

Energy credit cards and incentives for energy growth in India

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The energy sector in India is undergoing a major transformation and economy uplift by opting for renewable energy sources. Presently, 36 GW renewable energy generation (REG) plants are installed with 175 GW expansions by 2022. Incentives/taxes have contributed in accelerating energy growth worldwide. An integrated energy credit card (ECC) is proposed as a positive force for policy reinforcement in India to achieve REG growth. The ECC will accumulate eco-credits as R&D incentives, biofuel usage incentives, CO₂ taxes on fossil fuel emissions and the credit points may be utilized for payment of bills/taxes towards amenities paralleled with reduction in CO₂ emissions.

Keywords: Energy credit card, incentives and taxes, policy reinforcement, renewable energy generation.

ADVANCEMENT of world economies is essentially driven by energy. Clean, efficient and cost-effective energy services are essential for global well-being. India holds second position in global population with an estimated 1.2 billion people and is the seventh largest country in terms of geographical area, forests, wildlife and cultural diversity. Energy security of India is facing challenges with respect to reducing dependency on fuel imports, minimizing exploitation of natural reserves and climatic change.

According to International Energy Agency (IEA) report¹, India is emphasized to be the second biggest country to contribute towards increasing global energy demand by 2035. However, annual energy demands per capita by country remain far lower than those by Organization for Economic Cooperation and Development (OECD) countries¹. India is transforming rapidly and launching different programmes to fulfill the increasing energy demand, and incentive-driven policies play a big role in renewable energy growth in India². Figure 1 details the total capacity installed in India, including renewable energy till 2016 (ref. 3). In the last 7 years, the country has experienced immense growth in new installations from renewable energy. Presently, 36 GW of renewable energy generation (REG) units are installed and 175,000 MW more installations will be added till 2022 (ref. 4). India also has a target for installation of 63 GW nuclear power by 2032, three times its current capacity⁵.

The Indian Network on Climate Change Assessment (INCCA) report⁶ shows that India's CO₂ emissions had increased by 1884.3 million tonnes (mt) in 2010 and

about 2044 mt in 2014, i.e. by 7.8% (ref. 6). This increase made India the fourth largest CO₂ emitting country, behind the European Union and ahead of the Russian Federation⁷. This ranking is the result of its large population size, but CO₂ emitted per capita is much lower than that of China and the developed countries. According to PBL Netherlands report⁷, rise in CO₂ emissions in 2014 was due to 11.1% increase in coal usage, 6.5% more demand for other energy-related activities and rising dependency on electricity in households and industries. Despite global energy demand from coal and oil, renewable energy also accounted for 3% increase in 2015 (ref. 8).

Energy policies of the developing countries are considered to provide suitable options for India. Incentives and subsidies in energy policies of the developing countries are studied from the view point of India. The present article proposes the inclusion of a consolidated yet incentive-based, consumer-specific, integrated energy credit card (ECC) system in the existing energy policies of India. The proposed ECC has the potential to minimize energy gaps between demand and supply, simultaneously strengthening renewable energy generation (REG) in India and reducing global warming.

Renewable energy generation policies of India

The Ministry of New and Renewable Energy (MNRE), Ministry of Power (MOP), Ministry of Environment and Forest (MoEF) and Central Pollution Control Board (CPCB), Government of India (GoI) are major authorities in formulating REG policy. To reduce excess consumption, energy-efficient methods were adopted and the Bureau of Energy Efficiency (BEE) was established as part of the Energy Conservation Act in 2001. The major existing policies useful for integrating REG in India are summarized here.

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Electricity Act 2003

The MoP, mandated formulation of the Electricity Act 2003 and a different electricity policy to encourage usage of renewable sources. This primarily focused upon rural electrification, distribution of energy, consumer protection, tariff principles, trading development and electricity theft⁹.

