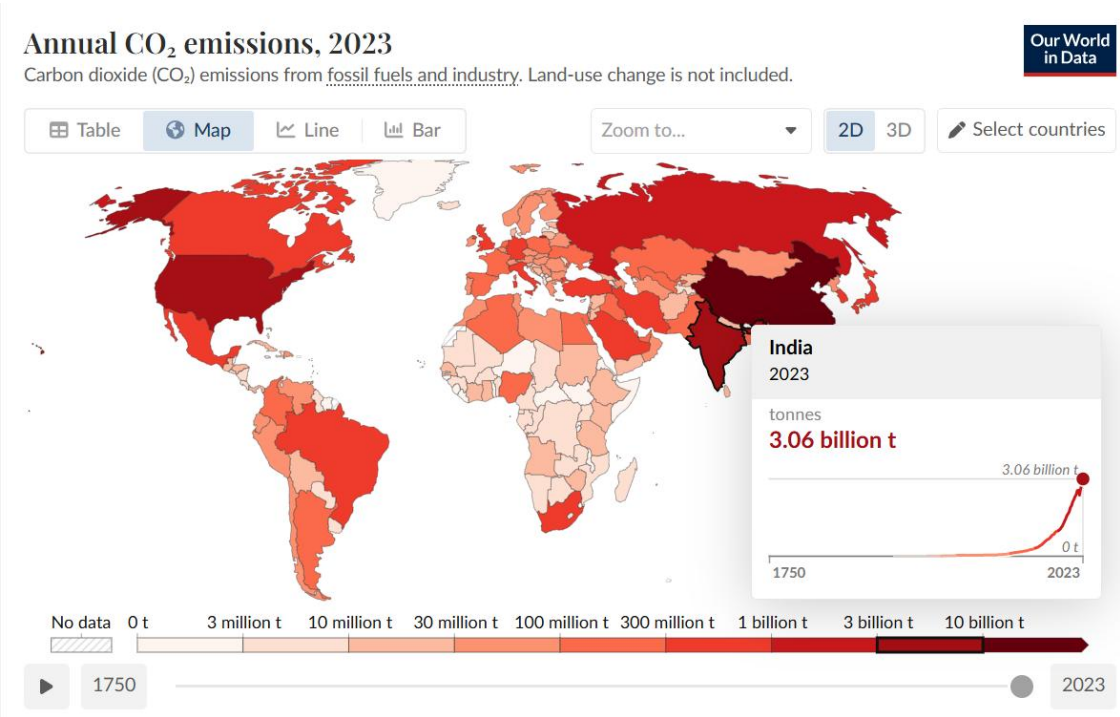


Figure 36 Country Wise Total Carbon Emissions 2023

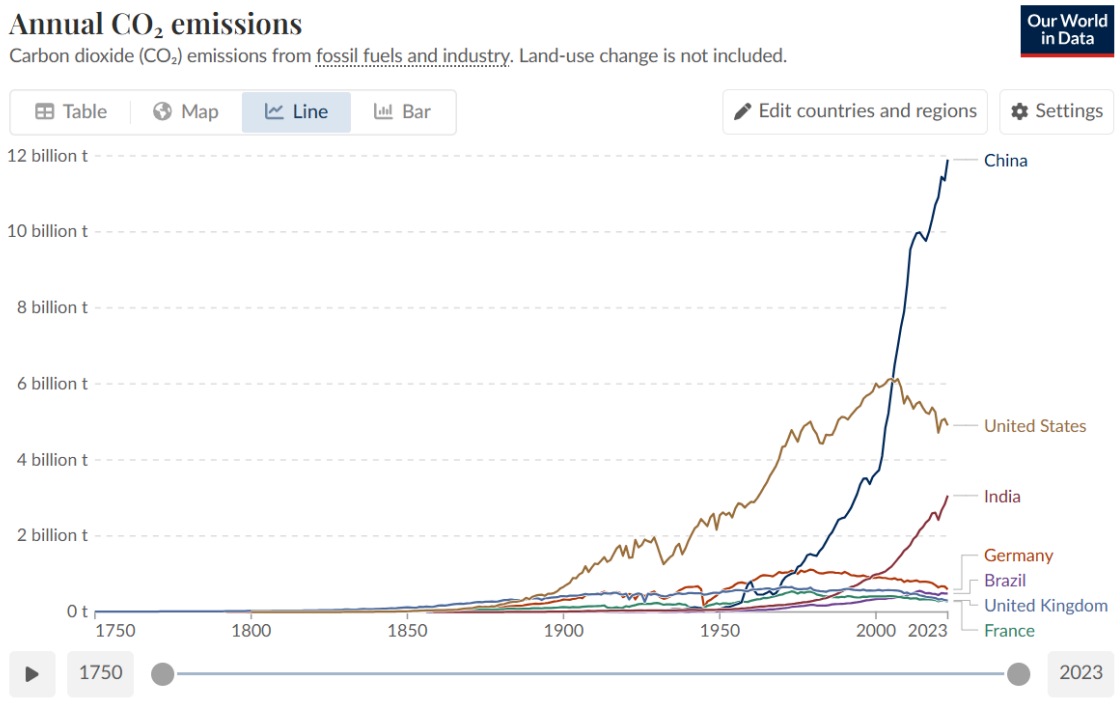


Figure 37 Country Wise Total Carbon Emissions -Line

Figure 38: Country Wise Per Capita Carbon Emissions 2023

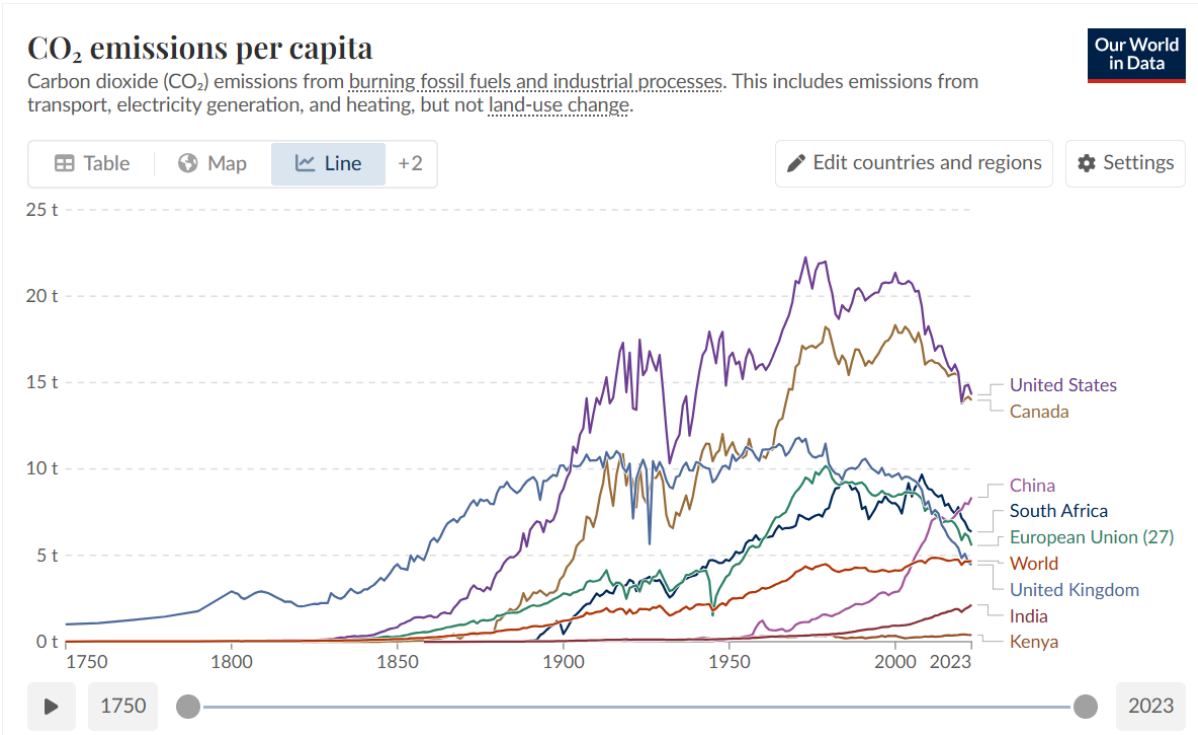


Figure 39: Country Wise Per Capita Carbon Emissions -Line

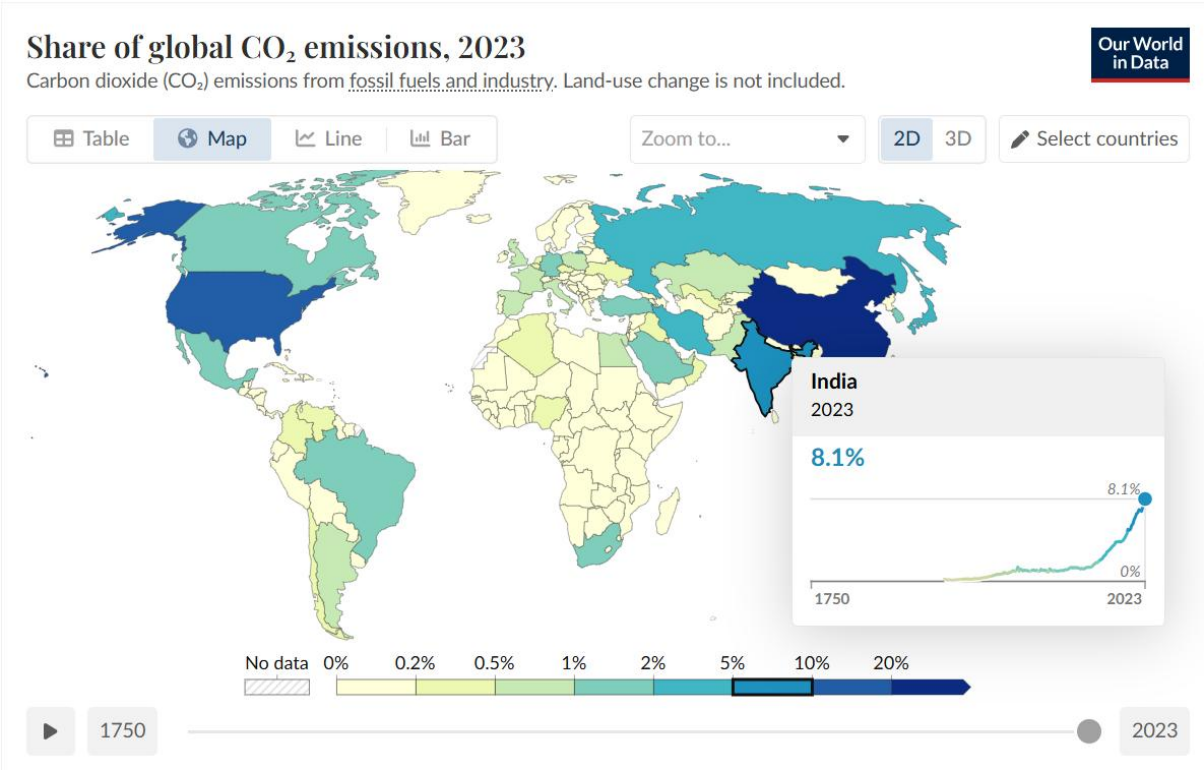


Figure 40: Country Wise Share of Global Carbon Emissions 2023

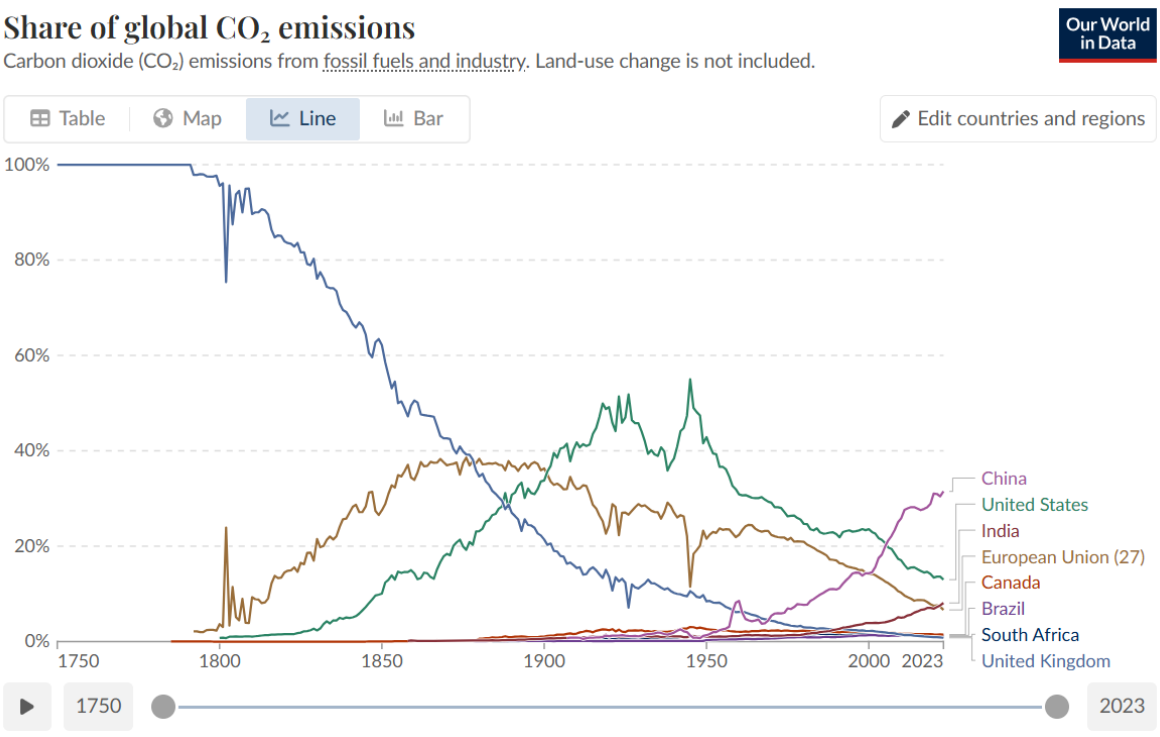


Figure 41: Country Wise Share of Global Carbon Emissions -Line

6.5 Country Wise GHG Emissions Linked Regulations

Globally, legislation mandating carbon emission disclosure has gained momentum as governments aim to combat climate change and ensure accountability from businesses. Various countries and regions have introduced laws, regulations, or frameworks requiring companies to disclose their greenhouse gas (GHG) emissions, particularly carbon dioxide (CO_2), as part of broader efforts to track progress toward climate targets such as the Paris Agreement.

