in budget airlines. Congestion in Europe's skies is responsible for extra emissions as planes, stacked up over airports, circle endlessly waiting to land. Unnecessary emissions could be avoided if EU states could agree on a better pooling of their air traffic control systems in the proposed Single European Sky programme.

It is hard not to conclude that inclusion of aviation in the ETS has been driven by its high profile, when at the same time there has been less of a move to include in the ETS the far less visible sector of shipping, which is responsible for just as many emissions as aircraft. The European Commission evidently did not want to chance any disruption to the 90% of Europe's external trade that is carried by ship. But the European Parliament and the Council of Ministers did agree in December 2008 that if the International Maritime Organisation did not agree before the end of 2011 on ship emission targets, the European Commission should propose EU action.

Brussels has not proposed putting road transport emissions into the ETS. This is partly because it had started down a different route of trying to get voluntary improvements from the car industry, partly because there is a complexity of other environmental policies dealing with cars such as green taxation schemes, and partly because the ETS usually deals with 'direct emissions'. That is, the recipients of allowances are the ones directly emitting the CO_2, in other words drivers, in other words millions of individuals. Putting millions of drivers into the ETS would be nonsense. Yet emissions allowances could have been allocated at the level of the car manufacturers' fleets, and these fleet allowances could have been incorporated into the ETS.

However, Europe has decided to deal with car emissions by direct regulation. The Commission initially proposed to oblige car makers to reduce their new car fleets' average emissions down to an average of 130grams of CO_2 per kilometre by 2012. This compares with current average emissions of new EU cars of 160g/km. Complementary action by tyre makers, fuel suppliers and others would contribute another 10g/km of emission savings to meet an overall objective of 120g/km for new cars by 2012.

This proposal provoked a political clash across the Rhine, with Germany rejecting constraints on its heavier or more powerful

Mercedes, BMWs, Porsches, and with France keen to exploit the focus of Renault and Peugeot on smaller cars. "It is hard to argue that heavier, powerful cars with more emissions should have the right to emit more than others", protested French environment minister Jean-Louis Borloo (sounding rather like a Chinese minister complaining about Americans and insisting on human equality in emission levels). Eventually a compromise between President Nicolas Sarkozy and Chancellor Angela Merkel paved the way for agreement at the end of 2008 on EU legislation phasing in the average 120g/km emission limit by 2015 and phasing in penalties on car makers for exceeding this limit. The longer term goal is to get the European car emission average down to 95g/km by 2020, by which time the Commission hopes that the car measures will have contributed one-third of all emission reductions outside the ETS.

The proposed EU standards are tough, particularly when compared to the US. Comparison is easy because emissions are determined by fuel consumption. In 2007, the US Corporate Average Fuel Economy (Café) standards were tightened – for the first time in many years – in order to reach an average of 35 miles per gallon by 2020. If US cars were to meet Europe's 120 g/km proposed standard, they would have to have petrol engines doing 47 mpg or diesel engines doing 52mpg, and not by 2020 but eight years earlier in 2012.

Yet if there were an international emissions scheme that covered the EU and US and their respective car sectors, might not an interesting pattern of allowance trading develop? EU car manufacturers could help pay financially-strapped Detroit to make relatively easy fuel/emission improvements in the US in return for credits that they, the EU car makers, could use to meet their much tighter EU targets. After all, the whole point about global warming is that it does not matter where the emission saving is made, just that it is made.

Conclusion

The biggest single determinant of the success or failure of Europe's climate change programme will be the ETS. This one

mechanism covers 40 percent of EU emissions. For all its early trials and errors, the ETS looks to be a workable instrument. Let us hope so – for capping and trading allowances to emit carbon has some important inherent advantages over taxing carbon. It allows maximum emission reduction to be achieved at minimum cost within sectors, within countries, within the EU and internationally. It rewards developing countries' climate control efforts by offering a market for their emission reduction credits. This is a necessary transfer of funds to poor countries, which could one day be supplemented with ETS auction revenue and which would be politically easier for rich countries to carry out than transferring their taxpayers' money.

But the weakness of a cap and trade system is that it cannot provide the absolute carbon price and cost certainty of a straight carbon tax. None of the features of the December 2008 compromise – such as the profligate dispensing of free allowances or the import of more external credits – can confidently be said to impact the future carbon price one way or another. However, together, they are a reminder that Europe's carbon market is very much a political creation, and that the level and stability of the carbon price is vulnerable to politicians' intervention. Tinkering with the ETS should therefore be as infrequent and minimal as possible.

But other factors will have a powerful impact on the carbon price. They include the pace at which low-carbon energy – whether renewable or nuclear – can be developed, and the degree to which energy can be used more efficiently or even not used. Such issues are addressed in the remaining chapters of this book.

CHAPTER 11

MAKING GREEN POWER COMPULSORY

If climate change and CO_2 emissions were the sole goal of energy policy, and the renewable energy sector were a mature and well functioning market, then a single CO_2-based target would be appropriate – but this situation is a long way off.

European Commission impact assessment, 2006.

The renewable energy target serves more than just reducing greenhouses gases.

European Renewable Energy Council, 2007.

The revival and development beyond all recognition of some of mankind's most ancient forms of energy, such as wind and water power, has provoked a very modern debate in Europe about policy goals and costs. The debate suddenly acquired a real edge to it after EU leaders surprised many, including perhaps themselves, by agreeing at their March 2007 summit that renewable energy must rise as a share of total energy consumption to 20 percent by 2020. Some leaders, it is said, misunderstood the '20 percent' just to be a share of electricity, a far lesser goal. At all events, they may all have rued this decision when ten months later the Commission handed them its proposals for the binding national renewable energy targets necessary to deliver the EU commitment.

Within a decade, renewable energy has gone from a nice-to-have to a must-have component of Europe's energy mix. It is the only sector (along with its sub-sector, biofuels, see next chapter) to be singled out for such special treatment by the politicians. This special treatment started in 1997, when the Commission proposed 'an indicative objective' for renewable energy to reach 12 percent of energy consumption.[1] At the time, the EU executive was of the view 'that an indicative target is a good policy

tool, giving a clear political signal and impetus for action'. This was to prove optimistic.

Four years later, the EU passed a directive setting a target, indicative again, of 21 percent for the share of electricity to be generated renewably by 2010. By 2007 the Commission judged that the EU was on track to reach a 19 percent share of renewable electricity by 2010, only a couple of points off the target. Outside of electricity, however, renewable energy had made little inroad.

By 2007, abandoning its earlier benign view of the effectiveness of voluntary indicative targets, the Commission was complaining that 'the absence of legally binding targets for renewable energies at the EU level, the relatively weak EU regulatory framework for the use of renewables in the transport sector, and the complete absence of a legal framework in the heating and cooling sector, means that progress is to a large extent the result of the efforts of a few committed member states.'[2] In wind power, the EU's three leaders are Germany, Spain and Denmark, far ahead of the rest. Finland and Sweden are the biggest burners of biomass for electricity. The photovoltaic sector is dominated by Germany with 86 percent of current installed PV capacity in the EU, a bizarre ratio reflecting subsidy rather than sunshine. So the Commission concluded that only mandatory targets could produce a more even performance for renewables across sectors and across countries.

The main rationale for promoting renewables is to reduce carbon emissions. Hitting the 20 percent target would save 600–900m tonnes in CO_2 emissions a year, the Commission claimed.[3] But there are other forms of low-carbon energy, notably nuclear, and cheaper ways of cutting emissions such as energy efficiency and demand reduction measures. So promoters of renewables also vaunt their other merits in providing energy security and employment. The EU will also save money on importing fossil fuels, as much as 200–300m tonnes a year according to the

1 'Energy for the Future: Renewable Sources of Energy', Commission White Paper for a Community Strategy and Action Plan, COM (97) 599, 1997, p.10.
2 Renewable Energy Road Map, COM (2006) 848, p. 5.
3 Commission Memo/08/33, p. 3.

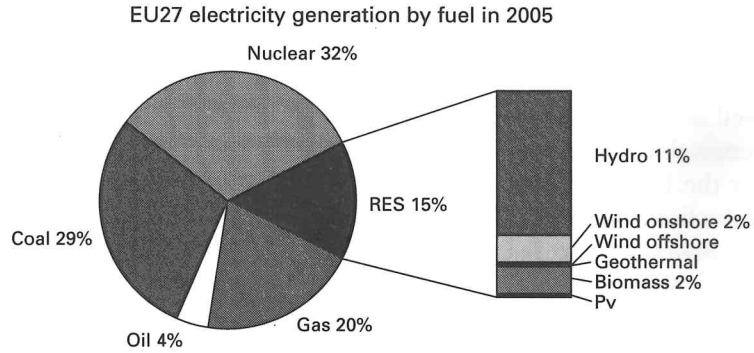

Figure 4: Renewables' Place in the Generation Mix

Source: European Commission document, SEC(2008)57, p.18

Commission, and give itself greater diversity of energy sources, strengthening Europe's resilience in the event of external shocks such as oil interruptions. Another gain would be the boost to Europe's renewable industry that already has a turnover of Euros 30bn a year, employs some 350,000 people, and provides alternative custom for Europe's farmers and foresters.

But there is a price tag on going green. This can be calculated as the total cost of renewable generation minus whatever conventional fossil fuels might cost in the future. The higher the oil price (to which the gas price is mostly linked), the lower the real net cost of renewable. The cost of renewable generating equipment might also vary, but not so dramatically as the oil price, and it could drop. So, at a $48 oil price the additional annual cost of moving towards the 20 percent renewable target would be $18bn, but this would sink to $10.6bn a year if the oil price rose to $78 per barrel.[4] It must be said this Commission cost estimate for the whole EU looks understated, if there is any accuracy to the UK's 2008 forecast for its own renewable costs by 2020. This forecasts an extra £5–6bn a year by 2020, on the assumption that oil would be around $70 a barrel then.[5]

4 Renewable Energy Road Map, COM (2006) 848, p.16.
5 Department for Business, Enterprise and Regulatory Reform, UK renewable energy consultation, June 2008.

This extra price is worth paying if, as the citation from the European Renewable Energy Council at the start of this chapter suggests, a value is put on energy security and employment as well as on the reduction of emissions. Reaching a 20 percent renewable share in Europe's energy mix is not strictly necessary for the EU to hit its over-arching goal of a 20 percent emission reduction, but it could bring these other benefits.

However, there is a risk that meeting the renewable target could, at the margin, hamper progress towards the greenhouse gas reduction goal. This is because of its effect on the ETS carbon price, which is, or should be, a neutral driver pushing forward all low-carbon technologies from nuclear power and carbon capture and storage (CCS) to renewables. The paradox is that if any of these low-carbon technologies is pushed artificially hard – through non-market mechanisms, such as targets, rules or government fiat – the effect will be to depress the carbon price simply by pushing demand for carbon allowances on the ETS artificially low.

Commission economists have run projections showing that, everything else being equal, meeting the twin 20 percent emission and renewables goals simultaneously would produce a carbon price of Euros 39 a tonne of CO_2 by 2020, compared to Euros 49 a tonne if the greenhouse gas target alone were allowed to drive renewables.

Thus, it is possible that the emissions target might not be met if the incentives to develop nuclear and/or CCS were sufficiently undermined by a weaker carbon price. The extent of any undermining would depend on how much carbon prices actually prove to be the deciding factor in nuclear or CCS investment rather than regulatory obstacles and planning delays. And, if the carbon price did prove key, it could be supported by withdrawing some carbon allowances from the market, though such intervention might damage belief in the market's integrity.

In theory, the minimum 10 percent biofuel target (see next chapter) could also weaken the ETS carbon market price, because it is another non-market mechanism being used to boost low-carbon energy. In practice, it will have less effect on the carbon price. This is because the transport sector, where most of the petrol and diesel carbon emissions displaced by biofuels will occur, is not covered by the ETS, though the process of manufacturing fossil fuels in oil refineries is. Yet the biofuel target does introduce artificiality. For without such a target, biofuels would, as one of the most expensive renewables, be one of the last to be developed. With the target, they may displace some other renewables.

Of course, it is true that the EU carbon market could have been bent more out of shape if EU leaders had followed the European Parliament, which had originally wanted a renewables target of 25 percent of final energy demand by 2020 (and an indicative 40 percent target for 2050). It is also the case that aiming now at a 20 percent renewable target might prove a useful building block if the EU subsequently went for a higher emission cut. For the EU has clearly said that while its 20 percent emission cut (from 1990 levels) is unconditional, irrespective of what the rest of the world does, it would move to a 30 percent cut if this were matched internationally.

