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Technology in a post-2012 Transatlantic Perspective

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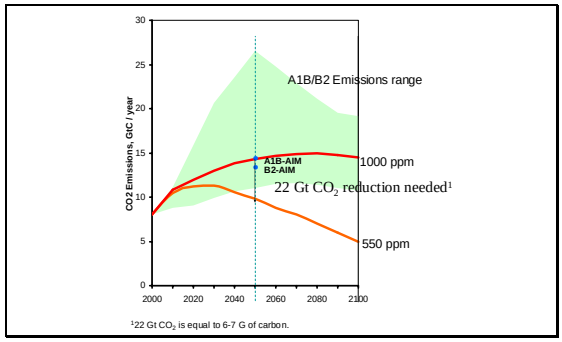
The EU and the US have found themselves supporting two polar views on which strategy is the most effective in achieving stabilisation of greenhouse gas (GHG) emissions: 'market pull' vs 'technology push'.[1] As an advocate of the latter, the US asserts that the principal emphasis should be on technology development, financed through typical public R&D programmes. It argues that it would be preferable to invest in the short term in R&D and to adopt emissions limitations later, when new technologies will have lowered the cost of limiting GHG emissions.[2] In supporting the 'market-pull' approach, the EU argues that technological change is an incremental process emanating primarily from business and industry, induced by government incentives. According to this logic, profit-seeking firms will respond with technological innovation.[3]

This paper argues that these two opposing positions can be explained by the respective political economies in the EU and the US but that changes are afoot that can improve the prospects for cooperation. In order to foster the convergence of views, additional conditions need to be fulfilled in both the EU and the US.

The Meaning of Meeting the Global Climate Change Challenge

To achieve stabilisation of GHG concentrations, the World Business Council for Sustainable Development has produced estimates based on scenarios developed by the UN-sponsored Intergovernmental Panel on Climate Change (IPCC). According to these calculations, there is a need to reduce global CO_2 emissions by 22 billion tonnes of CO_2 per year by 2050 – almost as much as today's total global emissions[4] (see Figure 1).

Figure 1. Achieving an acceptable CO_2 stabilisation



Source: World Business Council for Sustainable Development (2004).

This may require a peak of global emissions by around 2020, since GHG emissions stay in the atmosphere for a long time.[4]

To illustrate the scale of the task, one of the following innovations would have to be put into effect to achieve a reduction of just 3.3 billion tonnes out of 22 billion tonnes of CO_2 (or 1 gigatonne out of 6-7 gigatonnes of carbon): increasing current global wind power capacity by 150 times, bringing into operation 1 billion hydrogen cars to replace conventional 30-miles-per-gallon cars, boosting current nuclear capacity five-fold or using half of the agricultural area of the US for biomass production (see Table 1).

Although there are different opinions on whether or not the 2050 goals can be reached with technically proven technology, there is a broad consensus that there is a need for real breakthrough technology (technically unproven) beyond 2050. Pacala & Socolow (2004) and the IPPC (2001) argue that current technologies could solve the climate problem for the next 50 years, while Hoffert et al. (2002) believe that new and revolutionary technologies will be needed.

There is a growing consensus that neither 'technology push' nor 'market pull' on its own will be able to meet the climate change challenge. The International Energy Agency, for example, argues that energy efficiency improvements offer the greatest potential to reduce GHG emissions in a 2030 perspective. Such improvements

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[1] See Galeotti & Carraro (2003), Grubb & Stewart (2004) and Goulder (2004).

[2] See Humphreys (2001) and Edmonds (2003).

[3] Grubb et al. (2002).

[4] 22 Gt CO_2 equals 6-7 Gt of carbon.

[4] CO_2 for example, the most important GHG, stays in the atmosphere for 100 years.

depend critically on government incentives.[5] Smart government policy, i.e. market pull, can speed up diffusion of existing technologies, leading to significant reduction of GHG emissions in the short term.