Here's an overview of key global legislation mandating carbon emission disclosures:

Table 38: Country Wise Legislation Mandating Carbon Emission Disclosures

Country	Regulation-Implementations	Key Features
European Union (EU)	Corporate Sustainability Reporting Directive (CSRD) (formerly Non-Financial Reporting Directive, NFRD) is effective from 2024, with the first reporting required in 2025.	• Requires detailed climate-related disclosures, including the company's transition plans toward net-zero emissions. • Aligns with the EU's Taxonomy Regulation, which defines what qualifies as environmentally sustainable activities. • Additional Legislation: EU Emissions Trading System (ETS) and Sustainable Finance Disclosure Regulation (SFDR)
United Kingdom	Streamlined Energy and Carbon Reporting (SECR) Introduced in April 2019	• Requires large UK companies to report their energy use, carbon emissions, and energy efficiency measures. • Applies to quoted companies, large unquoted companies, and large Limited Liability Partnerships (LLPs). • Builds on the previous Mandatory Carbon Reporting (MCR) regime, which required listed companies to disclose their GHG emissions. • TCFD Compliance: From 2022, the UK government also mandates TCFD-aligned climate disclosures for large companies and financial institutions, making the UK the first G20 country to require TCFD reporting. However, it will soon be replaced by newly developed UK Sustainability Reporting Standards (UK SRS) which is based on ISSB Standard.
Canada	Federal climate-related financial disclosure requirements for large corporations. As of 2025, Canada is phasing in mandatory climate disclosures for federally regulated financial institutions (FRFIs),	• Requires large financial institutions to disclose climate-related risks and GHG emissions using the TCFD framework. • Applies to companies with assets over certain thresholds and publicly traded companies. • Canadian Sustainability Standards Board (CSSB) has published voluntary sustainability reporting standards — the Canadian Sustainability Disclosure Standards (CSDS) - in December 2024. This standard is built upon ISSB Standard which will replace TCFD.

	including banks and insurance companies.	• The government also aims to integrate climate disclosures in investment and pension fund management.
Australia	Australia has adopted mandatory climate-related financial disclosures for large, medium and small sized companies starting from 1st January 2025.	• Entities in scope are required to lodge a 'sustainability report' containing climate-related disclosures prepared in accordance with Australian Sustainability Reporting Standards (ASRS), which have been issued by the Australian Accounting Standards Board (AASB) • It requires reporting on climate-related financial risks, including emissions and the impact of climate change on business operations.
New Zealand	Climate-Related Disclosures (CRD) Bill New Zealand became the first country to pass mandatory climate risk disclosure legislation in 2021.	• Requires companies, including banks, insurers, and investment managers, to disclose climate-related risks and opportunities based on Aotearoa New Zealand's Climate Standards. • Mandatory for large publicly listed companies and financial institutions. • Applies to entities with assets over NZD 1 billion, banks with total assets over NZD 1 billion, and insurance companies with premiums over NZD 250 million.
Japan	While Japan has not fully mandated carbon disclosures, it has developed SSBJ standards for large companies	• The Tokyo Stock Exchange encourages listed companies to disclose climate-related risks in line with TCFD. • The Sustainability Standards Board of Japan (SSBJ) has also issued its three sustainability disclosure standards (SSBJ standards) on 5th March 2025. The standards are aligned with the ISSB standards with some jurisdiction-specific alternatives. • Following the issuance of the SSBJ Standards, Prime-listed companies are given two years of voluntary compliance period before such rules become mandatory as early as March 2027. • Japan's Corporate Governance Code encourages companies to address sustainability issues, including climate change, within their reporting. • Government initiatives like the Green Growth Strategy aim to support industries in reducing carbon emissions through transparency and regulation.
South Korea	Korea Stock Exchange ESG Guidelines	• South Korea encourages companies listed on the Korea Stock Exchange to disclose ESG factors, including carbon emissions. • The country has a voluntary framework for climate-related financial disclosures, Korean Sustainability Disclosure Standards (KSDS), with growing pressure to mandate emissions reporting for large companies and certain sectors. • South Korea's K-ETS (Emissions Trading System) also obligates industries with high emissions to report their carbon footprints.

China	China has not mandated comprehensive carbon emissions disclosure, but there are movements toward increased transparency.	• China's government encourages large companies to disclose environmental impacts, especially those listed on the Shanghai Stock Exchange. • They are also developing "Sustainability Disclosure Standards for Business Enterprises", a national unified sustainability disclosure standards that reflect the beneficial experience of ISSB Standards. • A growing number of Chinese companies are voluntarily adopting GRI and ISSB standards. • As part of its Dual Carbon Goals (carbon peak by 2030 and carbon neutrality by 2060), China is expected to move toward stricter reporting requirements for industries with high emissions.
Brazil	Brazilian Securities and Exchange Commission (CVM) ESG Reporting Guidelines	• In 2022, the CVM introduced requirements for publicly listed companies to disclose ESG information, including GHG emissions. • Brazil is developing frameworks for mandatory climate risk disclosures as part of its commitment to the Paris Agreement.
India	Business Responsibility and Sustainability Report (BRSR) Introduced by the Securities and Exchange Board of India (SEBI) in 2021.	• The BRSR mandates listed companies to disclose ESG data, including carbon emissions, from the 2022-23 fiscal year. • This reporting aligns with India's national sustainability and climate targets, including reducing carbon intensity by 45% by 2030.

6.6 Global Trends and Future Outlook

Governments are increasingly aligning their carbon emission disclosure mandates with internationally recognized frameworks, such as the International Sustainability Standards Board (ISSB) and the Global Reporting Initiative (GRI). This trend reflects growing recognition of the need for transparency, accountability, and global cooperation in addressing climate change.

In addition, voluntary carbon markets and initiatives like the Carbon Disclosure Project (CDP) encourage companies to report emissions, even in jurisdictions without mandatory requirements. As the global climate crisis intensifies, more countries are expected to adopt legislation requiring carbon disclosures, particularly for industries with high emissions.

7. WAY AHEAD

7.1 Corporate Sustainability Assessments

As we move towards implementing ESG into our business plans and corporate culture we need to understand from a global point of view what needs to be done to be recognized as a company that is driven by global standards of adherences.

Working backwards from achieving scores, we can make the journey more focused and thus a clarity of the path that we take.

Assessment Agencies that provide scores that are a touchstone to ESG adherences are multiple in number and also have slightly different assessment frameworks. The most popular and most respected are the DJSI scores which are given by S&P Global on an annual basis based on a CSA questionnaire that is answered by the participant company. This CSA – Corporate Sustainability Assessment is the basis for companies with the eligible market capitalization to be listed in the Dow Jones Sustainability Index – World, USA, Europe, Asia Pacific and Emerging Markets.

There are several other assessment agencies which provide scores on basis of disclosures done by the companies that they track which includes MSCI, Bloomberg, Sustainalytics. What is important for a good score is adherence to the respective guidelines, frameworks and standards of Environment Social and Governance standards advocated by global guidelines like UNSDGs, frameworks & standards like the SBTi, TCFD, CDP. It would be pertinent to mention the CII GreenCo Rating certification at this juncture.

