INTERNATIONAL

MARKET-BASED CLIMATE MITIGATION POLICIES IN EMERGING ECONOMIES

CENTER FOR CLIMATE
AND ENERGY SOLUTIONS

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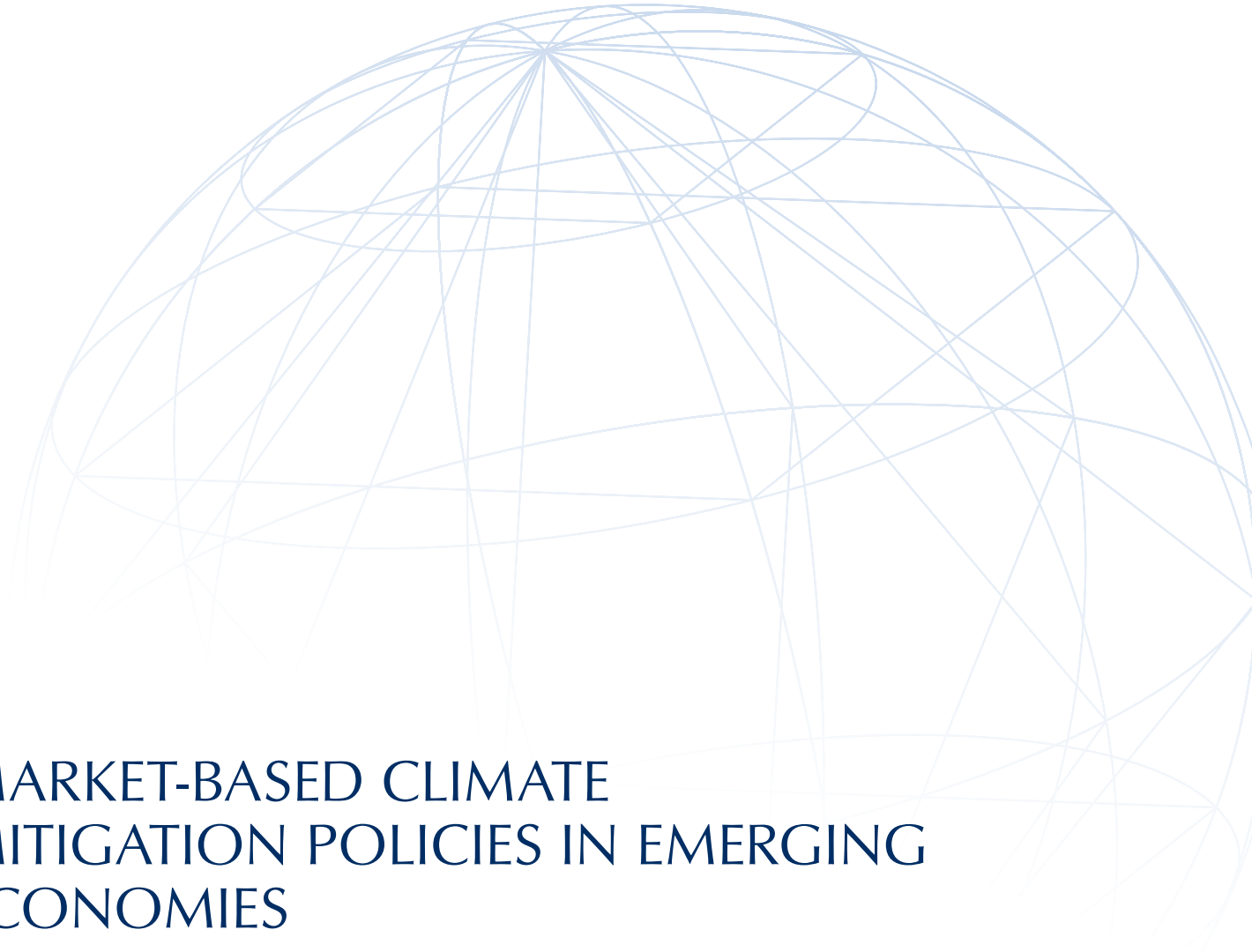
December 2012



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EXECUTIVE SUMMARY

Used by governments for decades, market-based policies are mechanisms to control environmental pollution at various leverage points. They work by changing relative prices – raising the cost of emissions-intensive activities and/or lowering the cost of lower-emitting alternatives – to provide producers and consumers with a financial incentive to adopt the latter. Policies that can be considered market-based include taxes and fees, subsidies, and the use of pollution control trading systems. Market-based policy instruments provide financial incentive to elicit specific behavior from entities responsible for greenhouse gas (GHG) emissions, whether consumers or producers.

This brief provides an overview of market-based policies aimed at reducing GHG emissions in several major emerging economies: Brazil, China, India, South Africa and South Korea. By implementing regulatory and market-based policy instruments across their economies, these countries are seeking to promote cleaner technologies and behavior change while also promoting economic development and growth.

INTRODUCTION

Market-based policy instruments aim to modify the behavior of firms and individuals by changing the financial incentives and disincentives they face. They typically operate by adjusting relative prices or creating markets that did not previously exist.[1] A wide range of policies can be considered market-based including the imposition or elimination of taxes, fees, or subsidies, and the use of pollution or energy trading systems.[2] Market-based policies construct systems to incorporate the costs associated with pollution – not normally reflected in market prices – into the polluting entity's decision making. Examples include taxes imposed on leaded gasoline and cap-and-trade programs, such as the sulfur dioxide trading system in the United States.

Market-based policies are attractive alternatives to traditional command-and-control regulatory programs, particularly for GHG mitigation. They provide firms greater flexibility to most cost-effectively achieve the required pollution abatement, allowing them to meet environmental objectives at a lower overall cost. In addition, well-designed market-based policies can also provide greater incentive for innovation compared with command-and-control programs.

Many countries are deploying market-based instruments to reduce GHGs and promote investment in clean energy technology in an effort to combat climate change. The European Union's Emissions Trading System is a large and well-established GHG cap-and-trade system. In 2011, Australia introduced its own carbon pricing mechanism that will also transition to a cap-and-trade system.[3] A growing number of developing countries have been actively developing market-based policy instruments to reduce energy consumption and GHG emissions, as well as jumpstart investments in clean energy.

For the purposes of this brief, a market-based policy instrument is defined as one that provides financial incentive for consumers and/or producers responsible for GHG emissions to adopt lower-emitting behaviors or technologies.[4] The policies described fall into three broad categories: taxes, subsidies, and trading systems.

Taxes set a price per unit of pollution, either directly on GHG emissions or on goods or services that are GHG-intensive, such as gasoline. Subsidies broadly are payments to encourage a particular economic action – the opposite of a tax. These include tax incentives and preferential loans. Finally, trading systems set a limit on quantities of pollution or on a specific type of energy, but allow emitters to buy and sell emission rights, letting the market determine the price rather than setting it directly as a tax does. Examples include cap-and-trade and baseline-and-credit emissions trading programs, as well as the use of trading systems to meet energy savings or renewable energy targets. These alternative policy approaches are further defined in the glossary while **Table 1** lists specific examples.

Taxes, subsidies and trading programs have corresponding pros and cons. The appropriateness of each must be weighed within the specific policy and political context of each jurisdiction. Economic, political and cost considerations must be taken into account, as well as the environmental outcome and the ease with which a program can be designed and implemented. The table below provides a brief overview of some of these relative advantages and disadvantages.

The following section offers broad observations of market-based policies across the five countries examined here. Subsequent sections describe the specific policies being implemented or developed in each country.

Insights

The five countries considered in this brief each have particular economic, political, social and environmental characteristics. Even so, the development and implementation of market-based policies across the countries highlights certain commonalities and shared experiences to provide insight into the applicability of market based interventions.

Overarching targets

Each of the five countries examined here has formally pledged under the United Nations Framework Convention on Climate Change (UNFCCC) to a quantified national-level or economy-wide objective to limit the growth of GHG emissions. For China and India,

TABLE 1: Overview of Policy Instruments Used

TYPE OF INSTRUMENT *	EXAMPLE
SUBSIDIES	
Tax incentives	Korea, Brazil – Tax exemptions for biofuels
Feed-in tariffs	India, China – Feed-in tariffs for electricity from Renewable Energy Sources (RES)
Preferential financing	Brazil – National Development Bank financing for electricity production from RES and ethanol
Credit guarantees	Korea – Credit Guarantee Funds for "green" technologies
TAXES	
Emissions Tax	South Africa – Tax on high CO2-emitting motor vehicles and electricity from non-RES
Reduction or removal of high carbon taxes and subsidies	Korea – Removal of price support for anthracite coal production
Differentiated pricing	China – Higher industrial electricity prices for more energy-intensive enterprises
TRADING SYSTEMS	
Energy efficiency and renewable energy target-based	India – Energy intensity-based cap-and-trade for industry and tradable renewable energy certificates
Cap-and-Trade	Korea – Emission trading legislation; China – pilot emission trading systems
Baseline-and-Credit	Korea – Voluntary emission reduction program

* *See the Glossary of Terms for definitions of policy instruments.*

this objective is intensity-based, expressed in carbon dioxide (CO_2) emissions per unit of gross domestic product (GDP). Both aim to reduce their economy's CO_2 intensity below the 2005 level by 2020, though in both countries the goal is expressed as a range: a 40-45 percent reduction in China, and a 20-25 percent reduction in India. By contrast, Brazil, South Korea and South Africa set goals against business-as-usual emissions projections in 2020, i.e. GHG emissions as they are expected to be in the absence of new policy. Brazil's goal is expressed as a range of 36.1 to 38.9 percent, South Africa's is a 34 percent reduction, while South Korea's goal is a 30 percent reduction. South Korea is also the only one of the five expected to result in an absolute decrease of emissions from the 2005 level. Moreover, China and Brazil have both inscribed their GHG objectives within specific domestic legislation.

