

“Comparative Analysis of REC, Carbon Credits & ESCerts”

A synopsis of the capstone report submitted in partial fulfillment of requirements for Masters of Business Administration (Energy Trading)
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STUDENT DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text.

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Many thanks and appreciations go to the colleagues in developing the project and to all those who have willingly helped us with their abilities.

MENTOR CERTIFICATE

This is to certify that the dissertation report entitled “**Comparative Analysis of REC, Carbon Credits and ESCerts**” submitted by **Aditya Singh Tomar** of UPES for partial fulfillment of requirements for Masters of Business Administration-Energy Trading is a bonafide record of the dissertation work carried out by him under my supervision and guidance. The content of the report, in full or parts have not been submitted to any other Institute or University for the award of any other degree or diploma.

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ABSTRACT

India has shown its concern towards the issues of global warming and reduce its adverse impact on environment through RECs, Carbon Credits and ESCerts. The renewable energy sector is undergoing changes rapidly. Renewable energy has begun to play a significant role in the energy security of the nation as conventional energy sources have become scarcer and quite expensive as well to import. The NAPCC, which in addition to India's response to climate change also tackles diverse issues such as energy security and industrial competitiveness.

My research includes analysis of the regulatory structure, trading procedure and mechanism, design and implementation of the REC, Carbon Credits and Energy Saving Certificates market in India as well its effectiveness in meeting the desired objective.

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Chapter 1: - Introduction

Overview Of REC, Carbon Credits and ESCerts

India has shown its concern towards the issues of global warming and reduce its adverse impact on environment through RECs, Carbon Credits and ESCerts. The renewable energy sector is undergoing changes rapidly. Renewable energy has begun to play a significant role in the energy security of the nation as conventional energy sources have become scarcer and quite expensive as well to import. The NAPCC, which in addition to India's response to climate change also tackles diverse issues such as energy security and industrial competitiveness.

India has target of 15% electricity generation via renewable energy sources by 2020. Under Jawaharlal Nehru National Solar Mission (JNNSM), the government is aiming to develop 20,000 MW of Solar energy by 2022. Regulations supporting the development of renewable energy in India are Electricity Act 2003 and National Electricity Policy of 2005. Under these act, implementation of renewable purchase obligation (RPO) is guided by the regulatory provision issued by respective State Electricity Regulatory Commission (SERCs).

Since the renewable energy is typically more expensive than fossil fuel based energy, it becomes financial burden on local distribution companies to meet their obligation because of their poor financial health. To address this mismatch and to achieve target renewable energy certificates (RECs) trading mechanism has been launched by MNRE.

Permit trading among polluting parties is now firmly established as a policy tool in a range of environmental policy areas. Carbon emissions credits, as proposed for carbon dioxide emissions from the energy sector, are based on the idea that a prevented emission is prevented forever.

Trading of carbon emissions credits among parties has been widely considered. The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC, 1998) accepts the principle that sequestration of carbon in the terrestrial biosphere can be used to offset emissions of carbon from fossil fuel combustion and introduces three processes for

cross-country transactions joint implementation, the clean development mechanism (CDM), and emissions trading.

The possibility of using carbon sequestration in the terrestrial biosphere has been recognized as a potentially powerful yet relatively low cost tool to offset carbon emissions. A purpose of carbon emissions credits is to eliminate the liability associated with a firm's (or country's) release of carbon into the atmosphere.

An issue for carbon sequestration is the extent to which a carbon offset can be a substitute, perfect or imperfect, for an emissions credit. To the extent that offsets lack permanence or require higher monitoring and transaction costs, their substitutability becomes less perfect.

The "Perform, Achieve and Trade" (PAT) mechanism is an innovative and challenging initiative that will be introduced under NMEEE (National Mission on Enhanced Energy Efficiency). The PAT mechanism will assign energy efficiency improvement targets to the country's most energy intensive industrial units. The targets will be set in such a manner that would reflect the current energy intensity of the installation vis a vis that of other installations in the same sector, and the economic effort involved in achieving the target.

Industrial units that achieve savings in excess of their target will be issued Energy Savings Certificates (ESCs) for saving in excess of target. Units that underperform can buy these certificates to meet their target compliance requirement. This will ensure that the total desired savings are achieved in the most cost effective manner.

Regulatory Structure

Renewable Energy Certificates (RECs)

Renewable Energy Certificates (RECs) basically hold responsible for the electricity generated from renewable energy sources. These are split from the physical electricity in to two products - the RECs personified in the form of certificates and in the form of commodity electricity that can be sold or traded separately.

One REC accounts for 1MWh of energy that is generated from renewable sources. RECs are flexible and they are not restricted to geographical or physical limitations of commodity electricity hence they show a great potential to be treated as the currency of renewable energy markets. RECs can also be used by entities that are obligated to signify their compliance with regulatory requirements, such as Renewable Purchase Obligations.

1 REC = 1 MWh of electricity that is generated from renewable energy source and is to be injected or is being counted to be injected (in case of self-consumption by eligible captive power producer) into the grid.

Energy Saving Certificates (ESCerts)

Introduction to PAT scheme

The Prime Minister of India released the National Action Plan on Climate Change in June 2008. This plan outlines eight Missions, one of which is National Mission on Enhanced Energy Efficiency (NMEEE). The objective of this mission NMEEE is to promote innovative policies, financing mechanisms, and business models that create and sustain markets for energy efficiency. Perform-Achieve-Trade (PAT) is one of the initiatives under NMEEE and many call it first “carbon market” in India. PAT mandates about 478 Business Units in Energy, Steel, Aluminium, Cement, Paper & Pulp, Textile and Chlor-alkali sectors to achieve specified energy efficiency target in the year 2014-15. The scheme further specifies reporting requirements, compliance process and a mechanism of developing “Energy Efficiency Credits market” in India.

