



# *Integral Coach Factory*

Chennai - 38



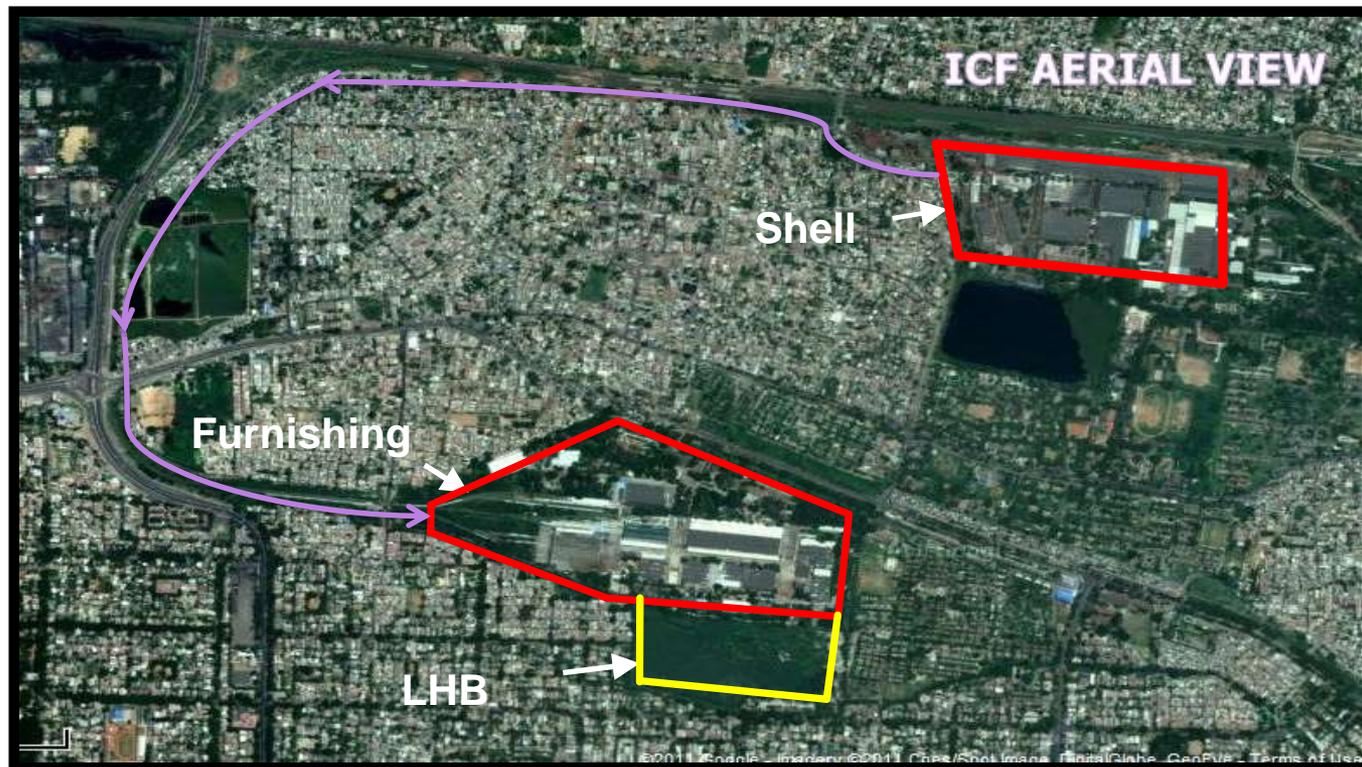
*Innovation Continues Forever*

*Energy Efficiency*

**GREENCO**

## Brief on ICF Introduction

Largest maker of  
Self-Propelled  
Coaches in country

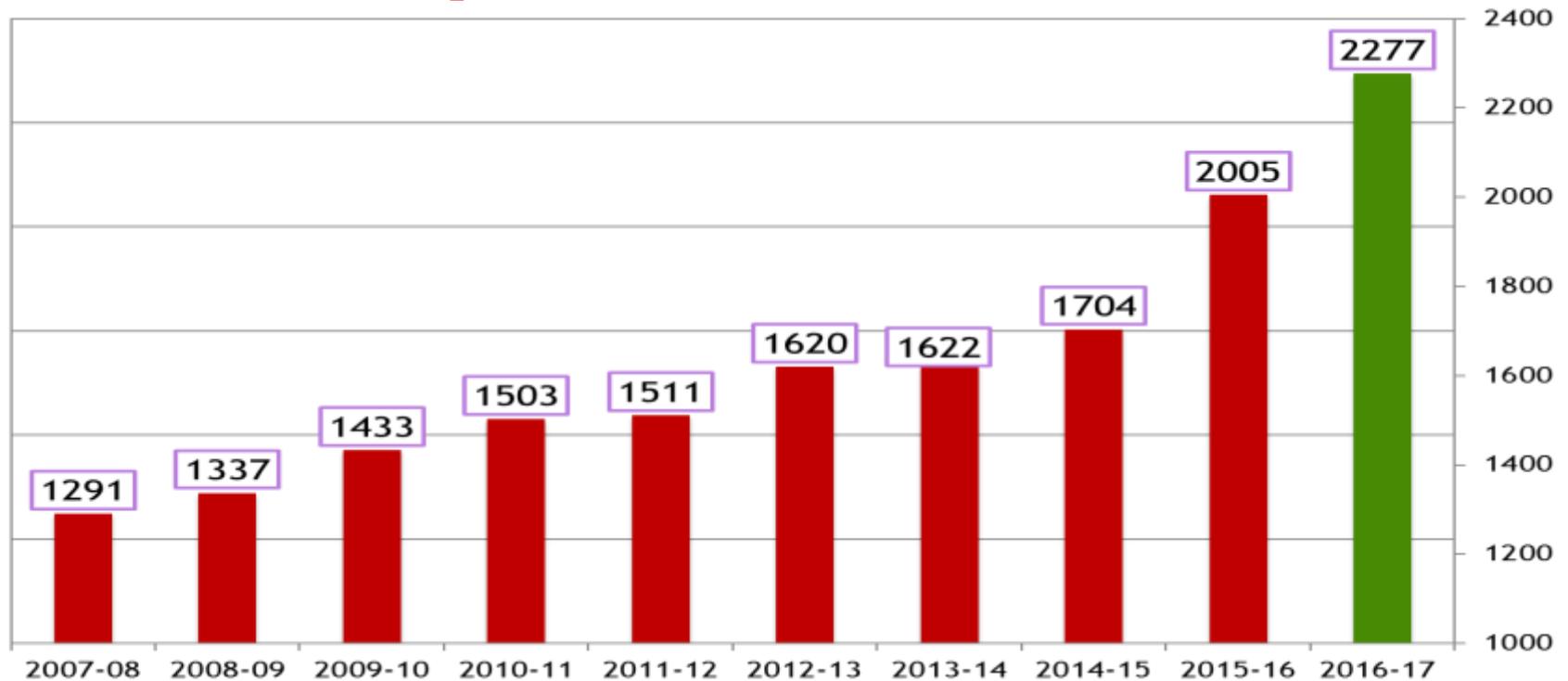


During the production year of 2016-17, ICF has not only achieved but also surpassed the prescribed target of 2178 and produced a record out turn of 2277 **coaches**. This is the highest ever production in the history of ICF and this production for the year 2016-17 is an **increase of 13.57%** over the last year production of 2005 coaches. ICF has already rolled out 169 Deen Dayalu coaches and one rake of Antyodaya coaches. ICF will soon be rolling out Tejas high speed LHB premium coaches and Anubhuti luxury LHB coaches. ICF plans to manufacture 15 coaches for Nilgiri Mountain Railway, 565 coaches for MUTP Phase-III and 16 rakes for Kolkata Metro. Export of 78 DEMUs and 160 coaches to Srilanka is under pipeline . ICF will be manufacturing prestigious state of the art 160 kmph speed Train Set, called “Train-18”.

# ICF@ a Glance ...

- ✓ 50000 coaches manufactured at single facility
- ✓ 500 + variants
- ✓ All varieties of Self Propelled Vehicles -  
EMUs/Metros/DEMU's/DHMUs/Maintenance Cars
- ✓ More than 2000 Coaches manufactured in 2016-17
- ✓ 1200 Stainless Steel Coaches per Annum

## Exponential Growth Of Outturn



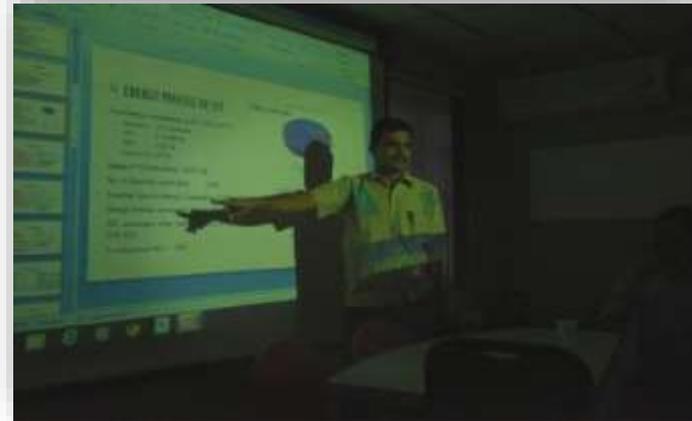
The Assessment for certification of ICF for “Green Co Rating” conducted by M/s CII on 10.04.2017 & 11.04.2017 in which Team ICF Certified “Silver Rating” .



# Awareness programs for Officers/Employees



Energy Audit outcome and Recommendation by M/s PCRA , GM/ ICF attended the Discussions



Awarness on Energy Conservation Measures to Supervisors by M/s PCRA

- ❖ 27,000 Nos of 7 watt LED lights have been distributed to ICF Family under Domestic Efficient Lighting Programme (DELP scheme).



- ❖ An interactive session carried out by Smt.G.Anandhi, Executive Engineer/ Tamilnadu Generation and Distribution Corporation Limited (TANGEDCO) on “Energy Saving Techniques and Electrical Safety” for employees of ICF on 12.08.2016 at AWTI auditorium



- ❖ A Technical Seminar organized for Electrical Maintenance Officers & Supervisors regarding “How to Improve Energy Efficiency & Reliability in Electrical Systems” by Mr. John Kochkutty, Joint General Manager, M/s L & T Mumbai., on 02.03.2017 at Vichar Sabha Grah



- ❖ A Technical Seminar organized for Electrical Maintenance Officers & Supervisors regarding training programme in ‘HVAC and pumping systems in ICF’ by Mr. Vasudevan, Consultant, M/s PCRA, Chennai on 09.03.2017 at Vichar Sabha Grah.



