in which each country can develop its own solutions. At the moment, Member States pursue individual strategies to secure the resources they need, but fail to leverage the Union's full market power. The European picture is further muddied by the divergent political postures that EU Member States have toward Russia, the continent's dominant supplier of natural gas. Nonetheless, several areas of real progress exist: Europe, for instance, has provided market pull to make it more likely that solar and wind will have a long-term future; it is at the vanguard of nuclear technology; and it is committed to implementing innovative market solutions such as carbon trading.

* * * *

Any effective solution in both the United States and Europe will have to push on the supply side while pulling from the demand side. For too long in the USA, new energy technologies and calls for increased efficiency have been dismissed as having too little potential, requiring too much time to implement, and costing too much. In effect, we were 'pushing on a string'.

To create the needed realignment, consensus must first be forged that new technologies are needed – not just in the developing world, but also in the wealthiest of countries. In addition, nations must acknowledge that tensions exist amongst them; they must then create some form of international cooperation around these crucial issues and establish the policies necessary to 'pull on the string' and move forward. The question Washington and the world's capitals should be asking is: What can we do to lessen the world's dependence on hydrocarbons while striving to realise these transformations?

On the new energy playing field, policy will set the boundaries, regulation will create the rules, government authorities will serve as the referees, and the market will determine prices, as well as the winners and losers in the game. In other words, we must allow a game to develop in which the markets will have the maximum play to determine which technologies succeed. The playing field must be set up in a way that allows carbon pricing to be a market force, thereby working toward carbon limitation and stabilisation. And a fundamental dynamic in all this is that while the rules will change over time, it is essential to forge agreement among the referees and the players regarding the game itself.

Put simply, failure to act will place both the developed and developing world at great risk of serious economic, political, environmental, and social crises as conventional energy supplies become more scarce and competition for them turns fierce. The world cannot afford to wait another thirty years.

US Environmental Policy in states vs. the States

David Fridley describes California's 'Global Warming Solutions Act' of 2006

On 27 September 2006, California Governor Arnold Schwarzenegger signed into law the first binding programme limiting greenhouse gas emissions in the United States. The law – Assembly Bill (AB) 32 – grew out of a multi-year effort of legislators, environmental groups, state businesses and the environmental justice community and establishes a framework for the creation of a comprehensive programme to limit state emissions of greenhouse gases across all sectors of the economy. The goal of the programme is to limit emissions in 2020 to the level they were in 1990, or about a 25 percent reduction from current levels. In this law, 'greenhouse gases' are defined to include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride, the same six gases as defined in the Kyoto Protocol.

Implementation will take place over several years through several stages, with full implementation starting in 2012. Detailed rule-making for the law will be the responsibility of the California Air Resources Board (CARB). Starting in 2006, AB32 set 31 December as the cut-off date for companies voluntarily reporting their emissions to the California Climate Action Registry to be grandfathered under that programme, making them exempt from any future substantial changes to their emissions reduction programmes as a result of new regulations from CARB. In addition, participating companies will get credit for their 'early action' under the Registry programme when specific emissions targets are set.

In 2007, CARB will publish a list of 'early action' measures for the reduction of greenhouse gases that can be implemented before 2010. These measures in turn will be formalised into regulations by 2010 and become enforceable on 1 January of that year. CARB is also required to incorporate the reporting standards protocols of the Climate Action Registry to the extent feasible and to issue their own set at the beginning of 2008. At the same time, the Board is required to report the level of emissions in 1990 and to approve it as the formal 2020 target.

By 1 January 2009, CARB is directed to develop a statewide 'scoping plan' indicating the maximum amount of emissions reductions that are technologically and economically feasible from specific sources or types of sources. This process will involve consultation with all other agencies with authority over greenhouse gas emissions (such as the Public Utilities Commission), public hearings, along with calculation of economic and non-economic costs and benefits from various measures. AB32 also establishes an Environmental Justice Advisory Committee and Economic and Technology Advancement

Advisory Committee to ensure that emissions of criteria pollutants and cumulative impacts be considered as reduction measures are evaluated, and to determine the best targets of state-supported investment in technology research, development and deployment to reduce greenhouse gas emissions.

"Of greatest concern is the impact of global warming on California's Sierra snow pack, the source of most of the state's summer water supply"

Finally, by 1 January 2011, CARB is required to publish implementing regulations to achieve the 2020 target, to go into effect one year later. The 2011 regulations must take into account the impact on public health and the economy, and specifically includes authority to use market-based mechanisms to achieve declining emissions limits. This includes a 'cap and trade' programme, which would establish a carbon market in California, but which must avoid the increase in emissions of other pollutants.

