

Understanding future models for the voluntary carbon market – and the potential for it to support efforts to address climate change – is particularly relevant as an increasing number of organisations and individuals are concerned about climate change and are taking voluntary action to both reduce their emissions and to offset those that remain via the use of carbon credits.

Historically, carbon credits have mostly been generated from projects implemented in countries that did not have GHG emissions targets under the Kyoto Protocol. In this context, the carbon credit's emission reductions were only used by the buyer to achieve a climate change mitigation target or goal, and not by the country hosting the mitigation project. Under the Paris Agreement, however, all countries must formulate climate targets or actions in the form of nationally determined contributions (NDCs). This new context poses important challenges for the role that voluntary offsetting can play in the future, in particular whether and how voluntary purchasing and retirement of carbon credits fits into this new global framework.

Currently the voluntary carbon market (VCM) is small with demand around 95 million tonne of CO₂ equivalent per year, representing 0.2% of global greenhouse gas emissions. However, analysis¹ shows that demand is likely to increase significantly, driven by a growing number of corporate Net Zero commitments. This in turn will increase scrutiny that real emissions reductions are being achieved. As demand for carbon credits increases, the costs of undertaking real emission reduction projects will need to rise as lower cost projects are used up. If the financing of voluntary projects is to genuinely reduce emissions beyond those that would otherwise have occurred, today's average prices of \$3-5/tCO₂e will need to increase to \$20-50 per tonne of CO₂ equivalent by 2030 and potentially \$100 per tonne of CO₂ equivalent if governments undertake lower cost projects first. Prices are then expected to keep rising to 2050. **Brief about select global mandatory and voluntary carbon markets design, structure, price and volume trends are provided in Annexure 1.**

1.3 PAT Background

Perform Achieve and Trade (PAT) scheme is a flagship programme of Bureau of Energy Efficiency under the National Mission for Enhanced Energy Efficiency (NMEEE). NMEEE is one of the eight national missions under the National Action Plan on Climate Change (NAPCC) launched by the Government of India in the year 2008

The PAT Scheme is a regulatory instrument to reduce the specific energy consumption in energy intensive industries. Target definition under the PAT scheme is provided in figure below.

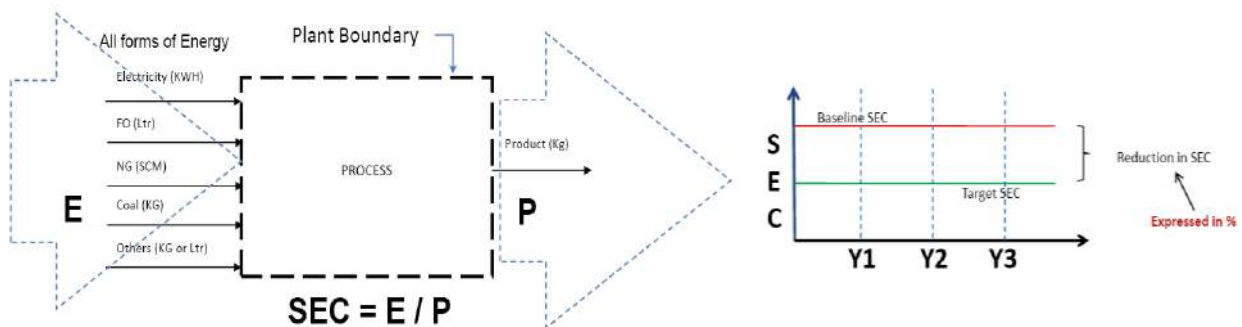


Figure 1 Target definition under PAT scheme

PAT is a completely market-based mechanism, focussed primarily on enhancing the energy efficiency of large energy intensive sectors through accelerated adoption of efficient and low-carbon technologies. A total of six cycles of the PAT scheme have been launched till April 2020, covering 1073 industries from 13 industrial and service sectors, which represents about 50% of the primary energy consumption of India. List of 13 sectors included in PAT are provided in figure below.