National Electricity Policy 2005

The National Electricity Policy 2005 was introduced by MoP, GoI¹⁰ to overcome energy shortages and supply of quality power at proper rates and increase the availability of electricity by 1000 units per capita¹⁰. It stipulates renewable sources purchase via competitive bidding to promote REG.

Tariff Policy 2006

A policy for purchase of energy by the State Electricity Regulatory Commissions (SERCs) considering the available resources was announced by MoP in 2006. Its effect on retail tariffs regarding acquisition of electricity by distributing companies was also considered¹¹.

National Rural Electrification Policies 2006

The MoP, GoI policies for rural electrification (2006) were established for providing electricity to entire households and villages by 2009 through grid connections or through providing off-grid solutions like stand-alone systems¹⁰.

The Integrated Energy Policy 2008

This MoP, GoI policy (2008) suggests that all energy sectors along with private institutions are allowed to integrate and ensure competent and continuous supply of

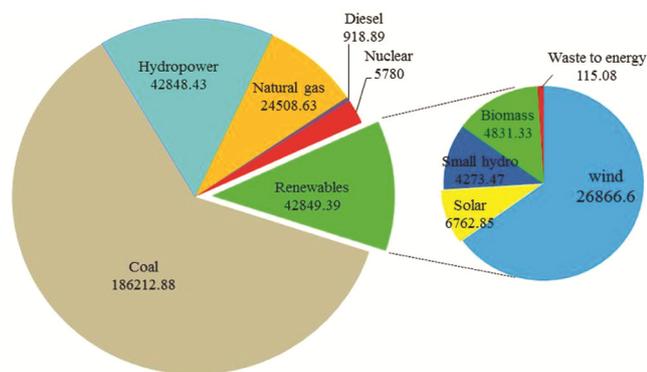


Figure 1. Total installed capacity for energy (MW) generation in India with break-up showing installed capacity of renewable energy (as on 31 June 2016).

energy¹². The feed-in tariff (FiT) was launched in 2009 to make REG more attractive and profitable than coal or oil-based generation for private companies.

National Action Plans on Climate Change (NAPCC)

The MoP, GoI developed NAPCC 2008 to address climate change and environmental issues as well as for sustainable development¹³. Jawaharlal Nehru National Solar Mission (JNNSM) and National Mission for Enhanced Energy Efficiency (NMEEE) are two major missions of the national plan. JNNSM was launched in 2010 with 22,000 MW grid-connected and off-grid power by 2022 (refs 14 and 15). GoI also launched the National Mission for a Green India to increase forest area, improve ecosystem services, livelihood income from forest and enhance CO₂ sequestration.

Eleventh five-year plan (2011–17)

The MNRE, GoI has proposed to develop REG technologies and commercialize them in industrial and R&D institutions, mainly from solar photovoltaic and thermal, and encouraging biofuels and hydrogen energy or fuel cells. The 11th five-year plan (2011–17) of MNRE, GoI targeted increase of REG from 16% to about 18% by 2022, with 7.3% contribution to total electricity¹⁶.

India’s incentive-based approaches for REG policies

Figure 2 shows major existing policies announced by the Indian government and the incentive approaches proposed within them to increase REG.

Four incentive strategies are analysed and detailed below.

Fiscal and tax incentives

GoI has launched some subsidies, low-interest loans, flexible/accelerated depreciation schemes, tax exemptions

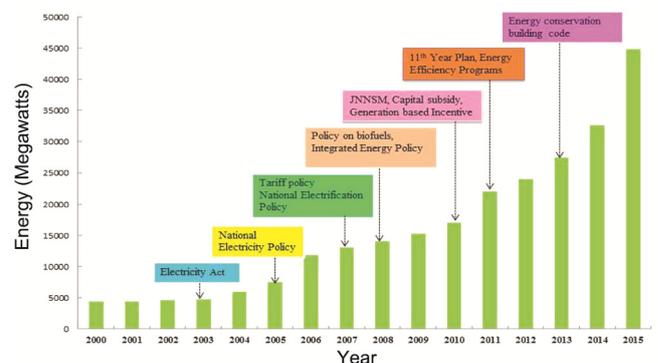


Figure 2. Effect of incentive-based policies on capacity increment of renewable energy generation in India from 2000 to 2015.