National targets

However, EU leaders only did part of the job when they agreed at their March 2007 summit to the 20 percent average target for the Union. The trickier part was to break this down into binding national targets. The leaders gave the following guidance in their summit conclusions:[6]

> Differentiated national overall targets should be derived with member states' full involvement with due regard to a fair and adequate allocation taking account of different national starting points and potentials, including the existing level of renewable energies and energy mix, and, subject to meeting the minimum biofuels target in each member states, leaving it to member states to decide on national targets for each specific sector of renewable energies (electricity, heating, cooling, biofuels).

But this left the Commission with guidelines that potentially

6 See http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/93135.pdf

conflict (starting point versus potential, for instance). So Brussels officials looked at various options:

- One was to repeat the classical modelling exercise that Brussels had used to produce the indicative national targets contained in the 2001 directive. The basic technique here was to increase the marginal cost of conventional energies and see at what point on their cost curve renewable energy could begin to compete with them. However, such an approach produced very different results for different countries, in particular high targets for the central and eastern European countries that were not part of the EU in 2001. Modelling brought out these new member states' high renewable potential – they had generally done little to 'go green', yet had considerable biomass to do so – and set them correspondingly high targets. Another difference with 2001 was, of course, that this time the targets were binding, and therefore as one official said, 'member states will always try to out-model us, or quibble with our assumptions, if they don't like the result'.
- Asking every member state to make by 2020 the same 11.5 percent point increase from their actual 2005 renewable share. But it was felt this would be unfair on those states that had done a lot already or had little extra potential to do more. Several countries would fall into both these categories.
- Facing such difficulties about national targets, the Commission even thought briefly of putting targets and constraints on companies rather than governments. So all companies would have a target or supply obligation, such as every oil company would have to make 10 percent of all fuel sold biofuel. But it was quickly realized that while such an approach could be applied to big operators (electricity and oil companies), it would be impossible to apply to the individualised sectors of heating and cooling.

Therefore, the Commission decided to combine some of the options in a way that would respond to the March 2007 summit's call for fairness. The overall goal was to raise renewables' share in final energy demand from 8.5 percent in 2005 to 20 percent by 2020. Half this 11.5 percentage point gap would be closed by an equal increase to every state's renewable target share, and

the other half with increases varied to take account of relative gdp and, to a small extent, states' green energy starting point and potential. At one extreme, this gave Romania only a 6.2 percent point renewable increase in its energy mix. At the other was the UK with a 13.7 percent point increase; Britain lags far behind in renewable development, ahead of only Malta and Luxembourg, but as a windy island has obvious wind and tide power potential. The Commission judged the balance right. The

Table 12: National Renewable Targets

	Share of energy from renewable sources in final consumption of energy, 2005 as a percentage	*Target for share of energy from renewable sources in final consumption of energy, 2020 as a percentage*
Belgium	2.2	13
Bulgaria	9.4	16
The Czech Republic	6.1	13
Denmark	17.0	30
Germany	5.8	18
Estonia	18.0	25
Ireland	3.1	16
Greece	6.9	18
Spain	8.7	20
France	10.3	23
Italy	5.2	17
Cyprus	2.9	13
Latvia	34.9	42
Lithuania	15.0	23
Luxembourg	0.9	11
Hungary	4.3	13
Malta	0.0	10
The Netherlands	2.4	14
Austria	23.3	34
Poland	7.2	15
Portugal	20.5	31
Romania	17.8	24
Slovenia	16.0	25
The Slovak Republic	6.7	14
Finland	28.5	38
Sweden	39.8	49
United Kingdom	1.3	15

Source: European Commission 2008

control. As the German environment and Spanish industry minister put it in a joint letter of complaint to the Commission (just before the EU executive unveiled its plans on 23 January 2008), 'if member states have to achieve a national target, they need to have the means in their hands and they must not lose these means through an EU-wide scheme.' There were worries about uncontrolled inflows of green power (in the form of GoOs being presented for feed-in payments) that might push a country unnecessarily over its renewable target and at an exorbitant cost. Equally, there were concerns about outflows of green power from countries that would then undershoot their targets.

The major reason, of course, for such inflows and outflows would be to exploit the differences in feed-in tariff or premium levels between various EU states. The effect of uncontrolled trade over time would be to reduce these differences, and to make it hard for governments to set their own tariff levels in the future. This prospect of de facto harmonization has been resisted by 'feed-in' countries, and the renewable energy industry itself, as fiercely as any formal attempt by Brussels to propose an EU-wide support scheme.

In other sectors of the European economy, the Commission would regard a multiplicity of state aids as dangerously distorting and would use its autonomous powers to rein in these state aids or, at a minimum, harmonize them. It has had to take a different attitude to renewable energy. State aid is accepted as essential because renewable energy is considered an unqualified public good, and because Brussels has no comparable EU money to promote it (see section on carbon capture and storage in Chapter 14).

Some Commission officials would like to harmonize national support schemes. They realize delay merely stores up trouble for the future. Indeed the 2001 renewable directive seemed to offer a chance to end the fragmentation of support schemes. It required the Commission to report in 2005 on the cost effectiveness of the various national support systems, on whether to harmonize them and if so on what model.

But when 2005 came around, the Commission dodged the issue. It said the track record of feed-in and quota obligations were too short to make a proper comparison and gave itself

another two years to answer the question. In 2007 the Commission came off the fence slightly. Its report then found that '*well-adapted* [original italics] feed-in tariff regimes are generally the most efficient and effective support schemes for promoting renewable electricity', as the chart below indicates. Yet the Commission went on to say that 'while harmonization of support schemes remains a long term goal on economic efficiency, single market and state aid grounds, harmonization in the short term is not appropriate.'[7]

The figure shows how spectacularly effective feed-in tariffs have been over recent years in Germany, Spain and Denmark.

The Commission's dilemma is that the system (quota obligations) most apt architecturally for the whole EU appears to be

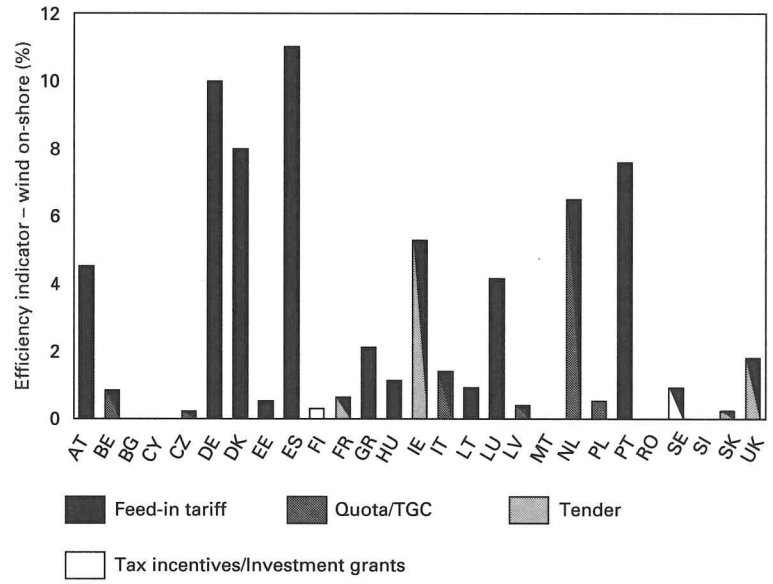

Figure 5: Effectiveness of Renewable Subsidies, 1998–2006

Source: European Commission document, SEC(2008)57, page 26. The effectiveness indicator is the ratio of increased electricity to additional realisable potential over the same period.

7 The support of electricity from renewable energy sources, COM (2008) 19, p. 17.

less effective in actually increasing green power than the system (feed-in tariffs) less suited to the EU scale.

Both systems can be prone to over-paying companies that thereby reap windfall profits. Feed-in tariffs need fine tuning, usually downward adjustment, to take account of technical progress as technology matures, but most tariffs have this degressivity, or downward tapering, built in. In the quota obligation system, it is the most expensive technologies that set the marginal cost of meeting the quota obligation and determine the price of tradable green certificates. So anyone operating more cost-efficient technology, typically onshore wind power, will benefit more. But feed-in tariffs seem to score better on effectiveness, in attracting investment, because they provide financial certainty irrespective of the market.

Such divorce from the market is a weakness from a national or European viewpoint. It is therefore welcome that some countries are moving away from pure feed-in tariffs (which totally supplant the electricity market price) to premiums (which top up the electricity market price). At the same time, the UK has said it will introduce some differentiation in its quota obligation system to encourage technological diversity in the way feed-in tariffs usually do. Such measures should remove the worst features of the two main systems, and represent a slight convergence between them.[8]

It can be argued that fussing about distorted renewable subsidies is relatively unimportant, because even if the overall 20 percent renewable target is met, this will only increase renewables to about a third of the EU electricity market. This is an argument made by the renewable industry, which contends Brussels' first order of business should be to tackle all the structural problems in the conventional two-thirds of the EU electricity market. There is a certain logic to this sequence of events. Removing discrimination in the internal energy market ought to make it easier for renewables to get on the grid, though there are technical, planning and financial issues that can also make that hard.

But the difficulty of general internal market reform should

8 Ibid. p. 15.

not be allowed to become the pretext for indefinitely delaying the creation of a coherent and consistent EU renewable support programme. The Commission finally said as much in the January 2008 launch of its renewable energy policy. 'When the single electricity market becomes competitive and new entrants producing renewable electricity can participate on a level playing field, certain design features of renewable electricity support schemes will have to be reviewed.'[9]

Restrictive trade practices

For the foreseeable future, however, it looks as though trade in green energy will be very restricted, out of deference to the big feed-in tariff countries and the renewable industry. The trade will probably be controlled by governments, as it was between members of Comecon, the Soviet bloc economic organization, which is not a great advertisement for any system.

Under pressure from the start to restrict trade, the Commission originally proposed that governments would be able to set up a system of prior authorization for the transfer in and out of their territory of these GoOs if they were concerned about maintaining their support schemes or hitting future renewable targets. Prior authorization would give the states the ability to vet, and the right to veto, green certificate transactions. Nor would renewable generators become free to go subsidy shopping around Europe. Out would go the current restriction tying a generator to the support scheme of the member state in which it is physically located. But in would come a new 'lock-in' restriction tying a generator to whichever member state it first presents a GoO; this could be another member state, though it would most likely be the generator's home state.

Nonetheless, this was still too 'free trade' for heavyweight renewable states such as Germany, for the renewable industry and, crucially, for Claude Turmes, the Luxembourg Green MEP who was the European parliament's rapporteur on the renewable directive. Mr Turmes' suspicion of the Commission plan was

9 Ibid. p. 13.

increased by the backing it got from the Eurelectric organization of big generators and the European Federation of Energy Traders. 'Creating an EU wide renewables certificate market is not the way forward', Mr Turmes wrote in his report. 'It would undermine the existing national support schemes, but also potentially generate Euros 30bn in windfall profits for traders and generators', on the ground it would favour technology with the lowest marginal costs like onshore wind to the exclusion of other more exotic technologies. This, he concluded, would far exceed the potential Euros 8bn a year saving by 2020 that the Commission had calculated could be gained by having EU-wide trading in green power certificates.[10]

By mid-summer 2008, most proponents and opponents of certificate trading had become bogged down in what one Commission official described as '1914–18 trench warfare'. It was at that point the UK, Germany and Poland got together to suggest a compromise. This would allow some trading across borders and even outside the EU. But it would crucially leave governments in charge of any trade of renewable energy, related to fulfilment of their national targets, which could be exchanged on the basis of official statistics.

This proposal preserves some of the Commission's plan for 'virtual' renewable energy trade, but puts it all under governments' control. It could take the form of statistical swaps between member states (which would buy and sell percentage points of green power), or two or more member states combining targets or support schemes, or deals between a couple of member states whereby a renewable project would be built in the first state but some or all of the energy would count towards the goal of the second state. 'We want a single market in renewable energy, but not, at this stage, a single market in renewable energy finance', commented a UK official.[11] The UK–German–Polish proposal was the basis for the renewable trading system agreed in December 2008.

In conclusion, the problem is not that the EU – for

10 Claude Turmes, Environment Committee report on the renewable energy directive, 26 September 2008

11 Author Interview 2008

understandable political reasons of solidarity and equity – settled on a system of differentiated national targets. The pity, rather, is that having come up with a system that requires cross-border trade, the EU then did its best to frustrate that trade. Significantly, in its otherwise gently-worded report in 2008 on EU energy policy, the International Energy Agency was sharply critical of EU restraints on renewable energy trading.

