An Overview of Greenhouse Gas (GHG) Control Policies in Various Countries

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Summary

As Congress considers legislation to address climate change, and follows negotiations toward a new international agreement to reduce greenhouse gas (GHG) emissions, the question of the comparability of actions across countries frequently arises. Concerns are raised about what the appropriate sharing of efforts should be among countries, as well as the potential trade implications if countries undertake different levels of GHG reductions and, therefore, incur varying cost impacts on trade-sensitive sectors. This report summarizes the GHG control policies in effect or under consideration in the European Union (EU) and various other large countries, and offers a brief set of initial observations. It gives particular emphasis to how particular trade-sensitive sectors may be treated in the context of each national program.

All countries examined have in place, or are developing, some enforceable policies that serve to reduce GHG emissions. Most are at some stage of making their programs more stringent. The wealthiest countries have all taken on GHG limitation or reduction targets under the Kyoto Protocol. Some of the emerging economies have voluntarily stated GHG targets, though none have yet accepted legally binding obligations in an international agreement. The forms of targets, and their stringencies, vary widely across countries.

The scope of specific GHGs and economic sectors covered by national (or sub-national) reduction measures is generally, but not completely, similar. All have policies that affect carbon dioxide emissions; most have some measures that cover the additional five gases covered under the Kyoto Protocol (methane, nitrous oxide, sulfur hexafluoride, perfluorocarbons, and hydrofluorocarbons).

The programs and measures used vary across countries. Even when some measures have similar names (e.g., voluntary programs and voluntary action plans), the measures may differ in important ways that may influence their effectiveness and impacts on trade competiveness. Within sectors of a country, emission rates and control requirements may vary widely. A country may have some facilities with emission rates (or energy intensities) comparable to the best globally, even if the country's sectoral average as a whole has, for example, a significantly higher energy intensity than the global average.

This report presents an overview of GHG control policies within individual countries. It does not present a rigorous assessment of the comparability of GHG control policies across countries or within specific sectors. The criteria for assessing comparability internationally are not widely agreed, and could encompass a range of considerations, not all quantitatively measurable.

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This report summarizes the greenhouse gas (GHG) control policies in effect or under consideration in a number of large countries, and offers a brief set of initial observations. This overview allows preliminary comparison across countries. Because of congressional interest in the comparability of countries' actions, and in the potential trade ramifications of differential policies, these country fact sheets give emphasis to how particular trade-sensitive sectors may be treated in the context of each national program. Where specific industries are not listed in a country's fact sheet, no further information was found.

The European Union's policies are presented first, followed by any additional rules or policies under consideration in several of the largest EU Member States (i.e., France, Germany, the United Kingdom). A number of additional large-emitting countries follow in alphabetical order. Finally, the **Appendix** provides a comparison of early 2009 vehicle efficiency standards across countries, which may be a useful reference for a sector that emits a large portion of global GHG emissions.

Synthesis Observations

- All countries examined have in place, or are developing, some enforceable policies that serve to reduce greenhouse gas (GHG) emissions. Most are at some stage of making their programs more stringent.
- The scope of specific GHGs and economic sectors covered by national (or sub-national) reduction measures is generally, but not completely, similar. All have policies that affect carbon dioxide (CO_2) emissions; most have some measures that cover the additional five gases covered under the Kyoto Protocol, including methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), perfluorocarbons (PFC), and hydrofluorocarbons (HFC).
- The programs and measures used vary across countries. Even when some measures have similar names (e.g., voluntary programs and voluntary action plans), the measures may differ in important ways that may influence their effectiveness and impacts on trade competiveness. For example, many countries support "voluntary programs" or "voluntary action plans." Some of these voluntary efforts may provide technical assistance with few requirements from participants; other programs may include formal emission reduction targets, reporting, and governmental pressure to achieve targets.
- Within economic sectors of a country, emission rates and control requirements may vary widely. A country may have some facilities with emission rates (or energy intensities) comparable to the best globally, even if the country's sector as a whole has, for example, an energy intensity significantly higher than the global average for that sector. Such discrepancies often occur in emerging economies wherein an older, less-efficient industrial sector is being replaced by new infrastructure.
- Most of the programs include provisions to assist or exempt trade-sensitive sectors, but the definition of what is trade-sensitive, and the approaches to assisting or protecting the sectors, vary widely. "Trade-sensitivity" is a continuing phenomenon. Companies become more or less competitive on an international market according to a host of factors, including productivity, market demand, resource costs, labor costs, exchange rates, and the like. The addition of a carbon control regime to this competitive dynamic has raised concerns that, in

the absence of similar policies among competing nations, trade-exposed industries that must control their emissions, or face increased costs passed-through by suppliers, may be less competitive and may lose global market share to competitors in countries lacking comparable carbon policies.[1] These concerns have led many countries to consider specific provisions for exposed sectors.

- Assessing the comparability of GHG control policies across countries and in specific sectors could be difficult, and the results could be subject to debate. How well alternative policy directions and methods could stand up under possible challenges against border adjustments under the World Trade Organization (WTO) may merit further investigation. However, consideration of specific methods to assess comparability, and their implications, is beyond the scope of this report.

[1] For a further discussion on trade-sensitivity issues, see CRS Report R40100, *"Carbon Leakage" and Trade: Issues and Approaches*, by Larry Parker and John Blodgett; and CRS Report R40914, *Climate Change: EU and Proposed U.S. Approaches to Carbon Leakage and WTO Implications*, by Larry Parker and Jeanne J. Grimmett.

European Union[2]

1. Overall GHG emission target, if any, and timing:

Under the Kyoto Protocol, the European Union (EU) agreed to reduce GHG emissions of its 15 Member states in 1997 (EU-15) in aggregate by 8% below 1990 levels during the first commitment period of 2008-2012. (There is no collective target for the EU-27, the current 27 Member states of the EU.) In 2007 and 2008, EU-15 GHG emissions were approximately 5% and 6%, respectively, below 1990 levels. In November 2009, The European Commission projected that the EU-15 will surpass its obligation to reduce GHG emissions under the Kyoto Protocol.[3] The EU-15 will have reduced their domestic GHG emissions to about 7% below 1990 levels during 2008-2012. Plans by EU-15 Member states to acquire international credits through the Kyoto Protocol's three market-based mechanisms would provide another 2.2% GHG reduction, while acquisitions by operators in the EU Emission Trading Systems may provide an additional 1.4% GHG reduction, and enhancement of carbon removals by sinks may offer another 1.0%. With additional policies and measures, the Commission projects that the EU-15 may be around 13% below 1990 levels in 2008-2015.

For the post-Kyoto period (beyond 2012), the European Council adopted on April 23, 2009, the "20-20-20" Policy"—a climate and energy package to require by 2020:

- a 20% reduction in GHG emissions from 1990 levels,
- a 20% share of renewable energy in the European Union's final consumption figures (including a 10% share in each Member State's transport sector), and
- a 20% reduction in energy consumption.[4]

The legislation also committed to scale up the GHG emission reduction target to 30% if other developed countries make comparable efforts under a new international agreement. The purpose is to limit the global temperature rise to no more than 2˚Celsius above preindustrial levels.

2. Principal Policy Instrument(s):

a. Expansion of current European Union Emissions Trading System (EU ETS).[5]

b. Effort-sharing relationships among Member States to reduce emissions in sectors not covered by the EU ETS. It will be left to Member States to define and implement policies in such sectors, although a number of EU-wide measures in areas such as efficiency standards, passenger car emission standards, and a landfill directive for waste disposal will contribute. The European

[2] This section was prepared by Richard K. Lattanzio, Analyst in Environmental Policy (7-1754), with input from Larry Parker, Specialist in Energy and Environmental Policy (7-7238) and Jane A. Leggett, Specialist in Environmental and Energy Policy (7-9525).

[3] http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/1703&format=HTML&aged=0&language=EN&guiLanguage=en.

[4] See {COM(2008) 13 final}; {COM(2008) 16 final}; {COM(2008) 17 final}; {COM(2008) 18 final}; {COM(2008) 19 final} at http://ec.europa.eu/environment/climat/emission/pdf/com_2008_16_en.pdf.

[5] (2003/87/EC); see http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/628&format=HTML&aged=0&language=EN&guiLanguage=en. Also see CRS Report RL34150, *Climate Change and the EU Emissions Trading Scheme (ETS): Kyoto and Beyond*, by Larry Parker.

Community infringement procedures and mechanisms for corrective action under the effort-sharing decision are to be put in place to monitor progress.[6]

c. Regulations stipulating mandatory national targets for the overall shares of energy from renewable sources in gross final consumption of energy, taking into account differing starting points for each Member.[7] It will be left to Member States to determine renewable share allocation among sectors.

At the national level, several EU Member states also impose carbon emission fees to some degree. Carbon fees exist in Denmark, Finland, and Sweden. French President Sarkozy had announced carbon taxes to begin on January 1, 2010, on French households and motor fuels, though their introduction has been delayed by an adverse constitutional ruling. Spain and Ireland reportedly have also signaled that they may consider domestic carbon fees in addition to EU and other national policies.[8] In addition, on October 5, 2009, an EU Taxation Commissioner revealed that in early 2010 the European Commission plans to propose an expansion of existing energy taxation in order to charge CO_2 emission fees as well.[9] The new carbon tax would cover sectors not under the EU ETS (see below), such as agriculture, households, and transport. The proposal explicitly is intended to help the EU achieve compliance with its law to reduce GHG emissions to 20% below 1990 levels by 2020. All taxation proposals, to pass into law, require unanimous agreement of the 27 EU Member states, which may be difficult to achieve, and the assent of the European Parliament.

3. Covered Gases and Sectors:

The only greenhouse gas covered under the original 2003 EU ETS was CO_2. The expanded EU ETS to take effect in 2013 will add N_2O emissions from nitric, adipic, and glyoxalic acid production, and PFC emissions from the aluminum sector. Gases not stipulated in the EU ETS, but defined as "greenhouse gases" in Annex II of DIRECTIVE 2003/87/EC include CH_4, HFC, and SF_6. These gases will be controlled under guidelines for sectors not covered by the EU ETS.

Sectors originally covered in the 2003 EU ETS were: power and combustion installations (exceeding 20 megawatts (MW)); petroleum refineries; coke ovens; metal ore production installations; iron and steel production installations (exceeding 2.5 tons of product per hour);

[6] Each Member State is responsible for the implementation of Community law (adoption of implementing measures before a specified deadline, conformity and correct application) within its own legal system. Under the Treaties (Article 226 of the EC Treaty; Article 141 of the Euratom Treaty), the Commission of the European Communities is responsible for ensuring that Community law is correctly applied. Consequently, where a Member State fails to comply with Community law, the Commission has powers of its own (action for non-compliance) to try to bring the infringement to an end and, where necessary, may refer the case to the European Court of Justice. For additional information, see http://ec.europa.eu/community_law/infringements/infringements_en.htm

[7] Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009.

[8] See, for example, Andres Cala, Europe Warming to Carbon Tax, Energy Tribune. "Spain and Ireland, which until recently were considered unlikely candidates to follow suit because of their high unemployment rates, are also weighing adding similar levies next year. Ireland's Finance Minister, Brian Lenihan, said recently that the government would not raise taxes to finance next year's budget, with the single exception of a carbon tax.... Spain's Prime Minister Jose Luis Rodriguez Zapatero, which has announced a fiscal reform to raise more money to control a rampant deficit, called the carbon tax an 'interesting' proposal and added carbon taxes will inevitably be applied by most countries." 23 Sept. 2009. http://www.energytribune.com/articles.cfm?aid=2354

[9] http://news.bna.com/deln/DELNWB/split_display.adp?fedfid=15354499&vname=dennotallissues&fn=15354499&jd=a0c0y8h5r1&split=0; http://www.reuters.com/article/GCA-GreenBusiness/idUSTRE59544A20091006.

factories for cement (exceeding 50 tons per day), glass (exceeding 20 tons per day); ceramics including tiles, bricks, stoneware, porcelain (exceeding 75 tons per day); and production of pulp, paper and board (exceeding 20 tons per day). The expanded EU ETS will increase the scope of covered sectors beginning in 2013 to include primary and secondary aluminum production facilities; ferrous, ferro-alloy, and non-ferrous metal production facilities; mineral wool and gypsum plants; ammonia, petro-chemical and chemical plants including carbon black organics, nitric acid, adipic acid, glyoxal, organic chemicals (exceeding 100 tons per day), hydrogen (exceeding 25 tons per day), soda ash, and sodium bicarbonate. Additionally, certain categories of aviation will be incorporated into the ETS involving commercial flights departing or arriving in a territory of a Member State.[10] In the EU ETS, Member states decide a National Allocation Plan (NAP), subject to review by the EU, to give emission allowances to individual plants. In the first pilot trading period, some Member states allocated more emission allowances than needed to companies, so that revisions to the scheme in Phase III, beginning in 2013, have been adopted to avoid over-allocation, including increasing rates of auctioning allowances.

Sectors not covered by the EU ETS but covered by adopted legislation include transport, housing, agriculture, and waste (see the following discussion).

4. Allocation of GHG reductions to various sectors:

The European Union's programs call for a 21% reduction in EU ETS sector emissions compared to 2005 and a 10% reduction in non-EU ETS sector emissions compared to 2005. This is expected to achieve an overall reduction of 14% compared with 2005, which is equivalent to a reduction of 20% compared with 1990. The EU ETS covers electricity generation and the main energy-intensive industries—power stations, refineries, iron and steel, cement and lime, paper, food and drink, glass, ceramics, engineering, and vehicles. Initially, countries allocate allowances to covered sectors, but limited auctioning of permits is planned for the future (e.g., maximum 10% of allowances are auctioned in Phase II).

Phase III ETS: Emissions from sectors covered in the EU ETS will be cut 21% from 2005 levels by 2020. A single EU-wide cap on emissions will be set for EU ETS covered sectors. Allowances will be allocated on the basis of rules harmonized across Member states. The tentative annual cap figure will begin at 1,974 million tons CO_2 in 2013 and decrease annually. The total number of allowances (one allowance equals permission to emit one ton) in 2013 will begin at the average total quantity issued for the 2008-2012 period and will decrease annually at a rate of 1.74%. Free allocation of emission allowances will be progressively replaced by auctioning allowances by 2020. Auctioning will begin in 2013 at 20% and gradually rise to 70% in 2020 and to 100% in 2027. Power producers must acquire all allowances at auction in order to prevent windfall profits (following experience under the pilot trading period). Member States that are highly dependent on fossil fuels and/or States insufficiently connected to the grid (these include Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland and Romania) are allowed to apply for a derogation procedure of reduced auctioning rates for power production of 30% in 2013, gradually rising to 100% in 2020, as long as producers invest in clean technologies to the market value of the permits. Furthermore, less affluent states (the 10 above plus Greece and Portugal) will receive an increased amount of emission permits to auction amounting to 12% more than their actual share to assist in revenue generation. Each Member state will be allowed to

[10] See CRS Report R40090, *Aviation and Climate Change*, by James E. McCarthy.

determine use of revenue with a suggested investment of 50% toward clean technologies and pollution abatement.

Non-ETS: Sectors not covered by the EU ETS are transport, housing, agriculture and waste. The 2009 Directive proposes to cut emission in these sectors by 10% EU-wide from 2005 levels by 2020. Targets will be mandated according to each Member states' relative wealth (based on GDP per capita and economic growth prospects) with figures ranging from -20% to +20%. Targets are binding on Member states and are enforceable through the usual EU infringement procedure.[11] If a country exceeds its annual objective, it must implement corrective measures, and will be penalized via a deduction from the following year's CO_2 allowance. Several flexibility measures are available including the possibility of trading emission cuts across countries; carrying forward ("banking") extra emission reductions; and using a limited amount of credit from developing countries (through an offsets mechanism similar to the Kyoto Protocol's Clean Development Mechanism).