Table 1. Research and development institutions set up in India under the National Tariff Policy, National Electricity Act and 11th Five-Year Plan

Institution	Responsibilities	Reference
National Institute of Solar Energy	Assists Ministry of New and Renewable Energy (MNRE), Government of India (GoI) for implementation of National Solar Mission, coordinates training, skill development, research, consultancy and other related works.	18
National Institute of Wind Energy	R&D institution dedicated to offering services and solutions to wind energy sector problems.	19
Sardar Swaran Singh National Institute of Renewable Energy	Facilitates R&D on bioenergy, synthetic fuels and biofuels for transportation and other integrated energy applications.	20
Indian Renewable Energy Development Agency	Under the administrative control of MNRE, GoI and provides term loans for energy-efficient or renewable energy projects.	21
Solar Energy Corporation of India	In the beginning a fraction (750 MW) of 3000 MW photovoltaic power plants through central scheme (project cost Rs 30,000 crores). Solar thermal installations for heating and industrial purposes. Implementing grid-connected solar rooftop scheme.	22

and fiscal incentives to install more REG units. The Indian Renewable Energy Development Agency (IREDA) is a specialized financing agency to finance renewable energy programmes.

Tax support: The KPMG report examined the availability of tax and fiscal incentives in India¹⁷. Few state governments have provided incentives as 5%–15% lower value added tax (VAT)¹⁷. However, the plants have to pay a minimum alternative tax of ~20% to 21% (based on income) levied on the energy-producing units with an offset in the next 10 years. The Indian Government assesses a cess on both the domestic and imported coal of Rs 50 (US\$ 0.81) per tonne. This policy acts to regulate taxation and is similar to the carbon tax². Accelerated depreciation of 80% was provided to solar and wind companies for installations before 31 March 2012 and 15% depreciation for windmills installed after that time period, but solar plants still enjoy 80% depreciation¹⁷.

Financial subsidy: Indian REG is capital-intensive, and companies investing therein are required to analyse carefully available options to fund such renewable energy companies in a tax-efficient manner. The JNNSM report (2013–14) shows the presence of generation-based incentives (GBI) for foreign investors in solar and wind under independent power producers (IPP)¹⁵. Foreign direct investment (FDI) permits 100% funding for REG projects under the Electricity Act of 2003. The JNNSM report (2013–14) states that no prior approval from regulatory authority is required. The KPMG report (2015) shows that custom duty/duty-free import concessions have been announced on specific goods required for the new REG project¹⁷.

Incentives for R&D

Table 1 shows the R&D institutions set up under the National Tariff Policy, National Electricity Act and 11th five-year plan^{18–22}.

The table indicates significant technological improvements owing to R&D works of Indian REG industry. It also describes that the country is continuously advancing in solar and wind technologies, yet on-going policies that support the establishment of research institutions have scope for further improvement by focusing on the production of waste to energy, nuclear and geothermal energy.

Market development incentives

Renewable purchase obligation (RPO) and renewable energy certificate (REC) are in place as a measure to encourage generation of renewable energy. NAPCC has recommended RPO target of 15% by 2020 (ref. 13). According to KPMG report, RPO has been fixed for distribution companies to enable the purchase of a certain percentage of their total power requirements. Currently, state level RPOs vary between 2% and 14% of their total energy demand¹⁷.

Grid connection incentives

Grid connection incentives are given under the JNNSM to achieve the first phase targets of the solar mission. Reverse auctions are used to select 1000 MW grid-connected projects which meet minimum size requirement and commissioning date. The Central Electricity Regulatory Commission (CERC) base price for allocation

of solar PV in batch 2 of phase I was Rs 15.39/kWh (against Rs 17.91/kWh for allocation in batch 1). Khare *et al.*¹⁴ have shown that solar PV winning bids under phase I of the JNNSM (batch 2) differ from Rs 7.49/kWh to Rs 9.41/kWh¹⁴.