Another criticism of the renewable energy targets is that they are impossibly high, certainly for a country such as the UK with a record of target failure; failing to achieve them or achieving them at excessive cost will discredit the whole programme. This is the charge made, among others, by Dieter Helm who has suggested various ways of softening the target (partly by redefining renewable as low carbon to embrace CCS or even nuclear and partly by prolonging the deadline beyond 2020).[12]

Of course there is a psychological point at which, if the bar is set too high, you don't even bother to try to jump. And at 20 percent the renewable bar might prove so high as to be incredible to the wide number of market players needed to create a broad renewable energy base. Yet so-called stretch targets can be good. If targets stretch the abilities or efforts of people, companies or states in a good cause, they are beneficial even if they are not met. However, while ability and effort are not finite and can and should be stretched, natural resources are finite. This is why the one renewable goal under real attack has been the sub-target set for biofuels.

12 Renewables – time for a rethink? June 2008. www.dieterhelm.com.

CHAPTER 12

PUTTING TROUBLE IN YOUR TANK

At the rate at which the European Union and its member states are supporting the production of ethanol, they could have gone to the world market and bought twice as much energy in the form of petrol for slightly less money.

2007 report by the Global Subsidies Initiative.

Not all biofuels are equal – there should be no favouring of EU production of biofuels with a weak carbon saving performance if we can import cheaper, cleaner biofuels.

European trade commissioner Peter Mandelson, July 2007.

Despite biofuels being cast as the culprit for pressure on world food prices, there is a case for *some* further increase in the use of biofuels in Europe.

Road transport accounts for nearly one third of Europe's total energy use. Around 98 percent of road transport is fossil-fuelled. Most of the future growth in Europe's CO_2 emissions will come from transport. And biofuels are the only cleaner alternative road transport fuel on the horizon. Moreover, replacing some of Europe's imported oil with home-grown fuel improves energy security, and in a small way moderates the rise in oil prices. According to the International Energy Agency, 'biofuels have become a substantial part of faltering non-Opec supply growth, contributing around 50 percent of incremental supply in the 2008–13 period.'[1]

So in March 2007 European Union leaders decided biofuels should, in principle, account for at least 10 percent of all transport fuel in all 27 states in the Union by 2020. In the January 2008 draft legislation to implement this goal, the Commission proposed the 10 percent minimum should be of 'renewable

1 IEA Medium Oil Market Report, 1 July 2008

energy', not just biofuels. This redefinition was retained in the December 2008 legislative agreement, which made clear the 10 per cent renewable energy minimum should be of the EU's total fuel consumption in all forms of transport. The final deal gives a preference to the development of so-called second generation biofuels – such as fuels made from residue, waste and woody biomass – which unlike crop-based first generation biofuels do not compete with food or feed production. So second generation biofuels will get a double credit towards the 10 percent target, while renewable electricity powering electric cars will be counted at 2.5 times their input towards the target. Green electricity powering trains can also count towards the target, but only once as with all first generation biofuels.

But before delving into the controversy behind this shift in emphasis, it is important to establish why a mandatory across-the-board minimum was felt to be necessary in the first place. It is not just that it suits European farmers and those EU states with a big farm lobby as a continuation of the Common Agricultural Policy by other means. There is another reason. If biofuels were bundled in with other forms of renewable energy, and left without a specific target, many people and governments in the EU would think it more environmentally or economically rational to focus on wind or solar power or even other uses of biomass.

For if you wanted to use biomass – crops, wood and waste – to get maximum reduction in greenhouse gases you would use it for electricity, and if you wanted to turn biomass into energy most efficiently, you would use it for heating. So, if there were no compulsion to develop biofuels, nothing would be done to clean up Europe's vehicle emissions. (The only profitable form of biofuels developed so far remains alcoholic spirits for human consumption. 'Biofuels are basically booze', a vice-president of the ExxonMobil oil company recently told a conference, 'and we don't do booze.')

For those who savour trade-offs and policy dilemmas in energy policy, biofuels are a gem. The biofuel industry will compete with the food sector for agricultural crops. It may, while helping to combat global warming and to clean up the atmosphere, also damage the terrestrial environment by encouraging monoculture

of energy crops and reducing bio-diversity. As a relatively clean home grown form of energy, biofuels would appear to appear to serve the cause of both energy security and climate stability. But there could be friction between these two goals, especially if, because of its protectionist biofuel lobby, the EU were to aim at biofuel self-sufficiency by growing biofuels that only marginally reduce carbon and by shutting out imports with a far higher 'carbon-saving' capacity. That in turn could lead to conflict with many developing countries that see in biofuels a valuable new export. The climate could also suffer if Europe were to import biofuels heedless of whether these had been produced on land cleared of rain forest; for halting tropical deforestation is by far the most effective way of slowing the rise in carbon emissions.

Aware of some of these pitfalls, EU leaders attached some conditions to their March 2007 summit's endorsement of the 10 percent biofuel target for 2020. They said it should be introduced 'in a cost-efficient way', and added that 'the binding character of this target is appropriate subject to production being sustainable, and second generation biofuels being commercially available'. But, perhaps unwisely, the Commission did not take this too seriously. It entered a statement into the minutes of the March 2007 summit that it 'does not consider the binding nature of the target should be deferred until second generation biofuels become commercially available'. Subsequently the Commission official in charge of renewable and biofuel policy told a conference that the rider about second generation development should not be regarded as 'absolute conditionality'. However, as we shall see, the European Parliament has taken this condition rather more to heart.

Although used in Europe during periods of war or excess agricultural production, biofuels only became the object of serious scientific research and political attention after the first oil shock of the early 1970s, and of industrial production since the early 1990s. The first policy measures to benefit biofuels were not specific to the industry at all – the CAP was reformed to divert agricultural surpluses to industrial uses. As part of its deal with the US concluding the Uruguay round of world trade negotiations, the EU instituted a scheme whereby farmers had to set aside a portion of their arable land, on which they could

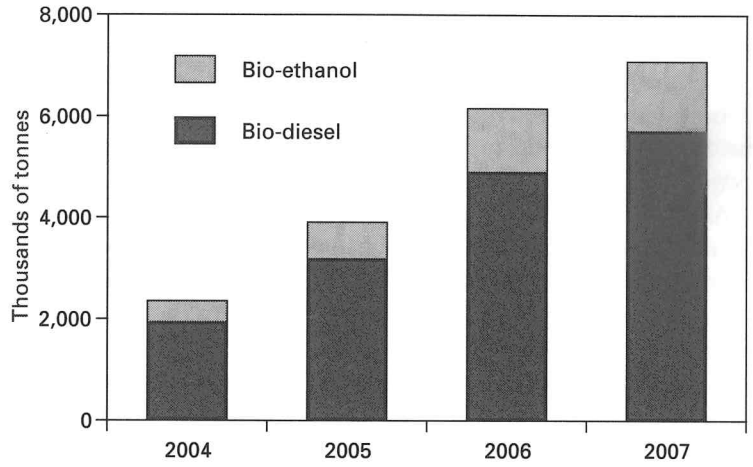

Figure 6: Biofuel Production in the EU

Source: Sources: European Bio-diesel Board, European Bio-ethanol Fuel Association.

grow non-food crops, such as oilseed rape for biodiesel. The Commission reported in 2006 that more than 95 percent of the 'non-food set-aside areas' had been used for energy crops.[2]

A 2003 directive on the voluntary promotion of biofuels set a non-binding target for a 2 percent biofuel share of the EU road fuel market by 2005, and 5.75 percent by 2010.[3] But by 2005 the actual biofuel share was only 1 percent, and it became clear that voluntary means alone would be insufficient to meet the 2010 goal, despite the existence of sizeable fiscal incentives.

Economic costs

The biggest financial prop for biofuels has been exemptions from, or reduced rates of, excise duty on fuel. There is no EU-wide exemption from excise duty for biofuels – partly because there is no EU excise duty or common EU-wide level of national

2 COM (2006) 500, Report from the Commission to the Council on the review of the energy crops scheme, p. 7.

3 EU directive, see 2003/30/EC.

excise duty on fuel. But there is EU legislation allowing member states to give biofuels exemptions from their standard rate of excise on fuel. In the 1990s these fiscal advantages were limited to biofuels produced in pilot plants, but since the passage of the 2003 Energy Taxation Directive they can, and do, cover commercial biofuel production.

As of mid-2007, 16 member states were offering such tax breaks to their biofuels sectors. Since the aim is to enable biofuels to compete on equal terms with fossil fuels in the marketplace, the tax break is supposed to cover no more than the gap between oil prices and biofuel production costs. Nonetheless, these tax exemptions constitute by far the largest part of financial support for biofuels in the EU. By one calculation, they amounted in 2006 to over Euros 900m of the Euros 1.3bn total financial support that went to bioethanol in Europe, and Euros 2.1bn of the total Euros 2.4bn that went to biodiesel in Europe.[4]

However, the burden of support will spread more widely to consumers as well as taxpayers, as the compulsory minimum market share for biofuels comes into effect. Some such quotas are already here on a national level. By 2008 nine member states had already, on their own initiative, imposed mandatory biofuel market shares or blending targets on themselves. They included, ironically, the UK, a country that lags behind almost all others in its take-up of biofuels. The UK introduced its 'renewable fuel obligation' on April 1 2008, only to respond to growing public disquiet about the biofuel impact on food prices by announcing a couple of days later a review of the policy by Ed Gallagher, chairman of the UK Renewable Fuel Agency.

To clean up conventional road fuels, the EU also agreed at the end of 2008 on a revision of its 1998 Fuel Quality Directive. As well as raising the amount of biofuel that can be blended with petrol from 5 percent to 10 percent, the revision would require a 6 percent reduction in greenhouse gas emissions per energy unit of fossil fuel by 2020.

The cost of supporting biofuels is bound to increase in the

4 'Biofuels – At What cost? Government Support for Ethanol and Biodiesel in the European Union – 2007 Update' Global Subsidies Initiative, Geneva, October 2007.

future. The biggest element in that support – exemption from excise duty – would evaporate if biofuel production costs fell below that of oil. Even at the very high oil price of mid-2008, this is unlikely to happen, partly because some fossil fuel is needed to make biofuels. As the Organization for Economic Cooperation and Development (OECD) has pointed out, 'higher oil prices will both raise the production cost of biofuels (as fossil fuels are an important input in the production process) and exert upward pressure on agricultural commodity prices as a result of the increased demand for them.'[5] So by expanding biofuel production, the positive link between oil prices and biofuel costs might awkwardly get stronger, not weaker. If the cost of biofuels moves in the same direction as oil prices, the biofuels would be unlikely to reduce transport prices.

If all that mattered was producing biofuels, the EU could do a great deal. According to the Commission's Biofuel Research Advisory Council, 'in 2030, EU biomass would hold the technical potential to cover between 27 percent and 48 percent of our road transport fuel needs, *if all biomass would be dedicated to biofuel production*'(emphasis added).[6] But, in the absence of war or total and prolonged interruption in oil imports, devoting all biomass to making biofuel is a quite unrealistic proposition. So the advisory council settled for a quarter share of EU road transport fuel needs being covered by biofuels in 2030 as 'realistic', half from domestic production and half from imports.

Even a quarter-share could be fanciful, however, according to a report done for the OECD. It believes the economics of biofuels will remain unfavourable. 'Although there is scope for production costs for biofuel feedstocks to decline as a result of improvements in yields, it is not clear that such improvements will be enough to compensate for rising prices due to production factors and the combined pressures on prices of rising demand for food, feed and biofuels. Increasing competition with biomass feedstocks – woody material as well as agricultural products – is

5 OECD report, 'Biofuels: Is The Cure Worse Than The Diseases?', 12 September 2007, p. 5.

6 Final report by the Biofuel Research Advisory Council, Office for Official Publications of the European Communities, 2006, p.18.

actually pushing feedstock prices and production costs up. Higher oil prices will have the effect of increasing biofuel production costs while simultaneously making fossil fuel alternatives such as tar sands and coal-to-liquids increasingly competitive.'[7] All of these are factors that would threaten the economics of all but the most competitive biofuels such as Brazilian ethanol.

Environmental costs

The most obvious tensions in promoting biofuels are the risks to food production and the environment. Controversy rages over biofuels' share of the blame for higher world food prices. The US administration and the European Commission put this share as low as 3 percent, but an internal World Bank report was reported to blame biofuels for 75 percent of the 140 percent rise in the price of a basket of food commodities over the period of 2002–8.[8] For its part, the UK's Gallagher review concluded in July 2008, 'the demand for biofuels contributes to raise prices for some commodities, notably for oil seeds, but that the scale of their effects is complex and uncertain to model.'

