

Global Climate Change Policy Tracker

Winners and Losers

July 2011



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Executive Summary



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During 2010 and to date in 2011 the leaders in climate policy continued to maintain their position, while others have lagged behind or moved backwards.

- Countries such as Germany, China and increasingly the UK continue to develop strong domestic policies that contribute to global climate change mitigation,
- Whilst others, such as the US, Russia, Spain and Canada (Ontario) either fail to initiate, or in some cases, even reverse or threaten to reverse, crucial climate policy initiatives.
- Thus, some policy regimes have succeeded while others have failed, and the key for investors is to identify the winning policy structures which reduce uncertainty. Within this context, we continue to develop our 'best-in-class' climate policy framework, with emphasis on policies directed at clean energy technologies and efficiency.

Countries with more 'TLC' – transparency, longevity and certainty - in their climate policy frameworks will attract more investment and will build new, clean industries, technologies and jobs faster than their policy lagging counterparts. This is particularly evident in countries such as Germany and China, who have emerged as global leaders in low carbon technologies and investment in recent years. In stark contrast, **a politically divided US Congress and vast budget deficit has resulted in very little significant regulation at the Federal level, with substantial implications for emerging clean technology industries in the US.** This climate policy inertia has existed for some time in the US now, with activity on this front largely taking place at the state level. We have long argued that the states must continue to press ahead with climate legislation, but a negative effect of this trend is a patchwork of inconsistent state policies. The net effect is that while Congress stumbles, the US stands to fall behind.

At the start of 2011 the world witnessed the Fukushima nuclear disaster in Japan. We believe that the dual impact of this and the oil price shock as a result of unrest in the Middle East are likely to mark 2011 as a key inflection point in the global energy mix and as catalysts for a transition toward cleaner, sustainable and more secure energy supplies. In the wake of the nuclear disaster there was a dramatic reassessment of nuclear energy policy and safety around the world from China to Europe to the US. In March the German Chancellor Angela Merkel ordered that all old nuclear reactors built pre-1980 be temporarily taken offline, in April Merkel announced a six-point plan that stated the country would accelerate the fundamental conversion of their energy supply towards greater penetration of clean energy, and in June the German parliament approved plans to phase out nuclear reactors by 2022. Similarly, Switzerland and Italy have abandoned plans to build and replace nuclear plants.

In this study we track the policy momentum of mandates, emission targets and supporting policies in the Clean Energy Ministerial (CEM) countries and key US states, which represent ~80% of global GHG emissions. There has been an increase in activity around a variety of supporting policy incentives throughout 2010, although the use of feed-in tariffs to support renewable energy continues to overwhelmingly dominate in European markets (20 out of 27 EU member states use FiTs). We tracked 390 climate policies which are binding or accountable up to April 2011. 104 of these are new to the database since March 2010 when we last published. Policy momentum is still positive, but shows signs of slowing down in recent months as many economies have by now developed and implemented their domestic climate policies. In addition to this slowdown, we have seen some negative revisions and fine-tuning of policies, particularly in FiT markets, largely driven by budget concerns over the recent financial crisis, as well as cost reductions in renewable energy technologies as they achieve greater scale (particularly solar). In most cases these have left investors with long-term TLC. **However,**

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retroactivity is the most harmful change to a policy and Spain did enforce this. Meanwhile the outlook in Ontario in Canada has deteriorated with projects failing to get connected to the grid, fear of some revocation of projects starting development and importantly an uncertain political outlook towards the FIT that needs clarification post election. These trends are leading to the establishment of winners and losers at the policy level.

In terms of the impact on carbon abatement, 364 policies are modeled globally, 41 of which are new since 2010. In total the maximum potential abatement of modeled policy initiatives, assuming that these are implemented, will reduce global emissions by nearly 11Gt to global emissions of 49 Gt/y in 2020. This is still ~5Gt higher than the 44 Gt/y target for stabilization in 2020 (the 450ppm pathway). Compared to our March 2010 model run, this is almost 1Gt better in terms of reduction, but unfortunately the Business-as-Usual emissions for 2020 also rose by 1Gt so the net result of a 5Gt gap is the same. The message is thus clear: policy at the current level still will not achieve the reductions necessary to stabilize global emissions at 2 degrees.

In the absence of an international agreement, the continued push for new initiatives to address climate change further supports what we have always asserted: that fighting climate change is not just a matter for international agreements but rather a collection of regional, national and (in some cases) sub-national initiatives. The solution lies in a bottom-up approach with national governments establishing policy frameworks that foster the investment, job and wealth creation that will emerge with the development of a global low carbon economy.

Indeed, the policy frameworks in place do require significant investment in order to be fulfilled, from both public and private capital sources, even if new policy impact is slowing. Thus, private investors have a strong role to play in mitigating climate change by investing across asset classes, including infrastructure and private equity. But that means understanding who has the policies and political will in place to get there.

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1. A Focus on the Clean Energy Ministerial (CEM)

In this update on policy momentum we expand on the 17 countries of the Major Economies Forum (MEF) on Energy and Climate Change to the 23 Clean Energy Ministerial (CEM) countries. The CEM is a high-level global forum born out of the UNFCCC conference in Copenhagen in December 2009 and designed to bring countries together to accomplish more towards advancing clean energy and transitioning to a global clean energy economy than by working alone. It includes the world's major economies (MEF countries) as well as a select number of smaller nations that are leading in various areas of clean energy (Spain, UAE, Sweden, Norway, Denmark and Finland). Together the CEM nations account for ~80% of global GHG emissions, thus providing a fairly comprehensive picture of global trends.

Policy Collection and Verification

We monitor and collect climate policies which are either legally binding (law passed by a legislature) or are accountable announcements (an official government goal or strategy with strong intention and which is measurable, including policies submitted to the Copenhagen Accord). We do not model or count proposals. These policies are used to calculate momentum, assess best in class regimes and to model abatement potential where possible.

While we are confident in our policy list, some target policies for some countries/states may not have been captured owing to limitations of data in the available public domain. The database contains policies announced up to and including April, 2011. While additional targets and supporting policies may have been implemented between this date and publication, the constraints imposed by modeling the emissions pathways have not allowed us to capture these.

To collect the policies detailed in the paper we regularly screen reliable, third-party published sources including:

- Government websites from environment and energy departments;
- Research from Multilateral Development Banks;
- Mainstream news sources including The Wall Street Journal, The Financial Times and the Times;
- Climate subscription research websites including Bloomberg New Energy Finance and Ren21.

Policy Methodology

Policy regimes contain a variety of interrelated elements, and in the case of climate change, policies are set with the goal of reducing emissions, increasing the penetration of renewables, boosting efficiency, or transforming an industry or sector. In the model we separate emission reduction target policies from mandate policies based on the scope of the policy. Economy-wide reduction goals, without specifying a sector, are classified as emission targets. If the policy is specified as reducing energy use or increasing renewable share, then the energy matrix will be affected and these policies are thus categorized as mandates.

Emissions targets aim to reduce greenhouse gas emissions by a specified level by a set year. These targets can be supported by carbon pricing, either through carbon taxes or cap-and-trade regimes.

We include “**greenhouse gas (GHG) emissions intensity and carbon intensity**” targets as emissions targets, as they are overarching goals without specific industry or sector measures attached. These intensity targets aim to reduce the ratio of GHG emissions relative to GDP. For these policies, the emissions target is estimated from the target intensity and the GDP of the target year and then used to estimate the emission reduction impact.

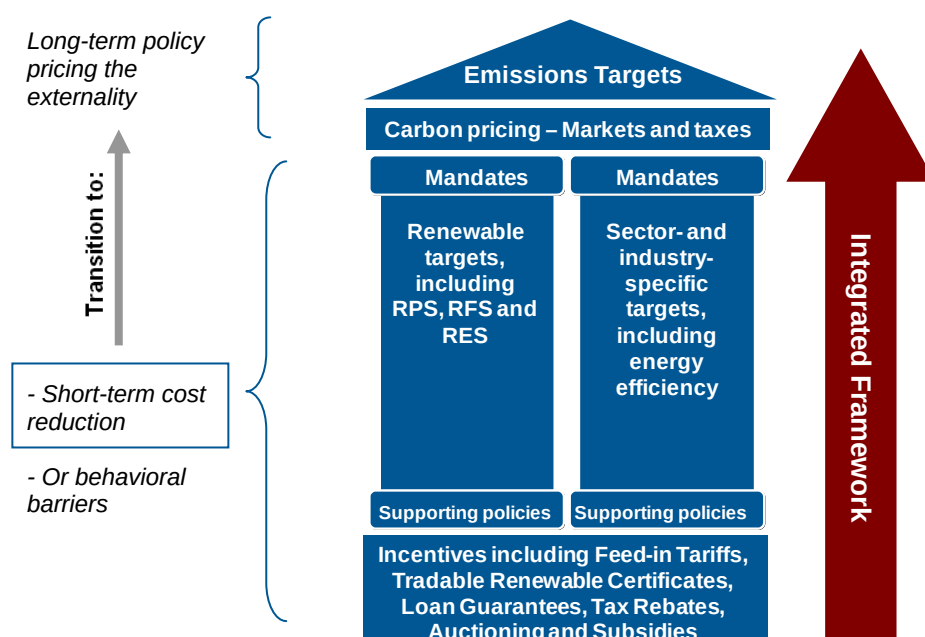
Mandated renewable, industry and sector targets support emissions targets in that they may require a minimum proportion of renewables in fuel pool or electric power mix, stipulate increased industrial efficiency, or mandate other actions, such as reduced deforestation or the phase-out of inefficient appliances. We classify “**energy intensity**” targets in the mandate targets, as they aim to reduce energy consumption per unit of GDP. Also emission reduction targets for particular sectors or

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regions of the economy, such as Regional Greenhouse Gas Initiative (RGGI) targets in the US for the power sector are classified as mandates as they are not overarching economy-wide emission reduction targets.

As the abatement model, based on emission targets and mandates, has become more advanced and energy data more readily available, we are now able to include some more sector specific mandates. Thus the increase in number of targets modeled compared to the March 2010 Tracker is attributed partly to this as well as new targets captured in the year March 2010-April 2011. There are noticeably fewer new emission target policies compared to the March 2010 model as that period captured the Copenhagen Summit, a period of unprecedented climate policy action regarding emission targets.

Stylized current policy structure and relationships



Source: DBCCA analysis, 2011.

Separately, underlying all of the targets described above are **supporting policy mechanisms** that help drive overall achievement. While not in the abatement model, they are used in our momentum and best in class policy regime analysis. As a means to execute a mandate, and thus to reduce emissions, supporting policy mechanisms are put in place to help developers overcome cost and behavioral issues in order to adhere to these mandates. A range of mechanisms that support overarching emissions targets and mandates are currently in place, with financial incentives being critical to taking technologies down the cost curve when in a commercial scale-up development phase. Incentive schemes can range across feed-in tariffs, markets for tradable renewable energy certificates (RECs), reverse auctioning for renewable capacity, tax credits, loan guarantee schemes and government-backed funds. Still other policies, such as net metering and grid interconnection laws, are also key enablers for target achievement.

DBCCA maintain that investments in the renewable energy sector are frequently driven by government policy and are subject to policy risk. **Transparent, long-lived and certain policies**, 'TLC,' provide investors with the framework to mobilize capital. However when energy policy lacks TLC there is increased risk and reduced transparency to these investments. Regulatory policy currently remains the core to renewable energy investing and carbon mitigation. Policies are characterized by traditional regulation, carbon pricing and innovation policies. To date, the layering of traditional mandates and standards backed up by

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innovation policy incentives have been the key drivers for investors and will continue to be so for many years to come. It will take a long time for carbon markets to mature enough to become hedgeable and fungible, absent of supportive policies.

We now look at these policies in terms of

- Best in class policy regime assessment
- Policy momentum
- Abatement model results.

2. Policy: Best-In Class Policy Regime Assessment

In the March 2010 Tracker we focused on a numerical risk assessment, giving a country a score of 1, 2 or 3 according to whether the country had a low risk regulatory regime, moderate risk regulatory regime or high risk regulatory regime for investors. In this update we used an alternative methodology that we have developed in the last year, moving away from a numerical country risk assessment approach to a 'best-in class' policy approach.

