INTEGRAL COACH FACTORY

Production unit of Indian Railways

GOVINDARAJAN V M

Deputy Chief Electrical Engineer

ALTHAF SHARIFF.MD

Senior Section Engineer

SATHESH BABU.N

Senior Section Engineer

ICF – Overview

Rolled out 75000 Coaches

ICF, a premier production unit under the Ministry of Railways, was established in 1955 to manufacture passenger coaches. Spanning 475 acres, ICF employs around 8,000 people and produces over 3,000 coaches annually.

ICF, conscious of its commitment to Society, strives to minimize the environmental impact of its operations and reduce its carbon foot-prints. An **'Environmental Policy'** has been adopted by the organization which lays down guidelines to create a safe, harmonious and ecologically balanced environment for its members and the community at large. In this direction, ICF has taken several measures in the recent past turning ICF to a "**Green Factory**" by sourcing all electrical energy from renewable sources.

ICF, dedicated to societal responsibility, actively works to lessen its environmental impact and carbon footprint.

ICF Coaches




LHB Coaches

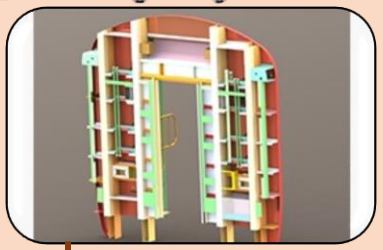



ICF Coach Production Process

Roof Assembly

Underframe Assembly

Sidewall Assembly



End wall Assembly

Wheel Assembly

Bogie frame Assembly

Body Shell Assembly

Bogie Final Assembly

Final Shell

ICF Coach Production Process

LHB Shell Manufacturing

Painting

Electrical Production & Harness

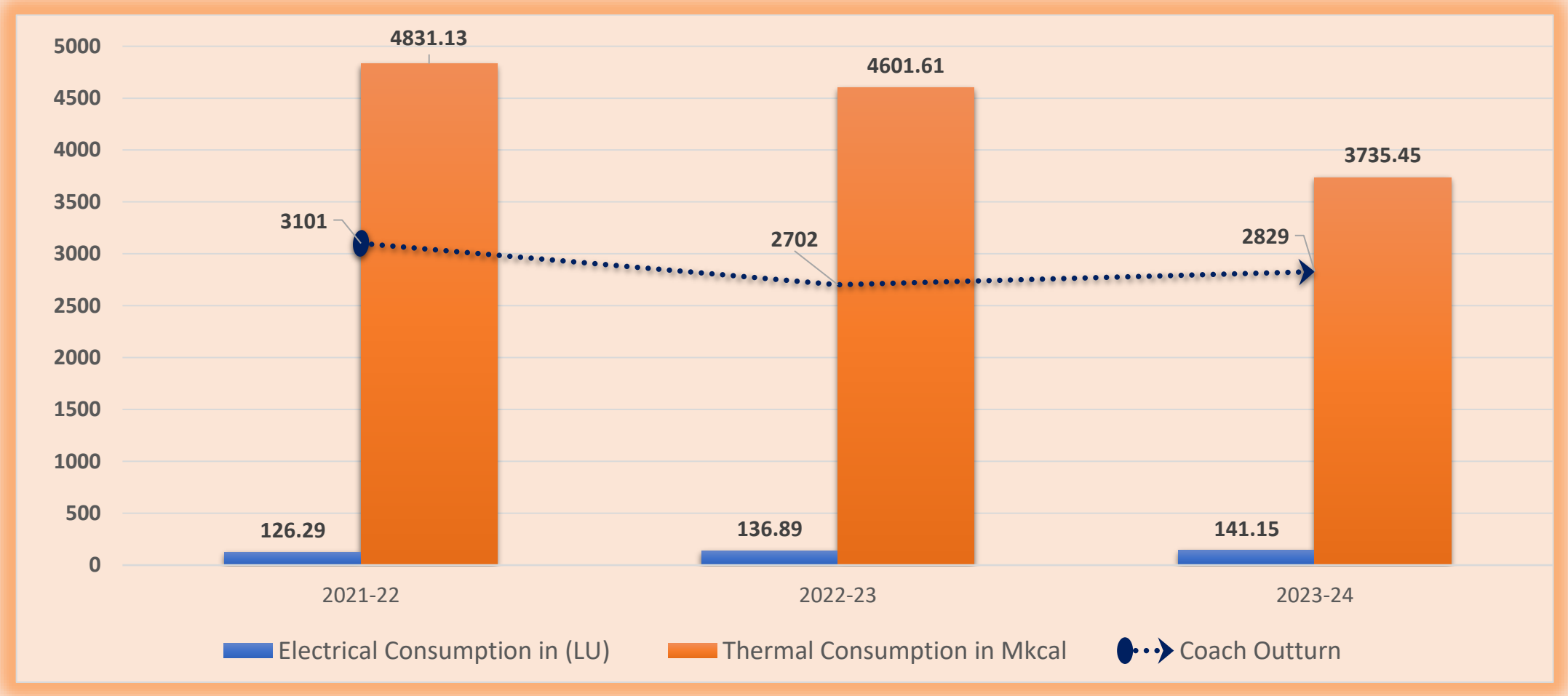
Carpentry Work

Braking Assembly

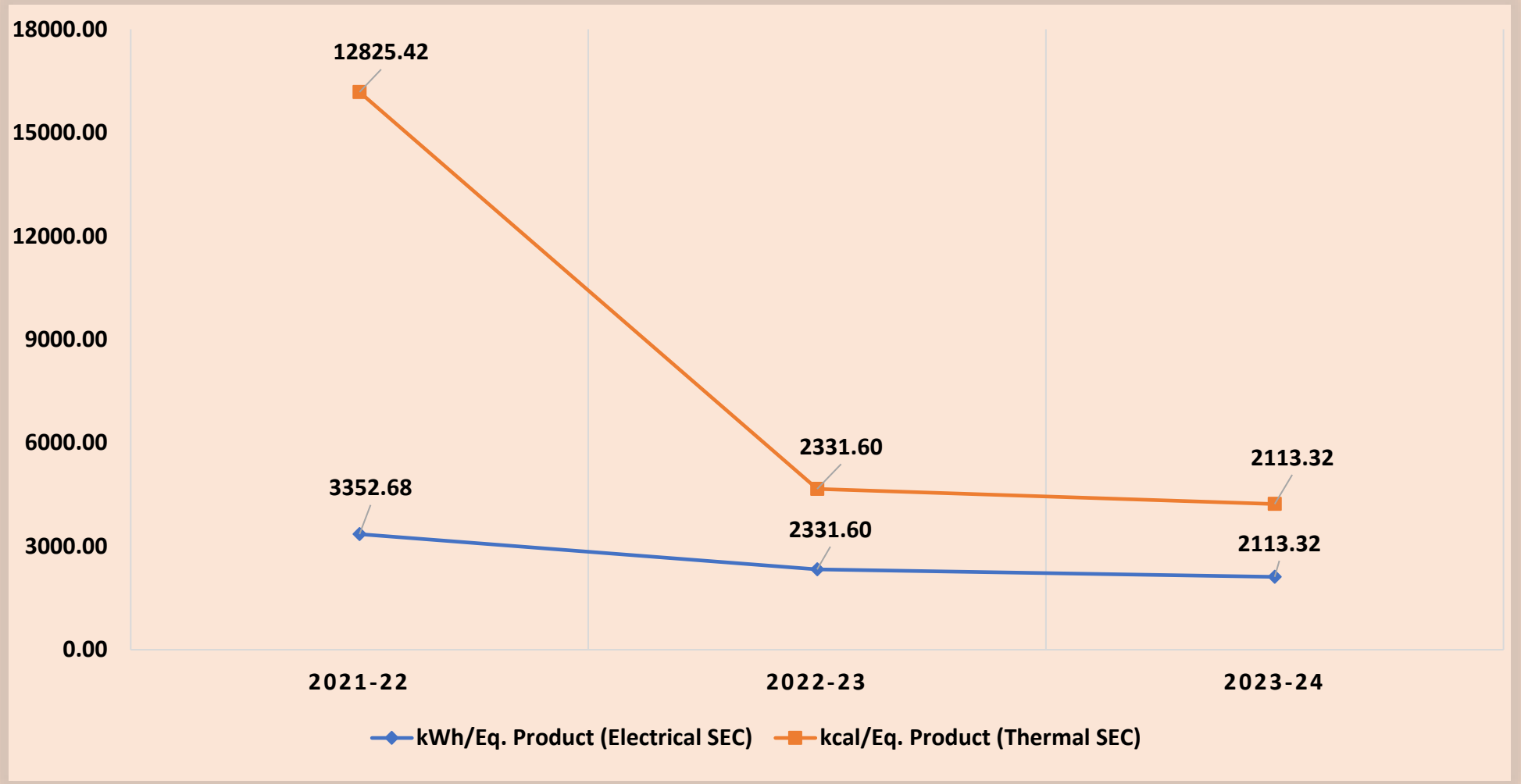
Final Inspection

Dispatch to User Railways

Energy Consumption Pattern



Specific Energy Consumption



Internal & External Benchmarking

Internal Benchmarking

Previous Year SEC

Review SEC for the Assessment Year

External Benchmarking

COMPETITOR (RCF)