PAT is a regulatory instrument to reduce specific energy consumption in energy intensive industries in India. It is a Market based mechanism to enhance cost effectiveness in these industries and at the same time focusing on the conservation of the environment. The scheme has introduced certifications (known as ESCerts), where the excess energy saving can be traded. Only Eligible entities would be permitted by Power Exchanges to trade these certificates.

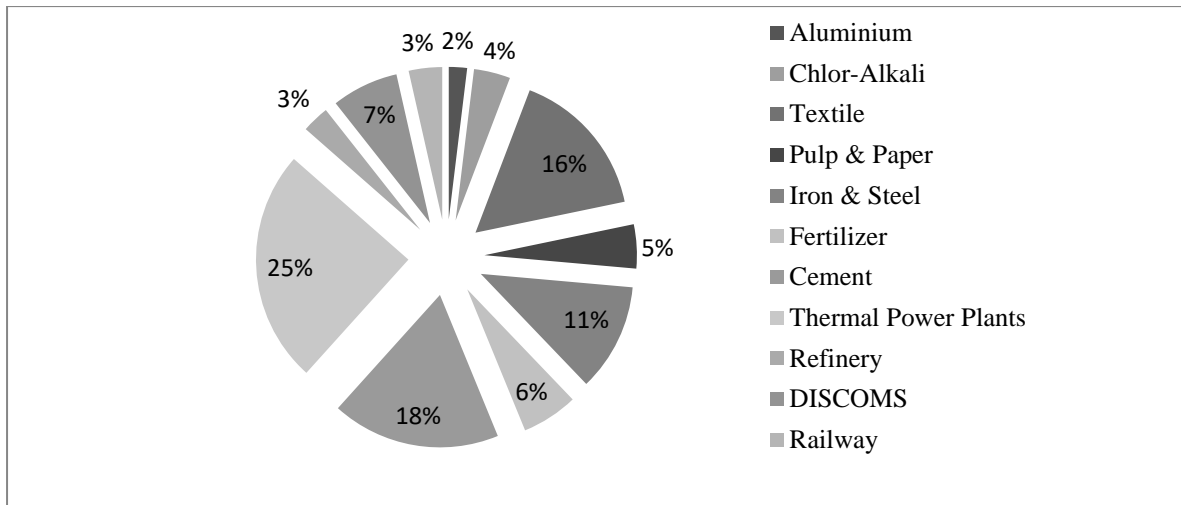


Fig: 1 PAT cycle II Notified sectors

The above figure shows the list of notified sectors by the ministry. These sectors were chosen based on their specific energy consumption. These industries are high-energy intensive sectors, which contributes to the major part of the Indian GDP.

Eligible entities to be issued ESCerts in electronic form in a cycle period for achieving specific energy consumption less than the energy consumption norms and standards notified by the Central Government, under Energy Conservation Rules.

Eligible entities whose specific energy consumption are more than the prescribed energy consumption norms and standards specified for a cycle period and who wish to comply with the prescribed energy consumption norms and standards using ESCerts for implementing energy conservation, efficiency improvement measures.

Any other eligible entity, as permitted in the EC Act on subsequent intimation by the Bureau to the Commission, shall be allowed to enlist for participating in dealing of ESCerts on Power Exchanges.

Carbon Credits

In order to provide quantitative limits on the greenhouse gas emissions, the Kyoto protocol agrees on the principle that sequestration of carbon from the terrestrial biosphere can be used for offsetting emissions of carbon from combustion of fossil-fuel. Carbon credits, for energy sector, are basically based on the idea, that a prevented emission can be prevented forever, and carbon credits can be traded among industries. If sequestered carbon is released subsequently to the atmosphere, it can prove advantageous to know the liability and who will assume that liability.

The Kyoto protocol has proposed United Nations Framework Convention on Climate Change (1998), a process that can establish quantitative and enforceable limits on the emission of the greenhouse gases to the Earth's atmosphere. The protocol contains commitments which are under negotiation, on greenhouse gas emissions from 2008 to 2012 for 38 developed countries and countries whose economies are in transition plus the European Community which is listed in its Annex B. The protocol says that, within prescribed rules, countries can remove the greenhouse gas CO₂ from the atmosphere into living plants, sequester the carbon in the terrestrial biosphere, and use that sequestered carbon for offsetting some of their greenhouse gas emissions from other sources.

Mechanism

Renewable Energy Certificates (RECs)

Entities that are obligated to purchase RECs

The entities, which are mandated to purchase a pre-defined quantum of renewable energy out of their overall consumption, are obligated entities. These obligated entities may either purchase their pre-defined quantum of renewable energy or can purchase RECs to meet their required obligation, defined under Renewable Purchase Obligation of respective States.

Entities that are generally obligated in the State:

- Distribution Licensees
- Captive Consumers
- Open Access users

Entities that are obligated to sell RECs

Obligated entities to sell RECs are mainly renewable energy generators who falls under following criteria:

- MNRE and respective State Commission are responsible for approval of the source from which the renewable energy is generated.
- Generators, who do not have any Power Purchase Agreement (PPA) for the quantum generated by them, can sell their power at a preferential tariff, which is determined by commission.
- Generators who do not have agreement to sell their power to local DISCOM at price not higher than the pooled cost of power purchased by that DISCOM.
- Generators can sell RECs to any licensee or to an open access consumer at a price mutually agreed by both, or can sell at price determined by market through power exchange.