Climate change policy regimes vary by region and country, and often need to be assessed within their own context. Policy support and risks will thus vary by region, country or state.

Policy regimes contain a variety of interrelated elements, and in the case of climate change, there are different types of targets set with the goal of reducing emissions, increasing the penetration of renewables, boosting energy efficiency or transforming an industry or sector. The most attractive areas for investors in renewable energy will be those that offer the most robust policy regimes, combining all of the above elements. Such regions offer the most 'TLC' to investors.

Using the best-in-class risk policy table below, investors can evaluate which countries/regions exhibit the strongest elements of 'TLC,' versus those with variable and unstable regimes.

Each country is assessed according to 6 criteria:

Emission Controls

- A binding emission target
- A renewable electricity standard
- A long-term energy efficiency plan

Financial Support

- Feed-in Tariffs
- Long term government-based 'Green Bank'
- Tax benefits
- Long-term funding programs

Long-term grid improvement plan

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Key to best-in-class ratings:

	The policy exists at a national level and generally displays TLC
	The policy exists at a national level, but has been negatively modified/proposals are in place to negatively modify - creating greater investor uncertainty
	No policy exists
State-Level	The policy exists at a sub-national level only
State-Level	The policy exists at a sub-national level only, but is only present in a minority of states and/or has been negatively modified/proposals are in place to modify negatively - creating greater investor uncertainty
	The policy is only in tentative or planning stages or is dependent on certain provisions such as a legally binding agreement or funding
 COP Acc	The policy is a submission to the Copenhagen Accord and is not a national binding target

We also show the level of the budget deficit in each country as a potential barometer on government policy, especially where subsidies run directly through the budget. Red indicates a deficit over 5% of GDP.

Finally we show the actual amount of clean energy investment over the last decade and the latest level of GDP to see how significant this level of investment is relative to the national economy.

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Table 1: Best-In-Class: Driving Transparency, Longevity and Certainty

Country	Emissions Control			Financial Support				Long-term Grid Improvement Plan	Budget strength (deficit as % of GDP in 2010)	Capital Investment (\$mn) 2000-2010	GDP 2010 (Real growth rate \$tn)
	Binding/Accountable Emission Target	Renewable Electricity Standard	Long-term Energy Efficiency Plan	Feed-in Tariff	Long-term Govt-based 'Green Bank'	Tax Benefits	Long-term funding programs				
China	✓	✓	✓	✓	✓	✓	✓	✓	-1.6%	148291	\$5.88
Germany	✓	✓	✓	✓	✓	✓	✓	✓	-3.6%	39315	\$3.32
United Kingdom	✓	✓	✓	✓	✓	✓	✓	✓	-11.5%	38405	\$2.25
California	✓	✓	✓	✓	✗	✓	✓	✓	-1.0%	-	\$1.92
Finland	✓	✓	✓	✓	✗	✓	✓	✓	-2.5%	1670	\$0.24
Denmark	✓	✓	✓	✓	✗	✓	✓	✓	-2.7%	4464	\$0.31
Japan	✓	✓	✓	✓	✗	✓	✓	✓	-7.5%	13968	\$5.46
France	✓	✓	✓	✓	✗	✓	✓	✓	-7.8%	16830	\$2.58
Brazil	✓	✓	✓	✗	✓	✓	✓	✓	-2.2%	42254	\$2.09
Italy	✓	✓	✓	✓	✗	✓	✓	✓	-5%	22515	\$2.06
South Korea	⌚ COP Acc	✓	✓	✓	✗	✓	✓	✓	-1.1%	3199	\$1.01
India	⌚ COP Acc	✓	✓	State-level	✗	✓	✓	✓	-5.5%	27050	\$1.54
Spain	✓	✓	✓	✓	✗	✓	✓	✓	-9.24%	74897	\$1.41
Sweden	✓	✓	✓	✗	✗	✓	✓	✓	-1.3%	3836	\$0.46

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Country	Emissions Control			Financial Support				Long-term Grid Improvement Plan	Budget strength (deficit as % of GDP in 2010)	Capital Investment (\$mn) 2000-2010	GDP 2010 (Real growth rate \$tn)
	Binding/Accountable Emission Target	Renewable Electricity Standard	Long-term Energy Efficiency Plan	Feed-in Tariff	Long-term Govt-based 'Green Bank'	Tax Benefits	Long-term funding programs				
New Jersey	✓	✓	✓	✗	✗	✓	✓	✓	-2.1%	-	\$0.50
Australia	✓	✓	✓	State-level	✗	✓	✓	State-level	-4.2%	9780	\$1.24
Canada	✓	State-level	✓	State-level	✗	✓	✓	State-level	-2.5%	20482	\$1.57
Indonesia	⌚ COP Acc	✓	✓	✓	✗	✓	✓	✗	-1.1%	1681	\$0.71
Norway	✓	⌚	✗	✓	✗	✓	✓	✓	+9.9%	5767	\$0.41
Mexico	⌚ COP Acc	✓	✓	✗	✗	✓	✓	State-level	-1.8%	4516	\$1.04
United States	⌚ COP Acc	State-level	State-level	State-level	⌚	✓	State-level	State-level	-10.0%	164085	\$14.66
Texas	✗	✓	✓	✗	✗	✓	✓	✓	-2.2%	-	\$1.14
South Africa	⌚ COP Acc	✓	✓	✓	✗	✗	✓	⌚	-5.3%	351	\$0.36
UAE	✗	State-level	✓	✗	✗	⌚	State-level	State-level	<-1.5%	105	\$0.32
Russia	✓	✓	⌚	✗	✗	✗	✗	✓	-3.9%	640	\$1.47

Source: DBCCA Analysis, 2011. GDP Data: CIA World Factbook and US Government Spending (www.usgovernmentspending.com); Budget Strength Data: CIA World Factbook & DBCCA Analysis, 2011; Capital Investment Data: Bloomberg New Energy Finance, 2011.1) Totals for each country reflect new financial investment across the three primary asset classes (CC/PE, PM, AF) and across the clean energy and energy smart meter technologies markets.2) PE buy-out deals are not included in the total capital figures. 3) For South Africa and Russia 'grossed-up' numbers were used as back-end estimates were not available. Grossed means that it includes estimates for undisclosed deals to give a better estimate of the true value.

Key observations from this Best-In-Class table are as follows:

- China, Germany and the UK exhibit the strongest elements of 'TLC' in their energy policy regimes, all with a binding emission target and renewable electricity standard along with strong supporting incentives to support and meet those targets. The UK has budget concerns but has plans to address them while preserving much of its green agenda. All three countries have seen strong investment, and China now dominates global new clean energy investment.
- A second group of countries/states - California, Finland, Denmark, Japan, France, Brazil and Italy - possess many of the key climate policy elements, but other than Brazil do not have, or plan to implement, a green investment bank.

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These areas are still considered to be leaders in the renewable energy market. Brazil does not currently deploy Feed-in Tariffs, but has mandated deployment of a significant amount of investment via reverse auctions and its development bank, BNDES, is playing a significant role.

- South Korea, and India have all of the key climate policies in place, bar a green investment bank. However, some of these are at the provincial or state-level only, with federal policy often not exhibiting the same level of 'TLC.' They also have only submitted national emissions targets to the Copenhagen Accord, and these are not legally binding, limiting the ability to enforce them.
- Spain, Sweden, New Jersey and Australia lack a Green Bank and either lack a Feed-in Tariff or have negatively revised them. As discussed in our Fit Feature box following, the Canadian province of Ontario faces uncertainty around its FIT and this will need resolution following the upcoming election.
- Indonesia, Norway, Mexico and Texas have a mixture of more than two policies absent, and all but Norway have only non-binding emissions targets at the Copenhagen Accord level.
- The US, South Africa, the UAE and Russia generally have fewer national-level policies or are in the process of reversing them.

3. Policy Momentum in the CEM indicates continued growth in 2010/2011

Commitments to tackle climate change and reduce emissions continue to be noticeably different by region and country. Asia and Europe continue to experience the greatest momentum, while the US has yet to adopt federal emission reduction targets and standards.

Historically, we have tracked the momentum or frequency of climate policy announcements – emission targets, mandates and supporting policies - since June 2008. In our last Tracker publication, "Global Climate Change Policy Tracker – The Green Economy; The Race is On," (March, 2010) we published momentum results which depicted binding legislation, aspirations and policy proposals for countries globally. Momentum surrounding these policy types continues to be significant, and we believe that it is useful to continue focusing on the core fundamental legislation moving key climate change markets.

Therefore, we focus on the momentum in binding and accountable climate policies (which while not legally binding, are significant statements of intended action) for the CEM countries and the EU Bloc. We also simulated the impact of policies from three clean energy leading US states (California, New Jersey and Texas) on US emissions.

We started capturing the momentum of climate policies in June 2008; in that time the number of global climate policy initiatives announced has increased substantially. We have **390** binding and accountable policies in our database overall, with 263 of these since June, 2008.

We have mapped out below the cumulative number of announcements by type for the CEM from December 2008-April 2011, classifying policies as positive, neutral and negative, and thereby determining the net effect. Investors can use these charts to understand the "policy momentum" in the climate change sector, noting that governments have increased their commitment to supporting this area. Once again, we group policies into mandates, emissions targets and supporting policy mechanisms.

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**Cumulative Net Binding & Accountable climate policies for CEM countries, EU government and Major US States
December 2008 – April 2011**

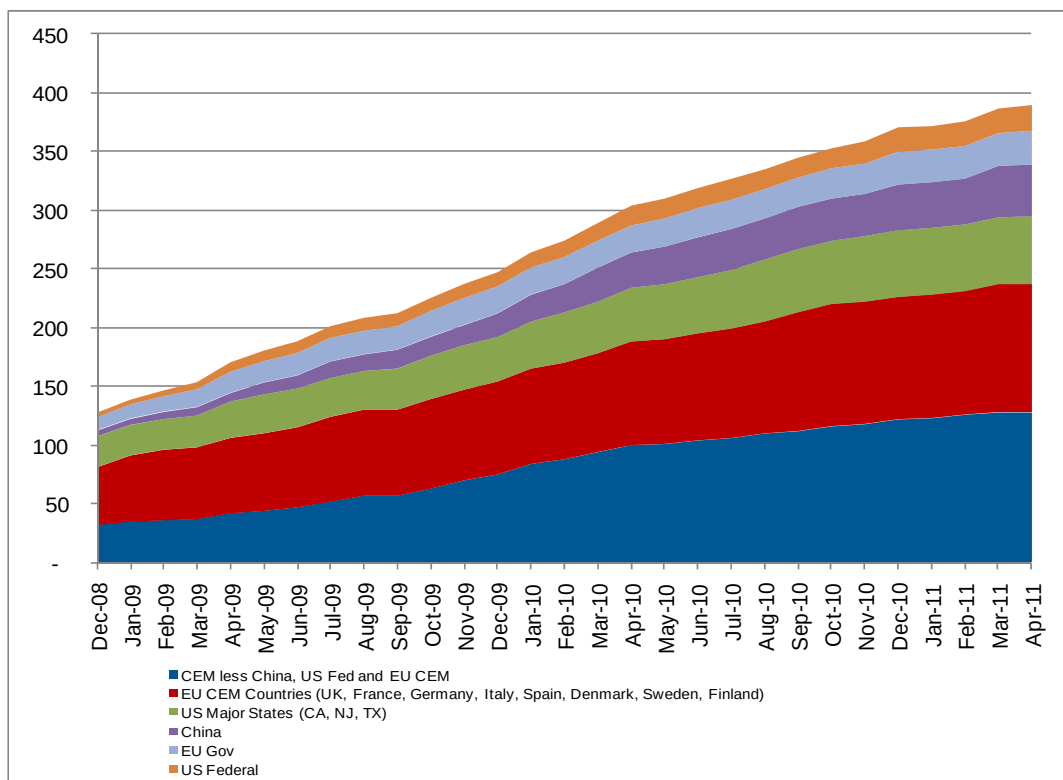


Table 2: Total Net and Cumulative Binding & Accountable climate policies for CEM countries, EU government and major US States 2010-2011

NET Totals	Mandates	Emission Targets	Supporting Policy	Total CEM Policies
December 2009	2	2	6	10
January 2010	5	5	7	17
February 2010	0	0	10	10
March 2010	2	0	10	12
April 2010	4	0	10	14
May 2010	5	1	3	9
June 2010	3	1	6	10
July 2010	0	0	8	8
August 2010	2	0	6	8
September 2010	3	1	6	10
October 2010	1	0	7	8
November 2010	0	1	5	6
December 2010	9	0	3	12
January 2011	0	0	1	1
February 2011	1	0	3	4
March 2011	2	1	8	11

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April 2011	0	0	3	3
Cumulative Numbers	Mandates	Emission Targets	Supporting Policy	Total CEM Policies
December 2009	84	44	119	247
January 2010	89	49	126	264
February 2010	89	49	136	274
March 2010	91	49	146	286
April 2010	95	49	156	300
May 2010	100	50	159	309
June 2010	103	51	165	319
July 2010	103	51	173	327
August 2010	105	51	179	335
September 2010	108	52	185	345
October 2010	109	52	192	353
November 2010	109	53	197	359
December 2010	118	53	200	371
January 2011	118	53	201	372
February 2011	119	53	204	376
March 2011	121	54	212	387
April 2011	121	54	215	390

As noted in our March 2010 tracker, commitments to reduce emissions were largely introduced towards the end of 2009 and into the beginning of 2010, driven by international negotiations and the resulting Copenhagen Accord, which requested countries to submit voluntary targets by January 31, 2010.