The CII GreenCo Rating System is a first-of-its-kind framework that recognizes and facilitates the growth of top-notch green companies in India. This framework is developed by the CII Sohrabji Godrej Green Business Centre and launched in 2011. Total GreenCo Rated companies are 880+ and 1170+ companies are working on to get the GreenCo Rating.

This rating system reflects the collective wisdom and expertise of industry leaders, policymakers, and environmental experts. This collaborative effort ensures that the framework encompasses diverse perspectives and addresses the evolving needs of industries in achieving sustainability.

The objective of the GreenCo rating system is to assist companies in improving their environmental performance in a comprehensive manner and go beyond sheer compliance.

The GreenCo rating system embraces a life cycle approach that focuses on key environmental performance aspects addressing energy efficiency, renewable energy, water conservation, greenhouse gas emissions reduction, waste management, material conservation, green supply chain, product stewardship & life cycle assessment, innovation for environment and green infrastructure & ecology. These areas provide a framework for evaluating and enhancing sustainability practices across industries.

The rating system categorizes companies based on their total score, across Platinum, Gold, Silver, Bronze, and Certified, providing recognition and motivation for continual improvement. The threshold criteria for certification levels are provided in the figure 36.

GreenCo Version IV

Rating Levels

Sl. No	Parameter	Points
1	Mandatory Requirements	-
2	Management Systems	75
3	Energy Management	150
4	Carbon Management	150
5	Water Management	125
6	Material Resource Management	125
7	Green Supply Chain	100
8	Product Stewardship & Life Cycle Approach	125
9	Innovation for Environment	50
10	Green Built Environment & Others	100
	Total	1000

Platinum+ Applicable to Platinum companies – continue to improve & excel to next higher level

Figure 42: CII GreenCo Rating Levels and Points

Under Environment of ESG the process would start with aligning the policies and activities of the companies with such standards and frameworks right from the structuring of the Environmental Policy. The policies need to take into its drafting the Pillars on which it is being structured, what are the Operational processes, the Legal and regulatory matrix which is being adhered to, how and who support the Implementation of the policies, Influencers & Champions who are responsible to drive it and the Yardstick on which the YoY targets achievement will be measured.

The roadmap should include important ISO certification like ISO 14001:2015 - Environmental management systems, ISO 14064:2018 – GHG emission inventory and reporting standards, ISO 14067:2018 – Carbon Footprint of Products, ISO 14072:2024 – Life Cycle Assessment (LCA) and the ISO 50001 – Energy Management.

Having established the Carbon Footprint Baseline, we need to move on to include water usage, waste management and focus on circularity, procurement efficiency, vendor categorization, human rights due diligence, effective EHS and OHS implementation.

Leaders in Environment Stewardship have shown the way by implementing and showing excellent results in this area. A few examples from globally acclaimed Environment related activities are shown in table 38.

7.2 Leadership in Sustainability Practices by Peers

Peer	Emissions	Energy management
Schneider Electric S.E	• Have their **net-zero targets, validated by the SBTi.** • Since 2021, emissions from Schneider Electric's operations (Scopes 1 and 2) have **decreased by 31% in absolute**, • Scope 3 emissions **decreased by 7% from 2022 to 2023** • As part of the decarbonization approach to air transportation, the Group is committed to replace at least **5% of conventional jet fuel** use with **Sustainable Aviation Fuel (SAF) by 2030**	• Schneider Electric is part of the FTSE EO Energy Efficiency indices. • Targets to **increase energy efficiency** in its sites by **15% by 2025** and double energy productivity by 2030 compared to 2005 (EP100), • Has a Group's **Energy Policy**. • 128 Schneider Electric sites are **ISO 50001 certified** as part of the Group's Integrated Management System to **drive energy excellence**, focusing on the highest energy consuming sites.
ABB Ltd.	• Aims to **reduce absolute scope 1 and 2 emissions** by at least **80 percent by 2030** and by **100 percent by 2050**, versus 2019. • Has established **science-based, net-zero-aligned targets for 2030 and 2050and submitted for validation.** • Since 2019, has reduced **GHG emissions** by **76 percent**	• Plans to **electrify vehicle fleet**, amounting to more than 10,000 cars, source **100 percent of electricity from renewable energy sources by 2030.** • Implements **energy efficiency measures** across operations that include installation of **energy-efficient lighting**, upgradation of **HVAC** systems and implementation of building automation systems that enable a high level of efficiency.
Siemens Limited	• Aims to **achieve Net Zero** operations **by 2030** and in supply chain by 2050 • **Joined Science-Based Targets initiative (SBTi),** pledged to **reduce** emissions from its own operations (Scope 1 and 2) by **50%**and its value chain (Scope 3) **by 15% by 2030** compared to 2019. • Has **reduced VOC emis**sions by another **9%** from the previous year to 250 metric tons in fiscal 2023	• Siemen's is committed to **100% renewable electricity by 2030**. • Aims to improve overall **energy efficiency by 10%** by 2030 compared to 2021 • Has **increased energy efficiency** by **39%** in fiscal 2023 compared to fiscal 2021. • **45 Siemens sites** have implemented energy management systems compliant with **ISO 50001.**
Toshiba Corporation	• Plans to achieve **carbon neutrality** throughout the entire value chain by **FY2050.** • Aims for **100% reduction** of emissions generated from Toshiba Group business activities by **FY2030** • Achieved **70.4% of reduction** of **GHG emissions** in products and services associated with power supply (compared to FY2019)	• Promotes the development of energy technologies to realize decarbonization and to improve the **energy efficiency of products** • Toshiba Group Kawasaki headquarters with the purchases of FIT non-fossil certificated, the Centre is **100% powered by renewables.**

Table 39 : Illustrative Practices/Initiatives of Peers

8. SOURCE DOCUMENTS & Team Details

8.1 Source Documents

The following source documents are available for access by clicking the respective titles:

1. Scope 1 & 2 Activity Data
2. Scope 3 Activity Data
3. GHG Emission Calculations – Also attached as Annexure at the end of the report

8.2 Team Details

ESG Department has received support from several teams across group companies who have sent data and supporting documents for verification. Our extended team members who have participated in this study are as below. We sincerely thank leadership across locations without whose support this herculean task would not have been possible.

SSEL Kadapa:	**SSEL Naini:**	**SSEL Corporate Office:**
Mr. Surya	Mr. Arunkumar Yadav	Mr. Jagannadham Naidu. A
Mr. Bixam Reddy	Mr. Shishupal Sharma	Ms. Renu Dandoli
Ms. Sireesha.K	Mr. Shubham Ghosh	**ISPL Corporate Office:**
Mr. Koteswara Rao	**INDO TECH, Kancheepuram:**	Mr. Niranjan Reddy A
Ms. Pavani.D	Mr. Gandhirasan KKS	Mr. Sravan Kumar
Mr. Naresh Kumar	Mr. Kipson Amelraj	Mr. Avinash. B
Mr. Satyanarayana	**ISPL Ramayapatnam:**	
Mr. Ganga Raju	Mr. Jagadeesh Nellore	
Mr. Reddaiah	Mr. Ramakrishna.P	
Mr. Mahendra	Mr. Bala Venkata Sai Krishna Y	
Mr. Sampath	Mr. Ramarao Padamata	
Mr. Arun Reddy	Mr. Dande Naveen	
Data compilation & coordination, verification with source documents, GHG calculation - Thipparapu Saicharan		
SSEL Group Carbon Footprint Report FY 24-25 by Mrs. Madhusree Vemuru		