Classification of RECs:

RECs are classified under two categories:

- Solar Certificates, these are issued to the entities whose generation is based on solar as renewable source of energy.
- Non Solar Certificates, these are issued to the entities whose generation is base on renewable source of energy other than solar.

Energy Saving Certificates (ESCCerts)

Dealing in ESCerts

- The exchange of ESCerts would be in accordance with the rules and byelaws of respective power exchanges in India. The frequency of exchange of ESCerts would be on monthly basis or in such periodicity as per the commission.
- All eligible entities that intend to participate in the exchange of ESCerts shall register themselves with the power exchange.
- Eligible entity can exchange the ESCerts either directly on power exchange or through member of a power exchange.
- In any trading session, an eligible entity shall not place sale bids in excess of total ESCerts held in its registry account. In case of breach, such eligible entity shall not be considered by the power exchange for the purpose of price discovery.

Table:1 Baseline Specific Energy Consumption for DC's

S.No.	Type of Industry / Sector Minimum	Annual Energy Consumption (Metric Ton of Oil Equivalent – MTOE)
1	Thermal Power Station	30,000
2	Fertilizer	30,000
3	Cement	30,000
4	Iron & Steel	30,000
5	Chloro-Alkali	12,000
6	Aluminum	7,500

7	Railways	30,000
8	Textile	3,000
9	Pulp & Paper	30,000

(*Source BEE)

The Table above provides the details for Baseline that is specified by the Bureau of Energy Efficiency, India (BEE) to the designated consumers, which are the industries with high-energy consumption. The DC's needed to adhere with the given target and auditing would be done for the same after the end of a cycle (i.e. 3 years).

Baseline calculation

- The Normalization procedure is depicted in the following steps:
 - Calculate the annual SEC for the last 3 years
 - Calculate the capacity utilization (CU) for the same period.
 - The average CU is also computed for the same period.

- The SEC for a specific year will be Normalized if:
 - If the deviation of the CU in that year is greater than 30% and
 - If the deviation of the SEC is more than 5% for that year, and
 - If production operations did not begin in that specific year, and

Targets & Penalties

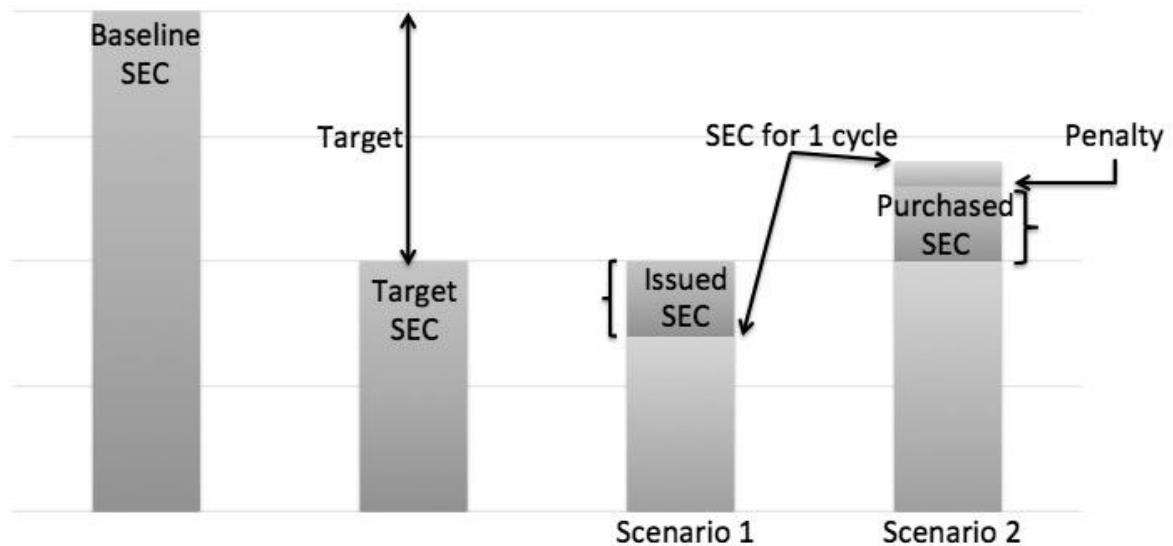


Fig: 2 Targets and penalties for DC's

The above figure shows two scenarios where in scenario 1, the DC has over achieved the target. Thus ESCerts are issued to this DC for the over achieved quantity. In scenario 2 the DC has not achieved the target thus they must buy the ESCerts of the underachieved quantity or must pay the penalties.

The Total National Target for cycle II is 10 mMTOE. A brief calculation of how the targets would be given to the sectors is explained further.

Example: Aluminium Sector

- Total Energy Consumption: 2.42 mMTOE
- Share of industry in total Energy consumption of 8 sectors : 1.01% (2.42 mMTOE of 240.52 mMTOE)
- SEC reduction target by aluminum sector : 0.10 mMTOE or 1,00,000MTOE (i.e. 1.01% of 10 mMTOE)

In accordance with energy conservation act 2001, linked with market value of oil equivalent the DC are liable to a penalty which shall not exceed ten thousand rupees for each such failures and, in the case of continuing failures, with an additional penalty which may extend to one thousand rupees for every day during which such failures continue.

1ESCert is equal to energy consumed in terms of 1MTOE. The market price of ESCerts shall be as discovered through the process of bidding at the respective Power Exchange. Fees & Charges would be determined by the commission in consultation with Bureau may from time to time determine, the fees and charges payable by the Eligible entities to the Registry for meeting the cost and expense for management of Registry and software platform.

