

OUTCOME OF ENERGY AUDIT

SBI LOCAL HEAD OFFICE BUILDING CHENNAI

M.T.SAMBANDAM
CONSULTANT

|

DATE : 17.07.09

SINCERE THANKS

Mr. Manavalan Asst. General Manager

Mr. N. Kannan Chief Manager

Mr. Shanmuganathan Electrical Engineer

STATE BANK OF INDIA

SUMMARY OF CASH FLOW

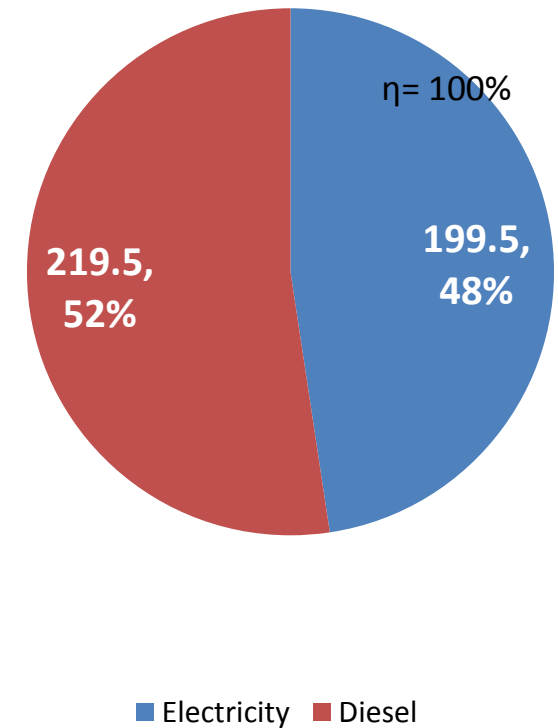
Working hours 10 hr Max/day

Average unit consumption/yr apx. 40.00 Lakh
Unit

Diesel Consumption 6.5 Lakh Lit

Energy Bill Electricity Rs. 199.50
Lakh/annum

Energy Bill (Diesel) Rs. 219.5
Lakh/Annum

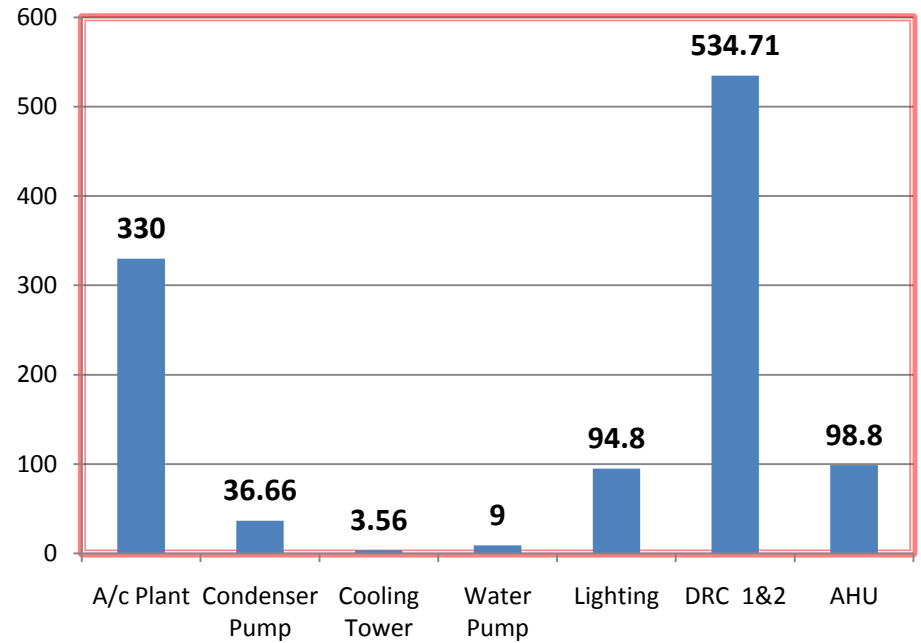
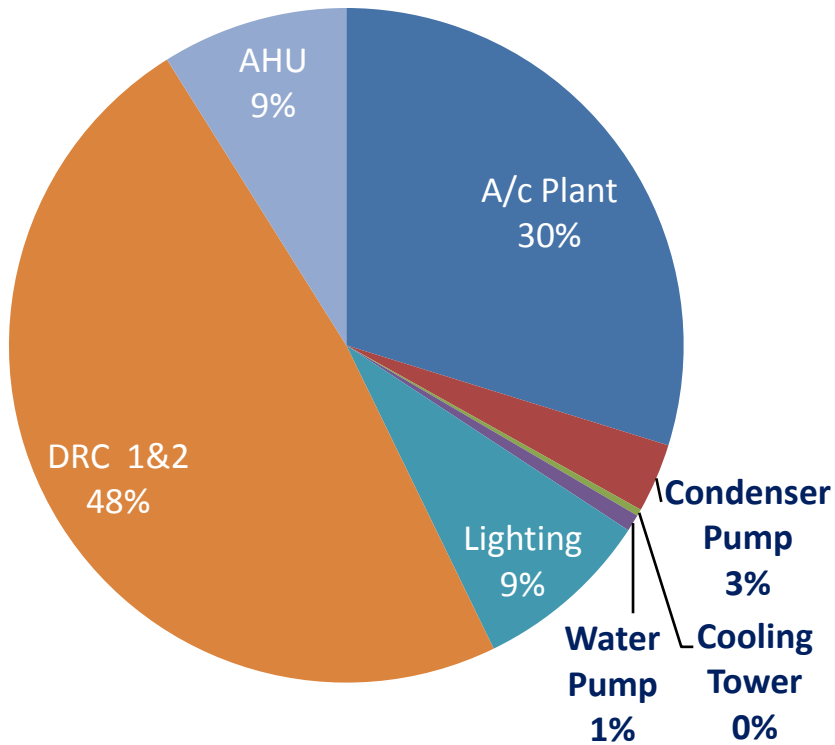