Table 40: GHG Team Members

ANNEXURES

SSEL, Corporate Office, Begumpet

SSEL , Corporate Office - Carbon Emission - FY 24-25							
Sl. No	**Description**	**Activity data**	**Unit**	**Emission Factor**	**Unit**	**Reference**	**Carbon Emission in tCO2 e**
Scope 1 Emissions							
1	Refrigerant top up						
	R-22	32	kg	1960	t CO2e/t	IPCC (AR6)	62.72
	R-32	0	kg	771	t CO2e/t	IPCC (AR6)	0.00
	R-410A	35	kg	2255.5	t CO2e/t	IPCC (AR6)	78.94
2	LPG used in Canteen	95	kg	2.992	tCO2e/t	IPCC	0.28
						Total Scope 1	**141.95**
Scope 2 Emissions							
1	Power obtained from GRID	65234	kWh	0.727	tCO2/MWh	CO2 Baseline Database for the Indian Power Sector V.20	47.46
						Total Scope 2	**47.46**
Scope 3 Emissions							
1	Business Travel						
	Air	941564	Pass-km	ICAO		ICAO	68.03
	Car - Diesel (MUV <2500 cc)	2437.4	km	0.216	kg CO2/km	India GHG Program	0.526
	Car - Petrol (Sedan <1400 cc)	1096	km	0.153	kg CO2/km	India GHG Program	0.167688
2	Employee Commute	568844	km	Refer Survey Spreadsheet		India GHG Program	38.49
3	C3 - Fuel & Energy related Activities	Refer C3 calculation sheet					21
						Total Scope 3	**125.66**
						Total Scope 1+2	**189.40**
						Total Scope 1+2+3	**317.17**

SSEL Unit 1, Kadapa

SSEL-Unit 1, Kadapa - Carbon Emission - FY 24-25							
Sl. No	**Description**	**Activity data**	**Unit**	**Emission Factor**	**Unit**	**Reference**	**Carbon Emission in tCO2 e**
Scope 1 Emissions							
1	Refrigerant top up						
	R-22	0	kg	1960	t CO2e/t	IPCC (AR6)	0
	R-32	0	kg	771	t CO2e/t	IPCC (AR6)	0
	R-410A	0	kg	2255.5	t CO2e/t	IPCC (AR6)	0
2	CO2 used for refilling into fire extinguisher	0	kg	1	t CO2e/t	IPCC (AR6)	0
3	LPG (used in Brazing, Cutting)	38	kg	2.992	t CO2e/t	IPCC	0.113733
		0					
						Total Scope 1	**0.11**
Scope 2 Emissions							
1	Power obtained from GRID	144349.50	kWh	0.727	tCO2/MWh	CO2 Baseline Database for the Indian Power Sector V.20	105.01
						Total Scope 2	**105.01**
Scope 3 Emissions							
1	C5 Waste Generation (Cotton Waste)	1050	kg	0.00468568	kg CO2/kg	DEFRA	0.0049
	C5 Waste Generation (Rubber Gloves)	337.5	kg	0.00468568	kg CO2/kg	DEFRA	0.0016
	Copper	14340	kg	0.18	t CO2/ts	EPA	2.85
	Aluminium	44930	kg	0.04	t CO2/ts	EPA	1.98
	Waste Transport	17129.03	t-km	Refer C5 calculations sheet in Scope 3 questionnaire			1.05
2	C3 Fuel & Energy related Activities	Refer C3 calculation sheet					44.31
						Total Scope 3	**50.19**
						Total Scope 1+2	**105.13**
						Total Scope 1+2+3	**155.32**

SSEL Unit 2&3, Kadapa

SSEL , Kadapa Unt 2&3 - Carbon Emission - FY 24-25							
Sl. No	**Description**	**Activity data**	**Unit**	**Emission Factor**	**Unit**	**Reference**	**Carbon Emission in t CO2 e**
Scope 1 Emissions							
1	Company Owned Vehicles						
	Diesel (Car, buses, Ambulances)	84457.66	L	2.925	kgCO2e/l	IPCC	247.06
	Petrol (Car, buses, Ambulances)	210.32	L	2.303	kgCO2e/l	IPCC	0.48
	Diesel (hydras, tractor cranes, forklifts tractors)	65700.00	L	2.925	kgCO2e/l	IPCC	192.1953
	Petrol (hydras, tractor cranes, forklifts tractors)	0.00	L	2.303	kgCO2e/l	IPCC	0.00
2	Refrigerant top up	0.00					0.00
	R-22	25.33	kg	1960	t CO2e/t	IPCC (AR6)	49.65
	R-32	25.50	kg	771	t CO2e/t	IPCC (AR6)	19.66
	R-410A	25.00	kg	2255.5	t CO2e/t	IPCC (AR6)	56.39
	R 134A	0.00	kg	1530	t CO2e/t	IPCC (AR6)	0.00
3	CO2 used for refilling into fire extinguisher	332.50	kg	1	t CO2/t	IPCC	0.33
4	Gas mixture used in welding (Argon+Carbon dioxide)	187986.84	kg	0.1	t CO2/t	IPCC	18.80
5	Acetylene (used in Brazing, Cutting)	811.50	kg	3.38	t CO2/t	IPCC	2.75
6	LPG used in Brazing, Cutting	8512.00	kg	2.992	tCO2e/t	IPCC	25.47
7	LPG used in Canteen	37278.00	kg	2.992	tCO2e/t	IPCC	111.54
8	Diesel used in DG sets	60809.00	L	2.925	kgCO2e/l	IPCC	177.88
9	Biomass used in Canteen (Wood) (Other than CO2)	94567.00	kg	0.143	t CO2e/t	IPCC (2006)	13.56
						Total Scope 1	**915.78**
Scope 2 Emissions							
1	Net Power Consumed from GRID	16996112	kWh	0.727	tCO2/MWh	CO2 Baseline Database for the Indian Power Sector V.20	12364.55
2	Solar Power Consumed by plant	1306265	kWh	0	tCO2/MWh		0.00
3	Solar Power Export to Grid	83103	kWh	0	tCO2/MWh		0.00
						Total Scope 2	**12364.55**