Incentives for green buildings development

The MNRE, GoI Annual 11th five-year plan (2011–17) has started development of energy-efficient buildings through incentives and rating system containing 100 points¹⁵. Some of the criteria are conservation and effective utilization of resources, water conservation and energy-efficient lightning in building, managing waste stepwise and energy recovery for a healthy environment. Different ratings are awarded to buildings depending on the points earned. The buildings which score points between 50 and 60, 61 and 70, 71 and 80, 81 and 90, and 91 and 100 will get from one to five stars respectively.

FiTs for REG

FiTs attract investments in REG for long-period producers. In India, FiTs were provided by the JNNSM programme in 2010 for installation of 20 GW solar power by 2022. The tariff for solar (PV and thermal) is fixed at Rs 17.90/kWh and Rs 15.40/kWh respectively¹⁷. FiT rates differ in different states; for example, biomass cogeneration plants for Gujarat are Rs 5.17/kWh, while for Maharashtra it is Rs 4.79/kWh. Additionally, preferential tariffs for wind energy in range from Rs 3.51/kWh in Tamil Nadu to Rs 5.92/kWh in Madhya Pradesh were commissioned after 31 July 2012 (ref. 23).

Proposed policy interventions

The energy policies of India incorporate taxes and incentives, as discussed earlier; yet the challenge remains to increase the share of REG together with reducing CO₂ emissions. Policies developed on the basis of unrealistic data from the government sector, setting up of more industries during recent times, lack of interest among youth with respect to agriculture and improper governance are perhaps some factors responsible for not achieving the predicted results. Table 2 describes policy measures present in the developing countries¹⁷.

The maximum exemptions in tax are reflected in the Philippines for REG, whereas policies of Mexico and South Africa largely include eco-credits and environmental incentives for energy-efficient equipment and effluent recycling industries. It is recommended to issue a certificate for each megawatt hour power to the producer and a fine or fee-based system may be implemented. Similarly, R&D incentive can be deployed to increase design of wind turbine on a large scale and making solar cells and

polysilicon cells using low-cost physical methods like those in China. Although Brazil is the leading biofuel producer with 6.15% PIS and 28.32% COFINS rate charged on biodiesel sales, biofuel policy of Argentina is more recommendable for the Indian system, as it provides tax exemption on hydric infrastructure for biofuel producers. Moreover, tax is exempted for gas oil in Argentina for fuel sale across the national territory. GoI can take some lessons from the Philippines biomass energy policy to provide incentives to farmers for cultivation of crops, exemption of VAT charges on agricultural products, equipment and machinery to increase biomass production and duty-free import of agricultural goods to cut down transportation cost for 10 years. The South African policy can be considered to provide incentive for the environment in the form of allowance to recycling assets and treatment plants for solid waste management.

We propose an 'integrated energy credit card (ECC) system' for India's energy policy which shall benefit energy stakeholders and which may be considered by government officials, policy planners and power sector personnel. Similar to credit card system of a bank, the integrated ECC is proposed to be used by individuals, suppliers/retailers, universities, organizations, including manufacturing industries and R&D institutions. Energy-efficient choices can be rewarded as credit points that may be redeemed towards paying environment-related taxes, fuel recharge, mobile recharge, for on-line payments and also electricity bills. As a beginning towards cashless society, ECC can be used for entertainment and travel purposes. Extra points may be earned, for example, R&D institutions may get some extra ECC points if they encourage research in the RE sector and simultaneously can get credit points for minimizing electricity load by employing energy-efficient practices. ECC can be rewarded for contribution towards reducing CO₂ emission. Few examples of how the ECC system can be integrated with different sectors are discussed below.

