Perform Achieve & Trade Scheme and its Alignment with DSM

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SHAKTI
SUSTAINABLE ENERGY
FOUNDATION

MP ENSYSTEMS™
Advisory Pvt. Ltd.

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MP Ensystems is a niche energy and environmental sector consultancy and advisory firm that was set up in 2012. MP Ensystems works with electricity regulatory commissions to evolve benign regulatory and policy structures that enable implementers to innovate new resource efficient products and approaches to meet resource conservation benefits. As a non-partisan expert business organization, through technical assistance from bilateral and multilateral funders, MP Ensystems has also assisted electricity distribution licensees in designing, implementing and evaluating demand-side management and energy conservation programs.

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ABBREVIATIONS

APTEL	Appellate Tribunal for Electricity
ARR	Annual revenue Requirement
AT&C	Aggregate Technical and Commercial
BEE	Bureau of Energy Efficiency
CAPEX	Capital Expenditure
CEA	Central Electricity Authority of India
DISCOM	Distribution Company
DL	Distribution Licensee
DSM	Demand Side Management
EEFP	Energy efficiency financing platform
ESCerts	Efficiency Saving Certificates
FEEED	Framework for energy efficient economic development
GHG	Green House Gas
GoI	Government of India
INDC	Intended Nationally Determined Contributions
IPDS	Integrated Power Development Scheme
M&V	Measurement and Verification
MoP	Ministry of Power
MTOE	Metric Tonne of Oil Equivalent
MYT	Multi Year Tariff
NAPCC	National Action Plan on Climate Change
NCEF	National Clean Energy Fund
NMEEE	National Mission for Enhanced Energy Efficiency
PAT	Perform Achieve Trade
PRGF	Partial Risk Guarantee Fund
R&M	Renovation & Modernization
RPO	Renewable Energy Purchase Obligations
SDA	State Designated Agencies
SERC	State Electricity Regulatory Commission

T&D	Transmission and Distribution
UDAY	Ujwal DISCOM Assurance Yojana
VCFEE	Venture Capital Fund for Energy Efficiency

ABSTRACT

Perform, Achieve and Trade (PAT) is a key efficiency-related implementation mechanism under India's National Action Plan on Climate Change (NAPCC). The PAT scheme has evolved over the years and the recent change in implementation plan by the Bureau of Energy Efficiency (BEE), termed as the PAT Cycle - II process, has identified the Distribution Licensees (DISCOMs) as designated consumers (DCs). This paper aims to explore the impetus provided by PAT scheme through incentives (financial support) and penalties (financial and other) on the operations of the DISCOMs. State Electricity Regulatory Commissions (SERCs) have already been assigning transmission and distribution (T&D) loss reduction targets to the DISCOMs. However, the PAT Cycle – II normalized the losses of the entire sector and assigned specific targets to the DISCOMs that have more than 10% reported losses. The study compares the parameters and targets provided in PAT with T&D losses targets provided by SERCs and the loss trajectory expected through Ministry of Power's schemes such as Ujjwal DISCOM Assurance Yojana (UDAY), to find out the extent to which PAT scheme is aligned with the current regulatory framework. It identifies lacunae in the framework for providing the necessary CAPEX provisions to the DISCOMs in the multi-year tariff (MYT) orders to enhance investments in distribution network. The study seeks to identify simple examples and scenarios of embedding higher T&D targets and the benefits aligned with the end-use efficiency. Thus, it also provides guideline for the DISCOMs to follow while planning for loss-reduction.

1. BACKGROUND

Recent changes in the Perform, Achieve & Trade (PAT) scheme of the Bureau of Energy Efficiency (BEE) termed the PAT Cycle - II process have identified the DISCOMs as designated consumers (DCs). State Electricity Regulatory Commissions (SERCs) have already been assigning T&D loss reduction targets to the Distribution Licensees (DLs)/Distribution Companies (DISCOMs)[1]. However, the PAT Cycle – II normalized the losses of the entire sector and assigned specific targets to the DISCOMs that have more than 10% reported losses. It is expected that the PAT Cycle II and the SERC targets are aligned and provide the necessary Capital Expenditure (CAPEX) provisions to the DISCOMs in the multi-year tariff (MYT) orders to enhance investments in distribution network. DISCOMs while planning the T&D loss reduction efforts can also embed the end-use efficiency measures at feeder levels. The proposed theme paper related to this topic can act as simple guideline for the DISCOMs to follow when considering loss-reduction targets.

[1] We have used two terms DLs and DISCOMs interchangeably in this paper.

2. PROBLEM STATEMENT

DISCOMs are included as designated consumers under Perform, Achieve and Trade Scheme (PAT cycle II) to provide impetus to T&D loss reduction efforts. The study explores examples of Demand Side Management which show how these measures can help DISCOMs achieve their T&D targets provided under PAT Scheme. However, available sources of information do not provide clear quantification of financial support provided and penalty levels imposed under the scheme. The available literature lacks the information and guidelines which create a situation where DISCOMs are not able to plan investment, which could be channelled through PAT towards Transmission and Distribution loss reduction efforts. It is also pertinent to note that over 16 SERCs have notified Demand Side Management (DSM) Regulations to be implemented by the DISCOMs.

Objective

This paper aims to explore the financial support provided by PAT scheme through documenting simple examples of end use efficiency which can help achieve more stringent targets[2] for T&D loss reduction by DISCOMs. This exploration is intended to highlight specific benefits of both T&D and end-use efficiency implemented together. Specific objectives are listed here:

- To compare and assess the targets set for T&D loss reduction in various regulatory frameworks[3]
- To explore the simple examples of end use efficiency and its impact on loss reduction with available funding in existing framework for DISCOMs

2 SERCs while reviewing the petitions submitted by DISCOMs for tariff setting, measure and evaluate the current performance as well as provide targets for the next tariff period. As a part of performance evaluation Discoms are provided with targets for T&D and AT&C losses. The losses beyond the targets are not approved by the SERCs and thus are not the part of ARR which will be paid by the consumers. This means DISCOMs have to suffer the losses, if they are not able to achieve the targets given by SERCs.

3 UDAY (Ujjwal DISCOM Assurance Yojana) scheme, launched by central government in the year 2015, to turn around performance of DISCOMS financially and operationally. 28 states and 1 UT have signed MoU with central government to participate in the scheme. It provides major targets – AT&C losses target at 15%, ACS-ARR (Average Cost of Supply – Average Revenue Rate) Gap to be Zero, in order to achieve its objectives.

- Provide suggestions related to role of DSM in improving the implementation of PAT scheme for DISCOMs

3. LITERATURE REVIEW

3.1 Introduction to PAT Scheme

PAT is an innovative policy mandated market-based mechanism launched in 2012, designed to accelerate energy savings in energy intensive and large industries by incentivizing energy savings. Overachievement above the assigned targets will result in allocation of tradable Efficiency Certificates (ESCerts), whereas under-achievers must comply by either purchasing ESCerts or by paying a penalty. The scheme was launched as part of energy conservation strategy in the 12th plan. As per the Energy Conservation Act, 2001, the central government in consultation with BEE has identified a list of energy-intensive industries and other establishments. The scheme targets saving about 6 to 7 million MTOE (Metric ton of oil equivalent) of energy, which reflects in the reduction of about 25 million Tons of CO_2 equivalent. Considering the cost of 1 MTOE to be INR 10,154 as notified by BEE in 2011-12, the cost of energy saved amounts to INR 6,782 Crores (approx. US$ 1 billion).