Scope 3 Emissions							
Sl. No	**Description**	**Activity Data**	**Unit**	**Emission Factor**	**Unit**	**Reference**	**Carbon Emission in t CO2 e**
1	C4 - Upstream Transportation & Distribution	103016333	t-km	India GHG Program			2343.85
2	C9 - Downstream T&D	5326401	t-km	India GHG Program			359.18
3	C5 - Waste Disposal						
	Copper	85851	kg	0.18	t CO2/ts	EPA	17.034
	Aluminium	172150	kg	0.04	t CO2/ts	EPA	7.590
	Food Waste	47215	kg	0.067	t CO2/ts	EPA	3.487
	CRGO	67140	kg	0.32	t CO2/t	EPA	23.683
	Mixed Paper (Winding Core Paper)	310632	kg	0.07	t CO2/ts	EPA	23.969
	Parma Wood	24880	kg	0.00468568	t CO2/t	DEFRA	0.129
	Mixed Metals (MS Scrap)	539921	kg	0.23	t CO2/ts	EPA	136.885
	Mixed Metals (Transformer scrap)	22000	kg	0.23	t CO2/ts	EPA	5.578
	Amorphous Scrap	46100	kg	0.23	t CO2/t	EPA	11.688
	Waste Oil Barrel (empty)	42075	kg	0.00468568	t CO2/t	DEFRA	0.197
	Waste Oil	528	l	0.00468568	t CO2/t	DEFRA	0.002
	Mixed Electronics	720	kg	0.02	t CO2/ts	EPA	0.016
	Waste Transport	112047	t-km	Refer C5 calculations sheet in Scope 3 questionnaire			6.888
4	C6 - Business Travel						
	Air	1226810	Pass - km	ICAO		ICAO	97.36
	Train	277612	Pass - km	0.0078	kg CO2/ Pass – km	India GHG Program	2.17
	Road - Bus	214424	Pass - km	0.0152	kg CO2/ Pass – km	India GHG Program	3.26
	Road - Car	42306	Pass - km	0.153	kg CO2/ Pass – km	India GHG Program	6.47
5	C7-Employee Commute						
	Car	67120	Pass - km	0.141	kg CO2/km	India GHG Program	9.46
	Bike	4800702	Pass - km	0.0356	kg CO2/km	India GHG Program	170.90
	Auto	11550	km	0.1322	kg CO2/km	India GHG Program	1.53
6	C3 Fuel & Energy related Activities	Refer C3 calculation sheet					5380.81
						Total Scope 3	**8610.5**
						Total Scope 1+2	**13270.25**
						Total Scope 1+2+3	**21890.84**

SSEL Unit 4 Kadapa

SSEL-Unit 4, Kadapa - Carbon Emission - FY 24-25							
Sl. No	**Description**	**Activity data**	**Unit**	**Emission Factor**	**Unit**	**Reference**	**Carbon Emission in t CO2 e**
Scope 1 Emissions							
1	CO2 used for refilling into fire extinguisher	0	kg	1	t CO2/t	IPCC	0.00
						Total Scope 1	0.00
Scope 2 Emissions							
1	Power obtained from GRID	69135.00	kWh	0.727	tCO2/MWh	CO2 Baseline Database for the Indian Power Sector V.20	50.30
						Total Scope 2	**50.30**
Scope 3							
1	C4 - Upstream Transportation & Distribution	6099909.85	t-km	India GHG Program			375.18
2	C9 - Downstream T&D	1596727.349	t-km	India GHG Program			118.32
3	Waste Disposal						
	Mixed Metals	49105	kg	0.23	t CO2/ts	EPA	12.449
4	C3 Fuel & Energy related Activities	Refer C3 calculation sheet					21.215
						Total Scope 3	**527.16**
						Total Scope 1+2	**50.30**
						Total Scope 1+2+3	**577.45**

SSEL, Naini

SSEL , Naini - Carbon Emission - FY 24-25							
Sl. No	**Description**	**Activity data**	**Unit**	**Emission Factor**	**Unit**	**Reference**	**Carbon Emission in tCO2e**
Scope 1 Emissions							
1	Company Owned Vehicles						
	Diesel (Forklift, Hydra etc.,)	16676	L	2.925	kgCO2e/l	IPCC	48.78
2	Refrigerant top up						0.00
	R-22	32	kg	1960	t CO2e/t	IPCC (AR6)	62.72
	R-32	0	kg	771	t CO2e/t	IPCC (AR6)	0.00
	R-410A	0	kg	2255.5	t CO2e/t	IPCC (AR6)	0.00
	R 134A	90.45	kg	1530	t CO2e/t	IPCC (AR6)	138.39
3	CO2 used for refilling into fire extinguisher	55	kg	1	t CO2/t	IPCC (AR6)	0.06
4	Acetylene (used in Brazing, Cutting)	363.32	kg	3.38	t CO2/t	Derived	1.23
5	Diesel used in DG sets	6963	L	2.925	kgCO2e/l	IPCC	20.37
6	Wood Briquette used in Thermic Fluid heater	647.19	t	0.143	t CO2/t	IPCC	92.80
7	HSD used in Thermic Fluid Heater	0	L	2.925	kgCO2e/l	IPCC	0.00
						Total Scope 1	**364.35**
Scope 2 Emissions							
1	Power obtained from GRID	3710805	kWh	0.727	tCO2/MWh	CO2 Baseline Database for the Indian Power Sector V.20	2699.58
						Total Scope 2	**2699.58**
Scope 3							
1	C4 - Upstream Transportation & Distribution	3802296.71	t-km	Refer Calculation Sheet		India GHG Program	240.013
2	C9 - Downstream T&D	4650272	t-km	Refer Calculation Sheet		India GHG Program	285.992
3	Waste Disposal						
	Copper (PICC/CTC/PI Cable Scrap)	69103.34	kg	0.18	t CO2/ts	EPA	13.711
	MS Scrap	77822.00	kg	0.23	t CO2/ts	EPA	17.116
	CRGO	10312.00	kg	0.32	t CO2/ts		3.637

	Wood Waste	79045.00	kg	0.00468568	t CO2/ts	DEFRA	0.370
	Press Board	6850.00	kg	0.07	t CO2/ts	EPA	0.529
	Press Board scrap Oil soaked	12150.00	kg	0.00468568	t CO2/t	DEFRA	0.057
	Transformer Oil with impurity	8390.00	kg	0.00468568	t CO2/t	DEFRA	0.039
	Waste Transport Emissions	52481.77	t-km	Refer calculation sheet			3.496
4	Business Travel						
	Air	173200	Pass - km			ICAO	12.73
	Rail	211546.90	Pass - km	0.00780	kg CO2/ Pass – km	India GHG Program	1.65
	Road	39286.70	km	0.1530	kg CO2e/km	India GHG Program	6.01
5	Employee Commute						
	Car	125664	Pass - km	0.141	kg CO2e/km	India GHG Program	17.72
	Bike	1326402	Pass - km	0.0356	kg CO2e/km	India GHG Program	47.22
6	C3 Fuel & Energy related Activities	Refer calculation sheet					1175.90
Total Scope 3							**1826.34**
Total Scope 1+2							**3064.84**
Total Scope 1+2+3							**4890.27**

INDO TECH, Kanchipuram

INDO TECH - Carbon Emission - FY 24-25							
Sl. No	**Description**	**Activity data**	**Unit**	**Emission Factor**	**Unit**	**Reference**	**Carbon Emission in tCO2e**
Scope 1 Emissions							
1	Refrigerant top up						
	R-22	0	kg	1960	t CO2e/t	IPCC (AR6)	0.00
	R-32	0	kg	771	t CO2e/t	IPCC (AR6)	0.00
	R-410A	0	kg	2255.5	t CO2e/t	IPCC (AR6)	0.00
	R 134A	0	kg	1530	t CO2e/t	IPCC (AR6)	0.00
2	CO2 used for refilling into fire extinguisher	0	kg	1	t CO2/t	IPCC	0.00
3	Acetylene (used in Brazing, Cutting)	1361.27	kg	3.380	t CO2/t	IPCC	4.60
4	Diesel used in DG sets	34749.65	L	2.925	kgCO2e/l	IPCC	101.65
5	FO used in Thermic Fluid heater	198640	kg	3.144	tCO2e/t	IPCC	624.37
						Total Scope 1	**730.63**
Scope 2 Emissions							
1	Net Power Consumed from GRID	2210882	kWh	0.727	tCO2/MWh	CO2 Baseline Database for the Indian Power Sector V.20	1608.40
2	Wind Power Export to Grid	357284	kWh	0	tCO2/MWh		0.00
						Total Scope 2	**1608.40**
Scope 3 Emissions							
1	C4 - Upstream Transportation & Distribution	13722187.21	t-km	Refer calculation sheet		India GHG Program	859.34
2	C9 - Downstream T&D	14926745.10	t-km	Refer calculation sheet		India GHG Program	947.91
3	Waste Disposal						
	Coper (Recycle)	52730.25	kg	0.1800	t CO2/ts	EPA	10.46
	Aluminium (Recycle)	980	kg	0.0400	t CO2/ts	EPA	0.04
	Brass (Recycle)	239	kg	0.2300	t CO2/ts	EPA	0.06
	Mixed Electronics	1130	kg	0.0200	t CO2/ts	EPA	0.02