Since March 2010 the number of announced mandate and emission targets has stabilized: 30 mandate and 5 emission target policies. In contrast to this stabilization in announced emission targets and mandates, supporting policy mechanisms such as feed-in tariffs, tax incentives, direct public funding have continued to pick up pace with 69 such policies tracked in the past year alone for the CEM nations and key US states. Such policies bolster mandated markets and provide direct spending measures for emerging climate policies.

The start of 2011 has seen a drop off in policy announcements. Due to the relatively brief history of our database it is unclear whether this is the start of a clear downward trend for the whole of 2011 or whether such a trough in announcements is just a normal common trend for the first quarter. However, it is likely that policy is maturing at this time in the more developed countries, a trend that is captured by measuring only CEM countries (which tend to be more developed), although there still remains positive momentum worldwide - particularly in Asia.

Looking at the cumulative effect of policy since we started collecting data for the CEM, we have captured a net total of:

- 54 Emission Targets (36 of these since June 2008)
- 121 Mandates (80 of these since June 2008)
- 215 Supporting Policies (199 of these since June 2008)

The EU, the US via its States, and China comprise the lion's share of the total policies (emission targets, mandates and supporting policies) collected in the momentum database:

- EU – The EU is still the leader in climate change policy action, with the EU Bloc and EU CEM countries (France, Italy, Germany, UK, Denmark, Sweden, Finland, Spain) comprising **35.4%** of the total policies (mandates, emission targets and supporting policies) collected since June, 2008. The EU's call for an emissions reduction of 80% by 2050 from

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1990 levels represents the magnitude of its commitment, and throughout 2011 so far there has been increased rhetoric around an increase to the EU's 2020 emission target to 30% from 20%. A vote on this proposal in the Parliament was defeated in July, 2011, but discussions will still continue. The EU also launched an ambitious new energy efficiency directive in June, 2011, aimed at forcing businesses to cut the amount of energy they waste by 2020.

- Individual CEM EU countries (France, Italy, Germany, Denmark, Sweden, UK and Finland) comprise 28% of the total count with a high number of supporting policies.
- US – Policies from the US, including both federal policies and policies from California, New Jersey and Texas, represent 21% of the total 390 policies in the database. It is important to note that there are only 22 US federal policies in the momentum database, compared with 58 policies for the 3 US states captured. This confirms that the US continues to rely on a state-level policy approach to mitigate climate change. At the federal level, the US still lags China, Germany and other European countries.
- China – China comprises 11% of the total count. The number of national policies in China is twice that of the US at the federal level. China is a strong emerging leader in mitigation policy with significant weight and magnitude to its policies. China's 12th FYP has provided the legislative and investment support needed to drive rapid change in the country's power industry through 2015.
- The BRIC countries (Brazil, Russia, India and China) constitute 20% of the overall policy total.
- These trends are reflected in many of the best-in-class rankings shown previously.

4. Key Policy Developments 2010-2011

Throughout 2010 and during 2011 so far we have tracked some key positive, neutral and negative developments in climate and energy policy in the Clean Energy Ministerial countries as summarized in Tables 3, 4 and 5 below.

Table 3: Key positive climate policy developments in CEM countries 2010-2011

Country	Climate Policies and Actions
Brazil	Brazil's Ministry of Mines and Energy approved a new 2010-2019 Decennial Plan for Energy expansion in December, 2010. The plan calls for installed capacity targets of 116.7 GW hydro by 2019; 7 GW small hydro by 2019; 8.5 GW biomass by 2019; and 6 GW wind by 2019.
China	With the introduction of China's 12 th Five Year Plan in March, 2011 there were many strong and expanded policy initiatives and green targets. 33.3% of the targets contained in the 12 th FYP address resource or environmental objectives compared to 27.2% in the previous 11 th FYP. The plan also includes pilot cap-and-trade schemes. The plan establishes goals for 2015, in addition to many of the 2020 targets already announced. The 12 th FYP creates a broad range of climate change-related investment opportunities for equipment and service companies in the renewable sectors and low-carbon transportation sector and project finance activity in the several areas of renewable power farm development. The continued trend toward higher energy efficiency also creates investment opportunities in the hardware, software and services areas.
Finland	In September, 2010 Finland adopted FiTs with fixed prices for wind and biogas. The tariffs came into force on January 1, 2011 and will last for 12 years.
India	India proposed a National Clean Energy Fund in 2010 which would be constituted through tax levied on coal usage in the country. In April, 2011 the CCEA approved the fund in the public account of India. The National Clean Energy Fund will be used for funding research and innovative projects in clean energy technologies.

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Japan	In June, 2010 Japan initiated its Basic Energy Plan laying out the country's energy strategy towards 2030. The document represented the most significant statement of Japanese energy policy in over 4 years since the publication of the New National Energy Strategy in 2006. The plan laid out some ambitious targets including a doubling of Japan's 'energy independence ratio' and a doubling of the % of electricity generated from renewable and nuclear power. However, it remains to be seen how the targets for nuclear and renewable energy will play out given the nuclear crisis in Japan emanating from the earthquake and tsunami in March, 2011. It is uncertain to what extent Japan will scale back its reliance on nuclear power, and how much of the "capacity gap" will come from renewables.
Japan	In April 2010 Japan announced that it will maintain rates for solar power in the year starting 1 April as in November 2009. The incentives were introduced originally in November, 2009. Furthermore in March, 2011 Japan raised the FiT rates paid for surplus solar power produced by businesses and schools by 67% for the year April 1, 2011 (binding). In the wake of Japan's nuclear disaster the civil society has suggested expanding the countries limited FiT to include geothermal energy
Mexico	In April 2011, Mexico unveiled a 15-year energy plan mandating that the country should derive 35% of its power from clean technologies by 2024 (including nuclear), building on an existing 7.6% renewable target for 2012. The Senate Energy Commission adopted the plan on condition that 3 year checks be made on progress towards the target. There are also ongoing efforts to adopt a package of fuel economy and emission standards in Mexico.
South Africa	In South Africa a national policy process is underway to adopt legislation, regulation, economic instruments and sector strategies relating to renewable energy. A carbon tax on non renewable sources has already been enacted as well as a carbon tax on passenger vehicles at the point of sale.
South Korea	In October, 2010 South Korea announced that it will spend \$36 billion in Renewable Energy by 2015 with the ambition of becoming a Top 5 renewable energy producer. The country unveiled a bold plan to foster the solar industry injecting KRW3 trillion into R&D activities; KRW1.5 trillion into developing 10 fundamental technologies including next-generation solar cells; KRW1 trillion into developing 8 major components, materials and equipment; and KRW500 billion into establishing test beds to support small and medium-sized businesses. The country also created a KRW100 billion win-win guarantee fund dedicated to renewable energy.
United Kingdom	The UK is pressing ahead with its Green Investment Bank plans, conducting a detailed Electricity Market Review and rationalizing FiTs to support the renewable industry.
United Kingdom	In May, 2011 the UK set its fourth carbon budget for 2027 stating that it plans to reduce GHG emissions by 50% by 2027. It aims to limit emissions of CO2 to 1950 million tons for five years from 2023-2027 – keeping on track to reduce emissions by 60% by 2030.
United Kingdom	In March, 2011 the UK announced a minimum price to power producers for emitting CO2 to be set at ~£16/metric ton from April 2013 rising to £30 by 2020. The UK also tripled the budget for its Green Investment Bank and permitted the bank to raise its own funds.
United Kingdom	In June, 2010 the UK announced the Green Deal, a new program to give financial support to over 14 million homes to improve energy efficiency by installing insulation.
United Kingdom	In June, 2011 the UK unveiled an integrated plan for Anaerobic Digestion (AD) – the Anaerobic Digestion Strategy and Action Plan. This marks a shift in attention towards energy-from-waste and highlights the potential for AD to develop into a £2 billion industry.
United Kingdom	In June, 2011 as part of the government's fast-track review of feed-in tariff levels the rates for anaerobic digestion were increased for installations less than 250 kW to 14p/kWh and to 13p/kWh for projects 250-500 kWh.

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United States	Despite Republican opposition, EPA continued with its mandate to regulate air pollutants in 2010/2011. The EPA has required large power plants to evaluate and install best available control technologies (BACT). Additionally, the EPA is developing maximum available control technology standards for Hazardous Air Pollutants (HAP MACT), with significant implications for high carbon / polluting energy technologies in the US. In addition to BACT and HAP MACT regulations, the EPA is mandated to regulate GHGs under the Clean Air Act. It is currently developing a specific level of emissions reduction, although Congressional push-back may also inhibit the level of reduction.
United States	Treasury Cash Grants in the US were extended for one year with the tax extenders bill ("Tax Relief, Unemployment Insurance Reauthorization and Job Creation Act of 2010") in December 2010. Grant now runs through the end of 2011 for all projects completed or that have commenced construction prior to December 31, 2011
United States	The US DOE Loan Guarantee Program's 1703 and 1705 faced a lot of criticism in 2010 and 2011 due to slow processing of applications and a lack of disbursement of allocated funds. In March and April 2011 US budget discussions, funding for the LGPs was very nearly re-allocated to other programs, but the program survived the negotiations intact and will run until its intended expiry in September, 2011.
United States – California	California's Prop23, which would have suspended the California's Global Warming Solutions Act (AB32) was defeated in the US mid-term elections in November, 2010.
United States - California	In September, 2010 the California Air Resources Board unanimously adopted the Renewable Electricity Standard to require a 33% by 2020 renewable energy procurement mandate for retail sellers in California. In April, 2011 California's governor Jerry Brown signed a law mandating that utilities obtain the 33% of power from renewables, making the mandate harder to challenge.
United States – New Jersey	SB 2036 was enacted in August, 2010 creating the US's first resource carve-out for offshore wind. The basic requirement is that the New Jersey Board of Public Utilities develop a % based standard for offshore wind to support 1,100 MW of new offshore capacity.
United States – Texas	The Texas PUC announced in August, 2010 that it adopted stricter requirements for energy efficiency which require that utilities offset 25% of growth in demand with energy efficiency measures by 2012 and 30% by 2013.