2021-22		2022-23	
Coach Outturn	SEC	Coach Outturn	SEC
3101	3352	2702	2331
2091	6340	1865	6337

ICF – Benchmark for Coach Production

ENERGY CONSERVATION MEASURES PROPOSED FOR 2024-2025

160 TR Chiller

90 TR VRF

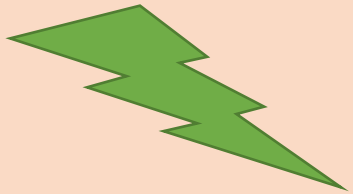
ENERGY SAVING

40%

11,278 Nos
Conventional Fans

11,278 Nos
BLDC Fans

70L



Auto Timer for
Air circulators

Payback 5 months

Energy Saving Projects

Financial Year	No. of Energy Saving Projects	Investment (₹ Million)	Electrical Saving (Million kWh)	Thermal Savings (Million kcal)	Total Savings (₹ Million)	Payback period (in Months)
2021-22	5	3.61	0.52	-	3.7	11.7
2022-23	5	1.49	0.46	-	3.3	5.5
2023-24	4	30.07	0.56	-	3.9	94

Major Energy Conservation Projects (FY 21-22)

ECM-1

Replacing Conventional Fans to BLDC Fans
Qty- 575 nos.

Investment
Rs. 10.35 Lac

Energy Saving
0.51 Lac kWh

Payback Period
34.8 Months

ECM-2

Replacing 1.5 Ton AC-14 Nos from to

Investment
Rs. 21.02 Lac

Energy Saving
3.44 Lac kWh

Payback Period
5 Months

ECM-3

- Centralized VRF – Temperature set from 26 to 28 degree
- Only one chiller pump and 1 condenser pump is made to run in place of two.

Investment
Rs. 0

Energy Saving
0.6 Lac kWh

Major Energy Conservation Projects FY 22-23

ECM-1

Arresting Compressed Air Leakages from 75% to 35%

Investment
Rs. 8.47 Lac

Energy Saving
3.44 Lac kWh

Payback Period
5 Months

ECM-2

Operating Air Compressor with VFD (2 Divisions)

