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Observation on Developed Forms

The nascent form-1 is format for reporting the total energy consumption and production figure and in turn energy consumption per unit of production i.e. **Specific Energy Consumption**. The form of energy consumed & quantity of energy consumed per unit of finished product depends mainly upon the Process Technology adopted & Through Put (Capacity/Rating of Plant). In case of power generation the Specific energy consumption i.e. Gross Heat rate (kcal/kWh) Varies as per technology adopted like Pulverized coal fired, AFBC, CFBC, Gas fired & Size/Rating of the plant. The BHEL Thermal 500 MW rating units have almost 10 % lower gross heat rate than their units having 60 MW rating.

Similarly in process industry for producing the same product different technology are being used ,like for producing Zinc, through Pyrometallurgical technology (Imperial Smelting Process U.K) Electricity, Coke ,F.O & L.P.G are being used as main energy input. The Hydrometallurgical technology (Lurgi Germany) uses mostly Electricity as main energy input. The Production of Zinc metal through the above two technology is having quite different input of energy mix & quantity of energy usage. For producing the same product if the energy mix remains same but sourcing varies then the specific energy consumption will also vary. Suppose one industry is producing one ton of metal by Consuming 4000 kWh of electrical energy purchased from grid and the other industry using same process technology produces one ton of metal with same 4000 kWh of electrical energy bust this electrical energy is being produced through their captive coal based captive generation plant having overall efficiency of approximately 35 % then in the later case the specific energy consumption kcal/Tonne will be 2.85 times higher than the earlier. Thus the detail of the energy mix & its sourcing should also be included in the format.

The total Energy consumed for producing the finished product in any industry is mainly in Electrical form or fossil fuel form. The Electrical form of energy may be self generated or purchased from grid or mix of the two. The Generated electricity may be from fossil fuel based Captive Power Plant (Diesel Generator, Steam Generator, Gas turbine) or Process Waste Heat Recovery Steam Turbine Generator. Similarly the purchased power from grid may be from open access provision under Electricity Act 2003 or from SEBs/Central sector or Private sector. The Total fossil fuel consumed may be for power generation or process heating in Furnaces, Pre heaters, Fired heaters, Process Boilers etc.

Thus data/information required for segregation of industries under the same sector with respect to technology used & plant capacity/rating, energy mix & energy sourcing (Having Captive Power Plant or Not) is prerequisite for reporting & this must be included in the first part of the format.

The quantity of fuel used for power generation & quantity of fuel & electrical energy used for Process/production should be accounted separately. Then the total energy consumed in process should be converted to the same unit Giga cal.

Hence the Very first part of the format -1 should have Plant Details like Make, Model, year of commissioning, installed capacity/rating & designed specific energy consumption .These details must be provided separately for Process Plant as well as Captive Power Plant if any.

Keeping the above points in view the form -1 has been modified and divided in six parts (A, B, C, D, E & F). The Industry having generation facility must be treated as separate plant for assessing the energy efficiency& the production unit under the respective sector. The form-2 has been modified and been made more effective for assessing/reviewing the status of implementation part of Energy conservation measures proposed in Business Plan. The format of form-3 is satisfactory from Energy Auditor point of View but it should be backed up with

pay back period calculation by various methods. The duly filled form-1& Form-2 is attached herewith.

Form – 1

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

Name of the company : Hindustan Zinc Limited
A Group Company of Vedanta Resources

Full Address : Chanderia Lead Zinc Smelter
Chittorgarh (Rajasthan)
Pin: 312021

Name of Energy Manager : Avinash Kumar

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Designated Sector : Mining (Zinc & Lead Smelting through
Imperial
Smelting Process U.K)

Reporting Year : Financial Year 2004-2005

A. Detail of Power Sourcing & Consumption:

| | |
|----------------------------------|--|
| Source of Purchased Power | Ajmer Vidyut Vitran Nigam Ltd. (R.S.E.B) |
| Connected Voltage | 132 K.V |
| Energy Purchased in Million kWh | 68.05 Million kWh |
| Contract demand in MVA | 14 MVA |
| Connected Load in MW | 40 MW |
| Total Cost in Crore | 28.99 Crore |
| Net Self/Captive Generation* | 44.12 Million kWh |
| Total Electrical Energy Consumed | 112.17 Million kWh |

*In case the Industry is having single Self Generating Capacity of 625 KVA & above then provide the detail of self/Captive Generation & Fuel consumption in Part-B