The Commission claims to be relatively confident that, at least in the short to medium term, the strains on EU crop resources would be manageable, provided that the EU lets in adequate imports and makes progress, over the longer term, on second-generation biofuels made out of wood and cellulose that would not compete with food. EU production of ethanol is relatively modest, using less than 1 percent of the Union's cereal and sugar beet harvests. But any further surge in biodiesel production in Europe could put serious pressure on rapeseed oil output, of which 60 percent already goes to biodiesel. The scientific committee of the European Environment Agency, an EU body, gave in April 2008 its view that the proposed 10 percent target was 'over-ambitious', carried too many environmental risks, and should be suspended pending further research and replacement by 'a more moderate long-term target, if sustainability cannot be

7 OECD report cited above, p. 6.

8 Reported in *The Guardian* newspaper, 4 July 2008.

guaranteed'.[9] Increasing concern has also been expressed about the 'displacement effect' of increased cultivation of biofuels in Europe, leading to more land being cleared in developing countries for the food that Europeans would no longer be growing. Moreover, the food industry is not biofuels' only competitor for the produce of Europe's fields and forests. Outside the energy field, there are other industrial users of biomass, especially chemical companies that draw many substances from agriculture and forestry, and the packaging and construction sectors that use a lot of wood products. The governments of Austria, Belgium, Finland, France, Germany and Luxembourg – all with forestry interests – made a joint appeal in December 2007 for the EU not to let its drive for biofuels short change these other industries of renewable raw material.

The environmental calculation has to weigh what a given biofuel process does for the atmosphere and the land. Specifically, can it 'save' enough greenhouse gases, compared to conventional petrol and diesel, to justify the extra strain it might put on the land? OECD studies claim only three current technologies meet this test: Brazil's sugarcane-to-ethanol process; ethanol produced as a by-product of cellulose output as in Sweden and Switzerland; and manufacture of biodiesel from animal fats and used cooking oil (requiring little or no further input of fossil fuel). Other conventional biofuel technologies typically deliver savings of greenhouses gases of less than 40 percent, compared to their fossil-fuel alternatives, which therefore may be insufficient atmospheric improvement to warrant extra strain on the terrestrial environment. 'When such impact as soil acidification, fertilizer use, biodiversity loss and toxicity of agricultural pesticides are taken into account, the overall environmental impacts of ethanol and biodiesel can very easily exceed those of petrol and mineral diesel.'[10]

The eventual EU legislation agreed in December 2008 took many of these considerations into account. For a biofuel to be counted towards a member state's 10 percent minimum

9 EEA Committee press statement, 10 April 2008, see also *www.eea.europa.eu*

10 OECD 2007 report cited above, p. 5.

renewable energy share in transport fuel, it must save at least 35 percent of greenhouse gas emissions compared to fossil fuels. The GHG saving threshold for target-qualifying biofuels will rise to 50 percent from 2017 onward, and from that date new installations must produce biofuel with emissions at least 60 percent lower than fossil fuels. The chosen fossil fuel benchmark for judging for GHG savings is the fairly tough one of Middle East oil, whose relatively easy extraction and refining requires little fossil fuel input (by contrast, virtually any biofuel would show enormous GHG savings if compared to, say, oil from Canadian tar sands).

The legislation sets out, for various biofuels, 'default' GHG savings rates which are generally below 'typical' rates. The default rate is the emission saving that a biofuel will be assumed to produce, in the absence of any evidence to the contrary. But, if they take the trouble to do so, producers can generally show to the EU authorities that their manufacturing technique will produce higher GHG savings, approaching the typical rate for that particular biofuel.

The table below has some examples of estimated GHG savings for different biofuels taken from annexes to the legislation. It illustrates, with the example of wheat ethanol, that the process fuel in making a biofuel can be crucial. It shows that corn or maize ethanol, the biofuel staple in the US, makes reasonable savings, but would only just meet the 50 percent EU threshold from 2017 on. It underlines that sugar crops produce a good GHG reduction, but that sugar cane (as grown in Brazil for instance) outperforms EU-grown sugar beet. It highlights that rape seed diesel, currently a European staple, may struggle under the new legislation to count towards national or EU targets. It points to the savings gained in using waste product, such as vegetable or animal oil, that has already been refined, or simply using gas as gas in the case of biogas from municipal organic waste being used as compressed gas to power vehicles. Finally, with the last three categories, it estimates the savings to be made from so-called second generation biofuels made from non-food crops.

But note that the chart below assumes that there has been no net increase in carbon emissions as a result of the change in

Table 13: Not all Biofuels are Equal

Biofuel production pathway (on the assumption of no net carbon emissions from land use change)	*Typical greenhouse gas emission saving**	*Default greenhouse gas emission saving**
Sugar beet ethanol	61 %	52%
Wheat ethanol (process fuel not specifed)	32 %	16%
Wheat ethanol (natural gas as process fuel in CHP plant	53 %	47 %
Wheat ethanol (straw as process fuel in CHP plant)	69%	67%
Corn (maize) ethanol EU-produced (natural gas as process fuel in CHP plant)	56 %	49 %
Sugar cane ethanol	71 %	71 %
Rape seed biodiesel	45 %	38 %
Sunflower biodiesel	58 %	51 %
Waste vegetable or animal oil biodiesel	88 %	83 %
Biogas from municipal waste as compressed gas	80 %	73 %
(Future) wheat straw ethanol	87 %	85 %
(Future) waste wood ethanol	80 %	74 %
(Future) farmed wood	76 %	70 %

* Greenhouse gas saving compared to oil from the Middle East

Source: Annexes to resolution adopted by the European Parliament, 17/12/08

use of the land on which the biofuels are grown. For there are types of land that would release such large amounts of carbon on being converted to biofuel cultivation that biofuel 'saving' could never make up the carbon loss from the original land use change. Top in carbon storage are wetlands, followed by forests, because of the foliage in both. According to the United Nations' International Panel on Climate Change wetlands on average hold 686 tonnes of carbon per hectare, forests 275 tonnes per hectare and grasslands 181 tonnes per hectare, compared to only 82 tonnes per hectare of arable land.

Obviously, maintaining land so good at capturing and storing carbon is essential. So the Commission has proposed that no financial support or compliance credit should go to biofuels

grown on land that, as of January 2008, was classed as wetland, mature forest, undisturbed forest, protected nature zones or highly bio-diverse grassland. Green groups criticized the Commission for setting the cut-off date so late that many of the slash-and-burn tropical clearance schemes of recent years will get into the EU biofuels scheme. The Commission said it had considered pushing the cut-off date back to 2003, the date of the previous EU directive on renewable energy, or even to 1992, the date of the UN Framework Convention on Climate Change. But it said it concluded that January 2008 was the appropriate cut-off because only then did its sustainability criteria become clear, implying that any earlier cut-off might unfairly penalize biofuel producers working on different assumptions about Brussels' eventual attitude. It is a pity that the EU did not think more about sustainability at the outset of its biofuel policy.

Many of the objections to the first 'booze' generation of biofuels would fall away if a second generation could be developed from 'lignocellulosic' biomass, from farm by-products such as straw, from wood products and from pulp and paper processes. Use of these inedible raw materials would avoid direct competition with the food industry, though there would still be some environmental concerns about what might be called 'factory forestry'. Indeed some first-generation biofuels only make sense as a bridge – and a short bridge at that – to the next generation. 'One reason that first generation biofuels continue to be promoted as serious solutions to the twin challenge of climate change and energy security is the notion that they will soon be supplanted by more advanced technologies now in development', according to the OECD study.[11]

But the same report goes on to cast doubt on whether second generation biofuels will become economically viable any time soon. It bases part of its doubt on logistics, not science. 'The logistical challenge of transporting biomass material to large production facilities is likely to impose a floor below which production costs cannot be lowered. This leads some to believe that the second generation biofuels will remain niche players, produced mainly in plants where the residue material is already

11 Ibid.

available in situ, such as bagasse (cellulosic residue from sugar cane pressing) and wood-process residues.' Such conditions are likely to be confined to Brazil and Finland.

Biofuels in moderation

For some years, however, the EU will have to make do with the current set of biofuels and cope with the dilemmas they cause. Having a mandatory biofuel target at some level is not a bad idea; the 2003 voluntary target produced little progress. Equally, putting too much stress on first generation biofuels is unwise, as many in the European Parliament pointed out. We have already seen in the previous chapter how Claude Turmes, the ponytailed Green MEP from Luxembourg, had a considerable influence on renewable electricity as the European Parliament's rapporteur on renewables legislation. On biofuels Mr Turmes wanted no mandatory target at all to encourage first generation biofuels. In the end he failed to get the 10 percent target killed, but he was very instrumental in scaling back incentives for first generation fuels by giving such favourable weighting to second generation biofuels.

One important advantage of scaling back the target, bringing demand more in line with sustainable supply, would be to reduce the incentives for producers to cheat on environmental standards. This is particularly important outside the EU, where the sustainability of biofuel production will inevitably be harder to police than in Europe.

Trade in biofuels will grow. Indeed it should grow. At present it only accounts for around 10 percent of global biofuel consumption. This is almost certainly too small, given that the wide differences in biofuel production costs around the world ought to make a higher proportion of commerce beneficial to all. But the EU, like the US, is generally keen to protect its biofuels sector from imports.

One instrument of protection is technical. The EU prescribes an iodine threshold below that generally in the soya bean oil grown by the big North and South American soya producers, while the tendency of palm oil, produced in quantity in south

East Asia, to go cloudy and waxy in cold weather inhibits to some extent its use in Europe.

But Europe's other means of protection are tariffs. These are relatively low (3.2–6.5 percent) on biodiesel. But because the EU is by far the biggest world producer of biodiesel, imports of it are equally low, except bizarrely imports from the US because of a US export subsidy (which Brussels has been contesting). EU duty on ethanol is much higher, 39 percent on denatured (rendered unfit for human consumption) ethanol and 63 percent on pure ethanol. Nonetheless Sweden in particular has become a very big importer of Brazilian ethanol, by importing it as a product for blending with petrol and thereby paying a much lower duty on it.

The EU needs to strike a balance on biofuel trade. It needs to persuade the domestic EU biofuel industry that Europe cannot hope to meet even scaled-down biofuel targets without a reasonable level of imports. At the same time, it needs to persuade foreign biofuel producers that they cannot hope to get into the EU market without observing environmental standards.

Neither task will be easy, as became evident at a biofuels conference that the European Commission hosted in Brussels in July 2007. While Swedish trade minister Sten Tolgfors argued that biofuel trade needed to be freed of all distortions so as to use 'the full potential of the international trading system to halt global warming' (and presumably to let Sweden import Brazilian ethanol duty-free), Ramon de Miguel, president of the European Bioethanol Fuel Association, claimed his industry continued to need import protection. Otherwise, he claimed, imports from countries like Brazil would jeopardize European investment in the sector, especially important research into second generation biofuels, and would undermine the extra energy security that home-grown fuels were beginning to offer Europe.

Most non-European biofuel producers at the Brussels conference grasped the need to convince their customers of the environmental acceptability of their product. President Luiz Inacio Lula da Silva said most of Brazil's sugar cane (for ethanol) was being grown far from the Amazon rain forest. While most biofuel producers stressed that they were using marginal or waste land, Yusof Basiron, chairman of the Malaysian Palm Oil Promotion Council, acknowledged that some of his country's palm oil was grown on prime land. But he said that this had been opened to farming so long ago – as far back as 1917 – that it made no recent difference to the climate.

But Argentine farm minister Javier de Urquiza warned against the imposition 'from the outside' of sustainability standards. EU attempts to impose its standards unilaterally may be resisted by many countries, but mutually agreed international standards for certification of 'good biofuels' would also be difficult to negotiate. It would raise the tough issue – as with carbon compensation measures discussed in Chapter 10 – of whether it is possible and legal in international trade to discriminate, on environmental grounds, between *processes*, not just between *products*.

In sum, then, some further increase in biofuels is needed as the only way of tackling road transport emissions pending the commercial development of electric or hydrogen fuel cell cars. Some degree of compulsion is necessary to achieve this increase, because the biofuel share in road transport fuel is still only 1 percent despite sizeable tax exemptions in more than half EU states as well as quota obligations in some countries. Why should there be compulsion at the EU level? One reason is the alternative of increasing the biofuel tax exemption and spreading it across all 27 states would be hard to agree politically, and create a very uneven instrument, given the lack of any common EU level of fuel tax that biofuel would be exempt from. The broader reason for common action on biofuels is to avoid distortion in Europe's internal and external markets. Some imports are vital to prevent environmental damage in Europe. But some sustainability standards are vital to prevent environmental damage outside Europe.

In retrospect, the EU should have established its environmental criteria for biofuels some years ago in less politically charged circumstances. If the debate becomes too polarized, it condemns the EU to the kind of inaction, which, as we shall see in the next chapter, is evident with nuclear power.

CHAPTER 13

NUCLEAR POWER: THE IMPOSSIBLE CONSENSUS

The EU needs to spend at least 30 times more on nuclear waste management research.