Carbon Credits

The Kyoto protocol says that the net flows in or out the biosphere will be treated as change in carbon stocks, this will simplify the measurement and accounting to some extent. Along with this, Intergovernmental Panel on Climate Change (2000) sees sequestration as an increment in the carbon stocks, in some reservoir which is other than the atmosphere. Sequestration in a non-Annex B country shall be measured as per the baseline (the protocol demands that any CDM activity will be measured with respect to what would have happened in its absence), therefore protection of the carbon or slowing down the rate of carbon loss in a standing forest shall be permitted to qualify as sequestration even though the carbon stock is not increased in complete terms i.e. even if the base case might have involved higher forest clearing and higher loss of carbon.

The partial challenge of accounting arises because Kyoto protocol does not equally count all changes in carbon stocks in the biosphere or all emissions of carbon to the atmosphere.

Sequestration of carbon in an Annex B country might generate carbon credits and subsequent release of that carbon must generate corresponding emissions debits.

Since the countries that are not listed in Annex B of the protocol do not have any limits on their greenhouse gas emissions, it might be possible that a project in a non-Annex B country may result emissions credits known as ‘certified emission reductions’ (CERs), over a period of carbon sequestration, but there might never be any debits if the sequestered carbon was subsequently released back to the atmosphere, e.g. as the result of a fire or any other disturbance, or may be at the end of a project. Sequestration shall be used to offset emissions from an Annex B country, but there might be no guarantee of permanence for the carbon sequestered in a non-Annex B host country.

One of the fundamental objections is that non-Annex B countries have conveyed regarding the inclusion of carbon sequestration as part of the CDM might be the possibility of obligation in quality, and the implications for national sovereignty.

Trading Procedure

Renewable Energy Certificates (RECs)

Procedure for Issuance of RECs



Fig: 3 Procedure for issuance of REC

Accreditation (Through State Nodal Agency-SNA)

- SNA through this process authorizes or endorses the RE generator and also recommends it for registration.
- Generators that are eligible can get the approval not before 6 months from their proposed date of commissioning.
- Validity of Accreditation Certificate is 5 years from the date of accreditation.
- For separate projects separate applications are required.

Registration (Through Central Agency - National Load Dispatch Centre-NLDC)

- NLDC through this process gets the generator registered as Eligible Entity for its RE generation project.
- Generators or Eligible Entities can get them self-registered not before 3 months from their proposed date of commissioning.
- Registration can be done only when the concerned SNA provides the receipt of 'Certificate of Accreditation'.
- Validity of registration is 5 years from its date of registration.

Issuance (Through NLDC)

- State Load Dispatch Centre (SLDC) is responsible for recording metered electricity through energy accounting.
- NLDC is liable to issue RECs to the eligible entities equivalent to the amount of the electricity, which the entity has injected into the grid, after being certified by SLDC. The application to apply for RECs has to be filed within 3 months from date of renewable energy generation.
- Application can be filed either on the first day or on the fifteenth day of the month.
- RECs are issued to Eligible Entities within 15 days after submission of Energy Injection Report by State Agency & SLDC.

- The issued RECs must be sold within time period of 1095 days from the date on which they were issued or else they will lapse.

Trading (Through Power Exchanges)

- Sale and purchase of RECs issued to the Eligible Entity can be done only on Power Exchanges.
- The process for trading RECs through Power Exchange is a double-sided closed auction that happens on last Wednesday of every month.
- The bids can be placed for sale or purchase of RECs from 13:00 Hrs. to 15:00 Hrs. on the day of auction i.e. T-Day.
- Exchange notifies NLDC the details of maximum sale bids placed by each Eligible Entity by 15:30 Hrs.
- By 16:00 Hrs. NLDC verifies the availability of RECs with Eligible Entities.
- After the conformation from the NLDC, Exchange determines both the market prices i.e. Market Clearing Price (MCP) & Market Clearing Volume (MCV) and final details of the trade cleared are send to NLDC by 17:00 Hrs. for extinguishing of RECs.

Redemption (Through Power Exchanges)

- The Eligible Entities, which are obligated to purchase RECs through Power Exchanges, have to submit the purchased RECs to the concerned or specified SNA by their respective SERC.
- The RECs act as a proof for the SERC that, Eligible Entities are meeting or following their RPO.
- NLDC holds and maintain all the records of RECs purchased or sold or redeemed for self-consumption in the REC registry.
- CGPs availing concessional/promotional transmission / wheeling charges or banking facility or not meeting registration / project commission timelines as specified by CERC or criteria as per Electricity Rules, 2005, will not be eligible to retain RECs for self-consumption against their RPO as consumer.

Energy Saving Certificates (ESCCerts)