- ❖ As per the directives of Railway Board, Energy Conservation Day was celebrated at ICF on 14.12.2016. A technical seminar was also organized which was attended by Officers & Supervisory staff.



## Energy conservation Banners



# Energy Policy



Integral Coach Factory, Chennai-38

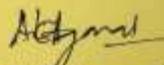


## Energy Management System Policy

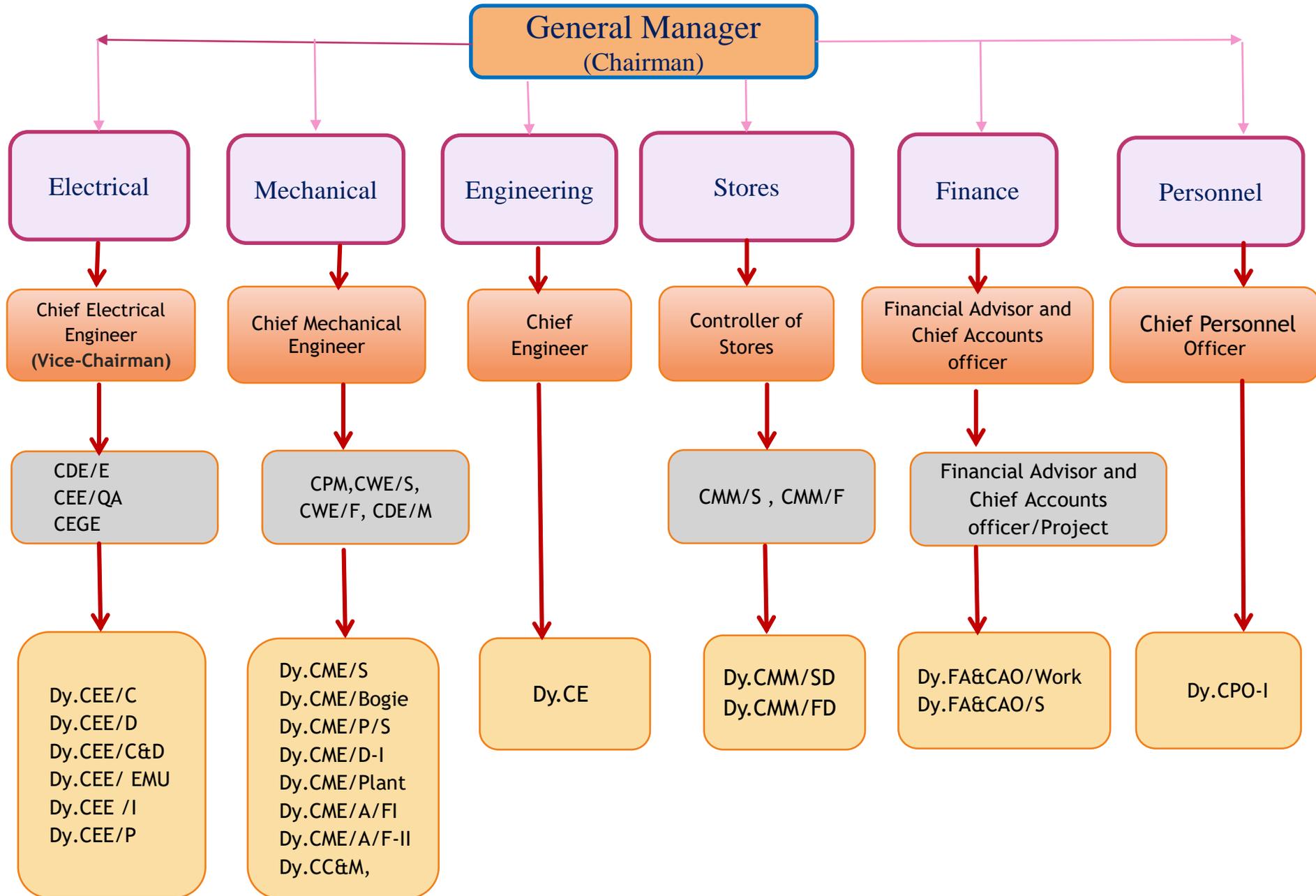
### ICF is committed to:

- 1 Design, Development and Manufacture of Energy efficient Railway Passenger Coaches using energy efficient process and resources.
- 2 Continual reduction of energy consumption by improving the process and adopting effective energy conservation measures.
- 3 Explore use of non-conventional sources of energy to the maximum extent possible for manufacturing and allied processes.
- 4 Comply with legal and statutory requirements related to energy use and conservation.
- 5 Periodic review of energy baseline and Pursue efficient energy use strategy and objective by an established system of documentation and effective communication across organisation.

Date : 15.05.2015  
Place : Chennai

  
(Ashok K. Agarwal)  
General Manager / ICF

# Organization Setup for Energy Management System



# Roles and Responsibilities of the Energy Management Cell

## Top Management (GM & PHODs )

Chairman/Chairperson of the Management Review Committee (MRC) for EnMS – **GM/ICF**.

Vice-Chairman of MRC for EnMS - **Chief Electrical Engineer (CEE)**

## Management Representative (MR)

Responsibility and authority of MR to ensure:

- MR will conduct MRC meeting once in six months.
- Reviewing of the audit reports, preparation of Internal audit plan & audit notification and presenting the same in MRC.
- A check list is prepared and complied with respect to conduct of internal audit, updating of documents, setting and review of progress of Energy management action plan and accomplishment of Energy objectives and targets.
- Organize training and awareness sessions on EnMS.
- Forming a core team in covering all areas.

## **Departmental Representative (DR)**

### **Responsibility of DR to ensure:**

- Implementation of EnMS and ensure all staff carry out activities as stated in EnMS procedures.
- Preparation of Production data and production variables Reports for the month - for Forwarding to MR.
- Smooth conduct of internal audit and timely action taken for correction, corrective action and preventive action for the non-conformities.
- Prompt implementation of recommendation of Energy Audit.

## **Energy Manager (EM)**

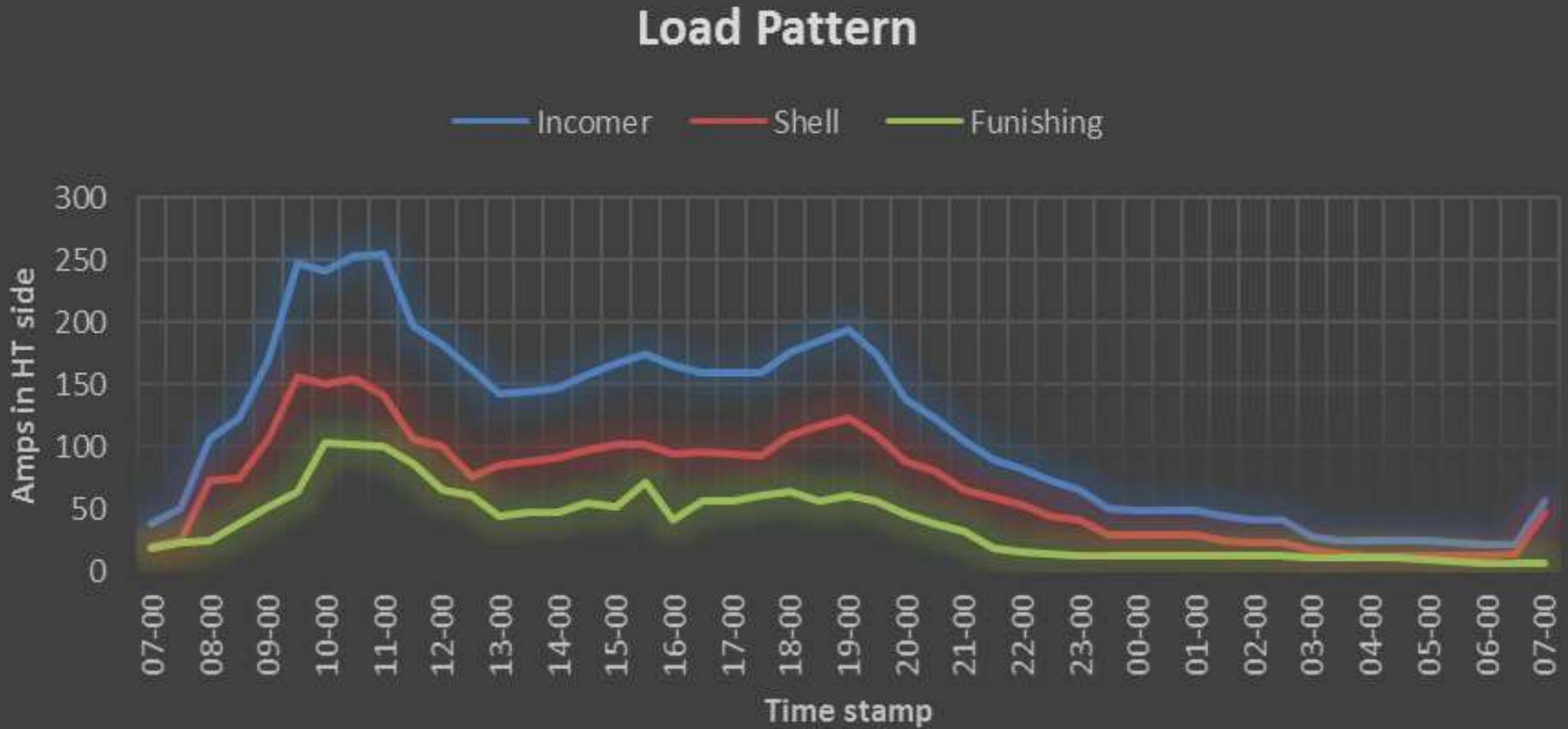
- Conduct of Energy audit periodically.
- Energy review is carried out as per plan.
- Energy base line are established for significant energy using operations and facilities
- Preparation of all kind of Reports of energy performance.
- Setting of Energy Management Action Plan & review of the same.
- Setting of Energy performance indicators.
- Monitoring and measurement are carried out
- Prompt action is taken and feedback given on Energy suggestion forms raised by interested parties (workmen, supervisors, contractors etc.,).