Investment
Rs. 3 Lac

Energy Saving
0.65 Lac kWh

Payback Period
8.54 Months

ECM-3

Insulate or Reinsulate furnace wall Insulation + Recuperator

Investment
Rs. 1.58 Lac

Energy Saving
0.1 Lac kWh

Payback Period
17.6 Months

Major Energy Conservation Projects FY 2023-24

ECM-1

Reduced the inlet air temperature in compressor

Investment
Rs. 0.15 Lac

Energy Saving
0.2 Lac kWh

Payback Period
10 Months

ECM-2

HVLS Fans at Shop Floors – 75 Nos

Investment
Rs. 2.62 Cr

Energy Saving
4.72 Lac kWh

Payback Period
8 Years

ECM-3

Air Circulators at Shop Floors – 500 Nos

Investment
Rs. 45 Lac

Energy Saving
0.72 Lac kWh

Payback Period
9 Years

Other Energy Efficiency Measures

5 Energy Audits in the last 4 years

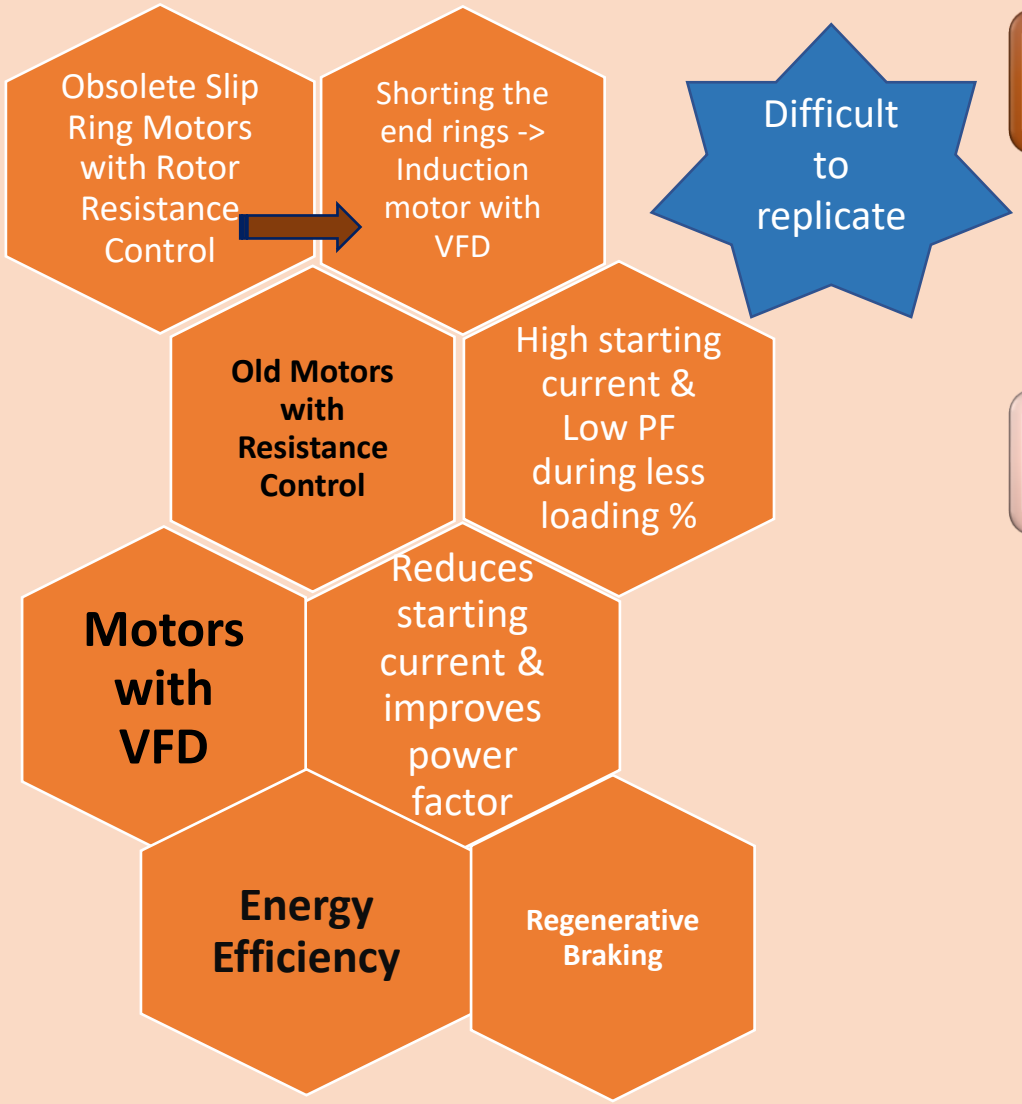
- Reduction of Maximum Demand to 6.5 KVA
- Automatic Power Factor Controller for HT Substations
- Strengthening of Power supply & improving reliability
- Replacement of 10 Nos of 40 HP Centrifugal pumps to 25 HP Submergible pumps
- SCADA for pump house
- Solar street lights
- VFD for Lifts
- Monitoring energy consumption of 60 vital machines
- Occupancy Sensors for Offices
- Air conditioning only during Summer

Way Forward

- 600 No's of MFM – Realtime monitoring / Energy Management Software
- RTU's for HT Panels
- Digitalization with BEE

Innovative Projects

RETROFITMENT OF EOT CRANES



Maintenance of Codal life crossed cranes

- Eliminates Resistance Box & Brushes
- Improvement in Reliability & Maintainability

Energy Efficiency

- Phase 1: 3 Nos
- Phase 2: 25 Nos
- Annual savings: Rs. 12.5 Lakhs
- Payback: 11.8 years

Phase-I

81 k

80%

Innovative Projects

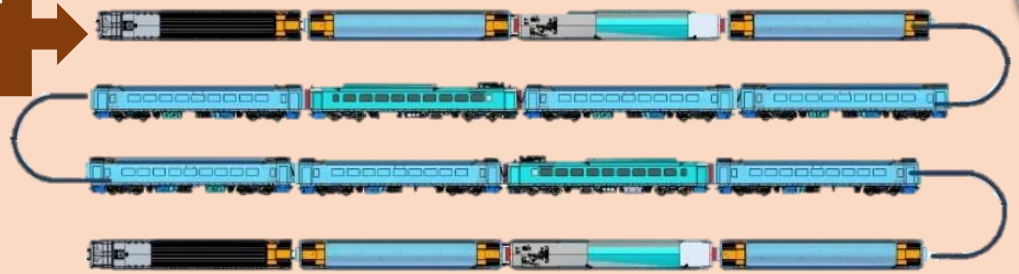
MAKING AN INDIGENOUS TRAIN SET - VANDE BHARAT, VANDE METRO

ICF worked on an indigenous design, which was constructed at the Integral Coach Factory.