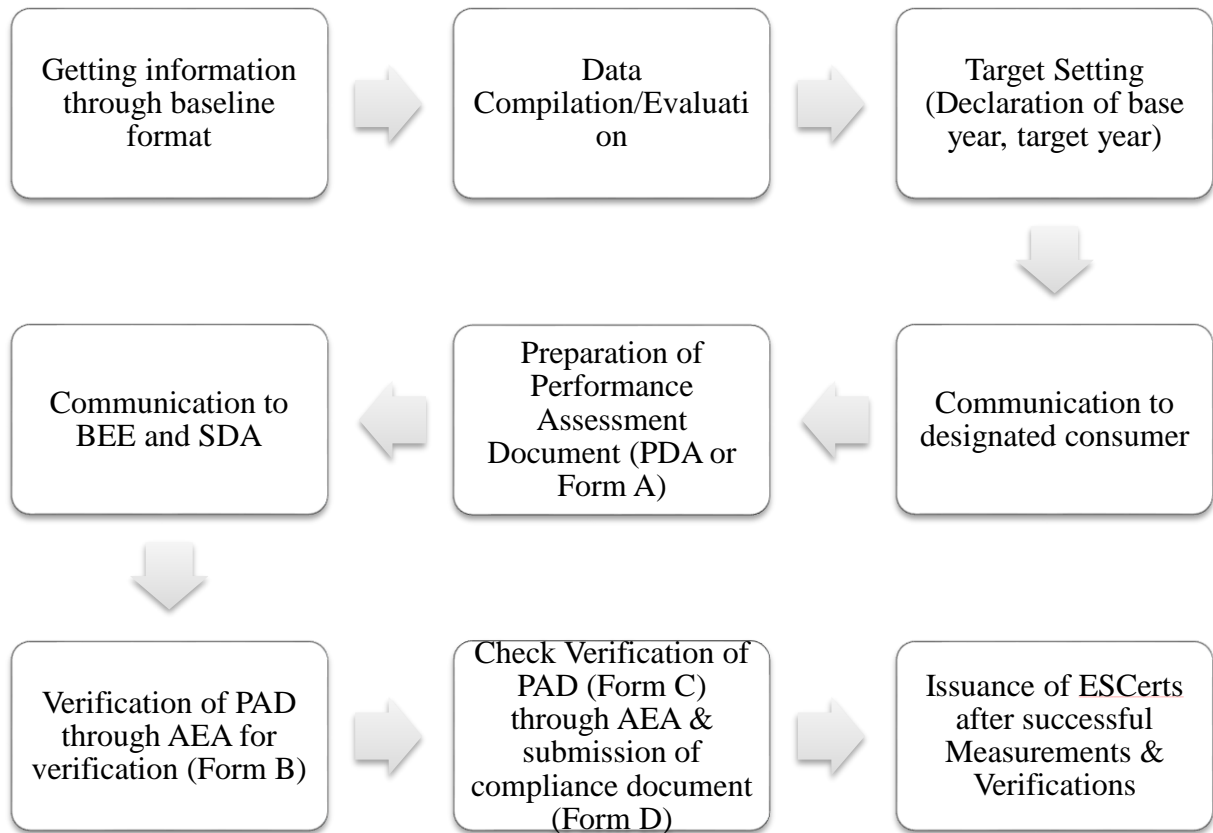


Fig 4: Process of issuance of ESCerts

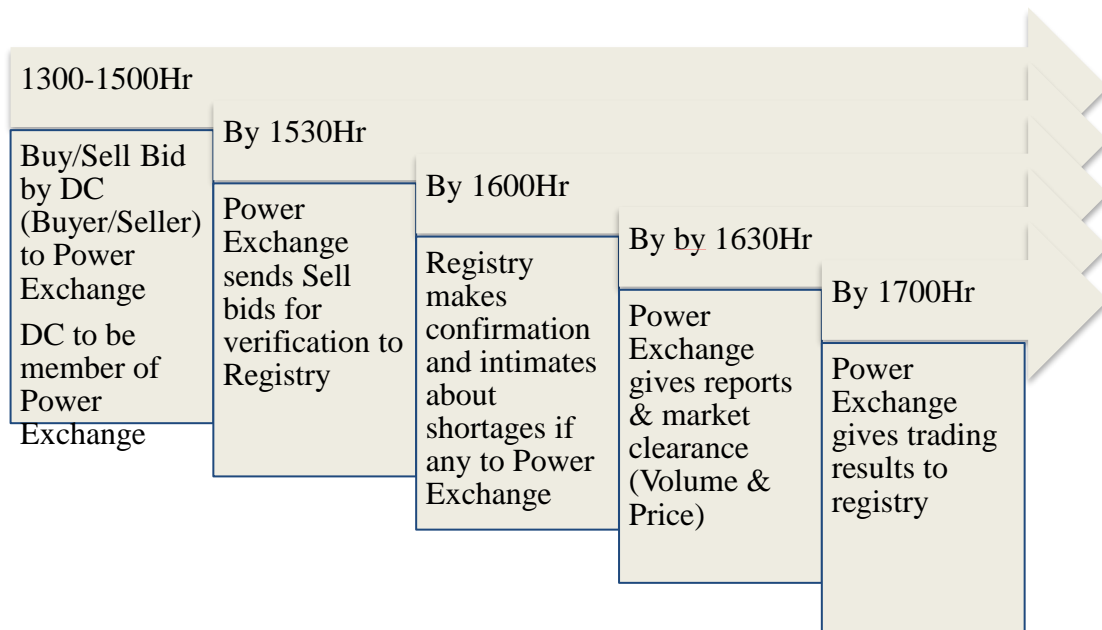


Fig: 5 Process Flow of ESCerts

Banking of ESCerts

Banking means the Energy Saving Certificates(ESCerts) issued by Ministry of Power (MoP) or purchased through Power Exchange(s) during the current cycle may be used by Designated Consumer for the purpose of compliance in next cycle.

Banking of excess ESCerts (purchased over and above the obligation) for next cycle. Subsequently, trading of the banked ESCerts in the next cycle. ESCerts carried forward would need suitable tagging.

Carbon Credits

Carbon credits “1 credit equals a one metric ton reduction” and carbon offsets are the basically tools that are being used by national and international communities as a tool for reducing emissions on industrial scale. Credits can be exchanged between business entities or can be purchased or sold in the markets. The carbon credit market is now well established. In 2006 about 5.5 billion dollars of carbon credits were purchased. The expectation from this market is to touch a trillion dollars mark within a decade. There are now five carbon exchanges that are operating across the global. The largest of them is the Chicago Climate Exchange.

The carbon trading system operates by permitting carbon reducing industries to gather credits which they can sell as carbon offsets to business entities which either voluntarily want to reduce their emissions or whose regulator caps require them to reduce emission.

