E3G Briefing Note
An effective, fair and robust global climate agreement: Considerations for US policymakers

Summary

In this time of economic uncertainty and instability, countries around the world are assessing how to increase energy independence and address the threat of climate change while meeting future economic growth plans and create new jobs. This debate is occurring on the national level in most major economies either as part of economic stimulus plans or part of national energy and climate policy.

In addition, as part of the ongoing international negotiations taking place under the UN Framework Convention on Climate Change (UNFCCC), countries have been debating how best to take international action to address the global threat of climate change. At a UNFCCC conference in Bali in 2007 all countries agreed to launch a process to agree a stronger international response which would be completed in Copenhagen in December 2009. Countries with similar circumstances would contribute similar levels of mitigation – a principle commonly referred to as "comparable effort". Useful benchmarks already exist for what is required – the Intergovernmental Panel on Climate Change (IPCC) has found that developed countries must reduce their emissions between 25-40% below 1990 levels by 2020 to maintain a 50-50 chance of keeping global temperature rise below 2°C (3.6°F). Comparability is a critical issue because it is the basis under which developed countries have agreed to set quantifiable and binding emissions reduction targets. If any individual countries are seen not to be contributing their fair share it will put the international negotiations in jeopardy.

The European Union (EU) has made a legally binding commitment to reduce its emissions by 20% below 1990 levels by 2020. This would increase to 30%, within the IPCC range, if other developed countries committed to sufficiently ambitious reductions of their own and major emerging economies took enhanced actions. President Obama has pledged that the US will return its emissions to 1990 levels by 2020, as well as a long term target of an 80% reduction below 1990 levels by 2050. Other major economies are watching closely to see how the US position might evolve while they decide on their own level of ambition leading up to Copenhagen.

There are two ways to assess whether countries are taking comparable efforts – top down analyses that use formulas to share the effort between countries; or taking a

bottom up perspective of what is both needed and possible at the sectoral level to ensure all countries converge to a near-zero carbon economy by 2050. The results of top down models show that emission targets are likely to have a lower impact on GDP in the US than in other developed countries; and in most cases the US is given weaker emission targets than the EU. They also demonstrate that the formula used to share the targets makes relatively little difference to each country's individual commitment – the overall level of ambition of developed countries as a group is much more important. This suggests that a bottom up perspective is more useful.

Analysis at the sectoral level shows that the difference in carbon productivity between the United States and other developed countries is not primarily the result of geography or the share of heavy industry in its economy but rather results from a failure to use the best available technologies for power production (including coal), industry, transport and buildings. Further, many of the US's current commitments regarding efficiency standards or renewable energy obligations fall far short of efforts already under way in other parts of the world. The US thus has an opportunity to catch up and overtake other developed and developing economies through innovation and stretch targets which would give its manufacturers a competitive advantage in the rapidly growing global market for low carbon goods and services. These measures would also result in significant cost savings in the future and would have other co-benefits such as reducing US dependence on imported oil.

The comparability debate has important implications for international and domestic policy. A recent study shows that the current reduction proposals put forward by the world's major economies, including a US target of a return to 1990 by 2020, would likely result in a temperature rise of at least a 5.4 degrees Fahrenheit.[1] Existing evidence also challenges the assertion that delayed action can be made up for by steeper cuts in later years. A recent report suggests that delaying action by 10 years significantly increases the risks of overshooting 3.6°F.[2] This is particularly relevant given that weak action from the US would likely result in low ambition from other countries. Without a substantial shift in climate change and energy policy we will likely lock ourselves in to a carbon-intensive future. The transformation to a low carbon future can only be achieved if the US uses its influence to catalyze further action from the rest of the world. The current short term US target is not comparable to many

[1] Sawin et al (2009), Current Emissions Reductions Proposals in the Lead up to COP-15 Are Likely to Be Insufficient to Stabilize Atmospheric CO2 levels: Using C-ROADS – A Simple Computer Simulation of Climate Change – To Support Long Term Climate Policy Development. Presented at the "Climate Change – Global Risks, Challenges, and Decisions" conference, University of Copenhagen, 10 March 2009. Copenhagen, Denmark.
[2] Hare, B., Schaeffer M. & Meinshausen, M. (2009), Emission reductions by the USA in 2020 and the risk of exceeding 2°C warming, Potsdam Institute for Climate Impact Research & Climate Analytics.

other developed country commitments and is unlikely to deliver the increased global ambition we need. As a worst case it could lead to a breakdown in the international negotiations, while at the same time increasing the threat to US climate and energy security.

The Copenhagen negotiations represent an opportunity for the United States to lead the world in the transition to a low carbon economy through greater investment in markets for clean technology while simultaneously realizing significant cost savings through improved efficiency. The Union of Concerned Scientists for example finds that the US could meet an emissions reduction cap of 56% below 2005 levels by 2030 while saving consumers and businesses $465bn in that year.[3] Such a transition can also be a large part of the solution to the problems caused by the economic crisis through generating short term demand and jobs and providing long term sustainable growth. From the Marshall Plan to putting a man on the moon, the US has shown in the past that in can summon the vision and ingenuity to meet great challenges. By showing such leadership once again it can create millions of clean energy jobs, reduce dependence on oil and gas, and help safeguard current and future generations from catastrophic climate change.

Reducing emissions: What is effective?

The vast majority of the world's mainstream policymakers now agree that climate change is occurring and is caused by human activity. The impacts already observed that are consistent with scientific scenarios include falling crop yields, increased water scarcity due to the disappearance of mountain glaciers and prolonged droughts, and rising intensity of storms, forest fires, droughts, flooding and heat waves. The recent Fourth Assessment Report by the IPCC (AR4) reveals that warming of the global average temperature by 2°C (3.6°F) or more above pre-industrial levels would result in an increasing number of damaging impacts such as widespread loss of biodiversity, decreasing global agricultural productivity and widespread deglaciation of Greenland and, possibly, the West Antarctic ice sheets.