The transportation sector has legally binding standards for CO_2 emissions from new passenger cars to apply as of 2012 in order the meet the 20% emission reduction by 2020.[12] Reductions are required to achieve 120 grams carbon dioxide per kilometer (CO_2/km) for 65% of fleet in 2012, 75% in 2013, 80% in 2014 and 100% starting in 2015. A target of 95 grams CO_2/km is set for 2020. Enforcement is set through financial penalties against the car manufacturers depending on how far their fleet exceeds the targets.[13]

A renewable energy mandate sets mandatory national targets for each Member state in accordance with each country's different starting points. The purpose of mandates is to provide certainties for investment. Each country will report to the European Council by June 2010 regarding how each Member has allocated the renewable target among transport, electricity, heating and cooling sectors. A 10% target for renewable energy in the transportation sector is set at the same level for all countries.

5. Any regulations or exemptions specific to trade-sensitive sectors:

The climate and energy package in the 2009 Directive provides that the risk of "carbon leakage"[14] may be reduced by allotting free carbon allowances to businesses exposed to "significant risk of carbon leakage" (SRCL) by the cost of compliance with the EU ETS. (The European Commission must adopt a list of sectors deemed exposed to a significant risk of carbon leakage no later than December 31, 2009. A draft list was proposed in September 2009, discussed below.) However, any free allowances will not be decided until 2011. The list may be revised before 2014, based on reanalysis of trade figures, and identification of countries that make firm commitments to reduce their GHG emissions.

[11] http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/misc/107136.pdf.

[12] Directive 2009/33/EC of the European Parliament and of the Council of 23 April 2009.

[13] http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/misc/107136.pdf.

[14] If one or more countries requires carbon controls that add to production costs in businesses that compete internationally, it is possible for "carbon leakage" to occur if production in the controlled countries declines because purchasers instead buy increased supply from uncontrolled producers in other countries. Though emissions may decline from the controlled facilities, they may increase at uncontrolled facilities, thereby leading to "carbon leakage." This would offset the benefits of the emission controls.

If international negotiations on climate change in Copenhagen do not lead to a comprehensive international agreement, several criteria permit an EU ETS-covered industrial sector to allege SRCL:

- if the industry can demonstrate that purchasing permits increases its costs (more than 5% of gross value added) and faces international competition (non-EU trade intensity above 10%), or
- if the industry can demonstrate that purchasing permits significantly increases its costs (more than 30% of gross value added), or
- if the industry faces international competition (non-EU trade intensity above 30%), then it can qualify for the free allocation of allowances.

Free allocation of permits typically will not be at 100% of needs for SRCL facilities, however. Free allowances will be adjusted according to Community-wide ex-ante benchmarks so as to ensure incentives for GHG reduction. The benchmarks will be set at the average performance of the 10% most GHG emissions-efficient installations in a sector in 2007-2008. Only the most efficient businesses in a sector, therefore, have a chance to receive all of their allowances free. If a business emits more than this benchmark allocation, it will need to acquire allowances up to its actual emissions.

As of September 2009, EU analysis assessed the industries and productions potentially exposed to carbon leakage risks. Assuming that 100% of allowances were auctioned (which will not occur initially), the analysis concluded that 146 sectors (out of 258) and five additional product categories meet the EU's criteria for being exposed to SRCL.[15] Outside of these sectors, 13 subsectors and products may be exposed to risk: food processing industries; industrial gases; non-metallic mineral products; glass fibers (filament glass fibers); and, colors and similar preparations for ceramics/glass etc.[16] The EU analysis estimates that the listed sectors now constitute about 75% of GHG emissions covered by the EU ETS.

An alternative approach to issues of competitiveness in trade sensitive sectors put forward by the European Commission is the integration of importers into the EU ETS. Under an integrated emission trading regime, foreign producers would purchase emission certificates for their imports according to the emissions produced. In a speech in London on January 21, 2008, the President of the European Commission, Jose Manuel Barroso, said: "I think we should also be ready to ... require importers to obtain allowances alongside European competitors, as long as such a system is compatible with WTO requirements." Beyond these measures, French President Nicolas Sarkozy, with possible interest from German Chancellor Angela Merkel, has indicated interest in potentially charging carbon levies against imports from countries that do not meet stringent environmental standards. (See fact sheet on France. See also the **Appendix**, comparing EU efficiency standards for motor vehicles with those of other countries.)

On December 22, 2009, E.U. environment ministers—including those from then-E.U. President Sweden and incoming-E.U. President Spain—were stated as saying that the 27-nation bloc would

[15] Of the 146 sectors, 117 have trade intensity > 30%; 27 have both estimated CO_2 costs >5% and trade intensity > 10%; and two sectors have CO_2 cost above 30% and trade intensity < 10%. Hans Bergman, "Sectors Deemed to be Exposed to a Significant Risk of Carbon Leakage—Outcome of the Assessment" presentation to Working Group 3 Meeting, 18 September 2009.

[16] http://ec.europa.eu/environment/climat/emission/carbon_en.htm.

consider imposing carbon tariffs and other border sanctions in the wake of perceived failures at the Copenhagen climate conference. No details were stated, but Teresa Ribera, Spain's Secretary of State for Climate Change, reportedly said that Spain plans to convene special meetings for the E.U. environmental ministers in the upcoming months to discuss the "strategic line" the European Union should take in promoting an international environmental agenda.

France[17]

(Policies and statements if substantially different from the European Commission)

1. Overall GHG emission target, if any, and timing:

Under the Kyoto Protocol, France's share of the EU target is not to exceed the 1990 level during the period 2008-2012.

France has a stated long-term national GHG emissions target of 75% below the 1990 level by 2050. A law is planned to reduce energy consumption of existing buildings by 38% by 2020.

2. Principal Policy Instrument(s): (See "EU ETS.")

Beyond instruments of the European Union, policy considerations have ranged from a freeze on the building of new highways and airports, to a vast plan to shift freight traffic from road to rail, to a commitment to slash pesticide use by half within 10 years by Europe's biggest farm producer. Tramway and TGV high-speed train networks are to be extended, and drivers encouraged to buy cleaner cars through bonuses and penalties. In October 2007, French President Nicolas Sarkozy called for a plan to institute a national "carbon tax" on global-warming pollutants. The Sarkozy-proposed carbon tax was rejected by France's Constitutional Council in December 2009; however, the party said the measure would be redrafted for passage in 2010 (see below).

3. Covered Gases and Sectors: (See "European Union.") The administration's proposed carbon tax would apply to households and motor fuels but not to large businesses and power generators, as they are not covered by the EU ETS.

4. Allocation of GHG reductions to various sectors:

About half of French industry's GHG emissions are covered by the EU ETS, including large emission sources in the power generation, iron, steel, glass, cement, pottery and brick sectors.

In September 2009, President Nicolas Sarkozy stated that the proposed carbon tax would begin in January 2010. Because Sarkozy's party holds a majority in its parliament, expectations are that the new carbon levy will be enacted into law. Initially set at 17 Euros (US$25)[18] per ton of emitted CO_2, the tax on the use of oil, natural gas and coal would nudge up the cost of a liter of gasoline by US$0.06 (US$0.23 a gallon). It would apply to households as well as enterprises, but not to the heavy industries and power companies in France that are covered by the EU's emissions trading scheme (see the EU ETS under "European Union"). Revenues from the new tax would be returned to taxpayers through cuts in income tax and other taxes. France's Le Monde newspaper says the tax will cover 70% of the country's carbon emissions (e.g., from vehicles) and bring in about 4.3 billion Euros (US$6.4 billion) of revenue annually. Sweden, Denmark, Finland, Norway and Switzerland already impose similar taxes, although Sweden's is levied at a much higher emission fee (108 Euros/ton of CO_2, or US$161/ton).

[17] This section was prepared by Richard K. Lattanzio, Analyst in Environmental Policy (7-1754).

[18] Live market currency exchange rate for November 19, 2009, is listed as 1 Euro equivalent to 1.49 US$ (http://www.xe.com/). Currency rates are subject to fluctuation.

On December 28, 2009, France's Constitutional Council rejected the carbon tax because the bill reportedly contained too many exceptions for polluters, broke with past practices, and produced an unfair tax burden on individual consumers. The French Council was stated as saying that the tax was flawed because it would have raised the cost of vehicle and home heating fuel without commensurate increases on other sources of emissions. The Sarkozy administration promised an amended bill back to council ministers by January 20, 2010. To address objections, a new bill would need to subject corporate industry to the tax, a requirement opposed by French companies already concerned with decreasing competitiveness. France continues to back efforts to introduce an E.U.-wide carbon tax and a border tax at E.U. frontiers as ways to allay industry concerns (see below).

5. Any regulations or exemptions specific to trade-sensitive sectors:

French President Nicolas Sarkozy has promoted a European levy on carbon-intensive imports from countries outside the Kyoto Protocol. The United States could be subject to such proposed fees should it not adopt legally enforceable GHG controls domestically. The Economist has said, "That leads some to suspect that his ultimate objective is to create a pretext for protectionism."[19,20]

In addition, President Sarkozy, along with German Chancellor Angela Merkel, has called for the United Nations to support "appropriate adjustment measures" to be levied against countries that do not join or implement an international agreement being negotiated for agreement in Copenhagen in December 2009.[21]

Motor Vehicles: A law is planned to cut GHG emissions from transport by 20% by 2020; it would include a goal of 7% bio-fuels by 2010 and EU emissions limit for new cars—130g/km—to be phased in from 2012.

[19] Economist, Sept. 17 2009. http://www.economist.com/world/europe/displaystory.cfm?story_id=14460346.

[20] In the international negotiations held in Copenhagen in December 2010, France (nor the EU) agreed with the United States, Australia, and China to reaffirm a principle not to hide trade protectionism behind climate change policy measures, according to a *New York Times* article. http://www.nytimes.com/2009/12/16/business/global/16trade.html?fta=y.

[21] http://news.yahoo.com/s/afp/20090918/sc_afp/francegermanyclimateenvironmentuneu.

Germany[22]

(Policies and statements if substantially different from the European Commission)

1. Overall GHG emission target, if any, and timing:

Under the Kyoto Protocol, Germany's share of the EU target is to reduce GHG emissions to 21% below 1990 levels during the period 2008-2012. (Germany was able to take on such a deep target because of its reunification with East Germany, taking on East Germany's high emissions baseline and reducing emissions by closing and improving many inefficient installations.)

The German government approved a new package of climate change measures in June 2008 that are a legal transposition of the EU's Integrated Climate Change and Energy Programme.[23] The German measures aim at a CO_2 emission reduction of 40% by 2020 compared to 1990 levels. The legislative package focuses on the transport and construction sectors.

2. Principal Policy Instrument(s): (See "EU ETS.")

The Integrated Climate Change and Energy Programme: In 2007, the German government, working from the general guidelines of European policy decisions, implemented a concrete program of measures at the national level. Through 29 measures, the program addresses a wide range of matters, including combined heat and power generation, the expansion of renewable energies in the power sector, carbon capture and sequestration (CCS) technologies, smart metering, clean power station technologies, the introduction of modern energy management systems, support programs for climate protection and energy efficiency (apart from buildings), energy efficient products, provisions on the feed-in of biogas to natural gas grids, an energy savings ordinance, a modernization program to reduce CO_2 emissions from buildings, energy efficient modernization of social infrastructure, the Renewable Energies Heat Act program for the energy efficient modernization of federal buildings, a carbon dioxide strategy for passenger cars, the expansion of the bio-fuels market, reform of vehicle tax on the basis of carbon dioxide, energy labeling of passenger cars, the reduction of emissions of fluorinated greenhouse gases, procurement of energy efficient products and services, energy research and innovation, increased electric mobility, international projects on climate protection and energy efficiency, reporting on energy and climate policy by German embassies and consulates, and a transatlantic climate and technology initiative. In June 2008, the program was enacted with a package of measures to double electricity generated by combined heat and power technology (CHP) to 25%. The share of renewable electricity will also be increased to 20%, especially through subsidizing off-shore wind farm development. At the same time the package has set a target of producing half of Germany's electricity from renewable energy sources or super-efficient plants by 2020. The package aims for an 11% reduction in electricity consumption by 2020.

Loans for energy efficiency and CO_2 reduction measures in the domestic sector have been available as an economic recovery measure.

[22] This section was prepared by Richard K. Lattanzio, Analyst in Environmental Policy (7-1754).

[23] http://www.bmu.de/english/climate/doc/39945.php.

3. Covered Gases and Sectors: (See "European Union.")

4. Allocation of GHG reductions to various sectors: (See "European Union.")

5. Any regulations or exemptions specific to trade-sensitive sectors:

Germany wants to give companies in globally traded sectors bigger EU allowance quotas in the EU ETS to soften the cost impact of Europe's climate change policy.

Germany has been a vocal opponent of auctioning emissions allowances, although the EU has decided to move forward with limited auctioning. As examples of Germany's past stance, in January 2008, Environment Minister Sigmar Gabriel critiqued the European Commission's plan to commence auctioning emissions permits that are currently distributed for free, stating that "The European Union cannot ignore the question of how to preserve the international competitiveness of industries that consume lots of energy," such as cement, steel and chemicals, all key sectors of the Germany economy.[24] Sectors "which have reached their average for reductions of carbon dioxide emissions must be able to obtain free emission rights to be able to remain in Europe," claiming that many European industries could be forced to relocate elsewhere in order to maintain competitive prices in international markets. German Economy Minister Michael Glos has also criticized the plan to auction emission rights.[25] Gabriel also condemned the weakness of the commission's project in terms of developing renewable energies, which he said threatened national support for such energies. Gabriel nonetheless reiterated German opposition to EU plans to reduce new car emissions to 120 grams of CO_2/km by 2012 without distinguishing by the class of vehicle (German car makers produce many powerful automobiles which emit high levels of CO_2).

[24] See article at http://afp.google.com/article/ALeqM5jRYO-p98IjJ1mzuQxZoS4LODTsMg.

[25] See article at http://www.eubusiness.com/news-eu/1200576720.98.

United Kingdom[26]

(Policies and statements if substantially different from the European Commission)

1. Overall GHG emission target, if any, and timing:

Under the Kyoto Protocol, the United Kingdom's (UK) share of the EU target is to reduce GHG emissions to 12.5% below 1990 levels during the period 2008-2012.

Climate Change Act of 2008 introduced a legally binding long-term target to cut emissions by at least 80% by 2050 and at least 34% by 2020 compared to 1990 levels.[27] Major provisions of the act include the setting of legally binding targets, the establishment of a carbon budgeting system, and the creation of a Committee on Climate Change. The carbon budgeting system establishes caps on GHG emissions over five-year periods, with three budget periods being set at a time, charting progress to 2050. The act also requires that the government amend the act to include emissions from shipping and aviation by December 31, 2012. The act states that a reduction of power sector emissions by 40% should be achievable by 2020.

Goal to reduce CO_2 emissions from new houses to zero by 2016.

2. Principal Policy Instrument(s): (See "EU ETS.")

The Carbon Budgeting System is outlined in the 2008 Climate Change Act. In it, the Secretary of State is authorized to set an amount for the net UK carbon account (the "carbon budget") for successive periods of five years each ("budgetary periods"), beginning with the period 2008-2012.

The Carbon Reduction Commitment (CRC)[28] applies to non-energy intensive sectors not covered by the EU ETS. It will apply a mandatory emissions cap and trading program to cut carbon emissions from large commercial and public sector organizations (including supermarkets, hotel chains, government departments, large local authority buildings using more than 6,000 megawatt hours (MWh) of electricity through mandatory half hourly meters) by 1.1 million tons of carbon per year by 2020. Allowances in the CRC system would be sold by auction. The revenue raised from the sale of Carbon Reduction Commitment allowances are to be recycled back into the scheme through bonuses and penalties meant to stimulate organizations to reduce their levels of emissions. Any bonus or penalty administered to an organization are to be based on their ranked position on performance in three metrics (gross emissions, growth, and early compliance actions).[29]

The Carbon Emissions Reduction Target (CERT) came into effect on April 1, 2008, and will run until 2011 as an obligation on energy suppliers to achieve targets for promoting reductions in carbon emissions in the household sector. As reported by the Energy Savings Trust, an

[26] This section was prepared by Richard K. Lattanzio, Analyst in Environmental Policy (7-1754).