3.2 Genesis of PAT scheme

The National Mission for Enhanced Energy Efficiency (NMEEE) is one of the eight missions under National Action Plan on Climate Change (NAPCC) of Government of India (GoI), released by the Prime Minister of India on 30 June 2008 with the objective of promoting innovative policy and regulatory regimes, financing mechanisms, and business models which not only create, but also sustain, markets for energy efficiency in a transparent manner with clear deliverables to be achieved in a time bound manner.

The Ministry of Power (MoP) and BEE were entrusted with the task of preparing the implementation plan for the National Mission for Enhanced Energy Efficiency (NMEEE). NMEEE ushers in the following four initiatives, in addition to the policies and programmes for energy efficiency being implemented by BEE. These initiatives are:

1. 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

2. 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

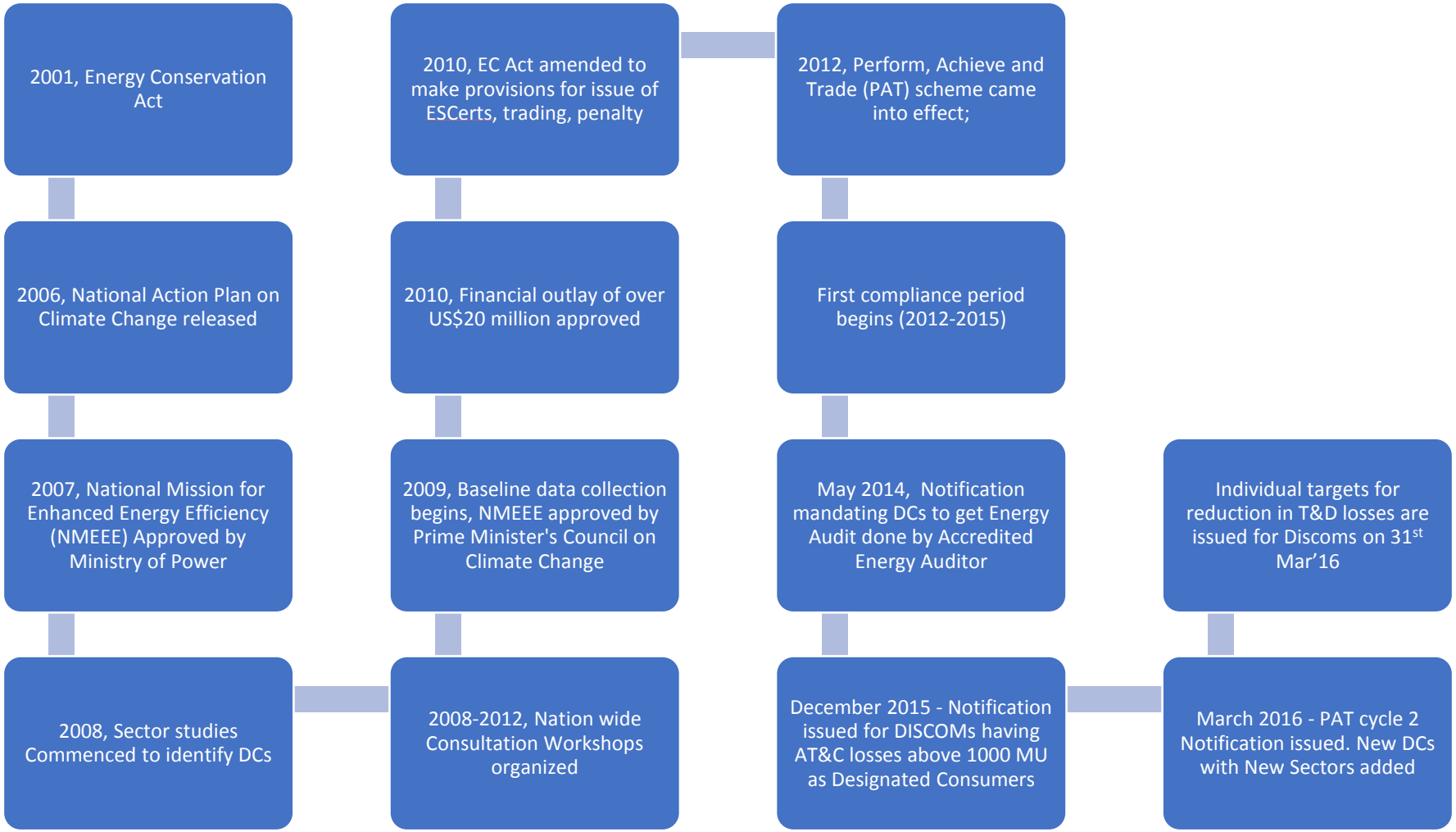
3. Energy Efficiency Financing Platform (EEFP), a mechanism to finance DSM programmes in all sectors by capturing future energy savings

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

PAT scheme is the flagship scheme of NMEEE and is designed to facilitate the Designated Consumers (DCs) to not only achieve their legal obligations under the Energy Conservation Act, 2001[4], but also to provide them with necessary market-based incentives to overachieve the targets set for them[5]. Figure 1 illustrates the chronology of genesis and implementation of PAT mechanism.

[4] (GoI, 2010)
[5] (PWC, 2014)

Figure 1 Genesis of Perform, Achieve and Trade Scheme



3.3 Vision, Approach and Milestones of PAT Scheme

The vision for PAT scheme during 2012-2017 can be explained by understanding the approach and milestones adopted by various governmental and quasi-governmental agencies involved. It was expected that implementation of 1st Cycle of PAT would achieve the set target of 6.6 mtoe by 2014-15. Further, post first cycle the focus was on widening and deepening the scope of PAT during the 2nd Cycle by including other energy intensive sectors like Refineries, Chemicals, Petrochemicals, Automobile manufacturing, Sugar, Glass etc. in the scheme and reducing the threshold energy consumption limit of existing sectors to bring in additional industries. This required the efforts to accelerate the implementation of ISO 50001 to promote benchmarking of Energy Management System in Industries and facilitate implementation of Frame work for Energy Efficient Economic Development. For the financial cost and risk sharing, fiscal instruments like Partial Risk Guarantee Fund (PRGF) and Venture Capital Fund for Energy Efficiency (VCFEE) have already been proposed in NMEEE for successful implementation of PAT scheme. To achieve the target in PAT scheme, the industry has to look for newer technology, Renovation & Modernization (R&M), adoption of clean energy and efficient energy management systems. BEE proposed a 3% interest subsidy scheme for adoption of energy efficient technologies by Designated Consumers in various sectors under PAT scheme. These activities could be supported by National Clean Energy Fund (NCEF).