Scientific studies released since the IPCC AR4 have reinforced this consensus, and in fact suggest that we have been underestimating the scale of the crisis. Recent studies have found evidence of the accelerated retreat of the Greenland and West Antarctic ice

[3] Union of Concerned Scientists, Climate 2030: A Blueprint for a Clean Energy Economy, Press Release, April 21, 2009. Available at: http://www.ucsusa.org/news/press_release/new-study-says-reducing-0222.html

sheets, increased levels of ocean acidification, and sea level rise well above that predicted in earlier models.[4] These threats are being closely studied by the American Academy for the Advancement of Science (AAAS) and the National Academy of Sciences (NAS).

Apprehension over climate change is not limited to scientists and environmental activists. There is now a widespread belief among defence policy experts that the changing climate represents a clear and present danger both to national security and global stability. The National Intelligence Council (NIC) warned recently that unchecked warming could lead to greater displacement of refugees, political instability, terrorism and increased conflict over resource scarcity.[5]

Major companies around the world are also assessing the risks that climate change poses for their operations and business models. Recently five major US companies including Levi Strauss & Co., Nike, Starbucks, Sun Microsystems and The Timberland Company formed Business for Innovative Climate and Energy Policy (BICEP) and are calling for strong US climate legislation in order to spur the clean energy economy. The Investors Network on Climate Risk, which claims to represent $7 trillion in wealth, promotes a greater understanding of the risks and opportunities posed by climate change.

In addition, many countries around the world are assessing how, in an energy insecure and economically precarious world, they can integrate climate change action into future economic growth plans. New approaches are emerging that allow countries to reduce dependency on foreign sources of oil and gas, maintain price stability in energy markets, create new jobs across the economy and tackle climate change. This has been a part of recent legislative initiatives in the US including "America's Clean Energy Security Act", a bill proposed by Congressmen Waxman and Markey. The challenge is to find a way forward that allows all countries to move together towards that stable and secure low carbon future.

Scientific analysis suggests that to have a mid-level of probability (46%) of keeping temperature rise below 3.6°F the concentration of carbon dioxide equivalents (CO2e) in

[4] For examples, see: Mitrovica, et al (2009) The Sea-Level Fingerprint of West Antarctic Collapse, *Science*, February 2009, Vol 323, no 5915, p. 753. Also: *ScienceDaily*, February 5 2009, Global Scientists Draw Attention to Threat of Ocean Acidification. And: Solomon et al (2009), Irreversible climate change due to carbon dioxide emissions, *Proceedings of the National Academy of Sciences* (PNAS), Vol 106 no.6.

[5] (NIC) National Intelligence Assessment on the National Security Implications of Global Climate Change to 2030. House Permanent Select Committee on Intelligence. 25 June 2008.

the atmosphere will need to stabilize at between 445-490 parts per million (ppm).[6] The IPCC's Working Group III has analyzed emissions pathways that could limit warming to about 3.6°F above pre-industrial levels. In these scenarios developed countries as a whole reduce their greenhouse gas emissions to 25-40% below 1990 levels by 2020 and 80-95% by 2050, while developing countries simultaneously slow their emissions growth substantially below business as usual, ultimately reducing absolute emissions, first in regions where emissions are growing fastest but eventually in all regions (see Table 1 below). In order to achieve this long-term goal, global emissions would have to peak by 2015 and decline rapidly thereafter. Over the long-term (2050) global reductions would have to be in the range of 50-85% below 1990 levels.

Table 1: The range of the difference between emissions in 1990 and emission allowances in 2020/2050 for various GHG concentration levels for developed (Annex I) and developing (Non-Annex I) countries as a group

Scenario category	Region	2020	2050
A—450 ppm CO2-eq[a]	Annex I	−25% to −40%	−80% to −95%
	Non-annex I	Substantial deviation from baseline in Latin America, Middle East, East Asia and Centrally Planned Asia	Substantial deviation from baseline in all regions
B—550 ppm CO2-eq	Annex I	−10% to −30%	−40% to −90%
	Non-annex I	Deviation from baseline in Latin America and Middle East, East Asia	Deviation from baseline in most regions, especially in Latin America and Middle East
C—650 ppm CO2-eq	Annex I	0% to −25%	−30% to −80%
	Non-annex I	Baseline	Deviation from baseline in Latin America and Middle East, East Asia

Source: IPCC, 2007, Box 13.7

Reducing emissions: What is fair?

At UN climate negotiations in Bali in 2007, all countries agreed to launch a process to agree a stronger international response to climate change. These negotiations are to be completed by the UN climate conference in Copenhagen scheduled for December 2009.

[6] Intergovernmental Panel on Climate Change. Fourth Assessment Report (AR4), Contribution of Working Group III.

They build on the commitments agreed under the UN Framework Convention on Climate Change (UNFCCC), which was signed in 1992, ratified by the United States in the same year and has since been ratified by almost every country in the world. Rather than leave the level of emissions reductions to be determined solely through a closed-door negotiation, as was the case with the Kyoto Protocol to the UNFCCC (1997), in Bali countries decided to ensure fairness in the deal. Developed countries with similar circumstances would contribute a similar level of mitigation. There are many ways to assess "comparable effort". This Briefing Note elaborates on some of the methods of comparison which have emerged and their implications for US policymakers.

In the face of mounting scientific evidence, countries have begun to form political positions regarding the acceptable level of risk and what actions must be taken in response. Since 1996 the European Union (EU) has based its policy on the overall goal of limiting global warming below a 3.6°F target. It recently agreed legislation requiring a 20% reduction in emissions below 1990 levels by 2020, regardless of whether a global agreement is reached in Copenhagen in December 2009. This target would rise to 30% if other developed countries accepted sufficiently ambitious reduction targets of their own and major emerging economies committed to enhanced actions.