[27] http://www.opsi.gov.uk/acts/acts2008/ukpga_20080027_en_2#pt1-pb2-l1g4

[28] For this and other policy descriptions, see the Department of Energy and Climate Change website: http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

[29] http://www.carbonreductioncommitment.info/carbon-reduction-commitment

independent UK-based non-governmental organization, "it was originally estimated that CERT would stimulate approximately £2.8 billion (US$4.7 billion)[30] of investment by energy suppliers in carbon reduction measures. In September 2008, the Government announced that the level of funding available from the energy suppliers would be increased by £560 million" (US$893 million). The investment would increase the program's lifetime carbon savings to 185 million tons (Mt) CO_2 (31 Mt CO_2 more than under the original CERT target of 154 Mt CO_2).[31]

The Renewable Energy Strategy: The Department of Energy and Climate Change (DECC) details how the UK plans to hit its target of getting 15% of energy (electricity, heat and transport) from renewable sources by 2020. In order to achieve the target, 30% of electricity must come from renewable energy sources, including nuclear power (a five-fold increase from today's rate of ~5%), 12% of heat must be generated by renewables, and 10% of transport energy must be from renewables. The main instrument to achieve these targets for renewable (and nuclear) electricity generation are "Non-Fossil Fuel Obligations" (NFFO), begun in 1989, now Renewables Obligations," requiring operators of the distribution grid to purchase quotas of renewable and nuclear electricity. The prices are subsidized by a Climate Change Levy.[32]

The Climate Change Levy was established in the UK under the Finance Act 2000 (2000 c:17): a tax on most fuels, including natural gas, electricity (including nuclear) and solid fuels, but not on vehicle or household users, nor renewable energy or cogeneration.[33] Revenues are used to help fund employment insurance, and to fund the Carbon Trust.[34] In addition, energy-intensive businesses qualify for a levy reduced by 80% if they signed voluntary Climate Change Agreements to improve energy efficiency or reduce GHG emissions. Although the Climate Change Levy initially was a fixed rate, the 2006 UK budget tied the rates to account for inflation beginning in 2007.

3. Covered Gases and Sectors: (See "European Union.")

4. Allocation of GHG reductions to various sectors

The EU ETS covers electricity generation and the main energy intensive industries—power stations, refineries, iron and steel, cement and lime, paper, food and drink, glass, ceramics, and engineering and vehicles. Overall, these account for around 50% of UK CO_2 emissions. Non-energy intensive, large-scale, commercial and public sectors are covered by the CRC policy (amounting to 25% of the business sector). Household emissions are covered by the CERT policy.[35]

[30] Live market currency exchange rate for November 19, 2009, is listed as 1UK£ equivalent to 1.67 US$ (http://www.xe.com/). Currency rates are subject to fluctuation.

[31] http://www.energysavingtrust.org.uk/Global-Data/Funding-Information/Carbon-Emissions-Reduction-Target-CERT.

[32] http://www.publications.parliament.uk/pa/cm200708/cmselect/cmenvaud/590/59003.htm.

[33] The Climate Change Levy revised and replaced a fossil fuel levy.

[34] Maria Pender, "UK Climate Change Programme: Business and Public Sector Economic Agreements."

[35] http://www.berr.gov.uk/energy/environment/euets/index.html.

5. Any regulations or exemptions specific to trade-sensitive sectors:

The UK's "Low Carbon Industrial Strategy" states a vision that the nation "must create the conditions for the UK to be—and be recognised as—the leading location in the world for growing an innovative low carbon business and developing new low carbon products and services."[36] The UK strategy appears oriented toward supporting identified opportunities in "green" businesses and technologies, aiding them through:

- a Low Carbon Investment Fund, (with financing of £405 million—US$674 million);
- a business-led Technology Strategy Board;
- an Energy Technologies Institute (ETI), serving as a private/public partnership to invest in development of low carbon energy technologies;
- R&D tax credits;
- a Carbon Trust to support development and deployment of new and emerging low carbon technologies; and
- a UK "innovation infrastructure," including intellectual property systems and procedures, standards, and a National Measurement System.

[36] DECC, *Investing in a Low Carbon Britain*, available at http://interactive.bis.gov.uk/lowcarbon/vision/.

Australia[37]

1. Overall GHG emission target, if any, and timing:

Under the Kyoto Protocol, Australia accepted a target to limit its net GHG emission increase to 8% above 1990 levels. It has also proposed that, under a new international agreement, it would take on a target to reduce its GHG emissions by 5% to 25% below 2000 levels by 2020, with the more stringent commitment conditioned on whether "the world agrees to an ambitious global deal to stabilise levels of CO_2 equivalent in the atmosphere at 450 parts per million (ppm) or lower."[38]

2. Principal Policy Instrument(s):

The Australian government proposed a Carbon Pollution Reduction Scheme (CPRS) to be phased in beginning July 1, 2011. A one-year period would occur from 2011-12, during which carbon emission permits would be sold at a fixed price Aus$10 per ton of carbon (US$9.20);[39] these may not be banked for use in later periods. The full cap-and-trade system would be in effect by 2012, by which time all covered businesses must purchase carbon permits at market prices. The Senate did not pass this proposal on its first or second readings in August and December 2009. Despite addition of several exemptions and aid to selected industries, strong political opposition (including the ousting of the Senate's opposition leader who negotiated the compromise provisions) in the Senate blocked passage of the measure. The Rudd Government has said it will maintain its overall GHG goal of 25% below 2000 levels and will resubmit the proposal to the Parliament again in February 2010. It has also indicated that, if the CPRS does not pass in February, it will lead to "double dissolution" of the Parliament and a snap election, expected to result in increased representation by Rudd's allies.

The Australian program includes a Renewable Energy Target, and investment in carbon capture and storage. Up to 5 percentage points of its offered 25% target for 2020 could be met by purchase of international emission reduction credits using CPRS revenue, though no earlier than 2015. Eligible businesses also may receive government funding for energy efficiency investments, available from a Aus$200 million (US$184 million) portion of a Climate Change Action Fund.

In August, though the Australian Senate did not pass the carbon reduction proposal, it passed the Renewable Energy Target (RET) into law[40] that establishes a system of tradable Renewable Energy Certificates (RECs). It requires that 20% of electricity come from renewable resources by 2020 (projected to require 45 gigawatt hours (GWh)). Currently, about 8% of Australia's electricity is generated with renewables. Among other provisions, the law provides Solar Credits, allowing receipt of a multiple of 2-5 of RECs for qualified installations, that will subsidize the capital costs of small-scale systems, such as household photovoltaic systems. The grants of RECs

[37] This section was prepared by Jane A. Leggett, Specialist in Environmental and Energy Policy (7-9525).

[38] http://www.environment.gov.au/minister/wong/2009/mr20090504.html.

[39] Live market currency exchange rate for November 19, 2009, is listed as 1Aus$ equivalent to 0.92 US$ (http://www.xe.com/). Currency rates are subject to fluctuation.

[40] Renewable Energy (Electricity) Amendment Act 2009, No. 78, 2009, C2009A00078; and Renewable Energy (Electricity) (Charge) Amendment Act 2009, No. 79, 2009, C2009A00079. http://www.comlaw.gov.au/comlaw/Legislation/Act1.nsf/0/94CB90B9EED48B69CA25762D001B6F5F?OpenDocument.

will depend on the generation of energy, not the installed capacity (which, in some countries, has not stimulated maximizing the use of installed capacity).

3. Covered Gases and Sectors:

As proposed, the CPRS would initially cover the six GHG of the Kyoto Protocol, and emissions from stationary energy, transport, industrial processes, waste, forestry, and fugitive emissions from oil and gas production.[41] It is expected to cover 75% of Australia's GHG emissions and about 1000 entities (out of 7.6 million registered businesses in Australia).[42] Agriculture was exempted in order to secure passage of the bill.

4. Allocation of GHG reductions to various sectors:

Permits would be available in 2011 at a fixed price of Aus$10 per ton of carbon-equivalent (US$8.60), after which all covered sources must purchase their permits through auction or the market.

5. Any regulations or exemptions specific to trade-sensitive sectors:

News reports indicate that the Rudd Government's legislative proposal has been modified to gain legislative support for the measure, by exempting agriculture from the system, and increasing financial incentives to electric power generators, coal mines, and food processors.[43] The proposed CPRS includes provisions to assist emissions-intensive, trade-exposed industries (EITE). Eligibility for assistance would be determined by an assessment of all entities conducting a specific activity. First, there would be quantitative and qualitative tests to assess the activity's trade exposure. Second, there would be assessments of greenhouse gas intensity based on the average emissions per million dollars of revenue or emissions per million dollars of value added. The baseline for the emission data would be 2006-2007 to 2007-2008, while the baseline for revenue/value added data would be 2004-2005 to the first half of 2008-2009.

The government allocates free permits using an allocation baseline of emissions per unit of output for each EITE activity. This baseline will provide the basis for eligibility at either the 90% or 60% assistance rates. The proposal[44] would set up two initial rates of assistance: (1) 90% allocation of allowances for activity with emissions intensity of at least 2,000 tons of emissions per million dollars revenue or 6,000 tons of emissions per million dollars of value added; (2) 60% allocation of allowances for activity with emissions intensity between 1,000 tons of emissions per million dollars revenue and 1,999 tons of emissions per million dollars revenue or between 3,000 tons and 5,999 tons of emissions per million dollars of value-added. This assistance per unit of production will be reduced by 1.3% annually.

The proposed CPRS would include a five-year Global Recession Buffer as part of an assistance package to EITE. Industries eligible for 60% assistance would receive a "buffer" of 10% free

[41] Australian Government, Carbon Pollution Reduction Scheme: Australia's Low Pollution Future: White Paper (December 2008).

[42] http://www.climatechange.gov.au/whitepaper/summary/index.html.

[43] Reuters, "UPDATE 1-Australia Govt Secures Carbon Deal with Opposition," November 24, 2009, http://in.reuters.com/articlePrint?articleId=INSYD51352320091123.

[44] http://www.environment.gov.au/minister/wong/2009/mr20090504a.html.

emission permits; industries eligible for 90% assistance would receive a 5% buffer of free emission permits.

Reviews of the EITE scheme would occur every five years, and would consider a list of identified issues, including whether the assisted firms are making progress toward world's best practice efficiencies, and whether "broadly comparable carbon constraints" are imposed in competing economies. Any changes to the system would require five years' advance notice.

The scope of consideration for assistance includes (1) direct emissions covered, (2) related cost increases for electricity and steam use, and (3) related cost increases for upstream emissions from natural gas and its components (e.g., methane and ethane) used as feedstock. The assistance package would include direct emissions and some indirect emissions.

Two amendment bills to the Renewable Energy (Electricity) Act 2000 were passed on August 20, 2009, and received Royal Assent on September 8, 2009. The Renewable Energy Amendments contain provisions to assist electricity-intensive industries and the coal industry. Under these provisions, one or more emissions-intensive trade-exposed activities may be partially exempted from its REC requirements. If resulting Partial Exemption Certificates are taken into account, it would reduce the charge for falling short of RECs that would otherwise be payable.[45] In this law, the definition of "emissions-intensive trade-exposed activity" would be either defined by further regulations, or by regulations under a Carbon Pollution Reduction Scheme Act 2009 if passed. The methods for calculating the amounts of partial exemptions would be defined by regulations.

[45] Renewable Energy (Electricity) Amendment Act 2009, Schedule 2.

Brazil[46]

1. Overall GHG emission target, if any, and timing:

In November 2009, Dilma Rousseff, chief of staff for Brazilian President Luiz Inácio Lula da Silva, was reported as saying that her country would take a proposal for voluntary GHG emissions reductions of 36%-39% by 2020 to the Copenhagen summit.[47] Brazil's emissions would drop to near 1994 levels if the top end of the pledge is met, representing about a 20% cut from the 2.1 million tons emitted in 2005. The emission cuts would be based largely on reducing deforestation rates, and would depend in large part on obtaining "sufficient" financing. President Lula stated in December 2008 that Brazil would slow its rate of deforestation in the state of Amazonas by 70% by 2017, compared to the average rate from 1996 to 2005. In September 2009, the Brazilian government extended this target to an 80% reduction by 2020.[48] Brazil has set a target by 2010 for zero deforestation in its Atlantic Forest.

On December 28, 2009, President Lula signed into law the 39% reduction in emissions by 2020, meeting the commitment made at the Copenhagen climate conference. The new law, however, is subject to several decrees setting out responsibilities and regulations for the farming, industrial, energy, and environmental sectors, and omits several vetoed provisions, including a reference to "promoting the development of clean energy sources and the gradual phasing out of energy from fossil fuels." President Lula is expected to sign the decrees in January after consulting scientists and other experts.[49]

2. Principal Policy Instrument(s):

In December 2008, Brazilian President Luiz Inácio Lula da Silva signed the National Climate Change Plan (PNMC) into effect.[50] Policy measures include:

- Stimulating energy efficiency through best practice, including the implementation of an energy efficiency policy that targets a savings of 106 terawatt hours per year (TWh/y) by 2030; the substitution of renewable charcoal for coal in manufacturing sectors; the replacement of one million old refrigerators per year for 10 years; the deployment of solar power systems for water heating; and the phasing out of the use of fire for the clearing and cutting of sugarcane.
- Retaining a high renewable energy share in the electricity sector, including the increase of the total electricity supply from cogeneration, mainly from sugarcane bagasse, to 11.4% by 2030; the reduction of non-technical losses in electricity

[46] This section was prepared by Richard K. Lattanzio, Analyst in Environmental Policy (7-1754).

[47] See http://www.reuters.com/article/marketsNews/idUSN1347815120091113.

[48] According to Brazil's National Institute of Space Research (INPE), Brazil's average rate of deforestation from 1996 to 2005 was 7,542 square miles annually, compared to averages of 6,574 annually from 1988 to 1995, and 4,974 from 2006 to 2008; http://www.mongabay.com/brazil.html. This target does not appear to include forests, including open canopy forests, in other parts of Brazil, which may be cleared for agricultural production. Also, http://en.cop15.dk/news/view+news?newsid=2351, http://www.cmcc.it:8008/cmcc/blog-en/brazil-sets-new-deforestation-target.

[49] http://www.grist.org/article/2009-12-30-brazils-lula-signs-law-cutting-co2-emissions.

[50] http://www.mma.gov.br/estruturas/208/_arquivos/national_plan_208.pdf.

distribution at a rate of 1,000 GWh/y over the next 10 years; the addition of 34,460 MW capacity from new hydropower plants over the next 10 years; the increase in electrical supply share from wind and sugarcane bagasse by 7,000 MW by 2010; and the expansion of the national solar photovoltaic industry and its deployment in systems isolated from the grid.

- Increasing the share of bio-fuels in transport matrix, including the attempt to encourage industry to achieve an annual substitution rate of 11% bio-fuels for fossil sources over the next 10 years; and the institution of a 5% bio-fuel to diesel mandate by 2010;
- Reducing deforestation rates and eliminating forest losses, increasing policing against illegal logging and curtailing financing to illegal ranching.
- Continuing the policy measures of prior renewable energy regulations including the 2004 Program of Incentives for Alternative Electricity Sources (PROFINA), coordinated by the Ministry of Mining and Energy and Centrais Elétricas Brasileiras (Eletrobras). The program contains new strategies for the incorporation of renewable resources in Brazil's energy matrix and strengthens the country's policy on diversification and development. On its inception, PROFINA contracted 144 generation stations to benefit 19 states with a combined capacity of 3,300 MW from wind, biomass, and small hydro sources for a potential GHG reduction of 2.8 Mt CO_2/year.

Many of Brazil's mitigation strategies involve the reduction of deforestation rates in the Amazon. The current administration has expanded protected areas in the Amazon and implemented new environmental policies. More than 62 natural reserves have been established in the Amazon, bringing the total area of the Brazilian Amazon protected by law to 280,000 square kilometers, the fourth-largest percentage of protected area in relation to territory among all countries. In addition to the aforementioned National Climate Change Plan, Brazil has enacted other laws that address deforestation and sustainable development.