Salient Features

Renewable Energy Certificates (RECs)

Table: 2 REC Highlights

KEY HIGHLIGHTS OF REC	
Drivers	<ul style="list-style-type: none"> • Renewable Purchase Obligation specified by State Commissions • Provisions to set RPO targets under EA-2003 • NAPCC • JNNSM • National tariff Policy • National Electricity Policy
Objectives	<ul style="list-style-type: none"> • Effective implementation of RPO obligations across all states • Creating competition among competing RE technologies • Protecting the local distribution licensee selling RE • Overcoming geographical impediments to use RE • Reduce the costs for RE transactions
Floor & Forbearance Price	<p>Non-Solar:</p> <ul style="list-style-type: none"> • Floor Price: Rs 1000/REC • Forbearance Price: Rs 2900/REC <p>Solar:</p> <ul style="list-style-type: none"> • Floor Price: Rs 1000/REC • Forbearance Price: Rs 2400/REC (As of 1st April 2017)
Validity of REC	1095 day from the date of issuance

Energy Saving Certificates (ESCerts)

Eligible Entities for Trading in ESCerts

- Eligible entities to be issued ESCerts in electronic form in a cycle period for achieving specific energy consumption less than the energy consumption norms and standards notified by the Central Government, under Energy Conservation Rules.
- Eligible entities whose specific energy consumption are more than the prescribed energy consumption norms and standards specified for a cycle period and who wish to comply with the prescribed energy consumption norms and standards using ESCerts for implementing energy conservation, efficiency improvement measures.
- Any other eligible entity, as permitted in the EC Act on subsequent intimation by the Bureau to the Commission, shall be allowed to enlist for participating in dealing of ESCerts on Power Exchanges.

Dealing in ESCerts

- Exchange of ESCerts shall be in accordance with the rules and bye laws of respective power exchanges
- The frequency of exchange of ESCerts shall be on monthly basis or in such periodicity as per the commission
- All eligible entities who intend to participate in the exchange of ESCerts shall register themselves with the power exchange
- Eligible entity can exchange the ESCerts either directly on power exchange or through member of a power exchange
- In any trading session, an eligible entity shall not place sale bids in excess of total ESCerts held in its registry account. In case of breach, such eligible entity shall not be considered by the power exchange for the purpose of price discovery.

Pricing of Certificates

- 1ESCert = Energy consumed in terms of 1MTOE
- The market price of ESCerts shall be as discovered through the process of bidding at the respective Power Exchange.
- Fees & Charges : Commission in consultation with Bureau may from time to time determine, the fees and charges payable by the Eligible entities to the Registry for meeting the cost and expense for management of Registry and software platform.

Entities Involved for Trading Mechanism

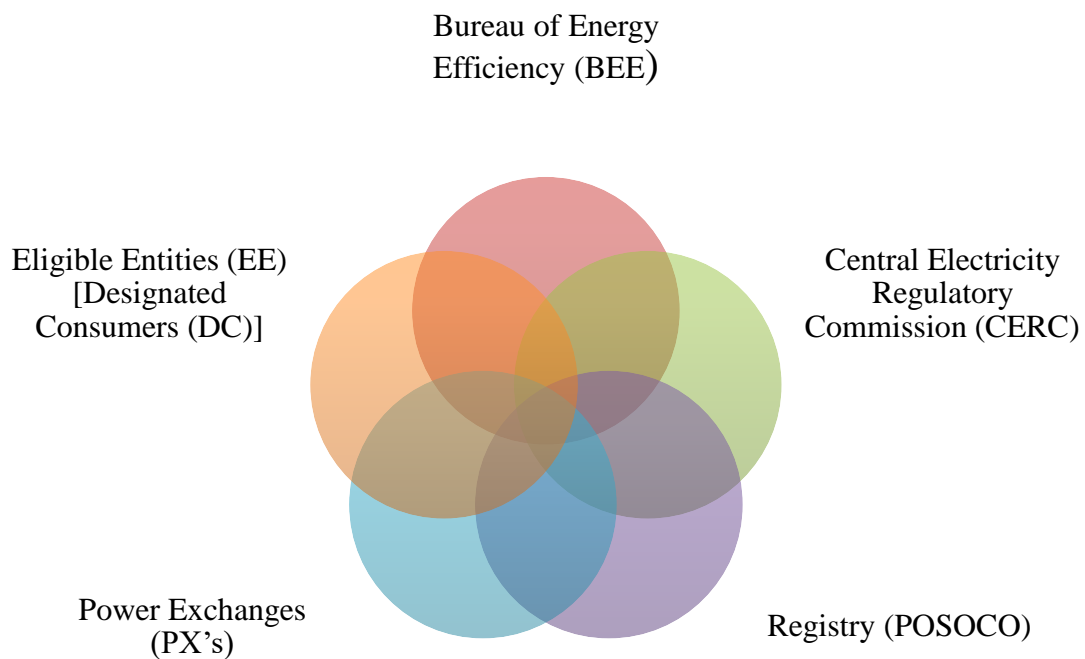


Fig: 6 Entities involved for Trading

Issues Faced by Industry

Renewable Energy Certificates

Monitoring

- The SNAs are not being able to keep proper check on the obligated entities. So, the clarity regarding purchase and sell of REC by obligated entities to fulfil their obligation is missing.
- There is no real-time compliance status available. Many SNAs are unaware about the obligated entities in their respective state.
- REC was basically introduced to compensate for RE Power but the RE power is getting reduced day by day, so trading of REC is ultimately getting quiet.