Loyola de Palacio, European energy commissioner, 2003

Earlier, in Chapter 2, nuclear power was rated as having a high potential for EU collective action. This does not necessarily mean a common policy, which would be impossible when 13 member states do not have, and some of those do not want, nuclear power. It is rather the EU's potential ability to make nuclear power development easier for member states than it would be if they did not belong to the Union. As mentioned in Chapter 2, nuclear power's EU potential is rated at least as high as that of energy market policy, because it was given a complete institutional framework right from the start with the Euratom treaty of 1957.

But, in spite of Euratom, all key nuclear power decisions are national and are likely to stay so for a long time. Nor has a lavish EU nuclear research programme solved the problems that most worry Europeans about atomic power, such as final disposal of radioactive waste. So it is easier to argue that nuclear power has contributed more to Europe than Europe has to nuclear power.

The past year, 2007–8, has seen a modest revival of EU-level interest in nuclear power. The Commission has formed new groups of national regulators, officials, executives and researchers to discuss how to improve safety and radioactive waste management, how to harmonize national rules in these areas with a view to reducing the differing national standards that new reactors would have to meet across Europe, and how to make regulation and risk in nuclear power more comprehensible and hopefully acceptable to mostly sceptical European publics.

Such efforts are appropriate. For nuclear reactors still generate a third of total electricity in the EU. This contributes to Europe's energy security; though natural uranium is almost entirely imported, it is a small part of nuclear power's total cost and its enrichment into reactor fuel is mostly carried out within the EU. It contributes even more to the fight against climate change. 'Continued use of nuclear energy in the EU is almost certainly going to be necessary to attain the policy goals in climate change and security of supply', said the International Energy Agency in its 2008 report on EU energy policy. The EU's 152 reactors, more than in any other region of the world, provide two thirds of Europe's carbon dioxide-free power As such they draw indirect financial benefit from not needing the carbon emission permits now required of electricity generators using fossil fuels. So the perspective for nuclear power in Europe should be brighter.

Yet nuclear power will be lucky to maintain its one-third share of generation in the future. The average age of the EU's 152 reactors is around 25 years. This would not matter – reactors are typically designed for a 40-year working life that these days can be safely extended by a few years – if a reasonable rate of replacements was being planned.

At the time of writing, only two reactors, one in Finland and one in France, were being built inside the EU. More countries are considering building new reactors. They include the three new member states: Lithuania, Slovakia, and Bulgaria, which are being obliged to shut down, as a condition of their entry into the EU, Soviet-era reactors judged to be unsafe. But there is interest elsewhere in Eastern and Central Europe, a region where green political parties are weak and where economic factors still tend to prevail over environmental ones, in expanding nuclear power. Romania and the Czech Republic plan to expand their atomic power programmes, while Estonia, Latvia and Poland are discussing participation in a new Lithuanian reactor.

In Britain, the first country in Europe to open a power reactor, the Labour government has decided in favour of replacing its existing reactor fleet (the oldest in Europe with an average age of 30 years), but is leaving to the market the question of how and who should do this. Again, at the time of writing,

the UK government had yet to entice any company into a firm contract to build new reactors. In Italy, the first country in Europe to abandon its nuclear programme (after a 1987 referendum with a narrow No majority vote against nuclear power), the government of Silvio Berlusconi, re-elected in 2008, announced it would seek to reintroduce nuclear generation. This will not prove simple.

Having shut down its programme, any government in Italy may feel the lack of local support for nuclear power surrounding reactors that are still operating, though there is still some residual employment around old reactors to carry out decommissioning. For it is an observable fact, virtually everywhere, that the strongest backing for nuclear power comes from those most immediately living and working with it; this is why the easiest place to put a new reactor is next to an old one. Any such difficulty in restarting nuclear power from scratch may give pause to those other EU states that have said they will phase out nuclear power by not replacing their existing reactors. Germany, Spain and Sweden are still on course to do this eventually, although there is a debate in each of these countries about the wisdom of this. Belgium announced in spring 2008 that it was reviewing its gradual rundown of nuclear power.

So the situation differs country by country, and it hard to see how things could be otherwise, given present perceptions of the costs and benefit of nuclear power. The memory of the 1986 Chernobyl reactor accident in neighbouring Ukraine is still too recent, and the prospect of catastrophic climate change, thankfully, still too remote, for EU states to agree – as they have on renewables – that nuclear power should form a *common* part of their energy mix.

Moreover, different European societies cope differently with the challenges of nuclear power. For France, the military use of the atom is not seen as original sin tainting civil nuclear; indeed its nuclear arsenal, the *force de frappe*, is a source of national pride. France, too, took very seriously the energy insecurity it felt during the 1973–4 oil shock, and as a result now has 59 of those 152 EU reactors. Public attitudes in other European countries to nuclear power have been shaped by issues such as reactor safety and particularly the lack of long-term nuclear waste

disposal. Not surprisingly, people are reluctant to contemplate new reactors producing new waste before ways have been found to deal with old waste from old reactors.

After long consultation and a very Nordic process of consensus-building, Finland took the decision on a long-term burial site for nuclear waste and, then, felt able to decide to build a new reactor nearby. This contrasts with France, which has still not decided on a final waste depositary but whose society is evidently ready to follow the state's lead in nuclear matters. The UK is somewhere in between France and Finland. As Malcolm Grimston has put it, Britain is 'more market-oriented but with governments which seem confused as to whether markets and consultation (on the one hand) or central diktat (on the other) are the appropriate mechanism for managing the interface between science and society'.[1]

What is clear is that the EU has done little to make individual countries' decisions about nuclear power any easier, let alone fashion a common policy. This is despite having, from the outset in 1957, the Euratom treaty which aims to promote nuclear energy in general and in particular uranium fuel supply, operational safety in reactors, safeguards against weapons proliferation, nuclear research, and has, in addition, a large staff to carry out these tasks.

Proliferation safeguards

Since 1970, when the Non-Proliferation Treaty (NPT) entered into force, the task of policing this United Nations treaty has been left to the UN's anti-proliferation body, the International Atomic Energy Agency (IAEA). But by that time, Euratom had already developed its own elaborate safeguards to prevent the spread of nuclear weapons, not least because in 1957, with Germany only recently allowed to rearm and join NATO, France wanted Euratom designed to keep an eye on any German atomic activity. (French desire to monitor Germany also lay behind the

1 Malcolm Grimston, 'The importance of politics to nuclear new build', Chatham House report, 2005, p. 42.

Euratom requirement that the Commission must be informed of any nuclear investment, and periodically the Commission publishes the state of EU nuclear investment plans to give them more transparency.)

Since bureaucracies are loath to renounce any rationale that keeps them in being, Euratom inspectors have kept on inspecting EU reactors, just as IAEA inspectors do. Duplication in so sensitive an area may not be an expensive luxury in this era of terrorism. And it is true that the Commission has recently scaled down the Euratom inspectorate, which numbered 180 people in 2006, as the result of more coordination with the IAEA. But even in the one area of inspection where there is no overlap with the IAEA, one has to wonder at Euratom's purpose.

In contrast to the IAEA, which has to respect the special privileges that the UN Security Council's five weapon states have under UN law in the NPT, Euratom has the right, under EU law, to inspect the civil installations of Europe's two weapon states, Britain and France. Euratom prides itself on this. Yet what precisely is there to safeguard here – apart from preventing outside theft of nuclear material which one must assume to be also a British and French concern – when Britain and France have openly (and in terms of UN conventions, legally) turned atomic material into bombs?

Fuel supply

Euratom's supply agency was created to ensure member countries' reactors got fair and regular access to nuclear fuel. The original expectation, at a time when there were relatively few sources of natural uranium and when the US was virtually the only provider of enriched uranium, was that it would need to manage a shortage of supply. In reality, there has been abundance, and as a result, the supply agency's role has moved from one of promoting imports to controlling them.

Nuclear supply contracts within the EU need Euratom approval. Indeed, in its early years Euratom used to be the co-signatory on all nuclear supply deals (except for France's contracts with Niger and Gabon, which Paris regarded as its private preserve). The big change in the market, for Europe, came in the early 1990s when, after the Cold War, Russia started to offer large quantities of natural and enriched uranium to the European market. Natural uranium imports pose no competitive threat to the EU where natural uranium is not mined. But enriched uranium imports do compete with enrichment plants in the EU. In particular, low cost Russian enriched uranium was judged to threaten relatively high cost EU enriched fuel, especially that made by Eurodif in France and by Urenco in the Netherlands.

As a result, when the EU signed its Partnership and Cooperation Agreement (see Chapter 9) with Russia in 1994 on the Greek island of Corfu, it adopted on the side a unilateral declaration on imports. The Declaration of Corfu, which has never been formally published, is to the effect that the market share of EU uranium enrichers should be maintained at around 80 percent, for reasons of security of supply. (The principle of setting a limit on imports was also confirmed for natural uranium, but for the reason mentioned above, this was less sensitive).

This effective limit on imports from Russia to 20 percent of the EU market has since bedevilled EU-Russia relations. As the Commission noted in 2002, 'every official meeting, including EU–Russia summit meetings, is treated as another opportunity for the Russians to protest about [nuclear fuel] restrictions and to call for a satisfactory resolution on trade in nuclear materials.'[2] In the last few years the restriction has come to bother Moscow slightly less because it has been making so much money selling oil and gas to Europe. But the issue has not disappeared as an irritant in EU-Russian relations, and will certainly re-emerge in any negotiations for a new EU-Russia agreement.

However, it is not proliferation fears or fuel worries that deter EU countries from developing or maintaining nuclear power, but rather the issues of operational safety, waste disposal and reactor decommissioning that worry their voters.

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2 Commission Communication on nuclear safety in the EU, COM (2002) 605 Final, pp. 5–6.

Safety

Euratom sets basic standards for radiation protection for people working in reactors. But bizarrely it has no role in setting safety standards for the design or operation of reactors, when for the population at large the risk of radiation exposure comes from faulty reactor design or operation. EU member states have always insisted on regulating their own nuclear installations, and setting their own reactor safety standards. 'Nuclear safety and radiation protection are now two closely linked concepts serving a common health protection objective', complained the Commission in 2002. 'Consequently it is now no longer possible or desirable to separate these two disciplines.'[3] But nothing has changed since 2002.

EU countries have, often to their detriment, had their own special ideas about reactor design. The UK is the classic example, where special UK-only designs for the Magnox and Advanced Gas-cooled Reactors (AGRs) have made impossible the sharing of economies and lessons with other countries and other nuclear programmes. A current instance of national particularism in reactor design is the European Pressurized Water Reactor (EPR) which the French-led consortium is building in Finland, and whose cost over-run and delay is partly due to design changes demanded by the Finnish regulators. This is unfortunate in the sense that TVO, the Finnish power company ordering the reactor, has been collaborating with other European companies to develop an industry-led harmonization of reactor design in the 'European Utility Requirement' (EUR) initiative. And TVO had used EUR as the bid specifications template for its new reactor.

It is not surprising that nuclear regulators differ, for they often have not only different ideas of what is safe, but different ways of arriving at those ideas. 'The Germans traditionally took a very prescriptive approach to reactor design,' notes one EU expert, 'whereas the UK and French regulators have tended to leave it to the companies to prove a design is safe.'[4] Lack of a common

3 Ibid, p. 7.

4 Author interview 2008.

standard or design across Europe obviously poses problem for any reactor manufacturer trying to gain economies of scale in replicating the same model.

In recent years, what evolution there has been towards common safety standards has come from the work – outside of the EU and Euratom – of the Western European Nuclear Regulators Association (WENRA). But in 2007, the Brussels Commission took a more proactive approach by setting up the European High Level Group on Nuclear Safety and Waste Management. Mainly composed of the EU's 27 national nuclear regulators, this body may in time produce a common approach in its two areas of responsibility.

Waste disposal

This is the issue that most exercises people about nuclear power. Indeed, according to a July 2008 Eurobarometer opinion survey, 40 percent of opponents of nuclear energy said they would *change* their mind if some safe and permanent solution could be found for radioactive waste. In the same survey, more than 60 percent of respondents wanted an EU role in monitoring national management plans for radioactive waste, and felt such national plans should be required and harmonized across Europe.[5]

Governments are often asked, 'How can you possibly decide to build new reactors when you have not decided what to do with waste from existing ones?' So far, only one has come up with an answer. Finland only decided to go ahead with building its latest reactor after it had decided on a final geological depository for nuclear waste, the first country to do so.

