

# **ENERGY EFFICIENCY IN HOTELS- CASE STUDY**

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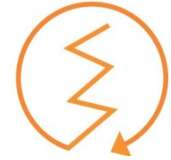
 **OTTOTRACTIONS**  
The Energy Engineering Solutions

**24-02-2010**  
**Thiruvananthapuram**



# CASE STUDY-1

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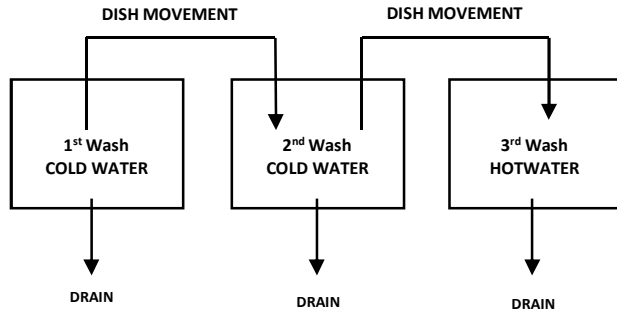
<b>Consolidated Cost Benefit Analysis of Energy Efficiency Improvement Projects</b>					
Sl No	Projects	Investment	Cost saving(Yearly)	Payback	Energy saved(Yearly)
		(Rs)	(Rs)	(Months)	(KWh)
1	Installation of 65 T-5 Tube Lights	22750.00	92137.50	2.96	8775.00
2	Energy Saving in 63KVA DG	5000.00	65380.00	0.92	19801.00
3	Good Kitchen Practices	2000.00	14647.50	1.64	1395.00
4	New 10m <sup>3</sup> , Biogas plant	150000.00	157500.00	11.43	48837.00
5	1500 L Solar water heater for hot water supply for Kitchen	150000.00	72450.00	24.84	14651.16
6	Improving House Keeping Practices	10000.00	26250.00	4.57	2500.00
7	Energy Saving in Existing Air Conditioners	0.00	63000.00	0.00	6000.00
8	Reducing Water Pipe line pressure using reducers in Wash Basins	3000.00	5901.00	6.10	562.00
9	Follow up Activities and Training	5000.00	6300.00	9.52	600.00
10	Improvement in Dish Washing System	0.00	14700.00	0.00	1400.00
11	Energy Saving in Fans	8100.00	53151.00	1.83	5062.00
Total		355850.00	1150623.18	3.87	109583.16

# CASE STUDY-1

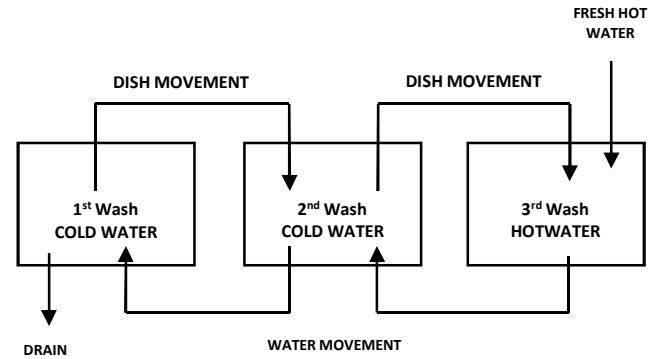
## Energy Saving in Dish washing system



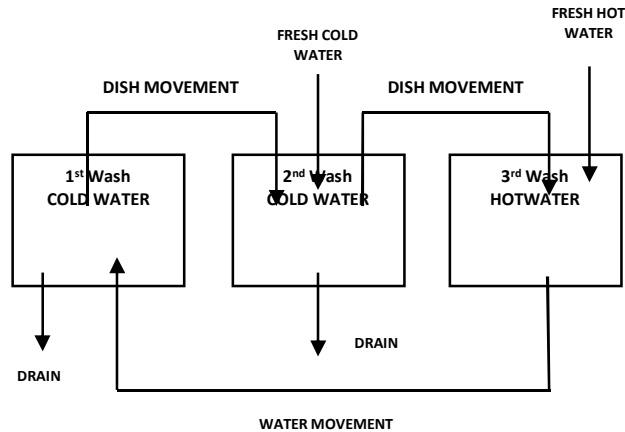
Existing Dish Washing System



Proposed Dish Washing System (Option-1)



