



United Nations

FCCC/IDR.5/USA



Framework Convention on
Climate Change

Distr.: General
14 September 2012

English only

Report of the in-depth review of the fifth national communication of the United States of America

Parties included in Annex I to the Convention are requested, in accordance with decision 10/CP.13, to submit a fifth national communication to the secretariat by 1 January 2010. This report presents the results of the in-depth review of the fifth national communication of the United States of America conducted by an expert review team in accordance with the relevant provisions of the Convention.

Contents

	<i>Paragraphs</i>	<i>Page</i>
I. Introduction and summary	1–7	3
A. Introduction.....	1–3	3
B. Summary.....	4–7	3
II. Technical assessment of the reviewed elements	8–161	4
A. National circumstances relevant to greenhouse gas emissions and removals, including legislative arrangements and administrative procedures	8–17	4
B. Policies and measures.....	18–86	7
C. Projections and the total effect of policies and measures	87–110	24
D. Vulnerability assessment, climate change impacts and adaptation measures.	111–122	30
E. Financial resources and transfer of technology	123–143	34
F. Research and systematic observation	144–155	38
G. Education, training and public awareness.....	156–161	40
III. Conclusions and recommendations.....	162–177	41

Annex

Documents and information used during the review.....	45
---	----

I. Introduction and summary

A. Introduction

1. For the United States of America the Convention entered into force on 21 March 1994. Under the Copenhagen Accord, the United States submitted a greenhouse gas (GHG) emissions reduction target in the range of 17 per cent below its 2005 emissions level by 2020, depending on the final energy and climate legislation enacted in the United States.

2. This report covers the in-country in-depth review (IDR) of the fifth national communication (NC5) of the United States, coordinated by the UNFCCC secretariat, in accordance with decision 10/CP.13. The review took place from 12 to 16 March 2012 in Washington DC, United States, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: Mr. Nagmeldin G. Elhassan (Sudan), Mr. Jim Penman (United Kingdom), Mr. Marcelo Rocha (Brazil) and Mr. Julien Vincent (France). Mr. Elhassan and Mr. Penman were the lead reviewers. The review was coordinated by Ms. Sylvie Marchand and Ms. Katia Simeonova (UNFCCC secretariat).

3. During the IDR, the expert review team (ERT) examined each section of the NC5. In accordance with procedures for review, including in-depth reviews, as defined in decisions 2/CP.1 and 9/CP.2, a draft version of this report was communicated to the Government of the United States, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

B. Summary

4. The ERT noted that the United States' NC5 mostly complies with the 'Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications' (hereinafter referred to as the UNFCCC reporting guidelines). The United States considered most of the recommendations provided in the report of the IDR of its fourth national communication (NC4).¹ The ERT commended the United States for its improved reporting.

1. Completeness

5. The NC5 covers all sections required by the UNFCCC reporting guidelines. However, the following mandatory elements were missing from, or only partly reported in, the NC5: projections presented on a sectoral basis, to the extent possible, using the same sectoral categories used in the policies and measures section, in particular, non-energy carbon dioxide (CO₂) emissions by sector and relevant information on factors and activities driving the expected emission trends, especially for non-CO₂ and non-energy CO₂ emission projections (see para. 90 below); clarification on how the United States has determined financial resources are 'new and additional' (para. 125 below); activities for financing access by developing countries to 'hard' or 'soft' environmentally-sound technologies (see para. 139 below); and a clear distinction between activities related to technology transfer undertaken by the public sector and those undertaken by the private sector (para. 139 below). Information on the missing items was sought by the ERT during the in-country visit and was provided by the United States. The ERT recommends that the United States

¹ FCCC/IDR.4/USA.

enhance the completeness of its reporting by providing the missing information in its next NC.

2. Transparency

6. The ERT acknowledged that the United States' NC5 provided clear information on most aspects of the implementation of the Convention. The ERT noted that the NC5 is structured following the outline contained in the annex to the UNFCCC reporting guidelines. During the review, the ERT formulated a number of recommendations that could help to further increase the transparency of the United States' reporting on national circumstances (see paras. 9 and 10 below), policies and measures (PaMs) (see paras. 19–22 below), projections and total effects of policies and measures (see paras. 92, 93, 97, 99 and 110 below), financial resources and technology transfer (see para. 127 below), and research and systematic observation (see para. 145 and 154 below). The ERT acknowledged the openness with which the United States responded to questions during the review.

3. Timeliness

7. The NC5 was submitted on 28 May 2010, after the deadline of 1 January 2010 mandated by decision 10/CP.13. The ERT noted with concern the delay in the submission of the NC5.

II. Technical assessment of the reviewed elements

A. National circumstances relevant to greenhouse gas emissions and removals, including legislative arrangements and administrative procedures

8. In its NC5, the United States has provided a concise description of its national circumstances and has elaborated on the framework legislation and key policy documents on climate change. Further technical assessment of the institutional and legislative arrangements for the coordination and implementation of PaMs are provided in chapter II.B.I of this report.

National circumstances

9. In its NC5, the United States has provided a description of its national circumstances, and information on how these national circumstances affect GHG emissions and removals in the United States and how changes in national circumstances affect GHG emissions and removals over time. Information was provided on the government structure, population, geography, climate and relevant economic sectors of the country. The information on the government structure in NC5 does not provide a complete description of the institutions involved in climate change policies and actions. Extensive information and clarifications on this matter were provided to the ERT during the in-country visit. The ERT encourages the United States in its next submission, to enhance its description of the institutions involved in climate policymaking including roles, responsibilities and coordination mechanisms.

10. The ERT noted that the main drivers of GHG emission trends in the United States include significant population and economic growth. Between 1990 and 2009, the country's population grew by around 23 per cent, which is one of the highest rates among advanced economies. During the same period, the economy of the United States grew by around 64 per cent and the total primary energy supply (TPES) grew by about 13.4 per cent. Oil

remained the most important fuel in the primary energy mix and continued to grow, driven by the continued increase in the demand for transportation. Recent years have seen an increased production of shale gas that has visibly increased its share in the TPES, mainly by displacing a percentage of the coal used in electricity generation. Overall, between 1990 and 2009, these changes resulted in a decrease in the emissions intensity of the economy by about 35 per cent per unit of gross domestic product (GDP), and in emissions per capita by about 13 per cent. The ERT acknowledges the improvement in the description of how national circumstances are affecting GHG emissions in NC5 compared with NC4 and encourages the United States to continue enhancing the description of, and the relationship between national circumstances and GHG emissions/removals. Table 1 provides some indicators relevant to the development of GHG emissions and removals in the United States since 1990.

Table 1

Indicators relevant to greenhouse gas emissions and removals for the United States of America

	1990	1995	2000	2005	2009	Change (%)		
						1990–2000	2000–2009	1990–2009
Population (million)	250.18	266.59	282.41	296.04	307.53	12.88	8.89	22.92
GDP (2000 USD billion using PPP)	7 063.99	8 001.95	9 898.80	11 150.37	11 591.77	40.13	17.10	64.10
TPES (Mtoe)	1 915.00	2 067.21	2 273.33	2 318.86	2 172.11	18.71	–4.45	13.43
GDP per capita (2000 USD thousand using PPP)	28.24	30.02	35.05	37.67	37.69	24.14	7.54	33.49
TPES per capita (toe)	7.65	7.75	8.05	7.83	7.06	5.16	–12.26	–7.73
GHG emissions without LULUCF (Tg CO ₂ eq)	6 161.46	6 528.27	7 072.45	7 178.66	6 587.69	14.79	–6.85	6.92
GHG emissions with LULUCF (Tg CO ₂ eq)	5 293.37	5 727.30	6 424.13	6 118.28	5 545.72	21.36	–13.67	4.77
CO ₂ emissions per capita (Mg)	20.35	20.31	21.13	20.60	17.86	3.79	–15.46	–12.26
CO ₂ emissions per GDP unit (kg per 2000 USD using PPP)	0.72	0.68	0.60	0.55	0.47	–16.39	–21.39	–34.28
GHG emissions per capita (Mg CO ₂ eq)	24.63	24.49	25.04	24.25	21.42	1.69	–14.46	–13.02
GHG emissions per GDP unit (kg CO ₂ eq per 2000 USD using PPP)	0.87	0.82	0.71	0.64	0.57	–18.09	–20.46	–34.84

Sources: (1) GHG emissions data: the United States' 2012 greenhouse gas inventory submission; (2) Population, GDP and TPES data: International Energy Agency.

Note: The ratios per capita and per GDP unit are calculated relative to GHG emissions without LULUCF; the ratios are calculated using the exact (non-rounded) values and may therefore differ from a ratio calculated with the rounded numbers provided in the table.

Abbreviations: GDP = gross domestic product, GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, PPP = purchasing power parity, TPES = total primary energy supply.

11. As noted in the previous in-depth review report, the political and institutional system in the United States renders the climate change policymaking process complex and difficult. The Executive Branch of the Government, represented by the President, his Cabinet and the Executive Office is central in the development and implementation of climate policy. The Legislative Branch, which consists of the House of Representatives and the Senate is the primary law-making body. The passing of new legislation, including new climate and energy legislation, requires support from both chambers of the Congress and

the President who signs the relevant bills into law. For example, although the support needed to enact the legislation of a GHG emissions cap-and-trade system received support from the House of Representatives in 2009, it did not pass the Senate. Finally, the Judicial Branch plays a significant role in defining the jurisdiction of the Executive Departments and interpreting the application of climate and energy policies under existing laws.

12. In addition to policies implemented at the federal level, many states have implemented climate and clean energy policies that go far beyond these federal policies. For example, starting from January 2009, several north-eastern and mid-Atlantic states are covered by the first mandatory market-based cap-and-trade system that is designed to reduce GHG emissions. In 2007, five western states launched the Western Climate Initiative (WCI) that aims to cap emissions from the electricity sector and now represents a partnership between California and Canadian provinces. Mandatory renewable portfolio standards (RPS) were introduced in many states and experience gained from the implementation of these policies at the state level can have a catalytic role in the design and implementation of relevant policies at the federal level.

13. The NC5 provides, in the body of the report and in an annex, summary information on GHG emission trends for the period 1990–2007. This information is consistent with the 2009 national GHG inventory submission. During the review, the United States presented to the ERT information on the draft 2012 annual GHG inventory, including data up to 2010, which was subsequently officially reported on 13 April 2012 to the UNFCCC secretariat as part of the United States' 2012 national inventory report submission. The in-depth review report takes this information into account in so far as possible.

14. The ERT acknowledged, with appreciation, the improvement in the Party's inventory relating the use of higher tier methods for methane (CH₄) and nitrous oxide (N₂O) from fuel combustion for electricity generation, and N₂O from agricultural soils. This led to significant changes in the GHG emission estimates compared with the previous submissions. The ERT noted that the Environmental Protection Agency (EPA) launched the Greenhouse Gas Reporting Program, which requires large facilities for all source categories to report accurate and timely GHG emissions inventory data. The ERT commends the United States for the improvement in its methods and also for establishing the Greenhouse Gas Reporting Program. The latter is expected to contribute to further improvements in the quality of the United States' GHG inventory and to better inform future policy decisions.

15. In 2010, the total GHG emissions excluding and including emissions and removals from land use, land-use change and forestry (LULUCF) were 10.4 per cent and 8.6 per cent higher than those in 1990, respectively. Not accounting for LULUCF, the increase since 1990 is mainly attributed to CO₂ emissions, which increased by about 11.9 per cent over this period; emissions of CH₄ decreased by 0.6 per cent; and emissions of N₂O decreased by 4 per cent. Total emissions of fluorinated gases increased significantly during the same period by about 58.2 per cent from their 1990 level, in which hydrofluorocarbons (HFCs) increased by 233.0 per cent and perfluorocarbons (PFCs) decreased by 72.6 per cent while sulphur hexafluoride (SF₆) decreased by 57.0 per cent. Despite the increase in HFC emissions, overall, fluorinated gases still only accounted for a small share of the total emissions excluding LULUCF, around 2 per cent in 2010.

16. The ERT noted that the last three years of data reported in the 2012 GHG inventory submission, which were not reported in the NC5, show that from the peak year in 2007, total GHG emissions excluding LULUCF fell by 2.7 per cent in 2008 followed by an additional drop of 6.2 per cent in 2009, and then rose by 3.3 per cent in 2010. The corresponding data including LULUCF show falls of 3.0 per cent and 7.0 per cent in 2008 and 2009, respectively, followed by an increase of 3.6 per cent in 2010. The decreases between 2005 and 2010 excluding and including LULUCF were 5.2 per cent and 6.1 per cent, respectively. Emissions of CO₂ were responsible for about 95 per cent of the changes

since 2007, with the single most important source category responsible for the year-on-year changes being transport in 2008, and electricity generation in 2009 and 2010.

17. Historically, fossil fuel combustion has been the main source of CO₂ emissions in the United States. In 2010, 85 per cent of the energy consumed in the country was from fossil fuel combustion. Between 1990 and 2010, CO₂ emissions from this source increased by 13.5 per cent, driven primarily by domestic economic growth and increases in emissions from electricity generation and transportation activities. In the long term, population, economic growth, energy price fluctuations, seasonal temperature and technology development are among the main factors influencing the level of CO₂ emissions from fuel combustion. Table 2 provides an overview of GHG emissions by sector from 1990 to 2010.

Table 2
Greenhouse gas emissions by sector in the United States of America, 1990–2010

Sector	GHG emissions (Tg CO ₂ eq)							Change (%)		Shares ^a by sector (%)	
	1990	1995	2000	2005	2008	2009	2010	1990–2010	2000–2010	1990	2010
1. Energy	5 287.7	5 609.3	6 167.4	6 282.4	6 125.4	5 752.7	5 933.5	12.2	3.1	85.8	87.2
A1. Energy industries	1 837.0	1 968.0	2 318.5	2 431.5	2 390.5	2 175.7	2 289.7	24.6	5.2	29.8	33.7
A2. Manufacturing industries and construction	852.5	875.4	848.8	822.8	812.6	732.2	783.9	-8.0	7.1	13.8	11.5
A3. Transport	1 484.9	1 633.5	1 836.1	1 907.8	1 791.4	1 729.4	1 746.5	17.6	1.0	24.1	25.7
A4.–A5. Other	760.4	782.9	825.5	808.2	782.9	756.1	756.7	-0.5	0.1	12.3	11.1
B. Fugitive emissions	352.9	349.6	338.6	312.2	348.0	359.3	356.7	1.1	-0.7	5.7	5.2
2. Industrial processes	313.9	336.5	349.6	330.1	319.1	268.2	303.4	-3.4	13.1	5.1	4.5
3. Solvent and other product use	4.4	4.6	4.9	4.4	4.4	4.4	4.4	-0.4	-	0.1	0.1
4. Agriculture	387.8	416.3	415.3	424.6	433.8	426.4	428.4	10.5	0.5	6.3	6.3
5. LULUCF	-868.1	-801.0	-648.3	-1 060.4	-1 060.0	-1 042.0	-1 055.1	21.5	1.3		
6. Waste	167.7	161.6	135.3	137.2	138.2	136.0	132.5	-21.0	-2.6	2.7	1.9
GHG total with LULUCF	5 293.4	5 727.3	6 424.1	6 118.3	5 960.9	5 545.7	5 747.1	8.6	3.6		
GHG total without LULUCF	6 161.5	6 528.3	7 072.4	7 178.7	7 020.9	6 587.7	6 802.2	10.4	3.3	100.0	100.0
International bunker fuels	113.0	100.9	99.5	110.9	135.1	123.6	129.2	14.3	4.5		

Note: The changes in emissions and the shares by sector are calculated using the exact (not rounded) values and may therefore differ from values calculated with the rounded numbers provided in the table.

Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

^a The shares of sectors are calculated relative to GHG emissions without LULUCF; for the LULUCF sector, the negative values indicate the share of GHG emissions that was offset by GHG removals through LULUCF. Unless otherwise specified, the term 'total GHG emissions' refers to the aggregated national GHG emissions excluding LULUCF.

B. Policies and measures

18. As required by the UNFCCC reporting guidelines, the United States has provided in its NC5 a comprehensive and well-organized account of its package of PaMs implemented, adopted and planned in order to fulfil its commitments under the Convention. The textual description of the principal PaMs is presented by sector and, where relevant, by gas, and is supplemented by a summary table. Cross-cutting programmes and measures were also presented. The United States provided some information on how it believes PaMs are modifying longer-term trends in GHG emissions and the progress made since the submission of the previous NC. Overall, the NC5 included a PaMs package on a much more ambitious scale than that in the NC4, which relied mainly on voluntary measures.