While the United States under the Bush administration announced in 2001 that it would not ratify the Kyoto Protocol, President Obama has pledged an 80% reduction in US emissions below 1990 levels by 2050, consistent with the IPCC findings.[7] As a first step towards this goal, the Administration proposes to return US emissions to 1990 levels by 2020. This objective is identical to targets in legislation President Obama co-sponsored when still a Senator. The Global Warming Pollution Reduction Act, sponsored by Senators Sanders and Boxer states: "it shall be the goal of the United States, acting in concert with other countries that emit global warming pollutants, to achieve a reduction in global warming pollution emissions – to ensure that the average global temperature does not increase by more than 3.6 degrees Fahrenheit (2 degrees Celsius); and to facilitate the achievement of an average global atmospheric concentration of global warming pollutants that does not exceed 450 parts per million in carbon dioxide equivalent."[8] The Sanders-Boxer bill called for a 2% annual

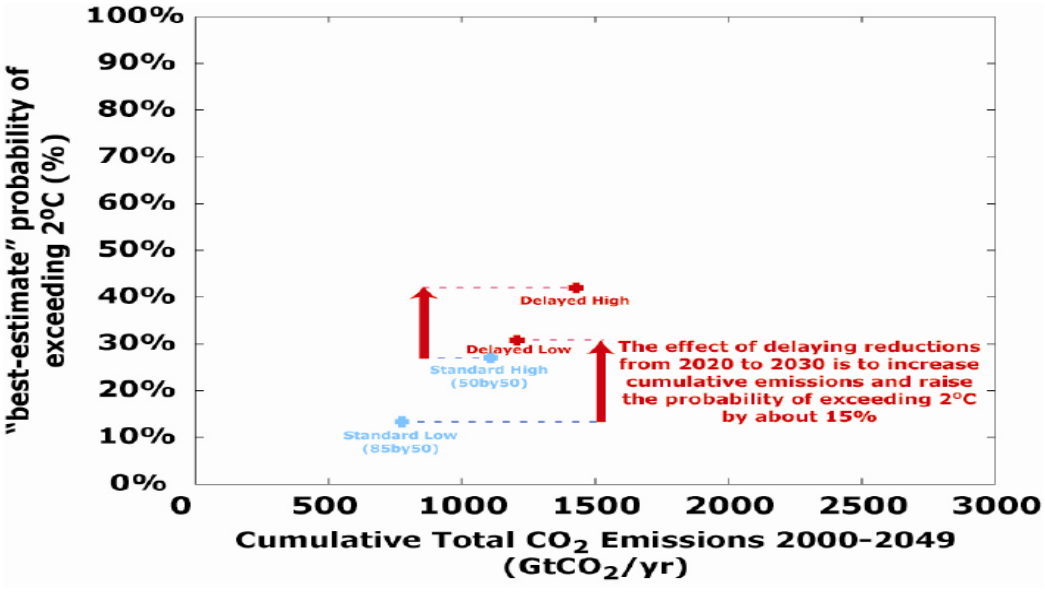
[7] This target is often expressed as a percentage reduction below a 2005 baseline. In that case, the target would be to reduce emissions by 83% below 2005 levels by 2050.

[8] More recent draft legislation, "America's Clean Energy and Security Act" released in March 2009 by Representatives Waxman and Markey calls for a 20% reduction below 2005 levels by 2020 or roughly a 7% reduction below 1990 levels. The bill also calls for achieving supplemental reductions of 6 billion tons by 2025 through forestry projects in developing nations. This would amount roughly to an extra 10% of reductions, compared to a 1990 baseline, through 2020.

emissions reduction between 2010 and 2020, followed by one third or roughly 27% of the remaining 80% overall target in each decade between 2020 and 2050.

Recent evidence suggests that current levels of ambition fall well short of what will be needed to ensure a 3.6°F future. One report released in 2009 considers all of the current emission reduction proposals that have been put on the table by the major economies. It then uses a simple climate change simulator to show that even if these reductions were fully realized it would lead to a CO2 concentration of roughly 730 ppm by 2100 and at least a 5.4°F temperature rise.[9] A separate report examined the relationship between the level of emissions reduction taken by the US by 2020 and the risk of exceeding 3.6°F warming, within the context of a new global agreement. It found that if developed countries were to delay an overall cut of 30% below 1990 levels by 10 years (i.e. pushing the target back from 2020 to 2030) this would significantly increase the probability of exceeding 3.6°F of global warming – escalating the risk of crossing dangerous tipping points in the earth's climate system (see Figure 1 below).[10]

Figure 1. Effects of a delay in emissions reduction by developed (Annex I) countries: increased probability of breaching the 3.6°F (2°C) threshold



Source: Hare et al, 2009

[9] Sawin et al (2009), Current Emissions Reductions Proposals in the Lead up to COP-15 Are Likely to Be Insufficient to Stabilize Atmospheric CO2 levels: Using C-ROADS – A Simple Computer Simulation of Climate Change – To Support Long Term Climate Policy Development. Presented at the "Climate Change – Global Risks, Challenges, and Decisions" conference, University of Copenhagen, 10 March 2009. Copenhagen, Denmark.

[10] Hare, B., Schaeffer M. & Meinshausen, M. (2009), Emission reductions by the USA in 2020 and the risk of exceeding 2°C warming, Potsdam Institute for Climate Impact Research & Climate Analytics.

These findings are particularly concerning given new evidence that CO2 emissions from fuel combustion are rising faster than otherwise thought – projected to be double their 2000 level by 2020 and to continue to rise beyond 2030.[11] This new evidence is not adequately reflected in recent estimates by the International Energy Agency (IEA) and others of the emissions trajectories necessary to stay below 3.6°F.