Proposed Dish Washing System (Option-2)





## Installation of T-5 Tube Lights Replacing existing TFLs

FINANCIAL ANALYSIS			
SL No	Description	Particulars	Remarks
1	Working Hrs	5000.00	<b>SHORT TERM</b>
2	Cost of Electricity Rs/KWh (Actual)	10.50	
3	Investment	22750.00	
4	Saving from TFL installations KWH	8775.00	
5	Saving in Rs	92137.50	
6	Pay Back	2.96	



# CASE STUDY-2



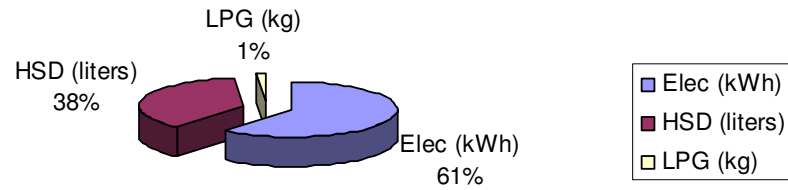
## CASE STUDY-2

Description	Details
Name of Hotel	Resort
Air Conditioned Area	1812.34 m <sup>2</sup>
Total Build up area	3272.34 m <sup>2</sup> , over a total land space of 25 acres
Star Classification	3 stars
Number of guest rooms	80 rooms
Contract demand	240 kVA
Transformer Capacity	500 kVA
Installed generator capacity	365 kVA, 125 kVA
Installed air conditioned capacity	499.8 kW
Installed hot water capacity	32 Solar panels providing 3000 liters hot water

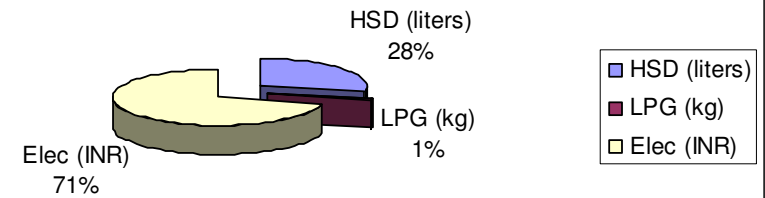


## CASE STUDY-2

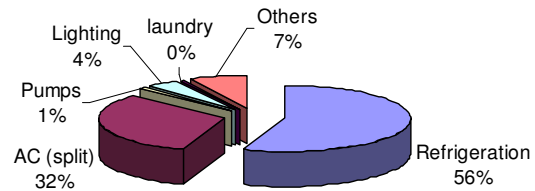
**Average Monthly Energy Consumption**



**Average Monthly Energy Bill**



**Sector Electricity Distribution per Month (kWh)**



	TERI	Poovar
<b>Energy Index (kWh/m<sup>2</sup>/yr)</b>	280	370.91
<b>Energy Index (kWh/room/day)</b>	70	54.13





Area	Recommendations	Energy Saving (MWh/year)	Environmental Saving (tCO <sub>2</sub> /year)
Diesel Generator	Replace with higher efficiency DG	91.86	69.6299
Kitchen	Replace stove head and cooking utensils	0.8665	0.6568
Refrigeration and AC	Using VFD	169.596	128.5538
Refrigeration Lighting	Replace incandescent bulb with CFL	0.438	0.3320
Toilet Lighting	Installing Occupancy Censor	0.0006	0.0005
Laundry Tumble Drier	Extend flame nozzle and insulate burning area	2.928	2.2194
Laundry Ironing	Install cutoff	5.676	4.3024
Building Envelope	Double glazing window, increasing set temperature by 2° C, adding wall and roof insulations	338.2	256.3556
Total		609.5651	462.0503