Table 4: Key neutral climate policy developments in CEM countries 2010-2011

Country	Climate Policies and Actions
Italy	In July, 2010 Italy's government introduced legislation that will cut FiTs for solar PV plants. The cuts were expected to be 6% every four months starting from 2011. In March, 2011 Italy released a decree on renewable energy setting no limit for solar power projects, leaving in place regulations and incentives for 3 months. In May, 2011 the Council of Ministers signed a bill that progressively reduces FiT rates for solar PV. The decree provided certainty to the solar industry and defines a sustainable progressive reduction in subsidies until January, 2013. The FiT scheme for solar PVs will start to slowly decrease each month, starting in June, 2011. The revision is in line with industry costs and demand is still seen as robust in Italy.
France	In January, 2011 new FiTs for biomass came into force in France. These apply to vegetable and animal agricultural waste, algae and some industrial biomass waste. Furthermore in March, 2011 France adjusted its FiT for solar PV – which had been one of the highest in the world. The support framework is now structured along two main systems: a FiT adjusted every trimester for building installations no larger than 100 kW and ground-mounted projects. In May, 2011 France increased its tariff for biogas by 20%.
Germany	In July, 2010 Germany came to a compromise decision between its two parliamentary houses relating to solar FiT cuts. The compromise would see cuts implemented in two stages, July and October 2011. However due to a weakened demand and the pull forward effects of the systems installed preemptively in 2010, less than 1 GW has been installed between March and May 2011 resulting in speculation that in fact the government will not go ahead with the July, 2011 cut. Demand is still robust in Germany.

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United Kingdom	In June, 2011 the UK government announced the outcome of its fast-track review of FiT levels. From August 1, 2011 FiTs for solar PV installations over 50 kW will be cut to 19p/kWh, those over 150 kW to 15p/kWh and those 250 kW to 5 MW to 8.5p/kWh. For installations of 50-100 kWh the new FiT represents a cut of over 42%, while for the largest developments and stand-alone installations the change will bring a cut of over 72% on current levels. The government maintains that the number of planned large-scale solar developments could have overwhelmed the scheme and that cuts are in line with expectations.
United States	The Regional Greenhouse Gas Initiative (RGGI) has 10 member states in the North-East and Mid-Atlantic US: Rhode Island, New Hampshire, Massachusetts, New Jersey, New York, Connecticut, Delaware, Maryland, Vermont, Maine. The initiative has faced some bumps this year, although no state has actually withdrawn yet. New Hampshire was very close to withdrawing from the RGGI, with several state votes this year, although the vote ultimately failed. New Jersey's governor announced in May he'd withdraw his state from the Initiative by the end of this year, although this has not occurred yet. And in June a suit was filed against New York for its membership to the Initiative, with the plaintiff claiming the state did not consult the state legislator, making membership illegal - however, this lawsuit is in very early stages.

Table 5: Key negative climate policy developments in CEM countries 2010-2011

Country	Climate Policies and Actions
Canada	In November, 2010 Canada's government defeated C-311, the Climate Change Accountability Act which had called for a 25% cut in GHG emissions from 1990 levels by 2020. Prime Minister Stephen Harper labeled the bill 'irresponsible' and maintained that Canada should stay in its position of trying to harmonize its 2020 target with the US. Additionally, Canada's \$1.5 billion ecoEnergy for Renewable Power programme ran out of money in 2010, two years ahead of schedule.
France	In September, 2009 French President Nicolas Sarkozy unveiled plans for a carbon tax to be levied on fossil fuels that do not fall under the EU ETS. The plan faced significant opposition and in December, 2009 France's Constitutional Council denied the approval of the tax which had been planned to go into effect on January 1, 2010. In February, 2010 the government announced that it would work towards implementation of a direct carbon tax by July, 2010. However in March, 2010 France's highest court struck down the bill.
South Korea	South Korea announced in December, 2010 that it will not present emission trading laws to the Parliament until February, 2011. In February, 2011 the country delayed any action on emissions trading until 2015 amidst opposition from industry.
Spain	In December, 2010 Spain's government implemented retroactive FiT cuts for solar PV schemes. According to the country's Deputy Industry Minister the cuts are necessary to grant the Government leeway in keeping consumer energy prices at a moderate level. A 30% reduction in the revenue that solar projects can earn will be in effect for the next three years. Retroactive cuts are considered unacceptable to the long-term viability of a FiT program.
UNFCCC	Despite a continued push for a global climate compact, Cancun and Bangkok UNFCCC meetings have not been fruitful and any hope of such a pact in 2011 has now faded. A UN negotiation fatigue has not yet dissipated, despite partial success in Cancun – in which agreement was reached to address the contentious issues such as the legal status of a follow up agreement to the Kyoto Protocol.
United States	A federal climate policy is looking increasingly unlikely. No federal bills have made it out of the House or the Senate in 2010 or 2011.
United States	The US fell back on plans to enact renewable energy legislation at the federal level. Several proposals were put forward over the past year, but none managed to pass the Senate. Now talk has shifted to a Diverse Energy Standard (including nuclear, clean coal and maybe gas) but no concrete action has been made on this so far in 2011.
United States	The US's 30% Advanced Energy Manufacturing Tax Credit for investments in advanced clean energy manufacturing was allowed to expire at the end of 2010 and was not extended.

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United States	The PTC/ITC tax credits for renewable energy continue, but no extensions are yet under consideration for wind PTC which expires at the end of 2012 (other technologies PTC's expire at the end of 2013) - given long lead time for wind projects, this is expected to slow down wind project development in the US.
United States – State level action	Multiple state Renewable Portfolio Standards have come under attack in 2011 in State legislatures. An attempt to eliminate Colorado's RPS failed, but bills to eliminate the programs have been put forward in Missouri, Montana and Minnesota, although none have yet succeeded.

Special Focus: Feed-in Tariffs – Still the incentive of choice in 2011

Feed-in tariffs continue to be the driving force behind many renewable energy deployments globally, and are an effective policy tool for catalyzing the large investment flows needed to achieve 2020 emission and clean energy targets. The EU continues to dominate the FiT market in creating the transparency, certainty and longevity needed to attract sustainable capital investment, although momentum is spreading to Asia, Canadian provinces and some US states.

Over the course of 2010 and 2011 so far there have been fewer new FiT policies in the EU, which is to be expected given 80% of member states already have FiT systems in place. Instead, many European countries have adjusted their FiTs to reflect degression schedules, driven by declining costs and increasing capacity. Such tariff reviews have become the norm and are understandable from a societal cost/benefit perspective; ultimately, such tariff adjustments are a sign that FiT policies are successful at driving down costs. Since March, 2010 we have tracked 4 downward FiT rate revisions that are binding or accountable, but we have classified these as Neutral, as the countries – UK, Italy, France and Germany - still have tariff structures that will generate future investments.

A key negative change in 2010 came when Spain's government ratified a Royal Decree to retroactively cut solar FiTs. The cut has resulted in extreme policy risk in Spain, creating lack of certainty and longevity, and has been challenged in court by project developers and investors.

China has become the first jurisdiction outside of Europe to implement wind energy tariffs differentiated by geographic location, as it prepares to meet its ambitious wind installed capacity target of 150 GW by 2020. Additionally, China is already implementing FiTs for solar PV projects at the individual provincial level and is considering expansion of the FiT system nationally to incorporate solar PV and offshore wind.

Current state-level FiTs in the US are unlikely to drive significant market growth. To date, low tariff rates in California and Maine have failed to drive development, where as policies in Vermont and Oregon are both capped. There are active interest groups in the US urging adoption of European style FiT policies at the state level. Although ~16 states have considered FiT legislation, only Vermont has implemented a program with rates based on generation costs.

In Canada, the key FiT in place has been the province of Ontario. There has been mounting evidence that the inter-connect to the grid has been a challenge and more recently, a clause in FiT contracts that allows the government to revoke the contract unless a notice to proceed has been received has been discussed as being potentially used. Importantly, the election in Ontario also looms in October, with the Conservative opposition questioning the long term viability of the FiT regime.

Similarly to the US and Canada, Australia also has state-level FiTs. These have been primarily targeted at small-scale solar PV installations, and there were incentive systems in place in eight states or territories during the first half of 2010. However, in response to a surge in installations and budgetary constraints the government of New South Wales recently canceled its small-scale solar FiT and retroactively reduced the rate – other Australian states and territories are also

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reviewing their FiTs with a view to limiting costs, and South Australia's FiT is due to expire later this year.

Outside of the CEM, there has been an increasing number of countries around the world that have been turning to FiTs as the best incentive structure to support renewable growth. Turkey implemented a FiT scheme in January, 2011 and Ecuador adopted a system of FiTs in April, 2011 along with Malaysia and Uganda. Botswana and the Philippines are both expected to adopt systems in 2011.

Key Policy Proposals

In addition to binding and accountable changes over the past 18 months, it is also useful from an investors perspective to assess upcoming proposals likely to influence renewable markets. Table 6 looks at some of the key proposals currently on the table in the CEM nations.

Table 6: Key positive climate policy proposals in CEM countries 2010-2011

Country	Positive/Negative	Climate Policies and Actions
Australia	Positive	Australia did not pass its Carbon Pollution Reduction Scheme in 2010, proposed by the former Rudd Government. The government is now hoping to price carbon during 2012 via a carbon tax although there is much backlash to the proposal. In May, 2011 Australia's Climate Change Minister said that the government will finalize its emission reduction package by the summer. If no scheme is passed at all, this could have implications for emissions reductions potential in Australia and the momentum of climate policy in the region. In July, 2011 Prime Minister Julia Gillard revealed the long-awaited climate policy. The climate tax will rise by 2.5% a year before moving to a market-based trading scheme in 2015. With the details now released, voters need to be convinced of the plan ahead of a parliamentary vote.
European Union	Positive	The current EU target to reduce emissions is 20% by 2020 from 1990 levels. There is increasing pressure on the European Union to increase this to 30% by 2020 from 1990 levels in the interests of strengthening Europe's economic future, boosting jobs and providing greater certainty and predictability for investors. Members of the European Parliament voted against proposals to make further cuts in GHG emissions in July, 2011. It remains to be seen how this will develop in 2011/2012.
European Union	Positive	In June, 2011 the EU released a new directive on energy efficiency and services. The European Commission proposed a new set of measures for increased energy efficiency to help meet the bloc's 2020 energy consumption target. The proposal for the energy efficiency directive brings forward measures to step up Member States' efforts to use energy more efficiently at all stages of the energy chain. The Commission proposes simple but ambitious measures: Legal obligations to establish energy saving schemes in all Member States; the Public sector to lead by example; and Major Energy savings for consumers.
South Africa	Positive	South Africa approved a draft policy for public consultation on a carbon tax. The policy proposes three pricing mechanisms for consideration: a direct tax on GHG emissions from industrial sources; a fuel tax based on the carbon content of the fuel; and a tax that could be applied to emitters where fuel is burnt.
South Africa	Negative	In March, 2011 South Africa announced that it is planning to reduce FiTs for renewable energy by as much as 40%.
United States	Positive	In October, 2010 the Obama administration proposed fuel efficiency standards for large vehicles. The initiative is expected to be finalized in mid-2011. The US loan guarantees for clean energy projects were left unscathed in the budget cuts in April, 2011.
United States	Positive	In May, 2010 California announced that it plans to double GHG emission cuts and fuel efficiency gains in a new round of regulation for vehicles for the 2017-2025 period.