## Power Supply Details

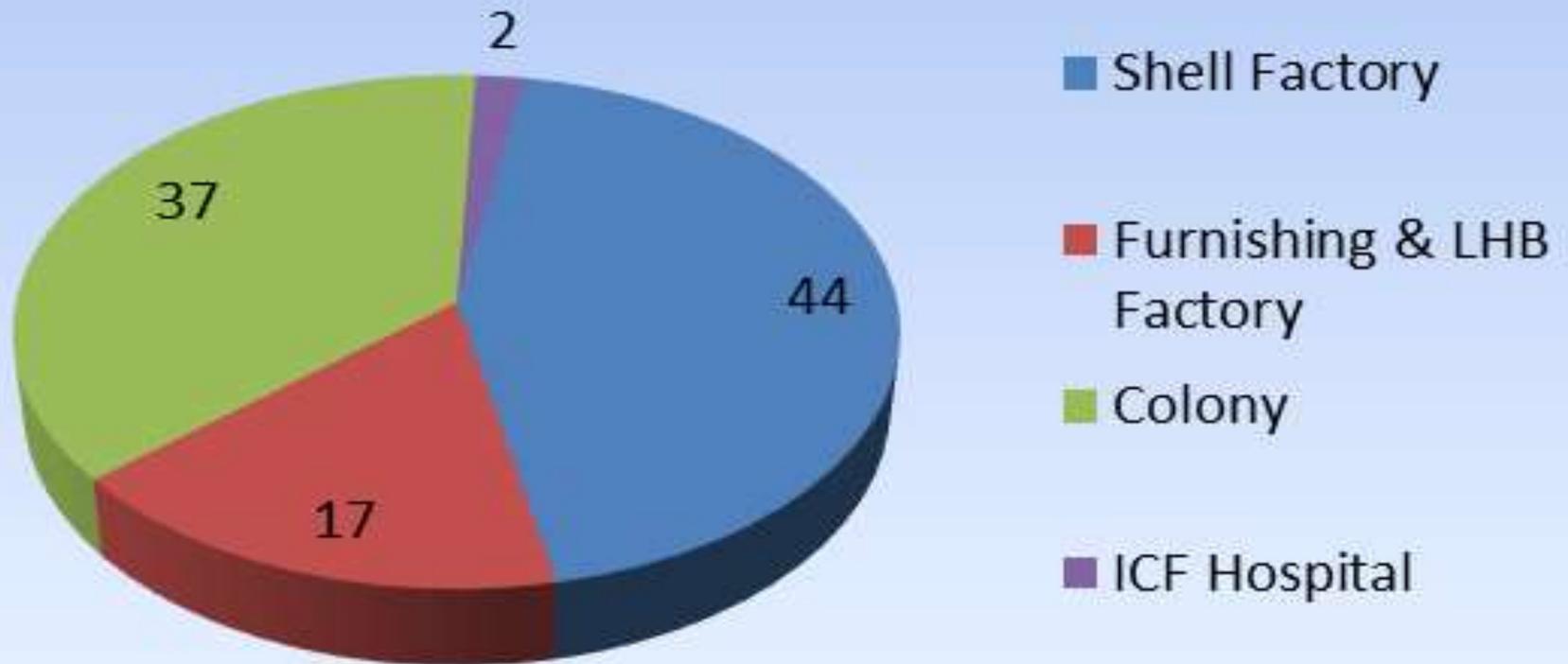
Description	Details
Connected load	71 MVA
Maximum Demand (avg.)	8,500 kVA
Maximum Billable Demand	7,650 kVA
Average consumption per month	Factory - 11.85 lakh units
	Domestic - 7.88 lakh units
<b>Captive Power Details</b>	
DG Set	1000 KVA, 11 KV – 4 Nos
	1250 kVA ,11 kV - 1 No
	250 KVA 415 V - 1 No

## Major Energy Consumption Equipment in plant

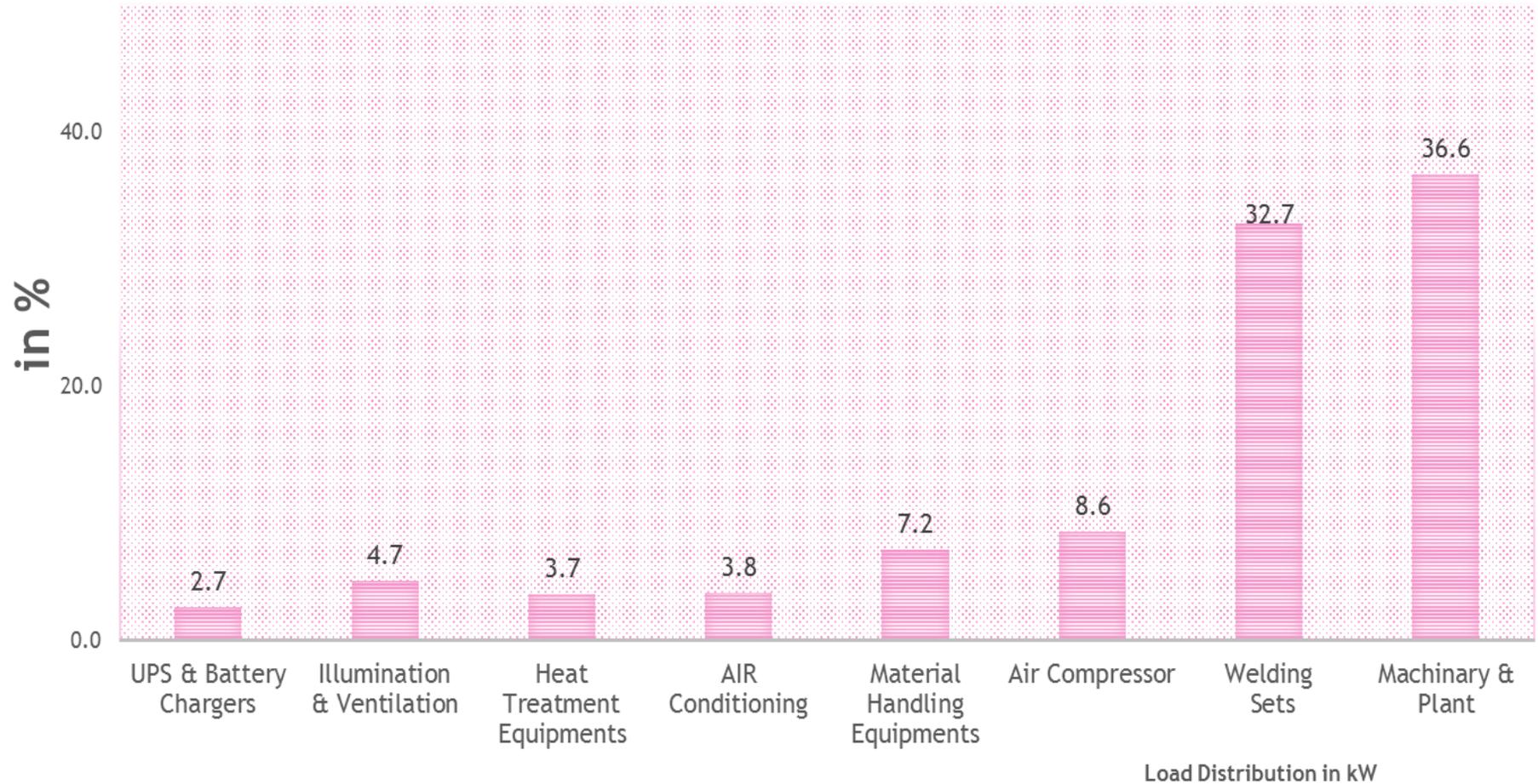
ABSTRACT OF CONNECTED LOAD PARTICULARS					
SL NO	DESCRIPTION	SHELL Load IN KW	FURN Load IN KW	SHOP-74 Load IN KW	LHB Load IN KW
1	MACHINARIES & PLANT	9412.58	3368.53	156.03	904.35
2	HEAT TREATMENT EQUIPMENTS	1543.07	178	405.75	26
3	MOTORS AND PUMPS	313.64	518.3	828.14	
4	AIR COMPRESSOR	1278.3	2545.65	15.6	300
5	MATERIAL HANDLING EQUIPMENTS (incl LIFT)	2386.07	496.15	15	326
6	WELDING SETs	12795.3	1148	431.86	
7	ALL LIGHTING FIXTURES	658.17	614.22	928.65	84
8	REF & AIR CONDITIONING EQUIPMENT	1267.1	465.26	518.6	
9	AIR CIRCULATORS & EXHAUST FANS	524.68	302.62	485.68	53.46
10	UPS, BATTERY CHARGERS & OTHERS	1120.46	936	23616.31	
	Sub -TOTAL	31299.37	10572.73	27401.62	1693.81