On so sensitive a matter, the EU or Euratom would be ill-advised to tell countries what to do with their nuclear waste, provided its basic conditions for radiation protection are met. Nor can it dictate the timetable for countries to decide on waste disposal. But what the EU could have done is put more effort into researching ways of permanently and safely storing nuclear

5 Eurobarometer surveys, *http://ec.europa.eu/public_opinion*

waste that governments could draw on, particularly if they are contemplating building new reactors.

One measurement of effort is money. In Euratom's 2002–2006 sixth framework programme, a mere Euros 90m was devoted to radioactive waste management, plus part of the Euros 290m nuclear research budget of the EU's Joint Research Centre. Compare this, however, with the Euros 750m that went over the same period to research into fusion. This distant dream of fusing atoms to reproduce the energy of the sun continues to eat up EU research money. In the seventh framework programme for 2007–13, of the Euros 2.75bn going on nuclear research, fusion will get Euros 1.947bn, compared to Euros 287m on solving the rather more immediate problems and issues of fission and radiation protection.

'I think the money for fusion should be more calibrated, because fusion is always 40 years away in the future and focusing on fission is more realistic', says Santiago San Antonio, director general of the Foratom nuclear industry association.[6] He points to the creation in 2007 of the Strategic Nuclear Energy Technology Platform to research the fourth generation of fission reactors as the sort of 'recalibration' he wants to see.

It should, however, be said that some EU nuclear experts believe that the EU should not necessarily be spending more money on more basic research into waste disposal, but rather on applying the techniques that are known to the potential burial sites. 'We are not really now doing basic research on waste, and we don't need to', says one expert. 'What we do need is more *in situ* testing, to get digging, looking at the geology of potential sites and doing things like heat tests on the rocks.'[7] However, such *in situ* work generally requires sites to be chosen beforehand by EU countries. This creates a circular chicken and egg problem, with the EU only able to provide the research that would help states choose storage sites if the states have already chosen the sites.

6 Author interview, 2008.
7 Author interview, 2008

An attempt at change

Euratom – or the European Commission into which Euratom's secretariat was subsumed in 1968 – did have a serious try at reform in 2003. In January of that year, the EU executive proposed draft directives on common rules on reactor safety and for funding the decommissioning of reactors, as well as on an obligation on member states to set a timetable to bury their radioactive waste.

This was not exactly a bolt out of the blue. The directives were partly drafted to reflect in EU legislation two international conventions that had already been adopted by most member states, after a typical EU institutional fight over treaty competences. In 1996 EU states negotiated within the IAEA the Nuclear Safety Convention. This did not create any requirement for a European safety standard, because there was the IAEA one. But when the Commission proposed that the EU, as Euratom, become a party to the convention, a number of member states objected, and the Commission took the issue to the European Court of Justice. While the appeal was being considered, EU states negotiated another convention in the IAEA, the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, which the Commission also wanted Euratom to sign. Eventually, the European Court of Justice ruled in 2002 that the EU had competence in nuclear safety, and so Euratom got to sign the conventions.

But the real catalyst for Commission action at the turn of the century was, in a way, the very event, the 1986 Chernobyl accident, that had cowed the Commission into silence on nuclear matters through most of the 1990s. As the prospect neared of enlargement and of East European states bringing their Chernobyl-style reactors into the EU with them, so concern about nuclear safety grew. In the late 1990s the Commission started to negotiate the closure of the riskier reactors from candidate countries, but found itself bitterly criticised by East European governments for having no proper criteria – because no EU safety standards – by which to judge them.

Eventually, the late Loyola de Palacio, a feisty Spanish conservative who was commissioner for energy as well as transport,

decided to exploit impending enlargement to East Europe to advance a more proactive EU nuclear power. So, armed also with the ECJ ruling that backed Euratom's competence in nuclear safety, she unveiled her draft directives in January 2003.

The proposals got the backing of the European Parliament, but were attacked from many other quarters. A majority of member states supported the Commission. This was not surprising, because nuclear safety issues were already figuring in EU summit communiqués.[8] But some governments regarded Ms de Palacio's proposals as a Commission power grab (which in part it was), and saw no problem in perpetuating double standards on safety, one for existing club members, another for newcomers. They also disliked, on subsidiarity grounds, Brussels involving itself in the details of decommissioning and waste disposal. There were enough objecting governments to form a blocking minority. Within this blocking minority, the UK was the most active. According to one official, 'the UK's strong objections were related to its worries that its Magnox reactors would not stand up to European scrutiny of safety, and to the fact that no decision had been taken in the UK, at that time, about geological disposal being the best way to go with radioactive waste material.'[9]

The nuclear industry itself was fairly supportive. It believed the directives would have pushed member states towards the harmonization of safety standards and towards decisions on waste management programmes that it, the industry, wanted in order to develop the sector. For their part, environmental groups believed, with some cause, that measures ostensibly designed just to increase nuclear safety had the wider purpose of revitalising an industry they oppose. For this reason they found themselves in the uneasy position of opposing clearer regulation on safety and on the necessity to publish nuclear waste management plans.

In September 2004, the Commission watered its proposals down, but not sufficiently to give them any chance of passage

8 The Laeken summit of 2001, for instance, said 'the European Council undertakes to maintain a high standard of safety in the Union'.

9 Author interview, 2008.

through the Council of Ministers. "Eventually we will need legislation on nuclear safety and waste", Dominique Ristori, the Commission's top nuclear official, said in mid-2008. "2003 was a bit premature [for agreement on the directives], but at the right moment we will come back with legislation which will be based on the fundamental rules already agreed internationally in the two conventions."[10]

In fact, the Commission judged 'the right moment' to revive one of its proposals was as early as November 2008, when it proposed a recast directive on nuclear safety.[11] However cynics might say the Commission's timing was mainly to satisfy France's desire for a nuclear proposal during its autumn 2008 spell in the rotating EU presidency. For the 2008 proposal was still weaker than the 2004 one, which had itself been diluted with the abandonment of an EU fund for reactor decommissioning. In 2008 the Commission stressed its recast proposal was to strengthen the role and independence of national nuclear regulators, who had played a big part in opposing its earlier draft directives. Virtually the only *communautaire* element in the 2008 proposal was the requirement that national nuclear regulators submit every 10 years themselves and their national systems to 'international' (left unspecified) peer review. Meanwhile, the 2003 directive on nuclear waste disposal, proposed in 2002 and revised in 2004, remains in limbo.

Nonetheless, the Commission has at least tried to dissuade more governments from abandoning nuclear power. In its spring 2006 green paper, the precursor of the present strategy, it reminded member states that while they were free to choose their energy mix, 'decisions by member states relating to nuclear energy can also have very significant consequences on other member states in terms of the EU's dependence on imported fossil fuels and CO_2 emissions.' The green paper made exactly the same point about the need for member states to consider the effect on the wider Union of their decisions on gas. 'Decisions to rely largely or wholly on natural gas for power generation in any given member states have significant effects on the security

10 Author interview, 2008

11 COM (2008) 790/3.

of supply of its neighbours in the event of a gas shortage', it warned.[12]

Italy is a case in point on both counts. Having closed down all its nuclear power plant at home, it imports very large amounts of gas and runs a chronic deficit in electricity trade, including imports of French nuclear-generated power. These are evidently the sort of considerations that the Commission wishes the Italian people had taken into account in 1987, when, in the immediate wake of Chernobyl, they voted by referendum to shut the country's nuclear power plants.

De Palacio's successor as energy commissioner, Andris Piebalgs, has been more circumspect in promoting the EU dimension in nuclear policy. On a purely personal level, this would be understandable. A Latvian who was a Soviet citizen in 1986, Mr Piebalgs was kayaking in Ukraine at the time of the Chernobyl and only found out about it two days after it occurred. Nonetheless, as energy commissioner, he has accepted nuclear power's essential role in climate change policy. In 2007, he has oversaw the creation of the High Level Group of national regulators to discuss safety and waste management, and the opening of the European Nuclear Energy Forum as a talking shop that will regularly alternate between Bratislava and Prague. The willingness of both the Czech and Slovak governments to host this forum is a sign of East European countries' seriousness about nuclear power. They tend to regard it as a surer road to a low-carbon economy than renewable energy.

Certainly the economics of nuclear power are better than for some time. Uranium prices rose 10 times in the 2003–7 period, though they have fallen back since. However, even at its price peak uranium still counted for much less in the cost of electricity it generates (because of the very high capital cost of reactors) than fossil fuels do. Nuclear power cannot for the moment expect the same overt public subsidy that goes to renewables. Nor does Mr San Antonio of Foratom believe it needs any state aid, 'just a stable framework over a long period in which to recover the investment'. Thinking of his own country, Spain,

12 Green Paper, 'A European Strategy for Sustainable, Competitive and Secure Energy', 2005, p. 9.

he says, 'nuclear energy cannot be a political football at every four-year election.'[13]

But nuclear power operators now reap advantage from the system of carbon permits (traded on the Emission Trading Scheme) that penalizes rival generators using fossil fuels. So, for the first time in many years, the EU dimension is making a real contribution to nuclear power. The technology-neutral characteristic of the ETS, which rewards all low-carbon technologies alike, is one of the beauties of the system.

It is not surprising that nuclear power's main financial assistance these days should have to come in rather disguised form through the ETS. For over the past 50 years, the consensus that once existed in favour of nuclear power has evaporated. How can 'Europe' actively promote nuclear power, when people throughout the EU institutions – the Commission as well as the Parliament and Council of Ministers – are split over it? Because Euratom is a founding treaty of the EU and was signed long before opt-outs were created to cater for awkward members such as the UK, it has been part of the set menu for all, something that all new members have signed. This may have been a mistake. The EU now has some viscerally anti-nuclear members, especially Austria and to some extent Ireland, which are full members of Euratom. They are against nuclear power not only for themselves but also for others. They can be an obstruction to progress, just as Britain would have been had it been forced into the common eurozone currency zone or the Schengen free-travel area.

An example of Austrian obstructionism came in February 2008 when Austria threatened to block energy ministers' agreement on the new Strategic Energy Technology plan unless it carried a guarantee that no money would go to nuclear research. A temporary compromise to please the Austrians was found whereby the SET plan was approved, but the financial consequences of that approval were left to be decided later.

In these circumstances, one can argue that Austria should abstain, or opt out, rather than obstruct research that might one day make nuclear power palatable even to Vienna itself. Indeed,

13 Author interview, 2008

why not have in the nuclear field the sort of variable geometry successfully tried in other areas, such as the euro currency zone, Schengen or EU defence? This would allow the Austrias and Irelands to opt out of Euratom, and turn Euratom into a sort of 'coalition of the nuclear willing'.

The snag is that no one wants to opt out of Euratom. As long as it exists, Austria and Ireland want to participate, if only to keep an eye on their neighbours' nuclear power plans. There was a moment in 2004 when change seemed briefly possible. During negotiations on a new constitution, five countries – Germany, Ireland, Hungary, Austria and Sweden – declared their interest in an intergovernmental conference to review the terms of Euratom. But they found no wider support, and the issue was dropped and is likely to stay dropped. Subsequent events with the Treaty of Lisbon have shown that EU treaty negotiation, and especially ratification, is contentious enough without adding in the nuclear power issue.

In reality, countries that are undecided about nuclear power may be more of an obstacle to Europe's low-carbon energy development than the outright opponents to it. In the undecided camp must be counted those countries – Belgium, Spain, Germany and Sweden – which have agreed to phase out nuclear power, but necessarily over long periods that provide opportunities for politicians to change their minds. Such countries fall between two stools. They make no plans to build new reactors, but as long as the possibility of a U-turn exists, they also shy away from committing themselves absolutely to replacing all their nuclear power with alternative energy. Germany and Spain have increased their renewable energy enormously, but not by enough to fill the energy vacuum that phase-out of their reactors will leave. How to plug this nuclear vacuum in the future is one of the challenges for Europe's energy research and development programmes to which we now turn.

CHAPTER 14

ENERGY R(ELUCTANCE) AND D(ELAY)

This market gap between supply and demand is often referred to as the 'valley of death' for low carbon energy technologies.

The European Commission on launching its energy technology plan in November 2007

Develop a new technology in every other sector of the economy, and you will usually have a market for it. As long as it does something new – not even necessarily useful (think of kids' electronic games) – or does something old but in a cheaper or better way, then you will have ready customers. Not so in energy. There seems to be an inbuilt lack of market interest in new energy technology that makes energy innovation especially difficult.

The problem is not a question of long lead times (except in nuclear fusion which always seems to be 40 years from commercialization). It is only partly the network challenge of connecting new energy sources to grids or transforming grids to suit decentralized power sources so that energy reaches everyone. Mainly, the problem is that low carbon electricity technologies are almost always more expensive than those they replace, but provide nothing more than the same old electrons. Equally, carbon capture and storage (CCS), which is another way of keeping carbon out of the atmosphere, is in a sense an assault on productivity, a step backwards. CCS is perfectly justifiable, because it is for the greater good of the planet, but is nonetheless a technology that has the effect of reducing the electricity output of the average power plant to what it was some years ago. This is because the process of capturing the CO_2 and pumping into underground storage itself requires power.