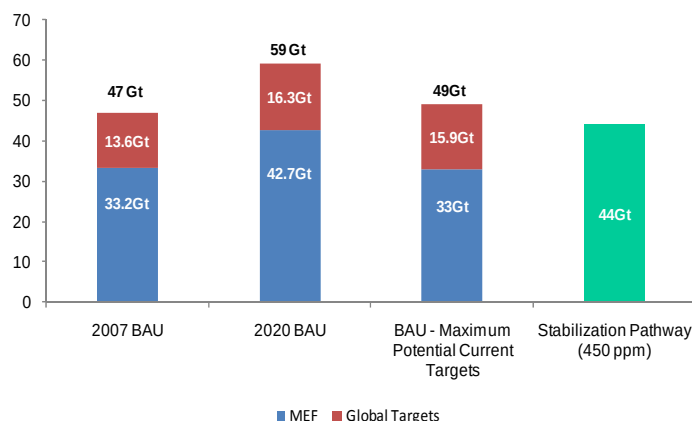
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5. July 2011 Tracker Model Results for Emission Abatement

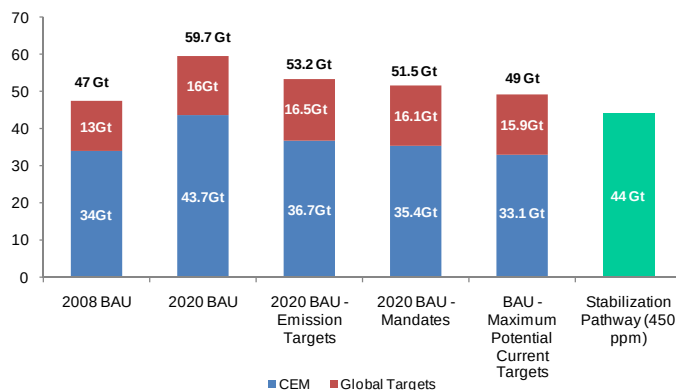
We now turn to modeling the abatement potential of the emission targets and mandates. Below we compare the aggregate impact of policies on global emissions from March 2010 and July 2011. The two simulation results differ that the database has expanded, the model has been updated since March 2010 (see Appendix for new model methodology), and the model now uses more recent projected growth rates and energy data.

Projected business-as-usual emissions in 2020 have increased since the March 2010 simulation by almost 1 Gt. The trajectory of maximum potential abatement, obtained by choosing the set of policies (emissions reduction targets or mandates) that has the greatest impact for each individual country, leads to global emissions of 49Gt in both March 2010 and July 2011. Globally, the projected impact of mandate policies in July 2011 is almost 2Gt greater than that of emissions target policies; emissions are higher when applying emissions reduction policies for non CEM countries than in BAU because emissions targets can exceed projected emissions (also known as hot air).

The 2020 estimated outcome March 2010 Model



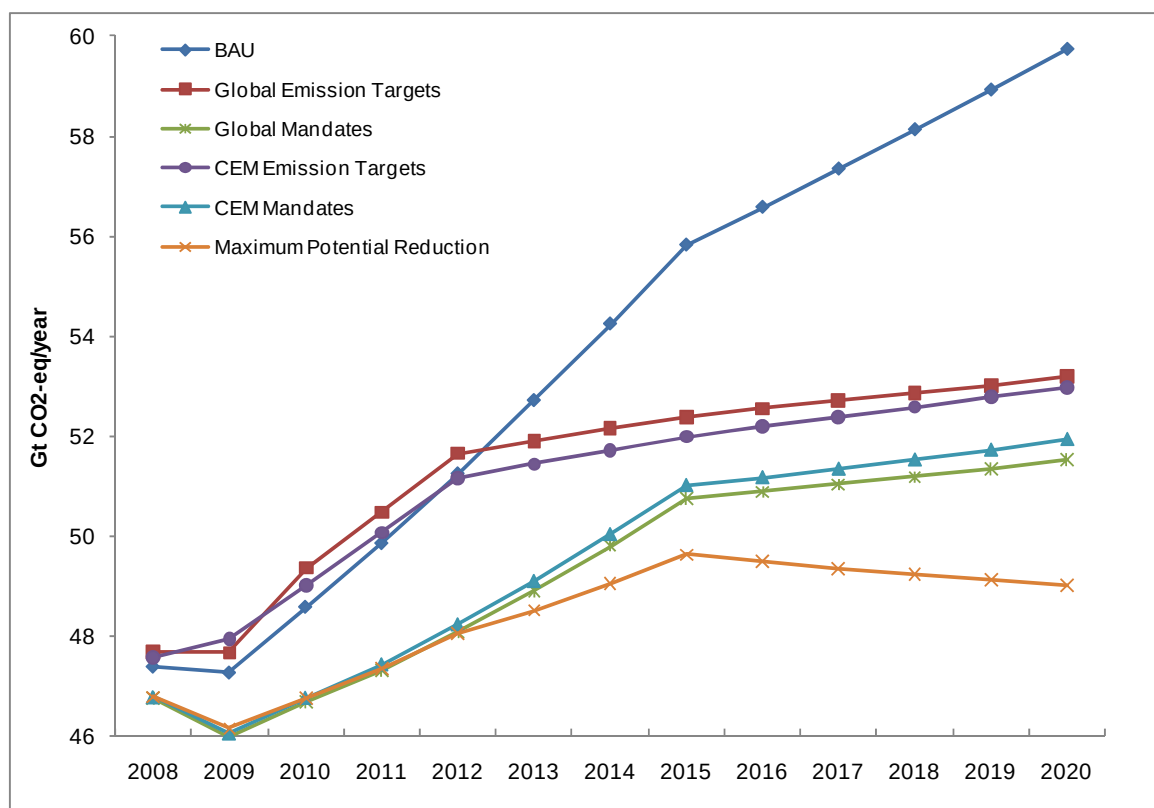
The 2020 estimated outcome June 2011 Model



Global impact of climate change policy targets through April 2011

The modeled global emissions pathway under business-as-usual (BAU) is compared with those assuming full compliance of policies for CEM countries and for the entire world. While either set of target policies reduces emissions considerably, both lead to emission exceeding the stabilization levels of 44Gt/y in 2020.

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Source: CCC, DBCCA analysis 2011. Results consist of targets included in October 2009 Tracker through April 2011.

* Range of 450 ppm pathways – Recent analyses (The Emissions Gap Report, UNEP (2010), p.10) propose 39-44 Gt/y level as the 2020 target for stabilization (UNEP, 2011).

Summary of quantitative results:

- Two model runs were carried out: 1) a global run including all country mandates and emission targets, including state and provincial targets where applicable, and 2) a CEM run where only the federal policies of the CEM nations were modeled.
- At a global level, we modeled 364 emission targets and mandates, of which 41 are new since March 2010.
- BAU emissions start at ~47 Gt in 2008 and following a fall in 2009, rise steadily to 2015 when the world aggregate growth rate weakens slightly. Emissions in 2020 are almost 60Gt. When we last ran the model in March 2010, BAU was more like 59GT, so revisions to emerging market economies in particular are still driving up the problem.
- Emissions targets on their own, if fully achieved, would reduce emissions by ~6.8 Gt in 2020 from BAU levels.
- Mandate targets on their own, if fully achieved, would reduce emissions by ~8.5 Gt in 2020 from BAU levels.
- The emissions trajectory assuming **maximum potential abatement of world policy targets is ~49 Gt**; thus this strongest combination of mandates and emission targets would reduce emissions by ~10.7 Gt.
- Projected emissions under the new maximum potential abatement still **exceed the stabilization pathway of 450 ppm by ~5 Gt**. Existing policies thus still fail to close the gap in reducing emissions. In our previous models maximum potential saved around 10 Gt, but also exceeded the stabilization pathway by ~5 Gt as BAU was lower. Thus 41 new policies when combined with all other revisions have not closed the gap any further.
- When only CEM countries' emission targets are considered (and only looking at federal policies), the abatement is 6.7 Gt in 2020. When only CEM countries' mandates are considered (and only looking at federal policies), the abatement level is 7.8 Gt in 2020.

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Policies carrying the highest potential abatement by 2020 used in maximum potential calculations:

- The highest potential abatement in the model through 2020 comes from China's energy intensity mandate policy with ~3.3 Gt abatement potential.
- Brazil's deforestation reduction target carries the second highest abatement in the maximum potential pathway.
- The US Administration's 17% emission reduction target would lead to the third largest reduction. This policy was the submission to the Copenhagen Accord, and was consequently modeled as an accountable policy.

Table 7: Largest targets by abatement in the Maximum Potential scenario (Mt, 2020)

Country	Policy	Abatement Potential by 2020 (Mt)	Policy Type
China	Reduce energy intensity by 20% from 2005 levels by 2010 and 18% reduction from 2010 levels by 2015	3330	Mandate
Brazil	80% reduction in deforestation by 2020 compared to 2006 levels	1098	Mandate
United States	17% reduction in GHG emissions from 2005 by 2020	1060	Emission Target
Total Abatement Potential		5488	

The next top 10 targets by abatement potential in the maximum potential calculation are shown in Table 8. All the countries shown are in the CEM.

- After the top 3 targets by abatement in the model, the next 10 targets contribute ~4 Gt of abatement potential by 2020 in the maximum potential calculation.
- From Tables 7 and 8 it can be seen that Mandate target policies dominate the maximum abatement potential pathway.
- The top 15 policies in the model in terms of abatement potential in the maximum potential scenario come from CEM countries.
- The European Union's targets are important in reducing emissions: the sum of the bloc's mandate policies represents 1.2Gt in abatement potential.
- China's individual technology-specific targets for renewables by 2020 carry a combined ~570 Mt abatement potential. At the country level, as Table 9 shows, China dominates overall abatement potential in the maximum potential pathway, followed by the European Union, Brazil and the US.

Table 8: Significant other targets by abatement potential used in the maximum potential calculation (Mt, 2020)

Country	Policy	Abatement Potential by 2020 (Mt)	Policy Type
Indonesia	26% reduction in emissions from BAU in 2020	885	Emission Target
Russia	40% reduction in energy intensity per unit of GDP from 2007 levels by 2020	523	Mandate
European Union	20% primary energy from renewables by 2020	493	Mandate
European Union	20% reduction in primary energy consumption through energy efficiency by 2020	425	Mandate
Japan	25% reduction in emissions from 1990 levels by 2020	383	Emission Target
China	70 GW installed capacity of wind by 2015, 100-150 GW by 2020	284	Mandate
China	15% of primary energy consumption to come from renewables by 2020	283	Mandate
Mexico	30% reduction in emissions from BAU in 2020	266	Emission Target
China	30 GW biomass capacity by 2020	249	Mandate
European Union	12% primary energy from renewable by 2010	241	Mandate

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Table 9: Top 10 Countries by maximum abatement potential 2020 (Mt) (World Run – includes state-level policies)

Ranking	Country/Region	Maximum Abatement Potential 2020 (Mt)	Maximum Abatement Potential Target Type
1	China	4080	Mandates
2	European Union	1207	Mandates
3	Brazil	1136	Mandates
4	United States	1130	Emission Targets
5	Indonesia	885	Emission Targets
6	Russia	567	Mandates
7	Japan	383	Emission Targets
8	Canada	320	Emission Targets
9	Mexico	266	Emission Targets
10	South Africa	213	Emission Targets

In March 2010, emissions targets had greater abatement than in this study because of a reclassification of energy intensity as mandate targets instead of emissions. For example, China's energy intensity target through 2015 is classified as a mandate and it is accompanied by aggressive technology-specific renewable targets. (Note that the carbon intensity target for China by 2020 also carries significant abatement potential – 2.3Gt – but is lower than the energy intensity target). Since emission targets are often economy-wide, mandates offer tangible ways in which to realize the ambition to reduce GHG emissions. Therefore, a higher abatement potential attributed to mandates in the model can be interpreted as a positive outcome of energy policy.

India does not appear in the CEM top 10 country list for abatement potential or the World run, even though it has a carbon intensity reduction target of 25% by 2020 from 2005 levels. This apparently ambitious target has no impact in 2020 because India's GDP is projected to grow more than its emissions, leading to carbon intensity under BAU that is already more than 25% smaller than in 2005.

Table 10: European Union Top 5 Countries by Maximum Abatement Potential CEM Run 2020 (Mt)

Country/Region	Maximum Abatement Potential 2020 (Mt)	Maximum Abatement Potential Target Type
European Union	1220	Mandates
Germany	212	Mandates
United Kingdom	135	Mandates
France	101	Mandates
Sweden	67	Mandates
Spain	66	Mandates

- Table 10 shows the top 5 European Union Member States in the maximum potential calculation.
- Aside from the bloc dominating the abatement potential, Germany is a clear leader with almost 80 Mt more abatement potential in 2020 than the next highest abatement potential country, the UK.
- This table supports our best-in class ranking order of these European countries with Germany and the UK demonstrating clear leadership in setting ambitious climate policies.