Enforcement

- In some states regulations are very different from the model REC regulations. In such states trading of RECs gets discouraged due to lack of clarity of regulation.
- There is lack of stringent enforcement provisions in the regulation. Obligated entities are not very strictly made to follow the regulations, many states also allow carry forwards of RECs in meeting RPO. Also, penalty clauses are not invoked in case if any obligated entity has no fulfil his obligation.

Energy Saving Certificates

Regulatory Related Issues

- The regulators are still not clear about the framework and methodology for PAT.
- BEE has still not suggested any guidelines or measures for reduction in energy cost.
- Still there is no focus on the 'Measurement and verification', which is an important part of baselining and improvement.

- No incentives are given to the power plants for reducing the auxiliary power consumption as there is no clause in the PPA on the sale of additional energy achieved because of efficiency improvement.
- No adjustments are mentioned in SECerts for installation of additional pollution control equipment as per the stringent CPCB norms.

ESCerts Related Issues

- With no clarity on price ESCerts, it gets very difficult to justify any capex investments to the top management of the DC.
- The fear of oversupply of ESCerts will affect the ROI for the investment in energy efficient projects by the DCs.

Carbon Credits

By using free market model, the polluters too often make the decision that their cost of reducing the emissions by utilizing best of technologies, higher efficiency and conservation standards. It is far cheaper to pollute the environment and then buy credits so as to change their production processes.

Since credits bring along the potential of profit, there might occur a chance of unconditional incentive for companies to help them maximize their carbon footprint and at latter stage can get credit for cutting back.

There are various certifications stands which try to create a baseline as per which true carbon reductions can be measured, but still verification is falling short.

Chapter 2: - Review of Literature

- Renewable Energy certificate markets in India – A review 12 July 2013

Gireesh Shrimali, Sumala Tirumalachetty

This article explains the regulatory structure, mechanism and essential aspects regarding trading of REC's. It also highlights the objective of introducing the RECs and the targets that are to be achieved with their help.

- Inter-trading permanent emissions credits and rented temporary carbon emissions offsets: some issues and alternatives 14 May 2003

Roger A. Sedjoa, Gregg Marlandb

This article explains the regulatory structure, mechanism and essential aspects regarding trading of Carbon Credits. It also highlights the objective of introducing the Carbon Credits and the targets that are to be achieved with their help. It gives the over view of the about the liability, rental alternative and market relationship between permanent and temporary credits.

- "Analysis of the potential of Mandatory Trading in energy saving certificates to drive energy efficiency in the Indian industrial sector"

This article explains the regulatory structure, mechanism and essential aspects regarding trading of ESCerts. It gives the over view of the sector, consumption of energy by each sector and ways to ensure participation. It also highlights the objective of introducing the ESCerts and the targets that are to be achieved with their help, the cost involved and financial support mechanism.

- EE_in_India_PAT_The_Way_Ahead July 2014

The articles explain the challenges and hurdles faced by the market in the implementation of ESCerts. It highlights the key points that can help in strengthening the regulatory structure and make trading process more transparent and easy.

- http://www.forestecologynetwork.org/climate_change/credits_%26_offsets.html

The articles explain the challenges and hurdles faced by the market in the implementation of Carbon Credits. It highlights the key points that can help in strengthening the regulatory structure and make trading process more transparent and easy.

- http://edgar.jrc.ec.europa.eu/news_docs/jrc-2016-trends-in-global-co2-emissions-2016-report-103425.pdf

Dec 2016

The report provides insides about the carbon credits and the impact of carbon emission globally. It throughs light trends in CO2 emission globally and in India, how India can reduce its carbon emission.

- <http://shaktifoundation.in/wp-content/uploads/2014/02/REC-Framework-Short-Term-Report.pdf>

The articles explain the challenges and hurdles faced by the market in the implementation of Renewable Energy Certificates. It highlights the key points that can help in strengthening the regulatory structure and make trading process more transparent and easy.

Chapter 3: - Objectives

The objective of this research **is to perform Comparative Analysis between RECs, Carbon Credits and ESCerts** which will determine the following sub-objectives: -

- To understand the difference between the regulatory structure of REC's, Carbon Credits and ESCerts.
- To understand the difference in the mechanism and the trading procedure used for the three.
- To identify and highlight the salient features of the three products in the Indian power market.
- To analyze the present scenario in the Indian power market, to analyze the performance of these products.
- To find out the issued faced by the market due to regulatory structure and also in trading of these products.
- To analyze the future scope of the three products, whether they will really be helpful to achieve their objective or will lose their objective with time.

Chapter 4:- Research Methodology

The research methodology which is used is Exploratory Research where focus is on understanding the response of the industry and critically examine the reasons of underperformance of design and implementation of REC's, Carbon Credits and ESCerts in Indian power market despite of following tough market, pricing mechanism recommended for stable market.

Research Description

The research conducted for this study is descriptive in nature. The data has been collected through secondary resources for this study. The data has been used in conducting the analysis that helps in understanding the industry response, objective, design and implementation of the REC, Carbon Credits and Energy Saving Certificates market in India as well its effectiveness in meeting the desired objective.