Emphasis on renewable energy

In all five countries, renewable energy development and deployment is a major goal of market-based policies, and climate change is not necessarily the single or principal driver. In Brazil, with its already vast hydropower resources, the major drivers are diversification of energy supply sources and industrial development. For China, the need for more energy is a fundamental driver.[5] Additionally, reducing fossil fuel consumption has significant pollution and health co-benefits, and renewable energy technology is seen as a strategic economic growth sector. Similarly, India is striving to meet its fast-growing energy needs by developing all of its energy resources, including renewables. South Korea, with fewer renewable resources than the others, still supports renewable energy as a means of reducing its significant dependence on imported energy. Finally,

TABLE 2: Relative Pros and Cons of Different Market-based Policies

	EASE	SCOPE	ENVIRONMENTAL CERTAINTY	COST CERTAINTY	ECONOMIC CONSIDERATIONS	POLITICAL CONSIDERATIONS
Subsidy	(-) Can be complex to design and implement (+) Can be included as part of existing program (-) Difficult to remove, though should be temporary, as vested interests develop	(+) Flexible: can be very targeted or broad	(-) Many factors influence uptake and use of subsidy; final environmental result can be estimated but will remain unknown beforehand	(+) Budget for subsidies generally known and allocated	(-) Difficult to get price of subsidy "right" (-) Can have distortionary effects, as firms get used to lowered cost of certain activities/technologies (+) Can be used for industrial development policy (+) Can spur innovation, incentivize activity not otherwise possible (-) May have international trade implications	(+) More politically popular than taxes (-) Net financial outflow from government
Tax	(+) Can be easily applied and understood (-) Can be complex to design and implement (+) Can be included as part of existing program	(+) Flexible: can be very targeted or broad	(-) Environmental outcome uncertain – difficult to determine the "right" tax level to achieve a given outcome	(+) Cost per unit of pollution known (-) Interaction with existing taxes may make it less effective	(+) Source of revenue (+) Provides clear signal for investment decisions (-) Cost of tax fixed and is thus not easily changed if macroeconomic conditions of the country change (e.g. recession or boom). (-) May have international trade implications	(-) Often politically unpopular (-) Potential for loopholes (+) Source of revenue; can be used to offset tax reductions elsewhere
Trading	(-) Can be complex to design and implement (+) Once in place, can be less costly to administer than a regulatory regime (-) Requires robust and complete data	(+) Broad; most efficient when cost differences are available within the program (+) (-) Can be applied to a specific sector, though will be less economically efficient overall	(+) Based on a cap or quantified pollution limitation (-) More difficult to ensure in baseline and credit systems (-) Design should account for carbon leakage where needed, i.e. displacement of emissions from the trading program to outside the program	(-) Difficult to foresee price of allowances (+) Various cost control measures can be included in program design to mitigate price fluctuations	(+) More economically efficient, as least cost abatement options will be found first (+) With gradual increasing stringency, can incentivize innovation (-) Cost containment features can reduce near-term incentive for innovation (+) Market price adapts to changing macroeconomic conditions	(-) Can be difficult to determine cap (-) (+) Concessions to specific interest groups can be provided – reduces economic efficiency, but can make implementation more politically feasible (+) Can be source of revenue, depending on design (-) Complexity can result in reduced political acceptance

South Africa is seeking to expand and diversify its energy sources while meeting its growing energy needs.[6]

A constantly evolving policy landscape

Market-based policies have evolved significantly over time as circumstances shift and they incorporate experience-based knowledge. In both Brazil and India for example, renewables policy has moved from feed-in tariffs to auctioning mechanisms. Conversely, China transitioned from an auctioning mechanism for wind power to a feed-in tariff system. Meanwhile, South Korea moved from feed-in tariffs to a regulatory command-and-control approach that directly imposes renewable obligations. In the area of GHG policy, South Korea encouraged a domestic voluntary market, and has established mandatory GHG targets for major industries, as a basis for transitioning to a cap-and-trade program in 2015.

Complex policies require significant groundwork

Many of the countries described are developing or implementing sophisticated market-based policy instruments including: multi-sector emissions trading systems in China; an economy wide cap-and-trade system in Korea; and an energy efficiency trading system in India. In each case, several years of preparation were required to ensure adequate data monitoring, appropriate institutional structures, and time for negotiation with industry and business on the targets and policy design. India's energy efficiency trading system, for example, required an extensive benchmarking exercise across various industrial sub-sectors. While some of China's pilot trading systems might get off the ground in 2013, only two years after their announcement, several are in the process of collecting the necessary data, engaging with industry, and developing institutional frameworks. Two Brazilian states are currently in the process of negotiating targets with industry ahead of implementing cap-and-trade programs. In South Africa's case, consideration of a carbon tax has been gradual, involving a series of policy documents beginning with a general exploration of environmental taxes in 2006, to a concrete budget proposal in 2012.

More carrots than sticks

Market-based policies can either incentivize certain behaviors ("carrots") or disincentivize behaviors ("sticks"), though in these instances the mechanisms quite strongly favor the former. In most of the five countries, the use of incentives is more extensive than the use of taxes or policies that increase the cost of a given activity. Most incentives aim to remove financial barriers to mitigation actions, notably the higher cost of renewable energy and the higher upfront cost of energy efficiency investments. These are often integrated into or supportive of industrial development policies. China employs both carrots and sticks, for example, combining policies that support efficient vehicle purchasing with those that increase taxes on larger vehicles; and preferential lending to clean energy industries with restricted lending to resource-intensive industries. Among other examples of disincentives, India applies a levy on coal, while South Africa applies taxes on certain vehicles, on electricity from non-renewable sources, and is considering the implementation of an economy-wide carbon tax.

Climate policy is not developed in isolation

Climate policies develop within specific political and economic contexts and particular market structures. Particularly relevant is the relation to energy use, which is in turn closely linked to economic structure and development. Several countries examined here have monopolistic or oligopolistic electricity markets and regulated electricity prices, providing different challenges and opportunities for climate and energy policy. In some cases, this has allowed for rapid and widespread implementation of public policy, while in others it has prevented passing through increased energy production costs to consumers, threatening the sustainability of clean energy investments and hindering behavioral change. Because of these issues, South Africa is moving to encourage more renewable electricity production by independent power producers, while South Korea and China have allowed for incremental electricity price increases, and South Korea aims to eventually transition toward fully flexible power pricing. On the other hand, state-owned enterprises have been mandated to purchase renewable electricity in China and have helped Brazil establish a competitive biofuels market. Brazil has also benefited from oil production rent, channeling funds into preferential financing programs benefiting climate mitigation activities. These examples also show that policies rarely address climate change in isolation; rather, they are designed to fulfill a range of parallel objectives, be it energy security, reduced air pollution, economic restructuring, or targeted industrial development.

BRAZIL

Brazil passed climate change legislation in 2009, establishing a range of policies that aim to reduce GHG emissions 36 to 39 percent below business-as-usual projected emissions in 2020. Since Brazil's GHG emissions are dominated by the forestry, agriculture and land-use change sectors, preventing deforestation comprises the majority of intended reductions by 2020.

In December 2010, a Federal Decree detailed the 2009 climate change law's policy objective, setting out quantified targets for 2020 in the forestry and agriculture sectors, as well as for the energy sector through Brazil's Ten-year Energy Expansion Plan. In 2012, reduction targets were also set for industrial, mining, and transport sector emissions.[1] Brazil has implemented market-based instruments for several years, notably preferential financing programs, feed-in tariffs, and tax incentives, mainly targeting renewable energy for both power generation and transportation.

TRADING SYSTEMS

The state of Rio de Janeiro, Brazil's second largest economy after São Paulo, announced in early 2012 that it would establish a cap-and-trade system starting with a test phase running from 2013 to 2015, followed by a five-year and a ten-year phase, running up till 2030. The launch of the test phase was delayed in June 2012, when the state government announced a new round of negotiations on emission limitations with the private sector, due to strong pushback from industry over competitiveness concerns.[2] The tradable CO_2 credits will allow companies to comply with GHG emission caps, once determined. The program will cover the industrial sector, including cement, steel, petrochemicals and oil. Most allowances are to be distributed for free in the test phase, an amount that will decrease annually starting in 2016; allowances will be fully auctioned starting in 2021. Administrative and technical aspects of the Bolsa Verde (Green Exchange) are currently being established. In addition to credits for CO_2, Rio's Green Exchange will also trade credits for mandatory forest reserves in rural areas.[3] The Rio government could allow companies to meet their obligations through purchasing forestry credits (reduced emissions from deforestation and forest degradation, known as REDD) from the state of Acre.[4]

The states of São Paulo and Acre have also signed a memorandum of understanding to discuss the terms of an offset program that would allow São Paulo to meet its 2020 GHG reduction target (20 percent below 2005 levels) in part through forestry offsets from the state of Acre.[5] Following this, in early June 2012, São Paulo announced that discussions with industries to determine emission reduction requirements were underway as part of plans to introduce an emissions trading program.[6]

SUBSIDIES

The Brazilian government offers a range of subsidies to encourage and allow for certain kinds of investments to be made by individuals and companies. These primarily target renewable energy production, but in some instances address the major emitting sectors of forestry and agriculture. Most of the subsidies described below take the form of preferential financing programs, though tax incentives, grants, and guaranteed tariffs are also used.

Preferential Financing

The Brazilian National Development Bank (BNDES) plays a leading role in the operation of preferential financing programs. Under these programs, the government subsidizes the provision of loans so they can be offered at a lower interest rate, with grace periods and longer repayment periods. In some cases, BNDES can also offer guarantees to cover the risk of non-repayment. The preferential financing programs target biofuels, renewable and other low-carbon electricity generation, energy efficiency, and land-based activities.

Preferential financing, primarily in the form of low-interest loans for the biofuels sector, is targeted at ethanol and biodiesel development in the context of a mandatory ethanol blending requirement that gasoline contain 20 percent ethanol by 2012, and that all diesel contain 5 percent biodiesel by 2013. While

TABLE 3: Preferential Financing for Ethanol and Biodiesel in Brazil

PROGRAM	DESCRIPTION
Agricultural and Livestock Plan (Plano Agrícola e Pecuário, PAP), Ministry of Agriculture[12]	Offers various financing lines, including some for expanding production of sugarcane and oilseeds.
MODERINFRA	For investments in irrigation and stocking: up to BRL 1.3 million per farmer, up to 12 years of financing, 3-year grace period, 6.75% annual fixed interest rate.
PROCAP-AGRO	For use by farming co-operatives as working capital or for investments: Up to BRL 50 million per co-operative, up to 6 years of financing, 3 years of grace period, 6.75% annual fixed interest rate.
MODERFROTA	For machinery and equipment acquisition: no limit, up to 8 years of financing, no grace period, 9.5% annual fixed interest rate.
PRONAMP[13] *Supported by BNDES since 2011-12 harvest year*	For machinery, equipment or other investments by "medium-size" farmers (maximum annual income of BRL 700 thousand): Up to BRL 300 thousand per agricultural year, up to 8 years of financing, 3-year grace period, 6.5% annual fixed interest rate.
National Program for Strengthening of Family Farming (PRONAF), Ministry of Rural Development[14]	Operates "family farming credit lines" for small, independent sugarcane growers. Some of the most preferential lines of credit available. Interest rate varies with annual income, but can range from 1 to 4% per annum for investments, and 1.5 to 4.5% for working capital. Maximum loan amount is BRL 50 thousand for both types of financing. Up to 8 years of financing, and 3 to 5 years of grace period.
BNDES, various lines of credit grouped since 2006 under the Program for Financial Support and Investments in Biodiesel[15]	Credit lines are offered on a case-by-case basis for investments in processing, stocking and commercialization. For small- and medium-sized companies interest rates are fixed at 7% for those bearing a Social Fuel Stamp, i.e. certification that a minimum percentage of raw materials have been purchased from family farms, and 8% for those without the Stamp. For large companies the rate is 8% for those with a Social Fuel Stamp and 9% for those without.
BNDES, PRORENOVA program[16]	BRL 4 billion to finance the renovation of old sugarcane farms and expansion of sugarcane cultivation areas, from January to December 2012. Three-year, low-interest loans for medium-large and large businesses covering up to 80% of investment needs, with an 18 month grace period. For individual farmers, conditions are determined on a case-by-case basis. Micro-, small- and medium-sized enterprises already receive even more preferential financing rates through a separate program (BNDES Automatic).
BNDES, PASS program[17]	Temporary, annual line of credit offered since 2010 to co-operatives and companies to stock ethanol in order to increase its availability during the off-harvest season. For 2012-13, a maximum of BRL 500 million, or 20% of the gross operating income of last fiscal year, interest rate of 8.7% per annum.

direct subsidies for the ethanol industry have been phased out,[7] various preferential lines of credit are available for investments. The policies cover various loan programs that include ethanol and biodiesel and are outlined below, in **Table 3**. The targeted activities range from sugar cane and oil seed production, expanding industrial capacity, cogeneration power, and logistics and transportation.[8] Often targeted to specific recipients including medium-sized farmers and farming co-operatives, they encourage specific types of investment such as irrigation, fuel storage, machinery, capital, etc. The low-interest loans channeled through the BNDES and Banco do Brasil are supported with public funds.