Appendix I: Detailed Results by Country

Detailed model results of CEM countries

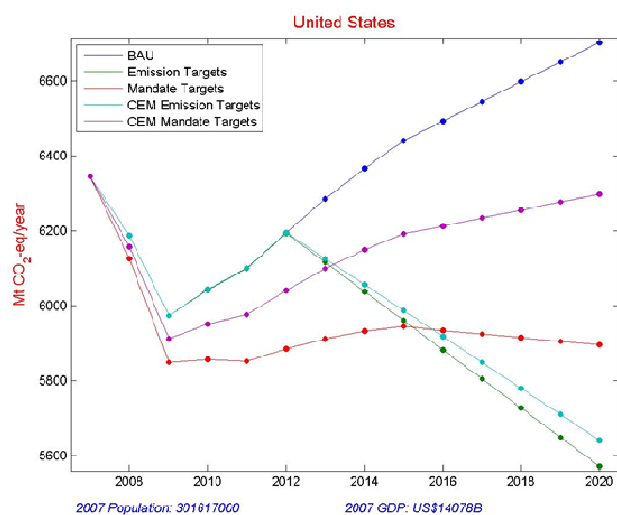
CEM Country	Base (Mt CO ₂ e)	No Policy BAU Emissions (Mt CO ₂ e)		Impact of Mandated Targets (Mt CO ₂ e)		Impact of Emissions Targets (Mt CO ₂)		GDP (purchasing power parity)	Capital Investment (\$mn) to Clean Energy
	2007	2012	2020	2012	2020	2012	2020	2010 (\$bn)	2000-2010
Australia	545	570	600	0	40	-10	120	900	9780
Brazil	2,350	2,460	2,600	0	1130	0	1060	2,190	42250
Canada	770	770	820	0	10	220	150	1,340	20480
China	8,090	11,210	15,410	0	4080	0	2250	9,870	148290
Denmark	610	560	570	0	10	0	0	200	4460
Finland	730	610	620	0	10	-10	-10	190	1670
France	500	500	510	0	100	-40	-40	2,160	16830
Germany	930	890	900	0	210	-50	180	2,960	39320
India	1,970	2,540	3,380	0	70	-80	-30	4,410	27050
Indonesia	3,160	3,230	3,400	0	0	0	890	1,030	1680
Italy	520	480	490	0	50	10	10	1,780	22520
Japan	1,350	1,260	1,250	0	140	150	380	4,340	13970
Mexico	740	740	890	0	10	120	270	1,560	4520
Norway	470	520	530	0	0	10	30	280	5770
Russia	1,960	2,020	2,250	0	570	-920	-110	2,230	640
South Africa	510	540	630	0	10	0	210	530	350
South Korea	630	700	750	0	120	0	210	1,470	3200
Spain	410	360	370	0	70	40	40	1,380	74900
Sweden	610	600	630	0	70	-10	-10	350	3840
UK	610	580	590	0	140	-50	120	2,190	38700
US	6,340	6,200	6,700	0	400	0	1060	14,720	164090
UAE	160	190	220	0	0	0	0	200	110
EU Bloc	4,810	4,580	4,700	0	1220	-570	270	-	-
CEM TOTAL (excluding EU Bloc)	33,970	37,530	44,110	0	7800	-600	6800	56,270	644400

Source: CCC, DBCCA Analysis, 2011. GDP data sources from CIA World Factbook, 2011. *All data is rounded to the nearest ten.

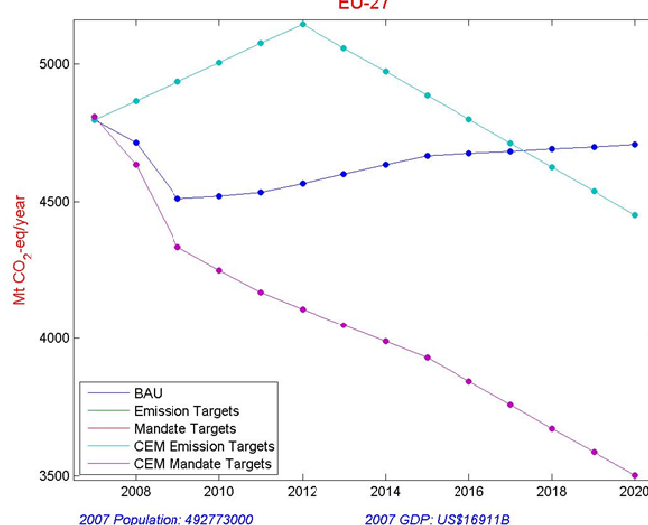
Appendix I: Detailed Results By Country

Regional emissions pathways

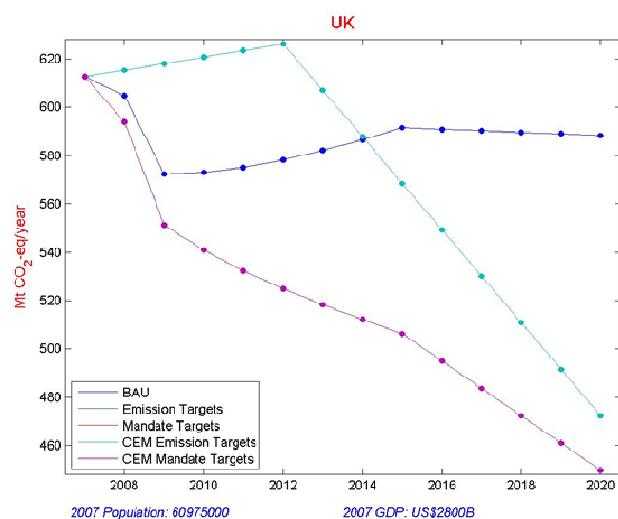
United States



EU-27



United Kingdom

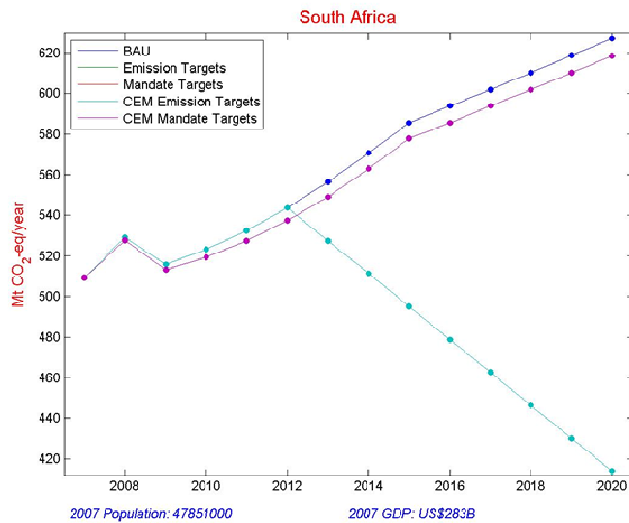


BAU emissions in the United States, the European Union and the United Kingdom reflect the economic recession in 2009; subsequently projected BAU emissions recover in the US, but remain below 2007 levels in the EU and UK. Shifts in the energy use of many EU countries led to lower BAU emissions than targeted for the Kyoto Protocol period, leading to 'hot air;' 2020 targets however exceed projected emissions. The ambitious US 2020 Copenhagen Accord pledge (green line) is not balanced by federal (purple) or total national mandate targets (cyan). In both the UK and the EU as a whole, the emissions reductions due to mandate targets (purple line) exceed those from emissions targets, indicating consistent a policy strategy.

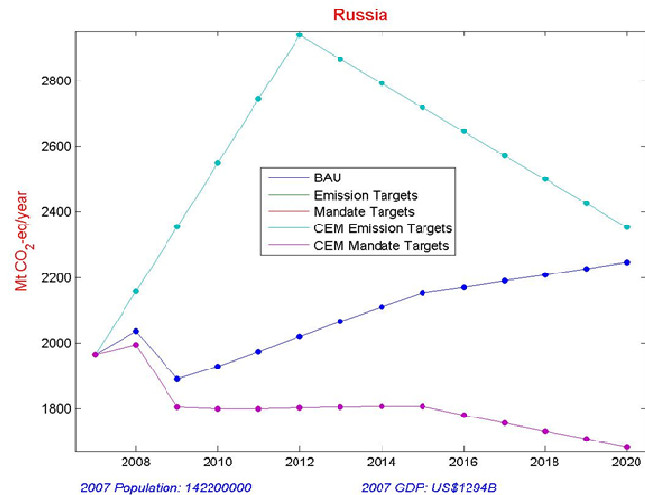
Source: CCC, DBCCA analysis 2011

Appendix I: Detailed Results By Country

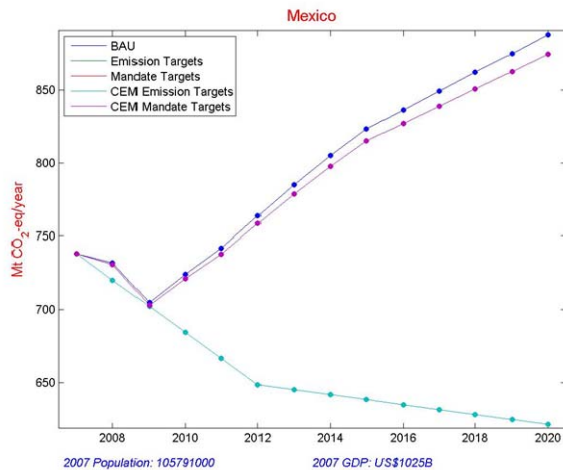
South Africa



Russia



Mexico



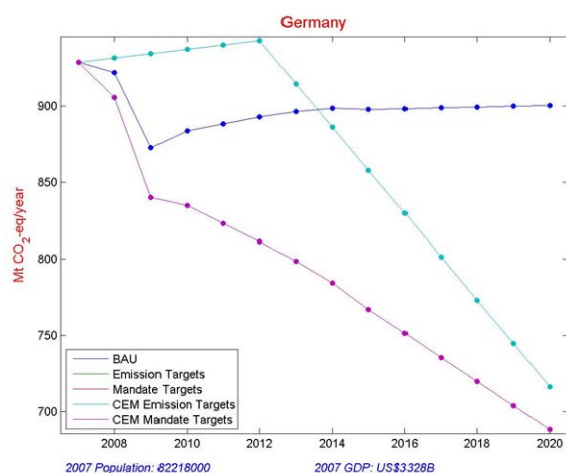
Discussion around these 3 countries

South Africa, Russia and Mexico all register a small decline in projected BAU emissions in 2009 associated with the economic recession, though emissions grow higher than in 2007, especially for South Africa and Mexico. Both Mexico and South Africa have ambitious emissions targets, while projected BAU 2020 emissions in Russia are lower than the policy target (hot air). By contrast Russia's aggressive energy intensity target leads to a significant decrease in projected emissions under the aggregate of mandate targets. In South Africa and Mexico, weak mandate targets have a very small impact on the projected emissions trajectory.