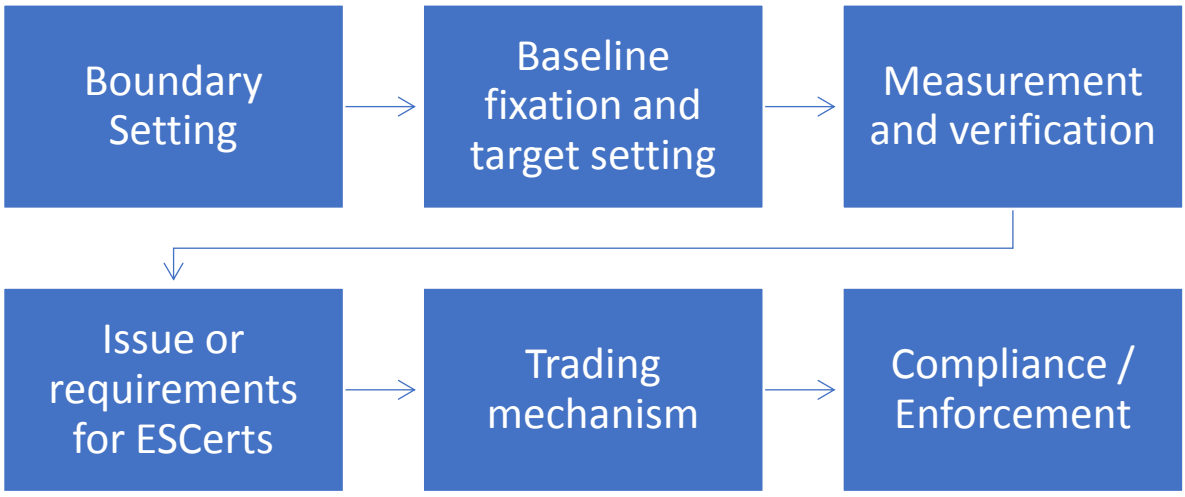
It was recommended that major R&D programs would be initiated in selective areas and selective sectors for developing new customized energy efficient technology through indigenous development of applications of already available energy efficient technologies / concepts. It is proposed that a need-based framework for research in industrial energy efficiency may be undertaken, centres of excellence would be established and improving the industry-institute-interaction at state level. The total projected saving in the year 2016-17 i.e. end of 12th Five Year Plan were of the tune of 11.43 mtoe in which 10.41 mtoe would be contributed by thermal energy. The rest, which is equivalent to 11.96 BU of electricity saving is estimated at busbar in 2016-17. The fund requirement was INR 190 crores to support the proposed PAT schemes[6].

[6] (Planning Commission, 2014)

3.4 PAT Scheme Design

The scheme targets improvement in efficiency of production and distribution processes to achieve the ultimate target of energy savings. This approach towards energy saving is a major digression from emission reduction directives followed in several developed and developing economies which, in general, aim at reduction in absolute number of emission/(fuel) consumption units. Thus, the reduction in energy consumption once achieved through PAT will be far more realistic (pointing towards a more efficient and less energy intensive economy) than those reported through other methodologies where absolute reduction of emission units may be influenced by commercial and/or political factors[7]. The policy, rules and regulatory framework is provided in Annexure I. Figure 2 illustrates process adopted in the PAT implementation.

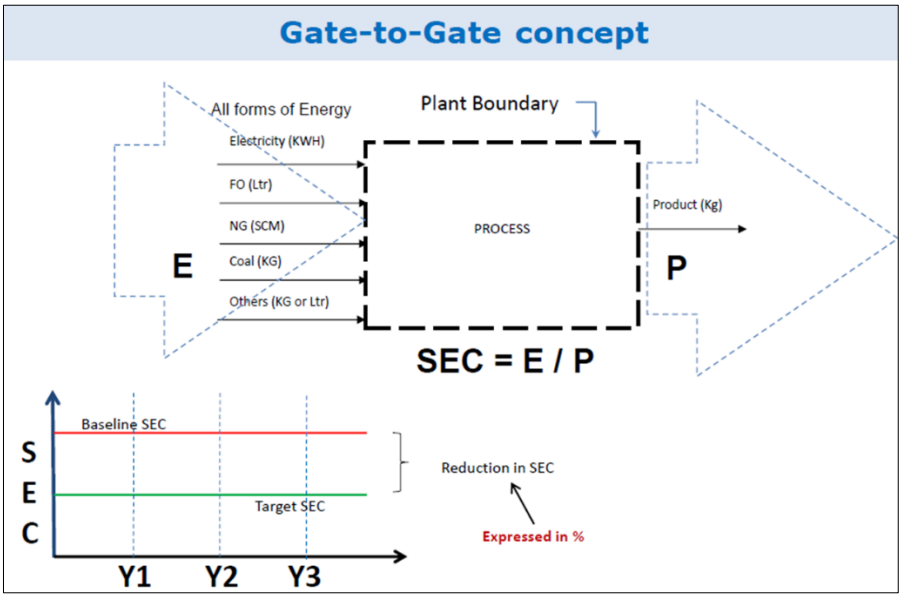
Figure 2 Major Process blocks of PAT Scheme



The boundary for the production or distribution facility is defined using gate to gate concept as explained further. The energy consumed within the system is calculated using 'Gate to Gate Concept' as shown in **Error! Reference source not found.**. The parameter used to measure the consumption is 'specific energy'. All activities that are carried out inside of the Gate-to-Gate premises of the DC are included for SEC measurement[8].

[7] (PWC, 2014)
[8] (GoI, 2012)

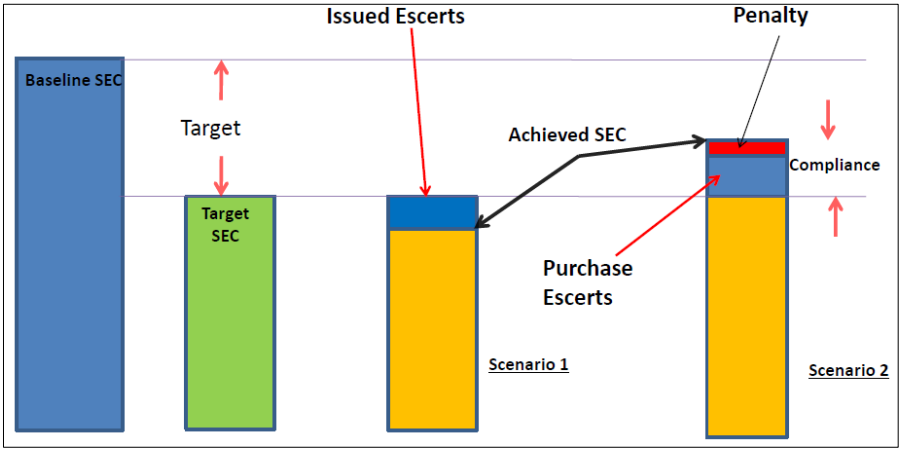
Figure 3 Gate to Gate concept to calculate the energy flow in a system



Source: BEE website accessed on 12th August, 2017

The concept of Target, Compliance, ESCerts and Penalty is illustrated in **Error! Reference source not found.**. DCs over achieving the target will be issued ESCerts by MoP on recommendations by BEE. DCs which under achieve the targets need to buy ESCerts for compliance[9]. DCs which are not able comply, will be imposed a penalty, as provided in Energy Conservation Act, 2001. Additionally, unmet target need to be paid at prevailing oil prices. As per 2016 amendment, price of one MTOE of energy will be INR 10,968 for the year 2014-15.

