

DETAILED ENERGY AUDIT STUDY

AT

LARSEN & TOUBRO INFOTECH LTD

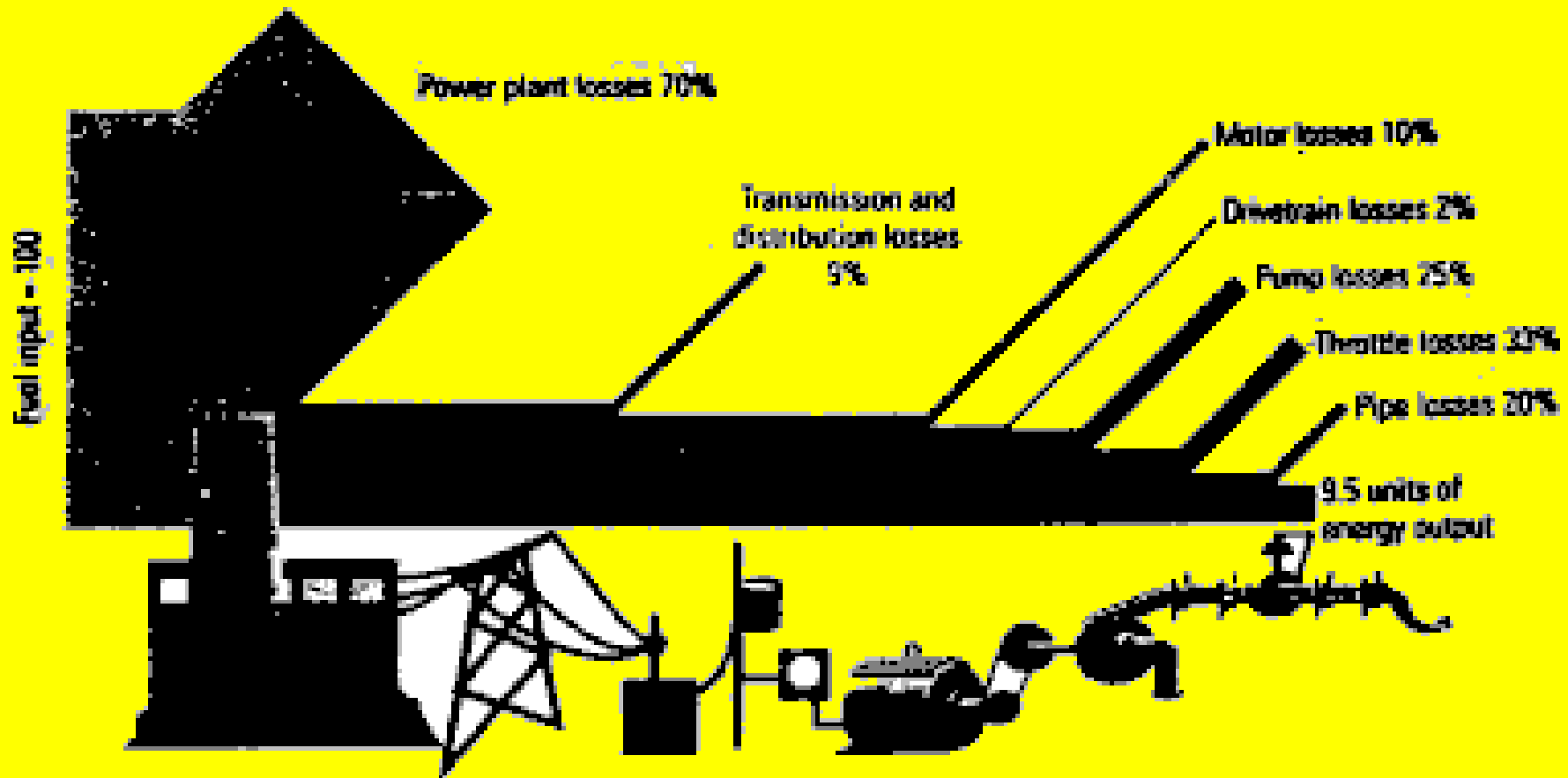


CONDUCTED BY



**NATIONAL PRODUCTIVITY COUNCIL
CHENNAI**

Stage Wise Energy Losses



DEFINITION

Commercial Buildings more than **500 kW** of connected load or **600 kVA** of contract demand have been brought under designated consumer under the **Energy Conservation Act** enacted by Bureau of Energy Efficiency, GOI

The EC Act implies that ...

