


Issue No# 24

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As per the clause (l) of EC Act-2001, that every designated consumer has to submit a report on the prescribed form on the status of the energy consumption data at end of every financial year. It is nice to know that Bureau of Energy Efficiency is preparing the following three forms for data collection and testing them on a pilot scale.

Form 1:	Format for information regarding Total Energy Consumption and Energy Consumption per Unit of Production.
Form 2:	Format for reporting status of implementation of energy conservation measures based on business plan of the company.
Form 3:	Executive Summary of appraised Energy Conservation potential as identified in energy auditor report.

On a pilot scale, these three following forms are tested for three sectors namely

- Engineering sector
- Power sector
- Commercial buildings (Hospital)

For Engineering & Commercial Building Sectors the Form-1 format is quite exhaustive and needs little modification. Where as for power sector, since there is no purchased electricity, coal/oil or gas will be the main inputs. Where as there is no column to enter the Auxiliary power consumption for their internal consumption. Auxiliary power consumption is the key energy indicator for comparing different power plants performance. In all these three sectors we found it difficult to calculate specific power consumption, because the exact production figures we can not figure out.. In the power sector, the power generation it self is production. So, we have to enter twice the generation data both in own generation & production columns. Of course this may not create any problem while calculating specific power consumption. We get only energy cost towards power generation in Rs./kWh

Form-2 is simple if we able to complete Form-3. Only problem with form-2 is to quantify / verify the actual savings achieved, based on the implementation of the measures , suggested by the Energy Auditor. This will be difficult unless the designated consumer has a very good Monitoring & Verification (M&V) system.

Form-3 is OK. But we find it difficult to fit some of the measures like Demand reduction etc. in any of the category. So it needs some modification. Exhaustive list of 22 categories are suggested, in the modified form-2, which will cover, all most all types of energy conservation measures.

The testing of each form and the corresponding comments & difficulties encountered during filling of these forms are presented in the following paragraphs.

Form - 1
Format for Information regarding Total Energy Consumption and Energy Consumption per Unit of Production

Name of the Sector : **Engineering Sector**
Name of the company :
Full Address :
Contact Person :
Email address :
Telephone/ Fax numbers :
Plant Address :
Plant Capacity :
Plant Capacity Utilisation :
Plant year of Commissioning :

A. Power and Fuel Consumption 2004/ 2005

1. Electricity

(a) Purchased

Contract demand 13000 KVA
Connected load 20000 kW
Annual consumption 280,54,475 kWh
Total cost 912.27 Rs. Lakhs

(b) Own Generation

(i) Through diesel generator (HSD)
Annual generation 38,18,489 kWh
Annual diesel consumption 980 kilo liters
Total fuel costs 127.28 Rs. Lakhs
(ii) Through steam turbine/generator
Annual generation _____ kWh
Fuel used¹ _____
(iii) Through Gas Turbine
Annual generation _____ kWh

2. Coal

Coal used for Producer Gas production
Quality (Gross calorific value) 5400 kCal/kg
Annual consumption 2000 Tonnes
Total coal costs 40.00 Rs. Lakhs

¹ State which type of fuel or energy was used (C = coal, B = biomass, O = oil, G = gas, E = electricity). If coal was saved state which grade i.e. C/I = imported, or C/F coal of grade F.

3. Oil		
(i)	Furnace oil (Boilers)	1250 kilo liters
	Annual consumption	
	Furnace oil (Furnaces)	_____ kilo liters
	Annual consumption	
	Total Annual costs	212.5 Rs. Lakhs
(ii)	Low Sulphur Heavy Stock (LSHS)	
	Annual consumption	_____ Tonnes
	Annual costs	_____ Rs. Lakhs
(iii)	Hot Heavy Stock (HHS)	
	Annual consumption	_____ Tonnes
	Annual costs	_____ Rs. Lakhs
4. Diesel Oil		
(i)	High Speed Diesel (HSD)	
	Annual consumption	_____ kilo liters
	Annual costs	_____ Rs. Lakhs
(ii)	Light Diesel Oil (LDO)	
	Annual consumption	_____ kilo liters
	Annual costs	_____ Rs. Lakhs
5. Gas		
(i)	Compressed Natural Gas (CNG)	
	Gross calorific value	_____ kCal/NM ³
	Annual consumption	_____ NM ³
	Annual costs	_____ Rs. Lakhs
(ii)	Liquefied Petroleum Gases (LPG)	
	Gross calorific value	_____ kCal/kg
	Annual consumption	_____ Tonnes
	Annual costs	_____ Rs. Lakhs
(iii)	Piped Natural Gas (PNG)	
	Gross calorific value	_____ kCal/NM ³
	Annual consumption	_____ NM ³
	Annual costs	_____ Rs. Lakhs
6. Biomass		
	Average moisture content, as fired	_____ %
	Average Gross calorific value, as fired	_____ kCal/kg
	Annual consumption	_____ MT
	Annual biomass costs	_____ Rs. Lakhs
7. Total Energy		
	In terms of Energy	57226.8 Mill.Kcal
	In terms of Cost	1292.05 Rs. Lakhs