Energy efficiency measures, examined in Chapter 15, have a payback in lower energy bills. But in the case of households, this

may accrue to the advantage of tenants rather than landlords who took the measures in the first place. In general, the benefits of most low carbon technologies often flow more to society than to the buyer.

Moreover, the innovation process, the introduction of low carbon energies has to take place in energy systems that have been optimised over decades. Yes, the lights went out across Italy in 2003 because a tree fell on a pylon in Switzerland, and across a wider area of north Central Europe in 2006, when a Germany utility had to switch off a power line to let a ship on the Rhine pass underneath, and other power lines became overloaded. Yes, too, for a few hours at the beginning of 2006 gas flows were reduced to several European countries as a result of a Russian dispute with Ukraine. But energy supply, at least in Western Europe, is reliable for 99.99 percent of the time.

Climate change, however, has altered the old order. In the past there has certainly been a close correlation between the oil price and energy R&D (see the chart below). When the oil price came down in the mid-1980s, so did energy R&D and it has only recently picked up. Had the 1980 peak in energy R&D been sustained, the situation would have been different because the EU and its member states would collectively now be spending Euros 7–8bn a year on energy, instead of Euros 2.5bn. But only a few countries took the 1970s oil scares seriously – these exceptions were France with its nuclear programme, and Denmark and Japan with their big investment in energy efficiency. Fifteen years of fairly low oil prices, from 1986 to the turn of this century, left the EU as a whole with, in the words of the Commission, 'accumulated under-investment [in energy R&D] due to cheap oil'.[1]

That period is over. Because of carbon constraints, we can no longer rely on oil prices triggering sufficient levels of research into alternative energy. Because of carbon constraints, we need to hurry on with this research regardless of what the oil price does. In any case, the oil price can no longer be trusted as a prop for energy R&D spending. It bounces around too much to be a reliable prop.

1 Memo/07/469, the Commission, p. 1.

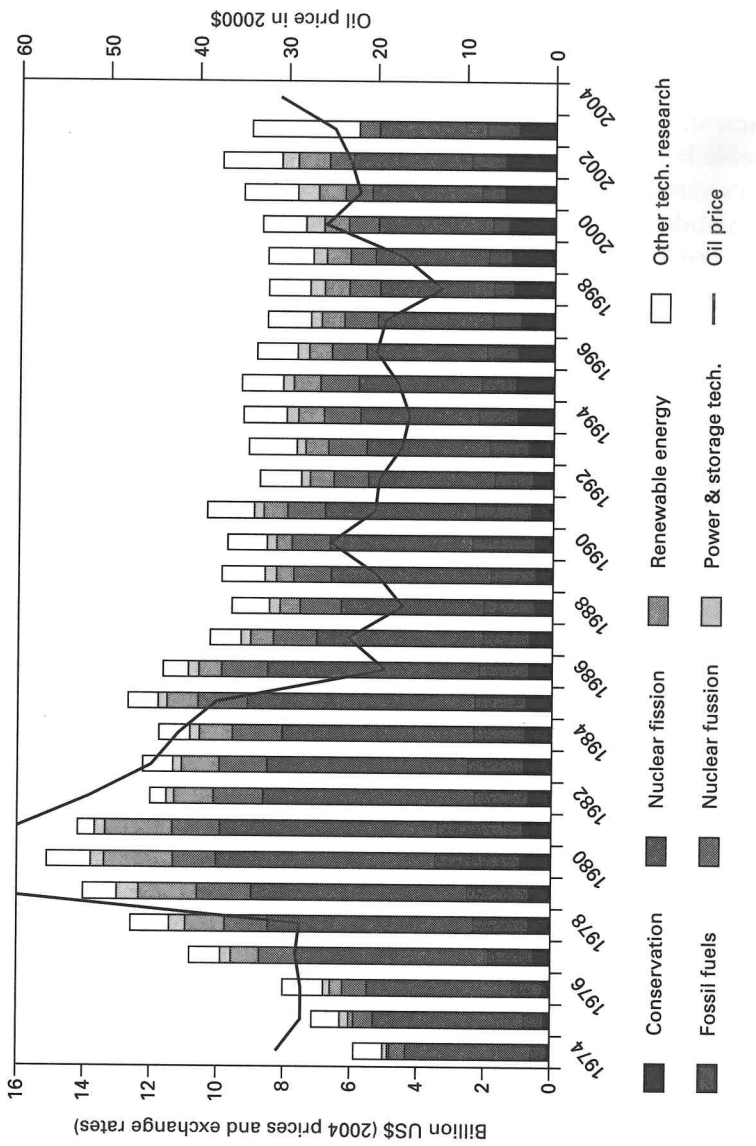

Figure 7: Energy R&D Spending in OECD Countries and the Oil Price

Source: European Commission Memo/07/469

The corporate energy sector is no better when it comes to R&D, though some of the research cuts in recent years may stem from privatization of many European energy companies and the liberalization of some European energy markets. The table below shows how little some of the major European utilities spend on R&D (new technologies), as distinct from capital expenditure (expansion and maintenance). The table also shows that oil companies are equally frugal on R&D – although their capex is high – because they can rely on research-intensive service companies such as Schlumberger and Halliburton.

Table 14: The Corporate Sector's Poor R&D Performance

	Research and Development Spending 2007				
Company	*£Million*	*Percent growth over last year*	*Percent growth over average of last four years*	*Percent of operating profit*	*Percent of sales*
EdF	262	-3	-5	4.6	0.7
Endesa	26.98	-7	44	0.8	0.2
RWE	90.96	6	-52	2.3	0.3
Suez	57.94	1	-8	1.9	0.2
Gaz de France	56.60	15	-9	2.3	0.3
Scottish & Southern	6.30	350	530	0.6	0.1
Eon (UK)	5.0	67	100	0.5	0.1
RD Shell	452.18	51	61	2.0	0.3
Total	383.37	-16	-14	2.1	0.4
ExxonMobil	374.52	3	12	1.1	0.2
BP	201.82	-21	-5	1.3	0.1
Eni	149.58	10	-35	1.1	0.3
Schlumberger	316.43	23	14	11.9	3.2
Halliburton	141.53	15	14	8.1	1.2

Source: drawn from R&D scoreboard, UK Department of Business, Enterprise and Regulatory Reform

The EU has tried to play a part in remedying this situation. For reasons examined in Chapter 13, its energy research programme has been too tilted towards nuclear, and within nuclear too tilted toward fusion. But there is a wider energy research effort. The annual average devoted to energy in the EU's current 2007–13 research framework programme is Euros 886m, up from average Euros 574m a year in the EU programme for 2002–6. There is

widespread acknowledgement, however, that too much of this has been increasingly scattered around in penny packets, because the trend has been towards smaller projects with more partners.

So, as part of its attempt to create a brave new world in European energy, the Commission came up in November 2007 with a 'Strategic Energy Technology' plan. It was specifically directed at low carbon technology 'for which there is neither a natural market appetite nor a short-term business benefit'.[2] In any other context or sector, the idea of Brussels backing technology it knew the market did not want would be anathema. But as we have seen energy innovation is especially problematic. The aim, in the words of one Brussels official, was to 'shepherd early energy technology through the so-called Valley of Death, which lies between the demonstration stage and getting big enough markets to survive'.[3] Further downstream, the Commission has a programme called Intelligent Energy. In the words of its director Patrick Lambert, it seeks to 'create market conditions for acceptance of new energy technology, such as designing EU-wide qualifications and courses for the training of installers of wind turbines'.[4]

The Commission has said the main EU technology goals over the coming decade are to:

- Make second generation biofuels competitive.
- Commercialize carbon capture and storage.
- Double the generation capacity of the largest wind turbines, especially for offshore use.
- Demonstrate the commercial readiness of large-scale solar power.
- Make possible a smart grid for Europe, able to take renewable and decentralized sources.
- Bring to market efficient energy conversion devices such as fuel cells for use in buildings, transport and industry.
- Improve the prospects of nuclear fission by solving the waste problem.

2 A European Strategic Energy Technology Plan, Commission communication, COM (2007)723 final, p. 3.
3 Author interview, 2007.
4 Author interview, 2007

These challenges are daunting enough to require a pan-EU effort. One of them – the smart grid – is also of a geographic scale that requires an EU effort. Indeed it is almost the technology equivalent of what the Commission is trying to achieve through liberalization and market integration.

In energy research, the EU, through the Commission, generally has two useful roles. One is convening and coordinating. Not every EU state belongs to the International Energy Agency, which generally requires that its members must first join its mother institution, the Organization for Economic Cooperation and Development. Only those EU states that do belong to the IEA (19 out of 27) have a dedicated forum in which to discuss energy research. Now, there is supposed to be a EU steering group, chaired by the Commission, to coordinate EU and national research efforts; a series of European Industrial Initiatives in the form of public-private partnerships in specific technology areas; and a European Energy Research Alliance linking universities and focusing more on basic energy science. The other use of the EU is its role in setting technical standards for its huge single market. 'Standards are a competitive element these days', says an outside specialist. 'No European company can afford not to bring a European standard to the table when it is, for instance, talking to the Chinese.'

But such powers of convening, coordinating and standard-setting are not enough to galvanize Europe into giving the world a lead in demonstrating the technical and economic feasibility of carbon capture and storage (CCS). This technology will take time to prove commercially, but is considered a vital contribution to preventing emissions from spiralling up in the 2020–30 decade before advanced renewable energy and revived nuclear power can take them down to much lower levels. The EU is keen to lead, by example, China and India, with their huge coal reserves, into adopting CCS technology. Yet in the January 2008 climate change package, the mismatch between the Commission's ambition and means was especially glaring in CCS.

Likely costs and benefits of CCS are both big. By capturing carbon dioxide as it comes out of power stations, funnelling it underground (most likely depleted oil and gas fields) and keeping it there, CCS technology could reduce emissions in the EU by 13

percent of total power and steam generation emissions by 2030.[5] Failure to act soon might have larger negative consequences. One Commission study estimated that if the EU were to delay CCS demonstration technology for seven years, and if this led to the same delay around the world, this could mean over 90 Gt [gigatonnes] of avoidable CO_2 emissions being released worldwide by 2050. This would amount to 20 years of total current EU emissions.

Costs are high too. The bill for research into CCS might not be that large – in all Euros 1bn between now and 2020 – but the industrial costs would be on the same scale as nuclear fusion, running into billions. To prove various CCS technologies in various geologies in various places around Europe, the Commission has proposed, and EU leaders have agreed, that a dozen demonstration plants need to be up and running by 2015. The present experience in and around Europe with CCS is limited to Statoil's extraction of CO_2 from its Sleipner field (due to Norway's high CO_2 tax) and to a BP-Sonatrach project in Algeria (motivated by BP's internal carbon trading scheme).

Installing the capture, transport and storage equipment would add anywhere between 30 percent and 70 percent in up-front investment to the cost of a standard power plant. Moreover, operating costs of CCS plant would probably be 25–75 percent more expensive – mainly because of the power diverted to running the CCS equipment – than with non-CCS coal-fired plants. Climate Change Capital, the specialty investment bank, calculated in 2007 that the dozen CCS demonstration plants would need financial support of Euros 1.5bn–4bn a year or Euros 10.3bn–16.4bn in upfront grants.

This scale of money is out of the EU research budget's financial league. At one point in 2007, the Commission's energy division had hoped to divert some serious EU money, coming from unspent farm funds, into CCS development. In the end this money went to rescue the Galileo navigation satellite project. So when the Commission set out in January 2008 its draft directive for a regulatory framework for CCS deployment, it had no more

5 Supporting Early Demonstration of Sustainable Power Generation from Fossil Fuels, Impact Assessment, SEC (2008) 47, p. 35.

financial aid to offer than a proposal that safely stored CO_2 should be treated under the emissions trading scheme (ETS) as not emitted. This would mean that a CCS operator would not have to buy ETS allowances as his non-CCS rivals would have to. But the Commission admitted this incentive would be insufficient until the cost of avoiding carbon through CCS was equal or lower than the cost of emitting it with an ETS permit, and it acknowledged that this crossover point was unlikely to occur before 2020.

In terms of upfront investment money in CCS, the Commission said it was counting on government state aid and corporate finance. It said it would take a very benevolent view of state aid to CCS, but there has been little so far. Only a few governments have been come up with any firm aid promises. Among them are the UK, which has invited companies to compete for a grant to develop a relatively small CCS plant (300MW), and Norway. The latter, though not in the EU, belongs to the European Economic Area and has to abide by EU internal market rules, including state aid. In July 2008, Brussels happily allowed Oslo to put some of its oil riches into funding up to 80 percent of Norway's Mongstad CCS project.