These train sets known as Train 18 initially, were introduced in 2018 and reached speeds of up to 183 km/h (114 mph) in trials. These train sets were later renamed to **Vande Bharat**.

Formation of Train -18 Set

16 Car Set



Modular Design

Regenerative Braking

Indigenous Design

No replication

ICF

Utilisation of Renewable Energy

	ONSITE			OFFSITE				TOTAL RE
	Source	Installed capacity (in MW)	Capacity Addition (in MW) after FY 2021	Total Gen. (in MU)	Source	Installed Capacity (in MW)	Capacity addition (in MW)	Total Gen. (in MU)	Total RE Gen. (in MU)	Share % w.r.t overall energy consumption
FY 2021-22		3.46	-	4.45		10.5	-	15.6	20.05	
FY 2022-23		3.46	-	4.38		10.5	-	17.8	22.18	100%
FY 2023-24		3.46	-	4.54		10.5	-	17.1	21.54	
FY 2024-July 24 *		4.46	1	1.6		10.5	-	5.5	7.1	

GHG Inventorisation

Scope 1

Furnace Oil
Diesel
Oxy Acetylene
LPG
Metal Cutting Gas

Scope 2

Purchased Electricity

Scope 3

Business Travel by Flight & Train

Material transport by vendors & product despatch to customers

Contract Vehicle

Employee Commutation

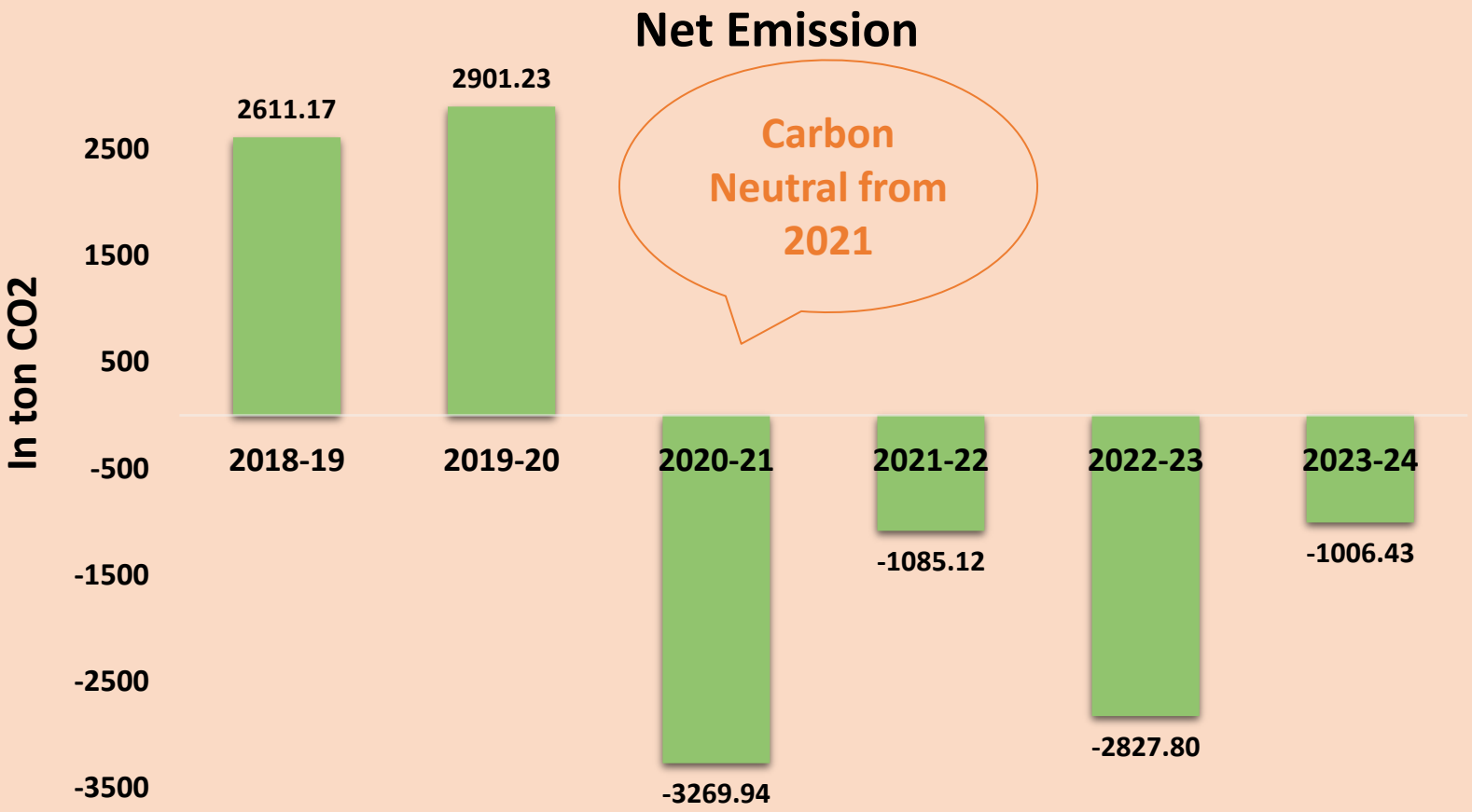
	FY 2021-22	FY 2022-23	FY 2023-24
Scope-1	841.58	514.23	568.18
Scope-2	2480.23	1754.04	2288.59
Scope-3	890.41	538.86	553.39
Total Emission	4212.22	2807.13	3410.16