- The Public Forest Management Law encourages sustainable development, places a moratorium on soybean plantings and cattle ranching in the Amazon, and authorizes the creation of a plan to reduce the rate of Amazon deforestation by half. Brazil plans to meet this goal by increasing federal patrols of forested areas, replanting 21,000 square miles of forest, and financing sustainable development projects in areas where the local economy depends on logging.
- The Action Plan for the Prevention and Control of Amazon Deforestation intends to improve the monitoring of the deforestation process, from a regional to a local scale; promotes the presence of public authorities in critical zones; confronts the economic speculation problem involved in public lands; plans the appropriate distribution of public lands according to social and ecological needs; and retains commercial wood exploration while also promoting sustainable forest management.

- The Amazon Fund (a private fund) aims to combat deforestation and to promote sustainable development in the Amazon. In 2008, Norway pledged $1 billion to the fund through 2015, making it the first country to do so, stating that it would donate as much as $130 million in 2009.[51]

The Brazilian government maintains that these efforts have been successful. It has recently been reported that deforestation of the Amazon fell by the largest amount in more than 20 years, dropping 45%, from nearly 5,000 square miles to some 2,700 square miles, in 2008, although there normally is a great deal of year-to-year variability in deforestation rates.[52] A continued emphasis on enforcement coincides with legislation. The enactment of the Prevention of the Use of Illegal Timber in the Building Industry Act, starting January 2009, asks for proof of the legal origin of timber from building companies. As such, the government recovered 1.4 million cubic meters of illegal wood and 700 people were put in prison.[53]

Observers note, however, that other factors contribute to the rate of deforestation beyond governmental policy measures. Brazilian deforestation is strongly correlated to the economic health of the country. Recent reductions are concurrent with the global economic downturn. Falling commodity prices have stalled the expansion of ranching and agriculture into the Amazon. While these trends have seemed favorable for emission reductions, some commentators still point to what they consider continued deforestation practices by commercial and speculative interests, misguided government policies, inappropriate World Bank projects, and commercial exploitation of forest resources. Others see favorable taxation policies, combined with government subsidized agriculture and colonization programs, as a continued encouragement for the destruction of the Amazon. Still others emphasize the inherent difficulty in measuring, reporting and verifying any GHG emission reductions in the Land Use, Land Use Change and Forestry (LULUCF) sector. Finally, most stress the crucial commitment to local law enforcement policies to sustain any regulatory reform that comes out of the federal government.

3. Covered Gases and Sectors:

Primarily CO_2 in deforestation and other domestic agendas; however, U.N. Clean Development Mechanism projects in Brazil include CH_4 and N_2O reductions.

4. Allocation of GHG reductions to various sectors:

Unlike other developed or developing countries, Brazil holds a unique endowment of natural resources that affects its climate change portfolio in the power generation and transportation fuel sectors. A low contribution of greenhouse gas emissions has been due to both market-driven and governmental decisions to adopt renewable energy sources over the past few decades. The markets for both hydroelectricity and sugarcane products (bagasse for thermal purposes and ethanol for transportation fuel) have expanded 10-fold. During this period there was also an important decrease in wood consumption in the residential and industrial sectors and an increase in charcoal consumption in the industrial sector.

[51] Brazil received $100 million of the pledge on March 25, 2009. The remainder is pending. See http://inter.bndes.gov.br/english/news/not036_09.asp.

[52] See http://www.eenews.net/Greenwire/2009/11/13/4.

[53] http://www.redd-monitor.org/2009/01/23/brazils-national-plan-on-climate-change-and-the-amazon-fund-%E2%80%9Cthis-plan-does-not-create-any-carbon-credits-or-right-to-emissions%E2%80%9D/.

Taken together, however, the sectors of energy, industrial processes, solvents and waste treatment contribute only 25% of total GHG emissions, estimated at approximately 1 billion tons. The rest of Brazilian GHG emissions is tied to the LULUCF sector, and of that total, 90% corresponds to the conversion of forests to other uses, especially agriculture and ranching. For this reason, most of Brazil's mitigation policies have concentrated on the forestry sector.

5. Any regulations or exemptions specific to trade-sensitive sectors:

Not specified.

Canada[54]

1. Overall GHG emission target, if any:

In April 2007, then-Environment Minister John Baird announced that by 2020, Canada would reduce its GHG emissions by 150 million tons, or 20%, from its 2006 level. Beyond this, the government hopes to achieve a 60%-70% reduction by 2050.[55] The Kyoto emission reduction targets are scored from 1990 (with a few explicit exceptions); some analysts assert that, since Canada's GHG emissions rose 27% between 1990 and 2004, the government would be able to demonstrate far greater progress if it were able to use 2006 as its base year in the Copenhagen Agreement.[56]

2. Principal Policy Instrument(s):

The government's most recent plan for regulating industrial air emissions was announced in March 2008.[57] However, observers note that it remains indefinite. Canada's current Environment Minister, Jim Prentice, is traveling around the country's 10 provinces soliciting ideas on a cap-and-trade system. There has reportedly been a great deal of pressure on the Minister to develop a plan that will be compatible with whatever may be developed in the United States. For example, the original 2007 Canadian plan called for an "intensity target" rather than a cap. Bilateral discussions over a compatible cap-and-trade system are underway.[58] The effort at cross-border harmonization is likely due to the extensive economic integration between the two countries.

The government aims to complete its policy formulation and present its formal plan before the December 2009 United Nations climate change Conference of the Parties in Copenhagen. Some observers note that the government's ambitions might be delayed or curtailed if a snap election is called; however the prospect of such a vote is believed to be increasingly unlikely.[59]

Recognizing that the transportation sector is responsible for about 27% of GHG emissions, the Canadian government is also set to issue mandatory auto emissions regulations—essentially converting fuel efficiency into CO_2 limits—and likely will seek to make its standards compatible with those set by the U.S. Environmental Protection Agency. The Environment Ministry may also issue modified regulations regarding usage of ethanol. These changes would be facilitated by amendments to the Canadian Environmental Protection Act of 1999, which, among other things,

[54] This section was prepared by Carl Ek, Specialist in International Relations (7-7286).

[55] Canada's New Government Announces Mandatory Industrial Targets to Tackle Climate Change and Reduce Air Pollution. News release. Environment Canada website. April 27, 2007. http://www.ec.gc.ca/default.asp?lang=En&n=714D9AAE-1&news=4F2292E9-3EFF-48D3-A7E4-CEFA05D70C21.

[56] No Clear Environmental Champion; Canada and the United States Have Shown Varied Levels of Aggressiveness in the Fight to Combat Climate Change. *Globe and Mail*. July 9, 2008. See also: Canada's Greenhouse Emissions Soaring Again: UN Report. *Canwest News Service*. April 21, 2009.

[57] Government Delivers Details of Greenhouse Gas Regulatory Framework. News release. Environment Canada website. March 10, 2008. http://www.ec.gc.ca/default.asp?lang=En&n=714D9AAE-1&news=B2B42466-B768-424C-9A5B-6D59C2AE1C36.

[58] Notes for an address by the Honourable Jim Prentice, P.C., Q.C., M.P. Minister of the Environment on Canada's climate change plan. Speech. Environment Canada website. June 4, 2009. http://www.ec.gc.ca/default.asp?lang=En&n=6F2DE1CA-1&news=400A4566-DA85-4A0C-B9F4-BABE2DF555C7.

[59] CRS discussion with Canadian government official, September 10, 2009.

can be used to regulate tailpipe emissions and ethanol blending. Regulations have yet to be published; the ministry likely will attempt to match and harmonize its emissions standards on a continental basis.

The federal government can also use its spending power to control pollution. The government has created a climate change "ecoTrust" fund from which the provinces may draw in order to pay for programs to reduce their own GHG emissions. The last two federal budgets have also included significant funding for carbon capture and storage, including a large-scale demonstration facility. This could be one important aspect of the attempt to reduce emissions arising from some provinces' extensive use of coal as an energy source; it also could be used for oil sands.

3. Covered Gases and Sectors:

Although the details are still being negotiated, Canada's regulations will likely cover the six gases included in the Kyoto Protocol. In reducing GHG emissions in Canada, the government will likely also attempt to co-reduce other pollutants such as sulfur dioxide, particulate matter, and mercury. Specific sectors have yet to be determined.

4. Allocation of GHG reductions to various sectors:

The government has not yet determined the sectoral allocation of reductions, but it has calculated that 35% of Canada's GHG emissions arise from fossil fuel production, industrial processing and manufacturing; 22% from services, residential, waste and agriculture; 16% from electricity and heat generation; and 27% from transportation.[60]

5. Any regulations or exemptions specific to trade-sensitive sectors:

Canadian government officials maintain that exemptions—if any—and regulations are yet to come, and that Environment Minister Prentice is still attempting to strike agreements with the various provinces.

[60] Notes For an Address by the Honourable Jim Prentice, P.C., Q.C., M.P. Minister of the Environment on New Regulations To Limit Greenhouse Gas Emissions. Speech. Environment Canada website. April 1, 2009. http://www.ec.gc.ca/default.asp?lang=En&n=6F2DE1CA-1&news=D8C4903B-B406-4B70-8A4A-EDEF99B71D38.

China[61]

1. Overall GHG emission target, if any, and timing:

The 11th Five-Year Plan set compulsory energy and pollution targets for 2006-2010 that have slowed growth of GHG emissions, and those energy targets appear likely to be reached or surpassed by 2010. However, as China publishes neither its GHG emissions nor the effects of policies on GHG trajectories, validating reports of progress is not possible. Chinese Premier Wen Jiabao in November 2009 stated a national target to reduce GHG emissions by reducing carbon intensity (emissions per unit of economic output) by 40%-45% by 2020 compared with 2005 levels.[62] The State Council indicated that this carbon-intensity target will be made a "binding goal" in China's 12th Five-Year Plan, from 2011-2015, and long-term national social and economic development plans.

One Chinese researcher has estimated that, if these Chinese economy doubles by 2020, the 40%-45% target would hold GHG to approximately today's emissions level.[63] The Chinese climate change website suggests that Chinese leaders are "mulling" GHG goals of improvement of carbon intensity of 4%-5% annually over several decades, which could lead to an 85%-90% reduction of carbon intensity by 2050 compared to the 2005 rate.[64] (A percentage improvement expressed as carbon intensity would be easier to achieve than the same percentage target expressed as energy intensity, so this rate of annual improvement would be less than the annual energy intensity improvement target in the current five-year plan.)

2. Principal Policy Instrument(s):

Edicts specify national, provincial, and plant-specific targets or actions. For example, one national goal is to reduce energy consumption per unit of GDP by 20% from 2006-2010. Each province was given a corresponding target in June 2006, and many local governments were assigned energy conservation targets by the National Development and Reform Commission (NDRC) in July 2006. Some of the key instruments the central government is using to meet its targets for 2010 include:

- reducing or eliminating incentives for energy-intensive exports (e.g., export tax rebates);
- implementing a program of "Large Substitute for Small," closing half of small, inefficient electric power plants by 2010, and banning new small plants;
- removing some subsidies from inefficient or polluting plants;

[61] This section was prepared by Jane A. Leggett, Specialist in Environmental and Energy Policy (7-9525).

[62] Xinhuanet, "China Announces Targets on Carbon Dioxide Emission Cuts," November 26, 2009, http://www.ccchina.gov.cn/en/NewsInfo.asp?NewsId=20831.

[63] Xinhuanet, ibid.

[64] http://www.ccchina.gov.cn/en/NewsInfo.asp?NewsId=20325. This article also points to a study indicating that an 83% reduction of carbon intensity by 2050 would cost about 2.3% of GDP, while a 90% reduction of carbon intensity would cost about 7% of GDP. It is unclear whether this is a lost compared to the annual rate of GDP growth, or to cumulative GDP growth in 2050.

- setting 2010 energy consumption targets within the Top-1000 Enterprise Program for each large enterprise (in total representing 33% of national energy use in 2004);
- requiring closure of small and inefficient industrial plants, sometimes with compensatory payments;
- setting electricity dispatch rules to favor low-carbon generation, such as feed-in tariffs for renewably produced electricity that can reach 25%-50% higher than coal-based electricity prices;
- providing large subsidies to help finance some large capital investments in efficient or low-emitting technologies;
- allowing energy prices to rise to international price levels in many cases, and imposing (and reportedly beginning to collect) pollution fees;
- setting new vehicle efficiency standards at the Europe-IV level (tighter than U.S.), and making payments to turn in and destroy older, polluting vehicles (like "cash for clunkers");
- raising investments in inter-city and intra-city rail; and
- tightening building efficiency codes by many municipalities, although enforcement may be spotty.

High-level officials have indicated that the 12th Five-Year Plan will embody the -40% to -45% carbon-intensity targets, and that several national laws will be amended in the near-term to achieve GHG reductions. Carbon cap-and-trade "pilot" projects will be initiated in "some designated areas and industries."[65] President Hu has summarized additional targets that likely would help to restrain expected growth of GHG: a target to increase non-fossil fuel share of primary energy consumption to 15% by 2020, and to increase forest coverage by 40 million hectares and forest stock volume by 1.3 billion cubic meters by 2020 from 2005 levels. China also requires strict fuel efficiency standards for vehicles.

Some have argued that China's policies may be undermined by incomplete implementation, due to sometimes vague statement of requirements, lack of enforcement resources, poor data, conflicting priorities at the local level, and other factors. Though some argue that reporting and enforcement of the targets and regulations have been irregular, there are indications that the central government is working to improve such weaknesses, and to impose career penalties on officials who do not meet their targets.[66] The State Council stated in November 2009 that new measures would be developed for auditing, monitoring, and assessing implementation of the GHG plans. Others are cautious about the central government's will and ability to gain full implementation of national policies at the provincial and local levels.

[65] Jing Li and Zhe Zhu, "Legislature Takes Urgent Action in Climate Change Fight," *China Daily*, August 28, 2009, http://www.chinadaily.com.cn/china/2009-08/28/content_8626140.htm.

[66] See, for example, http://news.xinhuanet.com/english/2007-06/20/content_6269732.htm; http://www.chinacsr.com/en/2009/06/18/5487-china-first-heavy-industries-fined-for-infringement-of-environmental-rules/; http://www.china.org.cn/environment/2009-09/28/content_18619189.htm; and http://www.china.org.cn/government/news/2008-03/12/content_12338958.htm.

3. Covered Gases and Sectors:

Policies are mostly focused on energy reforms not GHG control, though they also reduce CO_2 and methane emissions. Some projects under the Kyoto Protocol's Clean Development Mechanism address many industrial gases (such as hydrofluorocarbons) as well. Sectors addressed include energy, vehicle manufacturing, building, energy-intensive industries, forestry, etc. Agriculture seems engaged only through development of bio-fuels.

4. Allocation of GHG reductions to various sectors:

Many sectors are covered through various programs. Targets and actions are set by enterprise, not industry-wide.

5. Any regulations or exemptions specific to trade-sensitive sectors:

Many Chinese industry-specific policies seem aimed at eliminating the most energy-intensive and inefficient facilities within a sector. Many of China's exporting firms perform close to or at international energy-intensities. In 2007, China removed or reduced export tax rebates for many types of export products, including for energy-intensive, trade-sensitive industries. These adjustments generally have the effect of reducing incentives to export. Examples of additional programs are provided below.

Iron and Steel: The Chinese government has been emphasizing restructuring and improving the overall production efficiency of the iron and steel industry, much of which is likely also to reduce direct and indirect emissions. Closures are mandated in 2006-2010 of 100 million tons of iron production capacity and 55 million tons of steel capacity using inefficient and old technologies.[67] From 2006-2008, 61 million tons of iron and 43 million tons of steel capacity were closed, according to government statistics.[68] Mergers and acquisitions are being encouraged to increase concentration and efficiency in the industry. The adjustment and revitalization plan also envisions shifting the product composition of the sector's production, as well as shifting to integrated capacity.