ECC for energy-efficient appliances

Use of energy-saving appliances like air conditioner, fridge, television, microwave, etc. is encouraged through efficiency rating scheme by GoI with ratings 1–5 stars referring to the least to most efficient ones. The appliances bearing a label with more stars suggest more energy saving. Schemes like 'Bachat Lamp Yojana' (BLY) for bulk distribution of CFLs encourage energy saving in the country and benefit both the consumers and industries. Therefore, more consumer-specific incentives and schemes are needed in the present Indian energy policy. Lessons from eco-credits scheme of Mexico may be considered by India to replace obsolete equipment with highly efficient ones (Table 2), which can in turn be rewarded with equivalent credit points in the ECC. Moreover, if

Table 2. Types of incentives present in developing countries according to the 2014–15 literature available

Country	Types of incentive	Main works
Argentina	Financial subsidy	Feed-in tariffs available in several provinces according to the form of energy produced as solar (0.9), wind (0.015), hydro less than 30 MW (0.015) Argentine peso (ARS)/kWh provided.
	Tax exemptions	Value added tax (VAT) refunds for renewable energy projects; new depreciable property (except automobiles) and biofuel producers will not pay hydric infrastructure tax (liquid fuels and the gas oil tax marketed in the national territory).
Brazil	Taxes over revenue and imports (PIS and COFINS)	Imposition of 6.15% PIS and a 28.32% COFINS rate on gross revenues from biodiesel sales; or, fixed value of 26.41 and 121.59 Brazilian Real (BRL) of PIS and COFINS by cubic metre of commercialized biodiesel respectively.
	Special tax	Charge of 1.5% PIS and a 6.9% COFINS on gross revenue of ethanol sales for producers, importers and distributors of ethanol. Special tax on infrastructure development.
	Federal and state VAT	Sale of biodiesel, ethanol and equipment used in the renewable energy generation process is exempted from industrialized products tax (IPT) and state VAT exempted for biodiesel and ethanol sales and renewable energy generation equipment.
China	Tax exemption	250 MW project for solar, hydro, wind and geothermal projects will be tax exempted for the first 3 years of installation, and then 50% reduced income tax from the fourth year onwards. VAT charges for small hydro, wind and biomass energy projects installation are 6%, 8.5% and 13% respectively.
	Subsidies and incentives	First 50 wind power units rewarded at the standard rate of 600 Yuan/kW for infrastructure development. Also, 70% subsidies for installation of grid-connected solar projects for remote regions with no power supply. Subsidy standard for PV panels on building materials is 7.25 Chinese Yuan (CNY)/kWh and subsidy of 0.25 Yuan/kWh for biomass and co-generation projects for 15 years after industrial operation. R&D funds available for solar and wind power projects mostly keeping hydro and resource-rich geothermal power away.
	Feed-in-tariffs (FiTs)	Wind resource region of four types with defined FiT as 0.49, 0.52, 0.56 and 0.61 Yuan/kWh; FiTs for solar PV (0.9, 0.95 and 1 Yuan/kWh for 3 territorial regions), biomass power (0.75 Yuan/kWh) and 0.65 Yuan/kWh for waste incineration projects. Tariff also charged for hydropower exploitation cost and demand–supply of the electricity market. No tariff for concentrated solar power.
India	Subsidies and incentives	VAT rate from 5% and 15% levied by different state governments with exemption of 16% excise duty on bioethanol and biodiesel. Subsidy of Rs 30–50 lakhs per MW at a rate of Rs 8–10 lakhs/MW provided for sugar mills depending on capacity of the project. R&D funds for solar, wind and hydro power projects and very less funds for biomass, nuclear and geothermal power generation. Also, generation-based incentives (GBI) provided for 5 MW capacity project @ 0.50 per unit for 10 years.
	FiTs	FiT for solar PV and thermal projects is Rs 17.90/kWh and Rs 15.40 kWh respectively, under JNNSM programme and no specific tariff for rooftop solar projects. Windmills installed after 2012 are given 15% depreciation in GBI.
Mexico	Tax exemption	New Mexico's income tax law (ITL) offers 100% tax deduction for investments in renewable energy generation instruments.
	Financial support	Hydrocarbon projects: R&D funds for adopting newer technologies of hydrocarbon sources of energy for increased efficiency and reducing pollution from the oil industry specifically.
	Eco-credit	Municipal Street Lighting National Program: MXN120 million (USD 10 million) funds provided for energy-efficient street lighting. Integral Energy Services Program to provide electricity through renewable energy and small-scale energy generation to meet energy needs of rural populations. National Sustainable Energy Exploit Program: Funds to increase energy efficiency and defining new strategies to encourage the use of renewable energy for transportation, home equipment, lighting, industrial motors, etc. USD 27,000 for replacing obsolete equipment with energy-efficient equipments, including air-conditioning, commercial refrigeration systems, LED lighting, electric motors and electrical substations.