19. However, the ERT noted that the NC5 did not provide the information that the UNFCCC reporting guidelines ask Parties to provide on the institutional arrangements, and the methods used for monitoring and evaluating the progress of PaMs in mitigating GHG emissions over time. The United States mentioned during the review week that monitoring and evaluation of actual effects of PaMs over time is under consideration.

20. The ERT noted that although the NC5 did not provide information on how the quantitative effects of individual PaMs were estimated, additional information was provided during the review. The NC5 specified that the expected mitigation effects of individual PaMs reported for 2010, 2015 and 2020 did not take into account the potential synergies and interactions between PaMs which can result in the double-counting of mitigation effects. As such, the quantitative estimates provided in NC5 may represent overestimations of the effect of each PaM. Information on these matters was provided during the review. The ERT encourages the United States to explore estimation methods designed to help in avoiding the double-counting of mitigation effects, such as the estimation of a collection of PaMs combined in a single model where synergies and interactions are, to the extent possible, taken into account.

21. The ERT recalls that the recommendations about combining polices to estimate the sectoral effects and concerning methods used to estimate, monitor and evaluate the effects of polices, were among those made in the NC4 review.

22. The ERT noted that the NC5 provided some information on costs and cost savings associated with policies, but that how costs were determined was unclear. The ERT also noted that an estimate of the social cost of carbon was taken into account in some PaMs. The ERT encourages the United States to consider whether costs and benefits of polices can be defined in a systematic way and reported in future NCs.

23. Powerful co-benefits in terms of job creation, economic transformation, reduced oil dependence, and protection of national heritage are clearly identified in the NC5, and co-benefits are sometimes linked to specific climate and energy policies, such as weatherization. Conversely, PaMs for regulating other pollutants can have co-benefits for GHG emissions mitigation. For example, the United States informed the ERT that although more important factors include slowing the growth of electricity demand and reducing natural gas prices, the new regulations controlling mercury and other hazardous pollutants have also increased the likelihood of the retirement of coal- or oil-fired power plants and their replacement by those run on natural gas or other cleaner energy sources. The ERT encourages the United States to identify co-benefits more systematically and report thereon in future NCs.

24. The NC5 provided information on PaMs introduced since NC4. The ERT noted that PaMs already implemented and reported in NC4 have not been discontinued, and that there is nothing to report on PaMs that increase emissions.

25. At the UNFCCC Conference of the Parties (COP) at its fifteenth session in 2009, the United States proposed a GHG emission reduction target in the range of 17 per cent below its 2005 emissions level by 2020, depending on enacted energy and climate legislation, recognizing that the final target would be reported to the secretariat in the light of the enacted legislation. In the longer term, the United States expects to put its economy on a path consistent with a reduction of its emissions by more than 80 per cent by 2050 compared with its 2005 emissions level.

26. The NC5 reported a proposed comprehensive economy-wide energy and climate legislation, the American Clean Energy and Security (ACES) Act also known as the Waxman-Markey Bill, which if enacted would have contained the 2020 and 2050 targets for the United States. To achieve these legislated targets, the Act proposed a cap-and-trade system that would have imposed a limit on the amount of GHG emissions in the United

States and set a market where the permits to emit, distributed to firms, would have been traded in a similar fashion to the European Union’s Emissions Trading System. The cap on emissions would have been tightened over the 2012–2050 period to help to ensure that the target would be met. The proposed legislation also foresaw a number of key elements such as enhancing energy efficiency and reducing reliance on oil, stimulating innovation in clean coal technology, accelerating the use of renewable sources of energy, and speeding up economic recovery and job growth, in reshaping the manufacturing sector to respond to the demand for clean energy.

27. Though the ACES Act passed in the House of Representatives, it was later defeated in the Senate in 2010 and the ACES legislation containing the targets and tools to achieve them was not enacted. Furthermore, the United States stated during the review week that it seems unlikely, in the short term at least that a comprehensive piece of legislation including a cap-and-trade system at the federal level will be enacted. As a result, energy and climate policy in the United States relies currently on the use of a range of existing statutory authorities and new regulations, policies, and programmes, as well as actions at the subnational level. Nonetheless, although the reduction target in the range of 17 per cent below 2005 level by 2020 is a not a legally binding international and national commitment, the United States reiterated its reduction commitment at subsequent COPs and during the review week.

28. The climate and energy policy framework in the United States is based on three key pillars: the Clean Air Act (CAA), the American Recovery and Reinvestment Act (ARRA) and the Energy Independence and Security Act (EISA). The CAA was enacted in 1963 to control air pollution and Congress has adopted major revisions to the law several times. In 2007, the United States Supreme Court ruled that the act’s definition of an air pollutant encompasses GHGs. The EPA recently undertook several key steps to regulate GHG emissions (see the next section). The ARRA was enacted in 2009 in response to the 2008 economic downturn and appropriates investments for, among others, developing new clean energy technologies and helping to combat climate change. The EISA, enacted in 2007, aims at increasing energy efficiency and the availability of renewable resources, and was extensively discussed in the IDR of NC4 where further information can be found. Table 3 provides a summary of information on the main PaMs of the United States reported in NC5 and based on updated information provided during the review. The NC5 also provided information on other Acts and PaMs at the national, state and city levels that are currently implemented.

Table 3
Summary of information on policies and measures reported in the fifth national communication and updated during the review

<i>Major policies and measures</i>	<i>Examples/comments</i>
<i>Policy framework and cross-sectoral measures</i>	
Clean Air Act (1970, 1977 and 1990)	Law that defines the responsibilities of the Environmental Protection Agency for protecting and improving the nation’s air quality and the stratospheric ozone layer
American Recovery and Reinvestment Act (2009)	Law enacted as a response to the 2008 economic crisis, which aims, in part, to spur technological advances in science and health, and to invest in environmental protection and other infrastructures that will provide long-term economic benefits
Energy Independence and Security Act (2007)	Law under which many provisions are designed to increase energy efficiency and the availability of renewable energy

<i>Major policies and measures</i>	<i>Examples/comments</i>
Executive Order 13514	Sets sustainability goals for federal agencies focusing on improving environmental, energy and economic performance
<i>Policies and measures by sector</i>	
<i>Energy</i>	
Prevention of Significant Deterioration (PSD); Title V Operating Permit Programs: the Tailoring Rule	Requires large new and modified facilities to obtain pre-construction permits (under the PSD Program) reflecting the use of the best available control technologies to limit greenhouse gas (GHG) emissions. Requires large facilities to obtain operating permits (under Title V of the Clean Air Act (CAA)) that include all their CAA requirements, including GHG requirements. Focuses these permitting programmes on large sources (through provisions of the Tailoring Rule)
Proposed Performance Standard Rule for New Fossil Fuel-fired Electric Utility Generating Units	Would limit CO ₂ emissions from new fossil-fuel-fired electricity generating units that generate electricity for sale and have a generating capacity larger than 25 MW. Existing sources would not be affected
Renewable Energy Production Incentive	Provides financial incentives for electricity generated by new qualifying renewable energy generation, cost-sharing incentives for research, development, deployment and demonstration (RDD&D) renewable energy technology manufacturing, and 50 % matching grants for small-scale renewable projects
Renewable Portfolio Standard (Renewable Energy Standards)	Provides states with a mechanism to increase renewable energy generation using a market-based approach. Establishes requirements for electric utilities and other retail electric providers to serve a specified minimum percentage (or absolute amount) of customer load with eligible sources of renewable electricity
Biomass Program	Develops a portfolio of research, development and demonstration (RD&D) geared toward biomass feedstocks and conversion technologies. Includes development and deployment of infrastructure and opportunities for market penetration of bio-based fuels and products (55.2 Mt)
Wind Energy Development Program	Provides opportunities for and encourages use of federal public lands for development of wind energy
Nuclear Power Programs	Provides risk insurance against construction and operational delays beyond the control of the plants' sponsors and against liability claims from nuclear incidents. Also provides loan guarantees for new plants and research and development (R&D) support for advanced nuclear technologies (14.4 Mt)
Solar Energy Technologies Program	Supports R&D and deployment of cost-effective technologies toward growing the use of solar energy throughout the nation and the world. Seeks to make solar electricity cost-competitive with conventional forms of electricity by 2015 (2.5 Mt)
SunShot Initiative	Aims at widespread, large-scale adoption of solar energy across America through supporting innovation in this area
Energy Star-labelling Programs: Residential, Commercial, Industry	Labelling programmes to boost the adoption of energy efficient products, practices and services through valuable partnerships, objective measurement tools and consumer education
Coal Technologies Program	Seeks to develop and demonstrate technologies that can increase operating and capture efficiency, and permanently store GHGs in new commercial-scale plants or existing plants. Also includes tax credits (23.1 Mt)

<i>Major policies and measures</i>	<i>Examples/comments</i>
<i>Transport</i>	
Renewable Fuel Standards	Implements the Energy Independence and Security Act 2007 changes, including an increased total volume of renewable fuel used in transport, as well as new specific volume standards for cellulosic biofuel, biomass-based diesel, and advanced biofuel in the total volume. Also includes new definitions and criteria for both renewable fuels and the feedstocks used to produce them (138 Mt)
Corporate Average Fuel Economy and Greenhouse Gas Emission Standards	Regulations that aim at achieving GHG emission reductions through the increased fuel efficiency of vehicles. From the fifth national communication (NC5): light-duty trucks and passenger cars (model years (MYs): 2005–2011). After NC5: passenger cars, light-duty trucks and medium-duty passenger vehicles (MYs: 2012–2016); medium- and heavy-duty vehicles (MYs: 2012–2018); and light-duty trucks and passenger cars (MYs: 2017–2025)
Fuel Economy and Environmental Label	Labelling programme for new generation vehicles that provides information on vehicles' fuel economy, energy use, fuel costs and environmental impacts
Federal Transit Investments for Greenhouse Gas and Energy Reduction	Works with public transportation agencies to implement new strategies for reducing GHG emissions and/or reducing energy use within transit operations. Strategies can be implemented through operational or technological enhancements or innovations
<i>Industrial processes</i>	
Significant New Alternatives Policy Program	Facilitates a smooth transition away from ozone-depleting chemicals in industrial and consumer sectors (243 Mt)
Natural Gas STAR Program	Reduces methane emissions from natural gas systems in the United States through the widespread adoption of industry best-management practices (46.9 Mt)
<i>Agriculture and Forestry</i>	
Conservation Reserve Program	Encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to native grasses, wildlife plantings, trees, filter strips or riparian buffers to improve soil, water, wildlife and other natural resources (53 Mt)
Environmental Quality Incentives Program	Offers innovation grants to livestock producers and owners of working farmlands to accelerate the development, transfer, and adoption of innovative technologies and approaches, including those that deliver GHG benefits and improve the quality of nutrient management systems (14.2 Mt)
<i>Waste</i>	
Stringent Landfill Rule	Reduces methane/landfill gas emissions from United States landfills (9.9 Mt)
Landfill Methane Outreach Program	Reduces methane emissions from United States landfills through cost-effective means (30.8 Mt)

Note: The greenhouse gas reduction estimates, given for some measures (in parentheses), are reductions in carbon dioxide or CO₂ eq for the year 2020 as provided in the fifth national communication.

1. Policy framework and cross-sectoral measures

29. United States-wide climate legislation requires support from both chambers of Congress and must also be signed by the President. The main federal entities that have authority to implement legislation on energy and the environment in the United States are

the EPA, on air pollution matters including GHGs; the Department of Energy (DoE), on energy-related matters; and the Department of Transportation (DoT), on fuel-related matters. For many of the climate-related issues, jurisdiction for policymaking is shared by federal, state and local governments. Policy levers at the state and local levels exist in all economic sectors including, among others, GHG emission reduction goals, renewable portfolio standards, building codes and appliance standards, and emerging integrated transport and infrastructure planning.

30. At the federal level, climate policy in the United States is developed through a cooperative inter-agency process that involves the Executive Office of the President (Office of Energy and Climate Change, Domestic Policy Council, National Economic Council, National Security Council, Office of Science and Technology Policy, Council of Environmental Quality and the Office of Management and Budget) and a number of departments and agencies including the EPA, the DoE, the State Department, the Department of Agriculture, DoT and the Department of Interior. In addition, departments and agencies are responsible for implementing existing laws passed by Congress that apply to GHGs or set energy policy.

31. As for reporting to the UNFCCC secretariat, the State Department plays a central coordination role in the climate change area including the preparation and submission of the NCs. The EPA leads the technical inter-agency work in the preparation of the annual GHG inventory reports and the State Department makes the formal submission to the UNFCCC secretariat.

32. The 2009 ARRA, one of the three pillars of the Administration's approach to meeting the GHG emission reduction targets, provides tax breaks and targeted investment over the period 2009 to 2012 intended to stimulate the economy of the United States, reduce oil dependence and cut the pollution that causes global warming. The clean technology component of ARRA made available for disbursement through grants about USD 35 billion over the 2009–2012 period. This is an unprecedented incentive equivalent to about 10 times the annual budget of the DoE for funding clean energy innovation. Total ARRA incentives for clean energy, including also tax incentives and loans, exceeded USD 90 billion. ARRA also led to a USD 17 billion funding authorization for transit and high-speed rail investments. Separately quantified effects of the ARRA are not available. According to the information provided to the ERT during the review, together with the effect of the economic downturn in the 2010s and the increase in the shale gas in the TPES, ARRA is expected to contribute to an emission decrease of around 6 per cent in 2020 below the baseline decrease of 1.5 per cent.

33. The CAA, another pillar of the Administration's approach, is an important law that regulates air pollution, which is relevant to the bottom-up climate change policy process. Application of the CAA to GHG emissions required establishment of a threat to public health and welfare. In 2007, the United States Supreme Court ruled that GHGs are air pollutants under the CAA (*Massachusetts v. the EPA*), which meant that the EPA had statutory authority to regulate GHG emissions. Then, the EPA issued an 'Endangerment Finding', which stated that current and projected levels of six GHGs threaten public health and welfare, and that motor vehicles contribute to the threat. These findings required the EPA to regulate motor vehicle GHG emissions, and the EPA has proceeded to do so. Once GHGs were regulated pollutants, the act required stationary sources to obtain pre-construction permits based on the use of the best available control technology (see paras. 40–44 and 55–56 below). Most recently, the EPA has proposed performance standards for carbon pollution from new fossil-fuel-fired power plants.

34. The ERT noted the challenge in achieving the 2020 target in the absence of the anticipated cap-and-trade system as part of a comprehensive United States-wide energy and climate piece of legislation. The ERT also noted that achieving the goal from the bottom up

would require further effort using the existing framework as a basis. During the in-country visit, United States officials mentioned that the technical potential for emission reductions remains unchanged in the absence of a cap-and-trade system. They also highlighted that the reductions in GHG emissions from previous years and the projected reductions in energy-related emissions are not solely attributable to the economic down-turn but reflect also factors conducive to achieving further emission reductions while deploying this potential. These factors include higher oil prices and further penetration of shale gas into energy markets, provided this does not drive out other low-carbon and carbon-free energy sources, including renewables.

2. Policies and measures in the energy sector

35. Altogether, emissions from the energy sector accounted for about 87 per cent of total GHG emissions in the United States in 2010. Between 1990 and 2010, GHG emissions from this sector increased by about 12.2 per cent. After a steady increase up to 2007, emissions dropped by 8.6 per cent between 2007–2009 and increased by 3.1 per cent from 2009 to 2010. The drop in emissions over 2007–2009 was driven by lower economic output leading to lower energy consumption, mainly in the transport sector, fuel switching away from coal to natural gas, higher oil prices and an increase in the use of non-fossil energy sources. After a low point in 2009, comparable to the emissions level in 1996, emissions rose in 2010 mainly due to a growth in economic output stimulated by an increase in energy consumption across all sectors and related fossil fuel combustion.

36. Together, petroleum, natural gas and coal accounted for 78 per cent of the total energy production of the United States in 2010 while nuclear energy contributed about 11 per cent. Renewable sources, including biomass, represented 11 per cent of total production. The Energy Information Administration (EIA) Annual Energy Outlook (AEO) 2012 early release projections for 2035 suggest that total primary energy production could rise by 25 per cent from its 2010 level and that these shares could reach 74 per cent for petroleum, natural gas and coal respectively, and 10 per cent for nuclear energy. Renewable sources, including biomass, could account for about 16 per cent of total energy production. In absolute terms, the largest increases in energy production are expected to come from natural gas and biomass.

37. Climate actions in the United States are deployed in the context of the Administration's efforts to reduce the country's dependence on imported oil; to promote energy efficiency; and to change the energy mix towards cleaner sources. To that end, the first goal of the recent 2011 Strategic Plan of the DoE is to catalyse the timely, material and efficient transformation of the nation's energy system, and to secure United States leadership in clean energy technologies. To put this into effect, in its 2012 update to the 2011 Strategic Plan, the DoE has redefined its goal statements include the following: save low income families money and energy through weatherization retrofits; reduce consumer energy use and costs for household appliances; reduce the cost of batteries for electric drive vehicles to help increase the market for plug-in hybrids and all electric vehicles and thereby reduce petroleum use and greenhouse gas emissions; and make solar energy as cheap as traditional sources of electricity.