In the agricultural sector, the Low-Carbon Agriculture Program (ABC), active since August 2011,[9] is managed by the Ministry of Agriculture under the PAP and specifically funds six "sustainable agricultural practices"[10] aiming to reduce emissions from the agriculture sector by up to 173 million metric tons of CO_2 equivalent (Mt CO_2e) by 2020.[11] The loans have three preferential features: a 5.5 percent interest rate, a payback period of 15 years, and an eight-year grace period.

In February 2012, Brazil activated the preferential lending arm of its National Climate Change Fund, established in 2011. Funded through a levy paid by oil companies, the Climate Fund largely offers low-interest loans for low-carbon projects offered through the BNDES. For 2012, BRL 360 million has been made available for private, municipal and state investments. Qualifying project types include urban railways and other efficient urban transport; high-efficiency machinery and equipment; energy generation from wind (isolated systems), biomass, solar and ocean energy sources; waste-to-energy in cities hosting the 2014 World Cup; improving efficiency of vegetal charcoal production; and combating desertification.

BNDES also offers financial products with long-term low-interest financing for low-carbon energy and energy efficiency investments, given that financing is often the

TABLE 4: Preferential Financing for Energy and Energy Efficiency in Brazil

PROGRAM	DESCRIPTION
FINEM	Offers various financing lines equal or greater to BRL 10 million,18 each targeting specific activities or actors, directly through BNDES or through an accredited financial institution. In most cases annual interest rate offered is the long-term interest rate, plus 0.9% (BNDES basic spread), plus credit risk rate of up to 3.57%.
Electricity Generation[19]	For investments in hydro, thermal[20], nuclear and cogeneration facilities; nuclear and hydro projects benefit from low-interest rates, and can be funded up to 70% of the project cost (vs. 50% for thermal); 20-year amortization for nuclear and large hydro, 16 years for smaller hydro and 14 for thermal and gas cogeneration.
Alternative Energy[21]	For investments in biodiesel, bioethanol, biomass-based electricity, wind, solar, small hydro (defined as plants with less than 30 MW of capacity) and other renewable energy sources; covers 80 to 90% of investment costs, with an amortization period of up to 16 years.
PROESCO[22]	Created in 2006 and operating since 2008, for investments that a) lead to energy savings, b) improve efficiency of energy systems, and c) replace fossil fuels by renewable energy sources. Covers up to 80% of investment, which can be in machinery, equipment, installation, technical services, installations, or studies. The maximum loan period is of 6 years with a two-year grace period, and borrowers can be clients (end users), project developers (energy service companies, or ESCOs), or generation, transmission and distribution companies. Offers direct low-interest lending for amounts above BRL 10 million, and guarantees lending through commercial banks for smaller amounts. BNDES funds participating banks with a low-interest loan, and assumes up to 80 percent of the repayment risk on loans. To date, few projects have been financed under the PROESCO program due to its complexity and administrative burdens.

main barrier to such technology deployment. A few of the principal funding sources are summarized below in **Table 4.**

Guaranteed tariffs for electricity from renewable energy sources

Brazil's PROINFA program established a feed-in tariff for electricity generated from three targeted renewable energy sources (wind, small hydro and biomass) for a period of 20 years starting in 2002. The program anticipated that projects contracted under the feed-in tariffs would reach the 3,300 MW of capacity target by 2008. However, due to implementation delays, the final contracted projects are expected to begin operation in 2012. The PROINFA program will lead to the installation of 1,423 MW of wind power, 1,191 MW of small hydro, and 779 MW of biomass power. The state electricity company, Electrobrás, purchases the power and transfers it to direct consumers and distributors, who then include the costs of the program into their electricity tariffs (exempting low-income final consumers). Final tariffs averaged USD 184/MWh for wind, USD 96/MWh for small hydro and USD 70/MWh for biomass-based electricity.[23]

In 2007, Brazil began using technology-specific competitive power auctions to set market-determined tariffs for renewable energy capacity additions, rather than government determined feed-in tariffs (see **Box 1**).[24] To date, 6.2 GW of renewable energy capacity – excluding large hydro – has been contracted using such auctions.[25] The Brazilian government sets parameters for both regular and reserve energy auctions to further policy aims; it has excluded the participation of oil- and coal-fired generation capacity from regular electricity auctions since 2010.[26] Alternative energy reserve auctions lead to a 15-year energy contract (20-year for wind) that fixes a guaranteed tariff for the winning bids. The total cost of energy contracted at the given tariff is paid by all consumers through a fixed charge. All energy produced by the plant is sold on the spot market; any revenue generated is used to offset the fixed payment by consumers.

In the 2011 wind- and gas-only auction, for the first time average prices for wind power (BRL 99.58/MWh) were below those for natural gas (BRL 102.26/MWh).[27] The low prices seen in the winning bids for wind power have led to concern regarding the winning bidder's ability to complete the projects; approximately 40

BOX 1: Key features of the auctioning mechanism

Established: 2007

Objective: Increasing renewable energy electricity production at lowest cost

Coverage: electricity from small hydro, biomass and wind

Eligibility: renewable electricity project developers and generators

Tariff amount: determined by market; guaranteed for 15 years (20 years for wind) in reserve auctions

Overview of auctions:

2007: Renewable-energy only auction limited to biomass and small hydro

2008: Renewable-energy specific reserve energy auction, limited to biomass

2009: Wind-only reserve energy auction; use of specific accounting mechanism combining fixed payment for the power generated with penalties or incentives for under- and overproduction

2010: Regular and reserve auction, wind, small hydro and biomass; use of various hedging and accounting mechanisms to protect investors from the variability of wind power generation

2011: Renewable-energy specific reserve energy auction; regular auction limited to natural gas and wind

percent of wind energy projects from the 2009 auction were behind schedule in 2012.[28] Low prices may also mask indirect subsidies, such as reduced transmission and distribution costs for renewable energy projects under 30 MW, and other incentives offered to bidders. [29]

Direct incentives

Starting in 2007, the Bolsa Floresta Forest Allowance Program operates across 15 Conservation Units covering an area of 10 million hectares. It provides payments for local communities to manage and benefit from forest resources as a means of preventing deforestation. The Program has four components: Income and Social each offer BRL 350 per family per year to support income generation activities that preserve forest resources, and improvements in health, education, communication and transportation respectively; Family provides BRL 50 per month to mothers of families committed to zero deforestation and sustainable livelihoods; and Association provides 10 percent of the total amount paid under the Family program in each conservation unit to empower community associations. Monitored by satellite and field verification, participants that break the rules (e.g. deforest new areas of primary forest) receive two warnings before being excluded from the program. As of October 2010, the Program worked with 7,514 families.[30]

A smaller portion of the Climate Fund (BRL 30 million in 2011) also comprises non-reimbursable grant funding managed directly by the Ministry of Environment. [31]

Tax incentives[32]

The Brazilian government has implemented a range of tax incentives targeting biofuels and renewable energy:

- Until 31 December 2013, value-added tax (VAT) on sales and services can be exempted for equipment used in wind and solar energy generation. In 2011, the State of São Paulo also eliminated VAT on equipment for the production of bioelectricity from sugarcane.
- Since 2004, ethanol sales are effectively exempt from payment of the federal fuel tax. Another combination of federal taxes, charged to the manufacturer upon sale to distributors, has also remained at BRL 0.12/L since 2004.
- Also since 2004, Flex-fuel vehicles, which can run on ethanol as well as conventional fuel, are subject to slightly lower taxation and annual registration fees than standard gasoline vehicles.[33]
- The 2004 Biodiesel Production and Use Program provides full or partial exemptions from various federal taxes and state VAT. Exemptions from federal fuel excise taxes range from 32 to 100 percent depending on fuel source and region, and are designed to benefit biodiesel bearing a Social Fuel Stamp.[34]

CHINA

China's achieved a 19.1 percent reduction after the 11th Five Year Plan (2006-10) set a target to reduce the economy's energy intensity (energy consumption per unit of GDP output) by 20 percent between 2005 and 2010. In 2007, China adopted a National Climate Change Program, and in 2009, a carbon dioxide intensity target (CO_2 emissions per unit of GDP) to reduce carbon intensity 40-45 percent below 2005 levels by 2020. The target was inscribed in the 12th Five Year Plan (2011-15) as a 17 percent reduction below 2010 levels along with specific energy intensity reduction (16 percent from 2010 to 2015) and non-fossil energy development targets (to reach 11.4 percent of total energy consumption). Industrial development support policies are also directed towards seven new strategic and emerging industries, three of which relate to GHG mitigation: energy saving and environmental protection, new energy (nuclear, solar, wind and biomass), and clean energy vehicles.[1] Power generation, along with steel and cement manufacturing, together account for approximately half of China's total CO_2 emissions; fossil fuels, dominated by coal, account for 82 percent of all electricity generation, and both the steel and cement sectors include many old and inefficient plants.[2] Hence, many of the market-based policy instruments described below target these sectors.