- Commercial buildings should have a certified energy manager
- Periodic conduct of energy audit and
- Implementation of measures suggested thereof

SCOPE OF NPC STUDY

Conducts energy audit and suggests ENCON measures with cost benefit analysis covering the following areas:

- Transformer load management
- Air Conditioning Plant optimization and
- Diesel Generating Set optimization
- Pumps and pumping system
- Cooling tower optimization
- Lighting system
- Air Handling Units
- Computer UPS and other loads

NPC METHODOLOGY

- Discussion with plant personnel
- Analysis of past performance data
- Measurements of required electrical parameters
- Conduct of efficiency and performance improvement trials
- Discussion of the findings and recommendations with plant personnel
- Detailed techno economic analysis
- Report submission
- Follow up of performance monitoring

INSTRUMENTS

- Power analyzer 3 phase & 1 Phase (Make : Krykard)
- Ultrasonic water flow meter (Make : Esiflow)
- Lux meter (Make : Lutron)
- Thermo - anemometer (Make : TESTO 425)
- Non contact type temperature indicator (Make : Fluke)
- Digital contact type temperature indicator (Make : Fluke)

ABOUT L&T INFOTECH, CHENNAI

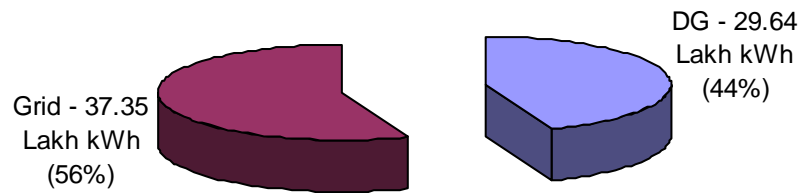
- Two buildings
 - TC - 1 (6186 sq.m, 3 floors) and
 - TC - 2 (11628 sq.m, 5 floors)
- Houses BPO's, software development facilities, design offices and data centers
- Working days :
 - normal = 254 days, 8-1/2 hours/day
 - for some projects, server room & data centres = 24x7

ENERGY CONSUMPTION OF BUILDING SITE

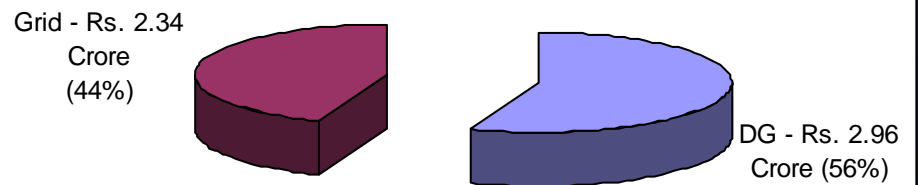
- Contract Demand = 2000 kVA
- TC1 & TC2 operates Captive DG sets on alternate days - to meet scheduled & unscheduled power cut
- Demand Quota permitted = 1060 kVA (till May 2009) enhanced to 1414 kVA (from June 2009)
- Energy Quota permitted = 3,70,880 kWh enhanced to 4,94,507 kWh

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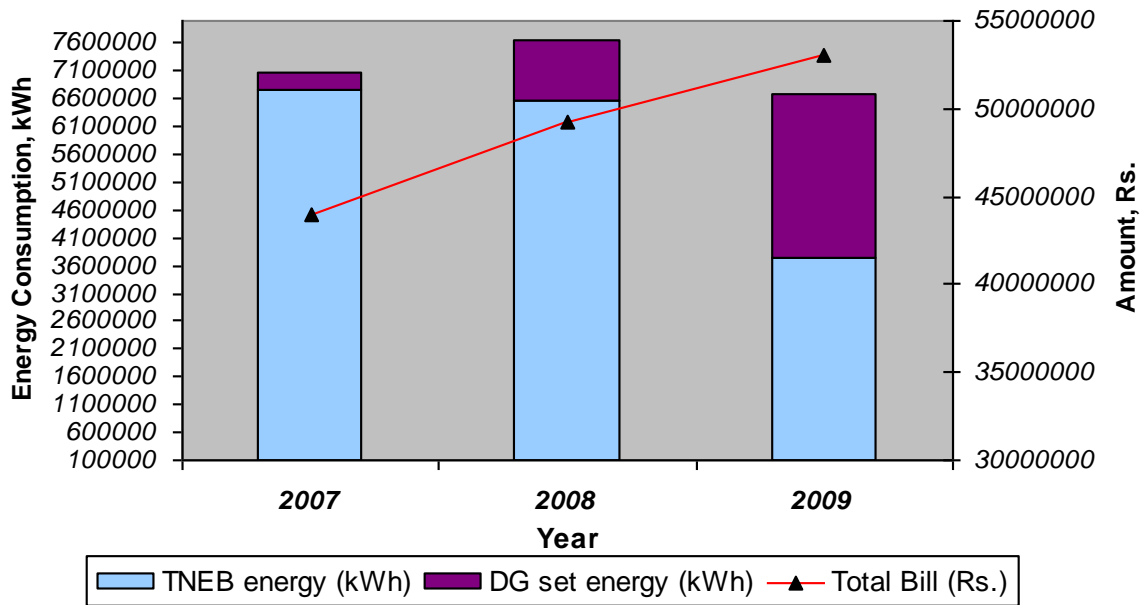
Break-up of Energy Supplied



