India

The World's Carbon Markets: A Case Study Guide to Emissions Trading

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Environmental Policy Overview:

As of 2009, India was the world's third largest CO_2 emitter,[1] and, through 2020, annual GDP growth is expected to be between 8 and 9 percent.[2] By 2020, India is expected to contribute about 6% to global emissions.[3]

One-third of the India's population lives on less than $1/day, and, according to Upadhyaya (2010), the government's primary focus for the coming years is economic development. While India has enacted climate-related policies to encourage sustainable development, India sees climate change as a problem caused by developed countries, so there is political reluctance to create an emissions trading system (ETS) due to fears that such a policy could hinder economic development. In international climate negotiations, India has steadfastly refused to take on mandatory emissions reductions.[4]

To encourage its own sustainable development, in 2011 India committed to a voluntary ***Copenhagen Accord target of 20-25% emissions intensity reduction relative to 2005 levels by 2020***. According to PBL Netherlands Environmental Assessment Agency, India's emissions intensity will improve 35% relative to 2005 levels by 2020 if India continues with its business-as-usual (BAU) trajectory.[5] The Grantham Institute (2012), on the other hand, projects that India would fall significantly short of this 20-25% emissions intensity reduction target in the baseline "business-as-usual" scenario; but, in a "Green" scenario, India would exceed 25% reductions.[6]

India's ***current domestic climate policies*** are expected to decrease emissions by 0.6 $GtCO_2e$ by 2020. These policies include:

- 20 GW of installed PV and solar-thermal capacity and 2 GW of off-grid power by 2020 (40 $MtCO_2e$ reduction);
- Increase renewable energy usage by 30 GW (60 $MtCO_2e$ reduction)
- Increase nuclear power usage by 40 GW (175 $MtCO_2e$ reduction)
- Additional energy efficiency measures (124 $MtCO_2e$ reduction);
- Afforestation of degraded lands and an increase in forest plantation area (55-191 $MtCO_2e$ reduction); and
- A 50% target for additional efficient supercritical coal plants (40 $MtCO_2e$ emissions reduction by 2020);[7]

In addition, since July 2010 there has been a nationwide carbon tax on coal for 50 rupees/ton of coal produced in and imported to India.[8]

The base of India's climate policy framework is its 2008 National Action Plan on Climate Change (NAPCC), which specifies eight national missions for 2017 that center on improving: energy efficiency, solar technology, sustainable habitats, water, Himalayan ecosystems, "green India", agriculture, and strategic knowledge.[9]

India's emissions trading progress stems from the NAPCC energy efficiency mission, or the 2010 National Mission on Enhanced Energy Efficiency (NMEEE), which functions under the Bureau of Energy Efficiency (BEE) – a statutory body under the Ministry of Power, Government of India. India's 'Perform Achieve and Trade' (PAT) initiative, which resembles an ETS, is currently undergoing its first phase (2012-2015), which is considered a test phase.[10] Apart from PAT, three initiatives launched by NMEEE are:

- Improvement of innovation appliances via innovation;
- Energy efficiency financing platform; and
- Development of fiscal instruments to promote energy efficiency.[11]

What distinguishes India's PAT from traditional cap-and-trade systems is that cap-and-trade usually entails absolute caps, whereas PAT specifies energy targets that are intensity-based. Like PAT, India has a Renewable Energy Certificate (REC) trading system, which is a non-ETS market-based mechanism aimed to fight climate change.

While pilot ETS programs—which focus on the abatement of particulates, not CO_2—are being launched in three states, Tamil Nadu, Gujarat, and Maharashtra,[12] the Indian government has historically opposed tackling mandatory, absolute emissions reduction targets on the grounds that climate change is a problem that developed countries have caused. According to Uppadhyaya (2010), if such a mentality were to continue to dominate, "it would not be possible to achieve consensus for a cap-and-trade system in the near future."[13]

Domestic Markets:

According to Upadhyaya (2010), India considers developed countries primarily responsible for climate change, and it fears that implementing an ETS with mandatory abatement targets might hinder economic growth.[14] As of yet, there has not been direct policy action on developing ETS for mitigating greenhouse gases (GHGs), but India's environmental policy landscape includes various market-based programs with interrelated implications.