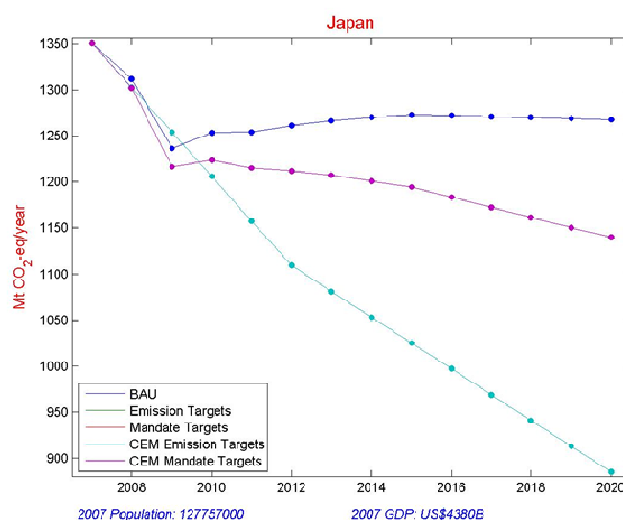
Source: CCC, DBCCA analysis 2011

Appendix I: Detailed Results By Country

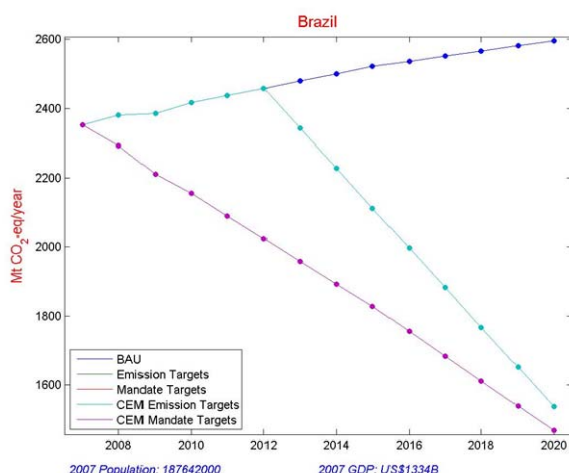
Germany



Japan



Brazil



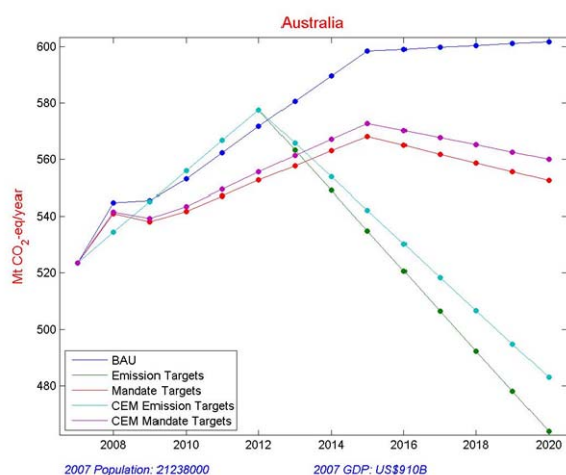
Discussion around these 3 countries

The projected BAU emissions of Germany and Japan fell in 2009 and remained at levels below those of 2007 until 2020. Brazil BAU emissions, by contrast, leveled off in 2009 and then continued to grow steadily. There is considerable coherence between reductions in projected 2020 emissions from emissions target policies and those from mandate targets in Germany and Brazil, while the potential abatement from Japan's mandate policies is less than half of that from its emissions target policies. Although Brazil has several installed capacity targets, the greatest abatement comes from the policy to reduce rates of deforestation. Germany's renewable power policies have the greatest impact, comparable in size to that of Japan's efficiency standard.

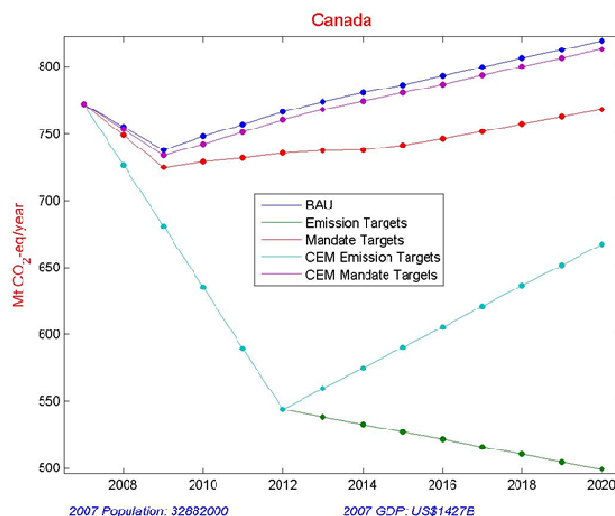
Source: CCC, DBCCA analysis 2011

Appendix I: Detailed Results By Country

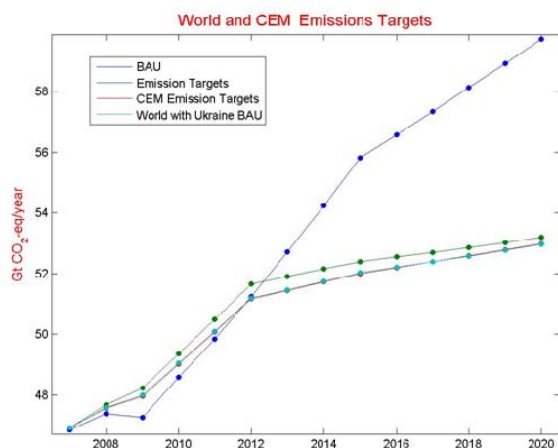
Australia



Canada



World and CEM Emission Targets



Canada and Australia, like the United States, have both federal and sub-national targets. While the impact of Australia's state-level targets complement that of the federal policies, the abatement of Canadian provincial policies, as in the case of state policies in the US, is similar in size or greater than that of federal policies. In both countries, the emissions target policies reduce emissions much more than mandate policies.

Projected world emissions that only consider emission target policies from Clean Energy Ministerial countries are lower than the emissions estimated using all emission target policies. This is due to hot air in a few countries. If we remove the emission target policies of the Ukraine and use instead their BAU, there is no mismatch (cyan line). Note that the cyan line (global run using Ukraine BAU) overplots the red line (CEM run).

Source: CCC, DBCCA analysis 2011

Appendix II: Energy Emissions Methodology

Energy Emissions Methodology

As the starting point for measuring the impact of the policies identified in this study, we have worked with researchers at the Columbia Climate Center of Columbia University's Earth Institute to calculate a Business-as-Usual scenario based on projected growth in energy demand, beginning with 2007 and 2008 data from the IEA (*Energy Balances* vol. 2009) and using the following key assumptions:

- Annual real GDP growth projections on a country-by-country basis for 2007-2015 (IMF *World Economic Outlook*, October 2010). Growth rates for 2016-2020 are not projected by the IMF, so for these years we use the average regional growth rates assumed by the IEA in its *World Energy Outlook 2010*.
- A global 1.5% annual decrease in energy intensity (measured as energy/RealGDP), which is equivalent to a 1.52% annual increase in energy productivity (RealGDP/energy). This reflects the assumption of autonomous efficiency improvement that is common in many energy-forecasting models (Lackner and Sachs, 2006). We have modeled this assumption slightly differently than McKinsey in its greenhouse gas mitigation cost curve, as they assume a 1.2% annual improvement in carbon productivity, or RealGDP/carbon (McKinsey Version 2 GHG Mitigation Cost Curve, 2009 p. 24). Given that we are modeling energy demand, it seems more accurate to assume an improvement in energy productivity, rather than carbon productivity.
- Energy data for the years 2007 and 2008 came directly from the IEA (*Energy Balances* 2010), while energy for the 2009-2020 period was based on a calculated projected growth in energy demand.

To illustrate this calculation, energy (measured as total primary energy supply) in France in 2020 is calculated as:

$$(\text{Energy}_{\text{France},2008}) \cdot (1 - 0.015)^{12} \cdot (1 + \text{GDPgrowth}_{\text{France},2009}) \cdot \dots \cdot (1 + \text{GDPgrowth}_{\text{France},2020})$$

Note that this approach to project future energy maintains the energy mix in business-as-usual. This implies growth in renewables at the same rate as the entire economy. This likely overestimates penetration of renewables and underestimates the impact of policies for increasing renewable energy.

Next, we estimate the corresponding CO₂ emissions using:

- The country-specific fuel mix from 2008 (the most recent year available in the IEA Energy Balances), assuming constant proportions in future years; and
- Carbon emissions factors in terms of MtCO₂/Mtoe for OECD and non-OECD countries in 2006 from the IEA (WEO 2008, pp. 508-509, 522-523). For OECD countries, these are 3.86 for coal, 2.53 for crude oil, 2.32 for gas. For non-OECD countries, they are 3.80 for coal, 2.57 for crude oil, and 2.20 for gas. The IEA Energy Balance data separates total primary energy supply estimates for petroleum products from estimates for crude oil. We assume here that all petroleum products are produced from crude oil and thus share the same carbon emissions factor. Biomass is assumed to have a net zero impact on carbon emissions; this is an acknowledged oversimplification of a complicated issue.

We considered using the reference case for CO₂ emissions from the IEA's *World Energy Outlook 2008* as the business-as-usual scenario against which to measure the impact of potential emissions reductions. The IEA reference scenario includes the impacts of oil prices and of other factors on emissions, providing a level of complexity and robustness that we cannot replicate. However, it also includes the "effects of those government policies and measures that were enacted or adopted

Appendix II: Energy Emissions Methodology

by mid-2008” (IEA WEO 2008, p. 59). Thus, using it as a baseline to assess the impacts of the policies in the database would result in a misestimate of the impact of potential emission reductions.

This analysis is also different from the IEA’s biannual *Energy Technology Perspectives* report, which analyzes the energy and emissions impact of many different future technology scenarios. For example, they estimate the emissions profile of a future where carbon capture and storage technology is widely deployed and nuclear energy is more prevalent than today. In contrast, our business-as-usual (BAU) scenario is exactly that – business-as-usual. The relative energy mix in each country is exactly the same as it was in our base year of 2008.

Energy Data

The model is built around the “energy matrix” of each country. This matrix is obtained from the energy balances published by the International Energy Agency (IEA). In accordance with their data, the energy matrix distinguishes sources of energy (products) and uses of energy (flows).

The matrix has eight main products (Coal & Peat, Crude Oil, Petroleum, Gas, Nuclear, Hydro, Geothermal, Solar and Wind, Biomass) and two byproducts (Electricity and Heat). These eight main products and two byproducts are distributed across 21 flows (Transfers; Statistical differences; Electricity plants; CHP plants; Heat plants; Gas works; Petroleum refineries; Coal transformation; Liquefaction plants; Other transformation; Own use; Distribution losses; Industry sector; Domestic aviation; Road; Rail; Other transport; Residential; Commercial and public services; Other sectors; Non-energy use).

The structure of the energy matrix allows us to distinguish between policies that are applied to the Total Primary Energy Supply (TPES) and policies that call for a reduction or shift in Total Final Consumption (TFC). We modify all flows when evaluating policies that apply to TPES. We only modify the nine consumption flows (Industry sector; Domestic aviation; Road; Rail; Other transport; Residential; Commercial and public services; Other sectors; Non-energy use) when evaluating the impact of policies that target TFC. In our previous model studies, this distinction was not applied systematically, which made it difficult to avoid double counting.

By modifying the energy matrix as a result of applying a policy we are able to apply successive policies within a country without double-counting. For example a biofuel mandate policy interacts with renewable energy standards. One of the largest differences between our previous model studies and the current one is the systematic transformation of the energy matrix and the successive evaluation of the criteria to apply each policy

CO₂e emissions

We estimate projected emissions from non-CO₂ Kyoto greenhouse gases – CH₄, N₂O, HFCs, PFCs, and SF₆ – by using data assembled by the U.S. EPA (Global Anthropogenic non-CO₂ GHG Emissions, 1990-2020). This dataset, used by both McKinsey & Co and World Resources Institute (WRI), includes actual emissions for 1990, 1995, 2000, 2005 and projected emissions for 2010, 2015, 2020. We have assumed that intervening years are a simple linear interpolation of the surrounding years. We note two potential concerns with this dataset:

1. The EPA projections incorporate regional GDP growth rates estimated by the Energy Information Agency in 2001. These rates are obviously different from the October 2010 IMF country-specific growth rates we use to estimate CO₂ emissions from energy. We do not have enough information about the EPA model to re-parameterize their estimates based on more recent GDP growth projections.
2. The EPA data use the Global Warming Potential (GWP) conversion factors from the earlier IPCC reports. We have updated the CH₄ and N₂O projections of CO₂e emissions using the GWPs from the IPCC AR4. The EPA does not report disaggregated data for the other Kyoto gases, so these are still projected using the older GWPs.

Appendix II: Energy Emissions Methodology

Greenhouse gases regulated by the Montreal Protocol are included in the estimate provided by the Greenhouse Gas Counter we launched on June 18, 2009 near Penn Station in New York City. It is reasonable to include these gases in the stock of climate-forcing gases currently in the atmosphere - which is what the counter monitors - but since they are generally no longer emitted, we have not included them in our estimate of BAU greenhouse gas emissions. In addition, none of the other common inventories or projections (McKinsey & Co, WRI, etc.) include the Montreal gases in their CO₂e emissions datasets.

