PROJECT PROFILE

ON

ELECTRONIC ENERGY METERS

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ELECTRONIC ENERGY METERS

INTRODUCTION

The energy meter is an electrical measuring device, which is used to record Electrical Energy Consumed over a specified period of time in terms of units.

PRODUCT USES AND SPECIFICATIONS

India is currently witnessing a revolution in the field of electricity measuring where electronic energy meters are fast replacing the conventional Ferraris meters. Energy measuring is essential at all places where electricity is consumed. i.e. at homes, offices, farms, workshops, shops, factories etc. The most important customer groups for these meters are the State Electricity Boards (SEBs) and private electricity supplying companies. The Electronic Energy meters are rugged, reliable and easy to calibrate. Unlike the conventional energy meters, the electronic energy meters do not have any moving parts. The current and voltage is sensed electrically and the power consumed is computed using electronic logic circuits. Electronic energy meters have a very good in the country. This is primarily due to drivers such as rural electrification, power sector reforms (deregulation process being vigorously implemented by federal and State Governments), the formation of privately-owned distribution companies with a mandate to improve revenues and efficiency in system operations, and to improve customer satisfaction.

Electronic Electric meters have an advantage over conventional electromechanical meters due to reason such as

1. Compactness
2. Ruggedness and reliability
3. Good accuracy
4. Computation of current and maximum demand

5. Detection and recording of tamper, peak load and maximum demand violations
6. Power quality measurement
7. Multi-tariff programming
8. Electronic energy meters come in different types depending on their application.

Sl No	Type	Application	Capacity
1	Single phase meter	Mainly deployed in domestic applications(homes, shops, etc)	5-60A
2	3-phase meter	KWh and KVA measurement –Mainly deployed in agricultural sector.	10-80A
3	3-phase meter	KWh, KW,KVA.V/ph,1/ph,pf, frequency measurement- Mainly deployed for light industrial and commercial applications	10-80A
4	3-phase meter	KWh, KW,KVA.V/ph,1/ph,pf, frequency measurement, load survey, multi tariff, time of use features= used in heavy industrial applications	10-80A

MARKET

Every house, small factory, business establishment, shops, offices etc. need at least one energy meter to register power consumption. The supplier of electrical raises the bill on the basis reading shown by this meter. The producers of electricity sale the electricity to the electricity boards and boards have to sale this energy to the consumer. Consumer needs to pay the amount against the bill raised by the supplier. The data generated by the energy meter is the base to raise the bill by power supplier. Because of massive rural and urban electrification programme of Government, there is a good demand for this product. This product is available in single phase and three phases at different current rating as

per customer's requirement. Though, newly developed electronic energy meter is also available in the market but in view of simple technology involved to manufacture this product and for replacement of spare parts, the present demand and future prospect of this product is reasonably good.

The Indian power sector has grown from a low 1300 MW at the time of independence to more than 138,000 MW. In terms of growth, the generation rate is slightly more than 8 per cent. In spite of this growth, the country as a whole suffers from black outs and brown outs with large parts of the population (more than 500 million) without access to power. The country faced a peak load deficit of 13.9 per cent and a supply deficit of 9.9 per cent in 2006-07.

The Indian economy has grown at an average rate of 8.4 per cent per annum in the Tenth Five year plan. This has catapulted the country into the world's big league, and on the basis of purchasing power parity, today it is ranked as the fourth largest economy, behind the U.S., China and Japan. From various projections, in absolute terms, India will be one of the top three economies in the world in the next 25 years.

While the economy has grown and India is today spoken of in the same breath as China, the power sectors in the two countries present quite divergent pictures. In 1950, the installed capacities of China and India were at the same level. Thereafter, while India could achieve an installed capacity of 138 Giga Watts (GW) at the end of 2006, China had an installed capacity of 620 GW.

During 2006 alone, China added more than 100GW of new capacity. Compared to this, during each of the last three five year plans on an average, India could add only 20 GW. Further, per capita consumption of electricity in China stands at 1440 KWH, whereas in India it is only 630

KWH. Also, considering the fact that large parts of the Indian population do not have access to electricity, it becomes clear that the power sector has to put in lot of effort.