TRADING SYSTEMS

Cap-and-Trade: Regional Pilot Emissions Trading Systems[3]

In June 2011, the National Development and Reform Commission (NDRC) announced that China would seek to implement carbon trading systems in pilot regions, and use the experiences with the pilot systems to establish a unified national system after 2015.[4] In September 2012, the NDRC announced it planned to extend pilot trading to more regions over the 2016 to 2020 period, suggesting the move to a national trading system would be more gradual.[5]

The provinces of Hubei and Guangdong, and the cities of Beijing, Chongqing, Tianjin, Shenzhen and Shanghai, have been selected for the pilot regional emissions trading systems (ETS). The seven pilot regions

BOX 2: Key features of emissions trading pilot programs

Established: 2011; due to start in 2013 (though not all will) and end after 2015

Objective: Reducing carbon intensity of the economy (CO_2 emissions per unit of GDP) most cost effectively, to meet target of a 17% reduction below 2010 levels by 2015; drawing lessons to inform the design of a national program

Coverage: Two provinces and five cities; sectoral coverage to be determined by each pilot region. Under discussion: electricity, cement, iron and steel, petrochemicals, non-ferrous metals, large buildings

Threshold: Under discussion, by region: Beijing, sources emitting over 10 $ktCO_2$ annually; Chongqing, over 20 $ktCO_2$ annually ; Guangdong, sources emitting over 20 $ktCO_2$ or consuming more than 10 kt of standard coal in any of the years between 2011 and 2014

Use of offsets: To be determined in each region, but most pilots plan to allow companies to use offset credits to meet up to 15 percent of their total cap. The offsets would be domestic, created under a voluntary GHG emission reduction trading system first outlined in June 2012, and known as Chinese Certified Emission Reductions (CCERs). These would include some projects registered under the UN Clean Development Mechanism

were selected based on per capita income, mature market systems and infrastructure, as well as strong political will and support.[6] Sectoral, regional, or city-wide absolute CO_2 emission caps have been cited as potential bases for the trading systems, several of which are aiming to launch in 2013.

In March 2012, Beijing was the first pilot region to release draft rules for its ETS. The program would cover stationary emissions sources; emission inventories for 2009 and 2010 have been requested from thermal electricity providers, the heating sector, manufacturers and large public buildings, suggesting these sectors are likely to be covered. The CO_2 cap would be based on Beijing's CO_2 intensity reduction target of 18 percent from 2011 to 2015. Facilities in covered sectors would fall under the program if they emitted over 10,000 tCO_2 per year on average in the 2009-11 period; those below the threshold could participate voluntarily. The draft rules provide for mostly free allocation of permits, price control measures, and allow the use of credits from a future, national-level voluntary carbon market as offsets for compliance. Monitoring and auditing is to be conducted by private energy service companies, and accounting reports to be verified by third parties.[7]

A draft design of Tianjin's ETS suggests its program would include 120 of the city's biggest energy consumers across five industries, covering 60 percent of CO_2 emissions. Electricity generation, oil, petrochemicals and metallurgy account for the majority of energy use in Tianjin.[8] Analysts also expect Tianjin's CO_2 caps will be in line with its cap on coal consumption for 2015 set at 63 million metric tons, a 31.3 percent increase from the 2010 coal consumption level.[9]

In September 2012 Shenzhen's government announced its pilot ETS would impose caps on over 800 power generators and manufacturers, regulating approximately 400 million metric tons of CO_2 emissions per year, or 54 percent of Shenzhen's total emissions. The pilot ETS is seen as an important tool for reaching Shenzhen's target of reducing the energy intensity of its economy 21 percent below 2010 levels by 2015.[10]

Hubei province has commissioned an exchange to conduct 13 research streams on different aspects of establishing its ETS, including accounting, allocation, coverage, and incentives. In September 2012, draft regulation indicated Hubei's ETS would cover 35 percent of the province's emissions by setting a cap on emissions from approximately 100 large companies across eight sectors. Draft regulations for the province suggest an overall emissions cap of 436.6 million metric tons of CO_2 in 2013 and 473.9 in 2015. Covered industries include power, iron, steel, cement, chemicals, car manufacturing, metals, glass and paper. The companies would be given free permits up to their cap, and could use offset credits to meet 15 percent of their cap. Permits for new facilities that could come online after the launch of the ETS will be set aside, though new entrants would only be able to meet 10 percent of their cap using offsets.[11]

Guangdong province, the largest of the seven regions, will cap its 2015 CO_2 emission levels at 660 million metric tons of CO_2, a nearly 30 percent increase from the 2010 level. The ETS will cover approximately 42 percent of these emissions, imposing caps on the 827 largest emitters in the power, iron and steel, ceramics, petrochemicals, textiles, non-ferrous metals, plastic and paper production sectors. Offsets from local forestry projects or the national domestic offset program could be used, but likely limited to 5 to 10 percent of a company's cap. Guangdong aims to launch its market in September 2013, and link to other pilots in 2014 or 2015. In a pre-compliance purchase, four cement companies acquired 1.3 million metric tons worth of allowances at a price of RMB 60 per allowance (one metric ton of CO_2) from Guangdong's Development and Reform Commission. The allowances were meant to cover emissions from planned new installations.[12]

Tianjin, Beijing and Shanghai already have major environmental exchanges that could act as trading platforms, and the province of Guangdong is also developing an exchange for its pilot system. The three exchanges, benefiting from direct or indirect government backing, are engaged in developing standards and methodologies, as well as registries, thus laying the groundwork for the pilot trading systems. Provincial and municipal government offices are working with the exchanges to take the lead in managing future registry systems and carbon trading platforms.[13]

SUBSIDIES

Government subsidies have been offered to manufacturers of more efficient products and wind turbines, as well as to consumers. These subsidies aim to encourage: vehicles with low-fuel consumption, hybrid and electric vehicles; energy-efficient appliances[14]; solar photovoltaic (PV) power projects and the production of wind turbines.

Direct subsidies to manufacturers and consumers

A large-scale efficient light bulb subsidy program was launched in 2008; 50 million subsidized low-energy bulbs were placed on the market, increasing to 100 million in 2009. The bulbs are sold at a discount and companies are reimbursed by the government for the shortfall. The price is subsidized 50 percent for retail sales (individual consumers) and 30 percent for wholesale purchases (businesses), with some local governments offering additional subsidies.[15]

A subsidy for the purchase of plug-in hybrid, fuel-cell and all-electric vehicles has been in place since 2008, as part of the "Ten Cities, One Thousand Cars" project which aimed to put 1,000 such vehicles on the road in each of the ten original pilot demonstration cities. The pilot cities numbered 25 in July 2011, providing subsidies for the purchase of government vehicle fleets, taxis and public buses.[16] Since June 2010, as part of a pilot subsidy program in five cities, the purchase of plug-in hybrid and all-electric vehicles by private consumers is subsidized CNY 3,000 per kW of battery capacity; the maximum subsidy amounts are CNY 50,000 for a plug-in hybrid and CNY 60,000 for an all-electric vehicle.[17] The subsidies are paid directly to manufacturers, who lower prices of appropriate models accordingly.[18] The same year, a national-level subsidy of CNY 3,000 was offered for vehicles within a specified weight range, with a maximum engine size of 1.6L and fuel efficiency of 6.9L per 100 km; the fuel efficiency requirement was tightened to 6.3L per 100km in November 2011.[19] In January 2012, a new subsidy of CNY 120,000 was introduced for the purchase of domestically produced all-electric vehicles.[20]

Launched in July 2009, the Golden Sun solar PV program offers subsidies for solar PV power generation, transmission and distribution projects of 300 kW and above.[21] The program covers up to 50 percent of the installation and related transmission costs of qualifying solar plant installations, increasing to 70 percent for non-grid connected plants in remote regions. Close to CNY 10 billion worth of subsidies has been committed, most of which has been allocated. The government selected 304 projects totaling 643 MW of capacity, dominated by 261 rooftop and building integrated solar PV (BIPV) installations totaling 290 MW.[22] In parallel, the Solar Rooftop Program supports the installation of rooftop solar PV and BIPV since March 2009, offering CNY 15 and 20 per watt of installed capacity for rooftop and BIPV installations respectively. The rate decreased to CNY 13 and 17 respectively in 2010.[23]

In order to encourage the commercialization of domestic wind turbines, the Ministry of Finance offers a subsidy of CNY 600 per kW of wind capacity to domestic manufacturers. The incentive is paid to the first 50 wind turbines over 1 MW produced, that have been tested and certified, are in operation and connected to the grid. The turbine components must also be domestically produced, and the incentive shared with component manufacturers.[24]

Feed-in tariffs

Wind power has benefited from an effective feed-in tariff since 2003, through a combination of bidding practices and guaranteed prices. A fixed feed-in tariff for new onshore wind power plants was established by NDRC in 2009. The feed-in tariff varies across four different zones, depending on a particular region's wind resources, ranging from CNY 0.51 per kWh to CNY 0.61 per kWh. Biomass-based power has benefited from a 15-year feed-in premium since 2006, with CNY 0.25 per kWh added to the benchmark price for coal-based power. In late 2008, the tariff rate was increased to CNY 0.35 per kWh, and to CNY 0.75 per kWh in 2010 for agricultural and forestry biomass. Seven provinces also provide feed-in tariffs for small-scale hydro power since 2009 (two of which have been doing so since the 1990s), ranging from CNY 0.16 to CNY 0.3 per kWh. [25]

On-grid solar PV power benefits from a feed-in tariff enacted in July 2011, set at CNY 1.15 per kWh for projects approved before July 1 and completed in 2011, as well as those in the province of Tibet (regardless of completion date). For projects approved after 1 July 2011 the feed-in tariff is CNY 1.0 per kWh.