Break-up of Energy Supply Cost



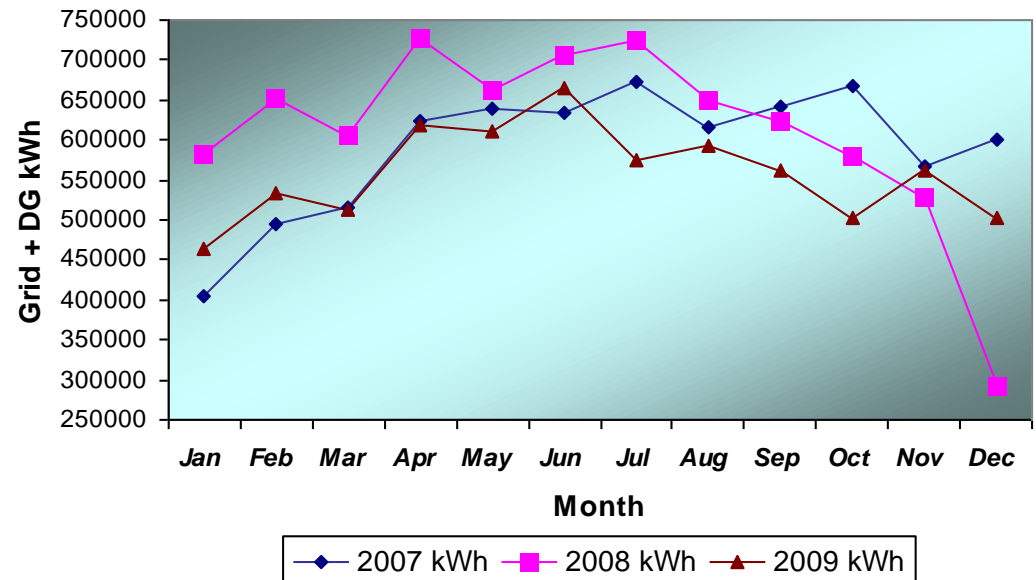
Energy Consumption and Cost Trend(TC-1 & TC-2)



Energy Consumption & Cost Trend

Building Electricity Use Trend

Month Wise Electricity Consumption Profile (TC-1 & TC-2)



ENERGY CONSERVATION MEASURES ALREADY IMPLEMENTED

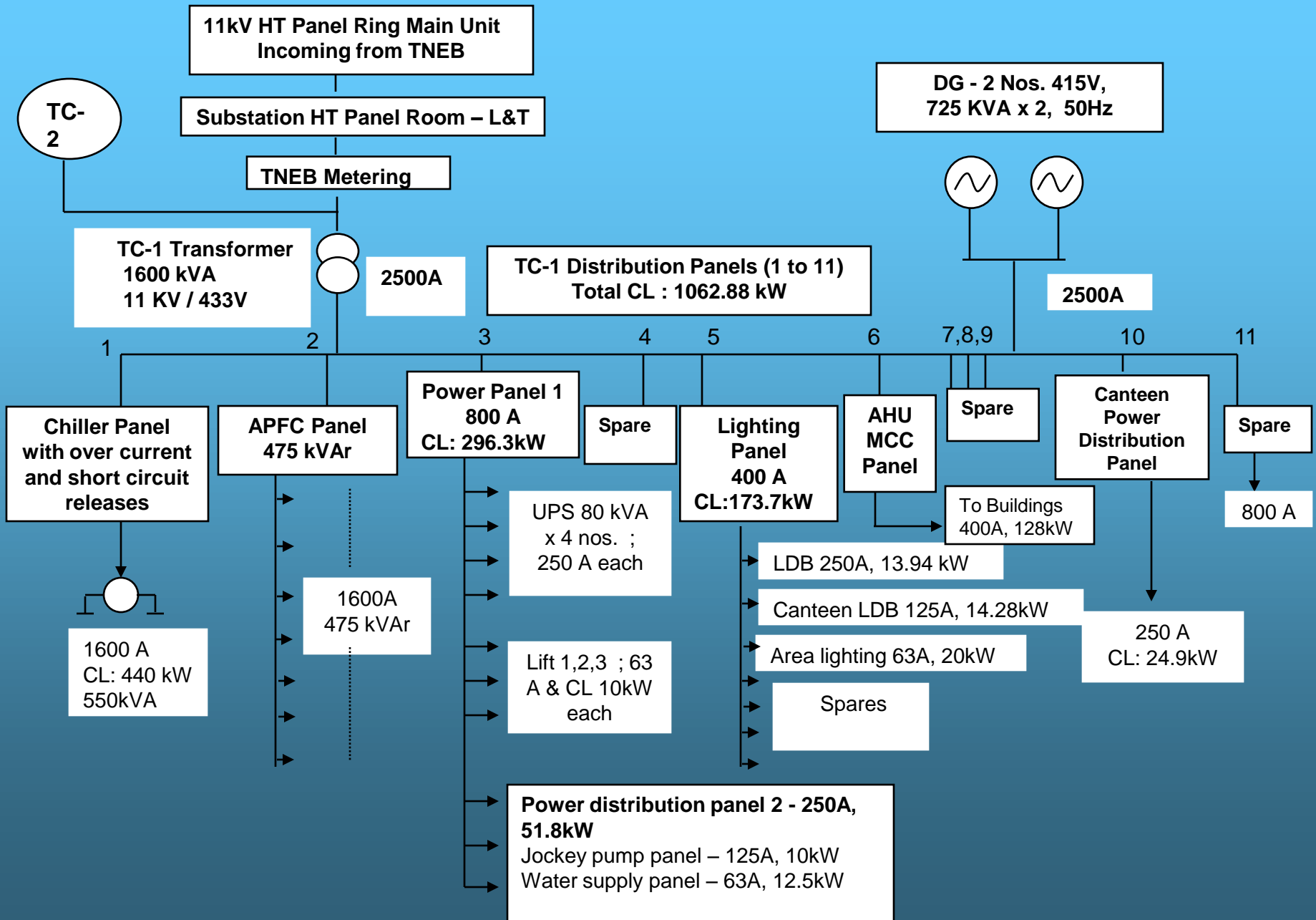
- VFD's for secondary chiller pumps in TC – 1 and TC - 2
- Maintaining average billing power factor at 0.99 by installing APFC
- Switching of AHU's after 20:00hrs and using fans
- Use of energy efficient lamps like CFL and T – 5 and installation of electronic chokes.
- Use of Building Management System (BMS)
- Switched off precision cooling for non-critical data center.
- Installed 120 kW & 14 kW solar PV panels at terrace.