(Contd)

GENERAL ARTICLES

Table 2. (Contd)

Country	Types of incentive	Main works
Philippines	Income tax exemptions	Income Tax Holiday (ITH) offered to renewable energy (RE) developers and exemption from income tax payment for the first 7 years of commercial operations. Ten per cent corporate tax rate levied on net taxable income by RE developers after 7 years of ITH. Zero per cent VAT on the sale of fuel or power from RE sources and purchases of local supply of goods, properties and services needed for RE plant facilities. Special realty tax rates of 1.5% deduction on the original equipment cost are provided exclusively for RE facilities. Accelerated depreciation for RE projects that fail to obtain ITH prior to full operation may request for it and be taxed accordingly. Tax Exemption of carbon credits: Sale of carbon emission credits is exempted from all taxes. Tax credit and duty-free importation of components, parts and materials to customers from VAT. Incentives for farmers of biomass resources for a period of 10 years to biomass growers for duty-free importation and VAT exemption on all types of agricultural inputs, equipment and machinery.
	FiTs	FiT rate for hydropower, biomass, wind, solar energy sources are 0.14, 0.15, 0.19 and 0.2 USD/kWh respectively.
South Africa	Carbon emissions incentives	Certified emissions reduction (CER) for a tax exemption on amount of CER credits derived from clean development mechanism.
	Incentives and subsidies	Fifty per cent subsidy charged to wind, solar and geothermal construction cost for less than 30 MW capacity and 50% deduction for all expenditures incurred during R&D activities.
	Environmental incentives	The allowance in respect of an environmental treatment and recycling asset is 40% of the cost of the asset in the first year and 20% per annum for the next 3 years.
	FiTs	FiT rates for wind, biomass, solar PV and CSP is ZAR 1.25/kWh, ZAR 1.18/kWh for less than 10 MW, ZAR 2.31/kWh for CSP with storage of 6 h per day.
Turkey	Incentives and subsidies	VAT and custom duty exemption on purchase of equipment. Mechanical and electromechanical equipment manufactured in Turkey used in renewable energy will be given additional incentives of USD cent (ct.) 0.4 and USD ct.3.5/kWh for 5 years, if operational before 31 December 2015.
	FiTs	Tariffs and government guarantee are applicable to power generation plant for 10 years from the operational date until 31 December 2015. Resources and FiT rates for hydro, wind, geothermal, solar, biomass (including landfill) is 7.3, 7.3, 10.5, 13.3 and 13.3/kWh USD cent respectively.

this is supplemented with higher prices of less efficient appliances with additional taxes obtaining no ECC points, it will discourage its use.

ECC for energy conservation in households and offices

There are incentives-based initiatives by GoI for solar buildings, solar cities and green buildings construction and 'Akshay Urja' shops for energy conservation in commercial buildings and households as part of new policy framework. The PAT scheme (perform, achieve and trade) is in place to set energy efficiency standards, but these schemes do not offer feasible and attractive rewards to consumers and for commercial set-ups. New incentives through ECC points can be introduced for real-estate stakeholders, like builders

and industrialists who follow energy-efficient norms and redeem ECC points towards green construction.