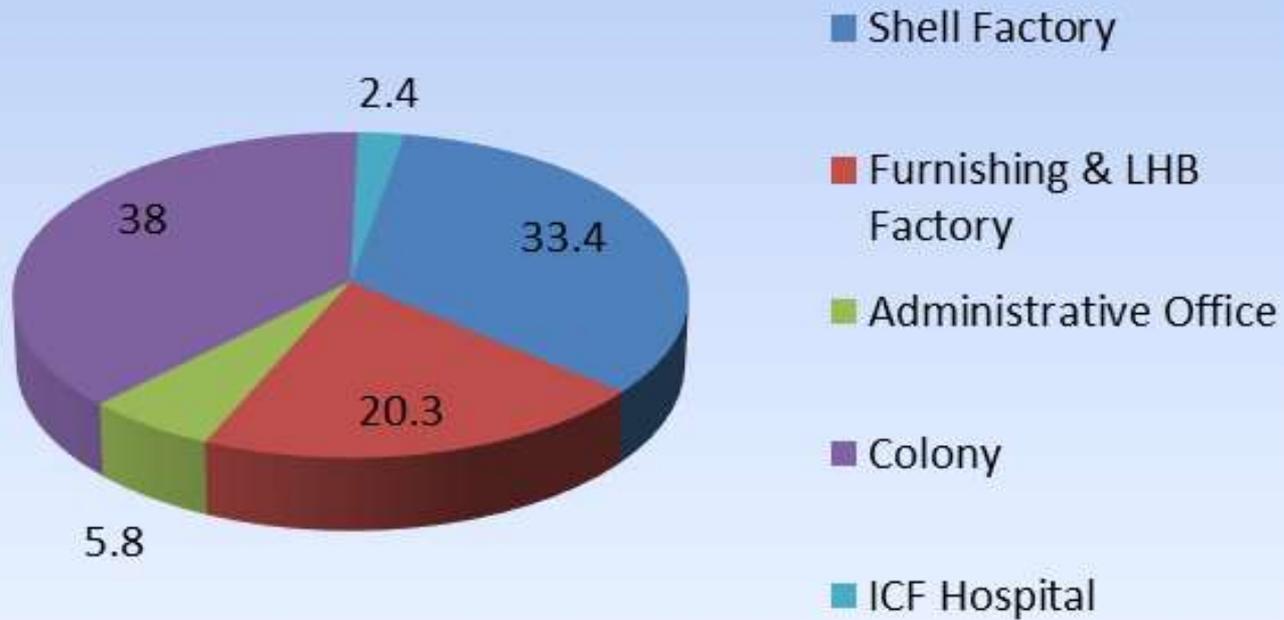
## Load in KVA in %



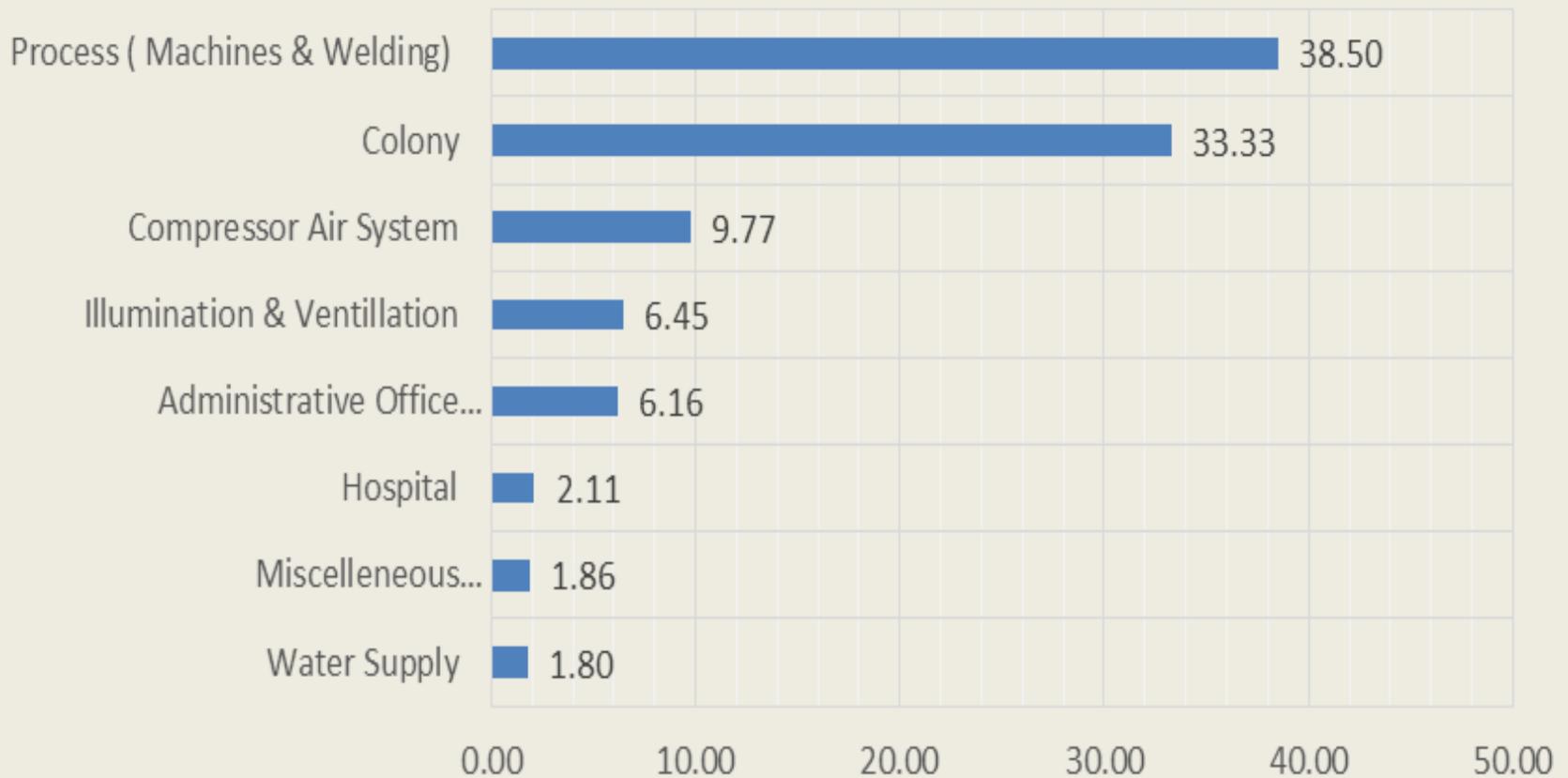
## LOAD DISTRIBUTION



## Annual Consumption ( Million units in %)



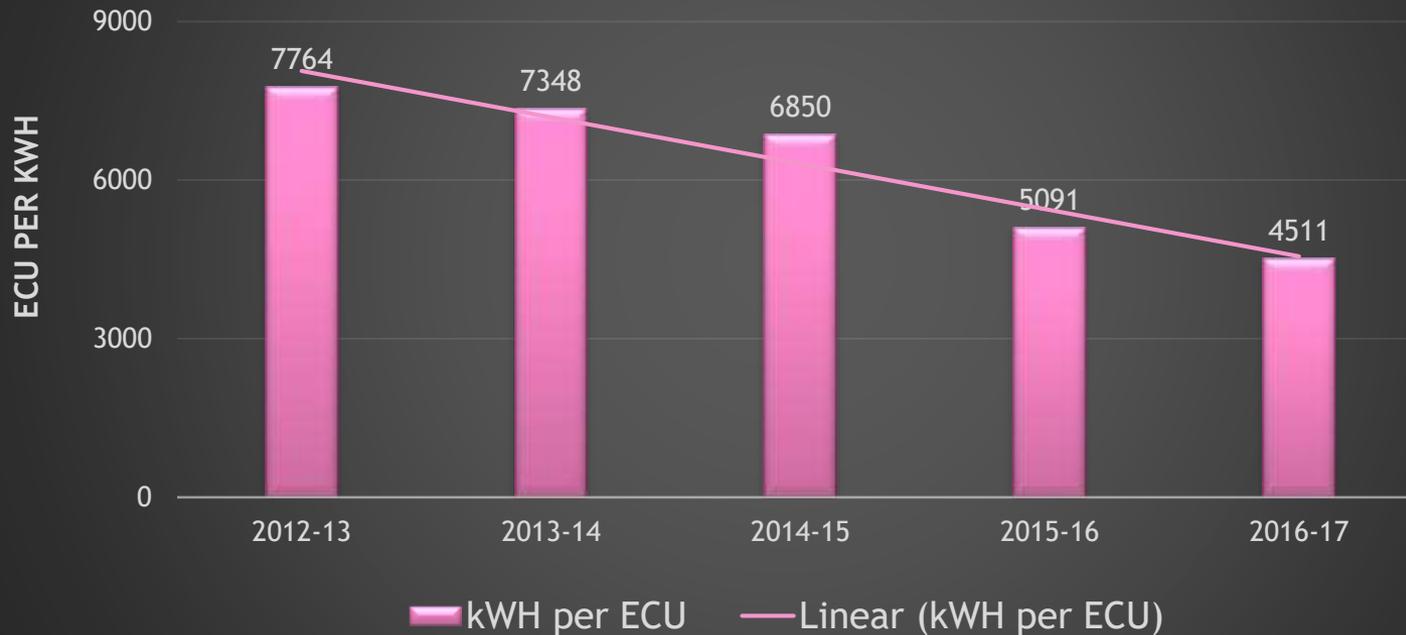
## Energy Profile: Factory & Ancillary area (Consumption in %)



# ECU of the company Last 5 Years

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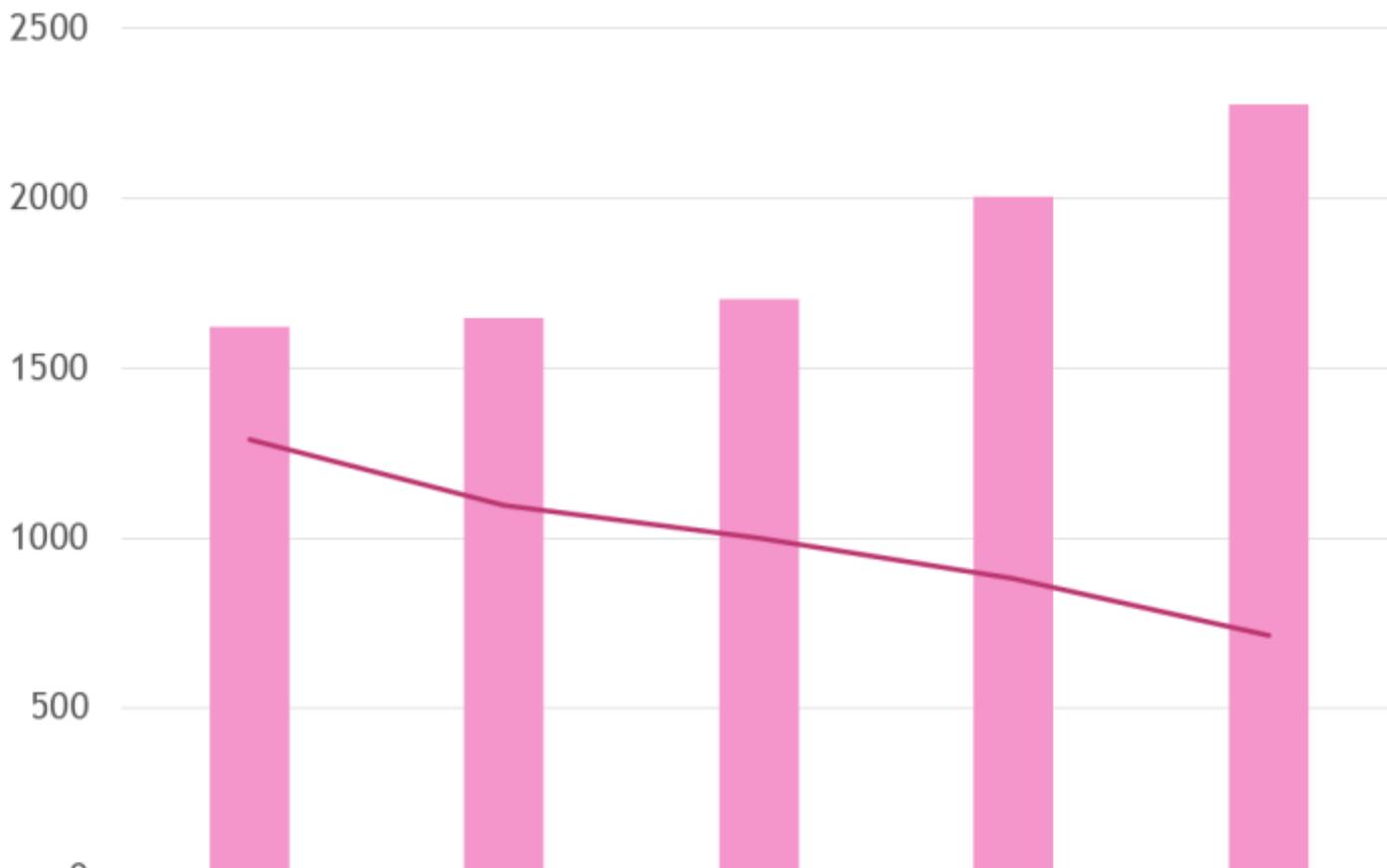
### Equated Coach Unit in kWh