ENERGY UTILISATION AT SITE

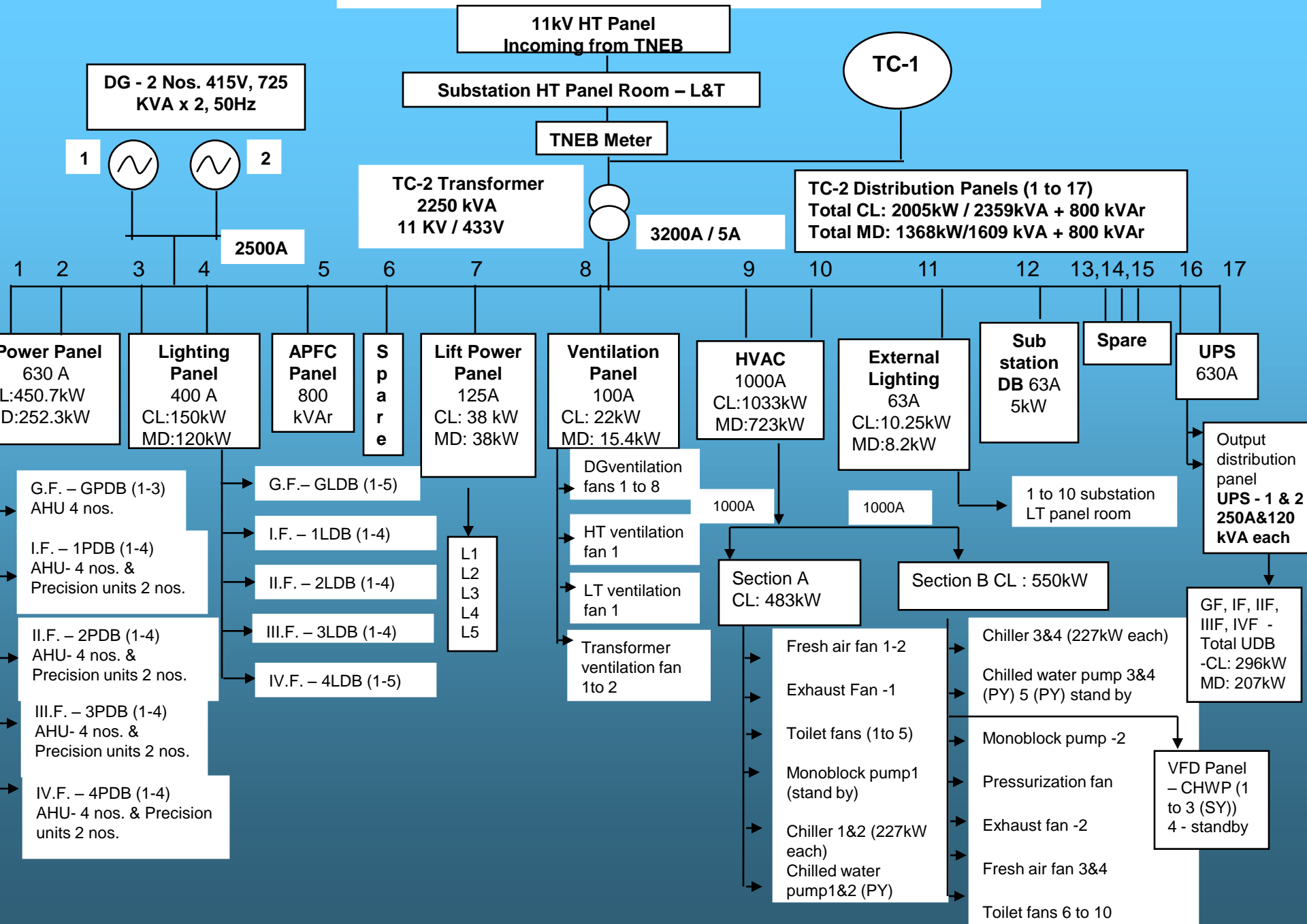
Transformer Rating and Operating Details

Transformer Reference	Unit	TC - 1	TC - 2
Transformer make		INDOTECH	VOLTAMP
Rating	kVA	1600	2250
Primary	kV	11	11
	A	83.9	118
Secondary	kV	0.433	0.433
	A	2133	3000
Designed Losses			
No load loss	kW	1.9	2.2
Load loss	kW	18	23
Existing Load (Average)	kVA	370	513
Loading	%	23	23
Transformer losses	kWh/day	69	81

