Perform Achieve And Trade (PAT) - A Market-Based Mechanism For Energy Efficiency In Pulp And Paper Mills.

*Garnaik S. , Thapliyal B.P. and Mathur R.M.

ABSTRACT

The Union Cabinet has recently approved the National Mission for Enhanced Energy Efficiency (NMEEE). The Mission will usher in the four new initiatives to significantly scale up implementation of energy efficiency in India. The flagship of the Mission is the Perform Achieve and Trade (PAT) mechanism, which is a market-based mechanism to make improvements in energy efficiency in energy-intensive large industries (known as Designated Consumers) making them more cost-effective by certification of energy savings that could be traded. The PAT mechanism is designed for the industries to achieve the legal obligations under the Energy Conservation Act, 2001 (Ammended), and also to provide necessary market based incentives to overachieve the targets set for them.

The Bureau of Energy Efficiency has carried out background work to design a transparent, flexible, efficient and robust system for the PAT mechanism. The key issues considered for the final preparations of the mechanism are:

a) Methodology for target setting for each sector
b) Monitoring and verification, in particular the identification of verification agencies that would be assigned by BEE for this purpose.
c) The manner of trading of the energy saving certificates, in particular instruments that could increase liquidity in the system.

In the present article, broad principles on the above mentioned issues and several other related issues that are important in the overall implementation of the PAT scheme in pulp and paper sector are discussed.

Introduction

The National Action Plan on Climate Change (NAPCC), released by the Prime Minister on 30 June 2008, recognizes the need to maintain a high growth rate for increasing the living standards of the vast majority of people and reducing their vulnerability to adverse impacts of climate change. The National Action Plan outlines eight national missions that represent multi-pronged, long-term, and integrated strategies for achieving key goals in the context of climate change.

Under NAPCC, Ministry of Power (MoP) and Bureau of Energy Efficiency (BEE) were entrusted with the task of preparing the implementation plan for one of the national mission, the National Mission for Enhanced Energy Efficiency (NMEEE). NMEEE will usher in the following four initiatives, in addition to the policies and programmes for energy efficiency being implemented by BEE.

These initiatives are as follows:

*Bureau of Energy Efficiency, New Delhi
Central Pulp & Paper Research Institute, Saharanpur-247001

a) Perform, achieve, and trade (PAT), a market-based mechanism to make improvements in energy efficiency in energy-intensive large industries and facilities more cost-effective by certification of energy savings that could be traded.

b) Market transformation for energy efficiency (MTEE) by accelerating the shift to energy-efficient appliances in designated sectors through innovative measures that make the products more affordable .

c) Energy efficiency financing platform (EEFP), a mechanism to finance DSM programmes in all sectors by capturing future energy savings.

d) Framework for energy efficient economic development (FEEED), or developing fiscal instruments to promote energy efficiency.

The implementation plan of NMEEE seeks to upscale the efforts to create the market for energy efficiency, which is estimated to be about Rs 74,000 crore. The Mission would create conducive regulatory and policy regime to foster innovative and sustainable business models to unlock this market. As a result of implementing NMEEE, it is estimated that by the end of five years, about 23 million tonnes of oil equivalent (MTOE) of fuel will be saved, capacity addition of over 19,000 MW avoided, and emissions of carbon dioxide reduced by 98.55 million tonnes annually.

The genesis of the PAT mechanism flows out of the provision of the Energy Conservation Act, 2001. Section 14 (e) of the Act empowers the Central Government to notify energy intensive industries, as listed out in the Schedule to the Act, as Designated Consumers (DCs). The Ministry of Power has notified units consuming energy more than the benchmark in 8 industrial sectors namely Thermal Power Plants, Fertilizer, Cement, Pulp and Paper, Textiles, Chlor Alkali, Steel and Aluminum in March, 2007 as DCs. The notification issued under section 14 (e) of the Act is summarized hereunder in Table-1.

Designated Consumers account for 25% of the national gross domestic product (GDP) and 44.4% of commercial energy use in India. Since 2000, industrial GDP has been growing at 8.6% annually and energy use in industry at 5.8%. The lower rate of growth of industrial energy use can be attributed to many reasons. It has been observed that in recent years, industry has been choosing state-of-the-art technologies, which are more energy-efficient. Also, there have been many

Table 1 Minimum specific energy consumption and estimated number of DCs (designated consumers) in select sectors

ĔĬŊĿŇ	Minimum annual energy consumption for the DC (tonnes of oil equivalent)	No. of probable DCs
Aluminium	7500	11
Cement	30000	83
Chlor-alkali	12000	20
Fertilizer	30000	23
Iron and steel	30000	101
Pulp and paper	30000	51
Textiles	3000	128
Thermal power plants	30000	146

Approach towards target setting for Energy Consumption in Pulp & Paper sector:

The targets for Energy Consumption for a Pulp & Paper mill will be set up based on pro-rata basis of energy consumption among the various Pulp & Paper industries after grouping them suitably with similar characteristics.