# Specific Energy Consumption w.r.t coach production last 5 years Cont...

SEC Comparison Last Five Yers

SEC / Coach Produced in units



	2012-13	2013-14	2014-15	2015-16	2016-17
<span style="color: #e91e63;">■</span> No of Units Produced	1621	1649	1704	2005	2277
<span style="color: #800000;">—</span> Specific Energy Consumption KgOE/ No of units	1291	1097	999	881	712

■ No of Units Produced

— Specific Energy Consumption KgOE/ No of units

# Target Setting

Description of the Target	Short term targets	Action Plan
To restrict Equated Coach Units (ECU)	ECU from 4511 Units to 4200 units	To provide natural illuminations, energy efficient light fittings and ventilations in shop floor Reduce compressor leakage and better control of air supply
Conservation of Energy Consumption	To reduce energy consumption by 5% from overall consumption compared to previous year	Close monitoring of high energy consumption area and action for efficient control for enable to reduce energy consumption by 5 % overall compared to previous year.
Lighting	Conversion of High Wattage conventional Light fittings like Metal Halide, Mercury Vapor lamps. etc., to energy efficient LED fittings	Action plan for Provision of Energy Efficient Lighting is detailed in PAT Cycle.
Energy Efficient Fittings	Procurement of Star Rated Equipments	Procurement of Star rated electrical Equipments Viz., Air Conditioner's, Geysers, Fans
Natural Illumination	Provision of additional light pipes in Shops & Office Buildings to reduce Lighting load during day time	Provision 20 Nos of Light Pipes in office & Shop buildings
Effective Monitoring	Implementation of SCADA in power distribution System	Implementation of SCADA in three Main Receiving Station (MRS) for effective monitoring.
Compressor	To reduce compressor energy consumption by 10% over previous year	Provision of three no of Motorized valve in the compressor pipe line at Shell & Fur. Division
Air turbine	Provision of Air turbine ventilators in place of motorized exhaust fans	120 nos of Air turbine ventilators in place of motorized exhaust fans
Pumps	Replacement of existing pumps with energy efficient pumps	10 Nos of Energy Efficient Submersible pumps to be provided in Colony pump house
Energy Conservation in EOT Cranes	Provision of VFD Control with Re-Generative braking in over head cranes at shop floor areas.	VFD Control with Regenerative braking system from the total population of 50 cranes would be implemented in phased manner i.e.,10 Nos/Year.

**Short Term- Action Plan reporting format for PAT Cycle - II (2016-19)**

Sl. No	Energy Efficiency Improvement Measures (EEIM)	Investment Rupees (Lakh)	Date of Completion of Measures / likely Completion	Life Cycle Year1	Annual Energy Saving
					Electricity ** (kWh)
1	Replacing T-5 / T-8 (41W) to LED Tube(18W) <b>Total in Nos -18,000</b>	153	31.03.2017 - 4000 31.03.2018 - 6000 31.03.2019 - 8000	10	31.03.2017 = 2.48 Lakh 31.03.2018=6.21 Lakh 31.03.2019= <b>11.17 Lakh</b>
2	Replacing MH street light (190W) with LED light (45W) <b>Total in Nos -700</b>	126.31	31.03.2017 - 200 31.03.2018 - 200 31.03.2019 - 300	10	31.03.2017 = 0.78 Lakh 31.03.2018= 1.56 Lakh 31.03.2019 = <b>2.74 Lakh</b>
3	Replacing 2x2 FL / CFL (108W) to LED Tube ( 3 x 14 W) <b>Total in Nos -1400</b>	21	31.03.2017 - 400 31.03.2018 - 400 31.03.2019 - 600	10	31.03.2017 = 0.71 Lakh 31.03.2018 = 1.42 Lakh 31.03.2019 = <b>2.49 Lakh</b>
4	Replacing High Bay MH 460 W /290 W to LED Luminarie 150/100 W <b>Total in Nos -1135</b>	185.22	31.03.2017 - 400 31.03.2018 - 410 31.03.2019 - 335	10	31.03.2017 =3.34 Lakh 31.03.2018= 6.77 Lakh 31.03.2019 = <b>9.49 Lakh</b>
5	Replacing CFL 15 W /23 W to LED 5 W / 9W <b>Total in Nos -19000</b>	45.22	31.03.2017 - 10000 31.03.2018 - 5000 31.03.2019 - 4000	10	31.03.2017= 2.70 Lakh 31.03.2018 = 4.05 Lakh 31.03.2019 = <b>5.13 Lakh</b>
6	Replacement of Old Conventional Ceiling fan (75W) with Energy Efficient fan (50W) <b>Total in Nos 1000</b>	3	31.03.2017 - 250 31.03.2018 - 500 31.03.2019 - 250	20	31.03.2017 = 0.16 Lakh 31.03.2018= 0.33 Lakh 31.03.2019 = <b>0.67 Lakh</b>
7	Replacement of Old Conventional AC with Star Rating AC <b>Total in Nos 150</b>	75	31.03.2017 - 50 31.03.2018 - 50 31.03.2019 - 50	10	31.03.2017 = 0.48 Lakh 31.03.2018 =0.96 Lakh 31.03.2019= <b>1.44 Lakh</b>
8	Replacement of Conventional pumps with Energy Efficient pumps at various location in ICF premises of capacity ranging from 5 HP to 25HP.	13.5	31.03.2017 - 10 31.03.2018 - 5 31.03.2019 - 10	25	31.03.2017 = 1.27 Lakh 31.03.2018 =0.235 Lakh 31.03.2019= 1.27 Lakh
9	Provision of Automatic Power Factor Correction Panels of 200 KVAR capacity.	35	31.03.2017 - 7	10	

# Energy monitoring System

Cont...

Sub-Station-wise Load Details			Sub-Station List
2017-2018	2016-2017	2015-2016	

## Shell - Machine Load

2016-2017	SS-01 A-Shed	SS-02 B-Shed	SS-03 B-Shed	SS-04 C-Shed	SS-05 D-Shed	SS-06 E-Shed	SS-07 J-Shed	SS-12 L-Shed	SS-14 K-Shed	SS-19 NBS	SS-30 NWS	SS-29 MRVC	SS-22	Total
Apr - 16	30630	22493	52301	9838	14064	30756	28262	39154	29060	46144	32118	15493	0	350313
May - 16	36716	27098	52207	30418	11928	29784	42666	24161	39120	47056	33829	29779	0	404762
Jun - 16	34722	33750	53806	30271	14502	35116	36868	31692	39240	47744	31998	10707	0	400416
Jul - 16	39348	27981	55220	23945	11862	28656	32146	30045	33600	38136	25884	9450	0	356273
Aug - 16	42972	31817	53503	31125	12295	31992	25022	40917	27240	50484	31098	10123	0	388588
Sep - 16	32376	22871	21102	25736	9082	30342	28106	28576	20800	35476	26090	8958	0	289515
Oct - 16	33644	24227	42378	28450	11101	29804	31352	17939	22600	45340	25613	9693	0	322141
Nov - 16	34710	31920	45651	34076	14322	33012	36784	39884	15760	42244	27902	9981	0	366246
Dec - 16	22790	8954	43505	22637	10723	19712	31140	38609	22360	38888	20065	9364	0	288747
Jan - 17	27048	23696	48466	28114	10164	20112	37498	18896	24200	26744	23218	9871	0	298027
Feb - 17	32464	24783	53122	28666	9513	21178	33920	9234	25600	40608	26268	10529	0	315885
Total	367420	279590	521261	293276	129556	310464	363764	319107	299580	458864	304083	133948	0	3780913

## Shell - Illumination Load

2016-2017	SS-01 A-Shed	SS-02 B-Shed	SS-03 B-Shed	SS-04 C-Shed	SS-05 D-Shed	SS-06 E-Shed	SS-07 J-Shed	SS-12 L-Shed	SS-14 K-Shed	SS-19 NBS	SS-30 NWS	SS-08 GM Office	SS-18 IT Centre	Total
Apr - 16	2990	3007	4054	3612	2537	4044	1088	13444	2800	4056	1262	104983	37104	184981
May - 16	3230	2949	4042	3432	2802	4316	804	12539	3080	4444	1571	104733	27207	175149
Jun - 16	2920	3074	4203	3304	2768	4084	952	14108	2760	4756	1652	118811	44292	207684
Jul - 16	3490	2722	4876	2955	2668	3844	964	14925	2800	3764	1340	98899	36551	179798
Aug - 16	4490	3409	5932	3200	2395	4408	1048	24823	3560	4016	1642	92440	38826	190189
Sep - 16	2770	2484	5911	3189	1918	3858	1104	15994	3000	3624	1440	88899	35081	169272
Oct - 16	2900	3079	5200	3525	2109	3996	1188	35421	4200	3560	1217	76811	35963	179169
Nov - 16	2740	3073	5889	3099	2508	4088	1176	26436	4040	4156	1298	41806	34048	134357
Dec - 16	2120	3026	4495	2288	2067	3288	980	24791	2640	3412	1025	29631	28342	108105
Jan - 17	2150	2732	5334	2486	1966	3388	892	20594	2800	3456	1212	39825	30428	117263
Feb - 17	2310	2599	4724	2709	1707	3122	880	22746	2800	3492	1192	43458	31757	123496
Total	32110	32154	54660	33799	25445	42436	11076	225821	34480	42736	14851	840296	379599	1769463

Reviewed by Energy Manager & Dy.CEE/C

# Energy monitoring System

Cont...