38. **Energy supply.** The NC5 sets out specific PaMs affecting energy supply, most of them targeting renewable energy sources or transport; both are discussed in their respective sections below. In addition to PaMs proposed in NC5 that were based on voluntary and incentive-based or research and information actions, the EPA recently took significant steps by addressing the largest stationary sources of emissions from the energy supply sector. The Supreme Court ruling (2007) and findings (2009), which lead the EPA to regulate GHGs from mobile sources implied that the EPA also had to regulate emissions from

stationary sources (see the Tailoring Rule and the New Source Performance Standards in paras. 40 and 43 below).

39. The EPA has good knowledge of the distribution of emissions by type of stationary source because of information gathered under the Greenhouse Gas Reporting Rule (GGRR), put into effect under the legislative umbrella of a request from Congress in the 2008 Consolidated Appropriations Act. The rule requires reporting of GHG emissions by all facilities that release annual emissions equal to at least 25,000 tonnes (t) CO₂ eq, and covers some 80 per cent of total United States emissions. In January 2012, the EPA made public the first set of data gathered under the GGRR. The information is relevant to regulation under the CAA, whether directly or by states, and the major increase in transparency of emissions reporting that it represents may lead to voluntary action even in the absence of regulation.

40. Being legally required by the CAA to oblige large stationary sources to obtain a permit before construction or major modifications, the EPA decided to address these sources through the Prevention of Significant Deterioration (PSD) and Title V Operating Permit Programs. But since the thresholds for the acceptable level of GHG pollution were the same as for any other pollutant under the CAA – 91 to 227 t CO₂ eq per year² – the number of permits required would have overwhelmed the capacity of permitting authorities and delayed issuance of pre-construction permits for new facilities. The EPA Tailoring Rule was designed to prevent this outcome. As a result, only the largest new and modified sources, such as power plants, refineries and cement manufacturers, are currently required to obtain pre-construction permits.

41. After the completion of the three phases of implementation of the rule, the EPA estimates that facilities responsible for nearly 70 per cent³ of national GHG emissions from stationary sources will be subject to permitting requirements. There are three phase-in steps under the Tailoring Rule: (i) 1 January–30 June 2011 – only new sources, or modifications to existing ones, that would trigger PSD for another pollutant anyway and that are expected to emit at least 68,039 t CO₂ eq per year are included; (ii) 1 July 2011–30 June 2013 – all new sources are expected to emit at least 90,718 t CO₂ eq per year and modifications that would add at least 68,039 t CO₂ eq per year are included; and (iii) July 2012 – streamlining of the permitting process and the thresholds are maintained.

42. To obtain a permit, industrial facilities need to install the best available control technology (BACT) that is based on the maximum degree of control that can be achieved. Other conditions include air quality and impact assessment analyses. As each facility is different, it requires a case-by-case decision that considers energy, environmental and economic impact. Examples of BACT include fuel cleaning and innovative fuel combustion techniques. The AEO2012 early release did not include the amount of GHGs expected to be avoided by the implementation of the PSD. As of 10 June 2012, several dozen large industrial sources of GHGs – such as cement plants, power plants, refineries and steel mills – had received permits under these programmes.

43. The EPA took another significant step in March 2012 when it proposed a New Source Performance Standard Rule for new fossil fuel-fired electric utility generating units (EGUs) such as boilers, integrated gasification combined cycle units and stationary combined cycle turbine units. New EGUs covered under this proposal are those that generate electricity for sale and must have a generating capacity larger than 25 MW. The standards of performance will require new EGUs to meet a CO₂ emissions rate of 454.5

² The range 91 to 227 t is equivalent to 100 to 250 short tonnes per year.

³ See page 3 of <<http://www.epa.gov/nsr/ghgdocs/ghgpermittingguidance.pdf>>. Paragraph 41 quotes the limits in metric tonnes; in short tonnes the equivalents are 75,000 and 100,000 tonnes per year respectively.

kg/MWh of electricity generated on a gross basis. Compliance can either be assessed over a rolling 12-month period or over a 30-year average and examples of available technology complying with the standard include natural gas combined cycle generation with no additional GHG control or coal-fired generation using carbon capture and storage (CCS).

44. Under the proposed rule, the standard has to be reviewed every eight years and the impact assessment of the EPA therefore covered the period up to 2020. The modelling of the EPA performed for the assessment suggested that in the absence of the rule (base case), most of the new fossil-fuel fired EGUs constructed up to 2020 would be using natural gas. Only under specific favourable market conditions and availability of funding would coal-fired units with CCS be built. The rule, therefore, provides some certainty over future conditions of the United States electricity market. Consistent with this, the EPA does not expect the proposed standards to result in significant additional CO₂ emission reductions relative to the base case, nor are energy impacts, quantified benefits, costs or economic impacts projected by 2020. However, based on a social cost of carbon analysis carried out by the EPA, a transition from coal to natural gas-fired power plants would mainly result in health benefits. The EPA is also preparing GHG standards for oil refineries (Clean Energy Standard Act) that are planned to be released later in 2012.

45. The NC5 identified programmes and partnerships in energy supply implemented by the EPA affecting CO₂ emissions, such as Combined Heat and Power Partnership, and non-CO₂ emissions, such as the Coalbed Methane Outreach Program and the Natural Gas Star Program. These programmes, many dating back to the 1990s, have achieved considerable penetration into the industries concerned, though they are information and voluntary programmes. Overall, the ERT noted that increased natural gas utilization will tend to increase fugitive CH₄ emissions, and that an effective PaMs framework to mitigate these emissions will be essential in establishing the low emissions credibility of this expanding energy source in addition to addressing effectively other environmental concerns over shale gas.

46. **Renewable energy sources.** The NC5 reported that about 9 per cent of United States electricity generation came from renewable sources. The AEO2012 update reported that this share had increased to 10 per cent in 2010 (comprising of 6 per cent conventional hydropower and 4 per cent other renewables) and is projected to increase to 16 per cent by 2035. In the NC5, the PaMs supporting the development and use of renewable energy sources included the DoE and EPA programmes in support of a range of technologies (biomass, geothermal, nuclear, solar power and wind).

47. Among the DoE programmes, the Renewable Energy Production Incentive offers financial incentives for producing electricity using renewable sources. It also provides cost-sharing incentives for research, development, demonstration and deployment of renewable energy technology manufacturing, and grants matching up to 50 per cent for small-scale renewable projects. The Biomass Program provides loan guarantees and support payments designed to ensure sufficient bio-refinery capacity to meet the Renewable Fuels Standard introduced under the 2007 Energy Independence and Security Act. This standard requires the use of 136.3 billion litres of biofuels by 2022, including 79.5 billion litres of cellulosic ethanol or other advanced biofuels.

48. In addition, the Geothermal Technologies Program is intended to overcome technical, institutional and market barriers to deployment. The Wind Energy Program undertakes research to reduce the cost of wind power, which is now cost effective in some areas of the United States. As a result, the Renewables Portfolio Standards introduced by many states lead to an installed wind capacity of about 47 GW in the United States as of January 2012. The Solar Technologies Program supports research and development (R&D) with the aim of achieving cost-competitiveness by 2015. The Nuclear Power Programs undertake research in support of Generation IV technologies, plus insurance against risks

beyond the control of operators and loan guarantees. The effect of these DoE programmes is estimated at around 29 Tg CO₂ emissions avoided in 2010 and 140 Tg CO₂ in 2020.

49. The Clean Energy Supply Programs of the EPA are partnerships with businesses, universities, state and local governments and other organizations to encourage combined heat and power, and other green generation sources. As part of these programmes, partners make annual reports to the EPA on performance, and the EPA provides technical assistance, general information and recognition, where appropriate. Other programmes that support renewable energy innovation are described in the section on research and systematic observation (See paras. 144–155 below). The effect of these programmes is expected to result in around 18 Tg CO₂ emissions avoided in 2010 and 73 Tg CO₂ in 2020.

50. **Energy efficiency.** GHG emissions from energy end-use sectors (residential, commercial and institutional) continue to be targeted by voluntary measures and programmes, and to a lesser extent by regulations and standards. In terms of identified emissions savings, the Energy Star Program of the EPA is one of the most significant end use efficiency measures identified in the NC5. The Energy Star Programs boost the adoption of energy efficient products, practices and services through valuable partnerships, objective measurement tools and consumer education. Through the implementation of strict performance standards, the Energy Star-labelling Program delivers cost effective energy efficiency for, at present, 65 categories spanning consumer electronics; office, heating, ventilation, air conditioning and commercial food-processing equipment; and lighting, the building envelope, appliances and other equipment. Savings generated from the programme are estimated from data on the market dynamics of the sales of products with and without the Energy Star label. Product specifications are regularly updated and, since 2011, subject to third-party certification in coordination with the appliance testing programme of the DoE described in the next paragraph. Energy Star labelling has achieved international recognition and therefore helps to improve efficiency standards beyond the United States. The Energy Star Program also provides a trusted source of information for consumers and businesses to leverage when investing in home improvement, purchasing efficient new homes, enhancing the efficiency of public and private buildings, designing efficient buildings and improving the efficiency of industrial facilities.

51. The DoE Appliances and Commercial Equipment Standards Program, Appliance Efficiency Standards and Lighting Energy Efficiency Standards develop test procedures and statutory minimum standards for over 40 categories of end-use equipment. The DoE is required to set a standard corresponding to the maximum improvement in energy efficiency that is technologically feasible and economically justifiable. The gradual improvement in the energy efficiency of incandescent light bulbs and other technologies is one consequence of the standards. The economic justification for the policy took into account the social cost of carbon in assessing the impact of the proposed regulations. Regulation by the DoE and the Energy Star Program of the EPA are complementary, the latter has wider coverage, which applies while the DoE develops mandatory standards. The DoE also provides verification and enforcement in support of the Energy Star Program.

52. **Residential and commercial sectors.** The DoE promotes building energy efficiency through the development of model, or exemplar, building energy codes, intended to influence mandatory codes which may be adopted at the state level, and to produce energy-saving improvements in new residential and commercial construction of between 3 per cent and 6 per cent every triennium until 2025. The Energy Star Program addresses energy efficiency in both the new construction marketplace and in improvements to existing homes. Through the Energy Star Certified Homes Program, the EPA works with the new residential construction industry to improve the energy efficiency of homes being built today. In the home improvement marketplace, the EPA educates and empowers homeowners with unbiased information about the actions they can take to improve their home's energy

efficiency. Through the Building America Program, the DoE also undertakes research on on-site power integration, and provides a portal to advise on low energy building. Also, the Net-Zero Commercial Building Initiative under the EISA, provides tools to design marketable net-zero buildings by 2025. The resulting buildings will generate as much energy as they consume using advanced efficiency technologies and on-site power generation systems, such as solar and geothermal energy. The DoE also provides weatherization assistance to low-income households.

53. **Transport sector.** In 2010, emissions from the transport sector were the second largest source of GHGs, after those from electricity generation, comprising 27 per cent of total emissions. Total GHG emissions from the transport sector increased by about 17.6 per cent between 1990 and 2010. However, this overall growth masks a net decrease of approximately 9 per cent in emissions between 2005–2010 due to an increase in fuel prices and the economic down-turn.

54. Most of the PaMs targeted at the transport sector that were reported in the NC5 were voluntary, research and information-based programmes. However, the reported PaMs that are expected to deliver by far the most sizeable emission reductions are regulations. The first of these regulations is the Renewable Fuel Standard (RFS), under the Energy Independence and Security Act of 2007 that requires that a total volume of 136 billion litres of renewable fuel for transport be used by 2022. EPA rules include statutory life cycle emission thresholds designed to ensure significant emission savings from the RFS. According to the AEO2012, biofuel use in 2010 was about 49.2 billion litres and projections suggest that the volume used in 2022 will not reach the legislated target but that the goal could be achieved by 2035.

55. Regulatory measures reported in NC5 also included regulations that aimed at improving fuel economy for vehicles. The initial Corporate Average Fuel Economy (CAFE) Standards targeted light-duty trucks and passenger cars for model years (MYs) up to and including 2011. In 2009, the EPA and the DoT had jointly proposed the National Policy to Establish Vehicle GHG Emissions Standards, which anticipated fuel economy standards for passenger cars, light-duty trucks and medium-duty passenger vehicles for MYs 2012–2016. These regulations were finalized in April 2010 as the Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy (CAFE/GHG) Standards Rule. These tighter CAFE/GHG standards for passenger vehicles were a milestone achievement in the United States and specifically intended to reduce fuel consumption and GHG emissions from fuel combustion. Building on the first stage of the national programme, the DoT and the EPA have proposed fuel economy/GHG emission standards for light-duty vehicles for the MYs of 2017 and beyond that would result in additional fuel savings and GHG emission reductions.

56. CAFE standards reinforce a trend towards greater fuel efficiency in cars and light-duty trucks. Standards that have been finalized for MYs 2012–2016 light duty vehicles are estimated to require approximately a 4 per cent average annual improvement in the fuel economy of these vehicles from MYs 2012 to 2016. Total program calendar year impacts in 2020 attributable to vehicles manufactured to meet the MYs 2012–2016 standards (assuming MY 2016 standards continue indefinitely beyond 2016) were estimated at 42.8 billion litres of fuel savings and 141.9 Mt CO₂ eq. These estimates are relative to a baseline set by the CAFE standard rule previous to the one current at the time. In determining the level of the standards for each model year, the DoT takes into account a number of factors, including technological feasibility and economic practicability. The DoT also considers the potential environmental impacts of the standards, including GHG emission reductions. Proposed standards for model year 2017 and beyond will also require average improvements of approximately 4 per cent annually through to 2025.

57. The EPA and the DoT recently finalized the first fuel efficiency/GHG emission standards for medium- and heavy-duty trucks pursuant to the Energy Independence and Security Act and the CAA. These joint rules apply to MYs 2014–2018 vehicles, with total lifetime fuel savings attributable to those vehicles estimated at about 83.3 billion litres of oil, which translates to about 270 Mt CO₂. The medium- and heavy-duty truck standards and the passenger vehicle standard (from 2017 and beyond) are not included in the revised energy projections of the EIA because they have not yet been finalized. The ERT noted that comparisons with vehicle efficiency internationally indicate that there may be scope for further tightening of the rules in order to match international standards.

58. In addition to regulation, the EPA and the DoT have introduced fuel economy labels on some MY 2012 vehicles, and, in prospect, on all MY 2013 light-duty vehicles. These labels provide fuel consumption, cost savings and smog ratings data, a range of comparison, which includes advanced technologies.

59. The work of the DoE on technological innovation contains elements covering fuel cells and batteries, and other advanced automotive technologies. Also, the trend reflects to some extent the effect from the ARRA given that a large part of it went into the vehicle manufacturing industry and in many cases it was used as an incentive to stimulate efficiency and innovation.

60. Though not a regulatory PaM, SmartWay is a partnership programme between the EPA and freight carriers whereby the latter commit to improved performance benchmarks and provide data to track achievements. The EPA provides technical information including ranking of vehicle performance, and grants and financing that make it easier to acquire more efficient fuel-saving equipment.

61. The ERT noted that while most federal PaMs after NC5 aimed predominantly at regulation, information and technological development, other PaMs, such as the infrastructure and encouragement of modal shift, are largely the responsibility of state and local authorities. The Federal Transit Administration of the DoT nevertheless provides grants to communities of the order of USD 10 billion per year for public transport investment, and supports transport authorities via the Transit Investments for Greenhouse Gas and Energy Reduction Program. Some of these grant programmes incorporate rating criteria for projects that address GHG emissions including reduction in vehicle miles travelled.

62. ***International aviation and maritime transportation.*** Emissions from international bunker fuels in the United States increased by about 14 per cent in 1990–2010 and accounted for about 2 per cent of total United States GHG emissions in 2010. Two PaMs reported in NC5 address the aviation sector specifically. The Aviation Fuel Efficiency, Renewable Fuels and Market Measures, and the Commercial Aviation Alternative Fuels Initiatives are both research-based PaMs aiming to improve technological and operational procedures as well as fuel efficiency in order to reduce GHG emissions from aviation.

63. The United States is working through the International Civil Aviation Organisation (ICAO) and the International Maritime Organisation. The United States is strongly supportive of the ICAO-stated ambition of working towards carbon neutral growth in international aviation by 2020, and implementing technical and operational measures to realise the ambition. Consistent with this, the Federal Aviation Administration (FAA) of the DoT has introduced GHG reduction goals as part of its consideration of Next Generation Air Transport Systems. It is expected that operational measures will make the most significant contribution at first, with technological improvements becoming more important in the longer term. FAA is also developing alternative jet fuels through the Commercial Aviation Alternative Fuels Initiative, a coalition of airlines, aircraft and engine

manufacturers, energy producers, researchers, international participants and United States Government agencies.