Aluminum: Chinese requirements for energy savings and emissions reductions in its aluminum industry have been estimated to achieve its target of reducing GHG from the industry by 25% by the end of 2010.[69] The central government mandated closures of inefficient aluminum smelting capacity in 2006-2010. China's Ministry of Finance announced it would levy a 15% export tariff on non-alloy aluminum rods and poles, and eliminate the 5% import duty on electrolytic aluminum and many other energy-intensive commodities, in order to "further restrict exports of high energy-consuming and polluting resources products and encourage imports of raw materials," as well as to suppress China's trade surplus.[70]

The Chinese government has removed preferential electricity rates for metal producers, so manufacturers now pay market prices. The (U.S.-based) Aluminum Association also notes,

[67] http://www.reportbuyer.com/industry_manufacturing/metals/steel/pollution_report_china_steel_industry.html.

[68] http://news.xinhuanet.com/english/2009-08/25/content_11942981_1.htm.

[69] Feng Gao et al., "Greenhouse gas emissions and reduction potential of primary aluminum production in China," *Science in China Series E: Technological Sciences* 52, no. 8 (2009): 2161-2166, doi:10.1007/s11431-009-0165-6.

[70] http://experts.e-to-china.com/analysis/general_analysis/Taxation/2009/0728/58804.html.

"Additionally, China has invested in alternative energy systems that will begin paying off in 2009, namely solar and hydroelectric power, which will reduce the cost of energy."[71] This is likely also to reduce associated GHG emissions.

Cement: China set a target to reduce energy intensity in its cement industry by 20% in the 11th Five-Year Plan (2006-2010), using plant closures and installing state-of-the-art technologies. China's cement production is about 50% of the global total. The central government mandated closures of inefficient cement production capacity in 2006-2010, with closures of about 140 million tons of production capacity achieved from 2006-2008.[72] One program is set to "design an economically viable, environmentally friendly alternative fuel and raw materials co-processing program, which will include conducting demonstrations in six Chinese plants, and developing, documenting, and disseminating technical guidelines for co-processing.... [T]ools, training materials, and results from the project will be disseminated to further enhance the capacity building of the entire Chinese cement industry. An integrated national database on energy efficiency and emissions for Chinese cement industry, using worldwide recognized methodologies and tools, will also be established."[73]

Motor Vehicles: New vehicle efficiency standards have been set at the Europe-IV level (stricter than US standards). National policy and investment promotes rail rather than road transport.

China has enacted its version of the "Cash for Clunkers" program: from Aug 1, 2009, to June 30, 2010, consumers may receive 3,000-6,000 Yuan (US$440-875)[74] per vehicle to replace "yellow tag" passenger cars, vans, and trucks that exceed emission standards, or are 8-12 years old. Previous changes in vehicle taxes, with higher rates for large cars and lower rates for small ones, resulted in increased small car sales in 2008.

The total trade-in subsidy, mainly targeting light commercial vehicles, is likely to cost the government around 5 billion Yuan.

[71] http://www.aluminum.org/AM/Template.cfm?Section=Home&CONTENTID=27780&TEMPLATE=/CM/ContentDisplay.cfm.

[72] http://news.xinhuanet.com/english/2009-08/25/content_11942981_1.htm.

[73] http://china.lbl.gov/news/chinese-cement-companies-reduce-their-carbon-footprint.

[74] Live market currency exchange rate for November 19, 2009, is listed as 1 CNY = 0.146 US$ (http://www.xe.com/). Currency rates are subject to fluctuation.

India[75]

1. Overall GHG emission target, if any, and timing:

The Minister of State for Environment and Forests, Jairam Ramesh, announced on December 3, 2009, that India will reduce its GHG emissions intensity (emissions per unit of GDP) by 20%-25% by 2020, compared to the 2005 level.[76] (He reportedly said that India's carbon intensity decreased by 17.6% from 1990 to 2002.) Ramesh also committed to India's Parliament that India would accept neither legally binding targets nor peaking dates[77] internationally.[78,79] Earlier, the government also pledged that 20% of India's energy would come from renewable resources by 2020, and 15% of India's annual GHG emissions would be taken up by forests by 2030[80] (up from about 11% in 2005[81]). The Indian government has pledged that its emissions per capita would always remain below those of the now-industrialized countries (though expected population increases are substantial).

2. Principal Policy Instrument(s):

Ramesh has indicated that the national Planning Commission has agreed that India's 12th Five Year Plan, from 2012-2017, will include a low-carbon growth strategy. He identified five categories of measures:[82]

- mandatory fuel efficiency standards for all vehicles by December 2011;
- national building code guidance for energy efficiency, to recommend to local governments to make mandatory;
- amendments to laws to reduce energy intensity of industrial activities;
- forest monitoring; and
- use of advanced technologies (super critical, ultra super critical, and coal gasification) for half of all new coal-fired power plants.

In actions to date, India's national government has relied almost exclusively on public information, training of energy auditors, voluntary "declarations" of energy management policies

[75] This section was prepared by Jane A. Leggett, Specialist in Environmental and Energy Policy (7-9525).

[76] "India's 2020 Target: Reduce Emission by 20-25%," *The Times of India*, December 3, 2009, online edition, http://timesofindia.indiatimes.com/india/Indias-2020-target-Reduce-emission-by-20-25/articleshow/5297073.cms.

[77] A date by which its national emissions would peak and then begin to decline in absolute terms. Some proposals have advocated peaking dates for developing countries of between 2015 and 2030.

[78] T.K. Arun, "For a Binding Climate Target," *The Economic Times (India)*, December 4, 2009, sec. Op-Ed, http://economictimes.indiatimes.com/opinion/columnists/t-k-arun/For-a-binding-climate-target/articleshow/5298331.cms.

[79] In the same speech to Parliament, Ramesh stated that India would not allow international review of GHG reduction actions it takes without international financing, though the government "can consider" international review of actions that are supported by international finance.

[80] http://www.forbes.com/2009/09/23/jairam-ramesh-india-business-energy-climate-change.html.

[81] http://www.thaindian.com/newsportal/india-news/indian-forests-absorb-11-of-annual-greenhouse-gas-emissions-jairam-ramesh_100240011.html.

[82] *Times of India*, December 3, 2009, op. cit.

by businesses, and small financial awards as its principal instruments to promote energy efficiency. In concept, Ramesh has said that India might enact a law directing the government to set climate-related, but non-mandatory, targets, with reporting to and review by the Parliament. He has indicated that the new law may be similar to the Fiscal Responsibility and Budget Management law (FRBM), which directs the government to develop targets, and requires reporting to the Parliament, as well as Parliamentary approval. The targets in the FRBM are neither specified nor binding.

Prime Minister Manmohan Singh approved in August 2009 a national energy efficiency plan that would require 714 energy-intensive industrial facilities in nine sectors, accounting for 40% of India's fossil fuel use, to meet energy efficiency targets. The energy efficiency plan is estimated by 2015 to avoid about 5% of India's projected fossil fuel use. The Prime Minister's Office may be contemplating setting up a new National Climate Change Mitigation Authority under the Prime Minister's authority.

Reportedly, the government has initiated greenhouse gas abatement plans in the past several months, including reforestation. An existing voluntary set of efficiency standards is expected to become mandatory by 2010. Stronger standards may be set for energy efficiency for certain appliances and government buildings; an Energy Conservation Building Code (ECBC) for all new government buildings; and monitoring of afforestation. Prime Minister Singh announced in late August the intention of introducing an energy efficiency trading system to reduce India's energy consumption by 5% and its CO_2 emissions by 100 million tons annually from projected levels by 2015 (about 8% of current emissions).[83] Two funds would be created with about $60 million of funding to provide partial loan guarantees and venture capital. Proposed targets may be set by December 2010.

In 2008, the Prime Minister released a National Action Plan on Climate Change, containing eight "national missions": the National Solar Mission; National Mission for Enhanced Energy Efficiency; National Mission on Sustainable Habitat; National Water Mission; National Mission for Sustaining the Himalayan Ecosystem; National Mission for a Green India; National Mission for Sustainable Agriculture; and National Mission on Strategic Knowledge for Climate Change.[84] The most concrete measures aimed at increasing solar energy capacity. In November 2009, the Indian Union Cabinet approved a Jawaharlal Nehru National Solar Mission (NSM) to increase India's solar electric capacity from 5 megawatts (MW) to 20 gigawatts (GW) by 2022 (slipping back two years from the initial target date), at a cost of $19 billion.[85] Some $900 million has been approved for the initial phase, to install 1.1 GW of on-grid and 0.2 GW of off-grid solar capacity by 2012. The NSM will offer financial incentives to investors, including tax breaks, and will boost research. Several existing laws support renewable energy development, according to a report from the Pew Center.

> The Electricity Act (2003) encourages the development of renewable energy by mandating that State Electricity Regulatory Commissions (SERCs) allow connectivity and sale of electricity to any interested person and permit off-grid systems for rural areas. The National Tariff Policy (2006) stipulates that SERCs must purchase a minimum percentage of power

[83] See, for example, http://in.reuters.com/article/oilRpt/idINDEL15998520090907?pageNumber=1&virtualBrandChannel=0.

[84] http://www.indg.in/rural-energy/environment/national-action-plan-on-climate-change.

[85] Ministry of New and Renewable Energy, "Statement of Dr. Farooq Abdullah on Jawaharial Nehru National Solar Mission – 'Solar India'" November 23, 3009.

> from renewable sources, with the specific shares to be determined by each SERC individually. The states of Himachal Pradesh and Tamil Nadu have the highest quotas—20% by 2010 and 10% by 2009, respectively. Under the Rural Electrification Policy (2006) electrification of all villages must be completed by 2012.[86]

India established a program to replace 400 million incandescent light bulbs with efficient compact fluorescents by 2012.

A fund supports the regeneration and sustainable management of forests. The initial capitalization of the fund was proposed to be $2.5 billion, with an annual budget of about $1 billion.[87]

Although India has some pollution control standards in place, enforcement of standards has been low.[88] The current government is planning to establish a new National Environmental Authority,[89] apparently to be modeled after the U.S. EPA.

3. Covered Gases and Sectors:

Most identified and proposed measures address CO_2. The proposed system of "tradable energy efficiency certificates" would apply to 714 energy intensive facilities in the following sectors: fossil fuel-fired electricity generation; fertilizer production; cement; iron and steel; chlor-alkali production; aluminum; rail transport; and textiles.

4. Allocation of GHG reductions to various sectors:

The Bureau of Energy Efficiency would assign energy efficiency improvement targets to the most energy-intensive industrial plants, based on benchmark performance "bands." Facilities in the most efficient "band" would have a less stringent improvement target, while those in less efficient "bands" would be required to make greater improvements. Facilities that perform better than the targets would receive energy savings certificates ("ESCerts") that could be sold to companies for compliance with their targets or, potentially, banked to meet future requirements. Facilities that fail to meet targets could be fined.

5. Any regulations or exemptions specific to trade-sensitive sectors:

Reportedly, Indian officials have suggested taxing imports based on the per capita carbon emissions of the exporting country.[90] This could have a large impact on the United States, as its per capita emissions are higher than most countries. (Besides foods and fossil fuels, the United States exports to India a wide variety of products, among which the largest in value are: civilian aircraft and parts, steel and other metal products, synthetic fertilizers, chemicals, electronics and industrial equipment, electronics, and gem diamonds.)[91]

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[86] Pew Center, "Climate Change Mitigation Measures in India," International Brief 2, September 2008.

[87] http://online.wsj.com/article/SB125018657071529801.html.

[88] Among many sources: http://www.business-standard.com/india/news/23-thermal-plants-not-complyingemission-norms/01/09/69289/on.

[89] http://www.business-standard.com/india/news/govt-to-reduce-water-air-pollution/365976/.

[90] http://www.dw-world.de/dw/article/0,,4707051,00.html.

[91] U.S. Census Bureau, Foreign Trade Statistics, http://www.census.gov/foreign-trade/statistics/product/enduse/exports/c5330.html.

Motor Vehicles: In India, high taxes are levied on motor fuels: 52% on gasoline and 32% on diesel in 2007. The Prime Minister's office has directed the Bureau of Energy Efficiency to set fuel efficiency labeling standards for vehicles under the Energy Conservation Act, to become effective by 2011. However, after several years' delay, these standards have not been set. As planned, the standards would require labeling only by 2011, with mandatory performance to be effective later. The Bureau of Energy Efficiency would certify the manufacturers' labels. Reportedly, some representatives of the automobile sector have demanded that the standards be set on the basis of CO_2 emissions and legally be put on India's list of "local pollutants."[92]

[92] http://www.greencarcongress.com/2009/06/india-fe-20090603.html.

Japan[93]

1. Overall GHG emission target, if any, and timing:

Under the Kyoto Protocol, Japan agreed to reduce its GHG emissions to 6% below 1990 levels in the period 2008-2012. The Japanese Ministry of Environment has estimated that national GHG emissions were about 1.9% above its 1990 Kyoto Protocol baseline or almost 8% above its obligation, though this comparison does not account for sequestration or international GHG credits. GHG emissions were 1,286 million tons in the Fiscal Year (FY) 2008-2009, about 6.2% below the previous year, due largely to the economic recession.[94]

In mid-2008, then-Prime Minister Fukuda offered to reduce Japan's GHG by 80% from 2008 levels by 2050, and by 8% below 1990 levels by 2020 (without using international credits). Newly elected Prime Minister Yukio Hatoyama pledged Japan to a GHG target of 25% below 1990 levels by 2020, conditional on all major countries' participation in a new international accord. (The outgoing government's proposed target was equivalent to 8% below 1990 levels. In 2008, Japan's GHG emissions were almost 16% above its Kyoto Protocol target.)

Despite the lack of an internationally binding agreement at the Copenhagen climate conference, Environment Minister Sakihito Ozawa and Minister of Economy, Trade, and Industry Masayuki Naoshima reportedly reiterated the Hatoyama administration's pledge of a 25% emission reduction below 1990 levels by 2020 at a press conference on December 22, 2009. At least one minister has noted that this pledge comes "with conditions" not specified.[95]

2. Principal Policy Instrument(s):

The Japanese Government formulated in 2005 the Kyoto Protocol Target Achievement Plan (KPTAP) to promote measures to cope with global warming. The KPTAP lays out estimated emissions and expected reductions by sector, and for several specific programs, in order for Japan to meet its Kyoto Protocol target. The 2008 review and revision of the plan called for further actions to close the gap between expected emissions and the Kyoto target, including more stringent efficiency standards for equipment, vehicles, and small businesses. The government plan concluded that it would be very difficult to constrain emission reductions associated with the residential and commercial sectors, and therefore relied on expanding the Voluntary Action Plans in the business sector to achieve 80% of the envisaged further GHG reductions.[96] (See section on covered gases and sectors, below.)

Since October 2008, Japan has established an integrated domestic GHG emissions market, comprised of four components: (1) Japan's Voluntary Emission Trading System (J-VETS) cap-and-trade system, initiated in 2005 for voluntary trading of CO_2 emissions from energy and process emissions covering only industries that do NOT have in place a Voluntary Action Program; (2) an Experimental Japanese Emissions Trading System, with emissions targets based

[93] This section was prepared by Jane A. Leggett, Specialist in Environmental and Energy Policy (7-9525).

[94] National Institute for Environmental Studies, http://www.nies.go.jp/whatsnew/2009/20091111/20091111-e.html.

[95] BNA, "Japan Stands by Pledge to Cut Emissions 25 Percent by 2020; Industry Voices Dissent," *Daily Environment Report*, 246 DEN A-3, December 29, 2009.

[96] For a summary of the plan in English, see http://eneken.ieej.or.jp/data/en/data/pdf/443.pdf.

on industry-specific Voluntary Action Programs; (3) Domestic Credit Scheme, to allow GHG reduction credits (i.e., "offsets") from small and medium-sized companies; and (4) Kyoto Credits, available through any of the three Kyoto Protocol emissions trading mechanisms.

The new Hatoyama government has indicated it plans to create a mandatory GHG cap-and-trade system, require "feed-in" tariffs as financial incentives for renewable energy generation, and may consider a carbon tax.[97] The Hatoyama campaign, on the other hand, pledged before the election to eliminate highway tolls and a fuel tax of about 25 yen (US$0.28)[98] per liter on gasoline by April 2010, which could raise vehicle GHG emissions by as much as 20%.[99]

The Law Concerning the Promotion of Measures to Cope with Global Warming[100] enacted in 1998, directed the national government to promote GHG emission reductions and to enhance carbon sinks. It also directed local governments and business to take actions to limit emissions. This basic authority also directs the central government to publish Japan's GHG emissions.