There is now a consensus that steps must be taken to address climate change in the context of energy security and economic stability. Most countries around the world are indeed aiming for a high growth, low carbon economic future. **What remains contentious is the level of emission cuts needed in the short-term to allow a realistic and economically viable chance of achieving a long-term target of 80% below 1990 levels.**

An analysis of this issue can be approached in two ways: 1) a top-down analysis that uses advanced macroeconomic models of the entire economy and uses a formula to share the effort between individual countries; or 2) taking a bottom up perspective of what is both needed and possible at the sectoral level for all countries to converge to a near-zero carbon economy by 2050. Combining these two approaches is useful to analyze potential pathways forward.

Top down reduction targets: defining "comparable effort"

A number of recent studies have used macroeconomic models to show how emissions reduction targets could be shared between developed countries. These models also allow for estimates of the impact of such targets on gross domestic product (GDP) and other macroeconomic indicators.

The first step in a top down analysis is to decide what indicators are used in the model. A number of methods have been proposed to ensure a "fair deal" based on various factors such as wealth, potential for emissions reduction, population growth, and historical mitigation efforts. The EU for example, in its communication on the Copenhagen agreement[12] recommends distributing targets among developed countries based on a combination of the following four indicators:

[11] Sheehan, P (2008), The new global growth path: implications for climate change analysis and policy, *Climatic Change*, 91: 211-231.

[12] European Commission: Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions: Towards a comprehensive climate change agreement in Copenhagen. Brussels, 28.1.2009.

- GDP per capita: reflecting the capability to pay for emission reductions
- GHG emissions per unit of GDP: indicating GHG reduction potential
- Trend in GHG emissions between 1990-2005: recognizing early action
- Population trends over the period 1990-2005: taking into account the link between the size of the population and total GHG emissions.

Based on these indicators, a modelling technique can be used to distribute an overall reduction target between the developed countries. The analysis produces the targets and estimates of economic impact for developed countries listed in Table 2 below.

Table 2. Impacts resulting from emissions reductions targets based on a combination of indicators. Assumes 30% below 1990 by 2020 as the overall target for developed countries as a group, with individual targets expressed against a 2005 baseline.

Country	Target vs. 2005	GDP	Employment
EU27	-24%	-1.4%	-0.4%
USA	-34%	-0.7%	-0.4%
Japan	-29%	-0.6%	-0.3%
Canada	-39%	-2.2%	-0.7%
Australia & New Zealand	-38%	-1.9%	-0.8%

Adapted from: European Commission: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Towards a comprehensive climate change agreement in Copenhagen: Extensive background information and analysis

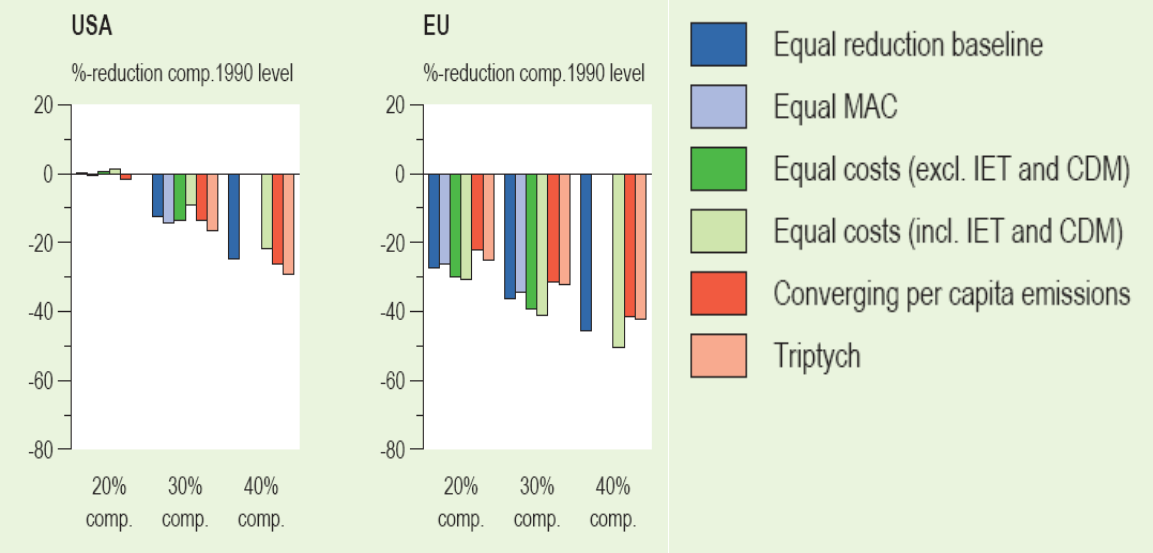
As seen in the table above, even though the EU formula takes previous actions into account the economic impact on GDP of sharing a 30% overall target is lower for the US (0.8%) than any country other than Japan (0.6%). The US also has a lower overall reduction target than Canada, Australia, and New Zealand**.**

Other models have been developed which provide different distributions of targets and impacts for developed countries.[13] One analysis uses six different indicators to model

[13] For examples see: den Elzen & Lucas, (2005), The FAIR model: A tool to analyse environmental and costs implications of regimes of future commitments, Environmental Modelling and Assessment 10:115-134. And: Greenhouse gas Air pollution Interactions and Synergies (GAINS), International Institute for Applied Systems Analysis (IIASA): http://gains.iiasa.ac.at/MEC/

reduction targets for developed countries based on an overall developed country target of 20%, 30% and 40% below 1990 levels by 2020. Each bar represents a different formula for distributing the reduction targets. The results are shown in Figure 2 below.

Figure 2. Emissions reduction targets for US and EU for 20%, 30% and 40% scenarios



Source: Exploring comparable post-2012 reduction efforts for Annex I countries. Netherlands Environmental Agency (PBL), The Netherlands, December 2008.