## Compressor Load \* Shell & Fur.

2016-2017	SS-07 J-Shed	SS-29 MRVC	SS-22 A-Comp	Shell Total	LHB Fur	SS-20 Fur-Comp	SS-24 Fur-Comp	SS-27 Paint Shed	Fur Total
Apr - 16	32750	9967	12000	54717	20870	60168	37778	24066	142882
May - 16	26930	18681	6920	52531	22178	52734	65420	39803	180135
Jun - 16	25880	25146	13360	64386	28607	54769	73454	27191	184021
Jul - 16	21990	26663	15360	64013	25994	71567	52782	30391	180734
Aug - 16	30230	18773	16080	65083	27595	90511	19247	33982	171335
Sep - 16	24090	15813	12600	52503	29982	92909	26160	29168	178219
Oct - 16	29760	11969	12240	53969	25780	103471	22807	26977	179035
Nov - 16	33240	14402	11880	59522	27959	123823	22507	27014	201303
Dec - 16	29380	9527	11520	50427	26297	95883	25999	25061	173240
Jan - 17	34910	8728	11400	55038	29972	106271	20524	24758	181525
Feb - 17	43400	1169	11960	56529	32059	89159	39456	31818	192492
Total	43400	1169	11960	628718	32059	89159	39456	31818	1964921



Energy consumption in significant areas for the Second Quarter i.e. Oct, Nov, & Dec 2016 are given below:

▶ **Factory Feeders (ICF I + II) Kwh: (Including Loss)**

Months	2015-16 (A)	2016-17 (B)	Difference (B-A)
Oct	1112310	1221780	109470
Nov	1000190	1181810	181620
Dec	1021340	882440	-138900
<b>Total</b>	<b>3133840</b>	<b>3286030</b>	<b>152190</b>

▶ **Domestic Feeder (ICF III) Kwh:**

Months	2015-16 (A)	2016-17 (B)	Difference (B-A)
Oct	747060	754500	7440
Nov	614820	646740	31920
Dec	281820	462540	180720
<b>Total</b>	<b>1643700</b>	<b>1863780</b>	<b>220080</b>

▶ **ICF Total Consumption Kwh :**

Months	Oct	Nov	Dec
2015-2016(A)	1840877	1633751	1391856
2016-2017(B)	2008499	1858075	1487363
<b>Difference (B-A)</b>	<b>167622</b>	<b>224324</b>	<b>95507</b>

Location	Oct		Nov		Dec	
	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17
Shell	466831	519332	430938	520795	379089	445795
Furnishing	390254	451372	379235	460843	384411	428034
GM Office	56862	76811	42776	41806	34660	29631
IT Centre	48621	35963	33977	34048	26439	28342
AWTI & Hospital	119267	94126	91492	92541	143285	31077
D & D Building	11982	35158	8535	21079	67629	33551
ICF Colony in PER Area	-	41237	31978	40223	34308	28393
Colony	747060	754500	614820	646740	322035	462540
<b>TOTAL</b>	<b>1840877</b>	<b>2008499</b>	<b>1633751</b>	<b>1858075</b>	<b>1391856</b>	<b>1487363</b>

Issued by  
SEE/M & Energy Manager/ ICF



▶ **Consumption of Furnace Oil (Liters) :**

Months	2015-16 (A)	2016-17 (B)	Difference (B-A)
Oct	27276	47733	20457
Nov	58577	56549	-2028
Dec	50006	37505	-12501
<b>Total</b>	<b>135859</b>	<b>141787</b>	<b>5928</b>

▶ **Consumption of HSD Oil (Liters) :**

Months	2015-16 (A)	2016-17 (B)	Difference (B-A)
Oct	20323	17468	-2855
Nov	11160	26714	15554
Dec	11213	68870	57657
<b>Total</b>	<b>42696</b>	<b>113052</b>	<b>70356</b>

▶ **Generation of Electricity**

a. **Energy Generated by DG sets(kwh):**

2015-16	2016-17
67314	129720

b. **Generation of Green Energy :**

i) **Wind Energy (Kwh)**

Months	2015-16 (A)	2016-17 (B)	Difference (B-A)
Oct	405304	700930	295626
Nov	212271	793040	580769
Dec	877549	913299	35750
<b>Total</b>	<b>1495124</b>	<b>2407269</b>	<b>912145</b>

ii) **Solar Energy at Hospital (Kwh)**

Months	2015-16 (A)	2016-17 (B)	Difference (B-A)
Oct	1767	179	-1588
Nov	1047	1166	119
Dec	1253	741	-512
<b>Total</b>	<b>4067</b>	<b>2086</b>	<b>-1981</b>

**Shell & Fur Compressor Load**

Months	SS-07 J-Shed	SS-29 MRVC	SS-22 A-Comp	Shell Total	LHB Fur	SS-20 Fur-Comp	SS-24 Fur-Comp	SS-27 Paint Shed	Fur Total
Oct-16	29760	11969	12240	53969	25780	103471	22807	26977	179035
Nov-16	33240	14402	11880	59522	27959	123823	22507	27014	201303
Dec-16	29380	9527	11520	50427	26297	95883	25999	25061	173240
<b>Total</b>	<b>92380</b>	<b>35898</b>	<b>35640</b>	<b>163918</b>	<b>80036</b>	<b>323177</b>	<b>71313</b>	<b>79052</b>	<b>553578</b>

Issued by  
SEE/M & Energy Manager/ ICF

# Energy Efficiency improvement in equipment wise

Cont...

S.I	Systems	Audit Recommendation's	Action Taken	Status
1	Compressed air network	Arresting air leakages	Necessary action has been initiated to arrest the air leakages by Millwright.	Completed
2		Conversion from $\Delta$ - Y mode during unloading of compressors		Not Feasible
3		Installing VFD to eliminate unloading of compressors		Not Feasible
4	Pumps	Cleaning of filters for drinking water pumps	The scope is covered under AMC and Engineering Department is advised to look into the issue.	Under Progress
5		Replacement of existing pumps with energy efficient pumps	Main Pumps are replaced with energy efficient pumps (40HP to 25HP). Out of total 16 Nos , 8 nos of pumps to be replaced are standby and it is operated only during emergencies. As the codal life of these pumps ( 8 nos) are ten years , steps are initiated to phased out of these pumps in phased manner.	Completed
6	Machinery	Reducing idling losses in presses	Steps were taken to identify the list of machinery which consumes energy during idle conditions. As a trial measure, timers are incorporated in the circuit of two nos, 200 ton Press brake to reduce ideal time if time exceeds 20 mins main motor is switched off. Also installing Drives in these machinery is been explored.	Completed
7	Lighting	Install Energy efficient lighting in C shop	The requirement has been assessed and proposal made for inclusion in PWP 2016-17	Under Progress
8		Install Energy efficient lighting in B shop		
9		Install Energy efficient lighting in 30 & 36		
10	HVAC	Replacement of fiber glass insulation with foam insulation	Investment cost is high	Not Feasible
11	Building	Install energy efficient light in Shell admin Building	Proposal for replacing conventional light with energy efficient fitting is concurred procurement is under progress.	Under Progress
12		Replacement of split air conditioner with 5 star AC	All AC's (128 nos) installed in the building are star rated (one star to three star) ,however replacing all these AC's into 5 star in phased manner with the expiry of codal life.	Completed
13		Install energy efficient light in Hospital	Proposal for replacing conventional light with energy efficient fitting is concurred procurement is under progress.	Under Progress
14	Renewable	Use of renewable energy in ICF	Addition of Solar PV rooftop system is in progress.	Under Progress
15	Transformer/ APFC	Keeping APFC panel in Auto mode	Out of 31 only in 15 sub stations APFC are operated in Manual mode due to shortage of capacitors & Contactors. Steps have been taken for rectification.	Completed

## Compressor Details

Compressor Details		
	Shell Div.	Fur Div.
No of Compressors	8	13
Total CFM	6500	13000
Type	Screw Type	Screw Type
Pressure Setting	6.2 to 6.9	5.5 to 6.1

2016-17	Shell	Energy /CFM	Fur	Energy /CFM
Apr-16	54717	8.4	142882	11.0
May-16	52531	8.1	180135	13.9
Jun-16	64386	9.9	184021	14.2
Jul-16	64013	9.8	180734	13.9
Aug-16	65083	10.0	171335	13.2
Sep-16	52503	8.1	178219	13.7
Oct-16	53969	8.3	179035	13.8
Nov-16	59522	9.2	201303	15.5
Dec-16	50427	7.8	173240	13.3
Jan-17	55038	8.5	181525	14.0
Feb-17	56529	8.7	192492	14.8
Mar-17	72979	11.2	228525	17.6

# Energy Conservation Measures Adopted

Cont...



One no of High Volume Low Speed (VFD) 24ft sweep ceiling fan of capacity 1.5kw 5 blade has been installed in dispatch shed of furnishing division. The fan rotates at 65 RPM.



1.2 KWp Off-Grid Solar Hybrid system is provided on the rooftop of Shell Administrative Building



The GM Administrative & Other Service buildings are Illuminated with LED Façade Light fittings.



All signage boards of ICF buildings are illuminated by LED lights



Occupancy Sensor have been provided in Officer's Chamber to switch off automatically Air Conditioners and Room Lights when the Room is unoccupied



Turbine Air Ventilators which operate on natural draft without Electrical Power have been installed in Workshop Roof Tops to exhaust hot gas emanating from Welding Operation, Furnace etc.



The conventional Window/Split Air conditioners are replaced with the state of the art Variable Refrigerant Flow (VRF) Centralized Air Conditioning System in both Shell and Furnishing Offices, which consume 40% less Energy



High Horse Power Pumps in Colony Pump Houses are being replaced with Energy efficient Submersible Pumps in a phased manner.