The 5,000 largest businesses in Japan have been required to report their energy production and consumption for more than a decade by the Law Concerning the Rational Use of Energy.[101] Consequently, the foundation for calculating the energy-related CO_2 emissions from each industrial source is established.

The Act on Promotion of Global Warming Countermeasures and Act on Rational Use of Energy establish authorities to promote energy efficiency in "energy-using" equipment, buildings, factories, and machinery. These and related legislation require efficiency labeling, and allow for low-interest financing, industrial improvement bonds, tax exemptions and other financial incentives to promote efficiency. They also require efficiency measures by industrial facilities and for appliances. The Energy Conservation Center of Japan (ECCJ) is a public-private partnership for research and implementation of energy conservation programs (including Japan's Energy Star program, modeled after the US EPA's), accreditation of energy managers, and information.

3. Covered Gases and Sectors:

Under Japan's Kyoto Protocol Target Achievement Plan, industry is expected to reduce its GHG emissions to 7% below 1990 levels during the Kyoto first commitment period (2008-2012). The Keidanren Voluntary Action Plan[102] on the Environment (VAP) covers 35 industries, include energy, mining, construction, and at least some manufacturing sectors (e.g., production of vehicles, electronics, steel, cement, etc.).

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[97] Various press reports, including http://search.japantimes.co.jp/cgi-bin/ed20090925a1.html.

[98] Live market currency exchange rate for November 19, 2009, is listed as 1 JPY = 0.0112 USD (http://www.xe.com/). Currency rates are subject to fluctuation.

[99] http://www.planetark.com/enviro-news/item/54691.

[100] Law No.117 of 1998.

[101] 22 June 1979, Law No. 49. Revised in 10 December 1983, 31 March 1993, 12 November 1993, 9 April 1997, and 5 June 1998.

[102] Established by Nippon Keidanren, the Japan Business Federation. Negotiated environmental agreements in Japan have been used in lieu of legally binding regulation since the 1990s, and are not comparable to "voluntary programs" in the United States or some other countries. For example, they may require inspections and there are few reported instances of non-compliance with set targets (Imura Hidefuri, "Building a Cooperative Relationship Between Industry and Regulatory Authorities," presented at OECD, Environmental Compliance Assurance: Trends and Good Practices Paris, 17-18 November 2008."

4. Allocation of GHG reductions to various sectors:

The Keidanren VAPs include a non-binding target of reducing CO_2 emissions in industry and energy-converting sectors "below" their 1990 levels by 2010. In the Keidanren VAPs, different industries' metrics of performance and targets differ. In 2007, about 18 industries tightened their voluntary targets, although some observers have criticized even the more stringent targets as being no more than what was already being accomplished. Others argue that the voluntary targets are costly compared to reductions expected in other countries, such as within the European Union.

5. Any regulations or exemptions specific to trade-sensitive sectors: (See **Figure 1**.)

Motor Vehicles: The Japanese government provides tax benefits for "eco-friendly" vehicles and exemptions from taxes for three years for "next-generation" vehicles.[103] Beginning in April 2009, subsidies have been offered to purchasers of eco-friendly vehicles (e.g., for cars: 100,000 yen, or US$1100). These include a "cash-for-clunkers"-type program that offers higher subsidies to owners who scrap vehicles 13 years or older and replace them with eco-friendly vehicles (e.g., for cars: 250,000 yen, or US$2700). The subsidies extend as well to minivans, trucks and buses. One industry official reported that, with the subsidies, "eco-friendly" vehicles accounted for almost half of vehicle sales in Japan.[104]

Japan is reputed to have among the most stringent fuel economy standards for vehicles in the world, at 46.9 miles per gallon by 2015 (see **Appendix**). These are expected to constrain new passenger vehicle emissions of GHG.

Iron and Steel: To contribute to Japan's Kyoto Protocol obligations, the Iron and Steel Federation set a voluntary target for the sector of reducing CO_2 emissions by 9% from its 1990-1991 (financial year) levels (200.6 million metric tons) during the period 2008-2012. Due largely to the recession, the industry's emissions were 178.2 million tons in 2008-2009, reflecting a 13% reduction in steel output from the previous year. The industry reportedly also has purchased 56 million tons of GHG reduction credits for delivery during that period.[105] The chairman of Japan's Iron and Steel Federation, Shoji Muneoka, has announced an industry reduction of 5 million metric tons of CO_2-equivalent GHG from their forecast level in 2020. The Federation's business-as-usual projection foresees crude steel production to rise from 2008-2020 by 13%, to 119.7 million metric tons.

[103] http://www.jama-english.jp/asia/news/2009/vol36/index.html.

[104] Ibid.

[105] http://steelguru.com/news/international_news/MTIxMjIw/Japan_steelmakers_to_receive_56_million_tonnes_of_CO2_offsets.html.

Figure 1. Japanese Regulations or Exemptions Specific to Trade-Sensitive Sectors

Keidanren Voluntary Action Plan on the Environment: (Target and Measures of Major Organizations)

Name of Organization	Target	Measures to Attain Goals (2008)
The Federation of Electric Power Companies of Japan (FEPC)	• In the period from FY2008 to FY2012, aim to reduce CO_2 emissions intensity (Emission per unit of user end electricity) by an average of approx. 20% or to approx. 0.34kg- CO_2 /kWh compared to the FY1990 level.	1. Promotion of nuclear power generation based on security and confidence-building 2. Further improvement of efficiency in thermal power generation and discussion on the management and control of thermal power source 3. Diffusion and expansion of renewable energy 4. Research and development of technology contributing to energy conservation, CO_2 recovery and storage technology.
The Japan Iron and Steel Federation (JISF)	• Reduce energy consumption in the production process in FY2010 by 10 % compared to the FY1990 level on the assumption of the crude steel production 100 million-ton level. • As an additional measure, use a million tons of plastic waste in blast furnaces, etc. on the assumption of the establishment of appropriate collection systems and others. *Take an average of five years from FY2008 to FY2012 to achieve the above target.	1. Recovery of waste energy (increase of recovery of by-product gas, steam, CDQ steam etc.) 2. Efficiency improvement of facilities (new installation and remodeling of in-house power generators, installation of regenerative burners, introduction of high efficiency oxygen compressor) 3. Reduction of process, making the process continuous (introduction of direct rolling etc.) 4. Improvement of operation (power saving, compressed air saving, steam saving, fuel saving activities, reduction of ratio of reducing agent) 5. Investment on energy conservation such as efficiency improvement at the renewal of facilities
Japan Chemical Industry Association (JCIA)	• Aim to reduce energy intensity to 90% of the FY1990 level by FY2010. • Develop the chemical industry's own technologies such as catalytic technology, biotechnology and process technology in harmony with the environment. • Contribute to CO_2 emission reduction measures in developing countries as well as transferring energy conservation technology and environmental protection technology which have been developed in the chemical industry.	1. Efficiency improvement of facilities and equipment (installation of high efficiency facilities, replacement of equipment and materials etc.) 2. Rationalization of process (process rationalization, process conversion etc.) 3. Recovery of waste energy (recovery of waste heat and cool energy, turning waste fluid/ waste oil/waste gas into fuel etc.) 4. Improvement of operation methods (condition change of pressure, temperature, flow etc.) 5. Fuel switch and others (fuel switch, product modification etc.)
Petroleum Association of Japan (PAJ)	• In the period from FY2008 to FY2012, reduce energy intensity in refineries by an average of 13% compared to the FY1990 level.	1. Revision of operation management (Improvement of control technology and optimization technology) 2. Expansion of mutual utilization of waste heat among facilities (among refining facilities etc.) 3. Additional construction of recovering facilities of waste heat and waste energy (waste heat boiler, recovery equipment of furnace exhaust gas heat, etc.) 4. Efficiency improvement by appropriate maintenance of facilities 5. Adoption of efficient equipment and catalyst 6. Participation in "Industrial Complex Renaissance" (sharing of heat energy among neighboring factories in industrial complex)

Name of Organization	Target	Measures to Attain Goals
Japan Paper Association	• In the period from FY2008 to FY2012, aim to reduce fossil energy intensity per product by an average of 20% and CO_2 emissions intensity derived from fossil energy by an average of 16% compared to the FY1990 level. • Strive to promote forestation in Japan and overseas to expand owned or managed forested areas to 0.7 million ha by FY2012.	1. Introduction of energy conservation equipment (heat recovery equipment, introduction of inverters etc.) 2. Introduction of high efficiency facilities (high-temperature high-pressure recovery boilers, high-efficiency cleaning equipment, low-differential pressure cleaner, etc.) 3. Revision of manufacturing process (shortening and integration of processes) 4. Fuel switch (switch to biomass energy, waste energy)
Japan Cement Association (JCA)	• Reduce energy intensity of cement production (Thermal energy for cement production + Thermal energy for private power generation + Purchased electrical energy) in FY2010 by 3.8% compared to the FY1990 level. * Take an average of five years from FY2008 to FY2012 to achieve the above target.	1. Facilities to utilize waste as alternative heat energy source (waste wood, waste plastic etc.) 2. Efficiency improvement of facilities (fans, coolers, finishing mills etc.) 3. New installation and remodeling of energy conservation equipment (high-efficiency clinker coolers etc.) 4. Replacement of facilities (including repair of facilities)
Japan Automobile Manufacturers Association, Inc. (JAMA)	• In the period from FY2008 to FY2012, reduce the total CO_2 emissions from production plants of 14 member companies by an average of 12.5% compared to the FY1990 level.	1. Energy supply side measures (introduction of energy conservation facilities, improvement of efficiency of boilers, introduction of cogeneration, introduction of high-efficiency compressors, introduction of wind power generation, high efficiency transformers) 2. Energy demand side measures (energy conservation in coating line, introduction of invertors for fans and pumps, energy conservation in lighting and air-conditioners) 3. Upgrading energy supply methods and technologies of operation and management (reduction of energy loss during no operation, reduction of air leak etc.) 4. Merger, abolition and integration of lines 5. Fuel switch
Japan Gas Association (JGA)	• In the period from FY2008 to FY2012, reduce CO_2 emissions intensity per $1m^3$ of gas in the process of city gas production and supply to an average of 12g- CO_2/ m^3 from 84g- CO_2/ m^3 in FY1990 and CO_2 emission to an average of 0.54 million ton- CO_2 from 1.33million ton- CO_2 in FY1990.	1. Promotion of switching materials (to make high calorie) to natural gas, etc. 2. Further Promotion of energy conservation measures (utilization of LNG cold energy, efficiency improvement of facilities, reduction of heat loss, review of the operation of LNG pumps, speed control of seawater pumps)
Scheduled Airlines Association of Japan	• Reduce CO_2 emission derived from aviation fuel by 12% per production unit (Available seat kilometers) by FY2010 compared to the FY1990 level.	1. Replacement for new and fuel efficient airplanes and promotion 2. Optimization of routes and time by introducing new air traffic control support system (CNS/ATM), etc. 3. Reduction in weight of loaded equipment and goods 4. Expansion of engine washing with water
Japan Department Stores Association (JDSA)	• Reduce energy intensity in stores (Floor space ・ ・Energy consumption per store hours) by 6% in the target years (from FY2008 to FY2012) compared to the FY1990 level.	1. Promotion of introduction of ESCO projects 2. Setting of top runner standard (further promotion of energy efficiency by comparing with other stores) 3. Introduction of energy conservation equipment, rooftop gardening, utilization of natural energy

Source) Prepared from "Results of the FY2007 Follow-up to the Keidanren Voluntary Action Plan on the Environment (Section on Global Warming Countermeasures, Version Itemized per Business Category), in March 2008" (Website by Keidanren (Japan Federation of Economic Organization))

Note: Table copied from The Energy Conservation Center, Asia Energy Efficiency and Conservation Collaboration Center, 2008. Available at http://www.asiaeec-col.eccj.or.jp/eng/e3104keidanren_plan.pdf.

Korea[106]

1. Overall GHG emission target, if any, and timing:

On November 17, 2009, the South Korean cabinet approved a 4% GHG emission reduction target by 2020 as a basis for its current and future climate change efforts. The goal is measured from a 2005 baseline and is equivalent to a 30% reduction from "business-as-usual." The target is the most ambitious of three options recommended by the country's Presidential Committee on Green Growth, which had urged South Korea to voluntarily participate in climate change efforts under a midterm target of either an 8% increase, no change, or a 4% cut. President Lee Myung-bak said in a statement released by his office that the decision was made "to facilitate the country's paradigm shift to low-carbon green growth." He characterized the policy as a "voluntary, independent, and domestic target for unilateral reduction," driven by "environmental technology and renewable energy development."[107]

2. Principal Policy Instrument(s):

The November recommendation will empower a governmental committee to prepare industry-specific quotas and implement support measures. Near-term reductions will focus on buildings and transportation to give other industry sectors more time to adjust.

In addition to these recent measures, Korea's policies have involved dialogue with industrial organizations, voluntary plans by participating facilities to save energy and reduce CO_2 emissions, and some non-regulatory emissions trading. The government has provided financial incentives and technological assistance. Voluntary agreements cover plants that consume more than 2,000 tons of oil equivalent annually.[108] This process has resulted in some performance benchmarking for industries, collaborative research, and participation in the Kyoto Protocol's Clean Development Mechanism.

South Korea recently said it plans to invest about 2% of its GDP annually in environment-related and renewable energy industries over the next five years, for a total of US$84.5 billion. The government said it would try to boost South Korea's international market share of "green technology" products to 8% by expanding research and development spending and strengthening industries such as those that produce light-emitting diodes, solar batteries and hybrid cars.[109] To meet its pledge of a new, quantitative target, the government has indicated it may use GHG-trading and tax incentives. It has also indicated that financial incentives would increase use of hybrid cars, renewable and nuclear energy, light-emitting diode lighting, and smart grids.[110]

[106] This section was prepared by Jane A. Leggett, Specialist in Environmental and Energy Policy (7-9525).

[107] http://www.korea.net/News/News/newsView.asp?serial_no=20091118002&part=101&SearchDay=&page=1.

[108] http://www.wwf.or.jp/activity/climate/lib/kyotoprotocol/20040928b.pdf.

[109] Mufson, "Asian Nations Could Outpace U.S. in Developing Clean Energy," *The Washington Post*, http://www.washingtonpost.com/wp-dyn/content/article/2009/07/15/AR2009071503731.html.

[110] Various press reports, including http://www.reuters.com/article/environmentNews/idUSTRE57308M20090804.

3. Covered Gases and Sectors:

Sectors included in Korea's "Industrial Organization for UNFCCC Task Force Team" are steel, cement, electricity generation, paper, semi-conductor manufacturing, petrochemicals, oil refining, and automobile manufacturing.

4. Allocation of GHG reductions to various sectors:

Not yet determined.

5. Any regulations or exemptions specific to trade-sensitive sectors:

Motor Vehicles: The automobile manufacturing association reached voluntary agreement with the EU to meet CO_2 emission standards of 140grams/km by 2008.[111]

[111] http://www.wwf.or.jp/activity/climate/lib/kyotoprotocol/20040928b.pdf.

Mexico[112]

1. Overall GHG emission target, if any, and timing:

Mexico voluntarily plans to cut national GHG emissions by 50 million tons per year beginning in 2012, constituting approximately 8% of Mexico's net GHG emissions in 2008. The government has established a non-binding goal to reduce GHG by 50% by 2050 (to 340 million tons of CO_2) below 2000 emissions. The pledge is contingent on availability of international technical and financial support and on successful negotiation of an international agreement consistent with stabilizing CO_2-equivalent concentrations at 450 parts per million. Mexico foresees converging by 2050 on global average emissions per capita at or below 2.8 tons of CO_2 annually.