Industry and political concerns over the rigidity of reducing emissions to 1990 levels led to the inclusion of a 'safety valve' that allows the Governor to suspend the regulations for one year in the case of serious economic challenges or catastrophic events such as a major earthquake.

Although AB32 is far-reaching and impacts nearly every part of the California economy, including its extensive chemical, biotech, oil and gas, agricultural, and health care industries, two main sectors stand out as keys to the programme's success: transportation and power generation, which together account for nearly two-thirds of state emissions. Substantial progress in both areas is necessary to achieve the 2020 reduction targets. In the transportation sector, which accounts for 41 percent of California's emissions, California has been a national leader in the push to improve vehicle efficiency, promote cleaner fuels, and reduce emissions, but recent policies have encountered stiff resistance from the automotive industry and the Federal government. In 2002, California passed a law requiring the CARB to develop and enact regulations by 1 January 2005 to achieve the maximum possible reduction of greenhouse gas emissions from passenger cars and light trucks, including SUVs. These regulations, collectively reducing emissions by 22 percent by 2012 and 30 percent by 2016, have been adopted and take effect in 2009. In late 2004, however, the Alliance of Automobile Manufacturers and California dealers filed suit in Federal court challenging the regulations, arguing that carbon dioxide reductions were primarily an issue of improving fuel economy, and that the Federal government has sole authority to regulate fuel economy. The California attorney general requested the US District Court to dismiss the suit in September 2006, and a hearing on the matter will be held in early 2007. Failure to win the suit or to achieve its dismissal would significantly reduce the possibility of achieving the 2020 target.

In a separate action intended to counter the auto companies' suit against California's vehicle emissions reduction target, California's attorney general filed suit in September 2006 against the major automobile manufacturers – including Ford, Honda, Toyota, DaimlerChrysler, Nissan, and General Motors – claiming damages for the millions of tons of greenhouse gases that their products have emitted in California, citing billions of dollars in damages and seeking to hold the automakers liable for future damages. Of greatest concern is the impact of global warming on California's Sierra snow pack, the source of most of the state's summer water supply and vital to the agricultural sector, the largest in the country. The outcome of the suit is uncertain, although a similar suit against major utilities brought by eight states in 2004 was dismissed by a Federal court in 2005.

Power generation accounts for 22 percent of California's emissions, including those emissions generated out of state for electricity imports consumed in California. Here, California's successes to date in promoting renewables and hydropower will likely make future reductions more difficult compared to other parts of the country where coal forms the primary fuel for power generation. Currently, renewables, large hydro, and nuclear power provide 42 percent of California's in-state generation, with natural gas accounting for another 38 percent. The balance – coal-fired generation – is all from plants physically located out of state but in the California power control area. Imports, which provide 22 percent of California's power, are largely from the hydro-rich Pacific Northwest and the coal-dominated Southwest. AB32 will prohibit investor-owned utilities from purchasing power from out-of-state sources that do not meet the California emissions standards, effectively extending the impact of California's emissions cap to other states.

"The California Global Warming Solutions Act of 2006 is likely to set a precedent for adoption in other states"

Given the relatively low proportion of coal-fired generation in the state power mix, achieving the 2020 target depends heavily on the success of California's Renewable Portfolio Standard (RPS) regulations, which requires investor-owned utilities to generate at least 20 percent of their power from renewables in 2010, and 33 percent by 2020, up from the current 10 percent. Although the public heavily favours the expansion of renewable energy, the RPS itself establishes complex bureaucratic hurdles to its development. Mindful of the chaos in California's deregulated electricity market in 2000 and 2001, when a combination of capacity shortages and market manipulation by traders led to rolling blackouts and widespread

economic losses, California regulators now require developers and utilities to work with both the California Energy Commission and the Public Utilities Commission for approvals of any new renewable energy projects, resulting in substantial delays in implementation. As a result, California has added only 240 MW of new renewable energy capacity since 1999, compared to 2200 MW of new renewable energy capacity in Texas, which has overtaken California as the largest wind power producer in the country.