The approach for reduction in specific energy consumption will be based on following basis as shown below in Fig,1:

Targets (% reduction in SEC) provided to the mill will be based on the present specific energy consumption (SEC) of the mill. For determination of present

in-house efforts made by the industry to become more energy-efficient. The Perform Achieve and Trade (PAT) mechanism is an attempt which will further accelerate as well as incentives energy efficiency.

Under the EC Act 2001, the DCs are required to:

a) Furnish report of energy consumption to the Designated Authority of the State as well as to BEE (section 14(k)).
b) Designate or appoint an Energy Manager who will be incharge of submission of annual energy consumption returns of the Designated Agencies and BEE (section 14 (l)).
c) Comply with the energy conservation norms and standards prescribed under section 14 (g) of the Act.
d) Purchase Energy Saving Certificates (ESCerts) for compliance to section 14 (g) in the event of default. The Act is being amended with the addition of new sub-section 14A to enable this and section 14 A (2) allows such trading. ESCerts are being defined by adding a new sub-section 2(ma).
e) Monitoring and Verification of compliance by Designated Energy Auditors (DENA) which will be prescribed by the Government/BEE under section 14A/13 (p) of the Act.
f) Excess achievement of the norm set would entail issuance of ESCerts under section 14 A (1).
g) Penalty for non-compliance being significantly enhanced to Rs. 10 lakhs and the value of non-compliance measured in terms of the market value of tonnes of oil equivalent by inserting a new section 26(1A).
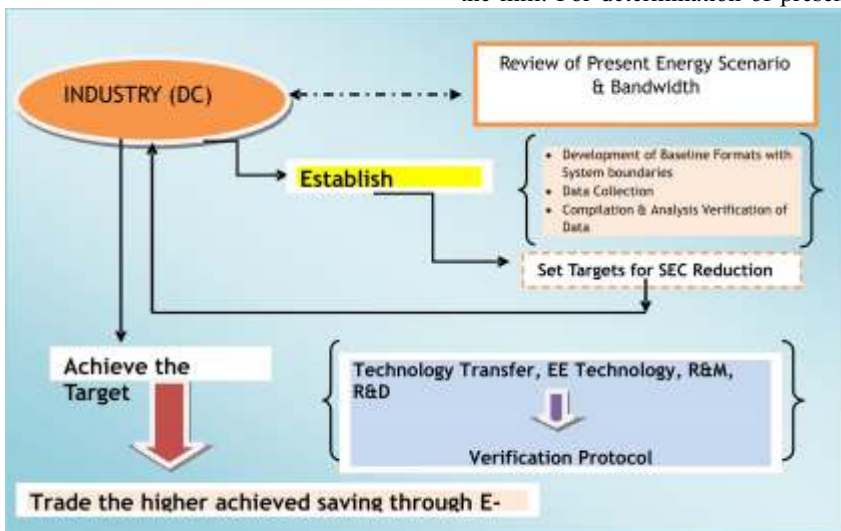
h) BEE to be the overall regulator and dispute resolution agency, EESL to be the process manager.

Pulp and Paper as a Designated Consumer (DC)

Pulp and paper is an energy intensive sector and mills, which consume equal to or more than 30000 Meteric Tonne Oil equivalent (MTOE) per annum have been included in the list of DC's. The Energy consumption in these mills varies between a wide range from 25 to 121 GJ/t. This is due to large number of variables such as raw materials, products, technologies used and production capacities of the mills etc. Among the industries 1.38 million MTOE is consumed per year which accounts for 0.6% of the total consumption. This calls for immediate attention to address the non-uniformity among 69 different Designated Consumers (DC) in Pulp & Paper sector.

Fig 1. Approach for Target Setting for the DC's

SEC in a mill, the energy consumption and production data for last 3-5 years will be used. Average of last 3 years SEC in terms of MTOE per ton of product will be used for an individual mill as shown below in Fig.2.