B. Product mix specifications² (Power sector has to enter their annual generation once again as production)

Product name 1: __Steam Turbines_____ (units)
Product name 2: __ Gas Turbines_____ (units)
Product name 3: __Generators_____ (units)
Product name 4: _____Heat Exchangers_____ (units)

C. Specific Energy Consumption figures

1.Product - 1 _____Kwh/Ton
_____M.Kcal/Ton
2.Axiliary Power Consumption _____ %
3. Heat Rate _____ Kcal/Kw

² For example if you are a cement manufacturing unit producing different grades of cement, you may like to say under product name 1: OPC grade – XXX Tonnes and under product name 2: Portland slag cement– XXX Tonnes and so on.

Comments on Form -1

Things to be included in the general Category are:

- (a) Name of the Sector
- (b) Plant Capacity
- (c) Plant Capacity Utilization (to know the effect of under utilization)
- (d) Plant year of Commissioning (to know the aging effect)

1. Electricity

(a) Purchased:

Contract Demand normally mentioned in KVA rather than KW.

(b) Own generation:

- DG set need not be run on Diesel, it can be even HSD. So fuel used need to be asked.
- Power sector people can write their total generation under own generation item (ii) through steam turbine/generator or (iii) through Gas turbine.
- However for Auxiliary power consumption for internal purpose in the Power Plants, there is no column in the present form –1. It should be included in a separate Category. (may be category – C under specific energy consumption figures)
- If we include this under Annual consumption category of 1 (under purchased Electricity), then we will be making of double accounting while calculating total energy cost, because, this Auxiliary power cost already included in the Annual consumption of either coal or gas.

3. OIL

- i) Furnace oil consumption can be either in Boilers or Furnaces /kilns. It is suggested to get oil consumption for Boiler & Furnaces separately.
- ii) Hot Heavy Stock (HHS) is not familiar in India, it should be HSHS (High Sulpher Heavy Stock)

B. Product Mix

It is difficult to report actual production in terms of product name 1:
Product name 2:.....

- For single product this format is OK. For multi product, even if we know production of different products , it is difficult to calculate specific energy consumption per unit of

product for different products, because we know only total energy consumption and total energy cost.

- For example in Engineering Industry, with various product mix, production quantity can not be added to get total production.
- Similarly for Hospitals/Hotels /Commercial Buildings there is no production. It is better to ask the Designated consumer to report their specific energy consumption per sq. ft or per patient etc.
- For power sector, we need to include total power generation once again under product mix.
- It is suggested to give coding to each items in the form –1, so that it helps in data entry and subsequent computerization and analysis of the data, to get total energy consumption/cost and also to calculate specific energy consumption figures etc.

The final expected output from the Form-1 , many be similar to the following Table.

ENERGY CONSUMPTION & ENERGY COST DATA TABLE									
SL.NO	SOURCE	UNIT	QUANTITY	HEAT CONTENT	HEAT CONTENT UNIT	ANNUAL COST Rs. Lakhs	% COST	ENERGY CONS. M.KCAL	% ENERGY
1	ELECTRICITY								
	PURCHASED	kWh	28054475	860	KCAL/KWH	912.27	70.61	24126.85	47.58
	OWN GENERATION								
	THROU' DG SET	kWh	3818489	860	KCAL/KWH	127.28	9.85	3283.90	6.48
	THROU' STEAM TURBINE /								
2	GENERATOR	kWh		860	KCAL/KWH			0	
3	COAL	MT	2000	5400	KCAL/KG	40.00	3.095855	10800	21.30
4	OIL							0	
	FOR BOILERS	KL	1250	10000	KCAL/KG	212.5	16.44673	12500	24.65
	FOR FURNACES	KL		10000	KCAL/KG			0	
	DIESEL FOR TRANSPORT /								
5	OTHERS	KL		10000	KCAL/KG			0	
6	GAS								
	CNG	MT							
	LPG	MT							
	PIPED N.GAS	SCM3							
7	BIOMASS	MT							
	TOTAL					1292.05	100	50710.75	100.00

The energy consumption monitoring and reporting format is different in different sectors, so, it is suggested to ask the designated consumer himself, to report their actual

specific energy consumption figures in addition to the National / International norms (if available) such as

- ✓ M.Kcal / MT of urea
- ✓ Kwh / MT of cement
- ✓ M.Kcal / MT of cement
- ✓ M.Kcal / MT of paper
- ✓ Kwh / 1000 Picks (textile)
- ✓ Kwh / Mtr or kg (textile)
- ✓ M.Kcal/MT of Steel
- ✓ Auxiliary power consumption % of Generation (power sector)
- ✓ Heat rate in Kcal/kwh (power sector)
- ✓ Lit /MT of production in furnaces.
- ✓ Lits/MT of melt Steel or Aluminium etc.