The Eleventh Plan envisages a capacity addition of around 80000 MW for which ordering has been completed. BHEL has got 55 per cent share of the orders. Integrated energy policy envisages coal to remain the dominant fuel source till 2031-32. To bring the per capita consumption to world average level, four-fold growth is required of which the share of nuclear power will go up significantly. McKinsey estimates demand to soar from around 148 GW at present to 315-335 GW by 2017.

To achieve these targets, the development of mega projects becomes a necessity. With a view to encouraging large size projects, the Central Government enunciated the mega power policy in 1995, which provided tax incentives to projects above a certain size that cater-participation of private players, the Government formulated the Ultra Mega Power Project (UMPP) policy in 2005, which envisaged the setting up of projects of 4000 MW capacity each. The developers for these projects were to be selected through a tariff based competitive bidding process. Three projects have been awarded under this policy and these are expected to be completed in 5-6 years.

India has an installed capacity (including captive) of less than 150,000 MW and has one of the lowest per capital consumption in the world (around 600 units a year as compared with a global average of over 2600 units and China's at 1100 units). Added to this is the harsh reality that only 55 per cent of the households across the country have access to electricity and more than 1.25 lakh villages are still to be electrified!

The abovementioned discussion points to the necessity of creation of additional capacity of power and the installation of more sub stations and transmission towers. There is tremendous scope and backlog to be fulfilled urgently in this sector.

INSTALLED CAPACITY

Product	**No of working hours per day**	**Capacity per day**	**Capacity per annum 300 days per annum**
Electronic Energy Meters	8	180	54000

PLANT AND MACHINERY

The following machines are required for the manufacturing of electronic energy meters.

Sl No	**ITEM**	**QTY in Nos**	**TOTAL Rs lakhs**
1	Wave Soldering Machine	1	25.10
2	General purpose oscilloscope DC-10 MHZ	1	0.20
3	Power Supply (0-30 V,2A)	2	0.15
4	Digital Multimeters	3	0.10
5	True RMS Multimeter	1	0.10
6	Digital LCR Meter	1	0.15
7	IC/Tester/EPROM Programmer	1	0.20
8	Transistor Tester	1	0.10

9	CV Eraser	1	0.10
10	Variacs (4A)	2	0.10
11	Bench Drilling Machine	1	0.10
12	Portable grinder	1	0.10
13	Tools/jigs/fixtures		0.20
14	Assembly line (conveyors)		0.30
15	Testing Machines		3.00
			30.00

MANAFACTURING PROCESS

The five basic Components of and electronic energy meter are input sensors, power supply, energy measurement module display (counter) and passive components.

An electronic energy meter transforms the load current and line voltage to a usable form. Current sensors such as shunts or current transformers (CTs) are used to transform current to a voltage proportional to current at the interface with the energy meter. Parameters such as power consumption, heat dissipation, quality and performance over a wide current dynamic range have to be considered when choosing a suitable current sensor. The meter also includes a voltage sensor such as a potential transformer (PT) or a resistive divider. The resistive divider attenuates the line voltage to an acceptable input voltage for the energy measurement LC.

In the heart of an electronic energy meter is an energy measurement LC, a fixed function DSP that calculates watts and accumulates watt-hours. The energy measurement LC, interfaces with a chosen sensors, accurately calculating the power and interfacing with an external display.

The external display of an energy meter can either be mechanical and electronic in nature. A Stepper motor counter is used for mechanical counter, while a digital counter and liquid-crystal-display,(L.C.D) are examples for electronic display. An advantage of using an LCD display is that such a meter can display more than one type of information at a time. For example, the display could include power information in watts, KWh, apparent power (VA) power factor (PF) and/or/meter temperature. The drawbacks are that LCDs are significantly more expensive than stepper motor counters and require non-volatile memory to store data in the event of power shutdown.

Passive components such as resistors, capacitors, light emitting diodes (LEDs), and jumps are used in the attenuation, power supply and calibration network. The manufacturing of electronic energy meters is an assembly process involving the sensors electronic circuits and display unit. In the electronic assembly the lCs, transistors, diodes, resistors, capacitors,transformers,coils,relays, potentiometers and laid on the PCB and soldered. The soldering is done either manually or using wave soldering machines. The assembled PCBs are tested for performance. Subsequently the electronics assembly along with hardware such as connectors, switches, terminals display, are assembled and housed in a polycarbonate casing. An attractive front panel (or fascia) is fitted on the casing.