	Mixed Metals (MS, SS, CRGO) (Recycle)	196602	kg	0.2300	t CO2/ts	EPA	49.84
	Wood	117230	kg	0.00468568	t CO2/t	DEFRA	0.55
	General Waste	152600	kg	0.00468568	t CO2/t	DEFRA	0.72
	Used/Spent Oil (Recycle)	7786.40	kg	0.00468568	t CO2/t	DEFRA	0.04
	Waste & Residues containing oil	6135	kg	0.00468568	t CO2/t	DEFRA	0.03
	Discarded container	688.20	kg	0.00468568	t CO2/t	DEFRA	0.0032
	Waste Transportation	52962	t-km	Refer calculation sheet			3.92
4	Business Travel						
	Air - Domestic	721631	Pass - km	Default	kg CO2/ pass-km	ICOA	55.89
	Road - by Car	132965	km	Refer Calculation Sheet		India GHG Program	19.70
5	Employee Commute						
	Car	329319	Pass - km	0.141	kg CO2/km	India GHG Program	46.43
	Bike	1446881	Pass - km	0.0356	kg CO2/km	India GHG Program	51.51
	Bus	5415974	Pass - km	0.0152	kg CO2/ pax km	India GHG Program	82.32
6	C3 Fuel & Energy related Activities						848.17
						Total Scope 3	**2976.97**
						Total Scope 1+2	**2339.28**
						Total Scope 1+2+3	**5315.99**

ISPL Corporate Office, Hitech City

ISPL, Corporate Office - Carbon Emission - FY 24-25							
Sl. No	**Description**	**Activity data**	**Unit**	**Emission Factor**	**Unit**	**Reference**	**Carbon Emission in tCO2e**
Scope 1 Emissions							
1	Refrigerant top up						
	R-32	0	kg	1960	t CO2e/t	IPCC (AR6)	0
	R-410A	0	kg	2255.5	t CO2e/t	IPCC (AR6)	0
						Total Scope 1	**0**
Scope 2 Emissions							
1	Power obtained from GRID	146157.33	kWh	0.727	tCO2/MWh	CO2 Baseline Database for the Indian Power Sector V.20	106.33
2	Purchased DG Power	473.939	kWh				0.00
	Diesel Consumption	0.158	kL	2.926	tCO2e/kl	IPCC	0.46
3	Purchased Cooling Capacity	426770	kWh				0.00
	Electricity Power Consumption for cooling	150133.61	kWh	0.727	tCO2/MWh	CO2 Baseline Database for the Indian Power Sector V.20	109.22
						Total Scope 2	**216.01**
Scope 3							
1	Business Travel						
	Air	1173149	Pass-km	ICAO		ICAO	85.96
2	Employee Commute	648887.04	km	Refer Calculation sheet		India GHG Programe	35.90
3	C3 Fuel & Energy related Activities						91.02
						Total Scope 3	**212.88**
						Total Scope 1+2	**216.01**
						Total Scope 1+2+3	**428.90**

ISPL, Ramayapatnam

ISPL, Ramayapatnam - Carbon Emission Calculations - FY 24-25							
Sl. No	**Description**	**Activity data**	**Unit**	**Emission Factor**	**Unit**	**Reference**	**Carbon Emission in tCO2e**
Scope 1 Emissions							
1	Company Owned Vehicles						
	Petrol (Car, buses, Ambulances etc.,)	81.53	L	2.303	kgCO2e/l	IPCC	0.19
	Diesel (Car, buses, Ambulances etc.,)	17840.88	L	2.925	kgCO2e/l	IPCC	52.19
2	Refrigerant top up	0					0.00
	R-22	15	kg	1960	t CO2e/t	IPCC (AR6)	29.40
	R-32	3	kg	771	t CO2e/t	IPCC (AR6)	2.31
	R-410A	0	kg	2255.5	t CO2e/t	IPCC (AR6)	0.00
	R 134A	186	kg	1530	t CO2e/t	IPCC (AR6)	284.58
3	CO2 used for refilling into fire extinguisher	0	kg	1	t CO2/t	IPCC	0.00
4	Diesel used in DG sets	71132.12	L	2.925	kgCO2/l	IPCC	208.09
5	LPG used in Canteen	4978	kg	2.97	kgCO2e/kg	IPCC	14.78
6	Diesel supplied to 3rd party	20917.94	L	2.925	kgCO2e/l	IPCC	61.19
						Total Scope 1	**652.85**
Scope 2 Emissions							
1	Power obtained from GRID	876170	kWh	0.727	tCO2/MWh	CO2 Baseline Database for the Indian Power Sector V.20	637.41
2	Power generated from Solar PV plant (offset)	0	kWh	0.727	tCO2/MWh	CO2 Baseline Database for the Indian Power Sector V.20	0.00
						Total Scope 2	**637.41**
Scope 3 Emissions							
1	C4 - Upstream Transportation & Distribution	58838.09	t-km	Refer Calculation sheet		India GHG Program	3.82
2	Business Travel						
	C6 Fuel & Energy related Activities not included in scope 1&2 (Diesel Supply to 3rd party free of charge)	20917.94	L	2.68	kgCO2/l	IPCC	56.06
3	Employee Commute						

	Car - Petrol	98028	km	0.153	kg CO2e/km	India GHG Program	15.00
	Bike - Petrol	451200	km	0.0356	kg CO2/km	India GHG Program	16.06
	Bus	881568	Pax km	0.0152	kg CO2/ pax km	India GHG Program	13.40
	Rail	24640	Pax km	0.007837	kg CO2e/pax-km	India GHG Program	0.19
	13 seater tempo traveller	24000	km	0.226	kg CO2e/km	India GHG Program	5.42
4	C3 Fuel & Energy related Activities		Refer C3 calculations sheet				339.33
						Total Scope 3	**393.23**
						Total Scope 1+2	**1290.25**
						Total Scope 1+2+3	**1683.49**