Table 1. The challenge: To reduce CO_2 emissions by 3.3 billion tonnes per year requires…

Technology	Required to reduce 3.3 Gt CO_2/yr (1 GT carbon)
Coal-fired power plant with CO_2 capture/storage	700 x 1 GW plants
Nuclear power plants replace average plant	1,500 x 1 GW (5 x current)
Wind power replaces average plant	150 x current
Solar PV displace average plant	5 x 106 ha (2,000 x current)
Hydrogen fuel	1 billion H_2 cars (CO_2-free H_2) displacing 1 billion conventional 30 mpg (7.84 litres per 100 kms) cars
Geological storage of CO_2	Inject 100 mb/d fluid at reservoir conditions
Biomass fuels from plantations	100 x 106 ha (1/2 of US agricultural area)

Source: Egenhofer & van Schaik (2005), based on presentation by ExxonMobil to a CEPS Task Force meeting on 22 October 2004 (http://www.ceps.be/files/TF/1).

Political economy perspectives on technology: Differences between the EU and US

The EU's short-term policy response to climate change has been to embrace the Kyoto Protocol, which can be explained by the largely synergistic relationship between the EU's situation with respect to natural gas supply and other EU policy objectives, such as power and gas market liberalisation. Moreover, weak EU competencies in the areas of energy policy and security of supply in combination with relatively strong competencies in the fields of market liberalisation and the environment have forced the EU to frame climate change responses in the context of energy efficiency and conservation rather than in terms of energy policy.[6] Climate change policy has been coined as a 'win-win' situation with regards to security of supply, higher efficiency, more competition[7] and co-benefits through reduction of local pollution. In a short-term perspective, understandably technology did not play a major role. The relatively modest Kyoto Protocol target helped as well.

More importantly, however, is the EU's security of supply position with regard to natural gas and its transformation through gas and electricity market liberalisation. The strategic positions of the EU and the US in natural gas are profoundly different: according to the European Commission (2003, p. 96), 'gas resources' are located in abundant supply within an economically transportable distance to the EU, and the potential exists for technological improvements concerning gas production, transport by pipeline, and LNG plants and carriers. These reserves could cover Eurasian demand for 50 years. Hence, switching from coal to gas is a viable, cost-effective short-term policy for the EU. The situation is different for the US, which increasingly will have to rely on liquefied natural gas (LNG). Hence, the share of coal in power generation is expected to remain stable and continue to account for about half of all fuels.[8] Climate policy will put pressure on coal. Any US alternative short of deploying 'carbon capture and storage' would increase concerns about security of supply.

Against the background of minimal trade-offs in the EU – at least in a short-term perspective – between climate change, security of supply and market liberalisation, it should come as no surprise that the energy sector has been broadly supportive of EU climate policy approaches and the EU emissions trading scheme (ETS). A modest carbon constraint, especially when implemented through the EU emissions trading scheme and based on free allocation, has been seen in business circles as a way of enhancing efficiency and even security of supply, as many energy savings measures come at a low or even negative cost.[9] In addition, as long as allowances are given for free ('grandfathering'), the 'competitiveness' effects on industry are minimised in general.[10]

The US situation gives a more heterogeneous picture.[11] At the federal or national level, there is a focus on research and technology programmes as well as on voluntary

[5] International Energy Agency (2004a).

[6] Wriglesworth & Egenhofer (2005).

[7] Market liberalisation and integration have transformed the traditional notion of security of supply in the EU and elsewhere. In competitive markets, firms in principle invest in those technologies that promise the highest return on capital, which has meant that the power generation sector favours the solution with minimum capital investment and the quickest returns. One result of EU electricity and gas market liberalisation has been a dash for gas, mainly in the form of CCGT and CHP, to the detriment of more capital-intensive generation technologies. The EU emissions trading scheme is another driver behind the use of gas.

[8] According to the International Energy Agency, the share of gas in power generation is projected to more than double in the period from 2002 (15%) to 2030 (35%). The European Commission does not rule out the possibility that 40% of total electricity will be produced from natural gas by that time (see IEA, 2004b). For US figures, see US Energy Information Agency (2003).

[9] See European Commission (2001).

[10] Nevertheless, a number of industries may be directly affected in a negative way. See Carbon Trust (2004), Renaud (2005), Quirion & Houcarde (2004) and Egenhofer et al. (2005).