Established market-based climate programs at present are ***'Perform Achieve and Trade' (PAT)***, which promotes energy intensity improvement, and the ***Renewable Energy Credit (REC) trading system***. The interrelationships between the two programs are currently being deliberated, and eventually credits from either system may become fungible with one another.[15] For the coming years, the Indian government has mandated the implementation of ***pilot emissions trading systems***, which will aim to reduce emissions of particulates, in three states: Tamil Nadu, Gujarat, and Maharashtra. In October 2013, the Pollution Control Board for these regions released guidelines for stationary sources to utilize Continuous Emissions Monitoring Systems (CEMS) to measure emissions.[16]

PERFORM ACHIEVE AND TRADE (PAT): PAT has been likened to a 'tradable white certificate' (TWC) system. TWC systems are designed to trade energy savings certificates in order to achieve energy intensity targets. This is in contrast to an ETS where emissions reductions certificates are traded in order to achieve absolute emissions reductions.[17]

PAT sets mandatory energy efficiency targets on ***478 facilities*** that are either part of energy-intensive industries or members of the electricity sector, which together comprised about 60% of India's 2007 GHG emissions.[18] Facilities covered by PAT are called "Designated Consumers," and the list of these facilities is published annually by BEE.[19] Under PAT, energy efficiency measures aim to ***reduce emissions by 26 million tons of CO_2e, as well as save 6.6 million tons of oil equivalent*** over its ***first commitment period (2012-2015)***.[20] Covered facilities are generally obligated to improve energy efficiency by 1-2% per year.[21]

Within the PAT, ***energy efficiency targets*** are measured in terms of Specific Energy Consumption (SEC), for which baselines are determined by the April 2007-March 2010 average. The average SEC reduction target under PAT is 4.8%, and it expected that achieving this target will cost industry over USD $5.4 billion. [22] Installations must achieve their plant-specific targets within ***three-year compliance periods***. An installation that fulfills and exceeds its SEC target will be able to sell Energy Saving Certificates (ESCerts) for the amount of its surplus energy improvements to installations that are unable to meet mandatory targets. Trading will occur via ***regulated exchanges***; platforms for trading ESCerts have been designated in the two power exchanges IEX and PXIL, and BEE has also set up a registry and exchanges for the trading of ESCerts. BEE hopes to enable cross-sectoral use of ESCerts. Companies that purchase ESCerts would do so in order to achieve compliance obligations and avoid ***non-compliance penalties***. BEE issued guidelines and regulations in March 2012, and the issuance and trading of ESCerts was to begin after April 2013.[23] The Energy Security Act (2001) provides legal basis for the sale and purchase of ESCerts. To create market liquidity and price discovery before the market is launched, some ESCerts will be auctioned ex-ante, other ESCerts will be allocated freely to companies, and individual facility targets will be set.[24] Rules regarding ***banking*** are still to be determined.[25] See Figure 1, below.