¹ Source: Future Demand, Supply and Prices for Voluntary Carbon Credits – Keeping the Balance, Trove Research, 2021

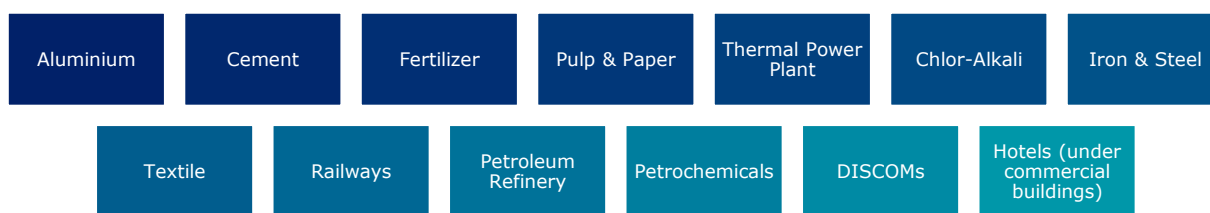


Figure 2 List of 13 sectors covered in PAT scheme

PAT Cycle-1

PAT Cycle-I, which concluded in 2015, had 478 units, known as “Designated Consumers” (DCs), from eight energy-intensive sectors, viz. Aluminium, Cement, Chlor-Alkali, Fertilizer, Iron & Steel, Pulp & Paper, Thermal Power Plant, and Textile. The baseline annual energy consumption of these DCs was around 164 million toe. Some key highlights from PAT Cycle-I are mentioned below²:

Table 1: Key highlights of the PAT-I cycle

Particulars	Unit	Value
Total Number of DCs	No's	478
Baseline Energy Consumption in PAT-Cycle-I	Million TOE	164.97
Energy reduction target	Million TOE	6.685
Energy savings achieved in PAT-Cycle-I	Million TOE	8.67
Energy Savings achieved in excess of target	Million TOE	1.985
Reductions in GHG emissions in PAT Cycle-I	Million Tons of CO2 eq.	31
ESCerts issued to over achievers	Million ESCerts	3.825
Purchase compliance of ESCerts for shortfall	Million ESCerts	1.42
Volume traded in 17 trading session	Million ESCerts	1.299
Balance ESCerts of PAT Cycle 1	Million ESCerts	2.53

PAT Cycle-2

In PAT Cycle–II (2016-19), three more sectors, viz., DISCOMS, Railways, and Refineries were added to the existing 8 sectors. The total number of DCs notified in this cycle was 621. PAT Cycle-II targeted to achieve an overall energy consumption reduction of 12.13 million toe. The estimated emission reduction from this was around 66.1 million tonnes of CO2. The expected investment on energy efficient project and technologies under PAT cycle-II was around INR 43,721 Cr².

Table 2: Key highlights of the PAT-2 cycle

Particulars	Unit	Value
Total Number of DCs	No's	621
Energy reduction target	Million TOE	12.13
Energy savings achieved in PAT-Cycle-I	Million TOE	14.08
Energy Savings achieved in excess of target	Million TOE	4.57
Reductions in GHG emissions in PAT Cycle-I	Million Tons of CO2 eq.	66.1
ESCerts issued to over achievers	Million ESCerts	5.7
Purchase compliance of ESCerts for shortfall	Million ESCerts	3.66

PAT Cycle-3

Since a decision was taken to put PAT scheme under the rolling cycle from PAT-II onwards, the third cycle was notified on 31st March 2017. The baseline year for Cycle-III was taken as 2015-16, and the target year is 2019-20. The total number of DCs notified were 116 from six sectors, namely, Thermal

² Source: Pathways for accelerated transformation in Industry sector: A report on Outcome of PAT cycle 2, June 2020

Power Plants, Iron & Steel, Cement, Aluminium, Pulp & Paper, and Textile. No new sectors were added in this cycle. The total savings target was given as 1.06 million tonnes of oil equivalent, which corresponds to a reduction of around 3 million tonnes of CO₂.

PAT Cycle-4

For PAT Cycle-4, the baseline year is taken as 2016-17 and the target year is 2020-21. A total of 109 DCs are likely to achieve a total reduction target of 0.6998 million tonnes of oil equivalent. These DCs are from eight sectors, consisting of six existing sectors and two new sectors. The new sectors are Petrochemicals and Commercial Buildings. Under Commercial Building sector, hotels have been identified as the potential designated consumer sub-sector for this cycle. The total expected CO₂ emission reduction from PAT-IV is around 2 million tonnes².