The two companies that operate the electricity grid in China are required to purchase all of the renewable electricity produced at the feed-in tariff rates. In turn, they are allowed to charge a renewable energy surcharge on electricity to compensate this purchase of more expensive electricity.[26] In place since 2006, the surcharge was established under the Renewable Energy Law. Starting at CNY 0.001 per kWh, it doubled in 2008, 2009, and again in December 2011 to reach CNY 0.008 per kWh. Grid systems that only serve local regions, the Tibetan region, the agricultural and fertilizer-related sectors, and residential customers are all exempted from paying the surcharge. From 2006 to 2010, the surcharge led to the payment of CNY 19.33 billion in subsidies for renewable energy.[27]

Restricted and encouraged lending

In May 2010, the People's Bank of China and the China Banking Regulatory Commission issued a joint circular, requiring that commercial banks restrict lending to companies with high levels of energy consumption and emissions, and industries with "backward" production facilities and over-capacity problems (excessive output and low-quality products). At the same time banks were instructed to encourage loans to new and high technology industries; including strategic growth industries, nuclear, solar, wind and biomass, clean energy vehicles, as well as new materials and high-end manufacturing (such as aeronautics and high-speed rail).[28]

Preferential Financing

Under the 2005 Renewable Energy Law, financial institutions are encouraged to offer preferential loans for renewable energy projects with interest rates as low as 2 percent.[29] State-owned banks, notably China Development Bank, can also award lines of credit to solar- and wind-energy manufacturers. These credit lines appear to act as conditional agreements, with access to them and the conditions under which financing is provided determined on a case-by-case basis. Solar and wind energy companies benefit from the availability of and access to credit, which past research has shown to be a positive driver of solar PV sector growth in China.[30] While it is not clear how preferential individual interest rates under the credit lines compared with other sources of financing, through the end of 2010, Bloomberg New Energy Finance found that at least 15 different solar and wind companies used USD 866 million out of the USD 47 billion in credit available.[31]

Tax Incentives

Beginning in 2003, foreign investment in both biogas and wind energy production benefits from a reduced income tax rate of 15 percent, as opposed to 33 percent. This preferential 15 percent income tax rate also applies to "high and new technology enterprises" as of 2007, which include most renewable energy enterprises. In addition, wind turbines and their main components, as well as photovoltaic modules, benefit from preferential customs duty rates.[32]

Starting in 2001 and expanding in 2003, reduced VAT rates have also been applied to wind power (a 50 percent reduction), the use of municipal solid waste for power generation, and for biogas production. Small hydro producers also pay a reduced VAT rate, and in some regions their income tax rate is reduced or eliminated. As of 2010, authorized biodiesel and ethanol producers also receive a rebate for VAT, and their fuels are exempt from fuel excise.[33] Based on an evaluation of annual financial performance, ethanol producers can also receive subsidies to compensate for production losses since 2002.[34]

While increasing excise tax rates for larger vehicles (see below), China reduced the excise rate for cars with engines under one liter from 3 percent to 1 percent. Starting in 2012 domestically manufactured electric and fuel cell vehicles are exempt from sales tax.[35]

TAXES[36]

Starting in September 2006, the Ministry of Finance increased export taxes on energy intensive industries by reducing the export tax rebate. One of the main goals was to encourage economic restructuring away from polluting and energy-intensive industries by discouraging the production and export of energy-intensive products. The export tax rebate was reduced by between 2 and 6 percent on steel, cement, glass and certain nonferrous metal products. In April 2007, the rebate on exports of most steel products was lowered to 5 percent. It was then raised several times to maintain economic growth from August 2008 to June 2009, including for steel and non-ferrous metals, only to be scrapped once again for various steel products in June 2010. In early 2011 the government announced further export tax rebate reductions and cancellations for heavy energy-using and polluting manufacturing processes.[37]

Other tax measures discourage the use of fossil fuels and polluting vehicles. Since April 2006, a tax focused on oil product consumption (naphtha, solvents and lubricants) has been levied on refiners and importers, with a CNY 0.8 per liter fuel oil tax. Since 2006, China also used excise tax rate adjustments to discourage purchase of larger cars that consume more fuel. In September 2008, the excise tax rate on cars with engines above four liters doubled from 20 percent to 40 percent, and increased from 15 percent to 25 percent for those with engines between three and four liters.[38]

Differential electricity pricing[39]

Starting in June 2004 and strengthened in 2006, differential electricity pricing policy (DEPP) was

implemented by NDRC for certain high energy-consuming industries, requiring them to pay a surcharge on their electricity price. Facilities are placed in four categories based on their level of capacity, energy and resource efficiency, and environmental standards: those in the "encouraged" and "permitted" category pay the standard price in their area, while those in the "restricted" or "eliminated" categories pay a surcharge of CNY 0.10/kWh and CNY 0.30/kWh respectively. This assessment is undertaken by the NDRC, and the list of "restricted" and "eliminated" enterprises changes over time.[40] This policy applies to a range of high electricity consuming industries, such as electrolytic aluminum, ferroalloy, calcium carbide, caustic soda, cement and steel production, with phosphorous and zinc smelting included as of 2007. Between 2004 and 2006, approximately 900 firms in the "eliminated" category and 380 firms in the "restricted" category had closed, invested in energy efficiency measures, or changed production processes. In 2007, the policy was adjusted for local governments to retain revenue collected through the DEPP to support local economic restructuring, energy conservation and emissions reductions, thus providing greater incentive for them to enforce implementation.

INDIA

India launched its first comprehensive climate strategy in July 2008, the National Action Plan on Climate Change (NAPCC). The Plan highlights existing and planned initiatives, policies and programs focused both on adaptation and mitigation. It consists of eight core "missions" running through 2017, including missions on energy efficiency, solar energy, and strategic knowledge for climate change. The solar mission sets quantified targets for production and deployment, and the energy efficiency mission establishes a program of energy reduction targets for industries along with a trading system to meet the targets. The Plan also refers to the use of incentives for more efficient transport, appliances, and the strengthening of regulatory measures such as building codes and fuel economy standards.[1] In early 2012, the Government of India announced its plans to establish an additional mission on clean coal technologies.[2] The Plan emphasizes the overriding priority of maintaining high economic growth rates to raise living standards, and "identifies measures that promote our development objectives while also yielding co-benefits for addressing climate change effectively." The Government of India has also internationally pledged to reduce its emissions intensity (CO_2 emissions per unit of GDP) between 20 to 25 percent below 2005 levels by 2020.[3]

TRADING SYSTEMS

Baseline-and-credit energy efficiency trading: Perform Achieve Trade (PAT)[4]

Initially authorized by the 2001 Energy Conservation Act, the Perform, Achieve and Trade (PAT) scheme is a market-based energy efficiency program covering eight energy-intensive sectors. It was adopted by the NAPCC's National Mission on Enhanced Energy Efficiency and operationalized in 2010 through an amendment to the Energy Conservation Act. The government expects PAT to deliver annual reductions of about 100 million tCO_2 by the end of its first phase in 2015.

The facilities covered under the first phase account for 165 million metric tons of oil equivalent (Mtoe) of energy consumption, equivalent to 36 percent of India's total final energy consumption in 2009.[5] Targets are set for each facility in specific energy consumption terms; kilo calories (kcal) per kWh for the power sector, and toe per ton of product for all other sectors. Less energy efficient facilities have a greater reduction target than more efficient ones, and the overall reduction target averages 5 percent over the three years.[6] The targets are set as a reduction against a baseline, which is determined based on the facility's specific energy consumption over the period 2007-2010. Facilities reported their

BOX 3: Key Features of the PAT Scheme in India

Effective: 1 April 2012, first three-year phase running through 2015

Goal: To enhance energy efficiency in large energy-intensive industries and facilities, reducing specific energy consumption by approximately 5 percent over the first phase

Scope: National; eight energy-intensive sectors: aluminum, cement, chlor-alkali, fertilizer, iron and steel, pulp and paper, textiles and thermal power plants

Coverage: 478 facilities across the eight sectors; largest number from the power sector (144), followed by the textile (90) and cement (85) sectors

Penalty: Base penalty of USD 20,000 plus an amount proportional to the number of units the target is short by

production and energy consumption data to the Bureau of Energy Efficiency (BEE) for baseline determination and target-setting. Baseline verification was conducted by certified Designated Energy Auditors who submitted their reports to the BEE. The BEE also acts as the market regulator for the PAT.

The PAT scheme is a means of achieving the targets at least cost, by allowing facilities to trade Energy Saving Certificates (EsCerts) to meet their energy reduction requirements. One EsCert is equivalent to one toe of energy consumption. Facilities monitor and report their specific energy consumption, and any energy savings achieved (i.e. specific energy consumption below the target level) will be issued EsCerts. These can be sold to facilities that have difficulty meeting their target, either bilaterally or on trading platforms created on two power exchanges (Indian Energy Exchange (IEX) and Power Exchange India Limited (PXIL)); they can also be banked for use in a subsequent phase of the PAT.[7] Details of subsequent phases of the PAT scheme are still to be determined but it is expected that its scope will be broadened to include other energy-intensive sectors, such as petroleum refineries, petrochemicals and chemicals, and that the targets would be made more stringent.

Renewable Energy Certificate Mechanism[8]

India's Central Electricity Regulatory Commission (CERC)[9] established a Renewable Energy Certificate (REC) mechanism to enable states to cost effectively meet their Renewable Purchase Obligations (RPOs); these require distribution companies to purchase a certain percentage of electricity from renewable sources, set by State Electricity Regulatory Commissions (SERCs).[10]

The mechanism provides flexibility for distributors in states that do not have adequate renewable sources to meet their RPOs, by establishing a market-based trading mechanism in renewable energy certificates.[11] A renewable energy generator can either sell electricity at a feed-in tariff rate (see below), or it can sell the electricity and the renewable attributes separately. In the latter case the electricity component can be sold as per usual, while the "environmental" or "renewable" electricity attributes can be exchanged in the form of a REC, with one REC equivalent to 1 MWh of renewable electricity fed into the grid. There are two types of RECs: solar and non-solar, both with floor and ceiling prices determined by the CERC. RECs are issued to renewable energy generators only, are valid for one year after issuance, and all compliance requirements are verified by external auditors. Besides being used to meet RPO compliance, RECs can be bought voluntarily. The RECs are traded on the Indian exchanges, PXIL and IEX, similar to the EsCerts under the PAT scheme; RECs are expected to be interchangeable with Energy Saving Certificates but not vice versa. The Indian REC market has conducted trades worth about USD 5 million since its launch, and monthly sales are expected to be valued at over USD 20 million by the end of 2012.[12]

BOX 4: Key Features of the REC mechanism in India

Implemented: March 2011

Objective: National goal of 15 percent renewable energy by 2020, implemented by states setting targets for a specific share of electricity to be acquired from renewable energy sources

Coverage: Renewable energy generators in 26 states (out of 28)

Floor Prices:

REC floor prices (INR/MWh): Until 31 March 2012 - 12,000 for solar and 1,500 for non-solar;

From 2012 to 2017 - 9,300 for solar (unchanged for non-solar)

REC ceiling prices (INR/MWh): Until 31 March 2012 - 17,000 for solar and 3,900 for non-solar;

From 2012 to 2017 - 13,400 for solar and 3,300 for non-solar

SUBSIDIES

Feed-in Premium: Wind Energy[13]

The Ministry of New and Renewable Energy (MNRE) implemented a national feed-in premium for wind power in 2009, known as the Generation Based Incentive (GBI) scheme. This policy was introduced with multiple objectives: to create a level playing field among different types of investors, especially since some are eligible to take advantage of the accelerated depreciation benefit; and to encourage independent power producers and foreign investors to invest in the Indian wind industry. A tariff of INR 0.50 per kWh of electricity fed into the grid is provided to eligible projects for a minimum of 4 years and a maximum of 10 years, up to a maximum of INR 6.2 million per MW.[14] This is on top of any feed-in tariff provided at the state level.[15] Eligible projects must meet several requirements: be independent power producers; have a minimum installed capacity of 5 MW; be grid connected or captive; not take advantage of the accelerated depreciation benefit;[16] and not sell power to third party/merchant power plants. The premium is offered to wind farms installed before 31 March 2012; the program will be evaluated in the course of 2012 and depending on the results could be extended. The program is expected to disburse a total of INR 3.8 billion until 2012. As of January 2011, about 400 MW of new capacity had been added.[17]

Feed-in tariffs

A range of feed-in tariffs are operating at both the federal and state levels in India for a variety of different sources. Seventeen SERCs implement feed-in tariffs for wind power projects, which range from INR 3.20/kWh in the state of Uttarakhand to INR 5.31/kWh in the state of Orissa.[18] SERCs are also implementing feed-in tariffs to incentivize solar power projects. For example, the state of Gujarat offers a 25-year feed-in tariff for megawatt-scale solar PV and solar thermal projects under its Solar Policy 2009. For 2012-13, the tariff rate is INR 9.28/kWh for solar PV and INR 11.14/kWh for solar thermal. The tariffs decline by approximately seven percent per year up until 2015.