Form – 2 (Testing for Engineering Sector)

Format for reporting status of implementation of energy conservation measures based on business plan of the company

Sl. No.	Description of measure	Category³	Investment (Rs. Lakhs)	Verified savings⁴ (Rs. Lakhs)	Verified energy savings	Units⁵	Fuel⁶
1	Revision of Contract Maximum Demand	1	-	18.70	75,000		
2	Incorporation of Lighting Energy Saver	4	6.00	5.00	8,000	kWh	E
3	Replacing HPMV lamps with Metal Halide lamps	4	3.60	1.50	1,50,484	kWh	E
4	Conversion of MG sets to Thyristor Drives	5	7.5	9.00	5,093	kWh	E
5	Reduction of compressed Air Leaks	9	1.00	26.00	75,800	kWh	E
6	Stopping of one Compressor during lunch time	9	--	3.00	86,100	kWh	E
7	Stopping of Cooling Tower Fan	11	--	1.57	44,800	kWh	E
8	Ceramic Fibre lining for Heat Treatment Furnaces	18	3.00	1.85	28,980	KWh	E
9	Re-commissioning of Solar Hot Water system for staff canteen	20	1.50	1.50	43,200	kWh	E
10	Incorporation of Welding Energy Savers	22	8.00	10.40	2,98,000	kWh	E
11	Use of producer gas for Boilers instead of F.oil	19	--	47.20	408	KL	O
	<u>Total</u>		30.60	125.72			

³ Use "C" number of form 3 as reference

⁴ First year

⁵ Use conventional energy, volume or mass units with proper prefix k = 10³, M = 10⁶, G = 10⁹

⁶ State which type of fuel or energy was saved (C = coal, B = biomass, O = oil, G = gas, E = electricity).
If coal was saved state which grade i.e. C/I = imported, or C/F coal of grade F.

Comments on Form -2

1. Once Form-3 is ready in all respects, the filling of Form-2 is easy and simple.
2. The anticipated savings identified by the Energy Auditor and the actual / verified savings may be different.
3. The quantification of actual savings achieved may be very difficult by individual measure wise, with the absence of proper Monitoring & Verification system.
4. It is suggested to get clarifications / barriers form the Designated consumer for not implementing some of the suggestions.
5. There should be provision for incorporating measures implemented by the designated consumer on his own also.

Form - 3

Executive Summary of appraised Energy Conservation potential as identified in energy auditor report

C. No.	<u>Area of improvement and modification</u>	Investment Lakh Rs.	<u>First year energy⁷ savings</u>					<u>First year cost reduction⁸, Lakh Rs.</u>					Life cycle years ⁹ (Pay back period)	
			Oil (KL)	gas	Coal (MT)	Electricity Kwh	other	oil	gas	coal	electricity	other		Total
1.	Demand Control : Demand reduction including PF improvement													
	Revision of Contract Maximum Demand	--				--					18.50			--
2.	House Keeping : Better house keeping measures													
3.	Instrumentation : Installation of improved process monitoring and control instrumentation, or software													
4.	Lighting : Measures in the area of lighting													
	Incorporation of Lighting Energy Saver	6.00				100800					4.70			1.3

⁷ Use commercial units of litre, kg, tons, normal cubic meter, kWh or MWh and indicate the unit. Indicate the anticipated potential in energy savings.

⁸ Anticipated cost savings in the first year based on anticipated fuel savings.

⁹ Estimate the predicted life of the measure, meaning the number of years the level of first year energy savings or even larger amounts will materialise.

C. No.	<u>Area of improvement and modification</u>	Investment Lakh Rs.	<u>First year energy⁷ savings</u>					<u>First year cost reduction⁸, Lakh Rs.</u>					Life cycle years ⁹ (Pay back period)	
			Oil (KL)	gas	Coal (MT)	Electricity Kwh	other	oil	gas	coal	electricity	other		Total
	Incorporation of Welding Energy Savers	8.00				298000					10.40			0.8
	Total	46.67				1930162		57.2			91.01		148.2	0.5

Name of the company : **ENGINEERING SECTOR**
Full Address :
Contact Person :
Email address :
Telephone/ Fax numbers :
Plant Address :

Comments about Form- 3

1. The Executive summary of appraised Energy Conservation potential as identified in Energy audit report, can not be fit into the present category of 13 items as given in the form-3.
2. There is no provision to include suggestions like Demand reduction towards cost savings.
3. There is no provision to report efficiency improvement in Boilers / Furnaces / DG sets / cooling towers etc.
4. It is suggested to include more categories (for eg. 22 no's) as suggested in the modified FORM-3.
5. It is suggested to include one more column called total savings in " First year cost reduction" because some times we may get energy savings in more than one resource by implementing same measure. For eg; by reducing excess air in boilers , we get savings both in coal/oil as well as electricity (due to ID fan load reduction).
6. Life cycle years is not understood by many of us. It is suggested to ask for the familiar simple payback period in years.
7. It is suggested to add a total savings row at the end of the table.
8. It is suggested to include/reproduce, the summary of energy savings table as it is, as given in the Energy Auditor report as a separate Annexure.