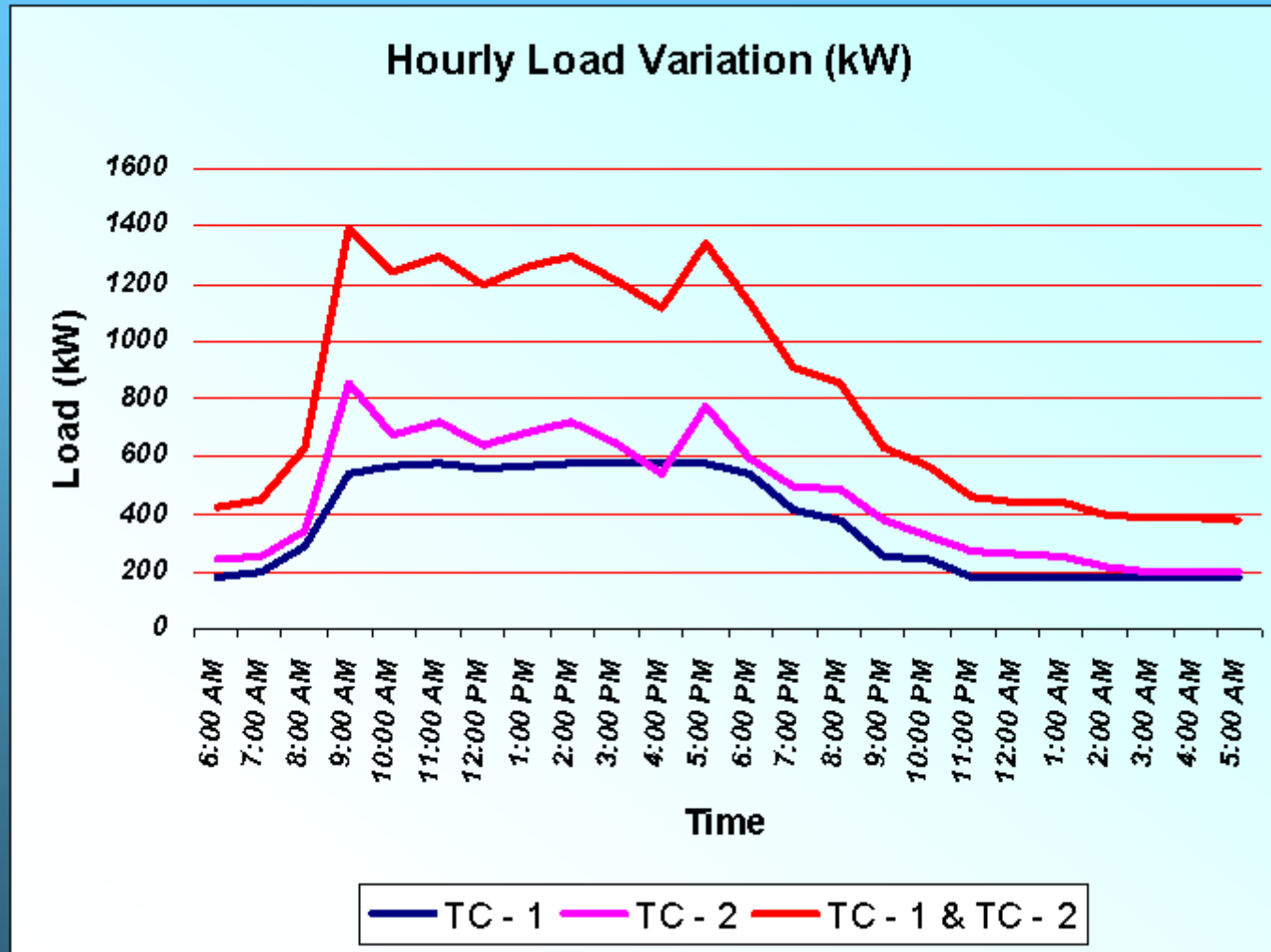
ELECTRICAL SUPPLY LINE DIAGRAM TC-1 (L&T InfoTech, Chennai)



ELECTRICAL SUPPLY LINE DIAGRAM TC-2 (L&T InfoTech, Chennai)