TOTAL POWER CONSUMPTION

Sl No.	Area	Total KW
1	A/c Plant	330
2	Condenser Pump	<u>36.66</u>
3	Cooling Tower	3.56
4	Water Pump	9.0
5	Lighting	94.8
6	DRC 1&2	534.71
7	AHU	98.8
TOTAL in KW		1107

Sl.No	Segment	Duration (Hr/Day)	Power Consumed (KWH)	%
1	Normal Hour	10	11974605	100
2	Peak Hour	Nil		
3	Night Hour	NIL		
	Total ENERGY AUDIT SBI BUILDING CHENNAI			100

TOTAL ENERGY DISTRIBUTION



SUMMARY OF CASH FLOW

Sl no	Energy Saving Proposals	Units Saved per Annum KWH	Amount Saved per Annum in Rs.	Investment in Rs	Pay back Period Months
01	Study of Lighting	65400	327000.00	8,50,000.00	36
02	Study of DRC 1&2	100000	500000.00	11,00,000.00	26
03	Study of Contract Demand & D.G	Not possible to estimate (19752096)	1,97,52,096.00	48,00,000.00	12
04	Study of Air Handling Units	2970	148500.00	10,00,000.00	80
05	Study of Chiller Unit	96000	480000.00	6,00,000.00	15
06	Roof Top Wind Power Generation	16848	168480.00	2,50,000.00	90.
	Total	281218	21376076	8600000.00	5.00

ELECTRICAL BILL ANALYSIS

Sl.No	Month	KWH	KVA	Peak Hr	Night Hr	P.F	P.F Incentive	Demand charges	Total cost
1	December-08	244768	654.24	0	0	0.97	14201	196272	1478206
2	November-08	348960	1078.24	0	0	0.99	41287	328941	2135607
3	October-08	473776	1136	0	0	0.99	54193	364500	2813961
4	September-08	453520	1181.44	0	0	0.97	26220	364500	2737670
5	August-08	449680	1157.76	0	0	0.97	25957	2612900	2717431
6	July-08	416144	1069.92	0	0	0.97	24017	364500	2542087
7	June-08	429184	1067.04	0	0	0.98	36990	364500	2596882
8	May-08	344076	1088.64	0	0	0.96	10025	289455	2284682
09	April-08	351190	919	0	0	0.95	0	275700	2146633
10	March-08	352279	883.80	0	0	0.95	0	255140	2183067
11	February-08	327460	873.40	0	0	0.95	0	262020	1996286
12	January-08	338500	834.90	0	0	0.97	19430	250470	2021717