The California Global Warming Solutions Act of 2006 is likely to set a precedent for adoption in other states. Already, eleven other states and three cities have brought suit against the Environmental Protection Agency to force it to regulate carbon dioxide as a pollutant. The case has gone to the Supreme Court, which will hear arguments and decide on the case in late 2006. In the US Northeast, seven states have agreed to implement the Regional Greenhouse Gas Initiative (RGGI), establishing a cap-and-trade programme aimed at reducing utility emissions of carbon dioxide. In establishing its own regulations for implementation in 2012, California is required by AB32 to consider other national and international practices for greenhouse gas reduction, including voluntary programmes and the operations of other carbon trading schemes such as the European Trading Scheme (ETS) and the voluntary Chicago Carbon Climate Exchange. Linkages to these programmes would likely make California's own programme more robust by increasing the size of the potential market for carbon, although the law does not specifically require a cap-and-trade scheme. As the twelfth largest greenhouse gas emitter in the world, California's response to climate change will provide a foundation for the political consensus to emerge in the USA for a national response.

Benito Müller looks at the climate change initiative in New England and the North East

The North East, and particularly New England, has for some time been active in introducing state, regional and even trans-border climate change measures. As with other state-level and regional initiatives, the key motivation for these North-Eastern initiatives was the realisation that climate change is a real problem, and that the Federal administration has failed to show sufficient leadership to address it. This sentiment is shared not only in the North East but also on the West coast, particularly in California. Indeed, California Governor Arnold Schwarzenegger has very recently met with George Pataki, his New York counterpart (both Republicans) to discuss linking California's emission trading system with the efforts undertaken in the North East of the country. And although Schwarzenegger 'has not criticised [President] Bush by name, he has been vocal in his condemnation of the slow-moving federal response to climate change' according to a recent article in *The Financial Times*.

There are ten states in the region – six with a Republican and four with a Democratic Governor – that have adopted some form of mandatory greenhouse gas emission reduction measures. As listed in Table 1, eight of these states – representing 9 percent of 2001 US emissions – involve state-wide emission caps for different time horizons, caps that are stricter than the target of returning to 1990 levels by 2020 just adopted by California (6.7 percent of US emissions)

At least two of these measures deserve to be highlighted, namely the Climate Change Action Plan (CCAP) by the Conference of New England Governors and Eastern Canadian Premiers (NEG-ECP), and the Regional Greenhouse Gas Initiative (RGGI).

Climate Change Action Plan (CCAP)

The CCAP includes provisions for reducing energy demand through conservation measures (20 percent reduction by 2025) and it addresses emissions from the transport sector and the electricity sector (20 percent reduction of CO_2/MWh by 2025). It adopts the following regional goals:

- **Short-term Goal:** To reduce regional GHG emissions to 1990 emissions by 2010.
- **Mid-term Goal:** To reduce regional GHG emissions by at least 10 percent below 1990 emissions by 2020, and establish an iterative five-year process, commencing in 2005, to adjust the goals if necessary and set future emissions reduction goals.
- **Long-term Goal:** To reduce regional GHG emissions sufficiently

Table 1: North-Eastern States with Climate Change Regimes

	Admin.	*Share of 2001 US emissions*			*2010 Target (rel. 1990 level)*	*2020 Target (rel. 1990 level)*
New Jersey	Dem	2.1%		RGGI	-3.5%	
New York	Rep	3.7%		RGGI	-5.0%	
Connecticut	Rep	0.7%	CCAP	RGGI	0.0%	–10%
Maine	Dem	0.4%	CCAP	RGGI	0.0%	–10%
Massachusetts	Rep	1.4%	CCAP		0.0%	–10%
New Hampshire	Dem	0.3%	CCAP	RGGI	0.0%	–10%
Rhode Island	Rep	0.2%	CCAP		0.0%	–10%
Vermont	Rep	0.1%	CCAP		0.0%	–10%
Delaware	Dem	0.3%		RGGI		
Maryland	Rep	1.4%		RGGI (2007)		

to eliminate any dangerous threat to the climate; current science suggests this will require reductions of 75–85 percent below current levels.

In 2001, the NEG states (black bars in Figure 1) were on average 5 percent above their 1990 target level, although with large variations, ranging from Rhode Island with 30 percent above the target and Massachusetts 3 percent below, with the larger emitters (in terms of shares in total US emissions, see Figure 1) faring rather better than the smaller ones. New York and New Jersey who, although not part of the NEG, have also taken on 2010 targets below 1990 levels, in turn were 7 and 10 percent above their targets.