[11] See Pew Center on Global Climate Change (2004) and Brewer (2005).

measures. The sub-federal level is characterised by a plethora of state and local government initiatives, including trading schemes. There are advocates of federal regulation, mainly in the Congress, as exemplified by the bipartisan McCain-Lieberman cap-and-trade legislation. The business community remains largely divided. Corporations participate in numerous voluntary initiatives but most of them oppose mandatory emissions limits.[12] A majority of US public opinion tends to favour stronger climate change policies than those advocated by the Bush administration,[13] as also do a number of religious organisations and churches.

One result of the impasse over climate change policies at the national level has been increased activism and cooperation among state and local governments. It is often noted in this regard that there is a tradition of some states (especially California) taking the lead on environmental issues, with the national government eventually adopting policies that have been developed at the sub-national level. To some extent, this may yet happen with climate change policies.

A growing coalition of Members of Congress – in both the Senate and the House of Representatives – supports a policy of mandatory domestic limits on GHG emissions. Although the coalition is composed predominantly of Democrats, it includes a number of Republicans, and its bipartisan leadership includes Senator John McCain, a prominent Republican. Both the congressional coalition and activist state and local governments tend to hail from the west coast and the northeast. The economic and political significance of fossil fuel industries in many mid-western and southern/southwestern states is likely to prevent them from following the trend towards increased mitigation efforts underway in the far western and northeastern regions of the country. But they will be open to technology approaches.

The role of technology: The (only) way forward?

With the entry into force of the Kyoto Protocol, there may finally be an opportunity to move the political agenda beyond Kyoto into the 'post-2012' period. This raises the question of what is to be done next and what role will technology policy play?

Let us look back in order to answer these questions. In the aftermath of the Kyoto Protocol negotiations, and especially after the US rejection of the Protocol, numerous alternative proposals were put forward (see Box 1).[14] In assessing these different approaches against environmental, economic or equity criteria, it quickly becomes apparent that there is no magic solution to the climate change challenge. It will take many years to reach a global consensus. But this conclusion should not be surprising: an effective response to climate change requires nothing less than aligning the national energy policies of more than 150 countries (see Ashton & Burke, 2004). Rather than 'reinventing the wheel', however, it seems only reasonable and practical to build a global agreement that is based on parts on the Kyoto Protocol structure, while at the same time accommodating a number of additional components, including technology. One can expect that we will continue to live in a differentiated world.

Box 1. Different approaches to the climate change challenge post-2012

- An international agreement with **absolute – Kyoto style – targets**, but with modifications such as a safety valve, i.e. a maximum price on allowances
- **Energy** or carbon-**intensity targets** to improve energy efficiency; the ultimate target can be a fixed per capita emissions target per country
- **Linkages**, i.e. linking participation to R&D cooperation or financial transfers
- **Environmental conditionality** in which emissions trading is linked to environmental 'progress', e.g. the Green Investment Scheme or trade-and-back approaches
- **Sector-specific targets,** i.e. a coordinated approach for domestic policies
- Coordinated **global carbon taxes**
- **Technology development** and international cooperation on R&D activities
- A **combination** of different instruments, including intensity targets, sector-specific domestic measures and technology development in the so-called 'triptych approach'
- **Orchestration of treaties** focusing on different co-existing commitments under different legal frameworks

Source: Egenhofer & van Schaik (2005).

The Next Priorities in a Technology Perspective

Most scholars and analysts attribute the EU-US climate change disagreement to divergent views on climate science, the role of domestic versus international action, technology, costs, the role of developing countries and the Kyoto Protocol process itself.[15] In order to overcome the 'climate divide', there is a need for some convergence in all of these areas. This will take time, however.

In the meantime, we have argued on other occasions (Egenhofer, 2005) that the EU and the US (governments and stakeholders) should concentrate on three areas likely to be critical for the EU-US climate change agenda: i) a

[12] Some electric power companies have, however, publicly advocated a mandatory cap-and-trade system or a carbon tax.

[13] For a detailed review of public opinion data from 1989-2005, see Brewer (2005b).

[14] For an overview, see Torvanger et al. (2004), Aldy et al. (2003), Bodansky (2004) and Kameyama (2004). See also Box 1.