Figure 4 Concept of Target, Compliance, ESCerts and Penalty



Source: BEE website accessed on 12th August, 2017

[9] PPTs and reference material by PXIL and IXL on trading of ESCerts, PPTs, booklets and reference material prepared by energy economists at BEE

It is provided in the PAT rules that,

Number of energy saving certificates (ESCerts) = % T&D loss notified - % T&D loss achieved[10]

1 ESCert = 1 TOE (Ton of Oil Equivalent) [11]

For PAT cycle-II, FY 2014-15 is considered as baseline year and all the targets will be calculated based on the data of performance of DISCOMs submitted at the end of FY 2014-15. PAT cycle-II spans from FY 2014-15 to FY 2018-19 and the assessment of scheme will be done at the end of FY 2018-19. The measurement and verification (M&V) period assigned is Apr 2019 to July 2019. The total energy consumption from 11 sectors is 227 MToE and energy savings target is 8.869 MToE. The 621 identified DCs have share of 50% of total energy consumption in the country (2009-10 level). PAT cycle-II includes 89 new DCs from existing sectors and 84 new DCs from additional sectors viz. Refinery, Railways and Electricity DISCOMs.

[10] (GoI, 2016)
[11] T&D loss (Million kWh) = Net Input Energy (Million kWh) – Net sale of energy (Million kWh)
Net Input Energy (Million kWh) = Total input energy (adjusted for transmission losses and energy traded)
Net sale of Energy (MkWh) = Total energy sold (adjusted for energy traded)

Table 1 Institutional Framework for PAT Scheme

Stakeholders within the Regulatory Framework	Operational Mechanism	Compliance Enforcement	Trading Mechanism
Regulators, Adjudicators, Quasi-Judicial, Judicial Institutions	Ministry of Power, Bureau of Energy efficiency (BEE)		
		Supreme Court, APTEL	CERC
		SERCs	
Enabling Agencies connected with DCs	SDAs (State Designated Agencies), Inspecting Officers		Power Exchange
	Accredited energy auditors (AEAs)		Depository
Designated Consumers (DCs)	EA / EM at DCs, Industrial associations		
Agencies to assist DCs	ESCOs	Legal and other experts	Traders

Source: Adapted from PWC report on PAT scheme insights[12]

3.5 Salient Features of PAT Scheme

Below mentioned are the salient features of PAT scheme, taken into considerations by various stakeholders responsible for creating and implementing the scheme.

- Regulatory instrument linked with market mechanism - certification of energy saving
- Consultative approach - Ministries/ DCs/ Associations/ Financial Institutions/ Research Organizations
- Self-competing - unit-specific targets
- Relative responsibility – Targets set based on various aspects – size, capacity, current performance levels, scope for improvement, need for improvement etc. Less target for more efficient and more for less efficient
- Supports improvement in energy management system - measurement, recording and reporting

3.5.1 Need for DISCOMS as Designated Consumers under PAT II

Table 2 provides information on achievements in energy savings at the end of the PAT Cycle-I. The scheme influenced 427 verified DCs, which could reduce 8.64 MTOE, i.e. about 5.24%

[12] (PWC, 2014)

of Total energy consumption. This is also equivalent to CO_2 emissions of 31 million tonnes. PAT Cycle-I did not include DISCOMs as designated consumers.

Table 2 Achievements in energy savings at the end of the PAT Cycle-I

Sr no	Sectors	No. of DCs	Savings (Million toe)	% Increase in savings
1	Aluminium	10	0.73	59%
2	Cement	75	1.44	76%
3	Chlor-Alkali	22	0.1	100%
4	Fertilizer	29	0.83	73%
5	Iron and Steel	60	2.1	41%
6	Paper and Pulp	26	0.26	117%
7	Textile	82	0.12	71%
8	Thermal Power Plant	123	3.06	(-)5%
	Total	**427**	**8.64**	**29%**

Source: BEE website accessed on 12th August, 2017

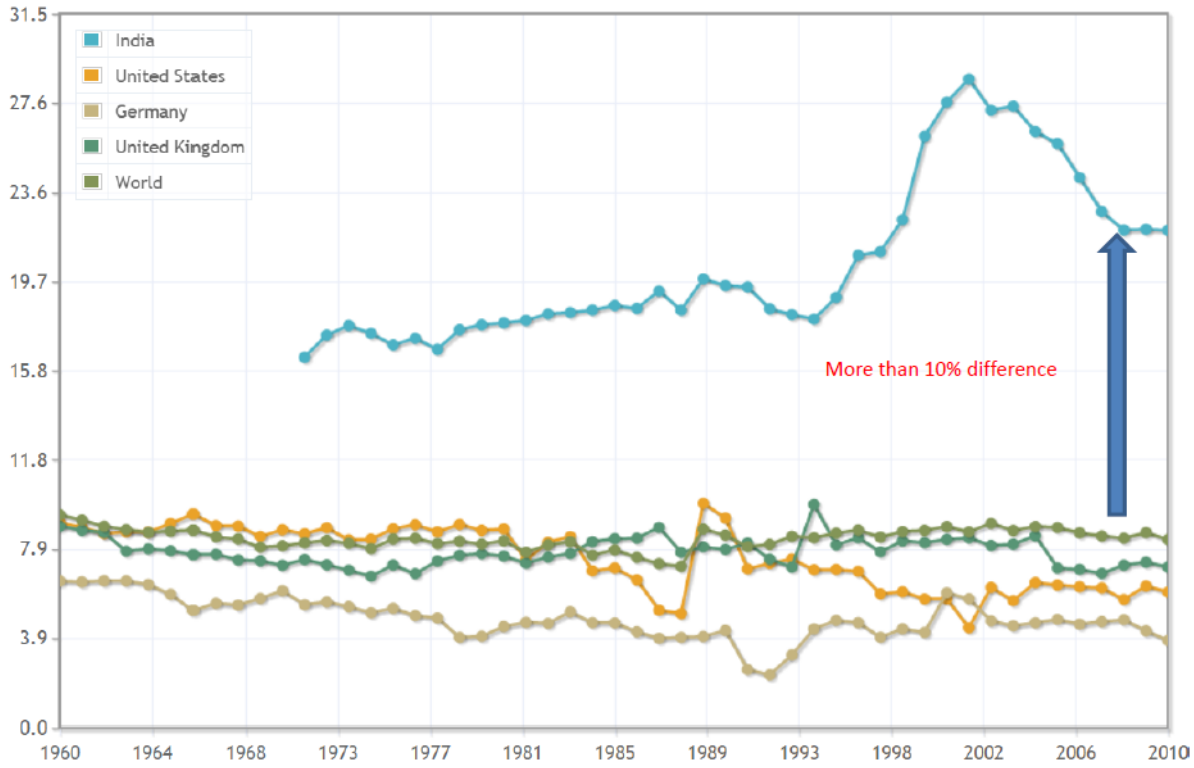
DISCOMs are the most crucial links in the electricity sector. As Shunglu committee report mentions, the performance of electricity sector can be captured by monitoring the performance of the DISCOMs. The DISCOMs have very high levels of energy consumption (Power purchased in 2013-14 was 8,28,368 MU) and losses (T&D Losses in 2013-14 were 1,93,750 MU which is 23.04%)[13] and thus provide for significant potential for energy savings.

Figure 5

Figure 5 shows the comparison of T&D losses between India and other countries. India's T&D losses figures are significantly higher than other countries, which also provides a huge opportunity for energy savings. Thus, it was imperative to include DISCOMs as a DC in PAT cycle-II.