I. STUDY ON DRC

- Vital Installation
- control the whole ATM net work and inter net banking globally
- Bank has DRC-1 and DRC-2

DRC-1

Sl.no	Load	V	I	KW	KVA	KVAR	PF
1	UPS 80KVA	404	57.2	19.6	39.74	34.8	0.47
2	UPS 80KVA	380	46.1	32.66	32.2	2.99	0.99
3	A/c Emersion	402	125	66.7	87.2	58.2	0.74
4	Lighting	232	12.6	2.35	3.01	2.0	0.99
	Total			121.31	162.15		

STUDY ON DRC

DRC-2

Sl.no	Load	I	V	KW	KVA	KVAR	PF
1	UPS - 250KVA	170	399	91.6	124	0.83	0.74
2	UPS - 250KVA	175	399	95.1	126	83	0.73
3	UPS - 80KVA	37.5	397	24.7	24.7	7.8	0.95
4	UPS - 80KVA	32	399	21.9	22.1	7.15	0.95
5	A/C Emersion	52.7	384.8	30.22	36.9	20	0.84
6	PSDB 1	106	399	62.7	78	47	0.79
7	PSDB 2	60	399	42.7	59	28	0.84
8	Lighting	7.1	230	5.46	6.0	4.45	0.67
	Total			413.4	365.1		

STUDY ON DRC

RECOMMENDATION

- Install 150 KVAR APFC (Automatic Power Factor Controller) to DRC No.01 and 90KVAR for DRC No.2 for improvement of power factor from 0.47 to 0.99lag
- The 80KVA UPS load may be share to the 250 KVA UPS , because the total load of 250 KVA UPS is only 50% during the operation.

STUDY ON DRC

COST BENEFIT ANALYSIS

Present total consumption	=	5544 KWH
Only in UPS /day		
Anticipated saving @ 5% day	=	277 KWH
Annual Saving for 365 days	=	277 X 365
	=	101105 KWH
		Cost saving @ Rs.5/ unit
	=	505525/-
	=	500000.00 per anum

INVESTMENT

Cost of APFC for 190 KVAR & 90KVAR	=	Rs.9,00,000/-
Cost of load sharing	=	Rs. 2,00,000/-
Total	=	Rs. 11,00,000/-

SIMPLE PAYBACK PERIOD

Simple pay back period = 26 Months

II. STUDY ON CONTRACT DEMAND

Permitted Demand (PD)	=	1350 KVA
Utilization	=	90% of PD \approx 1215 KVA
No of transformers	=	800 KVA , 2 Nos.
No of DG sets	=	750 KVA x2 Nos
	=	500 KVA x1

Sl No.	Location	KW	KVA
1.	Chiller Load	330.00	334.00
2.	DRC 1 & 2 Load	534.71	527.15
3.	AHU	98.80	133.44
4	Lighting	94.80	130.00
5	Cooling Tower	3.56	7.04
6	Chiller Water Pump	36.66	39.27
7.	Water Pump	9.00	12.25
	Total	1107	1182

II. STUDY ON CONTRACT DEMAND

EB/DG SET OPERATING SCHEDULE

SI No	Duration	Time in hrs	Source
01	9.30AM -12.30 PM	3hrs	D.G
02	12.30PM -2.00PM	2hRS	E.B
03	2.00PM – 6.00PM	4hrs	750KVA D.G
04	6.00PM – 23.00PM	5hrs	750KVA D.G
05	11.00PM -3.00AM	4hrs	E.B
06	3.00AM -9.30AM	6.30 hrs	750KVA D.G
E.B/DG Operating Scheduled of A/c Plant:			
07	8.30AM - 6.00PM	ChillerNo.1	E.B
08	10.00AM – 4.30PM	Chiller No.2	E.B
09	12.30PM – 2.00PM	Chiller 1&2	750KVA D.G

II. STUDY ON CONTRACT DEMAND

Maximum demand	=	1181KVA (Sept 2008)
Minimum demand	=	654 KVA (December2008)
Diesel consumption in 750 KVADG sets	=	148 Litrs/ h
500KVA D.G.	=	60 Litrs/h
Total fuel consumption for 750KVA D.G set	=	2294 Liters per day
Total cost spent per month on fuel high capacity DG set days	=	Rs.2294 X Rs.34per liter X 26
	=	Rs.2027896/-per month
Total cost spent per annum on fuel	=	Rs.2,43,34,752/-
DRC UPS Load	=	343 KV
Both DG sets are operated alternatively to meet the UPS load in addition to Grid supply		