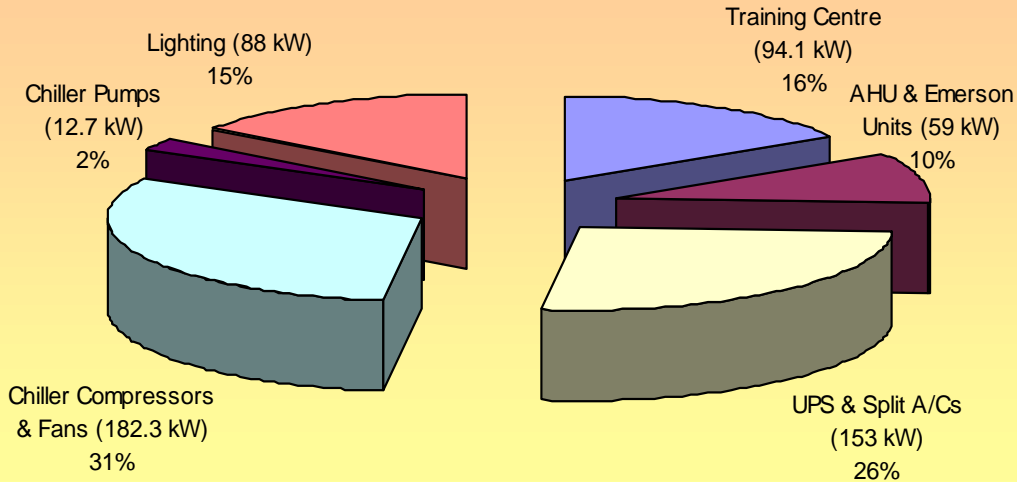


DAILY LOAD PROFILE

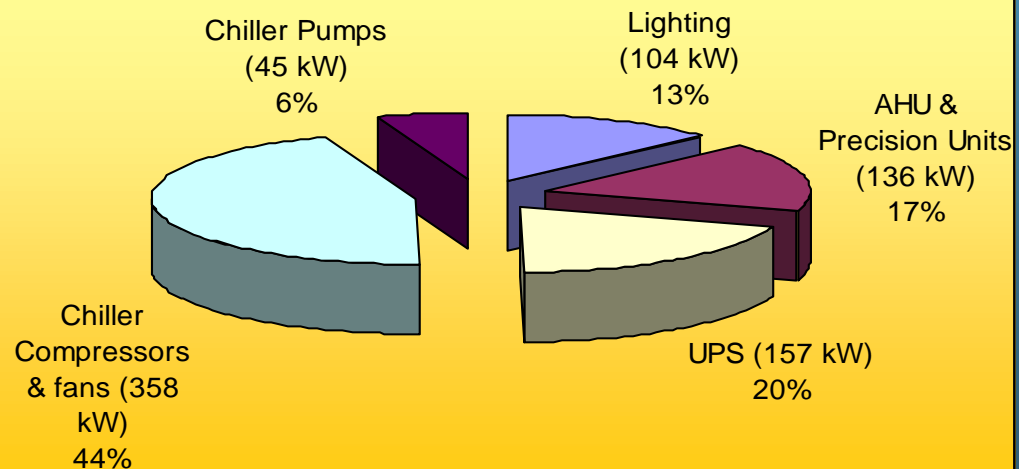


Consumption Pattern of Different Loads

Percentage Power Consumption of Different Building Utilities TC-1



Percentage Power Consumption of Different Building Utilities TC-2



Utility Wise Specific Energy Performance

Utility wise Specific Energy Performance	TC - 1	TC - 2
Installed TR /m ²	0.0566	0.062
Refrigeration kW /TR	1.13	1.22
Lighting Load Watts /m ²	17.2	13.67
Lifting Load Watts / m ²	-	3.27
DG set kWh /lit.	3.5	3.5
Connected Load Watts /m ²	172	