All figures are in kg CO2 per Equivalent Product

Offset by

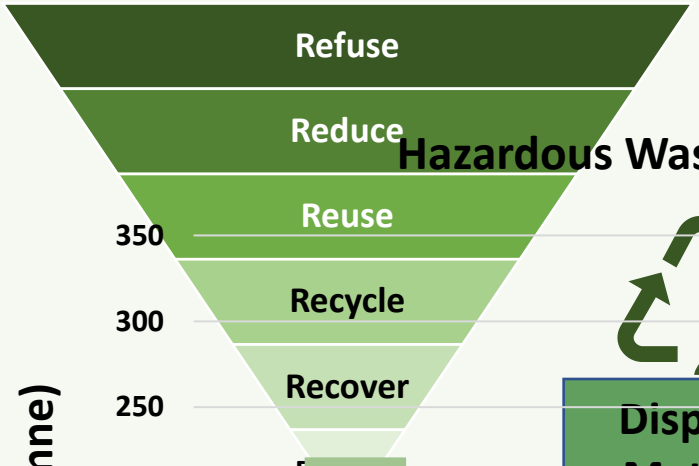
Trees

Wind & Solar Energy



Integrated Waste Management at ICF

Hazardous Waste



Hazardous Waste

Paint Flakes

91% of Hazardous waste disposed in the last 3 years

Co-processed in Cement Kilns as Alternate Fuel

Residue containing oil, Phosphate Sludge & Chemical / ETP Sludge

Recycled by vendors

Oil Soaked Cotton / Saw Dust

Incineration (TNWML)

Reduction of Hazardous Waste

Oil Fired Furnace to LPG Furnace

- Oil Sludge: 9 MT to 1 MT per annum

Air drying to LPG Oven drying of painted springs

- Elimination of Paint flakes

97% of Paint flakes disposed in the last5years

Scrap Waste Management

Scrap to Sculpture

Ferrous - 67.85%

Non Ferrous - 5.87%

Wood - 26.25%

Disposal of Scraps

Railway Board's Guidelines

- Auction 98% metallic scraps

By ICF Employees

Solid Waste Management

Bio Gas Plant
Input Capacity – **500 kg/day**
Output Bio manure – **800 litres/day**

Sewage Treatment Plant
Total Capacity – **365 kilolitres /day**

Recycle of waste water & effluent

Integrated Solid Waste Management
Output manure – **240 kg/day**

Effluent Treatment Plant

Green Supply Chain Management

- Development of nearby Vendor sources
- Just in time delivery

- 10% vendors with GreenCo certification
- Electrical items with Energy Efficiency

- Incorporated as tender condition in all tenders
- Trucks < 15 years old
- Valid PUC
- Battery FLTs inside premises