The testing process of the most critical in the entire manufacturing process. The electronic energy meter is tested and calibated to the desired specification on the testing assembly using standard voltages and currents. Endurance, impulse, climatic, vibration, shock, harmonics and ingress protecting testing ensure the reliability of the electronic

energy meter. After testing and calibration, the equipment is packaged and ready for dispatch.

EXHIBIT

SCHEMATIC-ELECTRONIC ENERGY METERS

ELECTRONIC CIRCUIT

PCB ASSEMBLY TESTING & CALIBRATION

PCB TESTING PACKAGING & DESPATCH

ELECTRO-MECHANICAL ASSEMBLY

INJECTION MOULDING

FITTING OF FASCIN

QUALITY AND STANDARDS

Bureau of Indian Standards specified IS 13779/IEC -1036 is the most widely followed standard by the manufacturers of Electronic Energy Meters in India. This standard lays down the range of accuracy as per class 1.0,0.5 and 0.2.

RAW MATERIALS

The basic raw materials used for manufacturing of electric energy meters are

Current Transformers (CT)	Potential Transformers (PT)
Integrated Circuits (ICT)	Components (diodes, transistors, resistors capacitors, potentiometer, rectifiers, transformers switches filter etc)
LCD display panels	Wires and Connectors
Housing material (Polycarbonate easing)	Consumables (solder)
Packing material	Printer Circuit boards (PCBs)

For Nos 54000.00

	Qty-Nos	**Rate**	**Value Rs**
Ics	54000	160.00	8640000
Transistors,Resistors Diodes, Capacitors Rectifiers, Potentio meters	54000	15.00	810000
CT/PT	54000	70.00	3780000
Terminals connectors	54000	10.00	540000
Switches	54000	10.00	540000
PCBs	54000	30.00	1620000
LCD panels	54000	80.00	4320000
Other mech hardware	54000	15.00	810000
Fascia	54000	20.00	1080000

Cabinet housing poly carbonate	54000	40.00	2160000
TOTAL			24300000
			243.00
Packing materials	54000	20.00	10.80

LAND AND BUILDINGS

Built up area-Sq.ft	10000
Rent p.m.-Rs per .10 per sq.ft	100000
Advance-10 months.Rs	1000000

UTILITIES

Power & Fuel

Three phase-	KW	100.00
Power charges Rs.lakhs p.a		13.20
For process-Litres per day		0
For human consumption-litres/day		200

MANPOWER

		Monthly wages	Total
Manager	1	14000	14000
Technical Supervisor	2	10000	20000
Sales Cum Service Engineer	1	9000	9000

Testing Qc Supervisor	2	9000	18000
Accountant	1	8000	8000
Skilled Workers	24	8000	192000
Unskilled Workers	3	7000	21000
Security	2	6000	12000
sub total			294000
Add benefits		20%	58800
Total per month			352800
TOTAL PER ANNUM-Rs. lakhs			**42.34**

COST OF PRODUCTION AND PROFITABILTY

Assumptions

Installed capacity	54000 Nos
Capacity utilisation	Year-1 -60% Year -2 -70% Year-3 onwards- 80%
Selling price Per Nos	Single Phase Electronic Energy Meter Rs.600 per piece, Three phase Electronic Energy Meter – Rs.1000 per piece..
Raw materials	As per the details given above
Packing materials	As per details given above
Power	Rs.13.20 Lakhs per Annum
Wages and salaries	Rs.42.34 lakhs Per Annum
Repairs and Maintenance	Rs.1.20 Lakhs per Year(10000 Per Month)
Depreciation	Written down value method -15 % on machinery
Selling general and administrative expenses	Rs.6.00 Lakhs per Year (50000 per Month)
Interest on Term loan	14%