The MNRE's use of auctions to set tariffs for renewable energy projects is leading states to re-examine their feed-in tariffs and potentially adopt a similar process.

Solar power feed-in tariffs for central power generating units were introduced by CERC for financial year 2010-11. For power purchase agreements (PPAs) signed by 31 March 2011, the tariff rate is INR 17.9 per kWh for utility-scale photovoltaic and rooftop projects and INR 15.3 per kWh for concentrated solar power (CSP). For PPAs signed after 31 March 2011, the feed-in tariffs for financial year 2011-12 are INR 15.39/kWh for solar PV and INR 15.04/kWh for CSP.

Guaranteed tariffs set through auctions[19]

India's National Solar Mission[20] sets an ambitious target of generating 20,000 MW of grid-connected solar PV and concentrated solar power by 2022, to be achieved in three, five-year phases. Each phase has quantified installation targets for utility-scale PV, rooftop PV, off-grid PV and concentrated solar power.[21] As a means to meet this ambitious target, the government has transitioned from setting feed-in tariffs to using auctions for determining tariffs awarded to solar projects.

Electricity generated in central power generating units is mostly allocated to different states and territories based on a specified allocation formula; 15 percent of power is "unallocated" and can be used at the central government's discretion. To meet the National Solar Mission targets, solar power generation in phase I (to 2013) will be bundled with power from the unallocated generation share, and sold to the state distribution facilities.[22] Solar projects are awarded in various rounds through a competitive bidding process (reverse auction), due to great interest shown by the Indian solar industry.

The National Thermal Power Corporation's (NTPC) power trading arm NTPC Vidyut Vyapar Nigam (NVVN) conducted the first reverse auction in 2010. 150 MW of solar PV and 470 MW of CSP were auctioned in the first round. Quotes received were on average 25 to 32 percent below the CERC's declared tariffs (INR 17.9 per kWh and INR 15.3 per kWh for solar PV and CSP respectively). Projects were selected based on the criteria of a maximum discount offered on the CERC tariff. The bids received totaled 5,126 MW, about eight times the maximum allotted capacity of 620 MW. The extremely low bids raised concern about the projects' viability, and about half the bids were discarded. In 2011, a second round of auctioning awarded 350 MW of solar PV and CSP projects. Bids received were significantly lower than even the first round; the lowest winning bid was INR 7.5/kWh, and the average bid INR 8.77/kWh. Once again,

BOX 5: Renewable energy feed-in tariffs and premiums

Wind energy

17 state-level feed-in tariffs

National-level feed-in premium since 2009 for independent power producers with minimum 5 MW installed capacity, installed before March 2012

Solar PV and concentrating solar power (CSP)

National-level feed-in tariffs for central power generating units since 2010: INR 15.4/kWh for solar PV and INR 15.04/kWh for CSP

Various state-level feed-in tariffs for state generating units

observers raised concern about the financial viability of the winning bids.[23]

Preferential Financing[24]

One element of the National Mission on Enhanced Energy Efficiency is to establish a Framework for Energy Efficient Economic Development (FEEED), with the objective of developing fiscal and investment guarantee instruments to promote energy efficiency. One of the instruments established is a Partial Risk Guarantee Fund for energy efficiency (PRGF), a risk sharing mechanism that lowers the lending risk associated with energy efficiency projects undertaken by energy service companies (ESCOs). The PRGF guarantees up to 50 percent of the principal loan amount in case the borrower defaults. The PRGF will be managed by the BEE and supported by a Project Appraisal Unit and a Supervisory Committee.

The PRGF is to be complemented by the Venture Capital Fund for Energy Efficiency (VCFEE), which will inject equity funding into energy efficiency projects. It is to be established with seed capital from the Government of India as well as other institutions. The VCFEE will provide risk capital, leverage other private venture capital investments, and set a comparatively lower rate of return expectation on its share of investment. The VCFEE is to be managed by an independent trust, to be established by the BEE. For both the PRGF and the VCFEE, the Government has allocated INR 666.2 million in 2010-11.

National Clean Energy Fund

Established in 2010 and funded primarily through a levy on coal (see below), the National Clean Energy Fund (NCEF) was created to fund research and innovative projects in clean energy technologies. This could include critical renewable energy infrastructure projects and clean fossil energy (CCS, coal gasification etc.).[25] Project proposals can be submitted by all types of companies or organizations, but must be sponsored by a government ministry or department. The NCEF awards loans or grants covering up to 40 percent of total project costs. Project proposals undergo various stages of review by the government, and decisions to disburse funding are made by different ministries or committees depending on the total amount. The NCEF collected revenues of approximately INR 106 billion in 2010-11 and an estimated INR 325 billion in 2011-12; to date it is estimated that INR 4.63 billion has been disbursed.[26] In practice, funded projects have supported existing government activities (such as PV installations under the National Solar Mission), some receiving more than 40 percent of total costs. Of these, some are far removed from the NCEF's stated objective (such as remediation of hazardous waste sites and forestry activities).[27]

TAXES

Clean Energy Cess[28]

A levy of INR 50 (approximately USD 1) per ton of domestic and imported coal, lignite and peat has been in place since July 2010, known as the Clean Energy Cess

(CEC). The CEC generated over INR 1 billion in 2010-11, approximately INR 3.2 billion in 2011-12, and INR 3.9 billion is anticipated for 2012-13. The revenue generated is channeled into the National Clean Energy Fund.

Removal of Fossil Fuel Subsidies[29]

At the 2009 G20 Pittsburgh Summit, India committed to rationalize and phase out inefficient fossil fuel subsidies over the medium-term, and the government has begun to implement this commitment. It has reformed the subsidy regime for petroleum, liberalizing prices and accompanying this with a reduction in duties. The government has also enacted reforms to improve direct subsidies to low-income households for kerosene and liquefied petroleum gas (LPG) cylinders, rather than subsidize their cost for all consumers. To better target provision of subsidized kerosene and LPG, a distribution program has been in place since 2009, and two pilot projects for LPG sales are taking place in Hyderabad and Mysore that provide cash subsidies directly to beneficiaries using their electronic identification numbers.[30]

SOUTH AFRICA

South Africa's National Climate Change Response Policy, formally published as a White Paper in October 2011, outlines the government's vision for an effective climate change response, the transition to a climate resilient and low-carbon economy, and highlights the key elements of South Africa's mitigation strategy. It explores the deployment of "a range of economic instruments … including the appropriate pricing of carbon and economic incentives, as well as the possible use of emissions offset or emission reduction trading mechanisms" and discusses both carbon tax and carbon markets as elements of South Africa's mitigation strategy. Mitigation actions are focused on the energy sector, responsible for over 70 percent of total GHG emissions, particularly electricity generation which itself accounts for 40 percent of total emissions.[1]

South Africa also released its Integrated Resource Plan (IRP) in 2011, the government's long-term plan for electricity generation till 2030, which includes a strong push for renewables, which are to make up 42 percent of all new electricity by 2030.[2] South Africa's climate strategy framework is based on the policy recommendations from the Long-Term Mitigation Scenarios (LTMS), a two-year process that culminated in 2008. It includes a "peak, plateau, decline" strategy: GHG emissions are to peak by 2020-2025, plateau for the next 10 years and then decline in absolute terms.[3] South Africa also pledged internationally that it will reduce GHG emissions 34 percent by 2020 and 42 percent by 2025 below business-as-usual projected levels, on the condition that it receives the necessary financial, technological and capacity building support.

SUBSIDIES

Setting tariffs through auction mechanism: Renewable Energy Independent Power Producer Program (REIPPP)

In 2009, South Africa established a renewable feed-in tariff policy (REFIT) to increase the contribution of renewables in its electricity mix. The National Energy Regulator for South Africa (NERSA) proposed to revise the tariffs in 2011, given no projects had been implemented and continuing industry concerns.[4] The South African National Treasury compounded the uncertain regulatory environment by questioning the legal authority of the REFIT policy. In August 2011 the Department of Energy finally decided to abandon the REFIT policy, replacing it with a competitive bidding process for electricity generation from renewable energy sources by independent power producers, the REIPPP, also known as "Rebid" (see **Box 6**).

REIPPP was launched to procure 3,725 MW of capacity by 2016, based on the deployment objectives outlined within the Integrated Resource Plan.[5] This was to be held in five rounds, the first of which was completed in November 2011 and the second in March 2012. In total, 47 winning bids representing 2,460 MW of potential capacity have been approved, comprising onshore wind, solar PV, concentrating solar power, and two small-hydropower projects.[6] Price ceilings for each technology were set by the Department of Energy, which will also act as the sole buyer of electricity produced under 20-year power purchase agreements until the establishment of an Independent System and Market Operator (ISMO), planned for the end of 2012. Prices for solar PV fell from ZAR 2.75c/kWh in the first window to ZAR 1.65c/kWh in the second; wind power fell from ZAR 1.14c/kWh to ZAR 0.98c/kWh. Bids meeting basic qualifications are evaluated against two criteria: price (70 percent) and economic and social development (30 percent).[7] Emphasis on the latter criteria increased from the first to the second window. The REIPPP policy has had a cautious but favorable response from industry.[8]

Energy Efficiency Savings (EES) Tax Incentive[9]

The EES Tax Incentive will provide tax deductions for energy efficiency investments by manufacturing facilities. Draft regulations for the incentive program were issued September 2011 and are currently being revised, while technical standards and an accreditation process for verification bodies have been developed by

BOX 6: Key features of the Renewable Energy Independent Power Producer Programme (REIPPP)

Established: 2011

Objective: 3,725 MW of renewable energy electricity to come online between 2014 and 2016, with target broken down by technology type; to date 2,460 MW procured

Technology types and targets: electricity from onshore wind (1,850 MW), solar PV (1,450 MW), concentrating solar power – CSP (200 MW), biomass and biogas (12.5 MW each), landfill gas (25 MW), small hydropower (75 MW), any source with installation under 5 MW (100 MW); only CSP target has been fully procured

Eligibility: Independent power producers (i.e. not the state electricity company, Eskom)

Tariff amount: Determined by market; guaranteed for 20 years

the South African Bureau of Standards. To qualify for the tax deduction, projects must result in a 10 percent minimum energy consumption reduction in the year the investment was made (relative to a predetermined base year) and be sustained for four years. The share of total investment allowed as a tax deduction as well as the maximum deduction amounts vary according to investment size categories (over and under ZAR 200 million), and whether the investment is greenfield (new equipment) or brownfield (refurbishment). Evidence for the savings achieved is provided through submission of energy efficiency certificates issued by the National Energy Development Institute following verification. The program is set to run until 2020, and ZAR 20 billion has been budgeted for the policy until 2015.