ENERGY AUDIT OF BUILDING SITE - ENCON OPTIONS & RECOMMENDATIONS

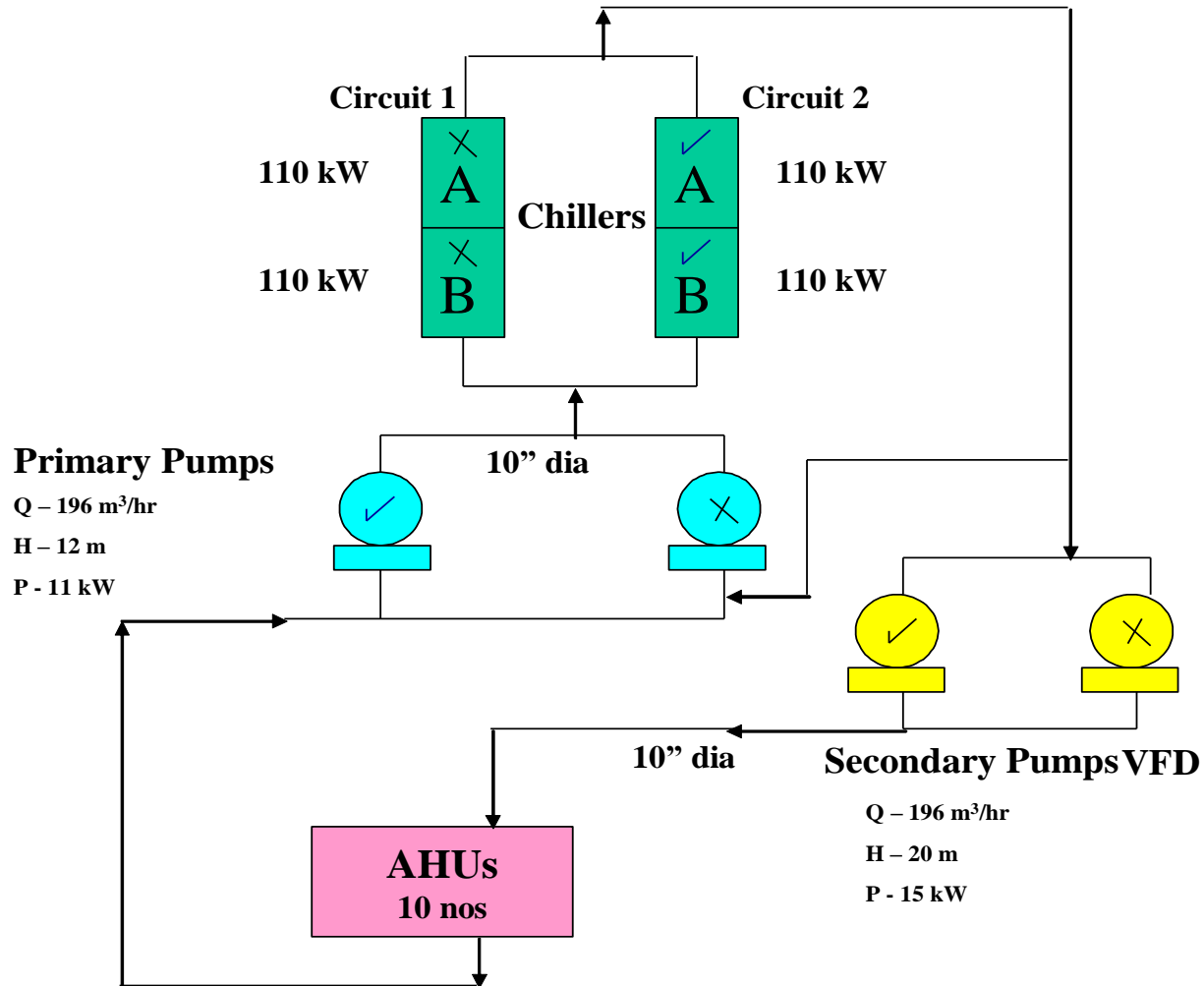
ENERGY AUDIT OF BUILDING SITE

Detailed study was conducted at TC1 & TC2 sites for the following major energy consuming utilities:

- **Air Conditioning Systems**
- **Lighting Systems**
- **UPS, Work stations and Server rooms / Data center**

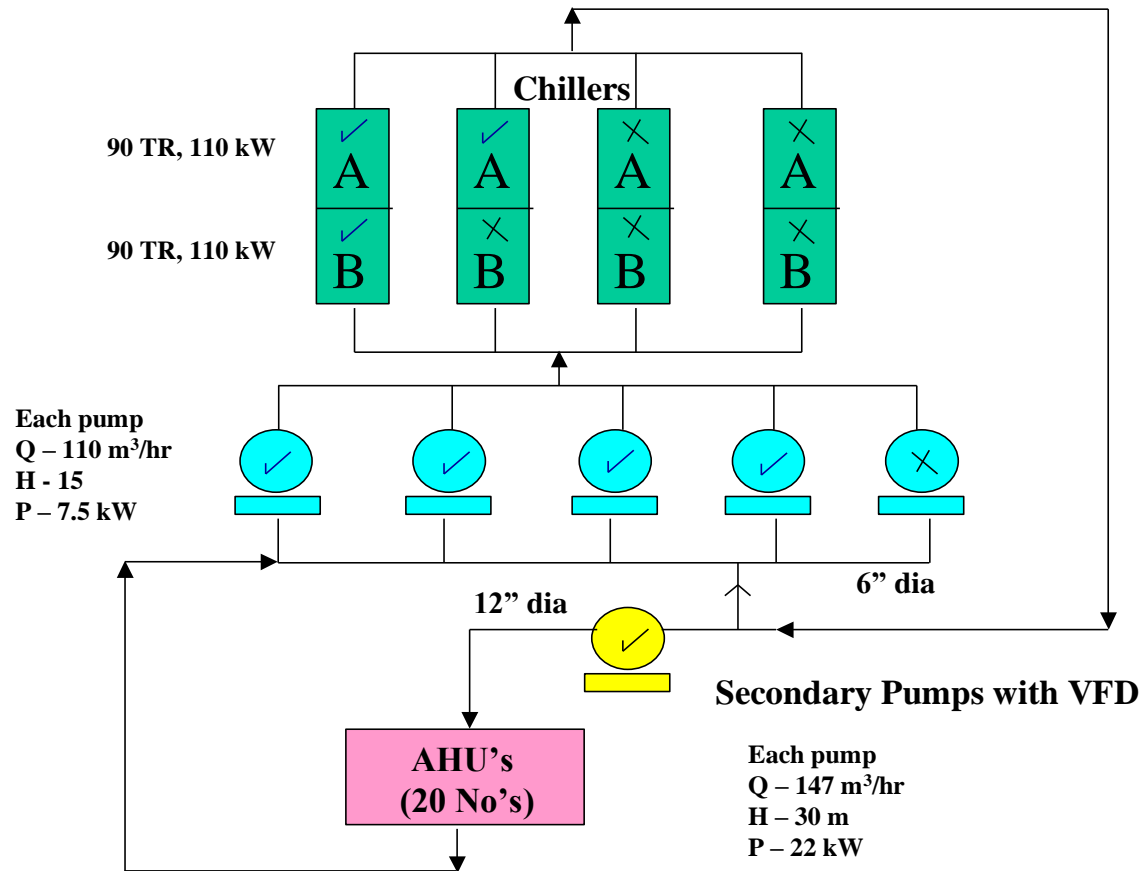
AIR CONDITIONING SYSTEMS (TC1)