Interest on working capital	14%
Income tax	34%

MACHINERY SUPPLIERS

1.Mechatroncis Test Equipments India Pvt Ltd

B-2 Fountainhead Apartment

Opp: Sangam Press

Kothurd

Pune-411038

2. Selecon Electronics Systems Pvt Ltd

59 Gandhi Nagar

Crawford

Trichy- 620012

3.Aplab

Aplab House

A-5 wagle Estate

Thane-400604

4.Yokogawa Blue star Ltd

40-4 Lavelle Road

Bangalore-560001

5.Meco Instruments

301,Bharat Industrial estate

T.J.Road

Sewree

Mumbai-400015

RAW MATERIALS , COMPONENT SUPPLIERS

1.Bharat electronics

116/2 Trade Centre

Race Course Road
Bangalore-560001
2.Electronic Corporation of India Ltd
ECIL post
Hyderabad-500062
3. Philips Electronics India Limited
The Estate, 4th floor (North Wing),
(Next to Manipal Centre),
121, Dickenson Road,
Bangalore - 560042, India.
4.Pieco Electronics Ltd
Philips House
7 Justice Chandra Modhab Road
Kolkatta -700020
5.Karthik Electronics
C-34 HSIDC Industrial Esatate Sector 31
Faridabad-121003
6.SMEC Electroncis India Pvt ltd
Plot No-A-3 GIDC
Electronics Estate
Sector-25
382, Gandhinagar

FINANCIAL ASPECTS

1. COST OF PROJECT

[Rs.lakhs]

Land & Building (Advance)	10.00
Plant & Machinery	30.00
Other Misc. assets	1.00
Pre-Operative expenses	2.00
Margin for WC	5.19
	48.19

2. MEANS OF FINANCE

Capital	25.69
Term Loan	22.50
	48.19

3. COST OF PRODUCTION & PROFITABILITY STATEMENT

[Rs.lakhs]

Years	1	2	3	4	5
Installed Capacity-Nos	54000	54000	54000	54000	54000
Single phase Electronic energy meters	42000	42000	42000	42000	42000
Three phase Electronic energy meters	12000	12000	12000	12000	12000

Utilisation	60%	70%	80%	80%	80%
Production/Sales-Nos	32400	37800	43200	43200	43200
Single phase Electronic energy meters	25200	29400	33600	33600	33600
Three phase Electronic energy meters	7200	8400	9600	9600	9600
Selling Price per piece Rs.					
Single phase Electronic energy meters	600.00				
Three phase Electronic energy meters	1000.00				
Sales Value (Rs.lakhs)	**223.20**	**260.40**	**297.60**	**297.60**	**297.60**
Raw Materials	145.80	170.10	194.40	194.40	194.40
Packing Materials	6.48	7.56	8.64	8.64	8.64
Power	7.92	9.24	10.56	10.56	10.56
Wages & Salaries	42.34	44.45	46.67	49.00	51.45
Repairs & Maintenance	1.20	1.32	1.45	1.60	1.76
Depreciation	4.50	3.83	3.25	2.76	2.35
Cost of Production	208.24	236.50	264.97	266.96	269.16
Selling, Admin, & General exp	6.00	6.30	6.62	6.95	7.30
Interest on Term Loan	3.15	2.76	1.97	1.18	0.39
Interest on Working Capital	2.84	2.84	2.84	2.84	2.84
Total	220.23	248.40	276.40	277.93	279.69
Profit Before Tax	2.97	12.01	21.20	19.67	17.91
Provision for tax	1.00	4.04	7.14	6.62	6.03
Profit After Tax	**1.97**	**7.96**	**14.06**	**13.05**	**11.88**

Add: Depreciation	4.50	3.83	3.25	2.76	2.35
Cash Accruals	6.47	11.79	17.31	15.81	14.23
Repayment of Term loan	0.00	5.63	5.63	5.63	5.61

4. WORKING CAPITAL:

	Months Consumptions	Values	%	Margin Amount	Bank Finance
Raw Materials	0.50	6.08	25%	1.52	4.56
Consumables	2.00	1.08	25%	0.27	0.81
Finished goods	0.50	8.68	25%	2.17	6.51
Debtors	0.50	9.30	10%	0.93	8.37
Expenses	1.00	0.30	100%	0.30	0.00
		25.44		5.19	20.25

5. PROFITABILITY RATIOS BASED ON 80% UTILISATION

Profit after Tax / Sales	=	14.06 / 297.60	5%
Profit before Interest and Tax	=	26.01	38%

Total Investment		68.44	

Profit after Tax	=	14.06	55%
Promoters Capital		25.69	

6. BREAK EVEN LEVEL

Fixed Cost (FC):

	[Rs.lakhs]
Wages & Salaries	46.67
Repairs & Maintenance	1.45
Depreciation	3.25
Admin. & General expenses	6.62
Interest on TL	1.97
	59.96

Profit Before Tax (P) 21.20

$$BEL = \frac{FC \times 100}{FC + P} = \frac{59.96}{81.16} \times \frac{80}{100} \times 100$$

59% of installed capacity