PAT Cycle-5

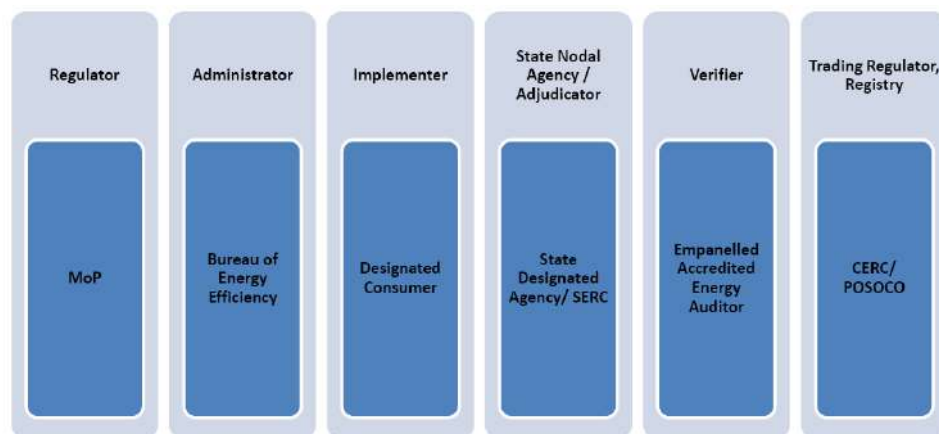
PAT Cycle-V has commenced with effect from 1st April 2019. Under PAT Cycle-V, 110 DCs from the existing sectors of PAT i.e. Aluminium, Cement, Chlor-Alkali, Commercial Buildings (Hotels), Iron & Steel, Pulp & Paper, Textile and Thermal Power Plant have been notified. The total energy consumption of these DCs is about 15.244 million TOE and they are expected to achieve a total energy savings of 0.5130 million TOE².

PAT Cycle-6

PAT Cycle-VI has commenced with effect from 1st April 2020. Under PAT Cycle-VI, 135 DCs from six sectors, i.e. Cement, Commercial buildings (hotels), Iron and Steel, Petroleum Refinery, Pulp and Paper and Textiles, have been notified. Cement grinding units has been notified separately as a sub sector of cement with threshold of 10,000 toe. The total energy consumption of these DCs is about 23.298 million TOE and they are expected to achieve a total energy savings of 1.277 million TOE.

1.4 ESCerts – Issuance, stakeholders, and Trading

As per PAT rules, when a designated consumer overachieves the notified SEC targets in compliance year, the ESCerts are to be issued by Central Government for the difference of quantity between notified target and achieved SEC. The DCs with SEC higher in compliance year than the notified target is directed to purchase ESCerts equivalent to quantum of shortfall. The various entities involved with PAT scheme are mentioned below:



Note: Designated Consumer = industrial company covered by the PAT scheme, CERC = Central Electricity Regulatory Commission

Figure 3: Key Stakeholders in PAT scheme

Apart from the above-mentioned entities, the two exchanges: Indian Energy Exchange (IEX) and Power Exchange India Limited (PXIL) play a crucial role in Escerts trading as well by providing platforms for trading. Governance process of PAT and trading mechanism is illustrated in figure 4 and 5.