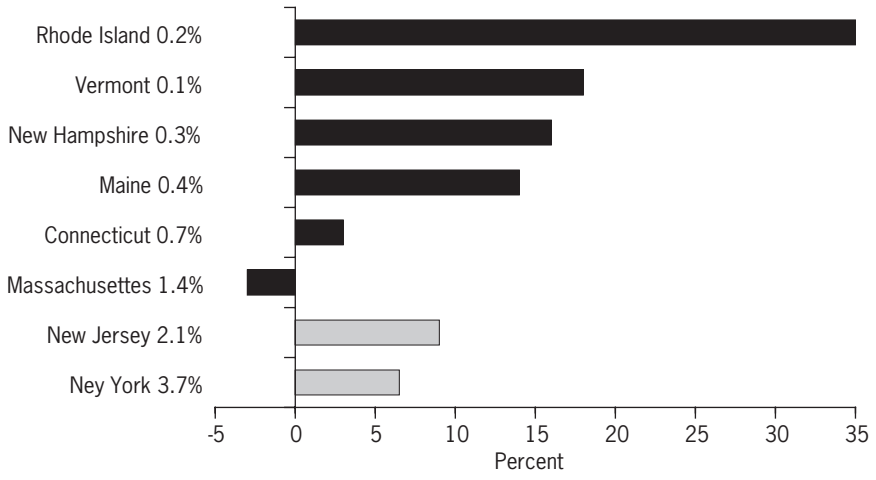
In total, the North Eastern state emission reduction targets, if achieved, would have meant a reduction of 21 $MtCO_2e$ from 2001 levels. Although only 0.3 percent of total US emissions at the time, as in the case of the Kyoto Protocol, one should not underestimate the signalling effects of such commitments and actions.

"the key motivation … was the realisation that climate change is a real problem, and that the Federal administration has failed to show sufficient leadership to address it"

Regional Greenhouse Gas Initiative (RGGI)

While the short-term goal of the 2001 CCAP is strikingly similar to the emission mitigation objective of the 1992 UN Framework Convention on Climate Change (namely to return CO_2 emissions of the rich industrialised countries to 1990 levels by 2000), the 2005 RGGI is a cap and trade regime which could be regarded as the region's answer to the 1997 Kyoto Protocol (although it might be wise not to say so, given the still prevailing Kyoto-phobia in large parts of the USA).

Figure 1: North Eastern States Compliance Status: Percentage Difference from 2010 Goals (per cent share of total US emissions listed in legend)



On 20 December 2005 the RGGI – the first mandatory US cap-and-trade programme for carbon dioxide – was announced by the governors of seven north-eastern states: Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, and Vermont.

The programme's trading sector covers electric generating units that have a nameplate capacity equal to or greater than 25 megawatts and burn more than 50 percent fossil fuel.

It aims to bring back emissions to approximately current levels over the period from 2009 to 2014, and it is expected that this involves on average a reduction of around 7 percent from 'business-as-usual'. Between 2015 and 2018 emissions will have to be reduced by a further 10 percent.

Like the Kyoto Protocol, the programme allows for project-based 'offset allowances' which are credits that can be generated outside the trading sector. Initially, a source will be permitted to cover up to 3.3 percent of its emissions with offsets – an amount that is approximately 50 percent of the projected average emission reduction obligation under the programme.

Offset allowances may be issued initially to verified reduction projects anywhere in the United States in the following areas:

- Natural gas, heating oil and propane energy efficiency;
- Landfill gas capture and combustion;
- Methane capture from animal operations;
- Forestation of non-forested land;
- Reductions of sulphur hexafluoride (SF6) emissions from electricity
- transmission and distribution equipment; and
- Reductions in fugitive emissions from natural gas transmission and distribution systems.

In case of prolonged periods of higher permit prices (>\$10/tCO_2), a number of safety valves are put into place. For one, the compliance period can be extended by up to three years, but more interestingly, there is the provision that after two years of such extensions, 'geographic scope will also be expanded to offsets from international trading programs', such as the Kyoto Protocol's Clean Development Mechanism. This means that RGGI contains the seed for 'internationalisation,' indeed for collaboration with the forthcoming Kyoto successor regime. As it is unlikely that any future mandatory Federal greenhouse gas reduction regime could ignore the architecture of RGGI, this seed is an important gesture and should be reciprocated by the international regime which is currently being renegotiated.

The latest news from the region is that on 6 April 2006, Maryland Governor Robert L. Ehrlich Jr. signed into law a bill which requires Maryland to join RGGI by 30 June 2007.