TAXES

Carbon Tax

South Africa's National Treasury began examining environmental taxes in 2006, followed by a 2010 discussion paper exploring various design options for a carbon tax as a mechanism to price carbon that would result in behavioral changes, including the uptake of clean energy and low-carbon technologies.

Implementation of a carbon tax was proposed in South Africa's 2012 Budget. The proposed tax would cover all direct, stationary sources of emissions, including process emissions, and apply to CO_2, methane (CH_4) and nitrous oxide (N_2O) emissions. The tax would be implemented from October 2014 in two phases, the first running to 2019 and the second to 2025. The initial proposed rate is of ZAR 120 per tCO_2e, applying above a certain threshold of a firm's emissions, and would increase 10 percent annually until 2019-20. In the first phase the tax would only apply to 40 percent of total emissions (basic threshold at 60 percent). Trade-exposed sectors with competitiveness concerns and process emissions would receive an additional exemption of 10 percent each. In addition, the basic threshold could be adjusted upwards or downwards based on a firm's carbon intensity (emissions per output) in relation to an agreed carbon intensity benchmark within a given sector.

An offset mechanism is also envisaged to offset carbon tax liability up to a maximum of 5 or 10 percent. Revenue would not be earmarked, but consideration given to environmental issues when determining revenue use, particularly to energy efficiency and assistance to low-income households.[10] National Treasury will release a policy document for public comment in late 2012 that will further flesh out the design of the carbon tax.

Taxes on goods

The South African government has implemented a range of taxes targeted at GHG emissions reductions since 2008:

- National Treasury introduced a CO_2 emissions tax on motor vehicles in 2010 – for passenger vehicles that exceed 120 gCO_2/km, the tax is ZAR 75/gCO_2 and for "double cabs" (extended cabs) that exceed

175 gCO_2 /km, the emissions tax is ZAR 100/ gCO_2. The main objective of this tax is to influence consumer behavior and encourage the uptake of more energy efficient and environmentally friendly vehicles.

- An electricity generation tax of ZAR 2.5c/kWh was introduced in 2008 on the sale of electricity generated from non-renewable sources and is collected at source by the generators of electricity. In July 2012, the levy was increased to ZAR 3.5c/ kWh[11] and the additional revenue will be used to fund energy efficiency initiatives. The objective of this tax is two-fold: to help reduce carbon emissions and to manage electricity supply shortages by reducing demand.
- To support energy efficiency and reduce electricity demand, an environmental levy on incandescent light bulbs was introduced in 2009. The levy of about ZAR 3 per bulb (between 1 cent and 3 cents per watt) is imposed on incandescent light bulbs at the manufacturing level and on imports.

SOUTH KOREA

In April 2010, the Korean government passed the "Framework act on Low Carbon, Green Growth", incorporating a range of direct government funding and price signals to champion low-carbon economic growth. This legal framework was the culmination of the "low-carbon, green growth" development strategy announced by President Lee Myung-bak in August 2008, followed by the establishment of the Presidential Committee on Green Growth in 2009, which developed national strategies and five-year plans. The Korean government aims to reduce fossil fuel dependence for both energy security and environmental reasons, and has been pushing the development of alternative energy sources and improved energy efficiency to this end.[1]

In 2009, the government also announced its objective to reduce GHG emissions 30 percent below projected business-as-usual level emissions in 2020, equivalent to a four percent reduction from 2005 emissions.[2] The Republic of Korea also implemented several measures to meet its national New and Renewable Energy (NRE)[3] technology development and deployment targets of having NRE sources make up 4.3 percent of total energy supply in 2015, increasing to 6.08 percent in 2020, and to 11 percent in 2030.

TRADING SYSTEMS

Cap-and-trade: Korea Emission Trading System [4]

The Korean government initially proposed a draft cap-and-trade bill in 2010, and submitted a revised proposal to the parliament in April 2011. The further revised cap-and-trade bill passed the National Assembly in May 2012, broadly supported by both the conservative party in power and the liberal opposition.[5] Industry pressure, falling public opinion polls, and concern that Japan and Australia would delay passing similar policies made the legislation less stringent than the original proposal, and delayed implementation of the ETS by two years. The ETS includes all six GHGs under the Kyoto Protocol, and would cover approximately 60 percent of Korea's GHG emissions. The legislation includes provisions to allow the government to increase or cancel allowances to control prices, and financial penalties for non-compliance; though these have reportedly been lowered from those originally proposed.[6] The Presidential Committee on Green Growth released draft rules to implement the ETS in July 2012, which were adopted 13 November.[7]

BOX 7: Key features of South Korea's emission trading system

Established: Legislation passed in 2012; in effect 2015.

Objective: Reducing GHG emissions 30 percent below 2020 business-as-usual levels.

Coverage: National; economy-wide; emitters over 25,000 tCO_2 / year (approximately 60% of emissions).

Length: Two three-year phases (2015-17 and 2018-20), followed by five-year phase in 2021.

Cost control measures: Banking and borrowing of allowances allowed; some early action credits potentially recognized; use of domestically sourced UN offset credits (CERs) recognized; no use of international offsets till 2021.

Allocation: 100 percent free in first phase; 97 percent free in second phase; below 90 percent free starting in 2021; full free allocation for key trade-exposed industries (steel, semiconductors).

Compliance: Penalty for non-compliance up to three times the average market price of an allowance in a given year, to a maximum of KRW 100,000 per tCO_2.

The ETS builds on the Greenhouse Gas and Energy Target Management System (TMS), a program that mandates GHG reduction targets by designated large emitters. Starting in January 2012 and set to run until 2014, the program currently applies to 458 companies emitting over 25,000 tCO_2 per year, dominated by 366 from the power and industrial sectors, and 92 from other sectors.[8] Coverage will deepen through 2014 as emissions and energy-use thresholds are lowered annually. The TMS establishes collective and company-level annual emission targets below business-as-usual levels (growth projections based on 2007-2009 average emissions); companies can either meet their target, or pay a flat KRW 10 million fee, regardless of how much a company emits above its target. An offset system will allow large companies to invest in emission reductions in small- and medium-sized enterprises (SMEs), and to count these toward meeting their target. The government has indicated these credits could count as early action credits within the cap-and-trade system in 2015.[9]

Baseline and Credit System: Korea Voluntary Emission Reduction Program (KVER) [10]

Since 2005, the Ministry of Knowledge Economy has operated a voluntary baseline-and-credit market for GHG emission reduction certificates, Korea Certified Emission Reductions (KCERs). While KCERs are available for purchase as voluntary offsets, since 2007 the Korean government purchases the vast majority at a price ranging from USD 4-6/tCO_2, as a means of stimulating GHG reduction activities and building capacity with project-based mechanisms.

Projects eligible to produce KCERs must reduce at least 100 tCO_2e annually and can be bundled; reduction amounts lower than 100 tCO_2e are also allowed if they are bundled.[11] Projects are subject to rigorous assessment and verification, and must account for social and environmental factors. The government can support project preparation and methodology development costs (approximately USD 2,000-5,000 per project), as well as verification costs for SMEs (up to USD 3,000). Projects can generate KCERs for five years after registration. From 2007 to 2010, 491 projects were verified and generated reductions of 8.8 kilo tCO_2e.

SUBSIDIES

Direct subsidies for renewable energy[12]

The Korean government has subsidized the installation of new and renewable energy (NRE) technologies since 1993. For 2012, the subsidy covers between 40 percent and 75 percent of the unit cost of renewable energy equipment (solar, geothermal, biomass, small wind and fuel cells), increasing to 80 percent for demonstration-stage projects. From 1993 to 2009, KRW 142 billion in subsidies were awarded.[13]

A special program to subsidize part of the cost of installing solar PV panels on homes was launched in 2004, aiming to deploy 100,000 solar PV systems. Between 2004 and 2008, KRW 169 billion was spent and 10.5 MW of capacity installed. The program aimed to spur the development of domestically-manufactured, high efficiency and low cost 3 kW solar cells. In 2009, the 100,000 Solar-roof deployment program was incorporated into the "1 Million Green Homes program", aiming to subsidize the installation of small renewable energy systems on 1 million residential buildings by 2020. The new program also supports the installation of fuel cells, solar thermal, geothermal, small wind and biomass-based power systems.

Since 1996, the government has also provided subsidies to local governments to develop regionally-appropriate renewable energy projects. In 2005, the Regional Deployment Subsidy Program developed a specific funding stream for NRE systems. The Ministry of Knowledge Economy shares up to 50 percent of project costs with municipalities for renewable energy manufacturing facilities and installations.[14]

Tax incentives[15]

The Korean government encourages the purchase of hybrid vehicles, providing an exemption from a range of vehicle taxes up to KRW 3.1 million. The tax exemptions are currently implemented on a temporary basis, from July 2009 to December 2012.

All renewable energy technologies receive a 5 percent tax credit, and in 2009, import duties were halved on all components and equipment used in renewable energy power plants.[16] Approximately 20 percent of the total investment amount for installing renewable energy systems can also be deducted from personal or corporate income tax.[17]

Preferential financing

The 2010 Framework act on Low Carbon, Green Growth provides support for the development of green technologies and industries through public financial institutions. This includes expanding public credit guarantees offered by the Korea Credit Guarantee Fund (KCGF) and Korea Technology Credit Guarantee Fund (KTCGF) to the green-tech and green-industry sectors.[18] The KCGF provided KRW 3.6 billion in guarantees to "Green growth enterprises" in 2011, approximately 12 percent of its total guarantee amount. The KTCGF is the leading technology financing institution within the Korean green growth industry. It plans to provide guarantees worth KRW 10 trillion up to 2013, and in 2011 offered KRW 24.3 billion in credit guarantees to green growth industries. In addition, it introduced a new "Green hi-tech special guarantee" system in 2011, providing KRW 500.3 billion to 787 companies, including specific credit guarantee support for the hiring of personnel and R&D expenses.[19]

The Korean government also provides long-term, low-interest loans through commercial financial institutions for both the installation of NRE systems (Installation Loans) as well as for manufacturers of commercialized NRE systems (Operational Loans), since the early 1980s. The loans support up to 50 percent of the funding requested for large companies, and up to 90 percent for smaller companies. Installation loans support system capital costs (up to KRW 10 billion), and Operational loans can support both the cost of acquiring and installing production facilities and equipment, as well as working capital (between KRW 1 billion and 10 billion).[20]

Direct consumer subsidies

Starting in 2009, three programs offer various cash incentives and discounts to individuals that consume energy efficient goods and services, or reduce their energy consumption. These operate by providing cash in exchange for points that are awarded when certain types of purchases are made, or a specific amount of emission reductions are made. While the three programs exist simultaneously, two have interchangeable point systems (Green Card Program and CO_2 Point System). Details on each program are provided in **Table 5** below.