12 Nos of Solar light pipe provided at various locations in Buildings & Shop floor areas .

# Energy Conservation Measures Adopted

- ❑ High Volume Low Speed Fan (HVLS) with VFD control was introduced in place of air circulators at shop floor areas.
- ❑ Bandwidth adjustment on compressors from band width of 6.5 -7.3 kg/sq.cm to 6.2-6.8 kg/sq.cm.
- ❑ Provision of Motorized valve in the Compressor pipe line at Fur. Division.
- ❑ Introduction of Smart Energy meters for ICF Colony for effective monitoring.
- ❑ Switching off Standby Transformers.
- ❑ Energy Efficient Submersible pumps are provided in Colony pump house.
- ❑ Energy savers, which switch OFF Arc welding sets during idle condition.
- ❑ Timers are installed at High consumption Machines to reduce the ideal running.
- ❑ Air turbine ventilators in place of motorized exhaust fans.
- ❑ Procurement of Star rated electrical fittings.
- ❑ Automatic timer switches to control lighting circuits/air circulators in Factory areas.
- ❑ Provision of LED lights in place of High wattage Conventional Lights fittings.
- ❑ Converted Six HT Substation to LT switch in Shell & Furnishing Div. of ICF.



*Renewable Energy*  
**GREENCO**

# ICF – “Green Factory”

- ▶ ICF a premier production unit under the Ministry of Railways, was established in the year 1955 to manufacture passenger coaches. Spread over a sprawling 475 Acre complex, ICF employs 11,000 strong work force and manufactures over 2,000 coaches every year.
- ▶ 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”.
- ▶ ICF is the only Railway unit to fully source its Electrical Energy requirement from Renewable Energy Sources

# Renewable Energy Policy

GOVERNMENT OF INDIA  
MINISTRY OF RAILWAYS  
(RAILWAY BOARD)

No. 2009/Elect(G)/150/13/Pt.

Dated: 18.11.2015

General Managers, All Indian Railways,  
And Production Units.

**Sub:** Harnessing of Solar Energy on rooftop of Railway Buildings.  
**Ref:** Board's letter No.2012/Elect(G)/150/4/Pt.IV dt. 10.03.15.

In order to meet the commitments given in Budget speech 2015 for installation of solar plants and as a part of Indian Railways Solar mission to reduce dependence on fossil fuels, Railway are required to put up solar plants on the roof tops of Railway premises. For this purpose, 50 MWp capacity has been identified & allocated to Zonal Railways vide Board's letter under reference.

2. Accordingly, the following policy frame work in this matter should be followed:

- i) Solar power plants should be installed through developer mode on the rooftops available in Railways Premises from investment by developers with consumption of complete electricity so generated by Railways for its own uses, through a long term Power Purchase Agreement (PPA) for 25 years with developers at a fixed tariff, as arrived through open bidding process. CFA shall be provided as per existing MNRE guidelines.
- ii) Zonal Railways should call for tariff based open bidding (based on model RFQ/RFP documents being circulated separately by Board in the regard) from interested developers with grant of permission to developers for use of roof top spaces of Railway buildings/stations/platforms/sheds/workshops or any other suitable roof top space without any charge, whatsoever it maybe, with utilization of complete energy by Railways through long term Power Purchase Agreement (for per unit cost of solar power) for a period of 25 years as per the model Tender document and PPA approved By Board.
- iii) However, while initiating the Bidding process simultaneous activity of identification of necessary rooftop space, alongwith preparation of plan for removal and relocation of existing encumbrances on these rooftops if any should be carried out and internal approval for use of space, where necessary, be obtained and kept in readiness.

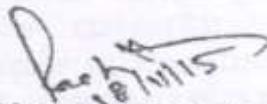
- iv) To protect Railways interest, in case there is a sharp drop in the price of per unit power being procured from other sources like DISCOMs etc. by Railways as compared to solar power contracted as per above policy, Railways will buy back the solar plant as per the provisions made for the same in the tender document being issued by Board.
3. Based on the above and in accordance with MNRE guidelines for Central Financial Assistance, Model Bid Documents are also being issued shortly.
  4. A suitable feedback /review mechanism should be put in place to monitor progress/performance by Zonal Railways and reporting to Railway Board on six monthly basis.
  5. Action taken in this regard may please be intimated.

This has the approval of Board (ML, ME & FC).



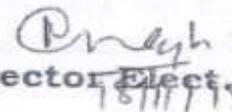
18.11.15

Director Finance/PPP



18/11/15

Director/L&A



18/11/15

Director Elect-Engg.(PS)

- Copy to:**
1. Chief Electrical Engineers; All Indian Railway & Production Units for information and necessary action.
  2. Director General RDSO, Lucknow,
  3. All Indian Railway Institutes.
  4. CEE/CORE/Allahabad.
  5. All Railway Workshops
  6. DME(C&IS) for uploading on website.

## Target Setting

Description of the Target	Short term targets	Action Plan
Solar Plant in Building/Workshops	Implementation of 4.255 MW Roof Top Solar PV System at ICF	I. 2 MWp Solar PV System under developer mode to be installed at LHB Shed Phase 1 . PDC 31 Oct 2017 II. Proposal sent to EEM/Railway Board for the implementation of 2 MWp Solar PV System at LHB Shed Phase II under PPPA model through REMCL III. Provision of 255 kWp Rooftop Solar panel in Administrative & Other service buildings is under progress
Natural Illumination	Provision of additional light pipes in Shops & Office Buildings to reduce Lighting load during day time	Provision 20 Nos of Light Pipes in office & Shop buildings
Hybrid (Solar & Wind) Plant	Provision of Hybrid Solar & Wind plant ,	5 Nos of < 5 kWp On Grid Solar Hybrid system is planned at Service Buildings
Solar Water Pumps	Provision of Solar Water Pumps	Provision 5 Nos of Solar Water Pumps for landscaping and gardening purpose

<b>Description of the Target</b>	<b>Long term targets</b>	<b>Action Plan</b>
Solar Power panel in Colonies	Provision of Solar Power Panels in ICF Residential Buildings	Proposal Under Discussion
Solar based Street Lights	Replacement of all street light to Solar based LED fittings in phase manner in ICF vicinity	Procurement and installation of solar street light fittings in peripheral of factory and colony 100 Nos/Year .
Solar Panel Passenger Coaches	Introduction of Solar panels in roof top of passenger coaches for meeting lighting & ventilations load.	A DEMU rake is under trail run which has six coaches with each coach fitted with twelve solar panels based on the report it will be extended to other coaches.

## On-site RE Generation (Electrical Energy)



**100 KWp** ON-Grid Solar Rooftop PV System is provided at roof top of ICF Shell Administrative Building & IT Centre. Annual Potential Generation would be 1.2 Lakh units which will eventually reduce CO2 emission by 96 ton/year



**20 KWp** On-Grid Solar roof PV system is provided at ICF Silver Jubilee Matriculation Higher Secondary School



**15 KWp** On-Grid solar PV system installed at ICF Hospital roof top



**10 KWp** On-Grid Solar roof PV system is provided at ICF Higher Secondary School, On an annual average it almost covers entire electricity requirement of the school



**3 KWp** Off-Grid solar PV system installed for illuminating approach road of LHB shed



**1.2 KWp** Off-Grid Solar Hybrid system is provided on the rooftop of Shell Administrative Building



40 Nos. of standalone solar street lights have been installed



3000 LPD Solar water heater system was provided at ICF hospital, ORH & officer quarters



12 Nos of Solar light pipe provided at various locations in Buildings & Shop floor areas .



Workshops in ICF have been so designed to facilitate diffusion of Natural Sunlight during day time from Roof and Windows to avoid artificial illumination through Electricity. Total covered area of Workshops in Shell & Furnishing Divisions: 1,24,941 sq. mtrs. Total Natural lighting provided by North Light Glazing: 66,000 sq.mtrs.

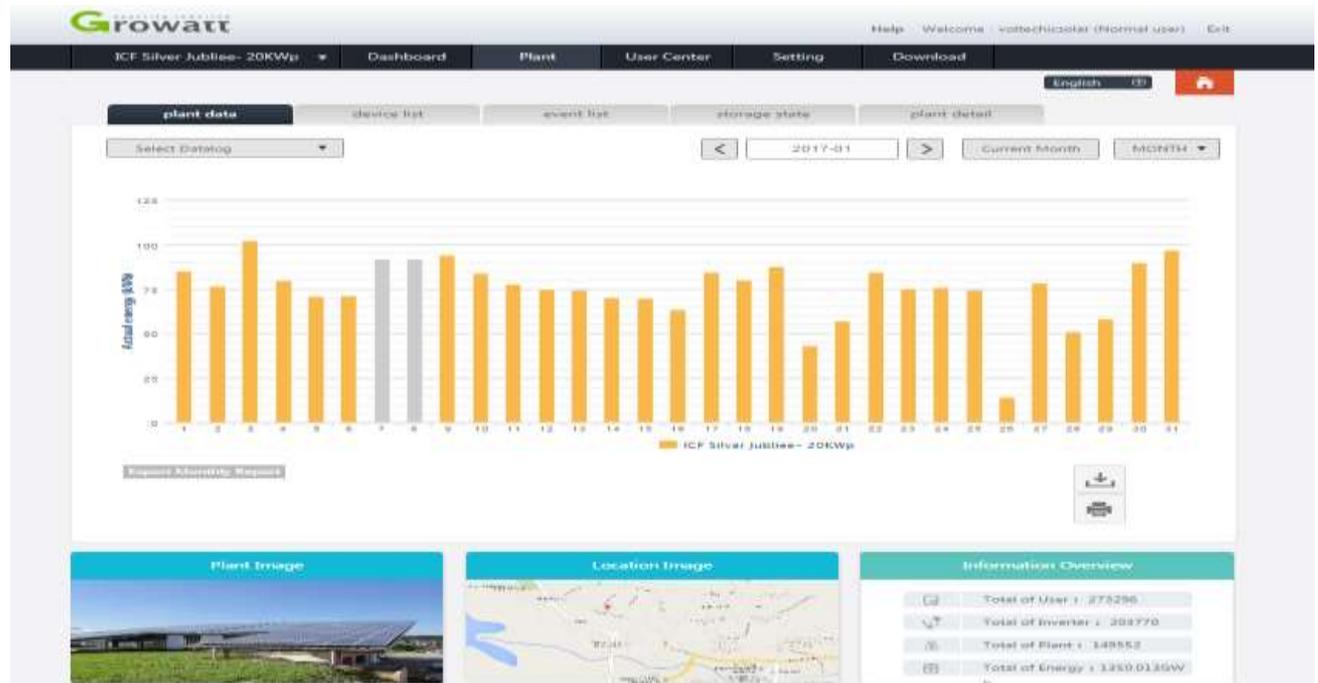


As a trial measure 180 Wp Solar Photo Voltaic panel installed in one Platform Truck for charging the battery when it is on use.