II. STUDY ON CONTRACT DEMAND

Average DRC Load (I & II)

450 KVA

RECOMMENDATION

- Keep separate 500KVA D.G set for UPS load of DRC 1&2 from 10 AM to 7 PM and then the load can be shifted to Grid power
- Keep separate 750KVA D.G set as stand by for balance supply
- Install demand controller in the main supply so that whenever the demand is crossed alert can be given to the operators to switch off non critical loads. The bank can also find opportunity to reduce the operation of DG sets to minimize the diesel cost.

II. STUDY ON CONTRACT DEMAND

COST BENEFIT ANALYSIS

Bank could reduce Demand charges, reduced cable loss through improving pf by installing APFC, fuel saving through reduced operating hours. The fuel saving alone will be :

Present fuel consumption by 750 KVA DG = Rs. 243.35 Lakh/Anum

Estimated fuel consumption by 500 KVA

DG with reduced operating hours = Rs. 45.83 Lakh/Anum

(750 KVA DG set will become stand by)

Coat saving in fuel = Rs. 243.35-45.83

= Rs.197.52

% Saving in Fuel alone

= 8%

Anticipated cost saving in power appx.

= 2%

Total saving

= 10%

II. STUDY ON CONTRACT DEMAND

INVESTMENT

The investment towards installation of Automatic demand controller is apx. = Rs. 5,00,000/-

SIMPLE PAYBACK PERIOD

Simple pay back period = 9 days

III. INSTALLATION OF ROOF TOP WIND TURBINES

- **The bank uses either grid power or DG power for its lighting requirements.**
- **The bank is having a 10 story building and has no high raise building near vicinity.**
- **The wind is directly comes from sea which is located just 3 km from the bank building.**
- **The roof has enough area to accommodate atleast Two wind mills in each side, ie 4 wind mills.**
- **Measured average wind velocity on a sunny day is varying from 10-14 m/s**

II. INSTALLATION OF ROOF TOP WIND TURBINES

RECOMMENDATION

- Wind velocity can be converted into green power by using roof top wind turbines
- Power can be generated up to 2 KW using roof top wind turbines.
- The generated power can be directly used for lighting , Backup power can be added by installing battery
- Four numbers of Wind mills having power capacity of 900 W each can be installed on roof top. The total green power that could be generated is 3.6 KW with utilization factor of 0.6.

COST BENEFIT ANALYSIS

Power generated @ 65% average
power generation

$$\begin{aligned} &= 3.6 \times 0.60 \\ &= 2.16 \text{KW} \end{aligned}$$

Annual generation for 300days for 24 hrs

$$\begin{aligned} &= 300 \times 24 \times 2.34 \\ &= 16848 \text{ kW} \end{aligned}$$

Cost saving @ 10.00(considering average cost
of power from grid and DG)

$$\begin{aligned} &= 16848 \times 10 \\ &= \text{Rs. } 168480.00 \end{aligned}$$

INVESTMENT

Cost of wind mill @ Rs. 2.50 lakh/Wind mill
(including Turbine, Pole and civil work, but excluding Tax)

$$\begin{aligned} &= \text{Rs. } 2.50 \times 4 \\ &= \text{Rs. } 10.00 \text{ Lakh} \end{aligned}$$

SIMPLE PAYBACK PERIOD

$$\text{Simple Payback} = 6 \text{ yrs}$$

IV. STUDY ON CHILLERS

Available Chillers	=	250 TR x 2 No.The
Supplies chilled water to DRC Office Building	=	24 hrs
Two chillers operates for Second chiller	=	8 hrs on d
Chilled water return temp	=	13 hrs
Chilled water supply temp	=	on need basis
Temp Difference	=	17 °C
	=	11°C
	=	5°C

Sl.no	Load	I	V	KW	KVA	KVAR	PF	TR	KW/TR	COP
1	Chiller -1	203	414	145	145	11	0.99	162.5	0.89	3.95
2	Chiller -2	234	412	185	189	4.5	0.99	175	0.94	3.72
	Total			330	334					