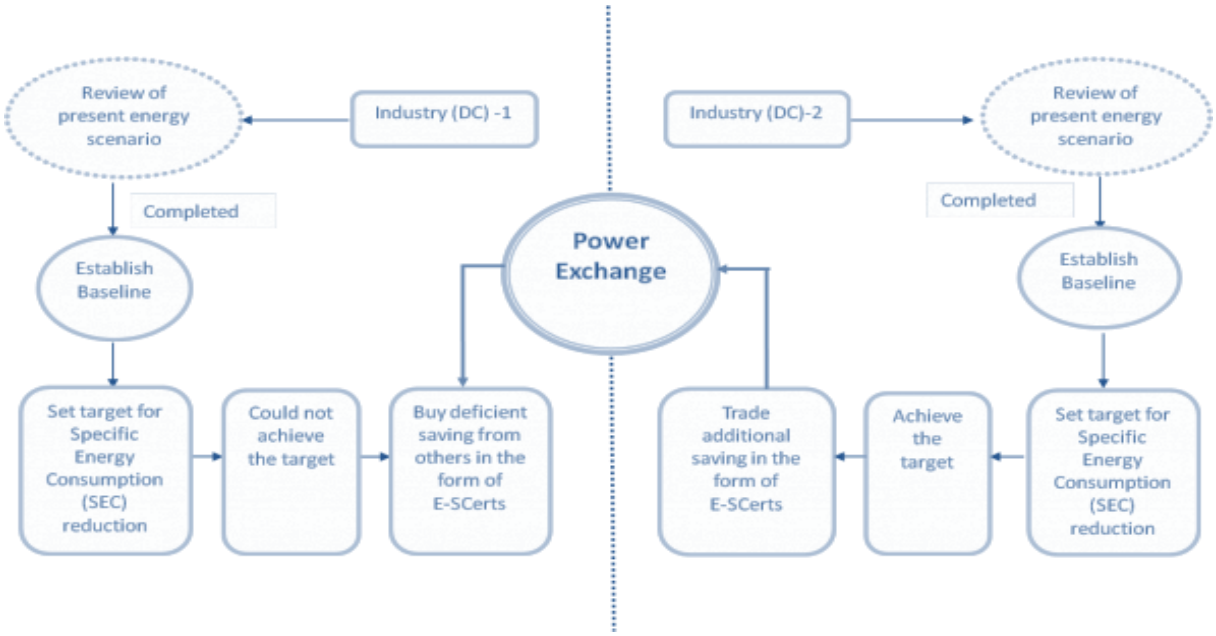

Figure 1: The ESCert Exchange Process within Perform Achieve Trade (PAT)[26]

As shown in Table 1, the PAT covers facilities in ***eight sectors***: power thermal, iron and steel, cement, fertilizers, textiles, aluminum, pulp and paper, and chlor-alkali. The railway sector is pending for implementation in the second phase. A facility is regulated as a DC if it exceeds the sector-specific threshold for annual energy consumption.[27]

Industry Sector	No. of Identified DC's	Annual Consumption Norm to DC's
Aluminum	10	7,500
Cement	85	30,000
Chlor-Alkali	22	12,000
Fertilizer	29	30,000
Pulp & Paper	31	30,000
Power	144	30,000
Iron & Steel	67	30,000
Textiles	90	3,000

Table 2: Designated Consumer & Annual energy consumption in Million ton of oil equivalent (mtoe)[28]

The PAT splits the facilities it regulates into categories indicative of a plant's energy efficiency potential. The system includes modern, state-of-the-art facilities and old, less efficient facilities. Grouping plants into bands of facilities with similar potential for efficiency avoids the inevitable closure of inefficient plants.[29]

RENEWABLE ENERGY CREDIT TRADING SYSTEM (REC): India's REC trading system was launched in November 2010, and the system's primary purpose is to ***promote renewable energy*** even in regions that have low potential for renewable power generation. The Indian government plans for this mechanism to contribute significantly to renewable energy generation goals outlined by the NAPCC and the Energy Act of 2003 (EA-2003). The Ministry of Power regulates the REC mechanism. Under EA-2003, the country's State Regulatory Commissions (SERCs) set targets for power companies to purchase a certain percentage of their total power from renewable sources. These targets are called Renewable Purchase Obligations Standards (RPOs).[30]

To comply with their RPOs or profit from a surplus of RECs, covered entities may ***trade*** RECs either within or across states. Each REC represents one MWh of a ***covered type of renewable energy***—solar, wind, small-scale hydro (capacity below 25 MW), biomass-based power, biofuels, and municipal waste based power—and the purchase of RECs are treated as the consumption of the corresponding quantity of renewable power. As a result, facilities are able to meet their renewable energy targets even if the local climate is not well-suited for renewable energy generation. The REC system enables renewable energy generators to weigh the costs and benefits of achieving their renewable energy commitments by selling electricity from renewable sources or by purchasing RECs.[31]

The REC mechanism's nodal agency for the implementation and registration of participating renewable energy generators—participation is voluntary—is Central Electricity Regulatory Commission (CERC). Participating generators have ***two compliance options***: (1) sell renewable energy at the preferential tariff fixed by the CERC; or (2) sell the electricity generation and environmental benefits associated with renewable energy separately in the form of RECs. RECs are submitted and traded—beginning in April 2011—at India's ***two major power exchanges***, IEX and PXIL, within the band of a floor price and a ceiling price to be determined by CERC from time to time.[32] RECs are traded once every month. In April 2011 only 260 units were traded on the Indian Energy Exchange. In May 2011, this amount jumped to 18,502, a number that ballooned to 265,606 in September 2012.[33] By May 2011, there were 71 accredited projects, of which 30 were registered in the system.[34] The price band for solar certificates is fixed at USD $264-375 per MW/h, and for wind certificates this value is USD $33-86 per MW/h. In May 2012, as many as 100 solar RECs traded on the IEX, marking the first time these markets included solar REC trading. On the IEX, 153,125 non-solar RECs traded for an average price of Rs 2,402 (~USD $42.70). On the PXIL, 15,550 non-solar RECs were traded for an average price of Rs 2,150 (~USD $38.23).[35] Trade estimates value the REC market's size at USD $1.2 billion. Of India's 28 states, 21 have REC system obligations, which range from 2% to 14% energy from renewable sources.[36]