ECC in transport and CO₂ minimization

Transport is a major consumer of energy and therefore, most dependent upon it. This sector is spreading rapidly in India, with people purchasing more motorized vehicles. Energy consumption in transport can be minimized by energy-efficient vehicles having more travelling average. Manufacture of biofuel-efficient engines and their usage rewarded as ECC points will also encourage new energy efficient technology. Carbon dioxide, sulphur and other taxes should be mandated if vehicles are not banned after 10 years of run and ECC points accumulated may be redeemed for paying these taxes through ECCs.

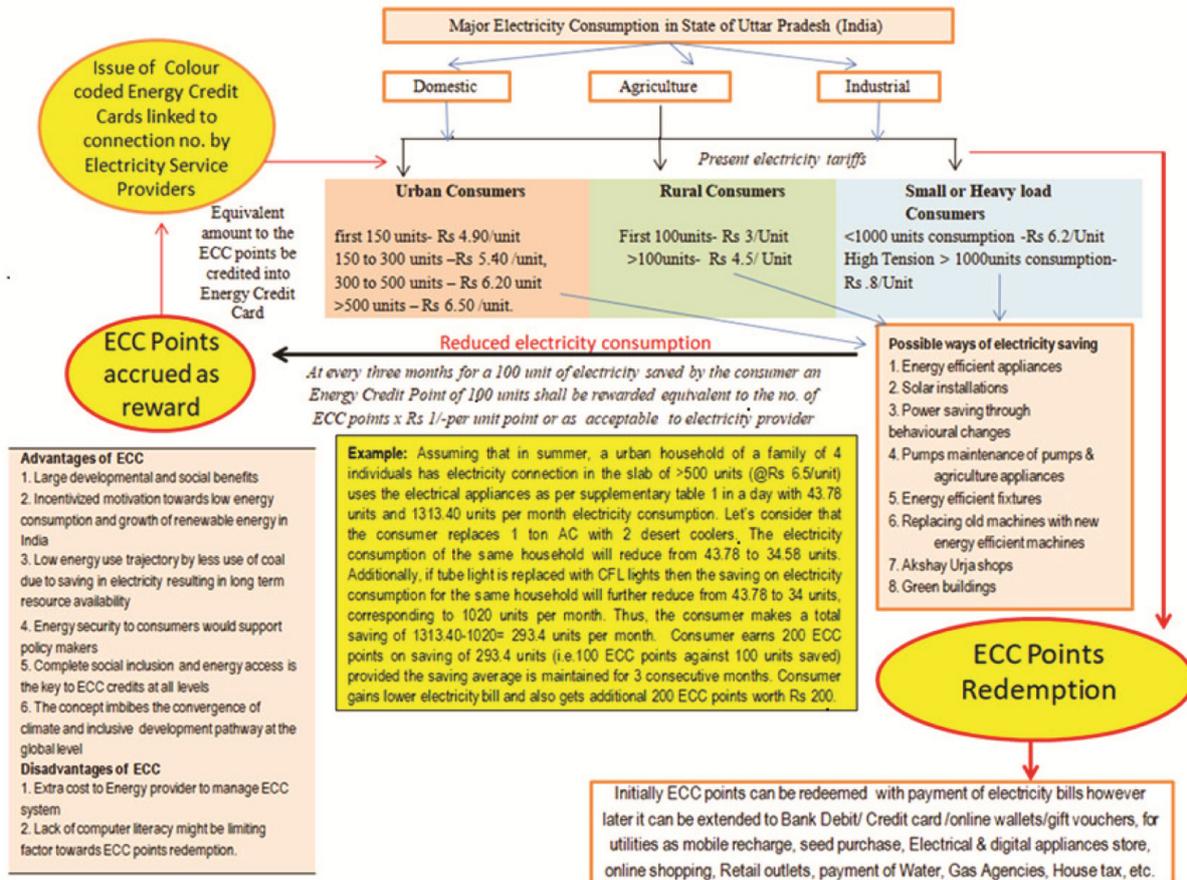


Figure 3. Proposed scheme for the implementation of energy credit cards (ECCs) in India with a simple example, electricity saving possibilities and advantages/disadvantages of ECC.