## On site RE Generation up to Mar 17

<b>S. N</b>	<b>Renewable Energy System Implemented On-site</b>	<b>Generation (In kWh)</b>
1	100 KWp ON-Grid Solar Rooftop PV System is provided at roof top of ICF Shell Administrative Building & IT Centre on 20 <sup>th</sup> Mar 2017	6,594
2	10 kWp On-Grid Solar roof PV system is commissioned at ICF Higher Secondary School on 26 <sup>th</sup> April 2016	10,577
3	20 kWp On-Grid Solar roof PV system is commissioned at ICF Silver Jubilee Matriculation Higher Secondary School on 29th June 2016	21,668
4	15 KWp on-grid solar PV system installed at ICF Hospital roof top on 26 <sup>th</sup> Mar 2015	41,413
5	3 KWp off-grid solar PV system installed for illuminating approach road of LHB shed on 12 <sup>th</sup> Dec 2014	8,600

# On-site RE Generation Monitoring Daily Wise



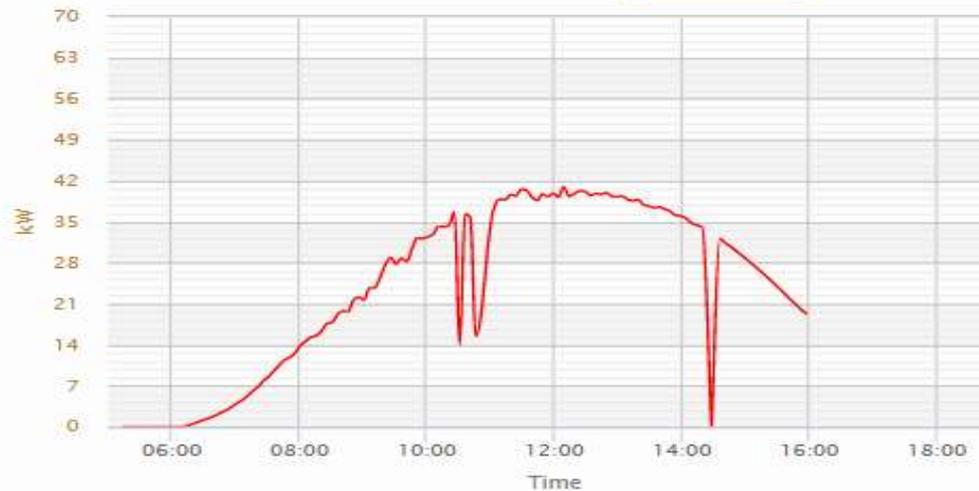


-  Dashboard
-  Home
-  Statistics
-  Analytics
-  Report
-  Escalation List
-  Notification
-  PV system
-  My Account

### Power Generation

AC Power  Yield

< 07/Apr/2017 Go >



Today energy generated : 253.21

### Power Information

Total Energy [kWh]

2868.2

Wattage [kW]

19.33

### Environmental Benefits



**2.295**  
Tons CO2 gas



**287**  
Ltr diesel



**25814**  
INR Earning

### Integral Coach Factory-Admin Building



Installed power: 53.2 kWp  
Commissioned on: 18 Mar 2017

[more..](#)

### Current Weather

Gurgaon



**23 °C**  
L:21°C H:24°C



2Pa



2mph

### Status

----- No Inverter Alarms -----

## Off-site RE Generation-Wind Mill

ICF is the first organization amongst all Government production units to entirely source its electrical energy requirement from a renewable source of energy. 7 wind mills of 1.5 MVA capacity each, which ICF has put up in the Tirunelveli District of the Tamil Nadu, has generated enough electricity since 2009 to meet the entire electrical energy requirement of ICF factory till date.



Commissioned on	: 30.03.2009
Location	: Tottapalli, Tirunelveli
Dist., TN	
No. Units	: 7 (Seven)
Capacity	: 10.5 MW
Capital Cost	: Rs. 66.05 Crores
Project Executed by	: M/s Suzlon Ltd. Gujarat.

**Energy Generated till Mar '17** : **143.24 Million Units**  
**Earnings till Mar'17** : **Rs. 61.78 Crores**

# Off-site Power Generation Details Monitoring



## Windmill Details of ICF

[ Data updated upto : 31/03/2017 ]



[Power Generation Details](#)

| [Power Consumption Details](#)

### Cumulative Power Generation - Comparison - Monthwise [kwh]

Sl-No.	Month	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
1	Apr		<a href="#">5,31,513</a>	<a href="#">4,18,293</a>	<a href="#">5,68,575</a>	<a href="#">4,46,107</a>	<a href="#">4,20,442</a>	<a href="#">1,91,083</a>	<a href="#">4,72,766</a>
2	May		<a href="#">21,86,414</a>	<a href="#">17,81,774</a>	<a href="#">18,12,672</a>	<a href="#">20,50,792</a>	<a href="#">10,61,446</a>	<a href="#">6,27,735</a>	<a href="#">9,81,424</a>
3	Jun	<a href="#">57,79,292</a>	<a href="#">29,68,481</a>	<a href="#">29,53,355</a>	<a href="#">31,92,583</a>	<a href="#">35,00,099</a>	<a href="#">27,21,592</a>	<a href="#">18,55,491</a>	<a href="#">22,04,461</a>
4	Jul	<a href="#">33,08,974</a>	<a href="#">24,46,814</a>	<a href="#">25,10,896</a>	<a href="#">27,84,700</a>	<a href="#">13,37,318</a>	<a href="#">28,91,901</a>	<a href="#">18,00,805</a>	<a href="#">20,25,642</a>
5	Aug	<a href="#">22,06,771</a>	<a href="#">20,81,887</a>	<a href="#">15,68,069</a>	<a href="#">31,92,833</a>	<a href="#">8,27,883</a>	<a href="#">14,73,756</a>	<a href="#">16,71,616</a>	<a href="#">19,01,109</a>
6	Sep	<a href="#">29,90,083</a>	<a href="#">19,44,095</a>	<a href="#">20,04,527</a>	<a href="#">23,21,170</a>	<a href="#">12,16,297</a>	<a href="#">11,01,232</a>	<a href="#">14,17,227</a>	<a href="#">16,23,629</a>
7	Oct	<a href="#">15,44,703</a>	<a href="#">20,44,161</a>	<a href="#">6,63,108</a>	<a href="#">11,41,837</a>	<a href="#">9,19,213</a>	<a href="#">4,91,069</a>	<a href="#">4,05,304</a>	<a href="#">7,00,930</a>
8	Nov	<a href="#">11,44,088</a>	<a href="#">7,10,834</a>	<a href="#">13,52,817</a>	<a href="#">8,07,074</a>	<a href="#">5,83,295</a>	<a href="#">8,17,861</a>	<a href="#">2,12,271</a>	<a href="#">7,93,040</a>
9	Dec	<a href="#">21,92,636</a>	<a href="#">12,01,826</a>	<a href="#">18,69,681</a>	<a href="#">23,36,770</a>	<a href="#">13,89,468</a>	<a href="#">11,12,832</a>	<a href="#">8,77,549</a>	<a href="#">9,13,299</a>
10	Jan	<a href="#">21,97,938</a>	<a href="#">18,97,492</a>	<a href="#">15,14,807</a>	<a href="#">20,72,864</a>	<a href="#">16,03,764</a>	<a href="#">8,54,635</a>	<a href="#">13,52,019</a>	<a href="#">15,01,106</a>
11	Feb	<a href="#">15,20,909</a>	<a href="#">12,63,227</a>	<a href="#">16,85,408</a>	<a href="#">14,69,992</a>	<a href="#">11,18,441</a>	<a href="#">10,39,414</a>	<a href="#">9,13,538</a>	<a href="#">17,68,867</a>
12	Mar	<a href="#">9,00,963</a>	<a href="#">8,98,065</a>	<a href="#">3,18,001</a>	<a href="#">7,43,577</a>	<a href="#">13,12,937</a>	<a href="#">5,52,184</a>	<a href="#">5,02,886</a>	<a href="#">6,63,830</a>
	<b>TOTAL</b>	<b>2,37,86,357</b>	<b>2,01,74,809</b>	<b>1,86,40,736</b>	<b>2,24,44,647</b>	<b>1,63,05,614</b>	<b>1,45,38,364</b>	<b>1,18,27,524</b>	<b>1,55,50,103</b>

NOTE : [Power-generation position upto Previous Month](#)

| [Admin Login](#) | [Main Menu](#) | [Wind-Mill Project](#) | [Wind-Mill-Principle](#) | [Go-Green](#) | [LED](#) | [Home](#) | [Logout](#) |

**System Developed by Personnel Department**

Data Maintained by Electrical Department [ 10.53.30.14 ]

The power-generation position updated upto : 31/03/2017

## Wind Mill Generation V/s ICF Consumption Analysis

Year	Wind Mill Generation (Units in Crores)	ICF's Energy consumption			% Share of Renewable Energy
		Factory (Units in Crores)	Domestic (Units in Crores)	Total (Units in Crores)	
2009-10	2.37	1.73	0.82	2.55	93%
2010-11	2.02	1.93	0.73	2.66	76%
2011-12	1.86	1.82	0.77	2.59	72%
2012-13	2.24	1.69	1.01	2.7	83%
2013-14	1.63	1.54	0.95	2.49	65%
2014-15	1.45	1.57	0.92	2.49	58%
2015-16	1.18	1.51	0.89	2.4	49%
2016-17	1.56	1.46	0.86	2.32	67%
<b>Cumulative Total</b>	<b>14.31</b>	<b>13.25</b>	<b>6.95</b>	<b>20.2</b>	



*Thank You*