Similar to Renewable Portfolio Standard (RPS) programs in the United States, United Kingdom, and Australia, India's REC mechanism is implemented as a compliance market to meet legal requirements, not a voluntary market.[37] It is expected that strong renewable policy will prompt enhanced renewable energy investment, and, as a result, cause areas with high renewable potential to build capacity.[38] Figure 2, below, illustrates the country's unfulfilled renewable capacity potential.

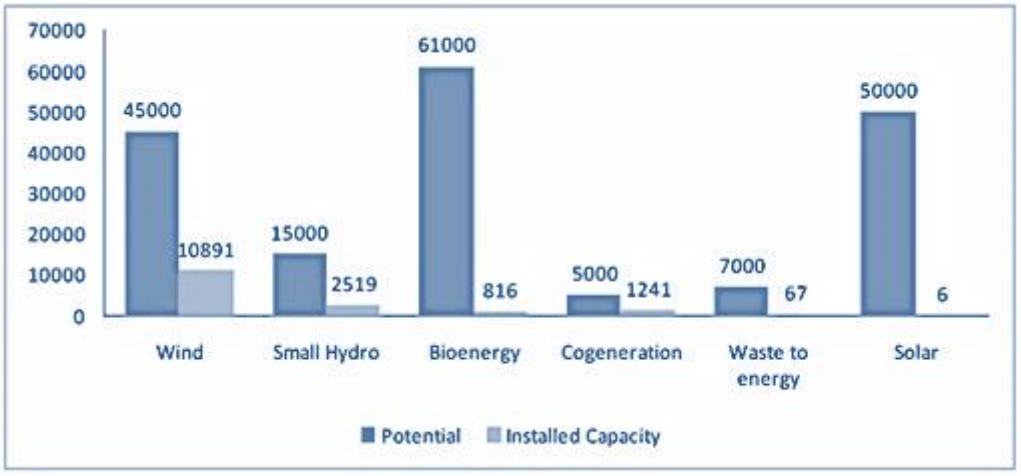

Figure 2: India's Installed vs. Potential Renewable Energy Capacity, by Source as of October 2009 (Source MNRE Report – October 2009)[39]

According to 2010 data, installed RE capacity was 11% of the country's total, but energy generation from renewable sources was less than 5% of the country's total. Table 3 enumerates national annual RE generation goals for 2010-2015.[40]

Year	Renewable Energy (RE) Target*	Energy Requirement (BU)	RE Generation Required (MU)
2010	5%	848.3	42,419.5
2011	6%	906.31	54,378.96
2012	7%	968.65	67,806.13
2013	8%	1017.09	81,367.35
2014	9%	1067.94	96,115.18
2015	10%	1121.34	112,134.38

Table 3: National Annual Renewable Energy Generation Goals for 2010-2015
Percentage of India's total energy generation that comes from renewable sources.

PILOT ETS: India's pilot ETS mechanism was unveiled February 1, 2011, and ***three states***—Gujarat, Tamil Nadu, Maharashtra—received government mandates to implement programs. While the pilot ETS mechanism ***focuses on particulates***, such as SO_2, NO_x, and SPM, which are detrimental to human health, these state pilot programs ***could function as a foundation for a future CO_2 trading program*** that could conceivably link up to a global system. According to the website for India's Ministry of Environment and Forests (MOEF),

"The pilot emissions trading scheme will be rolled out as a randomized-controlled trial to enable rigorous evaluation. Such an evaluation will provide gold-standard evidence on the environmental and economic benefits of the scheme. Pollution emissions will be measured in real time using ***continuous emissions monitoring****, and economic adjustments will be measured with regular unit surveys. Backed by this evidence, the pilot scheme will* ***provide a model for expansion within India*** *and a framework for implementing global environmental policy."*[41]