Current annual energy	1213737.4 kWh/year
Energy saved with measures	609565 kWh/year
New annual energy	604172.4 kWh/year
Total floor area (m <sup>2</sup> )	3272.34 m <sup>2</sup>
EUI	184.63 kWh/m <sup>2</sup> /year

Energy saved with new measures	609565 kWh/year
	50797.08 kWh/month
New energy consumption referring to December 2008	70021.85 kWh/month
	2258.77 kWh/day
New EUI for 72 rooms (90% occ)	31.37 kWh/room/day

	TERI	Existing
Energy Index (kWh/m <sup>2</sup> /yr)	280	370.91
Energy Index (kWh/room/day)	70	54.13



# CASE STUDY-3

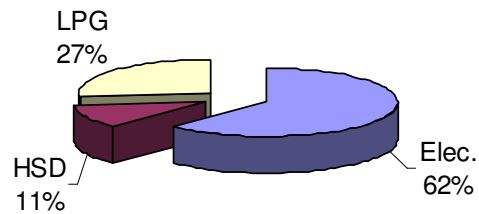


## CASE STUDY-3

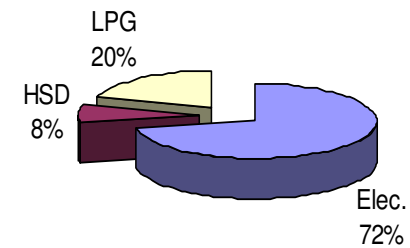
Description	Details
Name of Hotel	KTDC
Air Conditioned Area	2119.56 m <sup>2</sup>
Total Build up area	3517.24 m <sup>2</sup> , over a total land space of 5 acres
Star Classification	2 stars
Number of guest rooms	64 rooms
Contract demand	113 kVA
Transformer Capacity	500 kVA
Installed generator capacity	250 kVA, 110 kVA
Installed air conditioned capacity	236 kW
Installed lighting capacity	90.5 kW
Installed hot water	5.2 kW



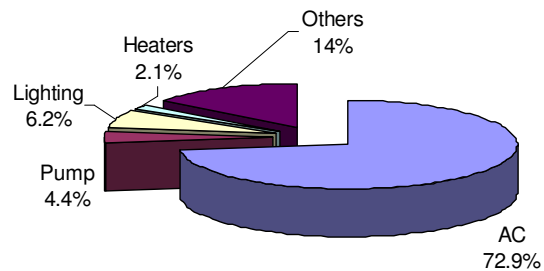
**Share of Average Monthly Energy Consumption (kWh)**



**Share of Average Monthly Fuel Bill (INR)**



**Sector Electricity Distribution per Month (kWh)**



	TERI	existing
<b>Electrical Index (kWh/m<sup>2</sup>/yr)</b>		169.23
<b>Fuel Index (kWh/m<sup>2</sup>/yr)</b>		101.33
<b>Energy Index (kWh/m<sup>2</sup>/yr)</b>	280	270.56
<b>Energy Index (kWh/room/day)</b>	70	47.79



Area	Recommendations	Energy Saving (MWh/year)	Environmental Saving (tCO2/year)
Air Conditioning	Turn off AC in unoccupied room	51.188	38.8005
Refrigeration and AC	Using VFD	76.464	57.9597
Building Envelope	Double glazing window, increasing set temperature by 2° C, adding wall and roof insulations	338.2	256.3556
Backdoor Lighting	Replace T12 with T5 fluorescent tubes	0.158	0.1198
Domestic Hot Water Production	Installation of solar water heater	11.388	8.6321
Diesel Generator	Replace with higher efficiency DG	43.74	33.1549
Pump	Relocate treated sewage water storage tank	2.116	1.6039
Kitchen	Replace stove head and cooking utensils	12.637	9.5788
Total		408.239	309.4452



Energy saved with new measures	408239 kWh/year
	34019.92 kWh/month
New energy consumption referring to December 2008	50423.69 kWh/month
	1626.57 kWh/day
New EUI for 57 rooms (90% occ)	28.54 kWh/room/day