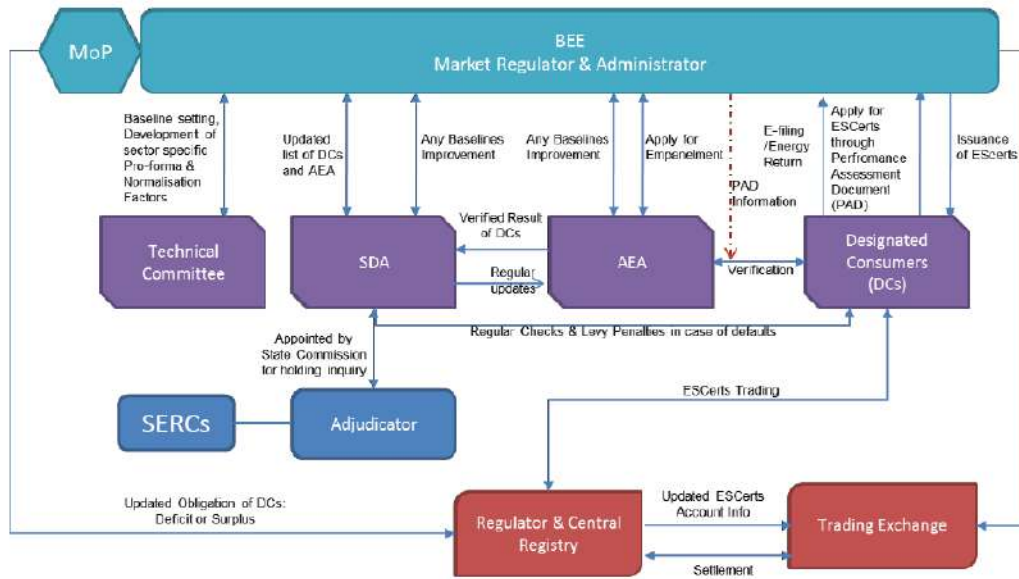


Figure 4 Governance process of PAT in India

The trading process overview is shown below

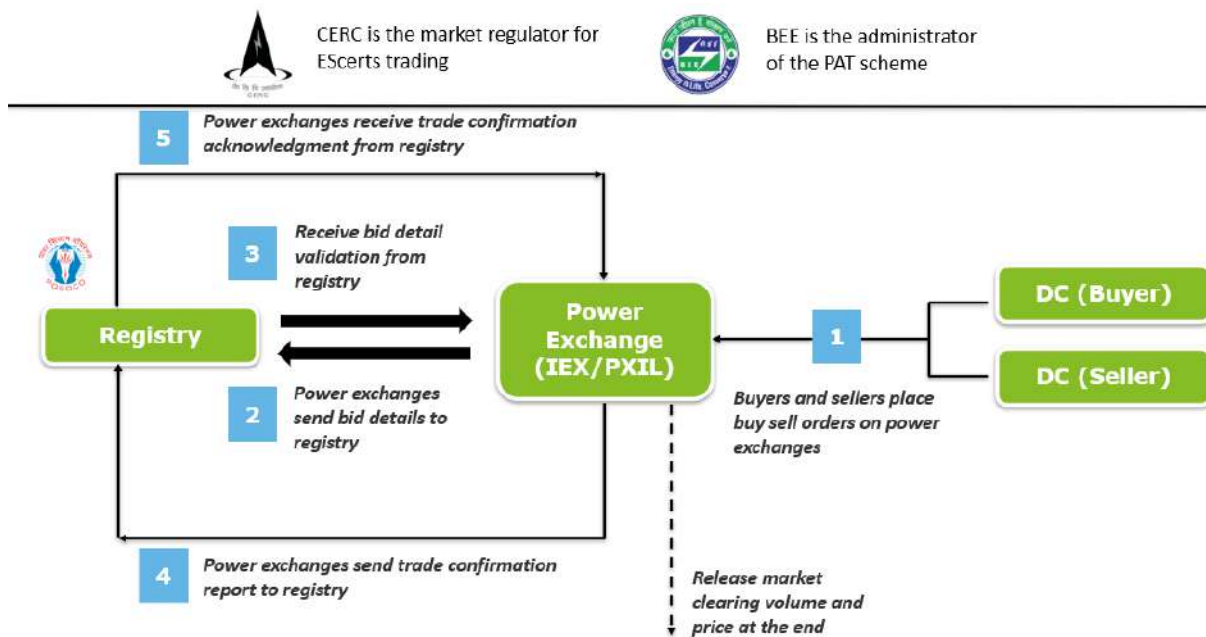


Figure 5: PAT Trading overview

1.5 Challenges seen in ESCerts trading

The success of PAT cycle-I resulted in 8.67 million toe of energy savings. In lieu of these savings, over and above the target, the DCs were awarded with tradable Energy Saving Certificates (ESCerts). From the assessment of PAT-I, around 309 DCs achieved in excess to their targets, thereby, adding to a total of 38.25 Lakh positive ESCerts. On the other hand, 110 DC could not achieve their target and were entitled to purchase a total of 14.25 lakh ESCerts. For PAT-I, out of 110 DCs who failed to achieve their target, 96 complied by purchasing ESCerts. A trading worth 100 Cr INR took place in 17 sessions with 12.9 lakh ESCerts being traded at a weighted average price of INR 768.5 per ESCerts. Details such as market clearing volume (MCV) and market clearing price (MCP) are provided in figure below:

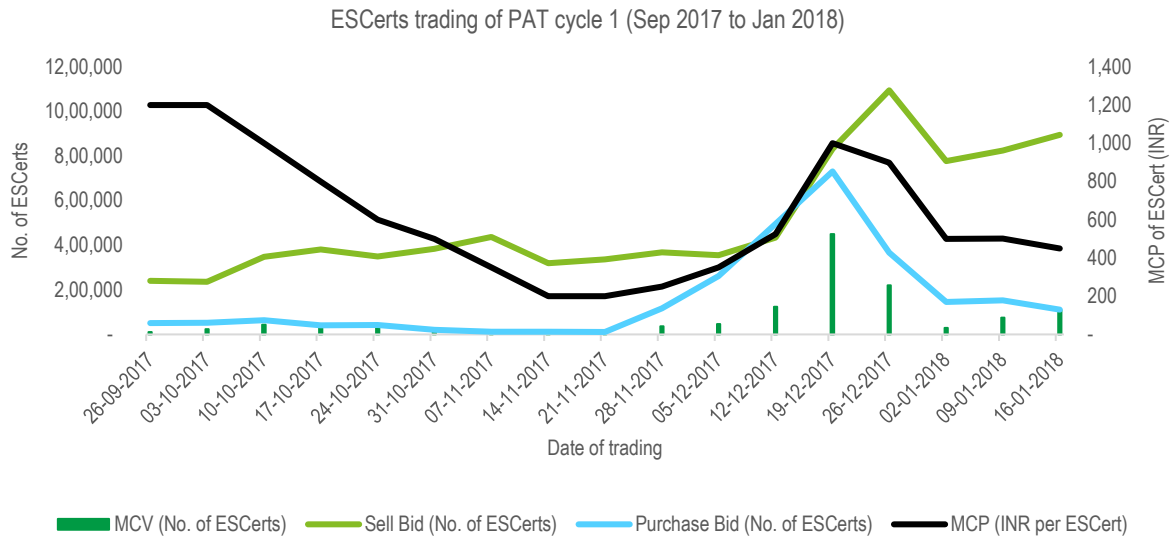


Figure 6 ESCerts trading of PAT cycle 1

Inference

- Basis the market trend of cycle 1 trading, the ESCerts is a buyers' market. The demand of ESCerts remained muted in during first two months of trading and picked up only during last month of compliance
- In 17 trading sessions, happened on every Tuesday, the MCP varied from INR 200 to INR 1200, with weighted average MCP of INR 768.50, which is about 7.3% of the price of one metric tonne of oil equivalent (or the penalty for non-compliance)
- At the end of the PAT cycle 1, there was surplus of 2.53 million ESCerts, which are banked for next PAT cycle.
- Banked ESCerts of PAT cycle 1 are expected to expire after completion of compliance of PAT cycle 2.

Future ESCerts market scenario

To understand future scenario of PAT trading, expected surplus ESCerts volume was estimated upto PAT cycle 6, with following assumptions:

- Actual trading numbers of PAT cycle 1
- Actual ESCert issuance and purchase compliance of PAT cycle 2, with assumption of 100% purchase compliance
- For PAT cycle 3 to 6, percentage over achievement of energy saving target is assumed at 20%

Based on above assumption, the surplus of ESCerts after each PAT cycle were estimated with following two approaches:

- Approach 1: Based on assumption that the ESCerts do not expire after successive compliance cycle and continue to remain valid till PAT cycle 6. The surplus after completion of compliance period for this approach is termed as "Cumulative surplus" in following graph.
- Approach 2: Based on assumption that the ESCerts expire after next compliance cycle from issuance cycle. The surplus after completion of compliance period for this approach is termed as "Cumulative considering retirement" in following graph.