While the European Commission's model results in a US target for 2020 that is deeper than the EU target, the PBL study above implies it would be the other way round: for any given level of overall ambition the EU target would be deeper than that of the US. This is primarily due to the fact that the European Commission's formula accounts for emission trends between 1990 and 2005. By contrast, the PBL study assumes the US would be starting from a baseline of 2005 rather than its Kyoto target of 7% below 1990 levels by 2012. Using 2005 as a baseline means the US in not penalized for the fact that its emissions are roughly 16% above 1990 levels. A 30% overall reduction target would imply a US target in the range of 10 to 15% below 1990 and an EU target in the range of 30 to 40% below 1990.

The PBL study demonstrates that the formula used to share the reduction targets makes relatively little difference to individual country efforts. What has the greatest effect is the overall level of ambition that is shared between the developed countries. Further, analysis by the EU shows that even

when the high growth in US emissions since 1990 is taken into account, an ambitious US target still has a relatively minor impact on GDP growth. This suggests that it is more informative to approach the issue of what is fair and possible by looking more closely at mitigation potentials at the sectoral level.

The low carbon transformation: a bottom up perspective

Under a business as usual scenario annual US greenhouse gas (GHG) emissions are projected to rise from 7.2 gigatons (GT) CO2e in 2005 to 9.7 GT in 2030.[14] For reference, total annual global emissions are currently around 40 GT Co2e. On this path, US emissions in 2030 would exceed GHG reduction targets contained in a sampling of economy-wide climate change bills proposed in the 110th US Congress by 3.5 to 5.2 GT. However, a study by the Union of Concerned Scientists finds that implementing a combination of climate, energy and transportation policies would allow the US to reduce emissions by 56% below 2005 levels by 2030 while also saving consumers and businesses $465bn in that year.[15] Using this kind of study, one can assess what is possible in the US and other countries thereby providing evidence with which to judge fairness of effort.

The race for a low carbon future will require widespread diffusion of existing technologies to improve energy efficiency, combined with a large-scale move to low carbon energy sources. Studies suggest that this is achievable *and* affordable, but requires bold action from governments, innovation from markets, and new levels of co-operation between countries. Specifically there are three core areas where swift action is needed:

1) The Power Sector

According to a recent report a successful low carbon transformation will require almost full decarbonization of the power sector by 2030.[16] The challenge will be to achieve a radical reduction in grams of CO2/kWh, thereby continuing to provide the needed energy services while simultaneously cutting pollution.[17]

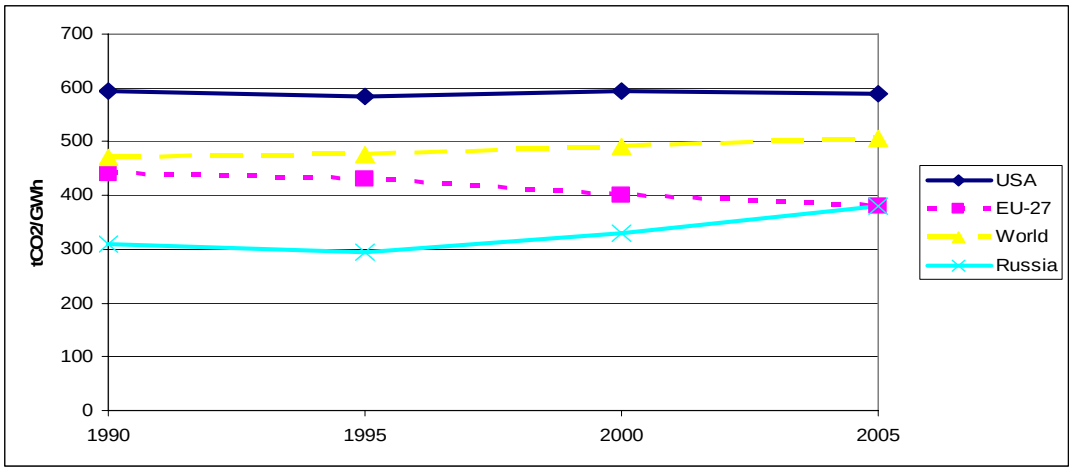
[14] McKinsey (2007): Reducing US Greenhouse gas emissions: How much and at what cost?: page 6.
[15] Union of Concerned Scientists, Climate 2030: A National Blueprint for a Clean Energy Economy. Press Release, April 21, 2009. Available at: http://www.ucsusa.org/news/press_release/new-study-says-reducing-0222.html
[16] Building a low-carbon economy – the UK's contribution to tackling climate change. Committee on Climate Change, December 2008.
[17] UK Committee on Climate Change, 2008.

Achieving this goal will require vastly expanded use of renewables. The wind energy from just three states – Kansas, North Dakota and Texas – or a 100 mile by 100 mile solar thermal installation in the Southwest could each produce enough energy to power the entire country.[18] President Obama has called for 25% of US electricity to come from clean sources by 2025. Experience in other parts of the world suggests this can be achieved comfortably: the EU has passed legislation with a binding target of 20% of the total energy mix from renewable sources by 2020 and China is making strong progress towards its target of 15% of the total energy mix from renewables by 2020. The fact that the EU and Chinese targets apply to the entire energy mix means they will result in greater overall emissions reduction than if the same targets applied only to electricity production, as is the case in the US. The Waxman-Markey bill addresses renewable energy by proposing to initiate a Federal Renewable Electricity Standard requiring retail suppliers to meet a percentage of electricity from resources such as wind, biomass, solar and geothermal.