REMOVAL OF ENVIRONMENTALLY HARMFUL SUBSIDIES

At the G20 Toronto Summit in June 2010, Korea provided an implementation strategy for phasing out subsidies to anthracite coal and briquette producers, as per its commitment at the 2009 G20 Pittsburgh Summit to rationalize and phase-out inefficient fossil fuel subsidies over the medium-term. At the end of 2010, the Korean government repealed a price support measure for anthracite coal.[24] Support for the production of anthracite briquettes is to be gradually phased-out by the end of 2020; this decreased from KRW 277.5 billion to KRW 186.5 billion from 2009 to 2010.[25] To protect low-income households from increases in briquette prices, the government is expected to expand a voucher scheme that directly subsidizes briquette consumption for such households. [26]

The Korean government regulates electricity prices, effectively setting the price below the cost of producing electricity. However, in an attempt to address rapid increases in electricity consumption over the past five years, the government announced plans to gradually increase power prices with the ultimate objective of implementing flexible power prices.[27] Allowing for the increasing costs of fuels to be reflected in the electricity price acts as an important signal to limit or reduce electricity consumption.[28] Electricity tariff increases in July and December 2011 led to a two percent increase for households, a 4.4 percent increase for commercial users, a 4.5 percent increase for education facilities, and two increases (of 6.1 and 6.5 percent) for industrial users. The government also announced it would impose progressive tariffs on winter peak times.[29]

TABLE 5: Direct Consumer Subsidy Programs in South Korea

PROGRAM	OVERVIEW	DESIGN	IMPLEMENTATION	INCENTIVES
Green Card Program[21]	Since July 2011, provides cash incentives for the purchase of certain products. Since March 2012, exchanges cash for reductions achieved through the Carbon Point program.	Points are awarded for the purchase of specially designated eco-label products and one point is equivalent to KRW 1.	Operates through a designated credit card provider, as well as a network of program-affiliated retail store credit cards and banks. Points given out by participating companies are treated as taxable donations, up to a limit of 10 percent of taxable income per fiscal year.	Points can be used like cash at Green Card affiliated retail stores, and withdrawn from ATMs at program-affiliated banks. Card use itself provides points that provdes discounts on public transportation, and discounted or free entry to national parks and forest lodges. Carbon Points can also be redeemed for a fixed price of KRW 2 per Carbon Point. Cumulatively, the program offers consumers up to KRW 200,000 per year.
Carbon Dioxide Point Program[22] (Carbon Point) The government is planning to expand the coverage of the Carbon Point program, link it with other local government incentive programs, and aims to have six million participating households by 2015.	Since July 2009, provides individual owners and tenants of residential or commercial buildings with points for GHG reductions achieved through reducing electricity, gas or water consumption.	One point is offered for every 10 tCO_2e reduction, calculated based on established emission factors and either historical or standard consumption amounts.	The program is implemented in partnership with all 232 local governments, and 2.5 million households participated by the end of 2011. Each local government selects whether electricity, water or gas will be the basis of the program.	Each local government determines which incentives are offered in exchange for points – this can take the form of cash, gift certificates, or financial reductions in other building operation-related expenses. The payment offered per point varies by local government, but can reach up to KRW 3.
Carbon Cashbag[23] Also called "Carbon Cash-back"	Since early 2010, awards redeemable points for the purchase of efficient goods.	One point is equivalent to KRW 1, and awarded to customers upon the purchase of high-efficiency and/or low-standby power appliances.	The program is rolled out in collaboration with one of the country's largest credit card providers, other affiliated card providers, as well as manufacturers and retailers, who share the cost of providing points to consumers with the government.	The points can be used to buy "low-carbon" products and services, including efficient appliances, compact cars, vehicle maintenance, utility bill pay, and offset purchasing.

GLOSSARY OF TERMS

TRADING SYSTEMS

Cap-and-trade[1] — In a cap-and-trade program, the government determines which facilities or emissions are covered by the program and sets an overall emission target, or "cap," for covered entities (firms held responsible for emissions). This cap is the sum of all allowed emissions from all included facilities. Once the cap has been set and covered entities specified, tradable emissions allowances (rights to emit) are distributed (either auctioned or freely allocated, or some combination of these). Each allowance authorizes the release of a specified amount of GHG emissions, generally one metric ton of carbon dioxide equivalent (tCO_2e). The total number of allowances is equivalent to the overall emissions cap (e.g., if a cap of one million tons of emissions is set, one million one-ton allowances will be issued). Covered entities must submit allowances equivalent to the level of emissions for which they are responsible at the end of each of the program's compliance periods. Entities with excess allowances (emitted below their cap) can sell these, or, in most cases, can keep them for a later compliance period (known as banking). Entities with insufficient allowances (emitted over their cap) can purchase allowances from other entities, or via an exchange.

Baseline and Credit[2] — Baseline and credit is an emissions trading system in which covered entities (firms held responsible for emissions) must "earn" credits before they begin trading. A benchmark or baseline level of emissions for each covered entity within the trading system is determined, and entities must reduce emissions below the established baseline level. The baseline level is usually determined based on historical average emissions levels, and anticipated changes in emissions levels. At the end of the program's compliance periods, the regulatory authority compares the baseline calculation with actual emissions, and entities with emissions below the baseline receive credits equal to the difference. These credits are then available for trading. Entities with emissions above the baseline level must purchase credits equal to their excess emissions. As with cap-and-trade, a credit generally represents one metric ton of carbon dioxide equivalent (tCO_2e). Baselines can be defined in intensity terms, that is, carbon pollution per unit of output. In this case total allowable emissions will therefore vary with output levels, rather than be capped under an absolute level.

Renewable Energy Certificates (RECs) — A Renewable Energy Certificate (REC) represents the certified generation and delivery of one unit of electricity from a qualifying renewable energy source, generally one megawatt-hour (MWh). Once a REC is issued, renewable energy generators have two commodities to sell: wholesale electricity and RECs.[3] Certificates can be traded and used to meet renewable energy obligations among consumers and/or producers, and can also be used for voluntary renewable energy power purchases.[4] Renewable energy obligations are often known as a renewable portfolio obligation (RPO) or renewable portfolio standard (RPS). They mandate that electricity suppliers (or, alternatively, electricity generators or consumers) source a certain quantity (in percentage, megawatt-hour, or megawatt terms) of electricity from renewable energy sources. Many – but not all – such policies include the trading of renewable energy certificates.[5]

Energy Efficiency Certificates (EECs) — An energy efficiency certificate (EEC) represents a specific, verified quantity of energy saved, generally one MWh or metric ton of oil equivalent (Mtoe). As with RECs, these are generally issued and traded to meet an energy saving target or obligation, mandating certain energy or electricity users to save a given amount of energy. Designated entities must implement energy-saving measures if they consume above their target level, and submit sufficient EECs to meet their target. Those entities achieving insufficient savings can purchase additional EECs from other entities.[6]

SUBSIDIES

Preferential financing — Broadly, preferential financing policies are those that address financial barriers to less GHG-intensive investments, notably in renewable energy

and energy efficiency. Such barriers include an insufficient availability of funds, project development and transaction costs, and higher risk perceptions. Preferential financing policies include: access to loans with low or zero interest rates; reduced fees on financial transactions; longer periods of time over which to repay loans (longer amortization periods); and extending the period of time for which payment on a loan can be received after the actual repayment due date without any penalties (grace periods). Often, such preferential conditions are offered by state-affiliated or national banks. Commercial banks can also offer preferential financing in collaboration with public institutions, including through the use of government-backed credit guarantees.

Credit guarantees [7] **—** Credit guarantees are financial risk management measures that reduce the repayment risk to the lender. Partial risk or partial credit guarantee programs established by a public entity (such as a government agency and/or donor organization) reduce the risk of financing low-carbon investments to the private sector, by sharing this risk through a guarantee mechanism. The public entity guarantees it will cover a portion of the loss due to loan defaults, that is, repay a specified portion of the loan amount (generally between 50 and 100 percent) in a situation where the loan recipient cannot do so and defaults on the loan.

Direct subsidies or grants — In this brief, direct subsidies or grants refer to non-repayable direct financial assistance provided by the government or a government-related entity to incentivize less-GHG intensive economic decisions.

Tax incentives — Like other financial incentives, tax incentives aim to alter behavior but through the use of tax measures, by making less GHG-intensive purchases and investments more financially attractive. These can include: tax reductions, which reduce the taxation rate on a certain product or service; tax deductions, which reduce taxable income by a specified amount; and tax credits, which lower the amount of income tax to be paid by a certain amount.

Feed-in tariff (FIT) / Feed-in premium (FIP) — A policy that sets a guaranteed price, over a specified time period, at which power producers can sell electricity generated from renewable sources into the grid. Feed-in premiums refer to a fixed premium provided on top of the market price for electricity, to make up the shortfall between the market electricity price and the generally higher cost of producing electricity from renewable sources. Feed-in tariffs and premiums are expressed in national currency per kWh or national currency per MWh.[8]

TAXES

Besides being used to raise revenue, governments can use taxes to increase the price of environmentally harmful goods so as to discourage their use. Such taxes are a way of correcting the negative externalities associated with their consumption, such as increased air pollution and GHG emissions. Examples in the brief include higher duty rates for more polluting cars, or levies on products such as coal. A carbon tax applies specifically to the carbon content of oil, coal, and gas to discourage the use of fossil fuels and aims to reduce carbon dioxide emissions.

Removal of environmentally harmful subsidies[9] **—** A subsidy may go beyond correcting for a market failure and convey a rent, or benefit, to the subsidy recipient. In the context of this brief, environmentally harmful subsidies refer to those provided to the fossil fuel energy sector (coal, oil and gas) that lower the cost of energy production, raise the price received by energy producers, or lower price paid by energy consumers. Subsidies distort price signals; governments can remove such subsidies to change the relative prices of higher- and lower-GHG intensive energy sources in favor of the latter.

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ENDNOTES

Introduction

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This report explores the role of market based mechanisms to address greenhouse gas emissions and climate change in the five developing economies of Brazil, China, India, South Africa, and South Korea. The Center for Climate and Energy Solutions (C2ES) is an independent non-profit, non-partisan organization promoting a strong policy and action to address the twin challenges of energy and climate change. Launched in 2011, C2ES is the successor to the Pew Center on Global Climate Change.

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