[15] See Cline (1992), Nordhaus (1994 and 1998), Harris (2000), Purvis & Meuller (2004) and Michael (2005).

(common) sense of direction, ii) a determination to make the EU climate change policy work and iii) technology policy. Progress in these areas is a prerequisite for a more constructive transatlantic dialogue.

A (Common) Sense of Direction

The first important step is to forge a common understanding between the US and the EU on the urgency of climate change and to demonstrate together the will to achieve more ambitious reductions and technological innovation. The EU has tried to provide direction after EU heads of governments in March 2005 endorsed a target to limit the global average temperature increase to 2°C and indicated a willingness to explore with other countries ways to reach a reduction target for industrialised countries of 15-30% for GHG emissions by 2020 on a 1990 basis.

The UK has used its G8 presidency to develop a package of practical measures to cut emissions, focusing largely on technology as well as on building a partnership with rapidly developing economies to find a way to combine economic growth with a low-carbon economy. This is an opportunity to inject fresh political momentum in the efforts to reach a new global consensus. The focus on technology and developing countries as the keys to tackling climate change has been a principal US demand for some time. It is important, however, that this new strategy not only responds to the concerns of the current US administration, but also to those of other stakeholders, notably business, as reflected in the following remark by a representative of Tony Blair's government: "Business and the global economy need to know that this isn't an issue that is going to go away".[16] As we have shown, most US stakeholders accept that climate change policy will become a necessity in the long-run.

Making EU Climate Change Policy Work

It is therefore up to the EU to show that climate change policy can be undertaken without ruining the economy. Implementation of the EU ETS has already given strong signals to the US. Successful EU performance can help change the minds of US stakeholders. The EU ETS is attracting increasing interest throughout the world and not just by the signatories of the Kyoto Protocol. US scholars are watching the EU ETS intensively. The total value of current EU allowances of permits stands at far more than €50 billion, at an allowance price of around €20. This might be too big a market to ignore. It is also often forgotten that climate change policy can have important benefits beyond climate policy objectives. Such co-benefits of climate change measures are the reduction of local pollution caused by NOx or SO_2, less congestion or noise from transport, innovation and technological leapfrogging and employment.[17] In fact, most studies assume that the benefits of reducing local air pollution are higher than the costs of reducing greenhouse gas emissions (see OECD, 2002). In short, climate policy is likely to have significant benefits that are not yet explicitly acknowledged. The experiences of BP, Entergy, Toyota or Rio Tinto show that reducing GHG emissions can yield net profits.[18] Finally, as the case of the Kyoto Protocol illustrates, when the US is absent, other countries will proceed to define the international agenda as they deem most appropriate. A global or even transatlantic GHG emissions market may offer the best hope for a less fragmented business environment.[19]

Technology Development

Given that medium-term targets will be more constraining than the current ones specified in the Kyoto Protocol, the EU will require more radical changes, which are likely to lead to greater distributional consequences.[20]This will require a further development of EU climate change policy along the lines of the recent European Commission (2005) Communication on Winning the Battle against Global Climate Change, which listed the various elements of a global strategy which notably included technology.

Since longer-term targets can only be met by the development of new technologies and the massive diffusion of both new and existing technologies, the EU also needs a greater focus on technology. What this means in practice will still need to be developed in the coming years.

[16] See Derwent (2005).

[17] See Jochen & Madlener (2003).

[18] BP calculated that reducing GHG emissions by 10% below its 1990 level has a net benefit of $650 million (see Browne, 2004).

[19] If one believes leading global business associations, there is a growing concern about an increasingly fragmented or even disintegrating regulatory framework. One of the recurrent themes of business responses is the creation of a greenhouse gas emissions market. According to Steve Lennon, Chairman of the Environment and Energy Commission of the International Chamber of Commerce (ICC), whose membership includes major US companies, business sees a "global system of emissions trading as inevitable" (see Harvey, 2005).

[20] See two CEPS multi-stakeholder Task Force reports that analyse these issues: Egenhofer & van Schaik (2005) and Egenhofer & Fujiwara (2005).

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