The pilot ETS mechanism was launched by India's MOEF together with the country's Central Pollution Control Board (CPCB) and relevant State Pollution Control Boards (SPCBs). Regulatory framework and technical capacity to implement ETS in India has existed since the passage of the Environmental Protection Act, 1986, and the accompanying rules to limit net adverse environmental impact from industrial activity.[42] According to the system's design, the SPCBs will determine which pollutants to include and set caps for industry facilities based on desired overall pollutant concentrations. State regulators will then distribute emissions permits to capped facilities, which

have the option of either complying to their caps and selling extra permits or buying from the market the amount of permits by which they exceed their caps. According to the Economic Times (2011), ***rationale for experimenting with ETS*** is two-fold: (1) it is a cost-effective method of emissions mitigation, and (2) it spurs innovation.[43]

The purpose for this program is to ***improve air quality*** and to incentivize facilities within states to do their part in enabling the states as a whole to meet the National Ambient Air Quality Standards (NAAQS). Tamil Nadu, which is in southern India, and Gujarat and Maharashtra in western India have concentrations of particulate matter that are above norms prescribed in NAAQS-2009. High particulate emissions renders meeting NAAQS very challenging.[44]

According to J-PAL and the SPCBs of Maharashtra, Gujarat, and Tamil Nadu (February, 2011), the ***five objectives for pilot ETS in India*** are:

(1) Extend regulatory framework: The pilot ETS will extend the existing regulatory framework to explicitly support ETS.
(2) Implement continuous monitoring: The pilot ETS will develop instrumentation and monitoring standards and roll out continuous emissions monitoring systems (CEMS) at several hundred factories in each participating state.
(3) Create emissions markets: The pilot ETS will establish permits to emit as a commodity in demand that trades easily on established Indian commodity exchanges. The scheme will develop a platform to reconcile permit holdings and total emissions in order to determine compliance.
(4) Document emissions cuts: The pilot ETS will measure emissions using CEMS at both participating industries and industries that cannot trade permits.
(5) Document cost savings: The pilot ETS will measure industry compliance over two years using semi-annual field surveys of economic and environmental variables at both participating industries and industries that cannot trade permits.[45]

The pilot systems for the three included states will ***cover 1,000 industries***. SPBs determine the precise ***eligibility criteria*** for industries.[46] The Maharashtra pilot program will encompass the cities of Aurangabad, Tarapur, Chandrapur, Jhalna, and Kohlapur. Selected industries must be of medium or large size, be high emitters of particulate matter (PM), and have at least one CEMS suitable stack. The Tamil Nadu pilot system will encompass the cities of Ambattur, Chennai, Maraimalai, Sriperumpudur, and Tiruvallur. Covered industries must lie within a 50 KM radius of Chennai City, have at least one CEMS suitable stack, or be of medium or large size. The Gujarat pilot ETS will encompass the cities of Surat, Vapi, and Ahmedabad. A covered industry must lie within a 20 KM radius of one of these three cities, be a high emitter of PM, or have at least one CEMS suitable stack.[47]

The evaluation of pilot ETS in India will be led by two J-PAL Board Members, Professor Michael Greenstone (Massachusetts Institute of Technology, MIT) and Professor Rohini Pande (Harvard University), as well as Nicholas Ryan (MIT) and Anant Sudarshan (Harvard Kennedy School and J-PAL).[48] The program is modeled after successful past and present cap-and-trade mechanisms, namely the US SO_2 trading program, the Chilean offsets trading program for suspended particulates, and EU ETS within which CO_2 and other GHGs are traded.[49] A country-wide report from February 2011 estimates the total budget for design and roll-out of this ETS to be Rs 360 crore; and, the single largest cost, comprising over 95% of the overall budget, is installation and maintenance of a CEMSs for industry.[50]

International Markets:

To date, ***CDM*** has been the dominant form of carbon market activity in India. According to Upadhyaya (2010), "CDM has been fairly successful in promoting investment in sustainable projects" in India. Behind China, India is the world's second largest supplier of Certified Emissions Reductions (CERs). As of 2010, India had issued 18.8% of the

420 million CERs that had been issued around the globe. Moreover, India had the second largest number of projects—509 of the 2,238 total projects—registered with the CDM Executive Board (CDM-EB). Energy endeavors, namely deriving from wind, biomass, hydro, and energy efficiency projects, comprise the majority of CDM projects that originate from India.[51]

Regulation and Oversight:

The Environmental Protection Act of 1986 and accompanying rules empowers the Ministry of Environment and Forests (MOEF) to limit adverse effects of industrial activity. In addition, State Pollution Control Boards (SPCBs) have the power to implement emissions trading systems within their jurisdictions. While an enabling framework exists for emissions trading, details, such as monitoring standards, must be elaborated before implementation. For the pilot ETS programs in Tamil Nadu, Gujarat, and Maharashtra, MOEF introduces the ETS regulatory framework. The Central Pollution Control Board (CPCB) sets ***monitoring and reviewing standards***. Then SPCBs implement ***monitoring and enforcement procedures***.[52]

The ***legal framework for the PAT*** is embedded in various sections of the Energy Act of 2003 (EA-2003). Legal mandates for covered entities include: (1) submitting a report of energy consumption to the Designated Authority of the State and to the BEE; (2) establishing an Energy Manager responsible for submitting annual energy consumption returns to the Designated Agencies and BEE; (3) compliance with prescribed energy conservation standards; (4) the requirement to purchase ESCerts to avoid defaulting on compliance obligations; (5) the monitoring and verification of compliance by Designated Energy Auditors (DENAs); (6) the ability to receive ESCerts that can be sold on a market if the compliance obligation is exceeded; (7) non-compliant entities must pay Rs. 10 lakhs; and (8) submission to regulation by BEE and process management by Energy Efficiency Service Ltd. (EESL).[53]

For any potential type of ETS to function smoothly, data monitoring, estimation of baselines, and regulatory framework must be strengthened.[54] Trading could take place on special platforms created within ***power exchanges***.[55] As mentioned earlier, PXIL and IEX are two exchanges in which platforms there are platforms designated for the trade of ESCerts and RECs.

Recent Environmental History:

While the PAT was launched as a program stemming from the 2008 National Action Plan on Climate Change (NAPCC), its structure flows from the Energy Conservation Act of 2001 (ECA-2001), which stipulates for fifteen energy-intensive sectors to implement ***energy efficiency measures***. The PAT covers eight of these sectors. EA-2001 also details the process of purchasing ESCerts for compliance in order to avoid defaulting on obligations. For the PAT program, ECA-2001 was amended to enable trading of ESCerts.[56]

The ***seven national missions***, apart from energy efficiency, stipulated by the NAPCC center on solar technology, sustainable habitat, water, Himalayan ecosystem, green India, agriculture, and strategic knowledge.[57] The goal of the solar mission, which was approved in 2009, is to increase PV power production and solar thermal generation to 1,000 MW per year, as well as to strengthen research, development, and deployment of solar energy.[58] In its first phase (2010-13), this mission is expected to enable the construction of 200 MW of off-grid solar power and cover 7 million square meters with solar collectors. The 2022 voluntary target of the solar mission is 20,000 MW.[59]

The goal of the ***sustainable habitat mission***, which was approved in 2010, is to strengthen energy efficiency in household and buildings, and to improve solid waste management. It also encourages a shift to public transportation.[60] The ***water mission*** aims to improve water use efficiency by 20%. The ***agricultural mission*** focuses on developing climate-resilient crops and adapting agricultural practices. Forest cover in India is to expand by 10% to 33%, and 6 million hectares of degraded forest lands have been designated for regrowth. The ***Himalayan***

ecosystem mission aims to conserve biodiversity within the region, and it establishes a Climate Science Research fund and calls for international collaboration.[61]

Challenges:

1. According to Upadhyaya (2010), India sees climate change as a problem caused by developed countries, so there is ***political reluctance*** to create an ETS due to fears that such a policy could hinder economic development. In international climate negotiations, India has steadfastly refused to take on mandatory emissions reductions.[62]
2. India will ***need to build its capacity***, namely improve its data collection and its supply of trained manpower, to implement ETS effectively.[63]
3. Non-compliance ***penalties are relatively weak***, so they could fail to incentivize compliance.[64]

Unique Issues:

1. ***PAT*** is the first of its kind—a market system geared towards enhancing energy efficiency—in the developing world.[65]
2. Few other countries, especially developing countries, ***have three national market-based environmental programs***—PAT, REC, and CDM—that are active with potential to reduce GHGs.

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Disclaimer: The authors encourage readers to please contact the EDF and IETA contacts with any corrections, additions, revisions, or any other comments, including any relevant citations. This will be invaluable in strengthening and updating the case studies and ensuring they are as correct and informative as possible

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