64. Although marine transportation is not mentioned in NC5, the ERT was informed that the Maritime Administration of the DoT has, under the provisions of the Energy Independence and Security Act of 2007, initiated the Marine Highways Program, which identifies 11 corridors where the modal shift to water transportation offers significant environmental or other advantages. This programme provides some grant assistance, and designates promising projects with the expectation of preferential treatment in future federal assistance, and initiatives, which are promising but require further development.

65. **Industrial sector.** In 2010, fossil fuel related GHG emissions from industry accounted for around 20 per cent of the total emissions of the United States, ranking third after electricity generation and transport over total emissions. Since 1990, GHG emissions from industry have (steadily) decreased by 11 per cent, due to a general economic transformation from manufacturing to service activities in the United States, fuel switching and improvements in energy efficiency.

66. In the NC5, before the 2009 endangerment findings of the EPA on GHGs, all the PaMs reported for the industry sector targeted non-CO₂ emissions like CH₄, HFCs and PFCs and consisted of voluntary or information measures. However, as highlighted earlier, the EPA started developing new regulations for large stationary sources in 2010 under the CAA. For stationary sources, CAA provisions for GHGs are, under existing legislative authority, being initially extended to new industrial facilities. The act provides authority for existing facilities to be regulated at the state level consistent with EPA guidelines. See paragraphs 40 to 42 above for a more detailed description of the Prevention of Significant Deterioration and Title V Operating Permit Programs, and the Tailoring Rule, which also apply to large industrial stationary sources other than those in the energy supply sector, given that they meet the emissions thresholds.

67. The innovative work of the DoE on clean technologies covers industrial energy efficiency. The DoE undertakes industry-specific and cross-cutting research on research, development, demonstration and deployment to increase efficiency, focusing on energy intensive industries. The Industrial Technologies Program (ITP) of the DoE under the Save Energy Now Program works with industry to identify opportunities for energy saving and improving plant efficiency. The ITP had a stated target of reducing United States industrial energy intensity by 25 per cent over 10 years. The DoE also funds 26 industrial assessment centres (IACs) linked to engineering departments at United States universities to provide advice to small- and medium-sized companies, and to train future energy engineers. There is also an IAC website with information from (at the time of the in-country visit) 13,000 previous assessments.

68. The Energy Star Program of the EPA that aims at enhancing industrial energy efficiency has been extended to include the provision of industry energy guides, performance indicators and plant labels. The programme covers some 16 industrial sectors for which industry-specific energy management tools and resources are provided. Examples of facilities involved in the programme include automobile assembly plants, cement plants, petroleum refineries, pharmaceutical manufacturing plants, and food and drink processing plants. The NC5 estimated that the Energy Star Program had prevented 23 Tg CO₂ eq in 2007, and could avoid 18.1 and 36.6 Tg CO₂ eq, respectively, in 2010 and 2020. The EPA had reported in NC5 that 48 plants had earned the Energy Star label and in early 2012, at the time of the in-country review, the number had increased to 112 Energy Star labelled plants.

3. Policies and measures in other sectors

69. In 2010, excluding LULUCF, GHG emissions from the non-energy sectors constituted about 13 per cent of total emissions of the United States. Industrial processes, solvent use, agriculture and waste accounted for 34.9, 0.50, 49.3 and 15.3 per cent of the non-energy total, respectively. Total emissions from non-energy sectors in 2010 were some 0.6 per cent lower than in 1990, up by 2 per cent from 2009.

70. **Industrial processes.** Emissions from industrial processes in 2010 represented about 4.5 per cent of total GHG emissions in the United States. They had a broad plateau between 1996 and 2000, and peaked again in 2007. Emissions are now some 3.4 per cent lower than in 1990 and 8 per cent lower than in 2005. The reasons for this are lower emissions from iron and steel production resulting from the decrease in the domestic industrial input, and abatement of nitrous oxide emissions at adipic acid production plants. Emissions of HFCs, PFCs and SF₆ have increased overall. This trend is mainly due to the increased use and emissions of HFCs and certain PFCs, which are replacing ozone-depleting substances that are being phased out globally by the Montreal Protocol and in the United States under the provisions of the CAA. While many of the ozone-depleting substances are also GHGs, their emissions are not included in the totals here as required by the UNFCCC reporting guidelines.

71. All the PaMs identified in the NC5 for non-energy industrial process emissions are implemented by the EPA and all are voluntary with the exception of the Significant New Alternatives Program (SNAP), which is a regulation under the provisions of the CAA. Some other industrial processes, such as cement or iron and steel manufacture seem likely candidates for early regulation under the stationary source provisions of the CAA.

72. The ERT noted that because of the strong upward trend in emissions of HFCs used to substitute ozone-depleting substances, implementation of SNAP so as to maintain emissions at or below 2005 levels could make a two or three percentage point contribution towards meeting the 17 per cent target. The ERT also noted that following the endangerment finding, the provisions of the CAA could presumably be extended to regulate point source emissions such as nitrous oxide from nitric and adipic acid production (where not already abated), hydrofluorocarbon-23 from hydrochlorofluorocarbon-22 production.

73. **Agriculture.** GHG emissions from agriculture accounted for about 6.3 per cent of total emissions in 2010, which is some 10.5 per cent above those in 1990 and 1 per cent higher than that in 2005. A shift to on-site manure management, rather than spread, has contributed to the upward trends. The ERT noted that the projected increase in emissions from agriculture to 2020 is about 0.24 per cent of total United States emissions in 2005, 0.05 percentage points from methane and 0.19 percentage points from N₂O.

74. Among the PaMs reported in NC5, the Conservation Reserve Program (CRP), the Environmental Quality Incentives Program (EQIP) and the Rural Energy for America Program (REAP) are the three largest agriculture and LULUCF sector programmes. CRP is an incentive for farmers to place highly erodible cropland or other environmentally sensitive acreage into vegetative cover (native grasses, wildlife plantings, trees, etc.) for 10 to 15 years. Incentives can take the form of technical assistance, annual rental payments or cost-share assistance. Among the benefits expected are the increased storage of carbon in soil and new biomass; and avoided CO₂ emissions from fossil fuel combustion and N₂O emissions from reduced fertilizer use. But the main effect is on soil and biomass carbon pools, and therefore comes under LULUCF. The United States Department of Agriculture (USDA) has estimated that CRP resulted in amounts of 50, 52 and 51 Tg CO₂ eq GHG emissions avoided in 2007, 2010 and 2011, respectively.

75. EQIP covers both the agriculture and LULUCF sectors. It proposes conservation practices to accelerate the development, transfer, and adoption of innovative technologies

and approaches to improve soil, water, plant, animal and air for livestock producers and owners of working farmlands that have natural resource concerns. Incentives provided in the form of technical assistance and innovation grants are expected to deliver GHG benefits. During the in-country visit, the USDA updated its estimation of actual GHG mitigation values for 2010 at 3.87 Tg CO₂ eq.

76. Finally, REAP provides loans and grants to rural residents, farms and businesses for energy audits and renewable energy systems, including methane recovery and usage and biorefinery construction. This programme is expected to result in energy efficiency gains and reduced methane emissions. The effects in terms of GHG emissions avoided were not available at the time of the in-country visit.

77. **LULUCF.** Estimated removals increased by just under 22 per cent over the period 1990 to 2010, and decreased by about 1 per cent between 2005 and 2009. These trends are driven mainly by forest sinks, and the reduction in removals is due to lower additions to the harvested wood products pool because of a decline in housing construction. There is no corresponding increase in forest biomass pools, which appeared unusual to the ERT, though it could be an artefact of age-class structure.

78. The main PaMs affecting LULUCF are the components of the CRP, EQIP and similar agricultural programmes which take land out of production for periods of typically 10 to 20 years and thereby increase biomass and soil carbon stocks. The ERT noted the importance of tracking the land and associated carbon stocks affected via the inventory, since return to production would usually be expected to lead to reversal of gains in the pools affected. Small net removals are also expected from a range of programmes that are implemented by the USDA that aim at promoting conservation and restoring wetlands, grasslands, natural habitat, forests, woodlands and rangelands. These include the Conservation Stewardship Program, Wetland Reserve Program, Grassland Reserve Program, Wildlife Habitat Incentive Program, Enhancing Ecosystem Services on Forestland, Grasslands, Parks and Wildlife Reserves and the Healthy Forest Initiative.

79. **Waste management.** In 2010, GHG emissions from the waste sector accounted for about 1.9 per cent of total emissions in the United States with a marked decrease of about 31 per cent since 1990 and a decrease of about 3.4 per cent since 2005. Although N₂O emissions have risen every year since 1990, landfill methane, as the largest source, is the main driver of the overall trend. Between 1990 to 2010, CH₄ emissions from landfills declined by about 27 per cent and can be attributed to many factors, including changes in waste composition, an increase in the amount of landfill gas collected and combusted, a higher rate of composting, and increased rates of recovery for degradable materials.

80. The Landfill Rule under the EPA has been implemented by the states since 1998. The Landfill Rule requires large landfills to capture and combust their landfill gas emissions. The EPA also has two voluntary programmes: the Landfill Methane Outreach Program (LMOP) aiming to reduce methane emissions through cost-effective means, and the WasteWise Program aiming to encourage recycling and reduce waste generation at source. During the review week, United States officials mentioned that the LMOP had facilitated 580 projects, a quadrupling since 1994, and that strong corporate interest continues in the use of landfill gas. According to NC5, it is expected that the Landfill Rule, the LMOP and the WasteWise Programs will continue to deliver significant reductions up to 2020.

4. Policies and measures at the state and city levels

81. The PaMs in NC5 discuss federal funding and grant programmes that assist communities in carrying out transportation improvements and services that can help reduce vehicle miles travelled and GHG emissions. In addition to transit grants, PaMs reported in

NC5 and during the review week include the Congestion Mitigation and Air Quality Improvement Program and the funding of bicycle-pedestrian improvements. Moreover, the Transportation Improvements Generating Economic Recovery Program, initiated by ARRA and continued by later budget appropriations, provides funds for sustainable transportation activities. The Interagency Partnership for Sustainable Communities works to align federal transportation, environmental protection and housing policies.

82. The ERT found, both in the NC5 and as part of an update during the review, that there is a large and growing number of PaMs and emission reduction targets at state and city levels. This also extends to states, which have a large economic reliance on coal production.

83. Table 4 summarizes the main PaMs current at the time of the visit by the expert review team. As of June 2012, 23 states had state-wide targets; 38 states had a climate action plan; 12 states were participating in regional initiatives; 38 states had renewable portfolio standards; 23 had low-carbon fuel standards; and 15 states had appliance efficiency standards. Key policy frameworks and levers at state and local levels are state-wide targets, emissions trading schemes, RPS (RPS, now adopted by 39 states), energy efficiency resource standards, building energy codes, emerging integrated transport and infrastructure planning including promotion of cycling and walking, especially with the shift in the focus of urban development from the urban fringe to city centres, and the rise of the concept of walkable neighbourhoods. The AEO2012 update includes the effect of several measures implemented at the state level, such as the trading schemes, the RPS and the appliance efficiency standards.

84. States will have responsibility for the application of CAA provisions to existing facilities. States can also lead federal action, as demonstrated by the part played by the vehicle efficiency standards in California in reducing the carbon intensity of motor fuel. States can also lead federal action, as demonstrated by the part played by the vehicle efficiency standards in California in reducing the carbon intensity of motor fuel. This is also demonstrated by the role of the Regional Greenhouse Gas Initiative (RGGI) and California in piloting emissions trading schemes, including experience with auctioning allowances, maintaining consistency across participating states or provinces, tracking allowances and compliance arrangements, and/or the use of revenues, including for energy efficiency.

85. During the in-country visit, representatives from states and cities emphasized the need to improve the models available to provide more robust and transparent estimates of the GHG reductions expected from PaMs at all levels, and to assess the comparability of effort. This is viewed as an issue both at state level as well as at the national level. Several states are currently working together under the North America 2050 Initiative on this issue and are interested in engaging the federal agencies of the United States.

86. The Conference of United States Mayors and the National League of Cities also mentioned that although building codes, transport infrastructure and alternative fuels were areas for action at the city level, progress on wider sustainability would benefit from state and federal coordination. Specific examples of action at the city level were from Philadelphia, which has an action plan to reduce its GHG emissions to 20 per cent below its 1990 level by 2015, and Portland with a goal of 80 per cent emission reduction by 2050. Examples of activities undertaken included the benchmarking of buildings' energy efficiency, projects for measuring and disclosing GHG emissions, programmes to curb vehicle miles travelled, investments in public transport, the adoption of procurement goals for renewable energy by municipalities, especially for local, integrated land-use planning and eco-districts, which take integration further to include power supply and building energy use.

Table 4
Summary of major policies, policy instruments, and targets at the state level

<i>Policy/Measure/Programme</i>	<i>Participating states</i>
<i>Climate action</i>	
GHG targets	AZ CA CO CT FL HI IL MA MD ME MN MI MT NH NJ NM NY OR RI UT VA VT WA
Climate Action Plan	AK AL AR AZ CA CO CT DE FL HI IA ID IL KS KY MA MD ME MN MI MO MT NC NH NJ NM NV NY OR PA RI SC TN UT VA VT WA WI CA CT DE MA MD ME NH NJ NY PA RI VT
Participation in regional initiatives	
GHG inventory	All except ND and NE
GHG registry	AL AZ CA CO CT DE FL GA HI IA ID IL KS KY MA MD ME MN MI MO MT NC NH NJ NM NV NY OH OK OR PA RI SC TN TX UT VA VT WA WI WV WY
Carbon cap/offset for power plants	CA CT DE FL IL MA MD ME MT NH NY OR RI VT WA
<i>Energy sector</i>	
Renewable portfolio standard	AK AZ CA CO CT DE FL HI IA IL KS MA MD ME MI MN MO MT NC ND NH NJ NM NV NY OH OK OR PA RI SD TX UT VA VT WA WI WV
Energy efficiency resource standard	AR AZ CA CO CT DE FL HI IA IL IN MA MD ME MI MN NC ND NM NV NY OH OK OR PA RI SD TX UT VA VT WA WI WV
Clean energy for state facilities	AL AR AZ CA CO CT DE FL GA HI ID IA IL IN KY LA MA MD ME MI MN MO MT NH NJ NM NV NY NC OH OK OR PA RI SC SD TN TX UT VA VT WA WI
Net metering: monitoring of net electricity generation outflow	AR AZ CA CO CT DE FL GA HI IA ID IL IN KS KY LA MA MD ME MI MN MO MT NC ND NE NH NJ NM NV NY OH OK OR PA RI SC TX UT VA VT WA WI WV WY
<i>Transportation</i>	
Vehicle GHG standards	AZ CA CT DE MA MD ME NJ NM NY OR PA RI VT WA
Mandates, incentives for biofuels	AK AL AR AZ CA CO CT FL GA HI IA ID IL IN KS KY LA MA MD ME MI MN MO MS MT NC ND NE NH NM NY OH OK OR PA RI SC SD TN TX VA VT WA WI
Low-carbon fuel standard	CA CT DE MA MD ME NH NJ NY OR PA RI VT WA
Medium- and heavy-duty vehicles	AL AR AZ CA CO CT DE FL GA HI IL IN KS MA MD ME MI MN MO NC NE NH NJ NM NV NY OH OK OR PA RI SC TX UT VA VT WA WI WV
<i>Buildings</i>	
Energy codes – residential	AK AR CA CO CT DE FL GA IA ID IN KY LA MA MD MI MN MT NC NE NH NJ NM NV NY OH OK OR PA RI SC TN TX UT VA VT WA WI WV
Energy codes – commercial	AR CA CT DE FL GA IA ID IL IN KS KY LA MA MD ME MI MN MT NC NE NH NJ NM NV NY OH OK OR PA RI SC TX UT VA VT WA WI WV
Appliance efficiency standards	AZ CA CT FL MA MD MN NH NJ NV NY OR RI VT WA
Property assessed clean energy	CA CO FL GA HI IL LA MA MD ME MI MN MO NH NC NM NV NY OH OK OR TX VA VT WI
Green building standards for state buildings	AL, AR, AZ, CA, CO, CT, DE, FL, GA, HI, IA, ID, IL, IN, KY, LA, MA, MD, ME, MI, MN, MO, MT, NC, NH, NJ, NM, NV, NY, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VA, VT, WA, WI

Source: Adapted from the Center for Climate and Energy Solutions, 27 June 2012. See < http://www.c2es.org/docUploads/All-State-Initiatives_0.pdf >.