[13] (World Bank, 2013-14)

Figure 5 T&D losses comparison between India and other developed countries



Source: The World bank, Electric power transmission and distribution losses, 2013-14

Table 3 Additional DCs in PAT cycle II

Sr. No	Sector	No of DCs in PAT I	Additional DCs in PAT II	Total No of DCs in PAT II
1	Aluminium	10	2	12
2	Chlor-Alkali	22	3	24
3	Textile	90	14	99
4	Paper and Pulp	31	4	29
5	Iron and Steel	67	9	71
6	Fertilizer	29	8	37
7	Cement	85	27	111
8	Thermal Power Plant	144	22	154
9	Refinery	NA	18	18
10	DISCOMS	NA	44	44
11	Railway	NA	22	22
	Total			**621**

Source: BEE website accessed on 12th August, 2017

Current targets provided in the PAT II notification (The targets for all the 44 DISCOMs are provided in Annexure I.) are arrived at, using following steps:

- Policy objectives is to reduce the energy losses by 7% between 2016 and 2019, i.e. 2.3% points per year = Net ESCerts of 2 MTOE. This will provide total savings of 19.6 +2 = 21.6 MTOE.
- Technical committee chaired by J.S (Distribution), MoP involving members from CEA, BEE, PGCIL, REC and selected Discoms constituted for devising the methodology, identifying the parameter and setting the target for monitoring and evaluation of performance of DISCOMs.

  T&D losses as a proxy indicator / parameter used. Overall reduction of 5.97% for the sector as a whole over a period of 3 years
- The targets may be revised in line with SERC target at a later stage as and when the targets figure for FY 2018-19 are made available. For the Discoms with single digit T&D losses, the target reduction will be zero.
- Threshold limit of Discoms based on AT&C losses is 1000 MU/ 86,000 MTOE
- The cumulative addition of AT&C losses above the threshold limit covers 44 Discoms, as shown in
-
-

Figure 6 Identification of DISCOMs as DCs using cumulative addition of AT&C losses for FY 2012-12

➢ [14]

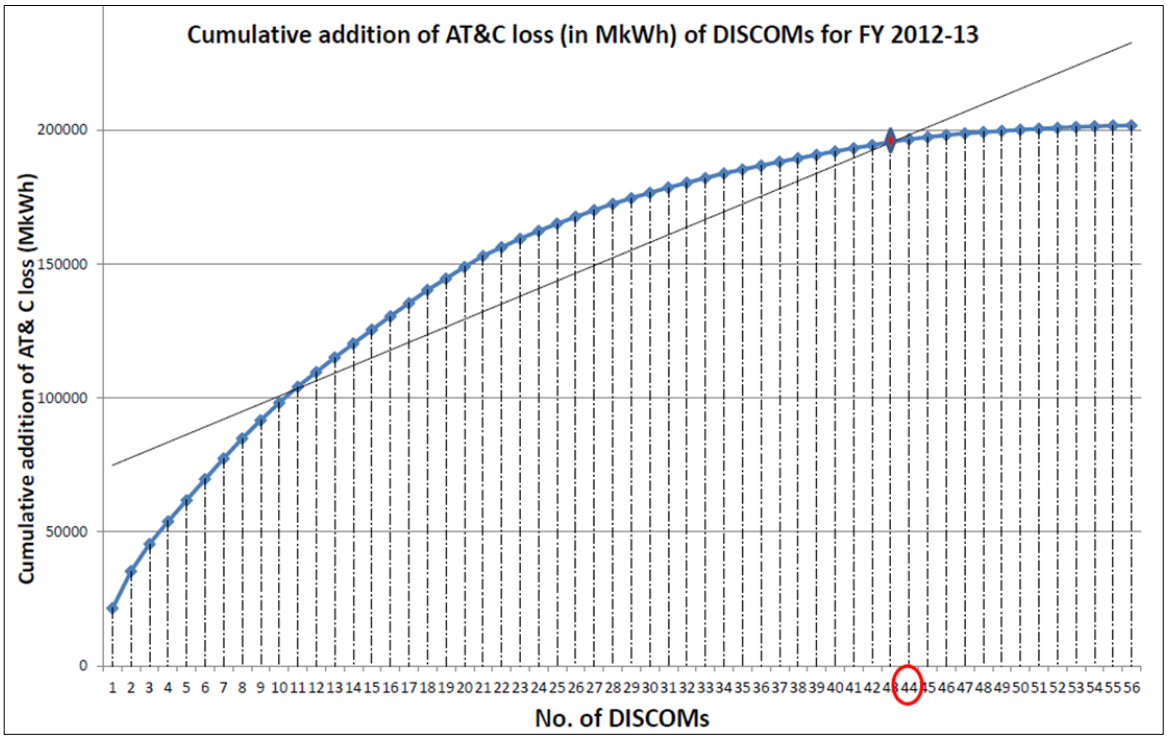


Figure 6 Identification of DISCOMs as DCs using cumulative addition of AT&C losses for FY 2012-12

Source: BEE website accessed on 12th August, 2017

[14] (Central Electricity regulatory Commission, 2016)

4. METHODOLOGY

The study utilized secondary data obtained from various government and quasi-government sources such as BEE website, various rules and regulations pertaining to energy conservation, efficiency and PAT scheme, tariff orders of central and state electricity regulatory commissions, UDAY and other portals of Government of India. The study draws threads from critical reports on financial status of DISCOMs such as Shunglu Committee report and reports produced by Planning Commission, Ministry of Power, Power Finance Corporation and World Bank, etc.

To understand the potential impact of PAT scheme in DISCOMs, the analysis is done with respect to three major aspects – harmony with existing regulatory environment, effectiveness based on incentives provided through PAT and effectiveness of penal provisions. These are explained below.

I. Harmony with existing regulatory environment

At present, along with PAT scheme, there are two major regulatory tools available in the existing regulatory environment, which are intended to directly or indirectly regulate the behaviour of DISCOMs pertaining to reduction in losses.

a. SERCs while reviewing the petitions submitted by DISCOMs for tariff setting, analyse and evaluate the current performance and provide targets for the next tariff period.

b. UDAY scheme, provides major targets – AT&C losses target at 15%, ACS-ARR (Average Cost of Supply – Average Revenue Rate) Gap to be Zero, in order to achieve its objectives.

As per the provisions of the scheme, states shall take over 75% of Discom debt as on 30th September 2015 over two years: with 50% of debt in 2015-16 and 25% in 2016-17. This debt will not be included in the estimation of state fiscal deficit by the central government. States will issue non-SLR and SDL bonds to banks and other financial institutions holding the debt. The remaining 25% of the debt shall be converted into loans or bonds by banks and shall be charged at base lending rate plus 0.1%. No prepayment charge to be levied on the debt by banks, which shall also waive of any applicable penal charges. states should take over future losses of DISCOMs without any support from FRBM act, as per trajectory in a graded manner. i.e. 0% of loss of 2014-15 & 2015-16; 5% of 2016-17; 10% of 2017-18; 25% of 2018-19 & 50%

of 2019-20. Balance losses to be financed through State bonds or DISCOM bonds backed by State Govt guarantee, to the extent of loss trajectory finalised with MoP.

Thus, state provides monetary support against the improvement in the performance by DISCOMs as per the targets given. We have provided the comparison between the targets provided in UDAY and in PAT scheme to establish the extent of coordination.