The US has a relatively high CO2 intensity (see Figure 3 below) primarily because it produces 50% of its electricity from coal. While average efficiency of hard coal-fired power plants in the US has not changed significantly over past 30 years, it has improved by roughly 6 percentage points in Western Europe and China.[19] The US could benefit greatly from increased use of Ultra Super-Critical Coal technology which is more efficient than previous methods. Emissions from coal-fired power plants can also be reduced by capturing and storing CO2. Most scenarios for low carbon power rely on large-scale commercial use of carbon capture and storage (CCS) beginning around 2020 following the completion of demonstration plants over the next 10 years.[20]

[18] See: Environment America Research and Policy Center (2008), On the Rise: Solar Thermal Power and the Fight Against Global Warming. And: Brown, L. (2006), Wind Energy Demand Booming: Cost Dropping, Environment News Service.
[19] IEA Energy Technology Perspective, 2008: In Support of the G8 Plan of Action.
[20] Committee on Climate Change, 2009 pg. 53.

Figure 3. CO2 emissions intensity of electricity and heat output

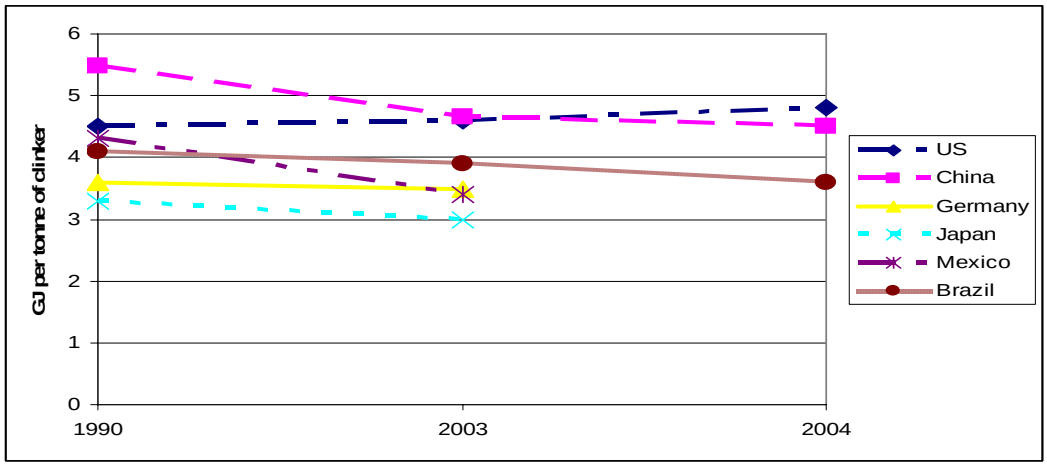


Source: adapted from EEA Energy and Environment Report, 2008

2) Energy efficiency in industry and buildings

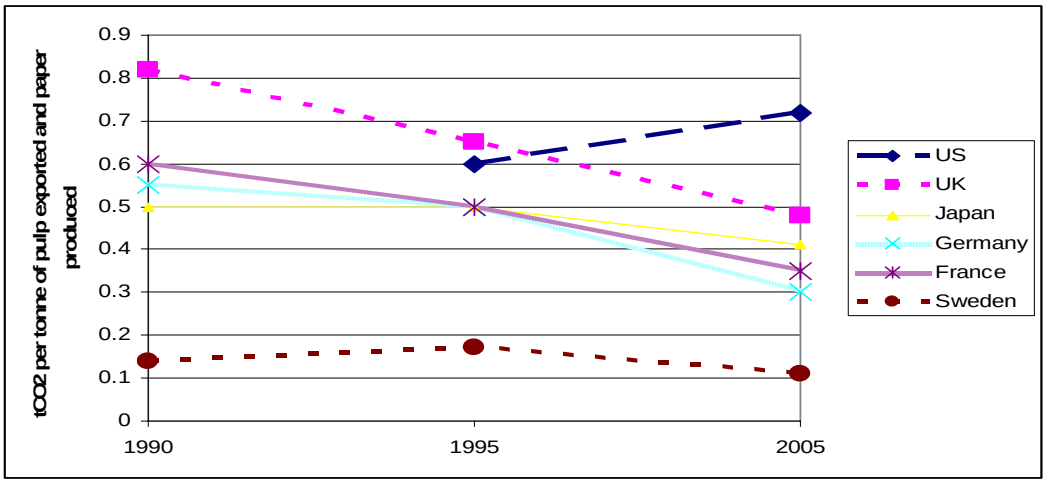
Energy-intensive industries such as iron and steel, cement, pulp and paper, and chemicals account for one third of global GHG emissions. US efficiency in these sectors lags behind most developed and many developing countries. Figures 4 and 5 below provide country comparisons in the cement and pulp and paper sectors.

Figure 4. Energy consumption per ton of clinker (cement) by country, including alternative fuels



Source: adapted from IEA, (2007), Tracking Industrial Energy Efficiency and CO2 Emissions

Figure 5. Co2 emissions per ton of pulp exported and paper produced



Source: adapted from IEA, (2007), Energy Balances of OECD Countries, 2004-2005

Figure 4 shows that the US consumes more energy per ton of clinker[21] produced than any other country listed, including China, Mexico and Brazil. The low efficiency of the US cement industry is due in part to the use of older wet-process kilns which are less efficient than state-of-the-art dry rotary kilns. According to the IEA the US has greater potential for emissions reduction in this sector using best available technology than the world average.[22] As shown in Figure 5 the US produces significantly more CO2 per ton of paper produced than any other major exporters. The high energy intensity of the US pulp and paper industry is due largely to the old age of US pulp and paper mills.