Scope 3, Category 3 – Fuel & Energy Related Emission Calculations

Scope 3 - C3 - FY24-25																		
S.No	Emission Source	UOM	SSEL Corporate office		SSEL Kadapa Unit 1		SSEL Kadapa Unit 2 & 3		SSEL Kadapa Unit 4		SSEL Naini		Indotech		ISPL Corporate office		ISPL , Ramayapatnam	
			Activity Data	Emission in tCO2e	Activity Data	Emission in tCO2e	Activity Data	Emission in tCO2e	Activity Data	Emission in tCO2e	Activity Data	Emission in tCO2e	Activity Data	Emission in tCO2e	Activity Data	Emission in tCO2e	Activity Data	Emission in tCO2e
1	LPG (used in Brazing, Cutting)	kg	0	0	38	0	8512	3	0	0	0	0	0	0	0	0	0	0
2	Acetylene (used in Brazing, Cutting)	kg	0	0	0	0	812	4	0	0	363	2	1361	6	0	0	0	0
3	Diesel used in DG sets	litres	0	0	0	0	60809	38	0	0	6963	4	34750	22	0	0	71132	44
4	Company Owned Vehicles (Fuel operated forklift, dozer, Fire tender, Cars, Buses, Ambulance, Excavators, any vehicles to shuttle employees)																	
	3-a. Diesel (Car, buses, Ambulances)	litres	0	0	0	0	84458	53	0	0	0	0	0	0	0	0	17841	11
	3-b. Petrol (Car, buses, Ambulances)	litres	0	0	0	0	210	0	0	0	0	0	0	0	0	0	82	0
	3-a. Diesel (hydras, tractor cranes, forklifts tractors)	litres	0	0	0	0	65700	41	0	0	16676	10	0	0	0	0	0	0
	3-b. Petrol (hydras, tractor cranes, forklifts tractors)	litres	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	LPG used in Canteen	kg	95	0	0	0	37278	13	0	0	0	0	0	0	0	0	4978	2
6	Biomass used in Canteen (Wood)	kg	0	0	0	0	94567	3	0	0	0	0	0	0	0	0	0	0
7	Refrigerant used/refilled																	
	5-a. R 22	kg	32	0	0	0	25	0	0	0	32	0	0	0	0	0	15	0
	5-b. R 32	kg	0	0	0	0	26	0	0	0	0	0	0	0	0	0	3	0

	5-c. R 410 A	kg	35	0.362	0	0.000	25	0.259	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
	5-d. R 134A	kg	0	0	0	0	0	0	0	0	90	1	0	0	0	0	0	0
8	CO_2 used for refilling into fire extinguisher	kg	0	0		0	333	0	0	0	55	0	0	0	0	0	0	0
9	Gas mixture used in welding (Argon+Carbon dioxide)	kg	0	0	0	0	187987	10	0	0	0	0	0	0	0	0	0	0
10	Fuel used in Thermic Fluid heater																	
	Furness Oil	kg	0	0	0	0	0	0	0	0	0	0	198640	142	0	0	0	0
	Biomass	t	0	0	0	0	0	0	0	0	647	20	0	0	0	0	0	0
	HSD	litres	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	Diesel Supply to 3rd party	litres	0	0	0	0	0	0	0	0	0	0	0	0	0	20918	13	
1	Power obtained from GRID	kWh	65234	20	144350	44	16996112	5216	69135	21	3710805	1139	2210882	678	146157	45	876170	269
2	Purchased DG Power Diesel Consumption	litres	0	0	0	0	0	0	0	0	0	0	0	0	158	0	0	0
3	Purchased Cooling Electricity Power Consumption	kWh	0	0	0	0	0	0	0	0	0	0	0	0	150134	46	0	0
			Total	**21**	**Total**	**44**	**Total**	**5381**	**Total**	**21**	**Total**	**1175.9**	**Total**	**848**	**Total**	**91**	**Total**	**339**

Scope 3, Category 7 – Employee Commuting Calculations

SSEL Corporate Office :

C7- SSEL Corporate Office - FY 24-25											
No of Working days		**279**									
Sl.No	**Mode of Transport**	**No of Employees**	**Cumulative One way km**	**Avg One way km**	**%**	**Extrapolated No of Emp**	**per yr km**	**EF**	**Unit**	**Source**	**Total emissions in tCO2e**
1	Bike (<200 cc)	15	190.9	12.73	50	20	248551.80	0.0458	kg CO2/km	India GHG Program	11.38
	Bike (<200 cc)	1	24	24.00	3	1	31248.00	0.0458	kg CO2/km	India GHG Program	1.43
2	Bus	1	6	6.00	3	1	7812.00	0.015161	kg CO2/Pax km	India GHG Program	0.12
3	Car - Petrol	3	37	12.33	10	4	48174.00	0.153	kg CO2/km	India GHG Program	7.37
	Car - Diesel	5	75	15.00	17	7	97650.00	0.141	kg CO2/km	India GHG Program	13.77
	Car - CNG	0	0	0.00	0	0	0.00	0.068	kg CO2/km	India GHG Program	0.00
	Carpool	0	0	0.00	0	0	0.00	0.153	kg CO2/km	India GHG Program	0.00
	Taxi	0	0	0.00	0	0	0.00	0.153	kg CO2/km	India GHG Program	0.00
4	Auto/Share Auto	0	0	0.00	0	0	0.00	0.10768	kg CO2/km	India GHG Program	0.00
5	Metro	4	85	21.25	13	5	110670.00	0.007976	kg CO2/km	India GHG Program	0.88
6	Walk	0	0	0.00	0	0	0.00	0			0.00
7	EV	1	19	19.00	3	1	24738.00	0.1432	kg CO2/kWh		3.54
	Total	**30**	437	110	100	**40**	**568843.80**				**38.50**

ISPL Corporate Office, Hitech City:

C7 - ISPL Corporate Office - FY 24-25											
No of Working days		**279**									
Sl.No	**Mode of Transport**	**No of Employees**	**Cumulative One-way km**	**Avg One way km**	**%**	**Extrapolated No of Emp**	**per yr km**	**EF**	**Unit**	**Source**	**Total emissions in tCO2e**
1	Bike (<200 cc)	18	238	13.22	24	4	162906.24	0.0458	kg CO2/km	India GHG Program	7.46
	Bike (<200 cc)	0	0	0.00	0	0	0.00	0.0458	kg CO2/km	India GHG Program	0.00
2	Bus	3	29	9.67	4	1	19849.92	0.015161	kg CO2/Pax km	India GHG Program	0.30
3	Car - Petrol	8	121	15.13	11	2	82822.08	0.153	kg CO2/km	India GHG Program	12.67
	Car - Diesel	5	57	11.40	7	1	39015.36	0.141	kg CO2/km	India GHG Program	5.50
	Car - CNG	1	10	10.00	1	0	6844.80	0.068	kg CO2/km	India GHG Program	0.47
	Carpool	4	33	8.25	5	1	22587.84	0.153	kg CO2/km	India GHG Program	3.46
	Taxi	1	6.5	6.50	1	0	4449.12	0.153	kg CO2/km	India GHG Program	0.68
4	Auto/Share Auto	6	44.5	7.42	8	1	30459.36	0.10768	kg CO2/km	India GHG Program	3.28
5	Metro	19	382	20.11	25	4	261471.36	0.007976	kg CO2/km	India GHG Program	2.09
6	Walk	10	27	2.70	13	2	18480.96	0		-	0.00
7	EV	0	0	0.00	0	0	0.00	0.1432	kg CO2/kWh	-	0.00
	Total	**75**	948		100	**17**	**648887.04**				**35.90**

SAVE THE WORLD