Chapter 5: - Present Scenario

Renewable Energy Certificates

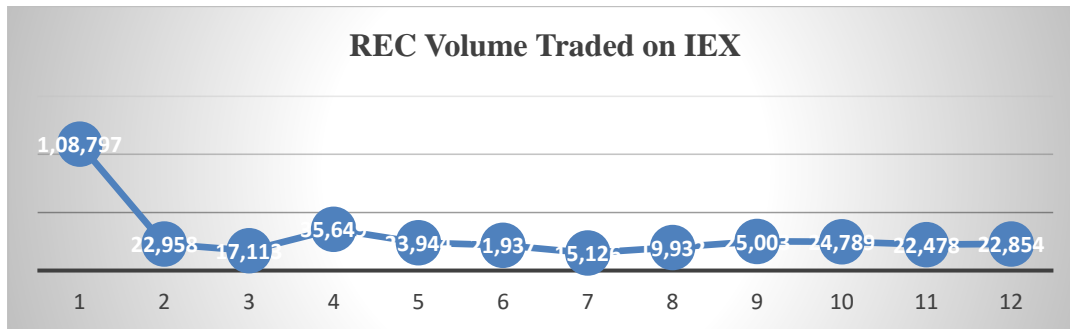


Fig: 7 RECs Volume Traded on IEX for Last 12 Months

RECs were introduced for compensating for RE Power but with day to day drop in the sale and purchase of RE power, trading of REC is also being impacted. The trend for trade of REC over last 12 months has shown down side movement. Also, no stringent penalty regulations are there for not fulfilling the obligation. Because of these reasons, RECs are not actively traded and are losing their purpose.

Energy Saving Certificates

ESCerts were introduced to reduce specific consumption of the DCs. But due to lack of clarity in the price and mechanism for trade of ESCerts DCs have opted to use more energy efficient equipment's and back up energy to reduce their specific consumption. So, with the advancement in technology the lack of clarity in methodology the concept of ESCerts is finding hard time to get implemented completely.

Carbon Credits

The concept of Carbon Credits has already vanished. This is due to the fact that sole purpose of carbon credit was to reduce the carbon footprint. But by use of other products like alternative fuel, E-vehicles etc. the industries have already managed to reduce their carbon footprints.

Chapter 6: - Future Scope

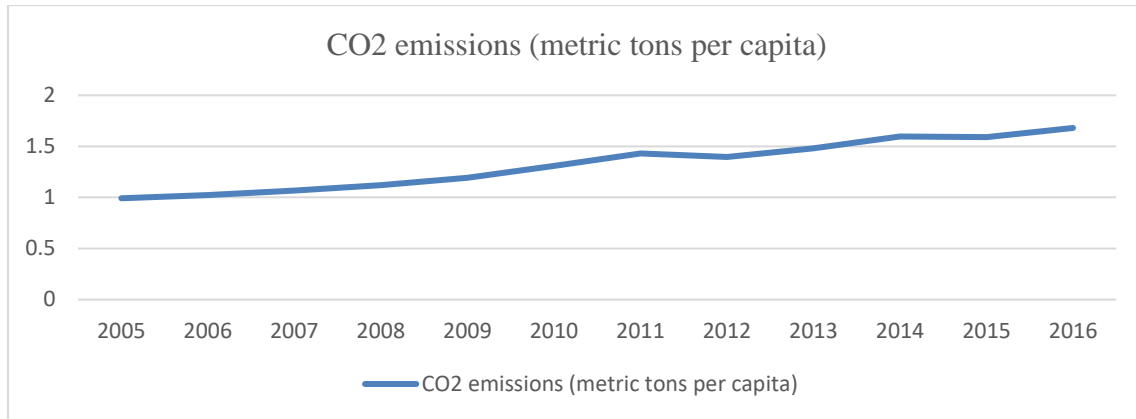


Fig: 8 CO2 Emission Trend for Past 10 Years of India

Source: World Bank

With increasing concern of the world for reducing the global carbon footprints, India is also under pressure of reducing its carbon emission. India contributed to 6.3% of all global emission in 2016. Researchers believe that carbon emissions from burning the fossil fuels are projected to further rise in future. Carbon emissions growth in year 2013 was 0.7% and in year 2015 was 2.3%. CO2 is responsible for causing global warming and climate change and India's emissions grew by 40% from 2000 to 2010.

India must promote develop more robust regulatory structure for products like RECs, Carbon Credits and ESCerts to reduce carbon emissions and keep check on the environmental impact. These products will not help India reducing the carbon emission but also will play a major supporting role in promoting the RE power.

Chapter 7: - Recommendations

Renewable Energy Certificates

- Forum of Regulators needs to take ownership for setting of RPO targets by various states, as per NAPCC and Tariff Policy. Also, guideline for RPO monitoring and bringing all states on common platform for monitoring and penal mechanism for non-compliance.
- Direct obligation should be imposed on large customers. This will eliminate many issues related to RPO compliance such as financial condition of utilities, compliance capabilities and enforcement of penalties. Since a significant proportion of the compliance requirements can be met through the REC mechanism. Therefore, it becomes important to ensure right kind of monitoring and compliance processes for implementing such direct obligations in a transparent, fair and cost effective manner.
- SERC can be introduced for overseeing RPO registry under the SLDC for accounting and monitoring.
- RECs should be issued from the date of generation instead of the date of registration, this will result in minimizing loss in case of project delay.

Energy Saving Certificates

- Strong monitoring and reporting system must be built in order to gain confidence and linkage should be made to international carbon markets & global EE funds.
- Transparency should be there in setting Baselining and Target in Cycle II.
- More clarity is needed on trading mechanism and price bands for ESCerts.
- T&D sector and Railways must be included as they have huge energy losses and very high potential for improvement.
- DENAs should participate more actively beyond data collection and must provide energy performance improvement measures to DCs.

Carbon Credits

- A competent regulatory body is required that can give credits only to the companies and projects that require credits to grow.
- A detailed understanding of economy, new technologies and all the industries is required.
- A carbon dioxide tax that assigns a direct cost to things should be regulated to work better.
- Carbon dioxide emissions must be made expensive, and then let the market work out, the best possible way to deal with those costs.
- A mandate system with caps and targets is required.

Chapter 8: - Bibliography

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