IV. STUDY ON CHILLERS

RECOMMENDATION

Install the VFD of capacity 200KVA in common main. This can be operated when only one chiller is in operation. VFD will control the chiller RPM with respect to chilled water return temperature. It can be set bet ween 15.5 and 17⁰C

COST BENEFIT ANALYSIS

Average power consumption	=	165 KW
Power consumption for 24hrs	=	595 KWh
Power saving in VFD mode	=	10%
Estimated power saving	=	165x16hrx0.10
	=	264 KWH
Cost saving on chiller per annum	=	264x365x R.5
	=	Rs.481800.00.
	=	Rs 4.80 Lakh

INVESTMENT

Investment for 200 KVA VFD = Rs.6.00Lacs (Appx)

SIMPLE PAYBACK PERIOD

Simple Payback = 15 yrs

V. LIGHTING

Bank has already replaced many tube lights with CFL of 36 W with electronic ballast.

Street lights are operated manually and works from 6.00PM to 6.00 AM on all days.

Measured lighting voltage was varying from 230-240V

V. LIGHTING

MEASURED LUX LEVEL

SI No.	Location	KW	KVA	LUX
01	Ground Floor	8.44	10.14	165
02	1 st Floor	4.38	4.52	250
03	2 nd Floor	7.69	8.13	250
04	DRC 1&2	7.81	9.49	322
05	4 TH Floor	24.59	17.3	275
06	5 th Floor	10.24	18.6	238
07	6 th Floor	10.44	15.57	290
08	7 th Floor	11.81	18.59	273
09	8 th Floor	10.83	12.87	260
10	9 th Floor	9.59	12.4	256
11	10 th Floor	3.26	2.79	239
Total		109.08	130.4	

V. LIGHTING

The Total power consumption on lighting per day	=109 X 10 (Hrs) =1090KWH
The Total power consumption on lighting per Month	= 28340KWH
The Total power consumption on lighting per Annum	=340080KWH
The total cost spent on lighting per day	= Rs.5,450/-
The total cost spent on lighting per month	=Rs.1,41,700/-
The total cost spent on lighting per Annum	=Rs.17,00,400/-

RECOMMENDATION

- Replace 3 X 18W, 3U CFL lamp in place of 36W CFL lamp in each fixture for all Floors (Replacement would be periodical)
- Remove the sodium vapour lamps and install 2 x 28W CFL Security lamps
- Install **Power Conditioner cum Saver** at mains
- Remove the sodium vapor lamps and install 2 x 28W CFL Security lamps

V. LIGHTING

COST BENEFIT ANALYSIS

Present total consumption	=	1090KWH
Anticipated saving @ 20% day	=	218KWH
Annual Saving for 300 days	=	218 X 300
	=	65400 kWh
Cost saving @ Rs.5/ unit	=	3,27,000/- per annum

INVESTMENT

Cost of energy saver for	= Rs.8,00,000/-
Cost of Timer for street lighting	= Rs. 50,000/-
Total	= Rs. 8,50,000/-

SIMPLE PAYBACK PERIOD

Simple Payback = 3 yrs

VI. STUDY ON AHU

Total no of Air Handling Units = 52
The average inlet and out let temperature of Chilled water = 11°C and 17°C respec
Ttotal power consumption = 990 KWH(10 hrs per day)
Total power consumption of = 308880 KWH/Annum
Total cost spend on AHU = Rs. 15,44,400 per annum

SL.NO	LOCATION		WING	I	V	KW Rated	KW Actual	KVA	KVAr	PF	Load efficiency
1	Ground floor	Left	AHU 1	3.5	407	2.25	2	2.45	1.38	0.88	0.88%
			AHU2	3.7	407	2.25	2.3	2.73	1.42	0.88	Over load
		Right	AHU 1	3.5	405	2.25	2.26	2.66	1.38	0.86	Over load
			AHU2	3.2	411	2.25	1.97	2.26	1.22	0.84	87%

RECOMMENDATION

Install VAM(Variable Air Volume) control in all AHUs
Anticipated saving = 10%

COST BENEFIT ANALYSIS

Present Power consumption	=	990 KWH/day
Anticipated savings	=	99 KEH
Annual saving ((300x29.7)	=	29700 KWH
Cost saving	=	Rs.148500.00

INVESTMENT

Investment for 52 VAV. = Rs 10,00,000.00

SIMPLE PAYBACK PERIOD

Simple payback period = 80 Months





THANK YOU