Abbreviations: GHG = greenhouse gas, AK = Alaska, AL = Alabama, AR = Arkansas, AZ = Arizona, CA = California, CO = Colorado, CT = Connecticut, DE = Delaware, FL = Florida, GA = Georgia, HI = Hawaii, IA = Iowa, ID = Idaho, IL = Illinois, IN = Indiana, KS = Kansas, KY = Kentucky, LA = Louisiana, MA = Massachusetts, MD = Maryland, ME = Maine, MI = Michigan, MN = Minnesota, MO = Missouri, MS = Mississippi, MT = Montana, NC = North Carolina, ND = North Dakota, NE = Nebraska, NH = New Hampshire, NJ = New Jersey, NM = New Mexico, NV = Nevada, NY = New York, OH = Ohio, OK = Oklahoma, OR = Oregon, PA = Pennsylvania, RI = Rhode Island, SC = South Carolina, SD = South Dakota, TN = Tennessee, TX = Texas, UT = Utah, VA = Virginia, VT = Vermont, WA = Washington, WI = Wisconsin, WV = West Virginia, WY = Wyoming.

C. Projections and the total effect of policies and measures

87. The NC5 contains information on projections of GHG emissions and removals, following the Intergovernmental Panel on Climate Change (IPCC) sector and source categories for a ‘with measures’ scenario. It also contains an estimate of the total effect of policies and measures for the year 2020 based on the EIA April 2009 update of the DoE of the AEO2009. New projections based on AEO2012 results for energy-related CO₂ emissions were provided to the ERT by the EIA during the review week. Emissions for other sectors had not been updated since NC5. Updates of projections for LULUCF and for non-CO₂ gases were planned for late 2012 or early 2013.

1. Projections overview, methodology and key assumptions

88. The GHG emission projections provided in NC5 include a ‘with measures’ scenario (described as ‘business as usual’), which is presented relative to the actual inventory data for 2000, 2005 and 2007. Projections are reported on a five-year basis for 2010, 2015 and 2020, and estimates of long-term projections of emissions by 2050 are also provided. Except for non-energy CO₂ emissions, the projections are presented on a sectoral basis as required by the UNFCCC reporting guidelines. Emissions are also presented on a gas-by-gas basis for CO₂, CH₄, N₂O, PFCs, HFCs and SF₆. In addition, emission projections are also provided in an aggregated format for the national total, using global warming potential values from the Second Assessment Report of the Intergovernmental Panel on Climate Change (IPCC 1996). Emission projections related to fuel sold to ships and aircrafts engaged in international transport were reported separately and were not included in the total. A figure illustrating these projections was also provided.

89. The ERT commends the United States for improving the reporting of its GHG emission projections compared with NC4. In particular, the projections reported in NC5 differentiate F-gases by type of products (PFCs, HFCs and SF₆). GHG emission projections from international bunkers are considered separately and are not included in the total emissions.

90. However, the ERT noted that the United States did not provide the following mandatory elements of the UNFCCC reporting guidelines, or the information provided was not complete: projections presented on a sectoral basis, to the extent possible, using the same sectoral categories used in the policies and measures section, and on a gas-by-gas basis, in particular, for non-energy CO₂ (e.g. energy industries, fugitive emissions, manufacturing industries, waste, etc.); relevant information on factors and activities relevant to projections were only partly provided for non-energy CO₂ and non-CO₂ gases. The following non-mandatory elements were not provided: the ‘without measures’ and ‘with additional measures’ projection scenarios were not explicitly presented; the total effect of PaMs was not reported for 2010 and 2015; and indirect GHG emission projections were not provided. The information describing the projection models used, their strengths and weaknesses as well as the sensitivity of the results to key assumptions provided in the NC5 was limited. More information was provided during the review.

91. The ERT recommends that the United States provide, in its next NC, projections for non-energy CO₂ emissions by main sectors and present information on factors and activities relevant to projections for non-CO₂ and non-energy CO₂ emissions as required by the UNFCCC reporting guidelines.

92. The ERT encourages the United States to report in its next NC information on the 'without measures' and 'with additional measures' scenarios, or to explain why they did not do so. It was clarified during the review week, that the total effect of PaMs reported in the text of NC5 was calculated as the difference between NC4 and NC5 'with measures' GHG emission projection scenarios. In doing this, changes due to economic outlook and fuel prices were disaggregated from changes due to newly implemented and anticipated policies and measures by comparing them with the sensitivity scenarios of the projections used for NC4 with lower macroeconomic growth and higher oil prices, more closely matching the updated expectations of NC5. The ERT noted that in this context, the NC4 projections could be considered as 'without measures' projections and encourages the United States to provide more background information on how the share of GHG emission reductions attributed to PaMs was derived with regard to other factors and drivers. The ERT noted that the assumed underlying economic and energy drivers between NC4 and NC5 are not consistent and that using this approach is unlikely to ensure consistency, thus comparability of both scenarios.

93. The ERT also encourages the United States to improve the transparency of its projections and underlying assumptions by providing more information on energy consumption trends and/or any changes in the energy supply mix; to report more detailed information on the models used, their strengths and weaknesses as well as sensitivity analyses (apart from energy for which background information is available), and to estimate and report projections of the indirect GHG emissions given that projections of sulphur dioxide, nitrogen oxides emissions from electricity power production are already calculated by the model used for the energy projections (see para. 97 below).

94. As noted above, the United States only reported a 'with measures' scenario in NC5, which presented GHG emission projections until 2020, taking into account all policies and measures that had been implemented as of 31 March 2009. The key policies included are the ARRA, the Energy Independence and Security Act of 2007, various state vehicle technology programmes, the RPS at the state level and the RGGI in north-eastern and mid-Atlantic states.

95. Several organizations are involved in the emissions projection process. The EPA is responsible for the compilation of projections for the purposes of NC5 using information provided from the different agencies. The energy-related CO₂ emissions were estimated by the EIA of the DoE and published in the AEO2009. These projections were then adjusted by the EPA to match the IPCC sector definitions and by subtracting emissions from international bunker fuels, and from United States territories from the national totals. With the exception of LULUCF, non-energy CO₂ and non-CO₂ emission projections came from the EPA report 'Global Anthropogenic Non-CO₂ GHG 1990-2020' (EPA/Office of Atmospheric Programs 2006). As these projections were published before the publication of the 2009 GHG inventory used in NC5, they have been adjusted to be consistent with this inventory. LULUCF projections were estimated by the USDA.

96. Several models are used to estimate projections for the different sectors. Energy-related CO₂ emissions were projected using the National Energy Modelling System (NEMS) developed by the Office of Integrated Analysis and Forecasting, EIA. The NEMS model is based on a market-based approach to energy analysis. It has modules representing fuel supply markets, conversion sectors, and end-use consumption sectors. It balances energy supply and demand, and accounts for economic competition among the various energy fuels and sources. It accounts for macroeconomic feedback and international

interactions. The model projects energy flows and emissions, for the period to 2030, that are driven by GDP, population, energy price scenarios. The coverage of PaMs is confined to those that are with enacted legislation and funding. All CO₂ emissions from fossil fuel combustion are estimated, as well as sulphur dioxide, nitrogen oxides and mercury from the electricity generation sector.

97. Projections of emissions from non-energy CO₂ and from bunker fuels are broadly based on the extrapolation of historical trends and are assumed to be nearly stable. For non-CO₂ emissions, projections are based on the report ‘Global Emissions of non-CO₂ Greenhouse Gas Emissions: 1990–2020’ (EPA 2006). The estimates of emission projections are obtained on the basis of the inventory estimation method using activity data on sectoral drivers and taking into account emission reductions from regulatory and voluntary programmes. There has been no update of these projections since 2006 and the next update is planned for late 2012 or early 2013. The projections do not therefore take account of the effects of the economic down-turn or more recent policies such as the Significant New Alternatives Programme introduced under the provisions of the CAA. For forest and agricultural land use sequestration, inventory-based models were used by USDA, taking account of anticipated wood harvest and extrapolating historical trends to projections of emissions from agricultural soils. Carbon stored in harvested wood products is taken into account, using the production approach, which yields the smallest flux. The ERT encourages the United States to update non-energy related CO₂ projections more frequently.

98. Future emission levels depend on economic activity, energy prices and technologies, as well as on the policy framework in place. The key assumptions used in NC5 projections include assumptions for GDP and population growth, energy intensity, light-duty vehicle miles travelled and energy consumption levels and prices. Assumptions are reviewed regularly as part of the annual AEO update process and led to a lower annual economic growth assumption by 2020, from 3.0 per cent in NC4 to 2.3 per cent in the NC5. Other significant changes in assumptions included a two-fold increase in the price of imported crude oil as well as a 50 per cent increase in all sector motor gas prices. All these changes in assumptions taken together led to a 13 per cent reduction in the 2020 projected total energy consumption between NC4 and NC5. Other non-energy related assumptions are made by the EPA on a sectoral basis. For non-CO₂ emissions, assumptions are based on economic parameters driving the activity trends and have not changed since 2006.

Table 5
Comparison of the third, fourth and fifth national communications and early release Annual Energy Outlook 2012 assumptions and model results for 2020

<i>Factors</i>	<i>Assumptions for 2020</i>			
	<i>NC3</i>	<i>NC4</i>	<i>NC5</i>	<i>AEO2012</i>
Real GDP (billion chain-weighted 2000 USD)	18 136	17 541	15 398	15 004
Population (millions)	325	337	343	342
Energy intensity (Btu per chain-weighted 2000 USD of GDP)	8 712	6 877	6 798	5 268
Light-duty vehicle miles (billion miles)	3 631	3 474	3 137	2 933
Refiners’ acquisition price of imported crude oil (2000 USD/barrel)	24.68	41.24	95.42	91.30
Wellhead natural gas price (2000 USD/tcf)	3.26	4.49	5.66	3.45
Minemouth coal price (2000 USD/short ton)	12.79	18.52	22.82	32.22
Average electricity price (2000 cents/kWh)	6.5	6.6	7.7	7.3

All Sector Motor Gasoline Price (2000 USD/gal)	1.4	1.9	3.02	2.96
Energy Consumption (quadrillion Btus)	131	121	105	101

Source: U.S. Climate Action Report 2010.

Abbreviations: AEO2012 = Annual Energy Outlook 2012, BTU = British thermal units, gal = gallon, GDP = gross domestic product, kWh = kiloWatt.hour, NC3 = third national communication, NC4 = fourth national communication, NC5 = fifth national communication, tcf = thousand cubic feet.

99. The NC5 discusses qualitatively the uncertainties and related sensitivities of emission projections to the key underlying assumptions, for example to technological development, regulatory and statutory changes, energy process and economic growth. The AEO2009 explores at a more in-depth level the quantitative sensitivity of projections to changes in economic growth and energy prices, and provides a number of case studies examining different assumptions in relation to technology, for example affecting transportation, electricity generation and gas supply. There appears to be no quantitative information on uncertainties related to non-CO₂ projections. The ERT encourages the United States to provide a summary of quantitative information on the sensitivity of the projections of all gases to different assumptions in its next NCs.

2. Results of projections

100. The key results of NC5 GHG emission projections are provided in table 6 and the emission trends are illustrated in the figure below. According to the projections reported in NC5 for the ‘with measures’ scenario, which excluded the ACES Act, total GHG emissions were expected to increase by 4.3 per cent and 3.7 per cent from 2005 to 2020, excluding and including LULUCF, respectively. From 1990 to 2020, emissions growth excluding and including LULUCF was projected to be 21 and 18 per cent, respectively.

101. According to the NC5 projections, energy-related CO₂ emissions would increase by 1.5 per cent between 2005 and 2020, representing 29 per cent of the total GHG emissions increase. The annual emissions growth of 0.1 per cent is much lower than the observed historical trend of 1.3 per cent per year between 1990 and 2005, reflecting chiefly the impact of the economic down-turn and the increased penetration of shale gas.

102. Non-CO₂ emissions accounted for 15 per cent of the total GHG emissions in 2005. These emissions were expected to increase by 21 per cent between 2005 and 2020. This increase represented 71 per cent of the total GHG emissions increase. In particular, CH₄ emissions were projected to increase by 8 per cent between 2005 and 2020, mainly driven by the extension of domestic shale gas production. CH₄ emissions from other sectors were expected to decrease as a consequence of greater control technologies such as flaring, recovery and use. N₂O emissions were projected to increase by 5 per cent between 2005 and 2020 mainly due to emissions from agriculture soil and nitric and adipic acid production. Fluorinated gases were expected to increase the most, driven mainly by the projected increase in HFC emissions by 140 per cent between 2005 and 2020 resulting from the greater demand for refrigeration and air conditioning. PFCs were expected to remain stable and SF₆ was expected to decrease by about 2 per cent according to voluntary emission reduction set by industries using this gas.

103. The NC5 also included long-term projections up to 2050. These were prepared by the EPA using a model, Applied Dynamic Analysis of the Global Economy. These projections build over the mid-term projections by 2020 prepared using the EIA NEMS model. The results reported in the NC5 for the long-term projections suggested that with the PaMs in place at the time when the NC5 was prepared, total emissions of the United States were expected to increase and to reach, in 2050, levels that are approximately 18 per cent higher than those in 2010.

104. The most recent AEO2012 early release energy-related CO₂ emissions projections are based on updated assumptions (see table 5) and the impact from the most recent PaMs implemented as of December 2011. They do not include the proposed light duty trucks and passenger cars increases in fuel economy standards for model years 2017 to 2025, the New Source Performance Standards for new or modified stationary sources and the measures targeting HFCs. The energy-related CO₂ emissions represented about 82 per cent of the United States total gross GHG emissions in 2010.

105. According to the AEO2012 projections, energy-related CO₂ emissions are expected to decrease by 7.5 per cent by 2020 compared to their 2005 level, vis-à-vis the 1.5 per cent increase reported in NC5 for the same period. The CO₂ emission reductions in the 2012 projections are mainly attributed to the 2008 economic down-turn and the subsequent extended recovery, the increasing energy efficiency in end-use applications and the increasing penetration of shale gas into energy-supply markets, particularly electricity generation at the expense of coal. This can be attributed to an increase in the price of coal-based electricity generation due to the EPA regulation on pollutants and the anticipation of future limits on GHG emissions and the associated risk with investments in high carbon intensive energy generation sources. Part of the reductions is attributed to the effect from the CAFE standards related to light duty vehicles adopted in 2010.

106. Assuming emissions from other sectors and gases remain stable between 2010 and 2020 as assumed in NC5, the adjusted AEO2012 projections suggest that the total GHG emissions including LULUCF would be about 356 Mt below the 2020 level projected in NC5. This corresponds to an increase in GHG emissions of about 10.5 per cent above the 1990 level, or a decrease of 4.4 per cent relative to the 2005 level reported in the 2012 inventory submission (see the GHG emissions projections figure below). The ERT noted that, although some policies highlighted above are yet to be included in the revised projections, they are unlikely to completely close the gap to a 17 per cent reduction in emissions below the 2005 level by 2020. Also, when the LULUCF projections will be revised, the results may contribute to widen the GHG emissions gap. Achieving the 17 per cent target will therefore rely on further policy development.

107. The non-energy CO₂ and non-CO₂ emission projections have not been updated since NC5. On projections for emissions and removals from the LULUCF, new projections were under preparation at the time of the review visit and they were expected to reflect the impact from the 2010 Resources Planning Act. According to the preliminary estimates discussed during the review week, the net removal from LULUCF is expected to gradually decrease over time and the sector could become a net source within the next 40 years.