B. Detail of Captive Power Generation & Fuel Consumption for the FY 2004-2005:

| *Type Of Plant | Diesel Generating Set | Coal Based Thermal Power Plant. | |
|---|----------------------------------|---|------------------------|
| No of Units Installed | Two | Two | |
| Rating/Capacity in MW | 2 X 5 MW | 2 X 77 MW | |
| Make & Model | Rolls-Royce U.K 16VS 37 G-HBC | B.H.E.L; Pulverized Coal Fired Regenerative Non-Reheat Cycle | |
| Year of Commissioning | 1990 | Unit-1 Jan - 2005 Unit-2 Mar- 2005 | |
| Gross Generation in Million kWh | 43.16 | 2.87 | |
| Net Generation in Million kWh | 41.53 | 2.59 | |
| Energy Used in Own Industry for Production in Million kWh | 41.53 | 2.59 | |
| Energy wheeled/Sold to other Source in Million kWh | Nil | Nil | |
| **Fuel Consumed | TypeNo.1 | H.S.D | L.D.O |
| | TypeNo.2 | L.S.H.S | Coal |
| Quantity of fuel in MT | TypeNo.1 | 258.8 KL*0.8 =214.85 MT | 560 KL*0.86 = 481.6 MT |
| | TypeNo.2 | 10072.75 MT | 480 MT |
| G.C.V kcal/kg | TypeNo.1 | 11000 kcal/kg | 10800 kcal/kg |
| | TypeNo.2 | 10500 kcal/kg | 6185 kcal/kg |
| Total Energy consumed in Giga Calorie | 108127.225 Giga cal | 8170.08 Giga cal. | |
| Source/Grade of fuel | I.O.C.L | Coal-Indonesian | |
| Total Cost of fuel | 11.84 Crore | 1.28 Crore | |

*The type of plant may be Diesel Generating Set, Coal Based Thermal Power Plant, Gas Turbine Generator, Waste heat Recovery steam Generator, If Other Please Specify.

**The fuel may be Coal, F.O, L.S.H.S, L.D.O, H.S.D, LNG, CNG, PNG, R.F.O, NAPTHA, Biomass etc.

C. Power & fuel consumption for Production FY 2004-2005.

| Name of fuel | Annual consumption | Calorific Value | Annual Cost in Crore |
|---|--------------------------|---------------------|----------------------|
| L.D.O in KL | 3084.2 KL*0.86=2652.4 MT | 10800 kcal/kg | 5.33 Crore |
| L.S.H.S in MT | 5091.857 MT | 10500 kcal/kg | 5.68 Crore |
| L.P.G in MT | 6735.8 MT | 12500 kcal/kg | 16.02 Crore |
| Metallurgical Coke in MT | 86715 MT | 7500 kcal/kg | 154.66 Crore |
| Fossil Fuel Energy Consumed in Giga cal | | 816670.42 Giga cal. | 181.69 Crore |

D. Total Energy Consumed from Electrical & Fossil source in Production Excluding Captive Generation

Power Consumption in Million kWh*860 + fossil fuel energy consumption in Giga cal.

$$= (112.17 \times 860 + 816670.42) = 913136.62 \text{ Giga cal}$$

E. Product Mix Specifications:

| Product Name | Quantity |
|----------------------|---------------|
| Zinc | 89098 MT |
| Lead | 20650 MT |
| Silver | 41.974 MT |
| Total Metal Produced | 109789.974 MT |

F. Specific Energy Consumption.

$$\text{SPECIFIC ENERGY CONSUMPTION} = \frac{\text{TOTAL ENERGY CONSUMED}}{\text{TOTAL METAL PRODUCED}}$$

$$= \mathbf{8.317 \text{ Giga cal / MT}}$$

Form - 2

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

| S.N. | Description of Measure | Category | Budget ed Amount in Lacs | Actual Invest ment in Lacs | Proposed Savings / Year | | Proposed Pay Back Period | Verified Energy | Verified Saving in | Status |
|------|--|----------|--------------------------|----------------------------|-------------------------|-----------------|--------------------------|------------------|--------------------|--|
| | | | | | kWh | Amou nt in Lacs | | | | |
| 1 | Slip Power Recovery system for 2600 KW SRIM of SO ₂ Blower Motor. | 5 | 50.00 | - | 2048471 | 85.83 | 9 | - | - | All Material received at site. Commissioning by Mar.2005. Civil works for SPRS / Transformer Building in progress. |
| 2 | Retrofitting of Pumps | 5 | 11.8 | 13.00 | 2216000 | 81.77 | 2 to 9 M | 198000 kWh/month | 7.3 Lacs /Month | Retrofitting job completed in the Month of Aug-05 & recurring saving is achieved since Sep-2005 |
| 3 | LDO to L.S.H.S Conversion in Acid Plant | 10 | 18.2 | 16.29 | - | 72 | 2.5 | - | 7.6 Lacs/Month | Due to Increased Gap in the price of L.D.O & L.S.H.S pay back period has further reduced. |

| | | | | | | | | | | |
|---|---|----|------|-------|---|------|-----|---|-----------------------|---|
| 4 | LDO to L.S.H.S Conversion in ISF Plant | 10 | 17.5 | 15.00 | - | 58 | 3.5 | - | 5.5 Lacs/Mo nth | Due to Increased Gap in the price of L.D.O & L.S.H.S pay back period has further reduced. |
| 5 | Conversion of GLS Indication Lamps to LED Lamps | 3 | 0.50 | 0.60 | | 0.66 | 10 | - | - | Under Tech. Evaluation. |