2. Principal Policy Instrument(s):

In 2007, the Government of Mexico set out a Strategy on Climate Change (NSCC) that identified GHG mitigation opportunities, and vulnerability and adaptation policies. The ensuing Mexico Climate Change Program (MCCP) sets 85 specific goals for mitigating GHG in four emission categories and 12 subcategories. In December 2008, Mexican President Felipe Calderon announced his intention to cap Mexican greenhouse gas emissions and allow GHG trading, beginning with state-owned energy producers. Mexico envisions eventually being part of a domestically regulated but internationally integrated North American GHG trading system.[113]

Mexico mainly promotes energy efficiency (including greater co-generation of heat and power by industrial sources) and renewable energy production, along with prevention of further deforestation, as its mitigation priorities. Principal instruments include Law for the Better Use of Renewable Energy and the Financing of Energy Transition (2007 or 2008) provide a number of legal energy reforms, including provisions that lay the groundwork for private investment in renewable electricity generation. The Law for the Sustainable Use of Energy created a three-stage program to 2050. It, *inter alia*, promotes renewable energy and energy efficiency. It also requires energy efficiency in all federal, state and local governments.

3. Covered Gases and Sectors:

Six Kyoto Protocol gases. The cap-and-trade system under development is likely to cover energy production (oil and gas, refining, electricity), metals, chemicals, textiles, and cement. Analysis is underway to include a cap-and-trade program for vehicle fuel efficiencies as well.

4. Allocation of GHG reductions to various sectors:

Not yet determined.

[112] This section was prepared by Jane A. Leggett, Specialist in Environmental and Energy Policy (7-9525).

[113] North American Leaders' Declaration on Climate Change and Clean Energy, August 10, 2009. Available at http://pm.gc.ca/eng/media.asp?category=5&id=2724.

5. Any regulations or exemptions specific to trade-sensitive sectors:

Motor Vehicles: The stringency of Mexico's vehicle efficiency standards was increased in 2004 to a mix of U.S. and European standards for different classes of vehicles.

Oil and Gas Production, Refining and Distribution: PEMEX, Mexico's state-owned petroleum company, has operated an internal carbon cap-and-trade system since 1998.

Russian Federation[114]

1. Overall GHG emission target, if any, and timing:

The Russian Federation (hereafter "Russia") projects that its greenhouse gas (GHG) emissions in the year 2010 will be 28% below the 1990 level, which is Russia's GHG emissions cap (its "Assigned Amount") under the Kyoto Protocol.[115] Though GDP in 2006 was 3% below the 1990 level, Russia's GHG emissions were 34% below the 1990 level (inclusive of carbon uptake by forests and other vegetation, net GHG emissions were 74% below the 1990 level). Some four-fifths of the GHG reductions came from the energy sector. Russia's GHG emissions are thus below its Kyoto Protocol obligation, creating a large surplus of emission allowances (Assigned Amount Units, or AAUs, in the terminology of the Protocol). Under the rules of the Kyoto Protocol, Russia may sell its surplus AAUs to other Parties with GHG obligations.

A Presidential Decree[116] on measures for increasing the energy and environmental efficiency of the Russian economy was issued in 2008, setting a target to decrease the energy intensity of the economy by at least 40% by 2020, compared to the 2007 level. The government has also set a target to increase the share of renewable energy (excluding large hydroelectric production) in electricity generation to 4.5% by 2020, and to use 95% of associated natural gas (produced with oil) by 2014-2016.

In the Copenhagen negotiations, President Dmitry Medvedev has offered a GHG target for Russia's emissions of 22%-25% below 1990 levels by 2020.[117] With policies and measures in place, the Russian government has projected that its GHG emissions in 2010, 2015, and 2020 will be reductions of 28%, 21%, and 13%, respectively, of its 1990 emissions level. Other experts project them to be 10%-37% below 1990 levels in 2020 with current policies and economic outlooks.[118]

Although Russian leaders agreed in the G8 summit meeting of July 2008 to consider an 80% reduction from 1990 levels of GHG emissions from developed countries by 2050, Russia leaders agreed only to a 50% reduction target for Russia.

2. Principal Policy Instrument(s):

Many observers contend that climate change has not attracted the interest of high level leaders in Russia and that, consequently, "[t]he government hardly has any official climate strategy, and

[114] This section was prepared by Jane A. Leggett, Specialist in Environmental and Energy Policy (7-9525).

[115] United Nations Framework Convention on Climate Change, *Report of the Centralized In-Depth Review of the Fourth National Communication of the Russian Federation* (Bonn, August 31, 2009), http://unfccc.int/documentation/documents/advanced_search/items/3594.php?rec=j&priref=600005423.

[116] Decree 889, June 4, 2008.

[117] http://www.reuters.com/article/idUSTRE5AH2IE20091118?feedType=RSS&feedName=environmentNews&utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%253A+reuters%252Fenvironment+%2528News+%252F+US+%252F+Environment%2529.

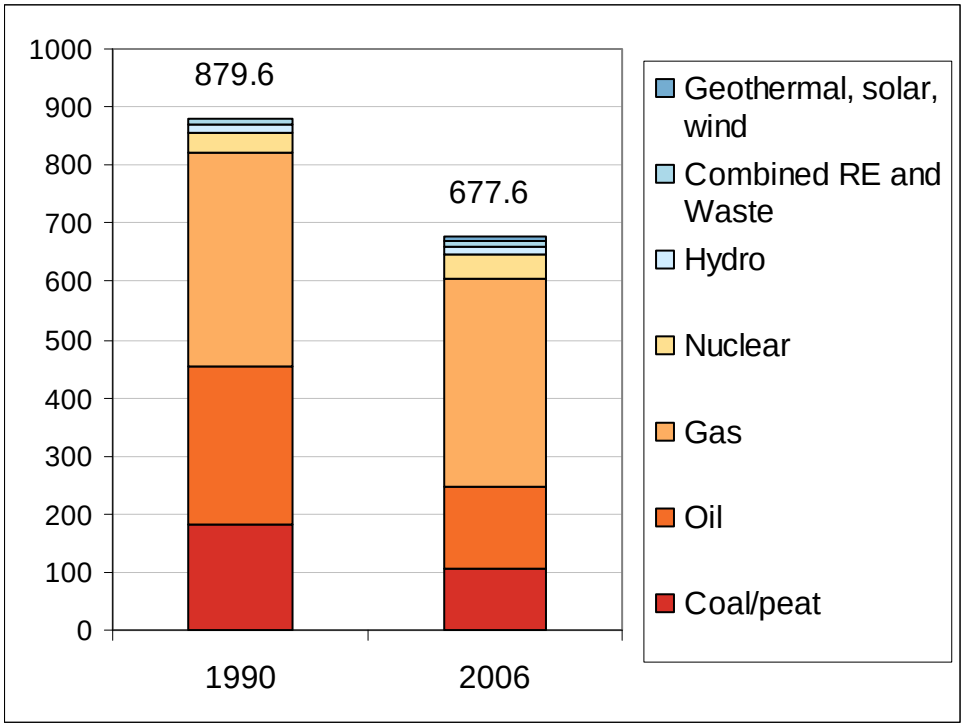
[118] See Table 5 in Aleksandra Novikova, Anna Korppoo, and Maria Sharmina, *Russian Pledge vs. Business-As-Usual: Impelementing Energy Efficiency Policies Can Curb Carbon Emissions* (The Finnish Institute of International Affairs, December 4, 2009), http://www.upi-fiia.fi/en/publication/97/.

little progress is occurring."[119] These claims persist in spite of apparent changes in the Russian leadership's diplomatic approach to the issue (e.g., an announcement of a climate "doctrine" accepting that GHG emissions would pose risks and would require actions to reduce emissions).[120] Many suspect that Russia's support for climate change actions is associated with expanding its export market for natural gas in Europe and, to a much smaller degree, the value of potentially selling its surplus AAUs to EU and other countries with GHG reduction obligations.

As noted above, Russia's reduced GHG emissions is due primarily to economic collapse, leading to steep drops in energy demand and production, as well as other activities (e.g., agriculture, waste) that lead to GHG emissions. Replacing old, inefficient manufacturing and other infrastructure has led to relatively slower increases in GHG emissions than in economic activity.

Figure 2. Russian Total Primary Energy Supply, 1990 and 2006

in million tons of oil equivalent (mtoe)



Source: Novikova, 2009, op. cit.

[119] Anne Karin Saether, "Moscow Environmental Conference Places Climate Demands on Medvedev," Bellona, March 27, 2009, http://www.bellona.org/articles/articles_2009/environmentalists_put_climate_changes_to_medvedev; Simon Shuster, "Russia offers climate goal with no real bite," June 19, 2009, http://www.reuters.com/article/environmentNews/idUSTRE55I3CP20090619; Ulkopoliittinen instituutti, "Russia's Post-2012 Climate Politics in the Context of Economic Growth," May 11, 2008, http://www.upi-fiia.fi/fi/event/195/; or, Simon Shuster, "Russia Still Dragging Its Feet on Climate Change," Time, October 8, 2009, http://www.time.com/time/specials/packages/article/0,28804,1929071_1929070_1934785,00.html.

[120] Quirin Schiermeier, "Russia makes major shift in climate policy," *Nature -News* (May 26, 2009), http://www.nature.com/news/2009/090526/full/news.2009.506.html; Simon Shuster, "Russia offers climate goal with no real bite," June 19, 2009, http://www.reuters.com/article/environmentNews/idUSTRE55I3CP20090619; or 1. Oleg Shchedrov, "Russia's Medvedev warns of climate catastrophe," November 16, 2009, http://www.reuters.com/article/environmentNews/idUSTRE5AF1SU20091116.

The government's strategy for economic and social development has relied on reform and expansion of the energy sector, in part because 50% of the central government's revenue comes from the oil and natural gas sector.[121] The export value of oil and natural gas has driven a policy emphasizing extraction of these resources for trade. However, many observers have noted a concomitant, low level of investment in new capacity. The 2006 Russian Energy Strategy to 2020 sought to increase reliance on nuclear and coal-fired electricity for domestic use in order to increase oil and natural gas available for export.[122] Investments are being made to back out natural gas use, for example, by investing in efficient, combined cycle gas turbine technologies. These energy initiatives have mixed effects on GHG trajectories.

In 2005, the government adopted the Complex Action Plan for Implementation of the Kyoto Protocol in the Russian Federation for 2004-2008. It gave coordinating authority to the Interdepartmental Commission on Implementation of the Kyoto Protocol in the Russia Federation. It established some sectoral targets for improving energy efficiency, although some commentators allege that no actions would be needed to achieve them.[123] The UNFCCC in-depth review concluded that these targets had been only partially met.

The Mid-term Social-economic Development Programme of the Russian Federation for 2003–2005 provided for economic incentives to modernize equipment and technologies, improving energy efficiency and thereby reducing GHG emissions. To supplement these initiatives, a Presidential Decree was issued in 2008 on measures for increasing the energy and environmental efficiency of the economy of Russia. Other reported actions include:

- Gazprom, Russia's state-owned natural gas enterprise, established an energy conservation program for 2001–2010.
- Gazprom is implementing measures to reduce CH_4 and CO_2 emissions through 2012 (the annual reductions expected are a 10% reduction in CH_4 emissions and a 2.5% reduction in CO_2 emissions); other measures to increase the efficiency of gas transport and decrease losses by Gazprom (emission reductions of 3 Mt CO_2 in the period 2001–2004 through reconstruction of pump stations).
- A federal program for housing for 2002–2010 targets housing retrofit and modernization and includes energy efficiency measures and introduction of small-scale renewable energy generation in the residential and services sectors.

On November 12, 2009, President Medvedev addressed the Federal Assembly and outlined his proposal for Russia to "undergo comprehensive modernization." In this speech Medvedev announced that "increasing energy efficiency and making the transition to a rational resource

[121] Jean Foglizzo, "Russia's New Energy Strategy Seems a Lot Like its Old One," The New York Times, March 30, 2008, http://www.nytimes.com/2008/03/30/business/worldbusiness/30iht-rnrgruss.1.11526942.html.

[122] Kevin Rosner, "Dirty Hands: Russian Coal, GHG Emissions & European Gas Demand," Journal of Energy Security (August 27, 2009), http://www.ensec.org/index.php?option=com_content&view=article&id=207:dirty-hands-russia-coal-ghg-emissions-aamp-european-gas-demand&catid=98:issuecontent0809&Itemid=349. The author raises, "The significant issue is whether it would be more advantageous, from an environmental-security perspective within the framework of Russia's coal paradigm, that the majority of new coal capacity is driven by comparatively more regulated OECD countries or whether it will revert back to Russia. Russia's environmental record is not exemplary in this regard."

[123] Ibid.

consumption model is another of our economy's [five] modernization priorities."[124] To this end, he highlighted a number of new program proposals to:

- produce and install individual energy meters for households;
- transition to energy-saving light bulbs from 2011 to 2014;
- introduce energy service contracts and introduce payment for consumption of services (and considering family incomes);
- increase efficiency in the public sector; and
- capture and sell natural gas co-produced with oil, instead of flaring gas.

President Medvedev also promoted developing waste-to-energy systems; super-conductors for electricity production, transmission, and use; and nuclear generation, including nuclear fusion. Some of these proposals were enacted into law in November 2009. The Russian government plans to provide 1.8 trillion rubles ($62.5 billion) for energy-saving projects by 2020.[125] According to the Kremlin website,[126]

> ... the new federal law introduces restrictions on the sale of incandescent light bulbs, sets requirements for providing energy efficiency information on goods' labeling, and also brings in provisions on mandatory commercial inventories of energy resources, new buildings' energy efficiency, and reductions in budget spending on purchasing energy resources. The new law also introduces energy evaluations for the most energy-intensive organisations and sets out provisions for transition to long-term tariff regulation and the establishment of a common inter-ministerial energy efficiency information and analysis system.

Some observers have expressed reservations about Russia's implementation of these policies, based on past performance.[127]

The in-depth review of Russia's Fourth National Communication under the United Nations Framework Convention on Climate Change (UNFCCC) found that Russia did not report on its specific domestic measures to abate GHG emissions or detail on how they would contribute to meeting Russia's GHG commitments.[128] The review recommended that the government provide greater transparency of how Russia's policies and measures may be modifying long-term trends in anthropogenic GHG emissions and removals. According to the UNFCCC in-depth review,

> In the period 1990–1998, GHG emissions decreased almost in parallel with the economic decline. In the period 1998–2006, GDP growth was accompanied by a relatively slower increase in the level of GHG emissions, which was 9.9 per cent higher in 2006 than in 1998. The differences between GDP and the GHG emission trends are mainly driven by: shifts in the structure of the economy (particularly of non-energy intensive industries); shifts in the primary energy supply (the share of oil and coal has decreased and the share of natural gas and nuclear energy has increased); a decline in activities in the agriculture and transport

[124] Dimtry Medvedev, "Presidential Address to the Federal Assembly of the Russian Federation," http://www.kremlin.ru, November 12, 2009.

[125] Sergei Blagov, "Russia Seeks to Sustain its Energy Security," Eurasia Daily Monitor, December 2, 2009, http://www.cdi.org/Russia/johnson/2009-222-20.cfm.

[126] Kremlin, November 23, 2009, http://eng.kremlin.ru/text/news/2009/11/222959.shtml.

[127] For example, Novikova, 2009, op. cit. and Blagov, 2009, op. cit.

[128] UNFCCC, op. cit., p. 4.

> sectors; the decrease in population (by 3.9 per cent); and the increase in energy efficiency. These trends resulted in a 31.9 per cent decrease in the Party's carbon intensity per GDP unit in 2006 compared with that in 1990.

Russia has not reported estimates of how government funding or financial incentives may influence GHG emissions.

Russia's latest energy strategy, as updated in August 2009, focuses in 2013-2015 on recovery from the current economic crisis. In its second phase, from 2015 to 2022, Russia would emphasize introducing new technologies and more efficiency into its energy sector. An expansion of renewable energy, including large hydroelectric plants, wind, and solar generation, would occur only in the third phase of the new strategy, from 2022 to 2030, along with continued development of hydrocarbon resources.

3. Covered Gases and Sectors:

Russia's target under the Kyoto Protocol includes the six Kyoto Protocol gases.

4. Allocation of GHG reductions to various sectors:

None specified.

5. Any regulations or exemptions specific to trade-sensitive sectors:

Motor Vehicles: In 2005, limits on motor vehicle pollutant emissions were introduced, including indicators of GHG emissions. These standards were comparable to the EURO 2–EURO 5 emission standards. (See **Figure A-2** in the **Appendix**.)