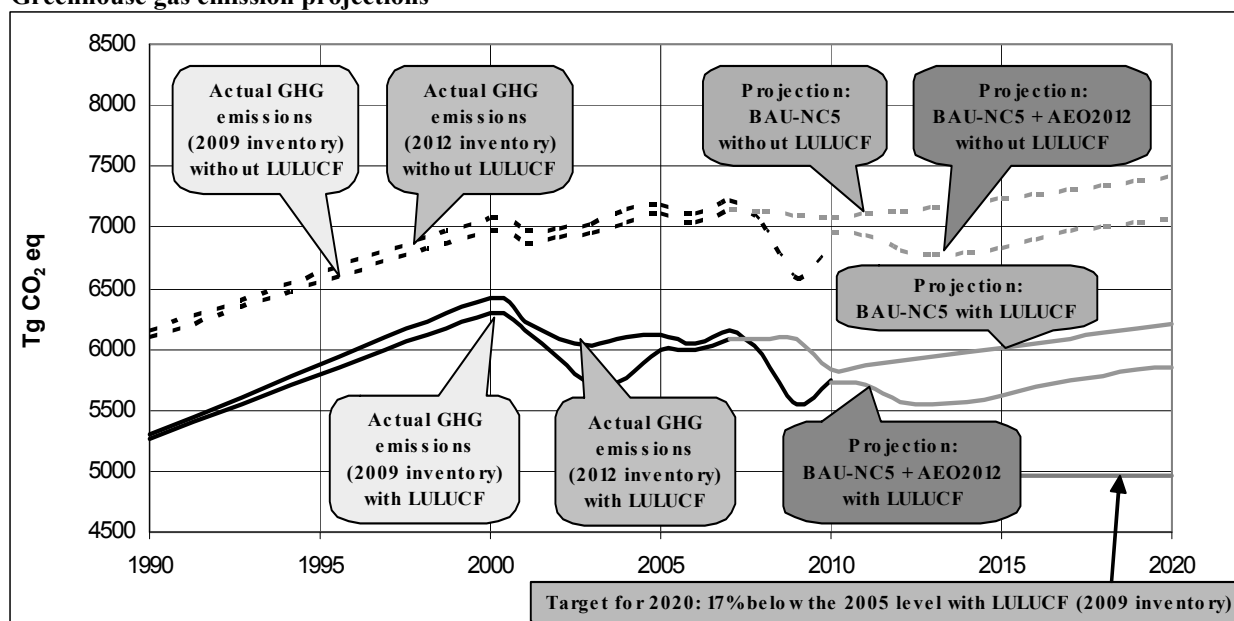
Table 6
Summary of greenhouse gas emission projections for the United States of America

	<i>GHG emissions (Tg CO₂ eq per year)</i>	<i>Changes in relation to 1990 level (%)</i>	<i>Changes in relation to 2005 level (%)</i>
Inventory data 1990 without LULUCF ^a	6 161	–	–
Inventory data 2005 without LULUCF ^a	7 179	16.5	–
Inventory data 2010 without LULUCF ^a	6802	10.4	–5.5
‘With measures’ projections for 2010 without LULUCF ^b	–	16.0	–0.5
‘With measures’ projections for 2020 without LULUCF ^b	–	21.6	4.3
Inventory data 1990 ^a with LULUCF	5 293	–	–
Inventory data 2005 ^a with LULUCF	6 118	15.6	–
Inventory data 2010 ^a with LULUCF	5 747	8.6	–6.1
‘With measures’ projections for 2010 with LULUCF ^b	–	11.0	–2.5
‘With measures’ projections for 2020 with LULUCF ^b	–	18.1	3.7

Sources: ^a 2012 greenhouse gas (GHG) inventory submission by the United States; ^b Fifth national communication of the United States of America.

Abbreviations: GHG = greenhouse gas, LULUCF = land-use, land-use change and forestry.

Greenhouse gas emission projections



Sources: Data for the years up to 2010: the 2009 and 2012 greenhouse gas inventory submissions of the United States, as indicated; (2) Data for the years 2007–2020: the NC5 of the United States; (3) AEO2012 early release provided by the Party during the in-depth review.

Abbreviations: AEO2012 = Annual Energy Outlook 2012, BAU = business as usual, GHG = greenhouse gas, LULUCF = land-use, land-use change and forestry, NC5 = fifth national communication.

3. Total effect of policies and measures

108. In the NC5, the United States estimated the total, or aggregate, effect of newly implemented and anticipated PaMs between NC4 and NC5 as the difference between the GHG emission projections for the single scenarios reported in NC4 and NC5, adjusted for the changes in economic outlook and fuel prices over that time period. Although the NC5 did not report a ‘without measures’ scenario, the ‘with measures’ scenario in NC4 was used as a reference in estimating the total effect of PaMs reported in NC5 vis-à-vis the NC4 projections. The NC4 reference scenario was adjusted for the purpose of distinguishing changes due to economic outlook from those due to policy by using alternate side cases of the NC4 projections assuming lower macroeconomic growth and higher fuel prices to more closely match the key driver assumptions in NC5. The NC5 ‘with measures’ scenario included the PaMs that had been implemented as of 31 March 2009 but not the effect of the ACES Act. The total effect of PaMs was presented in terms of total GHG emissions avoided in a single year, 2020, on a CO₂ eq basis. However, the ERT noted that the United States did not provide an analysis of the total effect from PaMs by gas, or relevant information on factors and activities for each sector for the years other than 2020, for example for 2010, 2015 and 2020.

109. The NC5 reported that the total estimated effect of implemented and anticipated PaMs by 2020 was around 500 Tg CO₂ eq, which was around half of the difference between the NC4 and NC5 projections. The analysis reported suggests that the total emissions avoided were mainly CO₂ emissions from energy and the effects from PaMs were attributed mostly to the recent programmes, measures and legislation such as ARRA. The rest of the emission reduction was attributed to economic changes in the country and increased use of shale gas. These estimates are confirmed by independent research provided to the ERT during the review week.

110. The ERT encourages the United States to report on all the elements required by the UNFCCC reporting guidelines, namely the total effect of PaMs by gas, and to provide more background information on how the share of GHG emission reductions attributed to PaMs was derived with regards to other factors and drivers.

D. Vulnerability assessment, climate change impacts and adaptation measures

111. In its NC5, the United States has provided all the required information in accordance with the UNFCCC reporting guidelines, including information on the expected impacts of climate change and vulnerability on the country, as well as on adaptation options. The United States has provided information on the actions taken to implement Article 4, paragraph 1(b) and (e), of the Convention on programmes and activities on international cooperation to prepare for adaptation to the impacts of climate change as required by the UNFCCC reporting guidelines. Table 7 summarizes some of the information on vulnerability and adaptation to climate change presented in the NC5.

Table 7
Summary of information on vulnerability and adaptation to climate change

<i>Vulnerable area</i>	<i>Examples/comments/adaptation measures reported</i>
Biodiversity and natural ecosystems	<i>Vulnerability:</i> Impacts are felt in many United States of America ecosystems, including wetlands, forests, grasslands, rivers and lakes, and coastal and near shore environments. Large-scale changes in the range of species and the timing of the seasons and migration are observed. Invasive weed species, some insect pests and pathogens have increased. Near shore ecosystems are under stress from rising temperatures and increased ocean acidity. The United States desert and dry lands are

<i>Vulnerable area</i>	<i>Examples/comments/adaptation measures reported</i>
Coastal zones	<p>likely to become hotter and drier, feeding a self-reinforcing cycle of invasive plants, fire and erosion. Impacts are likely to increase in the future</p> <p><i>Adaptation:</i> Options for better ecosystem resilience include changes in processes, practices or structures to reduce expected damages or boost beneficial responses to climate variability and change. Some adaptation options offer stakeholders many benefits, such as the addition of riparian buffer strips that, for example, manage pollution from agricultural land in rivers or provide a protective barrier against increases in pollution and sediment loadings that may be associated with future climate or other environmental change</p> <p><i>Vulnerability:</i> Sea-level rise and storm surge place many United States coastal areas at increasing risk of erosion and flooding, especially along the Atlantic and Gulf Coasts, Pacific Islands, and parts of Alaska. Energy and transport infrastructure and other property in coastal areas are very likely to be adversely affected</p> <p><i>Adaptation:</i> Many traditional and non-traditional responses are being and will be used, including both hard and soft (i.e. natural) armouring, accommodations such as raising buildings and retreat, including a system of rolling easements to allow property and ecosystems to migrate inland as the sea rises</p>
Human health	<p><i>Vulnerability:</i> The health impacts of climate change include increases and shifts in heat stress, waterborne and food-borne diseases, poor air quality, extreme weather events, and diseases transmitted by insects and rodents</p> <p><i>Adaptation:</i> Robust public health infrastructure could reduce the potential for negative impacts from climate change. For example, critical United States Government information to support action to reduce the health impacts of excessive heat days such as an Excessive Heat Event Guidebook developed by the EPA, NOAA, DHS and CDC helps community officials, emergency managers and scientists develop city-specific heat response plans and early-warning systems. Such information would be routinely used during heat-waves in many United States cities</p>
Infrastructure and economy	<p><i>Vulnerability:</i> The United States transportation network is vital for the country's economy, and its inhabitants' safety and quality of life. Examples of impacts include the softening of asphalt roads and warping of railroad rails; damage occurring to roads and opening of shipping routes in polar regions; flooding of roadways, rail routes and airports from extreme events, and sea level rise; and interruptions to flight plans due to severe weather</p> <p><i>Adaptation:</i> Work on better informing decision makers about future climate variability and change, and related impacts on existing and planned infrastructure, and about adaptation strategies that could be implemented. For example, in response to climate threats to transportation, efforts were undertaken to 'climate proof' a road on the island of Kosrae in the United States-affiliated Federated States of Micronesia: to prepare for increased heavy rain and sea-level rise, authorities placed the road higher and introduced improved drainage systems. The additional costs for these measures were projected to be offset by the reduced repair and maintenance costs, which would be evident after 15 years</p>
Water resources	<p><i>Vulnerability:</i> Potential impacts on water vary across regions. Reduced precipitation, drought, increased evaporation, and increased water loss from plants, are important issues in many United States regions, especially in the west. Floods, water-quality problems, and impacts on aquatic ecosystems and species are likely to be amplified by climate change in most regions. Declines in mountain snowpack are significant in the west and Alaska, where snowpack provides vital natural water storage</p> <p><i>Adaptation:</i> Creating a more drought resilient society requires a fundamental shift from crisis management to risk management. Studying the impacts of drought requires the examination of historical records, evolving demographics and population growth, water law, and ecosystem management. For example, researchers are developing methods to use seasonal climate and stream-flow forecasts more</p>

<i>Vulnerable area</i>	<i>Examples/comments/adaptation measures reported</i>
	effectively to mitigate the impact of drought on water supplies

Abbreviations: CDC = Centers for Disease Control and Prevention, DHS = Department of Homeland Security, EPA = Environmental Protection Agency, NOAA = National Oceanic and Atmospheric Administration.

112. The information reported in the NC5 suggests a gradual shift in focus in the United States from vulnerability assessment to identifying adaptation options. Also, the information reported in the NC5 suggests that the major agencies in the United States have an increased focus on adaptation in the relevant sectors, namely energy, water, health, ecosystems, transport and coasts at the local, regional and national levels. Recent efforts were mainly geared towards understanding the impacts and assessing the vulnerabilities across the United States as well as providing support for adaptation, including at the international level. Agencies were required (under Executive Order 13514) to assess their vulnerability to climate change impacts and to complete agency-specific adaptation plans. Some agencies worked on integrating adaptation in their decision-making process in the context of consideration of uncertainty.

113. The 1990 Global Change Research Act requires the Federal Coordinating Council on Science, Engineering and Technology to publish, at least every four years, an assessment of climate changes and trends, the effects on natural, economic and human social systems. In this context, during 2006–2009 the United States Government Climate Change Science Program (CCSP) completed a suite of vulnerability assessment studies that focused on high-priority climate research questions.

114. In an open and transparent manner, this exercise communicates scientific analyses to the public via a set of 21 synthesis and assessment products (SAPs) developed by the Global Change Research Program (GCRP) (United States CCSP/GCRP 2006–2009). These SAPs were synthesized in a single national-scale assessment, the Global Climate Change Impacts (GCCCI) in the United States report released in June 2009. This report analyses the climate change impacts and the response options available across the United States which is divided into nine regions and seven sectors, and identifies the following 10 key findings: (i) global warming is unequivocal and primarily human-induced; (ii) climate changes are underway in the United States and are projected to grow; (iii) widespread climate-related impacts are occurring now and are expected to increase; (iv) climate change will place a stress on water resources; (v) crop and livestock production will be increasingly challenged; (vi) coastal areas are at increasing risk from sea-level rise and storm surge; (vii) threats to human health will increase; (viii) climate change will interact with many social and environmental stresses; (ix) thresholds will be crossed, leading to large changes in climate and ecosystems; and (x) future climate change and its impacts depend on the choices made today.

115. During the review the United States presented the national climate assessment currently under development and scheduled for publication in 2013. The goal of the new assessment is to enhance the ability of the United States to anticipate, mitigate and adapt to changes in the global environment. The assessment will include a sustainable process with multiple products over time; new topics, cross-sectoral studies; consistent national matrix of indicators; central coordination, multiple partners, distributed process; regional and sectoral networks building assessment capacity and focused effort on development of scenarios and regional climate information.

116. Also during the review, the United States better explained the objectives and expected outcomes of the Interagency Climate Change Adaptation Task Force created by Executive Order 13514. As a result of the task force, key adaptation areas for federal actors and actions were identified such as: integrating adaptation into federal government

planning and activities; building resilience to climate change in communities; improving the accessibility and coordination of science for decision-making; developing strategies to safeguard natural resources in a changing climate; and enhancing efforts to lead and support international adaptation. Federal agencies are also developing adaptation plans that identify specific actions to incorporate the consideration of climate change adaptation into agency activities. There is also a Federal Adaptation Community of Practice group that was established by the EPA. The purpose of this group is to facilitate intergovernmental coordination on adaptation activities.

117. The task force also recommended the development of national adaptation action plans for freshwater resources; fish, wildlife and plants; and ocean and coastal resources. The first of these, on freshwater resources, was released in October 2011. The other two are expected to be released in the latter part of 2012. Key recommendations of the freshwater plan include the establishment of a planning process to adapt water management practices to a changing climate; improvement of water resource and climate change information for decision-making; strengthening the assessment of vulnerability of water resources to climate change; expanding water use efficiency; support integrated water resources management; and supporting training and outreach to build response capability.

118. Regional, state and local adaptation efforts are also being made to address local impacts, often with support from federal agencies. For example, the Southeast Florida Regional Climate Change Compact, a commitment between four counties in the region to coordinate adaptation and mitigation actions across county lines, is designed so that local governments can set their own agenda for adaptation while allowing state and federal agencies to engage efficiently with technical assistance and support.

119. In relation to cooperation with developing countries, the National Aeronautics and Space Administration (NASA), the United States Agency for International Development (USAID), and the National Oceanic and Atmospheric Administration (NOAA) are working to develop regional hubs around the world to use information obtained by remote sensing to development assistance.

120. The USAID Climate Change Program helps build developing country capacity to increase the resilience of people, places and livelihoods, including by improving access to science and analysis for decision-making; establishing effective governance systems; and identifying and taking actions that increase climate resilience. Recent and on-going climate change adaptation projects supported by USAID include the following: (i) using scientific information to inform management of flood risks in Barbados; (ii) ecosystem-based adaptation in coastal areas in Senegal; (iii) Famine Early Warning System Network, an early warning system in East Africa and other regions that uses climate science to inform food security analyses and predictions; (iv) building public-private coalitions to promote climate resilient production of wheat, a staple crop, in Central Asia; (v) introducing a tailored index insurance product for farmers in the Dominican Republic to complement their risk reduction activities; and (vi) work with municipal governments and rural communities in Peru to address the impacts of melting glaciers.

121. The ERT noted that a new national climate assessment is being developed using a bottom-up approach with higher challenges but with potentially higher benefits. The ERT also noted that the Interagency Climate Change Adaptation Task Force is playing a crucial role in coordinating adaptation information and support across the United States and acknowledges the challenge involved in transferring the results to the local level.

122. The ERT welcomes the new national climate assessment, the Interagency Climate Change Adaptation Task Force and national action plans, and encourages the United States to continue reporting information on new developments and progress achieved in its next national communication.

E. Financial resources and transfer of technology

1. Provision of financial resources

123. The NC5 provides detailed information on the measures taken by the United States to implement their commitments under Article 3, paragraphs 3–5 of the Convention. It covers most of the issues on which information is required under the UNFCCC reporting guidelines. This included financial resources provided through bilateral, regional and other multilateral channels, including the Global Environment Facility (GEF), and summarized this information using the tabular format in line with the UNFCCC reporting guidelines

124. However, the ERT noted that the Party did not provide the following reporting elements required by the UNFCCC reporting guidelines: an indication of what ‘new and additional’ financial resources they have provided pursuant to Article 4 paragraph 3, as well as a clarification of how they have determined such resources as being ‘new and additional’ in their national communications. Also, the NC5 did not contain detailed information on the assistance made available to developing countries particularly vulnerable to the adverse effects of climate change to help them to meet the cost of adaptation. During the review, the United States provided further information and clarifications on these matters. In particular, it explained that the annual process of authorization and appropriation of financial resources by Congress results in ‘new and additional’ funding.

125. The ERT reiterates the recommendation made in IDR4 that the United States clearly indicate how it has determined financial resources as being ‘new and additional’ in its next national communication.