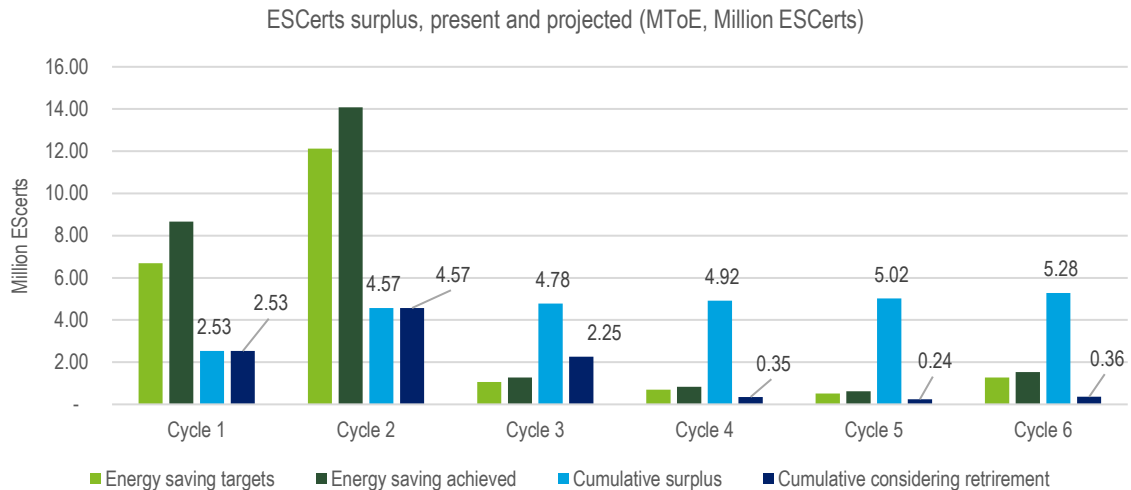


Figure 7: ESCerts status: Current and projected

Inference

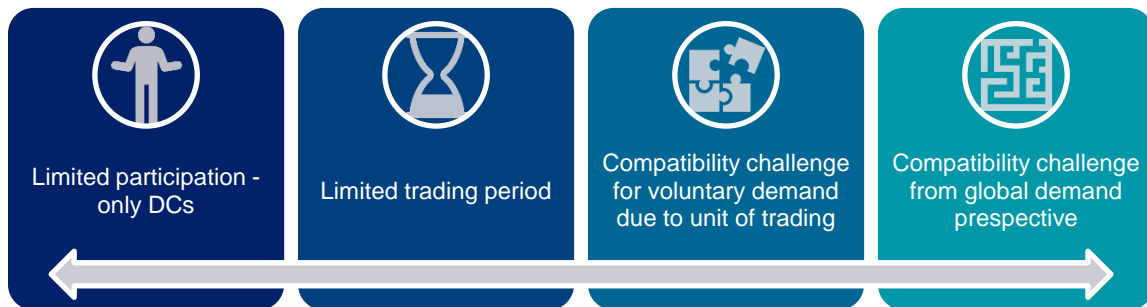
- With present rules, ESCerts of PAT cycle 1, if not traded during upcoming PAT cycle 2 trading will expire after PAT cycle 2 compliance period. **The expected desperation to sell a commodity, which is set to expire may result in lower MCP for ESCerts in terminal trading sessions**
- At the end of compliance period of PAT Cycle 2, surplus **ESCerts is expected to be 4.57 million ESCerts, which is 80% of the total ESCerts issued during PAT cycle 2.**
- **With present rules, at end of PAT cycle 3 compliance period, approx. 4 million ESCerts may retire without being traded.** This volume may go up if compliance is low in DISCOM sector, similar to the case observed in REC market for RPO compliance

While the PAT scheme has been able to significantly reduce emissions in the Indian economy, there has been a surplus in the ESCerts supply in the market. While this was evident in PAT Cycle-1 and is expected to continue into PAT-Cycle-II, a continued surplus supply and muted demand will lead to sustained lower prices in ESCerts trading and eventually deter DC's to make investments in EE technologies.

The PAT scheme is based on the premise that price of ESCerts shall act as an incentive for entities to invest towards energy efficiency profitably or where unable to buy ESCerts cost effectively. **To send a stable price signal, it may be useful to address the supply-demand gap.**

1.6 Major barriers in ESCerts trading

Major barriers identified basis the experience of two PAT cycles is provided in figure below:



Each of above-mentioned barriers are discussed in detail in subsequent sections.

1. Limited Participation – only DCs

In ESCerts trading, as per existing PAT rules, only designated consumers, having targets under PAT cycle can participate. Due to limited life of ESCerts, only DCs who have obligation of purchase in current cycle or expected shortfall in immediate next cycle, go for purchase of ESCerts.

A study on the participation of Indian companies Science-Based Targets initiative's (SBTi) 'Business Ambition for 1.5 C' campaign reveals that more than 60 private enterprises in India have either committed or set a target under the same. Currently of the 60 Indian companies that are a part of SBTi, 27 have already set a target for reductions in their scope 1,2 and 3 emissions by a specific target year.

To understand the potential demand of emission offset instrument, project team estimated annual offset requirement of 5 group companies, those are part of PAT as well as SBTi (with committed targets upto 2030).