Current annual energy	951631.1 kWh/year
Energy saved with measures	408239 kWh/year
New annual energy	543392.1 kWh/year
Total floor area (m2)	3517.24 m2
EUI	154.49 kWh/m2/year

	TERI	existing
<b>Electrical Index (kWh/m2/yr)</b>		169.23
<b>Fuel Index (kWh/m2/yr)</b>		101.33
<b>Energy Index (kWh/m2/yr)</b>	280	270.56
<b>Energy Index (kWh/room/day)</b>	70	47.79



# CASE STUDY-4





### BASELINE DATA

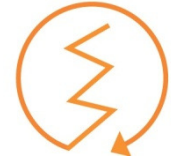
Sl No	Particulars	Description
1	Products/ Services	CLUB ACTIVITIES
2	Average energy Consumption (Electricity)	536286 KWh/Annum
3	Energy cost per annum (Electricity)	3440973 Rs /Annum
4	Total Energy Cost Annual (Electricity+LPG+HSD)	5687898.47 Rs /Annum
4	Previous energy efficiency measures	NA

### ENERGY BILL ANALYSIS

1	KSEB CONNECTION TYPE	11KV, HT-1V
2	CONTRACT DEMAND	240 KVA
3	AVERAGE BILLING DEMAND	200 KVA
5	ANNUAL ENERGY CONSUMPTION (KSEB)	536286 KWh
6	ANNUAL DIESEL CONSUMPTION	4305L
7	TOTAL ANNUAL ENERGY CONSUMPTION	81.88 MToE



<b>Consolidated Cost Benefit Analysis of Energy Efficiency Improvement Projects</b>				
Projects	Investment	Cost saving(Yearly)	Payback	Energy saved(Yearly)
	(Rs)	(Rs)	(Months)	(KWh)
Installation of 172 T-5 Tube Lights	77400.00	97541.00	9.52	13454.00
Over Hauling 160KVA DG	15000.00	21000.00	8.57	7325.58
Repairing Biogas Plant	15000.00	94500.00	1.90	29302.00
New 15m <sup>3</sup> , Biogas plant for Club Kitchen,1,2	150000.00	157500.00	11.43	48837.00
1500 L Solar water heater for hot water supply for Kitchen	300000.00	51800.00	69.50	12567.00
44 T-5 lamps in Shuttle Court	75000.00	159880.00	5.63	14000.00
Energy saving at Lighting load by using voltage optimizer	75000.00	140070.00	6.43	19320.00
Installing Air Curtain in PS Hall	30000.00	42000.00	8.57	5793.00
Installing/Repairing Door Closers and use of double glazed glasses for partition	201000.00	51656.00	46.69	7125.00
Adjusting Thermostat to 24°C	0.00	123975.00	0.00	17100.00
Reducing Water Pipe line pressure using reducers in Wash Basins	15000.00	15225.00	11.82	2100.00
Follow up Activities and Training	5000.00	6852.00	8.76	600.00
On line energy monitoring and Management system	80000.00	116642.00	8.23	9156.00
Solar Lighting System for Street Lighting	215000.00	19031.00	135.57	2625.00
<b>Total</b>	<b>1265400.00</b>	<b>1121857.60</b>	<b>21.48</b>	<b>192379.58</b>



### Energy saving at Lighting load by using voltage optimizer

#### Description

At night a load study has been taken and total lighting load drawing at night is around 30KW. There is a separate lighting feeder can be provided/ or arranged for the lighting applications. The average phase wise voltage at the facility is 241 V. For operating the lighting system is 200 to 210V. If the voltage is reduced to this range a considerable energy consumption can be reduced. The reduction is luminance level for this adjustment is very less compared to the saving achieved. A saving of 10 % can be achieved by install a voltage optimizer in the lighting feeder

FINANCIAL ANALYSIS			
SL No	Description	Particulars	Remarks
1	Investment	75000.00	MID TERM
2	Savings (in Rs)	140070.00	
3	Savings (in KWh)	19320.00	
4	Pay Back	6.43	



# Thank you

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