Chilled Water System : TC -1



AIR CONDITIONING SYSTEMS (TC2)

Chilled Water System : TC - 2



Chiller Plant Analysis (TC1 & TC2)

<i>Parameter</i>	<i>Units</i>	<i>Measured Data</i>	
		<i>TC1</i>	<i>TC2</i>
Compressor power*	kW	113	241
Condenser fan power consumption	kW	10	15
Compressor circuit -2 A loading	%	61	85-100
Compressor circuit -2 B loading	%	59	
Primary pump power	kW	11.8	31.0
Secondary pump power	kW	2.5	12.8
Chilled water flow through the primary circuit	m ³ /hr	165	255
Chilled water flow through the secondary circuit	m ³ /hr	41.26	194
Ch. W temp. Inlet to evaporator	°C	8.8	11.0
Ch. W temp. Outlet of evaporator	°C	7.2	8.2
Chiller Loading	TR	87.3	179.6
<i>Specific power consumption</i>	<i>kW/TR</i>	<i>1.18</i>	<i>1.26</i>
<i>Design Specific power consumption</i>	<i>kW/TR</i>	<i>1.13</i>	<i>1.22</i>

* The condenser fan power is included in the compressor power

Summarized Lighting Installation figures (TC1)

Type of Lamp	Total Nos.	Wattage	Nos./fitting	Total kW
TULIP	1267	36	2	91.22
TULIP	277	11	2	6.09
Tube light	68	52	1	3.54
Round PL	18	18	1	0.32
Outside Round PL	28	18	2	1.01
Tube light	4	52	2	0.42
Fancy	9			0.00
Elevation	8	275	1	2.20
Mirror light	9	11	1	0.10
Garden post light	39	18	1	0.70
Board light	9	85	1	0.77
Total				106.37

DETAILS OF OFFICE SYSTEMS

TC-1

S.No.	Floor	Installed (Nos.)	Unit Wattage	Total kW
1.	Ground	64	600	38.65
2	First	64	600	38.65
3	Second	64	600	38.65
	Total	192		115.95

TC-2

S.No.	Floor	Installed (Nos.)	Unit Wattage	Total kW
1	Ground	105	600	63.25
2	First	105	600	63.25
3	Second	105	600	63.25
4	Third	105	600	63.25
5	Fourth	105	600	63.25
	Total	525		316.25

Summarized Lighting Installation figures (TC2)

Type of Lamp	Total Nos.	Wattage	Nos/fitting	Total kW
WIF 36240 -IND	135	36	2	9.72
WIF36140	34	36	1	1.224
WCP 36118 -CFL	180	18	1	3.24
WCP 36218 - CFL	796	18	2	28.656
WCP64236	1076	36	2	77.472
WCH 50070	22	95	1	2.09
WCQ 22150 - spot light	89	50	1	4.45
WIF 20228 - cove	412	28	1	11.536
WCP 17218 - Mirror Optics	85	18	2	3.06
RL-1823 artlite	114	18	2	4.104
RL 2700 artlite	76	50	1	3.8
HCP 41226	81	28	2	4.536
Other lamp types				5.067
Total				159.0

ENERGY CONSERVATION OPPORTUNITIES

S. No.	ENCON Areas	Annual Energy Saving Potential (kWh)	Annual Monetary Saving Potential (Rs.)	Investment (Rs.)	Simple Payback Period (Months)
1	Cost reduction measures by fully utilizing the allotted energy quota	-	7905000	Nil	-
	TC - 1				
2	Energy Savings by ON - OFF operation of Chiller	100330	1003300	Nil	-
3	Energy Savings by removing one lamp from each Luminaire	111252	1112520	Nil	-
4	Energy Savings by installing VFD for primary pump	22606	226060	20000	1.1
5	Energy Savings by reducing speed of fan by changing pulley size/VFD	28321	283210	200000	8.5
6	Energy Savings by converting Existing air cooled condenser into water cooled condenser	98298	982980	1000000	12.2

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S. No.	ENCON Areas	Annual Energy Saving Potential (kWh)	Annual Monetary Saving Potential (Rs.)	Investment (Rs.)	Simple Payback Period (Months)
	TC - 2				
7	Energy savings by optimization of chillers	190500	1905000	Nil	-
8	Energy Savings by removing one lamp from each Luminaire	106680	1066800	Nil	-
9	Energy Savings By Replacing Centralized Chilled Water With Dedicated Direct Expansion Unit For Servers/Data Center	446736	2233680	450000	2.4
10	Energy Savings by reducing speed of fan by changing pulley size/VFD	55397	553970	270000	5.8
	Total	1160120	17272520	1940000	1.25

Estimated Savings Potential

NPC Energy Audit reveals that

Annual Energy Saving Potential = 11,60,120 kWh

Total Annual Energy Cost Reduction
= Rs.1,72,72,520

Energy Savings Potential Percent = 17%
(of the total building energy consumption)

Cost Savings Potential Percent = 32.6%
(of the total building energy bill)

Thank U