126. The ERT noted that the NC5 presents a comprehensive overview of financial assistance provided by the United States: by agency, cross-cutting initiatives, by mitigation (excluding forest); forest programmes; by vulnerability and adaptation programmes, and by trade and development financing. Several agencies have a major role in providing such financial and technical assistance, including the USAID, the EPA, the DoE, the Department of State (DoS), its Overseas Private Investment Corporation (OPIC), Export-Import Bank (Ex-Im), the USDA, NOAA, NASA and the Department of Commerce (DoC).

127. On bilateral assistance, the United States provided in the NC5 information on its financial contribution to mitigation and adaptation by country and sectors (table 7.5 from the NC5). However, the way the information was presented makes it difficult for the reader to have an idea of the resulting trends. The ERT encourages the United States to explore better ways to present this information. The ERT also encourages the United States to use the Organisation for the Economic Co-operation and Development Rio markers that allow tracking development assistance that targets climate change mitigation and adaptation. The ERT understands that the United States expects to make greater use of the Rio markers in drafting its NC6.

128. Similarly to multilateral assistance, bilateral assistance is allocated for adaptation, mitigation, the production of mainly clean energy, and reducing emissions from deforestation and forest degradation (REDD). Support for adaptation is growing but its absolute level of resources remains lower than that for mitigation.

129. The reported information in NC5 on funding to multilateral institutions and programmes relates to support for sustainable economic development and poverty alleviation. Although in many cases, a portion of this funding supports climate change activities, it is not currently possible to identify precisely that amount in all programmes. During the review, the United States noted its intention to include in its next NC information on contributions to specialized multilateral climate change funds. Table 8

summarizes the annual United States financial contribution to multilateral institutions and information on other contributions that can be attributed to climate change activities.

Table 8
Summary information on financial resources and technology transfer for 2005-2009 (USD million)

<i>Channel of financial resources</i>	<i>Year of disbursement</i>				
	<i>2005</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>	<i>2009</i>
World Bank Group	843.20	941.80	940.50	942.30	1 115.00
Other multilateral institutions, funds and programmes	424.44	412.46	398.56	387.58	435.30
Multilateral scientific, technological and training programmes	1 225.84	1 175.75	1 237.76	2 128.86	59.10
<i>Funding to climate change programmes</i>					
Montreal Protocol Multilateral Fund	21.33	21.50	21.29	18.85	21.00
Intergovernmental Panel on Climate Change/UNFCCC	6.35	5.95	5.89	6.45	7.00
International contributions for scientific, educational and cultural activities	5.95	6.00	5.94	5.46	8.00
Contributions to the GEF for climate change related activities	24.00	26.00	26.00	26.00	26.00

Source: Fifth national communication of the United States.

Abbreviation: GEF = Global Environment Facility.

130. The ERT noted that the financial flows to the GEF for climate change activities during the period covered by NC5 decreased from USD 56 million in 2003 to USD 26 million in 2010. However, as explained during the in-country visit, in 2012, the contribution has increased by USD 63.8 million to USD 89.8 million. In terms of other financial contribution flows reflected in table 8, the ERT noted that the financial contribution to the World Bank Group increased from USD 843 million in 2005 to USD 1,115 million in 2009; and the United States contributed USD 1.897 billion to the United Nations World Food Programme – more than 40 per cent of the programme’s total resources for that year. For some programmes, contributions increased, for example the Inter-American Development Bank; whereas for others, contributions decreased, for example the African Development Bank. In other cases, contributions remained stable, for example the United Nations Environment Programme.

131. In addition, to enhance the implementation of the Convention by developing countries, the United States reported in the NC5 that it had committed to provide USD 1 billion through 2012 to reduce emissions from deforestation, land degradation and other activities as part of the multilateral donor effort to amount to a total of USD 3.5 billion. Also as part of the broader multi-year, multi-donor effort, the United States pledged USD 85 million towards the Climate Renewable and Efficiency Deployment Initiative (Climate REDI), which will channel a total of USD 350 million to fund programmes over five years. The enacted budget for the 2010 fiscal year also includes an increase for adaptation assistance, including a first-ever United States contribution of USD 50 million to the Least Developed Countries Fund and the Special Climate Change Fund. It also includes USD 375 million for the World Bank-managed climate investment funds and a substantial increase in funding for USAID climate programmes.

132. During the in-country visit, the United States supplied further information on financial resources provided as a result of the Copenhagen Accord, also known as fast-start finance (see table 9). The initiative ‘aims at integrating climate change considerations into the foreign assistance strategy of the United States to foster a low-carbon future and promote sustainable and resilient societies in coming decades ...’.

133. Also, during the in-country visit, the United States presented the document entitled ‘Meeting the Fast Start Commitment – U.S. Fast Start Finance Country Fact Sheets for FY 2011’ that was submitted during the Conference of Parties in South Africa in December 2011. It comprises fact sheets by country that describe projects and programmes funded entirely or in part by the United States Government, including bilateral and multilateral programmes; projects financed by OPIC and Ex-Im; and initiatives funded by multilateral climate funds to which the United States is a donor (e.g. programmes undertaken by the CTF).

134. During the 2011 fiscal year, the amount of fast-start finance will cover three areas: (i) adaptation (USD 563 million) that targets countries that are highly exposed to climate change impacts and vulnerable to climate variability; (ii) mitigation/clean energy (USD 2.246 billion including funds from development finance and export credit agencies) that targets countries and sectors offering significant emission reduction potential, and countries that offer the potential to demonstrate leadership in large-scale deployment; and (iii) REDD plus⁴ and sustainable landscapes (USD 329 million), that targets countries with mitigation potential and countries with political will to implement REDD plus.

Table 9
Components of United States of America fast-start finance for 2010–2011 (USD billion)

<i>United States agency</i>	<i>Years of disbursement</i>		
	<i>2010</i>	<i>2011</i>	<i>Total to date</i>
Congressionally appropriated climate assistance	1.6	1.8	3.4
Development finance and export credit	0.4	1.3	1.7
Total United States climate funding	2.0	3.1	5.1

Source: United States Department of State, <<http://www.state.gov/e/oes/climate/faststart/index.htm>>.

135. The ERT noted that the contributions for fast-start finance increased by 50 per cent between the fiscal year (FY) 2011 and FY 2010, and in 2011 reached levels that are approximately 6.2 times the average value of finance provided for climate change in the period 2003–2009.

136. Several examples of bilateral and multi-country fast-start finance were presented to the ERT: (i) in Indonesia, approximately USD 332 million to support the Millennium Challenge Corporation’s Green Prosperity Project, a five-year project designed to promote environmentally sustainable, low carbon economic growth; (ii) in Kenya, OPIC committed USD 310 million for financing a project that will double the generating capacity of a geothermal power plant; (iii) USD 10.2 million are allocated above and beyond bilateral programming to support the Enhancing Capacity for Low Emission Development Strategies Program, which seeks to support 20 countries by 2013; (iv) USD 7 million are provided in 2011 funds to continue to support Climate REDI, a five-year, USD 35 million initiative; (v) USD 5 million in the fiscal year (FY) 2011 funds to support the Regional Visualization and Monitoring System SERVIR, a network of regional centres that provides eight countries in Mesoamerica, seven countries in the Himalaya region, and 14 countries in East Africa with satellite imagery and useable weather and climate information to inform decision-making; (vi) in Bangladesh, USD 11 million in FY11 for adaptation and biodiversity conservation to mitigate the effects of natural disasters and provide additional income for vulnerable poor communities.

⁴ Policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries

137. The ERT noted that provision of financial resources for climate change cooperation is an area of radical change in United States climate change policy. The ERT welcomes the new information presented during the in-country review, in particular the new approach to present information related to finance, in the document 'Meeting the Fast Start Commitment'. The use of such information in the next NC could help to increase transparency; for example on the assistance provided for the purpose of assisting developing country Parties that are particularly vulnerable to the adverse effects of climate change.

2. Activities related to transfer of technology

138. In its NC5, the United States provided detailed information on measures related to the promotion, facilitation and financing of the transfer of, or access to, environmentally sound technologies, as well as to support development and enhancement of the endogenous capacities and technologies of developing countries. However, the ERT noted that the NC5 does not meet the following requirements of the UNFCCC reporting guidelines: activities to facilitate financing access by developing countries to 'hard' or 'soft' environmentally-sound technologies; and activities related to technology transfer, including failure stories, using table 6 of the UNFCCC reporting guidelines. During the review, the United States noted that the NC5 includes some examples of finance for both 'hard' and 'soft' technology transfer but that they are not explicitly identified as such.

139. The ERT recommends that the United States explicitly identify this information in its next national communication, or explain why such information cannot be presented as 'hard' and 'soft' environmentally-sound technologies; and on failure stories on activities related to technology transfer. Though the United States indicated in NC5 that because some of the information is proprietary, some of the information on activities undertaken by the private sector could not be provided, the ERT encourages the United States to make a clear distinction between activities undertaken by the public sector and those undertaken by the private sector where possible. The ERT understands that the United States intends to describe in future NCs how the United States Government encourages private sector activities in the area of financing environmentally sound technologies.

140. The ERT noted that the United States continues to provide technical assistance to developing countries for low-carbon and climate-resilient development. The transfer of technology for mitigation, adaptation, capacity-building, and research continues to be through official assistance, export credits, project financing, risk guarantees and insurance to United States companies, as well as credit enhancements for host-country financial institutions.

141. This is reflected in the NC5, which presents a comprehensive overview of technical assistance for agencies, cross-cutting initiatives, mitigation (excluding forest mitigation); forest programmes; and vulnerability and adaptation programmes. These include the Millennium Challenge Corporation, USAID Global Climate Change Program, Global Hunger and Food Security Initiative, Global Earth Observation System of Systems, Asia-Pacific Partnership on Clean Development and Climate, Methane to Markets Partnership, Carbon Sequestration Leadership Forum, US-China Clean Energy Research Center, US-India Clean Energy Research Center, US Climate Technology Cooperation Gateway, EPA programmes, and the Global Bioenergy Partnership, among others.

142. During the review week, the United States elaborated on the new USAID Climate Change and Development Strategy that was released in January 2012. The strategy aims at accelerating the transition to low emission development (mitigation); increasing the resilience of people, places and livelihoods (adaptation); and strengthening development outcomes by integrating climate change in USAID programming, policy dialogues and internal operations. Also, the United States reported on the USAID Forward agenda that

includes activities to ‘foster innovative development solutions; use host country systems where it makes sense; build science and technology capacity in developing countries including through improved access to scientific knowledge and higher education and training opportunities; use an improved monitoring and evaluation process to measure progress and increase impact’.

143. Overall, support provided by USAID for international climate change activities almost doubled between FY 2009 and FY 2011, from USD 214 million to USD 398 million with the increase in funding for adaptation being noteworthy. The ERT noted that the new USAID approach could further develop and enhance endogenous capacities and technologies of developing countries.

F. Research and systematic observation

144. The United States reported, in its NC5, comprehensive information on its activities on research and systematic observation that addresses both domestic and international aspects of these activities, including on action taken to support related capacity-building in developing countries. The United States also reported summary information on global observation activities that broadly reflects the detailed information on that matter provided in a separate report to the secretariat published in 2008 that was prepared in accordance with the provisions of decision 5/CP.5 and the UNFCCC reporting guidelines, para. 59. The ERT commended the United States for being among the countries that prepare such separate reports and encourages it to continue with this activity in the future.

145. In addition, the United States reported, in its NC5, comprehensive information on research and development of technology for global change, and information on major new developments was provided during the review. In this context, following the suggestions from the previous in-depth review, the United States reported information on fundamental research that is relevant to climate change and provided further information on this matter during the review. The ERT noted that the information reported in NC5 is complete, transparent and is fully in accordance with the requirements of the UNFCCC reporting guidelines. The ERT encourages the United States to provide more information on its capacity-building activities in developing countries in relation to research and systematic observation that could reflect fully the scale of the ongoing activities.

146. The information reported in NC5, together with the information provided to the ERT during the review confirms that the United States continues to be at the cutting edge in the area of climate change research and systematic observation. Funding for relevant activities is sizeable, USD 2.6 billion annually, and steadily growing, which reflects increased priorities given to these activities compared with the NC4.

147. Most of the climate research and observation in the United States is conducted under the flagship GCRP, initiated in 1990, which coordinates and integrates federal research on changes in the global environment and their implications for society. The programme also aims at providing sustained assessment (see the 21 assessments provided in the section on impacts and adaptation) and communicating research findings (see the section on education, training and public awareness). Examples of the research area include understanding the Earth’s system (the role of aerosols in regional variations and the role of short-lived radiative agents, stratosphere and surface climate and integration of observation in the model); the science for adaptation and mitigation, as well as weather extremes. Recent years have seen a shift in focus from pure research to applied research that provides a solid foundation for decision-making in relation to global change at the national, regional and local levels. The GCRP has a 10-year strategic planning horizon to provide certainty in the support for the priority areas and confidence in related priorities by the Government.

148. The GCRP has a large international component to promote international cooperation on global change research and standardization of data gathering and data quality. It provides support for several international programmes, for example the World Climate Research Programme, the International Geosphere-Biosphere Programme, the Global Climate Observation System (GCOS) and the International Human Dimensions of Climate Change.

149. The United States attaches high importance to activities under GCOS and reported extensively on a range of activities under two broad headings: satellite (weather and climate, land imaging and global change satellites) and non-satellite observing systems. Data acquired from the two types of systems complement each other and set the foundation of a large portion of the international climate data infrastructure that are essential in defining the state of the Earth's systems, past trends and variability. In the realm of satellite observations, the United States continues to make substantial investments in Earth system research that have led to discoveries critical to understanding of the climate system, such as recent dramatic improvements in space-based observations of ocean salinity and its relationship to global climate change. The United States continues to maintain and develop both domestic and global networks for atmospheric, terrestrial and oceanic observations from terrestrial, airborne, freshwater and marine platforms, including by providing support to GCOS, the Global Ocean Observing System and the Global Terrestrial Observing System, and in developing of the Global Earth Observation System of Systems.

150. The United States is strengthening its cooperation to improve the capacity of developing countries for data processing and analysis. To that end, it continues to work under GCOS with the South-western Pacific nations to maintain the GCOS systems in the region and to support the GCOS cooperation mechanism to fund projects in developing countries. The ERT acknowledged the importance of the development of a new national strategy for earth observations for the purposes of a routine assessment and planning process for investments in earth observing systems across federal agencies.

151. In addition to supporting climate change research and adaptation, the United States invests heavily in research and development in clean energy technologies through relevant programmes, which reflects the highest priorities given by the United States to this matter. The levels of support for such research are impressively high, USD 6.7 billion in 2013 budget, and growing, 13 per cent increase only between 2012 and 2013. Importantly, this support helps to leverage private sector investment in a ratio of around one to five. Around half of the Government funding targets clean electricity production (electricity production being the main emission driver in the United States), 26 per cent goes to research on transport (in this particular field, car manufacturers are also driving investments) and the remainder goes into energy efficient end-use improvements and smart electricity grids.

152. Two documents released at the end of 2011 reflect the most recent development in this context, the DoE Strategic Energy Plan and the Quadrennial Technology Review. These documents outline the most recent strategies to promote the development and deployment of new technologies to reduce GHG emissions that address in a holistic way on the one hand stationary and mobile (transport) sources and on the other hand supply, demand and related infrastructure. Also, the United States Climate Change Technology Program led by the DoE continues to be the cornerstone of clean energy research and development in the areas of increasing efficiency, renewable energy, CO₂ capture and storage, and reducing emissions from non-CO₂ gases.

153. Support for renewable energy innovation in recent years is noteworthy; it reached USD 840 million in the 2013 budget. This support resulted in the installed capacity of wind in 2012 standing at 47 GW and accounting for 35 per cent of all new capacity over the last four years, as well as the cost of automotive fuel cells being reduced by 80 per cent since 2002. On solar power, the DoE SunShot Initiative that aims at widespread, large-scale

adoption of solar across America through supporting of innovation is expected to make solar energy systems cost-competitive with other forms of energy by the end of the decade. It already contributed to more than a doubling of solar energy capacity in 2011 compared with 2010.

154. On science and innovation, the United States allocated USD 5 billion for basic research, including in the areas of energy-related and material sciences. Three programmes have been launched by the Secretary of Energy since 2009 to spur energy innovation: (i) the Advanced Research Projects on Energy to overcome the long-term and high-risk technological barriers for clean air technologies; (ii) the Energy Innovation Hubs to develop critical synergies ‘under one roof’ of a plethora of innovation activities ranging from fuels from sunlight, nuclear energy and energy efficient buildings to energy storage and critical materials for manufacturing of advanced technologies; and (iii) the Energy Frontier Research Center’s focus on key barriers to progress and on basic research needs assessments. The ERT recognizes that the recent approach taken to stimulate technological innovation is very proactive and recent developments show breakthroughs in areas ranging from battery technology and solar energy, to solid-state lighting and nuclear power. The ERT encourages the United States to report on the progress made in the above-mentioned programmes in its next NC.