Demand from such companies estimated with assumption that around 50% of the targeted emission reduction would be met through in-house energy efficiency improvement and renewable energy and balance 50% would be met through purchase of offsets.

Basis this estimation, expected annual requirement of mentioned 5 group of companies was found to be 2.1 million tonne of CO₂ equivalent on yearly basis to offset emissions (which is approx. annual demand of 1 million ESCerts). Thus, bringing the voluntary players in the market, which some GHG emission reduction commitments, by giving them an opportunity to trade in the instrument could unlock pent-up demand in the private sector side.

As of today, globally 5600 corporates have committed emission reduction on SBTi or CDP and expected offset requirement from such companies is estimated³ to be 270 to 950 million tonnes of CO₂ by 2030.

2. Limited Trading period

The ESCerts are traded at the power exchanges at the end of each PAT cycle of three years. During PAT cycle one, the trading lasted for around 4 months. Such a short window for trading makes it difficult to attract significant number of buyers as well as sellers on exchanges to increase traded volume and for better price discovery.

For example, in the REC market in India, the trading happens every month on the last Wednesday. A few international experiences are cited below that demonstrate that carbon markets have aimed for regular trading⁴:

- The China ETS, which is the largest Carbon market, was launched recently in 2021 and is currently being traded on the Shanghai Environment and Energy Exchange (SEEE) on a regular basis. In the initial phase, while only carbon-emitting utilities can participate, over time, financial institutions as well as individual investors would be included
- The Korea ETS (K-ETS) also is traded daily on the KRX since its inception in 2015.

What is the Science-Based Targets initiative (SBTi)?

The Science Based Targets initiative (SBTi) drives ambitious climate action in the private sector by enabling companies to set science-based emissions reduction targets. The SBTi defines and promotes best practice in emissions reductions and net-zero targets in line with climate science. It is also the lead partner of the Business Ambition for 1.5°C campaign - an urgent call to action from a global coalition of UN agencies, business and industry leaders, mobilizing companies to set net-zero science-based targets in line with a 1.5°C future

For more details refer <https://sciencebasedtargets.org/>

³ Source: Future Demand, Supply and Prices for Voluntary Carbon Credits – Keeping the Balance, Trove Research, 2021

⁴ "Trading begins under China's National ETS", IISD-SDG Knowledge Hub, Link: <https://sdg.iisd.org/news/trading-begins-under-chinas-national-ets/>, accessed: 15th October, 2021

- In the EU-ETS system, auctioning of allowances happens monthly on the European Energy Exchange (EEX)
- Under the Western Climate Initiative (WCI), of which the California, Quebec and Noa Scotia Emissions market are a part, the trading of allowances happens once in a quarter.
- REC market in India, when operational, the trading happened every month on the last Wednesday.

3. Compatibility challenge for voluntary demand due to unit of trading

The ESCerts are not denominated in terms of GHG reductions, which is the de-facto trading unit of most compliance based as well as Voluntary carbon markets around the world. Also, the voluntary emission reduction commitments taken by corporates in India and around the globe on SBTi/CDP are in terms of CO₂ emission reduction.

Developing a provision for fungibility of the unit trading from energy saving to emission reduction may attract voluntary buyers (and in future sellers, if required) to participate in ESCerts market, as it would make the trading instrument more fungible (in the short and medium term) and in the long term this may lead to international participation in the market as the adoption of the instrument increases. The figure below presents the demand for EE certificates in International VCMs⁵:



Figure 8: Voluntary carbon credit prices and demand 2019 by project type (average of wholesale and retail prices)

4. Compatibility with standards of issuance and verification in the International VCM

Currently, there are 4 major groups that take part in standards and process guidance: ART, Verra, Gold Standard and American Carbon registry, (apart from some smaller less prominent ones) are followed for issuance of carbon instruments traded across various voluntary and compliance markets. The validation, verification, and issuance processes for each of the standards are quite expensive, and in the Indian context, where the M & V process of PAT is unique in terms of local requirement, may pose challenge of compatibility, in case fungible ESCerts is used as offset instrument at global scale. Additionally, each of the standards has shown difficulty in capturing additionality, permanence, and prevention of leakage in each of the standards mentioned above.

⁵ Future demand, supply and prices for voluntary carbon credits – Keeping the balance, UCL, Trove Research, 2021