If required, normalization factor for variation in capacity utilization and other variables will be used to smoothen the energy consumption pattern in the mill. Mills from different categories will be assigned system boundaries to account for all forms of energy being used by the industries as shown in Figure above. All energy inputs & products coming out of the industry will be identified and ratio of energy inputs to the product formed (E/P) will assigned as SEC for a mill.

The system boundaries for all types of mills have been identified by BEE. The system boundaries include all unit operation in a mill used for production of Paper & paper products within an industrial complex.

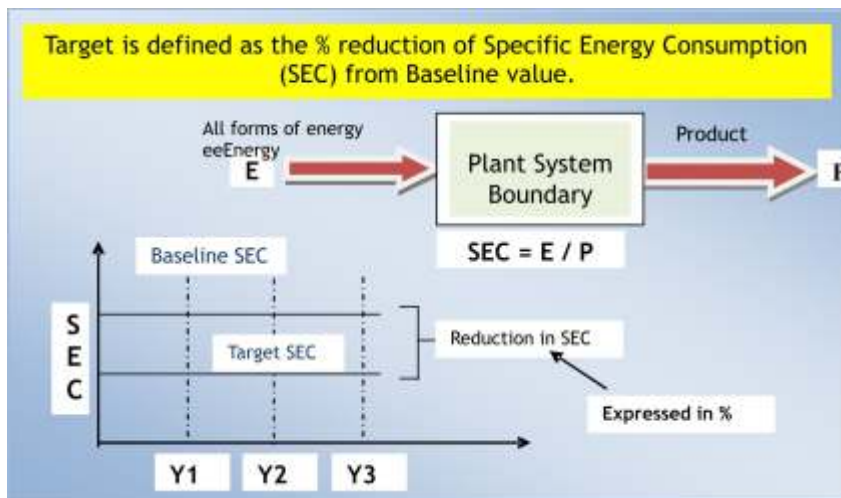As explained earlier, Targets for reduction in energy consumption will

Fig 2. Baseline, target and reduction in SEC for the DC's

be calculated based on relative SEC approach, after grouping the DC's suitably. Industry will be informed about their present Specific Energy Consumption levels (SEC) and the target of reduction in specific energy consumption which they have to achieve within 3 years i.e. from 2011 2014.

The estimated targets will be justified by the saving potential. BEE will conduct an energy audit in the initial stage by professional energy auditing firms to access the potential of energy savings in an individual mill.

The targets set up therefore will be realistic and achievable by the mill. The targets provided to the mill will be reviewed by an expert committee before notification. Industry will plan its energy management programmes keeping in view its resources and future development. The possibilities of technologies transfer for enhanced efficiency of processes, adoption of energy efficient technologies and energy management programmes will be undertaken by the mills to achieve the energy reduction targets. After the specified period (i.e. 2011 to 2014) review of the industries will be made to access industries efforts for achieving the targets. In case the targets have been achieved before the specified period, industry will inform BEE accordingly for further action.

Based on the energy saving, BEE is formulating a trading scheme for issuance of Energy Saving Certificate (ESCerts). The design of the trading scheme is under progress.

Analysis of the designated consumers in Pulp & paper Sector

Bureau of Energy Efficiency (BEE) has

identified 70 mills as designated Consumers (DC's) which will be covered under the Energy Conservation Act 2001, and Perform Achieve and Trade (PAT) scheme to enhance energy efficiency in the pulp and paper sector.

For the study, these mills have been classified into different groups according to raw material usage, products manufactured and technological levels adopted so as to measure their energy efficiency & performance levels and benchmark them.

In this section situation analysis of the

designated consumers in pulp and paper sector as a candidate for the PAT scheme has been discussed.

The pulp and paper mills use different types of energy sources for conversion of raw material to pulp and then to paper. The different types of energy sources used for pulp and paper manufacture are converted to a common energy unit and represented as oil equivalent, i.e. metric tonne oil equivalent (MTOE). The energy consumption data collected from various sources, converted to MTOE unit was analyzed for various mills under each category to find out the energy consumption norms by using following methodology.

"Norm setting based on the analysis of mill's SEC and calculation of the 3 years average specific energy consumption as baseline, as suggested by BEE for target setting of each mill."

The analysis of energy consumption data was made to study the pattern of energy consumption by different types of mills based on different raw materials producing various products. The average of 3 years energy consumption data or the data made available by the mills was used for arriving close to an energy consumption value or norm for the mills.