155. The United States also initiates and actively engages in many multilateral and bilateral programmes that aim at fostering research on clean energy. An example of multilateral activity is the multilateral research and collaboration clean energy ministerial initiative that covers countries that account for 80 per cent of global GHG emissions and 90 per cent of global clean energy investment. Another example is the 2012 initiative by the Bangladesh, Canada, Ghana, Mexico, Sweden and the United States on cooperation for addressing short-lived climate pollutants, such as black carbon (soot), CH₄ and HFCs. A prominent example of bilateral cooperation is the Clean Energy Research Centre that the United States set up together with China. The aim of this bilateral cooperation is to address the worst consequences of climate change through accelerated transition to a low carbon strategy, facilitating innovation and promoting research on various energy technologies, including on clean coal technologies and CCS.

G. Education, training and public awareness

156. In NC5 the United States provided extensive information on its actions related to education, training and public awareness reaching the national public. Compared with NC4, the United States provided summary information on the main activities carried out by federal agencies supplemented by a table grouping climate change programmes by primary audience. NC5 reported on many public information and education materials, resource or information centres, and training programmes. The ERT found the organization of this information more transparent than in NC4, since it provided a clearer picture of programme content and delivery, which is challenging given the number of audiences and programmes involved.

157. The NC5 reported a significant enhancement of the efforts put into climate change education, training and awareness-raising. In particular, the United States GCRP Education Interagency Working Group (EdIWG), initiated in 2008, has the mandate of coordinating the integrated federal approach to educational activities. The EdIWG is to serve as a forum for the development and coordination of the education strategy and related activities among federal agencies. Recommendations are also made to agency management regarding climate and global change educational activities.

158. There are about 13 federal agencies delivering programmes, including NOAA, NASA, EPA, DoE, National Science Foundation, USAID, DoI, DoT, USDA, the Smithsonian Institution, and the United States GCRP, which is responsible for coordinating the federal agencies climate change education programmes. In addition, a number of partnerships exist to produce educational, training and awareness material. A notable example is the NOAA-lead Climate Literacy: The Essential Principles of Climate Science publication endorsed roughly by all the above agencies and counting around 25 partner institutions.

159. During the review week, the ERT was provided with further information and updates on education, training and outreach activities carried out by the United States GCRP EdIWG. An integrated approach to climate change education, training and outreach has been developed that includes consideration of the audience (who is targeted), the objective (inform, educate, engage, etc.), the process and medium (how it is delivered effectively) and the message to deliver (what you want to say – state of science, data availability, service availability, etc.). The approach targets virtually all citizens, from the general public to school, college and university students and educators, from the public media to scientists and data users with the aim of ultimately reaching decision makers. It is worth noting that many programmes offered to target undergraduate and postgraduate students and professionals specifically. This strategic planning aims at maximizing the uptake of information and capacity-building and is based on a cross-disciplinary approach that closes the loop by monitoring public perception and understanding of climate literacy and related actions so that the approach can be modified to achieved better results.

160. The ERT noted the challenge stemming from the fact that in the United States, school curricula are decided at the district level, resulting in a wide diversity of education systems. Because the federal government cannot require that climate science be taught nationally, the federal programmes targeting formal education are voluntary and may or may not be implemented by the schools, depending on each district school board. This emphasizes the important role of informal education and public awareness programmes offered in museums, parks, nature centres, zoos and aquariums across the country and involving federal, state and local governments as well as industry and non-governmental organisations (NGOs). During the review week, the ERT noted the strong involvement of environmental NGOs, think tanks and local governments in the development and sharing of high-quality policy analysis with the federal government.

161. At the international level, NC5 reported that USAID plays a leading role in developing and delivering foreign assistance to more than 40 developing and transition economies. The agency's Global Climate Change Program integrates climate change factors in its approach to development assistance and projects. To help promote sustainable actions and economic growth, USAID places climate change education, training and outreach at the centre of its strategy. To enhance the transparency of its next NC, the ERT encourages the United States to explicitly refer sections where additional information is reported on foreign education, training and outreach where appropriate, or to provide more information on the specific actions taken abroad in Chapter 9 of its next NCs

III. Conclusions and recommendations

162. The ERT concludes that the NC5 provides a good overview of the national climate policy of the United States at the time when it was prepared. The information provided in the NC5 includes most mandatory information required by the UNFCCC reporting guidelines with the exception of some information on projections (e.g. non-energy CO₂ emissions by sector) and on financial assistance and technology transfer (e.g. indication on 'new and additional' financial resources). During the review week, the United States

provided the missing mandatory information. The United States also provided further information on the new developments in all areas covered in the NC5, in particular on the most recent policies and legislation, as well as updated energy-related CO₂ projections and initiatives in financial assistance and technology transfer.

163. The United States of America's emissions for 2010 were estimated at 6,802 Tg CO₂ eq excluding LULUCF and 5,747 Tg CO₂ eq including LULUCF, which is 10.4 per cent and 8.6 per cent above its 1990 emissions level, respectively. Emission increases were driven by strong economic and population growth, and related strong demand for transportation and electricity, as well as by the continued reliance on fossil fuels within the primary energy supply mix. These factors outweighed improvements in the efficiency of energy supply and use, and emission reductions in CH₄, PFCs and SF₆ where policy has produced actual results. Between 2005 and 2009 (when emissions reached their lowest level since the mid-1990s) there was a fall in total emissions of 9.4 per cent and 8.2 per cent including and excluding LULUCF, respectively. This was due to the economic down-turn, increased use of shale gas for electricity generation and to policies and measures, including those that aim at promoting energy efficiency and renewable energy sources. Between 2009 and 2010, following the economic recovery, emissions increased by 3.6 per cent including LULUCF and 3.3 per cent excluding it. The increase was almost entirely attributed to fossil fuel combustion (90 per cent of the increase), comprised of an increase in electricity generation (70 per cent) and in transportation (20 per cent).

164. In its NC5 the United States presented GHG emission projections up to 2020 for a single scenario that includes effects of implemented PaMs and those for which funding was secured at the time of the preparation of the NC5 ('with measures' scenario). According to this scenario, the GHG emissions with LULUCF were projected to increase by 3.7 per cent between 2005 (base year for the 17 per cent target) and 2020, while the GDP was projected to grow by 40 per cent for the same period.

165. The most recent results, published in the AEO2012 early release, present energy-related CO₂ emission projections based on updated assumptions that reflect the impacts of the economic down-turn and the recent displacement of a proportion of coal by shale gas for electricity generation; the most recent regulatory PaMs except for the CAFE standards for model years 2017 to 2025; and the New Source Performance Standards for new or modified stationary sources. These energy-related CO₂ emissions, covering about 82 per cent of the United States total gross GHG emissions in 2010, are projected to decrease by 7.5 per cent between 2005 and 2020, compared with the 1.5 per cent increase for the same emissions reported in the NC5. Based on the assumption that the emission trends reported in the NC5 for other sectors and gases between 2010 and 2020 remain unchanged, and adjusting the AEO2012 results accordingly, the ERT estimates that the total GHG emissions including LULUCF would be about 356 Mt below the 2020 level projected in NC5. This corresponds to an increase in GHG emissions of about 10.5 per cent above the 1990 level, and to a decrease of about 4.4 per cent below the 2005 level reported in the 2012 inventory submission.

166. The ERT recognizes that the effects of the CAFE standards for model years 2017 to 2025, the New Source Performance Standards for new or modified stationary sources and the measures targeting HFCs still need to be reflected in future projections of the total GHG emissions. However, in the estimations of the ERT these are unlikely to close completely the gap to the targeted emissions level at 17 per cent below the 2005 level, and the revised LULUCF projections, when incorporated, may contribute to widen the GHG emissions gap. Meeting the 17 per cent target will therefore require further policy development.

167. It seems unlikely, in the short term at least, that the United States will secure a comprehensive legislative approach to climate policy at the federal level as anticipated in

the NC5. Consequently, energy and climate policy in the United States currently relies on the use of existing federal legislation and on the actions at the state and city levels.

168. To that end, the EPA endangerment finding is allowing the government to address both mobile and stationary sources of GHGs. In addition, the ARRA has provided unprecedented support of around USD 90 billion over three years to 2012 for its clean energy component. Finally, the state and local energy and climate PaMs will continue to play an integral role in the development of the federal actions to address climate change and are therefore an important part of the overall strategy for the achievement of the 17 per cent reduction target.

169. The ERT welcomed the innovative approach of the DoE to stimulating the development of new technologies and acknowledged the step change in the Government approach and support for such technologies and innovation, aiming to secure cost effectiveness on a ten to fifteen year time horizon. Information provided in NC5 is extensive and confirms the objective of the country's energy policy to innovate and become a cleaner energy producer and consumer. One example is the DOE SunShot initiative to support innovation in the use of solar energy that already contributed to doubling the solar energy capacity in 2011 compared to 2010. The ERT believes that this type effort has the potential to make a significant difference to achieving emission reduction targets, especially in the period beyond 2020.

170. The ERT noted the large and growing number of PaMs at the state, regional and local level. There are interactions and synergies between the various levels of government and between actions taken at those levels.

171. The United States continues to provide financial support for developing countries chiefly through bilateral and multilateral institutions and programmes. Overall, bilateral and multilateral assistance were allocated for adaptation, mitigation, mainly clean energy, and REDD. Support for adaptation is growing, but its levels remain lower than that for mitigation.

172. The United States attached high importance to fast-start finance launched under the Copenhagen Accord. The amount of such finance increased by 50 per cent between the FY 2011 and FY 2010, and in 2011 reached levels that are approximately 6.2 times the average value of finance provided for climate change in the period 2003–2009. The ERT noted the positive changes in the provision of financial resources for climate change cooperation and in the support for the facilitation of technology transfer by the United States and welcomes the new information provided during the in-country review, in particular how information related to finance is presented in the recent report 'Meeting the Fast Start Commitment'.

173. The United States is a large and diverse country that faces complexity in assessing climate change impacts, and in preparing for, and implementing adaptation actions. A significant effort is deployed by the federal government in terms of research to develop and communicate information on the country's climate change impacts, vulnerabilities and adaptation. The ERT recognizes that initiatives taken by the United States have great potential to enhance vulnerability assessment and adaptation strategies. The ERT welcomes the approach taken in the new national climate assessment to be published in 2013, as well as the progress made through the Interagency Climate Change Adaptation Task Force and the resulting national action plans that suggest a shift towards a more action-oriented approach to adaptation.

174. The United States continues to be an international leader in terms of research and systematic observation, both for its national research programmes and its international commitment to research cooperation. Most of the research continues to be conducted under the flagship Global Change Research Program and the funding for the programme is secured in the near and medium terms.

175. Education, training, public awareness covers the full cycle of learning in that the United States closely monitors the effect of its education and training programmes where feasible. Though formal education is not a federal jurisdiction, the government recognizes the importance of this activity, and also invests significantly in public awareness. Recent public polls suggested a clear trend in the public's acceptance that the climate is changing due to human GHG emissions.

176. In the course of the IDR, the ERT formulated several recommendations relating to the completeness and transparency of the United States' reporting under the Convention. The key recommendations⁵ are that the United States improve the completeness of its reporting by including in its next national communication the following information:

- (a) Non-energy CO₂ emissions by main sector;
- (b) Relevant information on factors and activities driving the emission trends, especially concerning non-CO₂ and non-energy CO₂ emissions;
- (c) A clarification on how the United States has determined financial resources as being 'new and additional';
- (d) Activities related to technology transfer, including success and failure stories, using table 6 from the UNFCCC reporting guidelines;
- (e) Activities for financing access by developing countries to 'hard' or 'soft' environmentally sound technologies.

177. The ERT encourages the United States to undertake a number of improvements regarding transparency and completeness of reporting; the most important of these are that the Party provide more detailed information on:

- (a) The effect of PaMs in aggregate for several complementary measures in a particular sector or affecting a particular gas;
- (b) The way in which progress with policies and measures to mitigate GHG emissions is monitored and evaluated over time, and any relevant institutional arrangements;
- (c) How the PaMs interact with other policies and measures at the national level, and how policies complement each other to enhance overall GHG mitigation;
- (d) Energy consumption trends and/or energy mix trends per sector in relation to projections; more information on the models used for projections of emissions from energy and non-energy sectors, their strengths and weaknesses as well as sensitivity and uncertainty analyses of the GHG emission projections;
- (e) Capacity-building activities in developing countries in relation to research and systematic observation that could reflect fully the scale of such activities.

⁵ The recommendations are given in full in the relevant sections of this report.

Annex

Documents and information used during the review

A. Reference documents

‘Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications’. FCCC/CP/1999/7. Available at <<http://unfccc.int/resource/docs/cop5/07.pdf>>.

‘Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories’. FCCC/CP/1999/7. Available at <<http://unfccc.int/resource/docs/cop5/07.pdf>>.

FCCC/SBI/2011/INF.1. Compilation and synthesis of fifth national communications. Executive summary. Note by the secretariat. Available at <<http://unfccc.int/resource/docs/2011/sbi/eng/inf01.pdf>>.

FCCC/SBI/2011/INF.1/Add.1. Compilation and synthesis of fifth national communications. Note by the secretariat. Addendum. Policies, measures, and past and projected future greenhouse gas emission trends of Parties included in Annex I to the Convention. Available at <<http://unfccc.int/resource/docs/2011/sbi/eng/inf01a01.pdf>>.

FCCC/SBI/2011/INF.1/Add.2. Compilation and synthesis of fifth national communications. Note by the secretariat. Addendum. Financial resources, technology transfer, vulnerability, adaptation and other issues relating to the implementation of the Convention by Parties included in Annex I to the Convention. Available at <<http://unfccc.int/resource/docs/2011/sbi/eng/inf01a02.pdf>>.

FCCC/ARR/2010/USA. Report of the individual review of the greenhouse gas inventory of United States of America submitted in 2010. Available at <<http://unfccc.int/resource/docs/2011/arr/usa.pdf>>.

FCCC/IDR.4/USA. Report on the in-depth review of the fourth national communication of the United States of America. Available at <<http://unfccc.int/resource/docs/2009/idr/usa04.pdf>>.

Fourth national communication of the United States of America. Available at <<http://unfccc.int/resource/docs/natc/usnc4.pdf>>.

2009 GHG inventory submission of the United States of America. Available at <http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/4771.php>.

2011 GHG inventory submission of United States of America. Available at <http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/5888.php>.

2012 GHG inventory submission of United States of America. Available at <http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/6598.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Eric Maltzer (Department of State), including additional material on updated policies and measures, GHG projections, the national registry and recent climate policy developments in the United States. The following documents¹ were also consulted:

U.S. Environmental Protection Agency. 2012. *Regulatory Impact Analysis for the Proposed Standards of Performance for Greenhouse Gas Emissions for New Stationary Sources: Electric Utility Generating Units*.

Available at <www.epa.gov/ttnecas1/regdata/RIAs/egughgnspsproposalria0326.pdf>.

U.S. Energy Information Administration (EIA). 2012. *Annual Energy Outlook Early Release*. Available at <www.eia.gov/forecasts/aeo/er/>.

Center for Climate and Energy Solutions, 2012. *All-States-Initiatives*. Available at <http://www.c2es.org/docUploads/All-State-Initiatives_0.pdf>.

U.S. Congressional Research Service. 2012. *The Global Climate Change Initiative: Budget Authority and Request, FY2010-FY2013*. Available at <www.fas.org/sgp/crs/misc/R41845.pdf>.

U.S. Environmental Protection Agency. 2012. *Renewable Portfolio Standards*. Available at <<http://www.epa.gov/chp/state-policy/renewable.html>>.

U.S. Energy Information Administration (EIA). 2011. *Annual Energy Outlook 2011*. Available at <www.eia.gov/oiaf/aeo/aeoref_tab.html>.

U.S. Environmental Protection Agency. 2011. *PSD and Title V Permitting Guidance for Greenhouse Gases*. Available at <www.epa.gov/nsr/ghgdocs/ghgpermittingguidance.pdf>.

U.S. Environmental Protection Agency. 2011. *Final Rule - Prevention of Significant Deterioration and Title V Operating Permit Greenhouse Gas (GHG) Tailoring Rule Step 3 and GHG Plant-wide Applicability Limits*. Available at <www.epa.gov/nsr/documents/20120702fs.pdf>.

U.S. Environmental Protection Agency. 2010. *Final Rulemaking to Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards: Regulatory Impact Analysis*. Available at <<http://www.epa.gov/oms/climate/regulations/420r10009.pdf>>

United States Environmental Protection Agency. 2010. *Final Rulemaking to Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards*. Available at <www.epa.gov/oms/climate/regulations/420r10009.pdf>.

¹ Reproduced as received from the Party.