II. Effectiveness based on incentives provided through PAT

The study further determines approximate financial incentives provided by the PAT scheme.

a) The major incentives are provided through trading of ESCerts.

b) Another financial incentive will be the avoided investment in deferred capacity related to energy measurement and accounting. It is very difficult to determine exact value of incentives; however, an approximate estimation can be made using data available on IPDS (Integrated Power Development Scheme).

III. Effectiveness of penalizing the non-compliant

PAT scheme provides for penalty as enforcement mechanism. The study also identifies the level of penalty imposed on the non-compliant DCs.

5.1.1 Harmony with Existing Regulatory Environment

a) Comparison between T & D Losses targets by Respective SERCs and PAT II

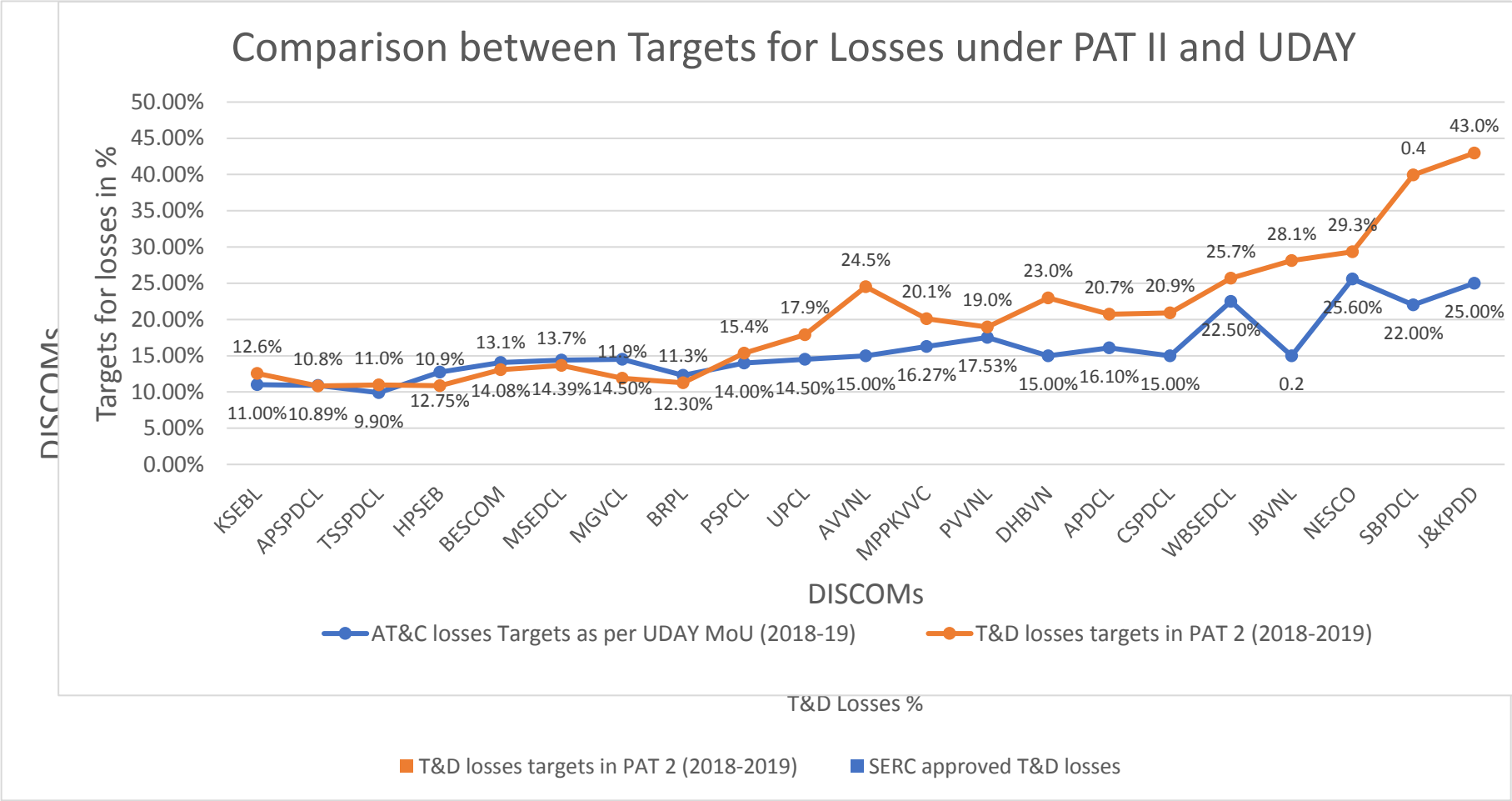
The Figure 7 shows the comparison between the T&D losses targets approved by respective SERCs for ongoing MYT / Last Tariff period and targets under PAT II. Out of 44 DISCOMs identified as DCs, the chart includes 13 DISCOMs. It is evident that for most of the DISCOMs target given under PAT II is higher than target given by SERC. In order to encourage the efforts for loss reduction by DISCOMs, most of the SERCs provide incentives for achieving better performance than the targets approved by them. Here, since PAT targets are higher than SERC targets, most of the DISCOMs are likely to achieve them, even with the ongoing business practices. Thus, it is anticipated that there will not be any additional investment made by DISCOMs to improve the energy efficiency or energy accounting to reduce the losses. With this, the possibility for transaction of ESCerts is minimal. There is no real incentive or threat (penalty) for DISCOMs to modify their behaviour.

b) Comparison between Targets for Losses under PAT II and UDAY

provides comparison between PAT II targets for T&D losses and UDAY targets for AT&C losses. It is well understood that the objectives of both schemes are different and thus regulators have chosen two different parameters. T&D losses can better represent energy inefficiency, while AT&C losses represent financial inefficiency. As explained previously, there prevails anomaly when we compare these targets. We can see clearly in the graph that for most of the DISCOMs, AT&C loss targets are lower than T&D loss targets, which is absurd and

shows lack of co-ordination between the various regulatory bodies. Another major point is that the financial and other capacity required to achieve these targets are already provided through the framework of one scheme. Under UDAY scheme, monitoring of the performance data is done by the regulatees only. This points out the possibility of discrepancies in the estimated data. Using the PAT scheme as an economic tool for regulating DISCOM's behaviour towards energy efficient technology and process may not be very helpful, because the tool itself is becoming ineffective in the absence of adequate incentives.

Figure 7 Comparison between T&D Loses Targets by SERCs and PAT II



Source: PAT targets from BEE website, notification PAT II, SERCs approved figures from respective orders. The list of orders is provided in the annexure.

Figure 8 Comparison between Targets for Losses under PAT II and UDAY

Source: PAT targets from BEE website, notification PAT2, UDAY targets from IPDS website[15],http://www.ipds.gov.in/IPDS_Order_Guidelines/ATandC_loss_Trajectory_13_04_17.pdf

[15] (Integrated Power Development Scheme, 2017)

5.1.2 Effectiveness through Incentives - Trading Potential for DISCOMs

To understand the incentives provided by PAT through trading of ESCerts, we need to determine the energy savings potential of DSM measures. The example of such DSM measure is provided in Box 1. As given in the box the DSM program for replacement of agricultural pump sets with energy efficient pumps can reduce the energy consumption of the state by 2.5 % with similar level of reduction in T&D losses.