United States

1. Overall GHG emission target, if any, and timing:

The United States has not set legally binding targets to reduce its greenhouse gas (GHG) emissions, neither under domestic law nor international treaty. The House of Representatives passed a bill in June 2009 (H.R. 2454, the American Clean Energy and Security act of 2009) that would cap GHG emissions at about 17% below 1990 emissions by 2020 and 83% below by 2050. The Senate has been working on similar legislation, including S. 1733, the Clean Energy Jobs and American Power Act, which contained a cap of 20% below 1990 levels by 2005 and 83% below by 2050 when it was passed by the Committee on Environment and Public Works in November 2009.

On November 25, 2009, the White House announced that President Obama would attend the December 2009 international negotiations in Copenhagen on an agreement to address climate change beyond the year 2012. The White House stated that he is prepared to offer a "provisional" emissions reduction target of 17% below 2005 levels by 2020, and "ultimately in line with final U.S. energy and climate legislation."[129] On a path consistent with "pending legislation" for a long-term policy objective of 83% below 2005 levels by 2050, U.S. GHG emissions would be 30% and 42% below 2005 levels in 2025 and 2030, respectively, according to the White House.

Had the United States become a Party to the Kyoto Protocol, it would have had an obligation to reduce GHG emissions by 7% below 1990 levels during the first commitment period of 2008-2012. In 2007, U.S. GHG emissions were about 16% above 1990 levels.[130]

Of the 50 States, 23 have set state-wide GHG mitigation targets, of which six are caps (maxima). While some are enforceable, others are not.

2. Principal Policy Instrument(s):

Current federal climate change policies provide incentives, but few requirements, explicitly to reduce GHG emissions; many programs exist, however, that contribute to limiting GHG emissions through energy efficiency standards, and technical assistance and financial incentives for renewable energy or other low-emitting technologies. For example, a number of tax incentives are in place to encourage investment in renewable energy, more efficient vehicles, and efficiency improvements to buildings. The White House identifies more than $80 billion of funding for clean energy provided under the American Recovery and Reinvestment Act of 2009 (P.L. 111-5), including the "largest-ever investment in renewable energy."[131] Other incentives induce agricultural producers to enhance soil carbon. While temporary financial incentives have been associated with greater investments, some stakeholders have indicated that longer duration of the incentives and combining with other market correction measures are important to effectiveness.

[129] White House, "Combating Climate Change at Home and Around the World," November 25, 2009, http://www.whitehouse.gov/blog/2009/11/25/combating-climate-change-home-and-around-world.

[130] United States Environmental Protection Agency, *The U.S. Inventory of Greenhouse Gas Emissions and Sinks: 1990-2007*, EPA 430-F-06-010 (Washington DC: Office of Atmospheric Programs, 2009).

[131] White House, 2009, op. cit.

A suite of federal[132] programs, including the Energy Star, Climate Leaders, and Climate Challenge branded initiatives, provides information, technical assistance, and nominal awards to businesses, universities, and other consumers to quantify and reduce their GHG emissions; such programs generally are intended to encourage emission reductions that are already economical but do not occur because of market inefficiencies.

Some GHG reductions are achieved by existing or contemplated regulations. A major regulatory effort governs the energy efficiency of vehicles. For example, Corporate Average Fuel Economy (CAFE) standards will tighten for Model Year 2011 cars and trucks to approximately 27.3 miles per gallon (mpg). Again, these regulations have been put in place for reasons other than abating climate change. However, the Department of Transportation and the Environmental Protection Agency (EPA) are coordinating to propose new, joint CAFE and GHG emission standards for Model Years 2012-2016. The proposal would reach an estimated combined average of 34.1 mpg by 2016 (**Table 1**); combined with EPA's compliance credits for improving air conditioners of vehicles, the improvement could reach the GHG equivalent of 35.5 mpg. The proposed rules contain flexibilities for manufacturers to comply with the new standards by earning credits by over-complying, or by producing alternative or dual-fueled vehicles. Holders of credits may use them for compliance of other model years or classes, or trade them to another manufacturer. The agencies project that the new standards would reduce GHG emissions by about 900 million metric tons,[133] and reap net cost savings over the lifetimes of vehicles.

Table 1. Average Required Fuel Economies under Proposed Standards

(in miles per gallon for model year vehicles)

	2012	2013	2014	2015	2016
Passenger Cars	33.6	34.4	35.2	36.4	38.0
Light Trucks	25.0	25.6	26.2	27.1	28.3
Combined	29.8	30.6	31.4	32.6	34.1

Source: National Highway Traffic Safety Administration, "NHTSA and EPA Propose New national Program to Improve Fuel Economy and Reduce Greenhouse Gas Emissions for Passenger Cars and Light Trucks" fact sheet available at http://www.nhtsa.dot.gov/portal/site/nhtsa/menuitem.d0b5a45b55bfbe582f57529cdba046a0/.

The United States has set minimum standards of energy efficiency for a wide variety of residential and commercial equipment since the 1970s, with updates by several more recent laws.[134] Efforts are currently underway to address a backlog of regulations, such as for residential water heaters, dishwashers, clothes dryers, and for commercial motors and lamps, and a number of new, more stringent standards were issues in 2009. About two dozen additional standards are planned over the next few years. In some instances, states may have set appliance efficiency standards more stringent than federal standards (e.g., television standards in California).

[132] See http://www.epa.gov/climatechange/policy/neartermghgreduction.html, http://www.pi.energy.gov/, and http://www.usda.gov/oce/climate_change/index.htm.

[133] White House, 2009, op. cit.

[134] Established by Part B of Title III of the Energy Policy and Conservation Act (EPCA), P.L. 94-163, as amended by the National Energy Conservation Policy Act, P.L. 95-619, by the National Appliance Energy Conservation Act, P.L. 100-12, by the National Appliance Energy Conservation Amendments of 1988, P.L. 100-357, and by the Energy Policy Act of 1992, P.L. 102-486, and by the Energy Policy of 2005, P.L. 109-58.

Methane emissions from landfills are controlled along with other air pollutants under the Clean Air Act. According to EPA, the regulation requires installation of gas collection and control systems for new and existing landfills and, generally, routing the gas to an energy recovery system. The gas control system must reduce collected landfill gas (LFG) emissions by 98%.[135]

Large programs are devoted to developing new technologies that would be necessary to reduce GHG emissions below current levels. Many experts contend that voluntary efforts (such as the U.S. Climate Leaders Program), research on technologies, and existing regulatory and tax incentives cannot achieve the GHG reductions necessary to avoid "dangerous" climate change.

Of the $6.4 billion in U.S. federal funding in FY2008 for climate change activities, almost all was for scientific and technological research and development. In addition, tax incentives that could help to reduce GHG emissions were equivalent to about $1.5 billion in FY2008. As mentioned above, more than $80 billion in funding was available in FY2009. Funding for regulatory, voluntary, and public education programs was a few percent of the total. President Obama has also pledged, along with leaders of more than 20 other countries, to seek to phase out subsidies for fossil fuels, reducing associated GHG emission by an estimated 10% or more by 2050.[136]

The 110th Congress enacted two broad pieces of legislation—an omnibus energy bill (P.L. 110-140) and a comprehensive appropriations act (P.L. 110-161)—that include climate change provisions. Both statutes increase climate change research efforts, and the energy act requires improvement in vehicle fuel economies, as well as other provisions that would reduce (or sometimes increase) GHG emissions. P.L. 110-161 directs the EPA to develop regulations that establish a mandatory GHG reporting program that applies "above appropriate thresholds in all sectors of the economy."

In the absence of a federal regulatory framework to address U.S. GHG emission reductions, a majority of states have established formal GHG mitigation policies, including targets for future reductions. Sixteen states[137] are regulating CO2 emissions from electric utilities: 11 using a sectoral cap-and-trade approach, and five using emission performance standards. In several regions, including the Northeast, the Midwest and the West, states are working together to create regional schemes to cap GHG emissions and allow trading of emissions permits across borders. All states but four now support "net metering" to allow producers of renewably generated electricity to sell what they don't use into the electric grid. Twenty-six states have set renewable portfolio standards and another four have set alternative energy portfolio standards; these standards require that a specified share of the state's electricity must be generated by renewable or alternative energy sources by a given date. An additional five states encourage renewable or alternative energy sources with non-binding goals.

In the transportation sector, 15 states, led by California, are adopting GHG emission standards for motor vehicles, and three additional states are poised to follow. Thirty-eight states offer tax exemptions, credits, and/or grants to promote biofuels, of which 13 have set regulations requiring a specified share of motor fuels to come from biomass. To address growth of traffic, 18 states have set "smart growth" policies. Arizona, for example, has enacted laws and required improved

[135] http://www.epa.gov/reg3artd/airregulations/ap22/landfil2.htm.

[136] White House, 2009, op. cit.

[137] Data on state policies come from the Pew Center on Global Climate Change website, extracted November 20, 2009. http://www.pewclimate.org/states-regions.

coordination of state agency spending to help communities address a variety of growth pressures. Three of these states have also set targets to reduce vehicle miles traveled in the state. For example, the State of Washington set a goal in 2008 to reduce annual per capita vehicle miles traveled by 18% by 2020, 30% by 2035, and 50% by 2050, compared to 1990 levels.

Building codes typically fall under local authorities, although a growing number of states have set performance standards that help to limit GHG emissions. Most states have set efficiency standards for state, commercial, and residential buildings. Twelve have set appliance efficiency standards as well.

Over the past five years, a proliferation of litigation relating to climate change also presses the federal government toward actions to reduce GHG emissions. For example, the Supreme Court ruled in 2007 that the EPA must consider regulating CO_2 and other GHG emitted from motor vehicles as pollutants under the Clean Air Act.[138] The Obama Administration has made clear that it would prefer Congress to enact GHG-specific legislation but that it will move to regulate in the absence of such new law. Further litigation has been pursued, challenging the Executive Branch to action, using the Endangered Species Act, the Energy Policy and Conservation Act and the Outer Continental Shelf Lands Act. A few international-law claims have been filed against the United States as well.[139]

3. Covered Gases and Sectors:

Only methane emissions currently are regulated directly, although CO_2 has been proposed to be regulated from motor vehicles (in a joint rule with fuel economy standards) and is reduced through other regulatory measures.

4. Allocation of GHG reductions to various sectors:

Because no economy-wide reduction strategy is in place, there is no allocation among sectors.

5. Any regulations or exemptions specific to trade-sensitive sectors:

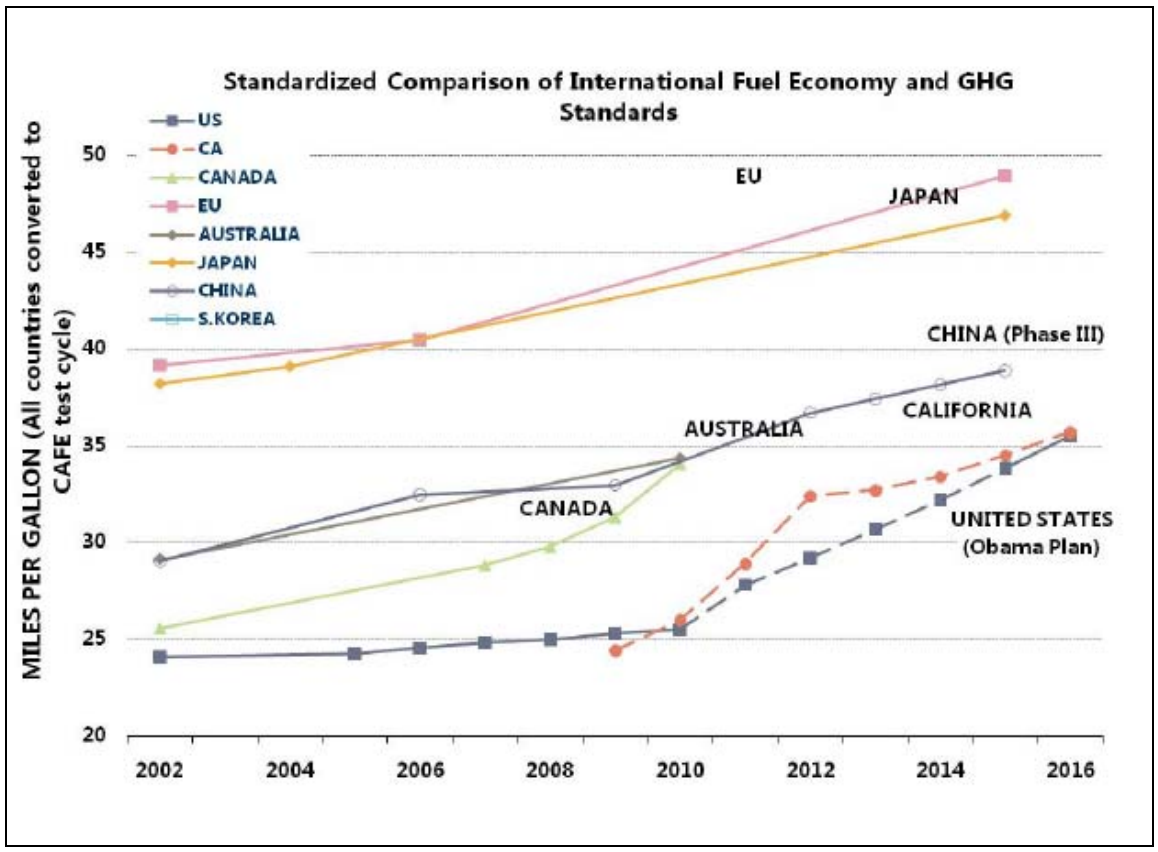
Because no economy-wide reduction strategy is in place, there are no regulations or exemptions in place specific to trade-sensitive sectors. H.R. 2454, which passed the House on June 26, 2009, includes two strategies to address possible shifts of GHG emissions from the United States to less regulated companies in other countries: (1) free allocation of allowances (similar to that of the EU), and (2) an international reserve allowance (IRA) scheme. The scheme would require importers of energy-intensive products from countries with insufficient carbon policies to submit a prescribed amount of "international reserve allowances," or IRAs, for their products to gain entry into the United States. Based on the GHG emissions generated in the production process, IRAs would be submitted on a per-unit basis for each category of covered goods from a covered country. Specifically, H.R. 2454 Section 768 requires EPA to promulgate rules establishing an international reserve allowance system for covered goods from the eligible industrial sector, including allowance trading, banking, pricing, and submission requirements. (See also the **Appendix**, comparing U.S. efficiency standards for motor vehicles with those of other countries.)

[138] *Massachusetts v. EPA*, 127 S. Ct. 1438 (2007).

[139] See CRS Report RL32764, *Climate Change Litigation: A Survey*, by Robert Meltz.

Appendix. Comparison of Vehicle Efficiency Standards Internationally (as of Mid-2009)

Figure A-1. Comparison of International Fuel Economy and GHG Standards



Source: Feng An, "Revised Chart for World Standards," Innovation Center for Energy and Transportation (iCET) (2009). Available at http://www.icet.org.cn.

Figure A-2. Standardized Comparison of Select Vehicle Efficiency Standards Internationally

(standards as of mid-2009)

CAFE mpg	UNITED STATES	CALIFORNIA	CANADA	EUROPE	AUSTRALIA	JAPAN	CHINA
2002	24.1		25.5	39.2	29.1	38.2	29.0
2003							
2004						39.1	
2005	24.3						
2006	24.6			40.5			32.4
2007	24.9		28.8				
2008	25.0		29.8				
2009	25.3	24.4	31.3				33.0
2010	25.5	26.0	34.1		34.4		
2011	27.8	28.9					
2012	29.2	32.4		48.9			36.7
2013	30.7	32.7					37.4
2014	32.2	33.4					38.1
2015	33.8	34.5				46.9	38.9
2016	35.5	35.7					

Note: all countries/regions normalized to US CAFÉ driving test cycle and converted to miles per gallon

Source: Feng An, "Revised Chart for World Standards," Innovation Center for Energy and Transportation (iCET) (2009). Available at http://www.icet.org.cn.

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