Table 2. Analysis fo Energy Consumption Data of Wood based mills for target setting

S. No.	NAME OF THE MILL	YEAR	Reported PROD. TPA	reported MTOE/t	3 YRS AVG MTOE/t	Saving potential %	Saving Potential, MTOE/annum	Target MTOE/t
1	MILL 1	09-10	124509.92	2.32	2.23	4.79	2567	2.19
2	MILL 2	09-10	230353.2275	1.67	1.73	3.08	4245	1.69
3	MILL 3	09-10	276845.5683	1.59	1.51	3.45	5983	1.47
4	MILL 4	09-10	233854.317	2.57	2.56	0.16	149	2.56
5	MILL 5	09-10	92078	2.67	2.77	3.83	3526	2.74
6	MILL 6	09-10	68592	1.79	1.68	6.06	4156	1.62
7	MILL 8	09-10	464000	1.15	1.15	1.05	4887	1.14
8	MILL 9	09-10	254903	1.60	1.69	5.56	14180	1.64
9	MILL 10	09-10	117989	1.73	1.65	3.26	3846	1.62
10	MILL 12	09-10	110000	1.95	1.95	2.03	2231	1.93
11	MILL 13	09-10	60312	2.05	1.92	5.95	3589	1.86
12	MILL 14	09-10	28230	1.9	1.90	0.271	7662	1.62
13	MILL 16	09-10	100546	0.96	0.91	6.12	6156	0.85
14	MILL 17	09-10	264086	1.74	1.77	1.67	4404	1.75

SEC Savings Potential is estimated at each band or cluster using the following formulae

$$Saving\ Potential = \frac{SEC_{avg} - SEC_{min}}{SEC_{avg}} \times 100$$

The analysis of data for wood, agro and RCF based mills is presented in Tables 2-4 below.

Conclusion:

The analysis of data has revealed that the prediction of the norms and energy consumption targets for the mills requires understanding of the various factors which affect and control the energy consumption. Based on the factors and their correlation with energy consumption, the normalization factors should be identified for different type of mills.

The method of averaging the energy consumption has been found to be very useful; however it is dependent on the quality and reliability of the data reported by the mill. The study has shown straight forward energy saving recommendations in case of the mills where the reported data is consistent and accurate. However in case of large no. of recycled fiber based mills the data verification is required as the mills do not have adequate monitoring and reporting systems in place. In large number of the mills in agro and recycled categories, with medium production capacities, the mills have not kept pace with automation and control. These mills therefore depend totally on the manual methods of reporting and therefore there are chances of significant error at the time of reporting.

The verification of the data by the BEE accredited agencies will help to address the problem related with the monitoring and reporting of the data. Once the analysis and reporting of the mill processes and equipments is over and the reliable data base is available from the mills, the representative interpretation of the data may be made for fixing up the targets for the mill.

Reference :-

1. PAT Consultation Document, BEE, New Delhi, Jan, 2011.

Table 3. Analysis fo Energy Consumption Data of Agro based Mills

S. No.	NAME OF THE MILL	YEAR	Reported PROD., TPA	Reported MTOE/t	3 YRS AVG MTOE/t	Saving potential %	Saving Potential, MTOE/ annum	Target MTOE/t
1	MILL 1	09-10	60553	1.2	1.13	7.47	4525.99	1.06
2	MILL 2	09-10	34675	2.0	2.05	10.78	3736.48	1.94
3	MILL 3	09-10	79485	0.562	0.59	4.22	3352.65	0.54
4	MILL 4	09-10	16641	1.353	1.41	4.39	730.11	1.37

Table4. Analysis fo Energy Consumption Data of RCF Based Mills

S. No.	NAME OF THE MILL	YEAR	Reported PROD., TPA	Reported MTOE/t	3 YRS AVG MTOE/t	Saving potential %	Saving Potential, MTOE/ annum	Target MTOE/t
1	MILL 1	09-10	28425	1.033	1.01	1.26	357.02	0.99
2	MILL 2	09-10	105296	0.622	0.58	5.72	6019.14	0.52
3	MILL 3	09-10	248515	1.176	1.28	8.12	20173.73	1.20
4	MILL 4	09-10	41683	0.316	0.31	3.76	1566.28	0.27
5	MILL 5	09-10	42375	0.157	0.17	7.52	3186.05	0.09
6	MILL 6	09-10	17726.58	0.722	0.78	7.26	1287.45	0.71
7	MILL 7	09-10	25960	0.560	0.57	6.32	1641.61	0.50
8	MILL 8	09-10	96186	0.445	0.44	3.29	3167.48	0.41
9	MILL 9	09-10	3480	0.245	0.25	3.03	105.30	0.22
10	MILL 10	09-10	33000	0.449	0.45	1.92	633.07	0.43