Box 1 Impact of DSM through replacement of agricultural pump sets

Example: Replacement of agriculture pump-sets in Haryana

- 2,290 MUs consumed by 2 lakh agriculture consumers
- Average consumption per pump-set per year is 11,450 kWh (5-7 HP pump-set running for 6 hours a day, 330 days a year)
- Save 10% energy (~1,145 kWh per year/pump set) or 300 MUs for agriculture consumer base
- Approximately 2.5% reduction in overall consumption and thus T&D losses.
- Equivalent to 3 ESCerts. Assuming that the price of ESCerts will be more than the prevailing oil prices of one tonne viz. INR 10,968.

Financial Incentives Through PAT = 3 X 15000 = INR 45000

Therefore, Financial Incentives <<<< Investment for / Gain out of Energy Savings

If we assume the average unit cost of electricity at INR 5 / KWh, then the total cost of energy saved (300 Million units) would be of the tune of INR 150 Cr. Thus, it is established that DSM measures have very high potential for energy and thus financial saving. This will also need huge investments. But, the level of financial support provided through PAT is extremely low. As per the PAT rules 2016, 3 % reduction in T&D losses will fetch 3 ESCerts for the DISCOM, which is only 3 MTOE. There exists a serious discrepancy in the design of the scheme.

5.1.3 Value of avoided investment in deferred capacity

DSM measures reduce the energy consumption and thus help to serve more consumers with the same available capacity. Here, important thing to note is that PAT targets reduction of T&D losses. Due to reduction in capacity requirement, the investment on energy accounting

is also reduced to maintain the same level of supply quality and collection efficiency[16]. If we look at the quantum of investment made in order to improve the quality of supply and collection efficiency, DSM provides huge incentives in terms of avoided investment in deferred capacity. Study conducted by ISGF (India Smart Grid Forum) provides statistics on investment made through IPDS to improve energy accounting and quality of supply[17].

AT&C losses reduced from 34.78% in 2003-04 to 26.15% in 2010-11 (at all India level). For this loss reduction of around 9% (AT&C), computation of approximate investment made in electrical network are provided in

Box 2. It is estimated that DSM programs which can reduce the overall consumption by 10 %, can also help to avoid the investment of more than INR 1,00,000 Cr only related to energy accounting infrastructure, while not interfering with the quality level of supply. This is the biggest factor DISCOMs can utilise, while filing the tariff petitions. The financial estimation of

[16] (Department of Science and Technology, 2017)
[17] (India Smart Grid Forum, 2015)

benefits (through avoided cost) can be put up against the investment required for DSM programmes to evaluate the proposals.

Box 2 Avoided Cost of deferred capacity

Example: Avoided Cost of Deferred Capacity

A. By Govt. of India – through APDRP: INR 20,000 crore approx. + R-APDRP: INR 15,000 crore (approx. value of work executed by March 13) = Total: INR 35,000 crore

B. By States/ Utilities: INR 35,000 crore (Assuming similar level of investment)

C. Total (A+B): Rs 70,000 crore (Investment in reducing 9% AT&C losses)

- Future investment envisaged: It is assumed that for next 9% (AT&C) reduction from 26.15% to 17% the investment will be almost double from 70,000 crore to 1,40,000 crore

- Investment made for reduction from 17% to below 10% will again be double i.e., 2,80,000 crore

- Equal amount will be required to reduce transmission loss to 3% level. Thus, to reach at the T&D losses at par with developed countries, total investment required is close to 10 lac crore. If we could avoid investment by 10%, it could save INR 1,00,000 Cr, which is approximately 12% of total annual revenues of electricity sector in the country.

5.1.4 Effectiveness of Enforcement Mechanism

It is generally seen that the enforcement of a scheme / rule/ regulation may not require very high levels of penalties, but certainly requires level of penalty significant enough to motivate the efforts for compliance. PAT has provisions for three types of penalties imposed for the non-compliance.

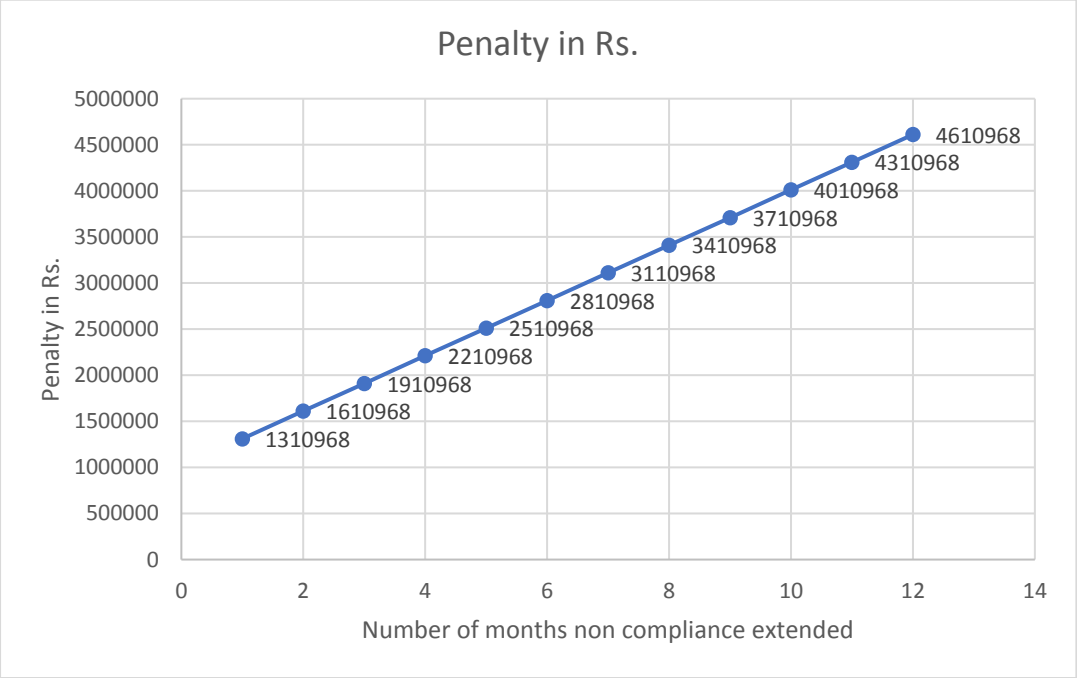
- Upfront penalty of INR 10,00,000
- Additional Penalty in case of continuing failure – may extend to INR 10,000/- for every day during which such failure continues
- Additionally, price of every TOE of excess energy consumed, for which ESCerts have not been purchased. price or value of one TOE of energy as INR 10,968 for the year 2014-15 as per 2016 amendment

- Section 26 also stipulates that any penalty which is payable and not paid may be recovered as if it were an arrear of land revenue

For our understanding, if we assume that a DISCOM is not able to comply the given T&D loss target by 1% and delays the purchase of ESCerts by 1 month,

then the penalty will be = 10,00,000 + 30 X 10,000 + 10,968 = 13,10,968 INR. Figure 9 shows the trajectory of penalty to be paid by non-compliant over a period of 12 months. If the non-compliance in the given situation extends to 12 months, then the total penalty will be INR 46,10,968. This is equivalent to 420 MTOE. However, in comparison with the investment required for achieving the intended energy saving, the penalty is too small to motivate the regulatees to comply.