Emissions from buildings and appliances are expected to grow faster than any other sector, but also have the greatest potential for mitigation in the US after the power sector – close to 1 GT of largely zero cost reductions are possible to 2030.[23] This is roughly equal to the total emissions of Germany. President Obama has called on the US Department of Energy (DOE) to propose appliance efficiency standards that the administration expects will save $500bn over the next 30 years.[24] The IEA has estimated that if their 16 recommendations to G8 governments on measures to reduce energy use were implemented globally this could save approximately 5.7 GT of CO2 annually by 2030, equivalent to the US's total emissions in 2004.[25]

[21] Clinker is produced when a mixture of minerals is rotated and heated in a cement kiln. The resulting product is then ground for use in cement.
[22] IEA, 2008: Worldwide Trends in Energy Use and Efficiency.
[23] McKinsey, 2007
[24] Talley, Ian, Obama Mandates New Appliance-Efficiency Standards, Wall Street Journal, February 5, 2009. Available at: http://online.wsj.com/article/SB123387168605454125.html
[25] IEA Energy Efficiency Policy Recommendations to the G8 Summit, Heiligendamm, 2007.

While the US DOE has launched an initiative to make all new commercial buildings zero net energy by 2030, this is less ambitious than other developed country plans; the UK has committed to make all new housing zero carbon by 2016, and the UK Green Building Council proposes to have all new non-domestic buildings zero carbon by 2020.[26] France will require all new buildings to produce more energy than they consume by 2020.

If every state were to achieve energy savings already realized by the most effective state-level energy efficiency programs the US could reduce electricity consumption by 8% compared to business as usual and avert 265 MT of CO2e by 2020 – approximately 4% of current US CO2 emissions and the equivalent of taking nearly 49 million cars off the road.[27] A proposal in the House of Representatives to implement a Federal Energy Efficiency Resource Standard (EERS) could save $168bn by 2020 and create 222,000 jobs.[28] Efficiency measures have also featured prominently in recent climate change legislation at the Federal level in the US. Title II of the American Clean Energy and Security Act released in March 2009 includes measures to increase efficiency across all sectors of the economy by for example codifying efficiency standards for lighting and appliances as well allowing for harmonization of fuel efficiency standards.

A focus on past country and state-level action gives a good idea of the potential for energy efficiency savings. The Top Runner Program in Japan stipulates energy conservation standards for domestic appliances and vehicles. It resulted in a 20% improvement in fuel efficiency between 1995 and 2006.[29] The program applies to 21 products and between 1997 and 2005 it resulted in energy efficiency improvements from 25.7% for television receivers to 99.1% for computers.[30] Standards have been increased in 2006 and will rise further through 2010. **California, the 7th largest economy in the world, uses 40% less electricity per person than the US national average and generates 68% more GDP for every unit of energy used than the rest of the US. The state's efficiency measures have saved**

[26] Britain's year zero: UK to leap from 'laggard to leader' on carbon dioxide emissions. The Independent. 24 February 2008. Available at: http://www.independent.co.uk/environment/climate-change/britains-year-zero-uk-to-leap-from-laggard-to-leader-on-carbon-dioxide-emissions-786534.html

[27] Environment America Research and Policy Center (2007), America's Clean Energy Stars: State Actions Leading America to a New Energy Future.

[28] Furrey et al (2009), Laying the Foundation for Implementing A Federal Energy Efficiency Resource Standard, American Council for an Energy Efficient Economy (ACEEE).

[29] Top Runner Program: Case Study: Japan, Ministry of Economy, Trade and Industry.

[30] January 2008, Top Runner Program: Developing the world's best energy-efficient appliances, Ministry of Economy, Trade and Industry (METI).http://www.eccj.or.jp/top_runner/e_02.html#04

$56bn in energy costs between 1972 and 2006 and created 1.5 million jobs in the process.[31]

3) Low carbon transport

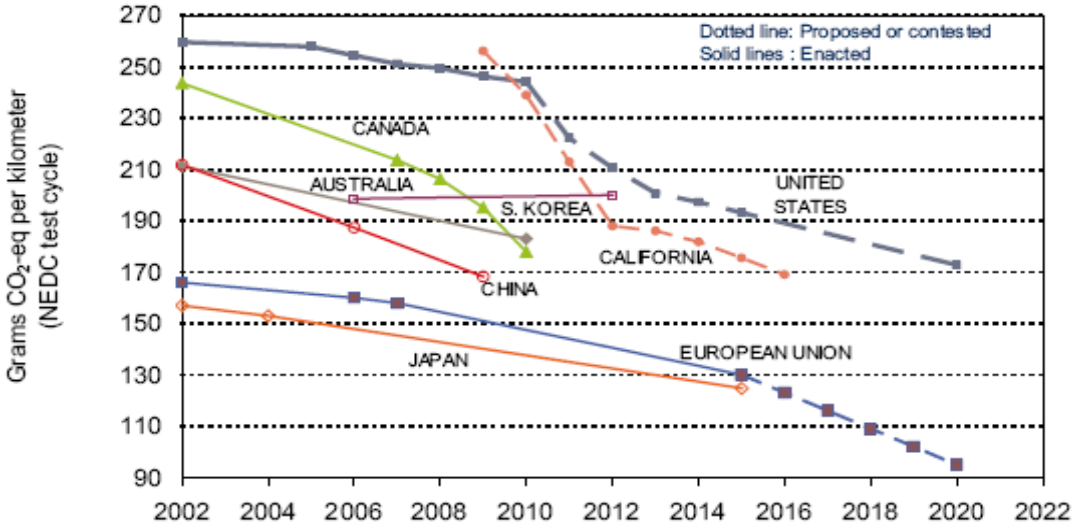
The world car fleet is expected to triple by 2050 – meaning efficiency must be drastically increased if climate goals are to be met. This also has significant implications for energy security as the US imports 65% of its petroleum for which it pays nearly $600bn each year – of which the transportation sector's share is $450bn.[32]