22 items

9.3 ton wood eliminated

4 ton CO_2 emission avoided

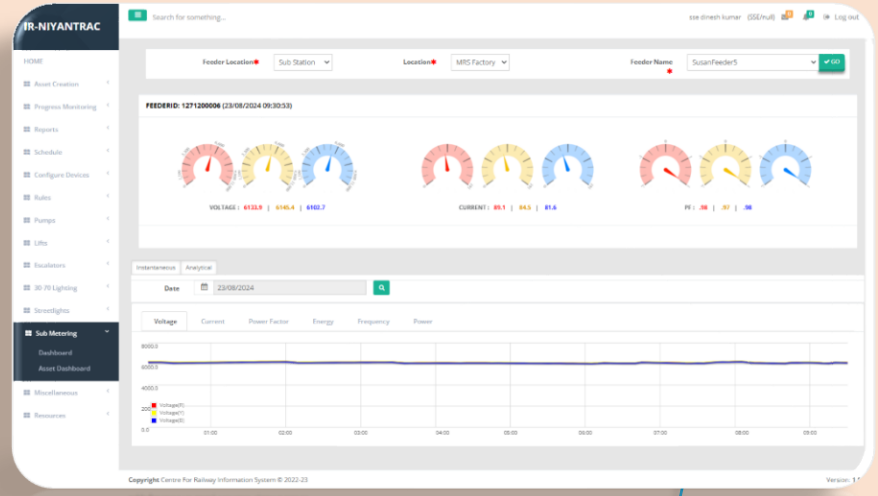
6 Subassemblies with returnable pallets

3 per quarter

Tenders
Purchase Order
Files
IMMS,IREPS,GeM,UDM

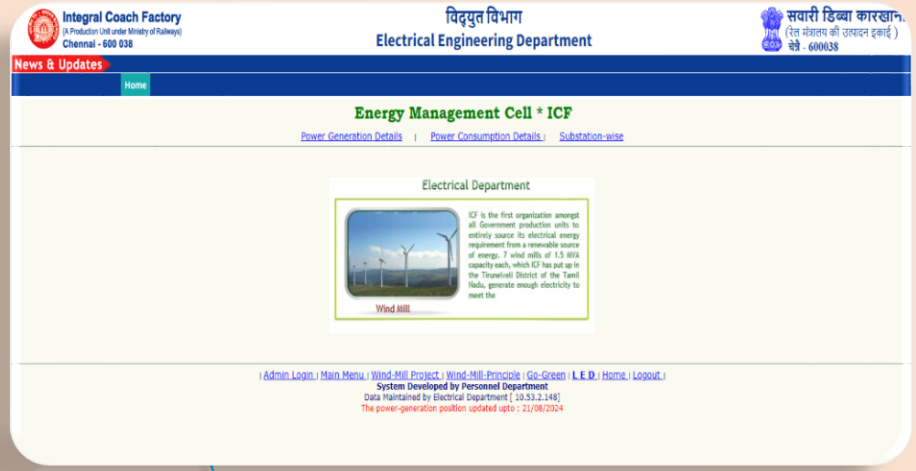
1 ton paper avoided

EMS and other requirements

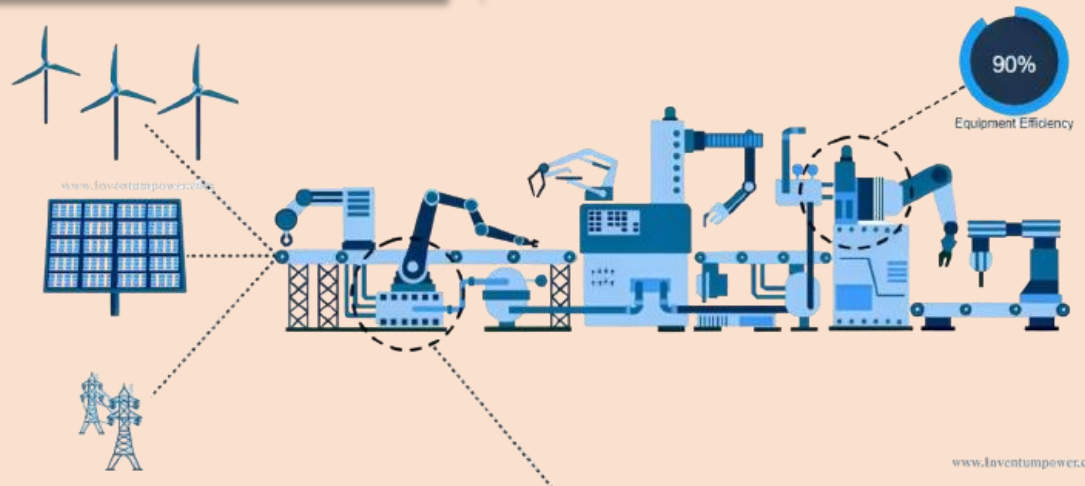


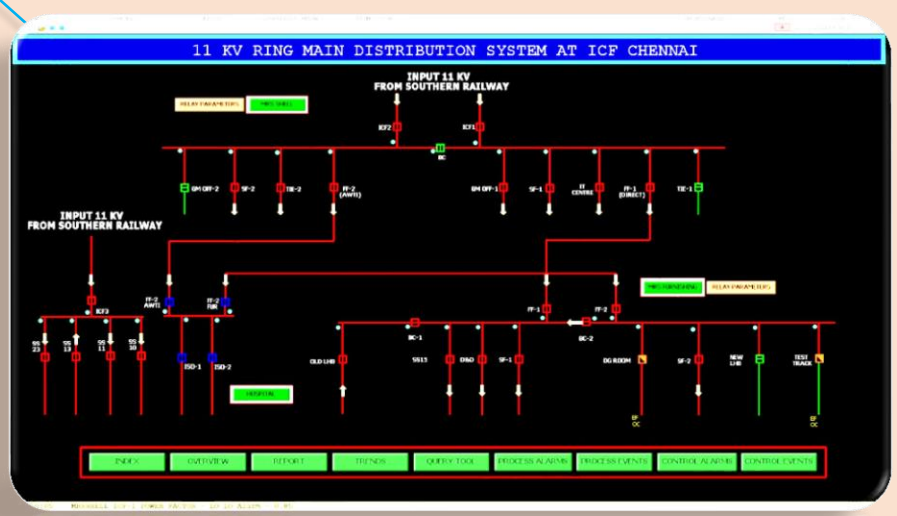
ICF is the first among the railways to install IR-NIYANTRAC Maintained by CRIS

Monitoring and Control for HT Side using SCADA



Energy Management Cell Web portal Maintained by ICF





EMS and other requirements

ISO 50001: 2018 certification – Energy Management System

Life Cycle Assessment for Vande Metro

GreenCo – Gold Shield 2022

ICF has been awarded Green Co Gold Shield since 2018

GreenCo Star Performer Award -2024

Net Zero Commitment

NET ZERO CARBON EMITTER BY 2030

Green Factory

INITIATIVES

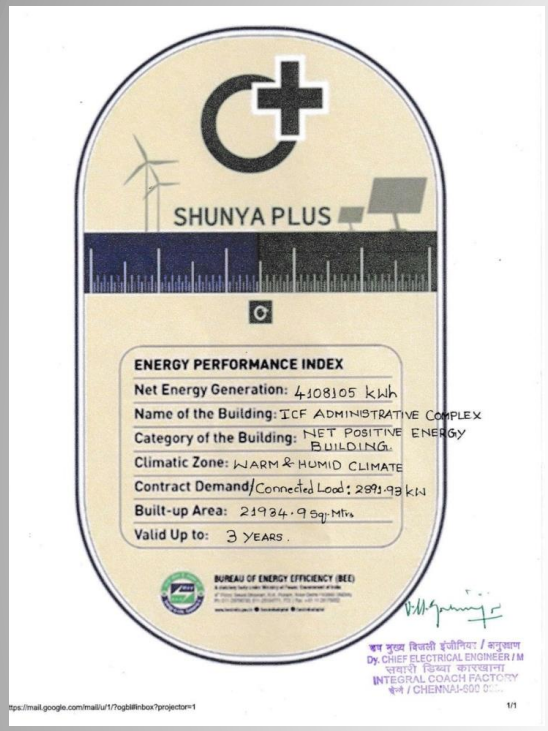
Pradhan Mantri Surya Ghar Yojana

Saturation of Govt. Buildings with Solar Panel

- 1 MWp Rooftop Solar Plant - Exclusively to meet the day time demand of the Colony
- A first step in Indian Railways where a Colony /Staff quarters is marching towards Net Zero targets

Estimated Annual energy generation: 1.3 MU
Annual monetary saving: Rs. 49.4 lakhs

Other Major Achievements



ICF received the "**Shunya Plus**" Label from Bureau of Energy Efficiency for **Net Positive Energy Building Category** –7 buildings inclusive of Admin Buildings & 2 Schools

PAT II Cycle: Best Performer in Railways Sector

- Target SEC: 695 kgoe/ECU
- Achieved SEC: 485 kgoe/ECU (30% reduction)
- 695 Energy savings certificate

Ongoing PAT VII cycle (2022-2025), ICF has achieved an SEC of 248.79 kgoe/ECU against the target of 448 kgoe/ECU for the year 2023-24

National Projects Excellence Award by Indian Project Management Associates

Innovation Continues Forever...