Similarly, manufacturing industries can pay-off the levied carbon taxes through ECC.

ECC and agriculture

Farmers engaged in growing or utilizing biomass resources can be rewarded with environmental incentives. Energy policies of the Philippines (Table 2) suggest that crops/trees cultivated by the farmers for more than 10 years will enjoy duty-free importation to cut down transportation cost and exemption of VAT charges on all agricultural inputs, equipment and machinery. Similar provisions can be adapted in our system too. Agricultural practices like upgrading existing pump sets will enhance water pumping efficiency for irrigation and agricultural productivity, rewarded with points in the ECC which will help farmers and land owners to pay electricity bills and for buying seeds, fertilizers, etc. As an example, the system of rice intensification (SRI) method started in 199 districts of India under the National Food Security Mission (NFSM)²⁴ is a good practice that helps in reduction of methane emissions significantly, and farmers employing this method if rewarded with points in the ECC could bring in more support to energy and environment²⁵.

Implementation of ECC in India

Figure 3 shows the proposed schematic model for implementation of the ECC system in India, and provides an overview of the possible ways of its inclusion in incentivizing consumers and their motivation towards low energy consumption while promoting renewable energy in India. The energy providers shall issue a connection-specific ECC to the consumers, wherein the ECC points can be accumulated. The ECC points can be collected by saving electricity consumption at all levels and through some of the suggested ways as shown in Figure 3. At every three months for 100 units of electricity saved by the consumer, an energy credit point of 100 units shall be rewarded equivalent to the number of ECC points × Rs 1 per unit point, or as acceptable to the electricity provider. Initially ECC points can be redeemed with payment of electricity bills; however, later they can be extended to bank debit/credit cards/on-line wallets/gift vouchers, for utilities like mobile recharge, seed purchase, electrical and digital appliances stores, on-line shopping, retail outlets, payment of water tariff, gas charges, house tax, etc.

There are several possible scenarios for implementation of ECC in India due to varied income groups,

electricity slabs in domestic, agriculture and industrial sector, energy providers in the states of India and private players. Therefore, it needs mention that the proposed integrated ECC system has to be more refined for various sectors, individuals, industries and organizations that benefit from it prior to formal inclusion in the Indian energy policy.

Conclusion

Currently India is experiencing a rapid economic growth, paralleled with extending modern services to millions still below the poverty line, expansion in energy capacity is essential for which all the efforts and investment should concentrate in complementing renewable energy resources. Systematic analyses of existing policies suggest that India majorly focuses upon providing grid connection incentives, financial support and exemption in taxes for solar and wind projects. The suggested incentive-based integrated ECC system may play a major role in creating awareness among people for saving energy. Purchase of efficient appliances, conserving energy in households and commercial buildings, biofuel usage in transport and good agricultural practices may be rewarded as ECC points. The energy credit points may be redeemed for paying electricity bills, emission-related taxes, fuel recharge, mobile recharge and on-line payments. The proposal becomes more feasible if the renewable fuels are made tax-free and in contrast heavy energy taxes, CO₂ emission taxes for fossil fuels usage are implemented. These taxes can be paid by redeeming the accrued and accumulated ECC points. The integrated ECC facility may thus not only reduce the electricity demand–supply gap, but also promote more small and large REG industries and R&D in this area, fostering a clean environment. Lastly, the role of people in facing challenges in energy security cannot be ignored. Therefore, judicious choices in buying energy-efficient products by the stakeholders will bring a sea change towards energy growth for a sustainable future in India.

Conflict of interest: All authors have contributed equally to this work and there is no conflict of interest among them.

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