A study by the Pew Center for Climate Change named the United States and Canada as having the lowest fuel economy standards and highest GHG emissions from transport in the world. The US auto industry has consistently fought to avoid stricter fuel economy standards, while simultaneously seeing a rapid decline in sales which reached a 27-year low in the first month of 2009.[33] This decline is partly driven by consumers fleeing SUVs and other large vehicles with high gas mileage to Asian brands producing passenger cars and hybrids.[34]

A focus on improvements in fuel economy could revitalize the American auto industry while also resulting in vast savings in fuel cost. **If the US matched fuel efficiency standards of Europe and Japan, it would be able to cut 20% from projected oil imports; this would have amounted to a saving of $80bn in 2008**.[35] President Obama pointed out in January of 2009 that increasing standards to 35 mpg by 2020, a 40% increase in fuel efficiency, would save over 2 million barrels of oil per day, nearly equivalent to the amount spent on imports from the Persian Gulf.[36] Title I of the Waxman-Markey bill would address clean transportation through a low carbon fuel standard as well as support for electric vehicle manufacturing and infrastructure.

[31] World Rivers Review, Vol 24, No 1, March 2009. Available at: http://www.internationalrivers.org/node/3918.
[32] American Physical Society, How America Can Look Within to Achieve Energy Security and Reduce Global Warming. September 2008.
[33] Kiley, David, U.S. Auto Sales Hit 27-Year Low, Businessweek, Feb 4 2009.
[34] Krolicki, Kevin, Auto sales hit 15-year low, Reuters, July 2 2008.
[35] Comparison of Passenger Vehicle Fuel Economy and Greenhouse Gas Emission Standards Around the World, Pew Center on Global Climate Change, December 2004. And: Onoda, T. (2008), Review of International Policies for Vehicle Fuel Efficiency: IEA Information Paper. August 2008.
[36] http://www.washingtonpost.com/wp-dyn/content/article/2009/01/26/AR2009012601147_pf.html

Figure 6. Actual and Projected GHG Emissions for new passenger vehicles by country/region, 2002-2022



Source: 50BY50 Global Fuel Economy Initiative (www.50by50campaign.org)

Converging to a low carbon economy is possible but it will not happen overnight. While energy efficiency improvements can begin immediately and will be cost-effective in the short term, scaling up the use of renewables, the commercial use of CCS and the switch from fossil fuel to hybrid vehicles will take longer. McKinsey estimates are based on the assumption that 42 million hybrid vehicles (including plug-in electric) will be sold by 2030 – 40% of all new car sales. Countries that lead the world in developing low carbon technologies will be well positioned to capture these fast growing markets and maintain national competitiveness.

Implications for the Copenhagen negotiations

President Obama has made it clear that he sees the challenge of climate change as an opportunity as well as a threat: "...It's time for America to lead, because this moment of peril must be turned into one of progress. If we take action, we can create new industries and revive old ones; we can open new factories and power new farms; we can lower costs and revive our economy. We can do that, and we must do that.[37]"

[37] Barack Obama: Remarks on Energy, January 26 2009. http://www.gpoaccess.gov/presdocs/2009/DCPD200900019.pdf

The current emissions reduction proposals put forward by the world's major economies would likely result in atmospheric CO2 concentration of well above 450 ppm and imply global warming of at least 5.4 degrees Fahrenheit.[38] There is also evidence that deeper reductions beyond 2020 cannot make up for less ambition now; a 10 year delay in implementing a 30% emissions reduction target for developed countries would significantly increase the risk of overshooting 3.6°F.[39] Without a substantial shift in climate change and energy policy over the next decade we will see an unprecedented growth in fossil fuel combustion and lock ourselves into a carbon intensive future.

Combining the long term targets outlined by the Obama administration and the EU with the bottom up potential for emissions reductions reveals a basic roadmap for progress by 2020 and 2030 to meet the 2050 targets. The challenge now is to translate this into binding commitments that are consistent with wider economic goals and deliver the deep cuts in carbon pollution needed to prevent catastrophic climate change. This is a formidable challenge but it is achievable. The US target must represent a credible downpayment for America's "share" of the global effort if the U.S. wants to leverage reciprocal efforts out of other countries.

The bottom up studies cited above can help create an evidence-based discussion of comparable effort. The large potential for cost-effective emissions reduction across key sectors in the US positions it well to make ambitious efforts when compared with others such as Japan and the EU that have already taken significant action. It is difficult to imagine other countries committing to the level of emissions reduction necessary to stay below 3.6°F without stronger US leadership. If the US only commits to a return to 1990 levels by 2020 the EU would likely not go beyond its goal of a 20% reduction below 1990 levels. We risk seeing a race to the bottom dynamic among other major economies, rather than one that pulls countries up to tackle the problem together.

It is particularly important that the developed world establish credible targets if they expect to see reciprocal action from developing countries. Countries such as China, South Africa, Mexico and Brazil have already begun to take action against climate change and have expressed a willingness to go further if the US and other developed countries provide the necessary leadership and support. The Obama administration has stepped up dialogue with these countries, launching bilateral climate and energy

[38] Sawin et al, 2009

[39] Hare, B., Schaeffer M. & Meinshausen, M. (2009), Emission reductions by the USA in 2020 and the risk of exceeding 2C warming, Potsdam Institute for Climate Impact Research & Climate Analytics.

initiatives with China and Mexico. Ultimately, however, US actions will speak louder than words.

The Copenhagen negotiations represent an opportunity for the United States to lead the world in the transition to a low carbon economy through greater investment in markets for clean technology while simultaneously realizing significant cost savings through improved efficiency. Such a transition can also be a large part of the solution to the problems caused by the economic crisis through generating short-term demand and jobs and providing long term sustainable growth. From the Marshall Plan to putting a man on the moon, the US has shown in the past that in can summon the vision and ingenuity to meet great challenges. By showing such leadership once again it can create millions of clean energy jobs, reduce dependence on oil and gas, and help safeguard current and future generations from catastrophic climate change.