Figure 9 Example of Penalty level for non-compliance



Source: MP Ensystems Research

6. OBSERVATIONS

The major focus of the study is to seek for the examples or possibilities which show the impetus provided by PAT scheme to DISCOMs towards loss reduction efforts. The analysis provides us with below given observations:

- The current provisions of PAT scheme are not very well aligned with the existing regulatory environment for efficiency improvement drive. The targets given under PAT are less stringent than the targets given by SERCs and UDAY scheme. The most expected outcome is that most of the DISCOMs will achieve the targets without making substantial investment. This may lead to the market scenario where all the players would want to sell the ESCerts gained and there will be very few takers, resulting into a market failure. Even if the transactions occur between the buyers (achievers) and sellers (non-achievers), the financial gain for achievers through sell of ESCerts is very small compared to actual savings in terms of MTOE and to the investments required to reduce the losses.
- The major instrument to channel incentives is through issuing ESCerts which could be traded in the market. The reward of one ESCert against the reduction in T&D losses by one Percentage Point is not congruent with the actual monetary value of savings achieved. The reward is too small against the efforts required.
- Another incentive to reduce the losses is the avoided cost of deferred capacity. Here, our analysis shows that any reduction in T&D losses through DSM programs provides for huge benefits. Until now it has never been the part of capacity planning DPRs (Detailed Project Reports). This should be incorporated in the tariff petitions filed for ARR (Annual revenue Requirement) determination processes.
- Although, the discourse on regulations world over has moved away from command and control approach, when we analyse the perceived monetary risk of non-compliance, it can be seen that the punitive measures mentioned under PAT scheme are not substantial enough to provide significant motivation for compliance efforts. In other words, the cost of non-compliance is too small against the cost of compliance and thus makes the tool less effective.

7. CONCLUSION AND RECOMMENDATIONS

The focus of the study was to assess the impetus provided to DISCOMS through PAT scheme and seek for opportunities to improve the effectiveness. PAT is an advanced regulatory tool designed to modify the behaviour of regulatees to reduce the inefficiencies of the production and distribution processes. At present, the scheme lacks the thrust required to achieve its intended objectives mainly because of its incongruent with other schemes and framework of the regulatory environment. There is a need to review the formula of issuing ESCerts against the achievement in energy savings. Currently, the estimated monetary value of ESCerts obtained is low compared to the investments required to obtain ESCerts. Only if the benefits exceed the cost of efforts for loss reduction can the intended objective be achieved. Additionally, an increase in the stringency of the targets is likely to provide demarcation between achievers and non-achievers that is necessary for the market mechanism to be effective. Market based regulatory mechanisms such as PAT scheme, work based on principles of soft hand regulations and thus stronger punitive measures will not help to improve the situation. In fact, the price discovery of ESCerts through trading will be indicative of necessary and prudent investment to be made to achieve intended energy saving. The major stream of incentive is the avoided cost of deferred capacity as mentioned in the earlier sections. Including DISCOMs in PAT is a good step, but the focus should be broader than just T&D losses. There should be a PAT-plus scheme, to get DISCOMs to work with larger consumers and carry out load management. PAT Plus should include BEE, DISCOMs, SERCs, CERCs and industries and issue LoadCerts along similar principles. These observations can be taken as inputs while planning for loss reduction programs by DISCOMs and SERCs.

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Annexure I: PAT Framework

PAT Scheme Policy, Rules and Regulatory Framework

Energy Conservation Act, 2001	• Empowers BEE to put in place the policies, rules and regulations to improve energy efficiency in energy intensive industries. • Provisions for energy efficiency improvement targets in energy efficiency are set under section 14, in a manner that reflects fuel usage and the economic effort involved
December 2006 - Notification of Rules	• To prescribe minimum qualification for energy managers designated or appointed under Section 14, clause (l) of the EC Act
Rules 2007	• Defining the form and manner for submission of report (Form 1) on the status of energy consumption by Designated Consumers
19th March 2007 - Notification of Designated Consumers	• Designated Consumer Sectors, and Energy Consumption Thresholds for Designated Consumers within each of the sectors. The notification also provides the GCVs of common fuels and the conversion factor for conversion of energy from kcal to toe
Amendments, May 2010	• Amendments to provide for trading of ES Certs
Regulations 2010	•Certification Procedures for Energy Managers •Qualifications for accredited energy auditors and maintenance of their list
Rules 2012 (PAT Rules)	• Detailed Rules of operation of PAT Scheme
30th March 2012 - Notification	• Energy Consumption Norms and Standards for the 478 Designated Consumers under PAT cycle 1
27th May 2014 Notification	•mandating DCs to get Energy Audit done by Accredited Energy Auditor
CEA recommendations and CERC regulations	➢ relevant to PAT scheme for the Power Plant sector and Trading of ES Certs
Power Market Regulations, 2010	➢Regulations related to trading of Electricity through various types of contracts including new contracts linked with electricity generated from renewable sources, e.g. Renewable Energy Certificates (REC), transacted on Power Exchange.
CEA Recommendations	•Operational Norms of Thermal Power Stations and Power Tariff Regulations – for TPP sector under PAT scheme relevant for PAT I
December 2015 - Notification	•Issued for DISCOMs having AT&C losses above 1000 MU as Designated Consumers
March 2016	•PAT cycle 2 Notification issued. New DCs with New Sectors added

Annexure II: T&D Targets – PAT, SERCs and UDAY

Comparison of T&D losses targets between PAT, SERC and UDAY

Sr No.	Discoms	SERC	Baseline T&D in 2014-15	T&D losses targets in PAT 2 (2018-2019)	Reduction in T&D losses %	AT&C losses Targets as per UDAY MoU
1	KSEBL	KSERC	12.97	12.55	3.24%	11.00%
2	APSPDCL	APERC	11.14	10.83	2.78%	10.89%
3	TSSPDCL	TSERC	11.3	10.98	2.83%	9.90%
4	HPSEB	HPERC	11.19	10.87	2.86%	12.75%
5	BESCOM	KERC	13.53	13.07	3.40%	14.08%
6	MSEDCL	MERC	14.17	13.66	3.60%	14.39%
7	MGVCL	GERC	12.27	11.89	3.10%	14.50%
8	BRPL	DERC	11.6	11.26	2.93%	12.30%
9	PSPCL	PSERC	16	15.35	4.06%	14.00%
10	UPCL	UERC	18.79	17.9	4.74%	14.50%
11	AVVNL	RERC	26.27	24.53	6.62%	15.00%
12	MPPKVVC	MPERC	21.24	20.1	5.37%	16.27%
13	PVVNL	UPERC	19.96	18.95	5.06%	17.53%
14	DHBVN	HERC	24.47	22.96	6.17%	15.00%
15	APDCL	AERC	21.93	20.72	5.52%	16.10%
16	CSPDCL	CSERC	22.14	20.9	5.60%	15.00%
17	WBSEDCL	WBERC	27.6	25.68	6.96%	22.50%
18	JBVNL	JSERC	30.46	28.12	7.68%	15.00%
19	NESCO	OERC	31.91	29.34	8.05%	25.60%
20	SBPDCL	BERC	45.07	39.95	11.36%	22.00%
21	J&KPDD	J&KERC	49.02	42.96	12.36%	25.00%

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