Land-use change and forestry emissions

The IPCC AR4 summarizes the range of estimates for Land Use, Land Use Change, and Forestry (LULUCF) (WG3, ch.9, table 9.2) and concludes that: "The picture emerging from Table 9.2 is complex because available estimates differ in the land-use types included and in the use of gross fluxes versus net carbon balance, among other variables. This makes it impossible to set a widely accepted baseline for the forestry sector globally. Thus, we had to rely on the baselines used in each regional study separately (Section 9.4.3.1), or used in each global study (Section 9.4.3.3). However, this approach creates large uncertainty in assessing the overall mitigation potential in the forest sector. Baseline CO₂ emissions from land-use change and forestry in 2030 are the same as or slightly lower than in 2000 (see Chapter 3, Figure 3.10)." This suggests that there is no definitive study and that existing studies have different methodologies and wildly different estimates. The range is 3 to 9 GtCO₂ per year worldwide between 1990 and 2005.

We have used data from Houghton (2003), (whose estimates are included in the IPCC table 9.2) and have assumed that the amount of deforestation in 2000 continues at the same level through 2020. The Houghton data are readily available, internally consistent (as opposed to using the IPCC range of estimates from various sources), and are used by McKinsey & Co and the World Resources Institute's Climate Analysis and Information Tool.

Houghton's 2003 dataset is available via the WRI website and represents emissions through 2000, allocated to individual countries. In the data documentation (<http://cait.wri.org/downloads/DN-LUCF.pdf>), Houghton states that "The errors associated with the regional estimates of carbon flux are substantial. The errors for individual countries are even larger because of the methods used to distribute the regional totals." This is a strong warning about spurious precision in interpreting LULUCF estimates. Global emissions in 2000 are estimated at 7.6 GtCO₂. Houghton has a more recent dataset (2008) with somewhat lower estimates, but these data are not available by country and are thus less useful for this project.

Finally, current peat emissions from peat bogs rather than from peat combustion – which is included in the IEA's coal category – are estimated by Hoojier et al 2006 (and included by McKinsey & Co, assuming constant future emissions). We have not investigated peat datasets, since there are no policies aimed at peat emissions in the tracker. Given the overall level of uncertainty with regard to terrestrial emissions (and the relatively small contribution from peat, estimated at 2.0 GtCO₂ per year, relative to 3-9 GtCO₂ range of land-use and forestry emissions in the IPCC AR4), we have excluded peat emissions.

Cement process emissions

Cement emissions must be incorporated in a BAU scenario. The IEA dataset includes the energy emissions associated with the production of cement, but does not include the emissions produced by the cement calcination process.

Oak Ridge National Lab's Carbon Dioxide Information Analysis Center (CDIAC) provides estimates of emissions from the cement calcination process for every country through 2006 (Marland, G., T.A. Boden, and R.J. Andres, 2008). This dataset is included in the World Resources Institute's Climate Analysis and Information Tool dataset. In McKinsey & Co's work, the

Appendix II: Energy Emissions Methodology

CDIAC data was used to build proprietary cement estimates assembled from a number of additional sources, including the World Business Council on Sustainable Development (WBCSD)'s Cement Sustainability Initiative, the IPCC, the IEA, and the European Cement Research Academy. The advantage of the CDIAC dataset is that it is transparent and easy to disaggregate by country and year.

Using the CDIAC data, we assume that cement process emissions grow at the level of GDP growth in countries that remained below \$15,000 in GDP-PPP in the IMF's forecast time period (2007-2014). In countries where GDP-PPP is projected to be above \$15,000 through 2015, we assume a constant level of process emissions. Finally, in those countries that are projected to hover around \$15,000 for most of the years between 2007 and 2014, we assume that process emissions grow at half the rate of GDP growth. These assumptions are obviously very simple, especially since they do not allow countries to move between the three groupings. In addition, we also ignore GDP-PPP growth after 2014. We think, however, that these assumptions allow us to estimate the approximate trend of cement process emissions (WWF-LaFarge Partnership, *Blueprint for a Climate-friendly Cement Industry*, 2008).

450 ppm CO₂e stabilization scenario

In our previous studies, we showed a reference CO₂e emissions stabilization pathway to reach 450 ppm of CO₂e from the *OECD Environmental Outlook to 2030* (2008, p. 140). That pathway, generated using the Netherlands Environmental Assessment Agency's FAIR model, had 2020 emissions of 45.6 Gt CO₂e. These values fall within the range of stabilization scenarios developed in recent years as reported in the IPCC AR4 report. The UNEP recently released *The Emissions Gap Report*, UNEP (2010), a comprehensive analysis of whether the Copenhagen Accord pledges can place the world on a pathway that restricts global temperature rise to 2°C or towards 450ppm. They recommend 2020 target emissions between 39 and 44 Gt CO₂e/y (p. 10). Here we compare projected emissions with that 44Gt CO₂e/y reference value.

Policy Targets: Emissions Reduction and Mandate Targets

There are two general categories of policy targets: emission reductions and mandates. The criterion to distinguish whether a policy is an emissions reduction versus a mandate target is scope. Economy-wide reduction goals, without specifying sector (such as the Kyoto Protocol reductions), are classified as emission targets. If the policies aim to reduce energy use or to increase the renewable share, they are categorized as mandate targets. Thus, the Regional Greenhouse Gas Initiative, which limits emissions of power plants through efficiency measures, is a mandate target because energy demand is reduced as a consequence of applying the policy.

To model the impact of emissions reduction policies, we calculated the difference between emissions in the baseline year (e.g., 1990 for most of the Kyoto targets) and those in the target year (e.g., 2012 for the Kyoto targets). For baselines not in our dataset (e.g., a 10% reduction from 2000), we used World Resources Institute data (as our dataset closely follows their methodology).

A variant of emission reduction targets are greenhouse gas (or carbon) intensity targets. These aim to reduce the ratio of greenhouse gas emissions and the real GDP. Since realGDP and emissions do not grow identically (because of the autonomous increase in efficiency), a 10% GHG intensity target leads to different target emissions than a 10% emissions reduction target. For these policies, the emissions target is estimated given the target intensity and the realGDP of the target year and then used to estimate the emission reduction impact. Carbon intensity targets assume that only energy-related carbon dioxide will be affected. This excludes CO₂ change from land use as well.

Mandate targets in our database aim to reduce emissions from energy use, either by reducing demand through efficiency measures – which can be applied to a specific industry, buildings, or vehicles, or by switching to low carbon emission fuel sources. Some policies target energy use while others target electricity. Economy-wide efficiency is addressed via energy

Appendix II: Energy Emissions Methodology

intensity targets. Energy intensity is defined as the Total Primary Energy Supply (TPES) per unit of realGDP. As already noted, energy and realGDP have different growth rates because of the model's built in increase in efficiency. Energy intensity targets are estimated by calculating the target TPES required to meet the target intensity for the realGDP of the target year and then reducing all energy flows accordingly.

Estimates of Target Impact

Target impact is calculated as the difference between business-as-usual emissions in the reported year and emissions assuming full compliance of the policy. A negative impact, hot air, occurs when the target leads to higher emissions than what is projected for business-as-usual.

We report the impacts of emission target policies for two target years, 2012 and 2020, reflecting the prevalence of the 2008-2012 and 2013-2020 periods in emissions targets. In some cases, policies specify a target year beyond 2020, such as a 60-80 percent reduction by 2050. For these targets, we downscaled the target to what would be attained by 2020. When a single emissions policy has two targets, we divide it into two periods to be consistent with the two periods in emissions targets.

In contrast, mandate target policies do not follow these two periods, so we consistently report the impact for 2020. When a single mandate policy has multiple targets for different years, we assume that they are related and only model the one with the end date closest to 2020. If the only end year is after 2020, we downscale the goal to 2020.

In the case of both emissions and mandate targets, if the end date is before 2020, the business as usual growth rate is applied to the the energy or emissions in that year.

Mandate Modeling Assumptions

Mandate targets are applied by modifying the country's energy balance. After a policy is applied, and the energy balance is altered, the associated emissions for each energy product are then calculated as described above. To calculate the impact of each mandate, the energy emissions are added to the emissions from non-CO2 Kyoto greenhouse gases, and LUCF, and are then compared to the business-as-usual scenario.

As mentioned above, our model assumes that only energy derived from fossil fuel-based sources, which include coal, crude oil, petroleum, and gas, emit carbon dioxide. Solar, wind, hydro, geothermal, and biomass are considered "renewable" and are assumed to contribute no CO2 emissions. Nuclear is not considered a renewable source in this study, but is assumed to contribute zero emissions.

Renewable Portfolio Standard (RPS) Energy Targets

For RPS-energy targets, we calculated the impact of additional renewables from the baseline level of renewables in the country's total primary energy supply and transfer the corresponding energy from the fossil fuel-based product into the renewable products. In other words, for every unit of renewable energy that is added, a unit of fossil fuel-based energy is removed.

We first compare the total energy to be reduced by the policy and the current contribution from renewable products. Assuming the target is not already met, we begin the displacement with the coal product. If the target is still unmet after removing all coal use, we then transfer the energy from the crude oil, petroleum, and gas products into renewable products. When the mandate does not specify the renewable energy to add, we evenly distribute the corresponding energy across the three categories of renewables (hydro, solar and wind, and biomass).

Appendix II: Energy Emissions Methodology

Renewable Portfolio Standard Electricity Targets

For RPS-electricity targets, we calculated the impact of additional renewables from the business-as-usual level of renewables in the country's electricity output data. As for the case of energy mandates, we assume displacement of coal first and move down the fossil products until the energy has been fully transferred. Unless specified within the wording of the policy, nuclear is not considered a renewable product; for those policies that specify nuclear, it is included.

When the policy calls for installed capacity of renewable power, these targets are applied prior to policies calling for an increase in the proportion of renewables. The capacity factors applied to renewable electricity are 1 for geothermal and biomass, 0.4 for hydro, 0.29 for wind, and 0.17 for solar power. Since the IEA energy data set does not distinguish between solar and wind energy we assume that the mix is 90% wind and 10% solar.

Energy Efficiency Mandate Targets

When applying efficiency mandates, we lower the energy, or electricity use across the relevant products for the country. Energy intensity targets lower the energy supply throughout the economy. Several mandate policies represent efficiency standards, such as bans on incandescent bulbs, efficiency of televisions or of lighting. In these cases we make assumptions regarding the proportion of the targeted sector within electricity consumption.

Transportation Mandate Targets

Unless specified within the wording of the policy, we assume that mandates regarding transportation target the road sector of each country. This assumption is based on the fact that the road component represents a substantial fraction of the energy use of many countries. Furthermore, international aviation and shipping are a significant portion of total aviation and shipping, but they are not included in the national energy balance published by the IEA.

Transportation policies include both efficiency (such as Corporate Average Fuel Economy Standards) and renewable fuel standards (mainly mandated reliance on biofuel or biodiesel).

For RPS-fuel mandates we calculated the impact of adding biofuels above the existing level of biomass consumed by a country's road sector. We assumed that biofuel displaced energy in proportion to the existing mix from fossil fuel products within the road sector. In most cases, fuel displaced in road came from petroleum. For policies asking for an increase in ethanol or biodiesel use, these fuels were assumed to be interchangeable because the energy data set does not distinguish between them. Our assumption of biomass emitting no carbon is an oversimplification but it provides a maximum impact estimate for biofuel policies. The true emissions associated with biofuels requires a lifecycle analysis for each type of biofuel (corn-based ethanol, sugar cane based fuels, etc) and nation. While a full analysis is outside the scope of this study, a low emission factor for road biofuels could be incorporated into future versions of the model.

For all mandates calling for a fuel efficiency standard, we computed the difference between the old fuel standard and the new standard, and decreased the energy usage in the road flow for petroleum and gas by this factor. We represent the transition that would take place during the application of such a policy, by assuming that each car in the fleet has a life of 10 years. That is, we assumed that 10% of the fleet each year has the new fuel standards, and that the fleet turns over completely in 10 years

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