To the companies, the Commission held out a weak mix of carrots and sticks. It appealed to companies' self-interest in gaining a first-mover advantage in CCS, and offering itself to give 'first movers a means of coordination, exchange of information and identification of best practices'. It ventured, rather endearingly, the notion that giving 'a European logo' to CCS projects might be an extra inducement for industrialists to part with several hundred million euros. But 'without bold funding decisions by the companies at the earliest opportunity, complementary public funding may not be triggered', it warned. It then managed to make a threat, and then in the same breath, withdraw it. 'The longer the power industry takes to start embracing the CCS technology, the more policy-makers will be obliged to look at the option of compulsory application of CCS technology as the only way forward.' But the Commission's own impact assessment acknowledged that the risk of imposing commercially unproven technology on the sector could not be justified.

Industry has also played a game of financial bluff and bluster. An early European Technology Platform was created to develop CCS under the name of Zero Emission Fossil Fuel Power Plants (ZEP). Even after it was clear that the Commission's financial cupboard was bare, a group of some 25 utilities, oil and engineering companies belonging to this ZEP programme wrote to Mr Piebalgs, the energy commissioner, in February 2008 to ask for money. They claimed to have spent Euros 635m over the previous five years on CCS, and they went to say 'we expect that our companies in the aggregate will commit upwards of Euros 11.159bn over the next seven years.' But, stressing 'first mover risk' rather than 'first mover advantage', they said they faced 'unrecoverable costs…which cannot be fully justified to our companies' shareholders'. Therefore they needed 'transitional financial incentives' in the shape of a 'substantial' initial level of support.[6]

Chris Davies, a UK Liberal who was the European Parliament rapporteur on the directive to create a legal framework for CCS, said he was very conscious of the game the utilities were playing. 'I have yet to find any power generator without a hand sticking out and a begging bowl attached to it.'[7] Nonetheless, he believed that, in order to kick-start CCS, something quite big had to be dropped into the begging bowl. Bigger than the original Commission proposal that 60m allowances should be taken from the new entrants' reserve in the ETS, and be used to subsidize a dozen early CCS demonstration projects. The proposition was that not only would a CCS operator not have to buy an allowance for any tonne of CO_2 that was captured and stored, but he would also, for that same tonne of safely-stored CO_2, be given one or more ETS allowances that he could then sell.

Mr Davies won parliamentary support for increasing the 60m to as much as 500m allowances. But as part of the December 2008 agreement, EU governments decided that the subsidy should be 300m allowances, of which no more than 15 percent going to any one project. MEPs accepted this. The same

6 Letter dated 21 February 2008, see *www.zero-emissionplatform.eu*
7 Author interview, July 2008

agreement encouraged national governments to use a portion of their revenue from auctioning ETS allowances as a subsidy to CCS. With governments loath to make any immediate pledges of taxpayers' money for CCS, a future raid on the larder of ETS allowances seemed a very convenient solution. In theory, now there is legislation enshrining this subsidy in law, potential CCS operators can go to a bank and raise finance on the back of it. In practice, bankers will have to weigh carefully the future value of ETS permits as collateral for their loans, and they may not be reassured by the uncertain impact of the December 2008 deal on the ETS market.

Nevertheless this arrangement could mark the opening up of a new channel of funding for energy R&D in Europe. At their December 2008 summit EU leaders issued a declaration noting 'their willingness to use at least half' of ETS allowance auction revenue for climate control purposes, including R&D into low-carbon energy. Such a declaration is far from a binding commitment, but nor is it necessarily meaningless for the future.

CHAPTER 15

DOING WITHOUT

Negajoules represent the biggest energy source in Europe – ahead of oil, gas, coal and nuclear.

European Parliament, 2006

The EU has given itself a target to improve energy efficiency by 20 percent by 2020. But that does not mean an aim of using 20 percent less energy in *absolute* terms by 2020 – if it did, meeting it would almost automatically fulfil, and make redundant, the other target of cutting emissions by 20 percent. Instead, the energy efficiency goal is to save 20 percent of energy consumption *relative* to what the EU's energy is projected to be by that date if Europe just continued with its business as usual.

In other words, it is a pretty soft target. It differs from the 20 percent targets for cutting emissions and raising renewables in three ways. It is not binding. Its contribution is harder to gauge because it is measured not against a past base year but a future estimate. And its fulfilment depends on a wider range of actors, on the actions and reactions of virtually all of Europe's 500m citizens.

But progress in energy efficiency is very important because reduction in energy consumption, even if relative, will exert downward pressure on energy prices, and cut both imports and pollution – the three totemic goals of EU energy policy. Progress towards the energy efficiency target will also influence progress towards the other two targets. As regards the ETS, the higher the energy saving, the lower the demand to buy carbon permits and the lower the carbon price. The knock-on effect of that on, say, nuclear power may not be good. But the lower energy demand, the easier it becomes to meet it by renewable means.

But if the importance of energy efficiency is evident, the EU dimension is less obviously relevant to this aspect of energy

policy than to other areas already discussed. It is axiomatic that design of the EU's internal energy market must be decided at the level of that market; it is only natural that countries seeking greater energy security should band together; and it is clear that global problems like climate change require the widest possible response, with a regional bloc of 27 countries merely a starting point. But energy saving is often seen as something done within the privacy of one's home or within the confines of one's state.

Brussels' usefulness, or otherwise, in energy saving policy is underrated, partly because energy saving or efficiency gets little attention in general. Deciding to save energy is not a process that brings EU member states into conflict with each other or creates press headlines. And actually saving energy, in the absence of some revolutionary gadget, is usually unglamorous. This is why, in the words of one EU official, 'there is a feeling that [energy saving] is so unconflictual that it will get done automatically, with a little help from oil prices.'[1]

Unfortunately, the rise in the oil prices since 2000 has not been that much help. Certainly overall energy use in the EU is fairly flat, amounting to 1,637m tonnes of oil equivalent in 2005 and showing no increase on 2004. And overall energy intensity – the amount of energy needed to generate a given unit of national wealth – continues to fall for the EU as a whole, to an average in 2005 of 208 kgs of oil equivalent for a 1,000 euros of gross domestic product (compared to 236 kgs of oil equivalent in 1995).[2]

But this average bridges an enormous gap. On the one hand, there is world-beating Denmark, whose energy intensity on the above measure is a miserly 114 kgs of oil equivalent, and at the other extreme, Bulgaria, a brand new EU member still with a Soviet industrial legacy, which uses energy 10 times more intensely than Denmark, at 1,582 kgs of oil equivalent. Yet even before Bulgaria's entry into the EU, the Commission was estimating in 2005 that the EU could save 'at least 20 percent of its present energy consumption in a cost-effective manner', which is where the 20 percent target sprung from.[3]

1 Author interview, 2007.
2 Eurostat, 2007.

The business of energy saving is, moreover, complicated by the perverse effect of efficiency on demand – the more energy you save, the more you have to use for something else, and the more efficiently energy can be produced and the cheaper it becomes, the greater the incentive to use more of it. This perversity, known as the 'rebound effect', has been recognised for a long time, since indeed the 19th-century invention of the steam engine enormously improved energy efficiency but also increased energy consumption.

It is also what is happening with electricity today. Electricity consumption in the EU rose between 1999 and 2004 at 10.8 percent, almost exactly in line with GDP.[4] Now, there are reasons to favour a continuation of the historic trend of progressively electrifying the European economy into areas such as transport that might otherwise be hard to decarbonize. It could, for instance, enable electric cars to recharge with low carbon energy by plugging into a renewable or nuclear-generated grid. Therefore transport is a sector where an increase in *electricity* intensity might be good. But there are many examples of increased efficiencies in the generation or use of electricity that have simply stimulated consumers' appetite for more of the magic electrons.

On the generation side, there is the success of combined cycle gas turbines (CCGTs) bringing down the cost, and in most instances the price, of electricity in a way that encourages consumption. Far more numerous are the improved efficiencies in the amount of electricity used by household appliances such as refrigerators and washing machines. These efficiencies go hand in hand with a rise in household consumption of electricity, because of the increased penetration of appliances such as air conditioners, dishwashers and tumble driers. These developments constitute real welfare gains for people who can now afford to buy useful household goods that compared to the past, use relatively smaller amounts of electricity made relatively cheaper by CCGTs.

3 Green Paper on Energy efficiency, European Commission, 2005.
4 Joint Research Centre, 2007, *http://ies.jrc.ec.europa.eu*

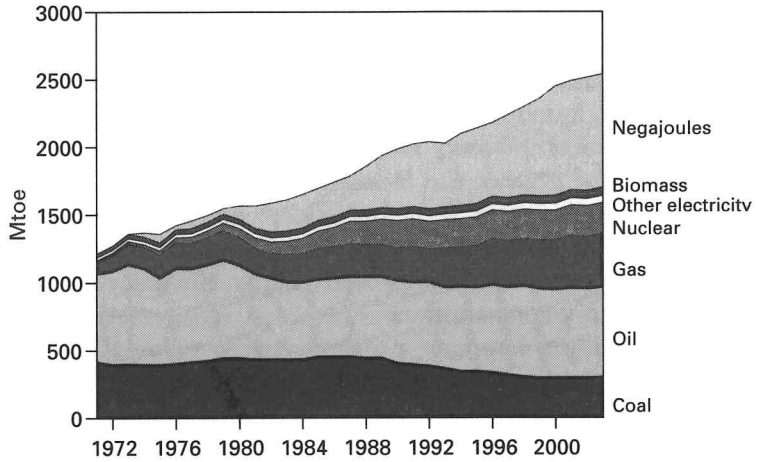

Figure 8: Energy Saving in Europe

Source: European Commission Green Paper on energy efficiency COM (2005) 265, p. 10

Less positive is the increase in standby electricity consumption from entertainment electronics, computer equipment and modern versions of traditional white goods that are fitted with special displays and microprocessors. Nor, in households, do these modern gadgets replace older ones as they would in businesses; older TVs are often shifted to children's bedrooms rather than thrown out. Newer appliances use less standby electricity. But the simple number of appliances with standby power mode continues to increase, and so therefore does overall consumption.

So is the energy conservationist on the hopeless treadmill encapsulated in the Red Queen's warning to Alice that in Wonderland 'you have to run as fast as you can just to stand still, if you want to get anywhere else you must run twice as fast as that'? Not quite. A recent UK study of the 'rebound effect' confirmed that the phenomenon certainly exists in both direct and indirect forms, and in total 'the evidence suggests that economy-wide rebound effects will be at least 10 percent and often higher of the energy saved.'[5] The direct rebound effect is

5 'The Rebound Effect', UK Energy Research Centre, 2007, pp. vii–xi.

where people use the money they save on energy to consume somewhat more of the same energy. This is likely to be higher in poorer countries or among poorer people because their demand for energy is less satiated. In developed countries, this same UK study suggests that the direct rebound effect for household heating and cooling and for personal transport 'is likely to be less than 30 percent and may be closer to 10 percent for transport'. The direct rebound effect may be somewhat larger when producers, rather than consumers, adopt energy efficiency technologies such as the steam engine in the 19th century or the electric engine in the 20th, because producers' appetite for energy will not be limited by their personal needs. An indirect rebound effect can occur where people (usually richer people) use the money they save on one kind of energy, say, electricity for heating and lighting, and spend it on another, say, kerosene to jet them away on another holiday.

Yet none of these effects really matters as long as energy efficiency improvements do not so stimulate demand that overall energy use actually increases. Energy economists term this counter-productive effect 'backfire', and it did occur when steam and electric engines arrived on the scene. The UK study underlines 'there is no a priori reason to believe that "backfire" is an inevitable outcome in all cases.' Even where an energy saving technology results in a rebound effect of 30 percent, 70 percent of the energy saving is still preserved. But this UK report suggests caution in estimating the actual energy savings from energy efficiency technology. It is also a reminder of the importance of carbon and energy pricing in reducing rebound effects, by keeping the cost of energy constant while efficiency in producing it improves. And with the issue of energy pricing, on which the EU has some agreements, the EU enters the picture.

What role, then, for Brussels and policy-making at the EU level? There is some ground to think that EU institutions – meaning the Commission and Parliament – are more inclined towards action on energy saving than national governments. Although Brussels is often considered as putting producers' interests above those of consumers (the most famous example being the Common Agricultural Policy), this is not so evident in energy. Indeed, arguably, the locomotive that has driven

EU energy policy forward for some time has been Brussels' competition directorate with its anti-trust investigations, usually launched on complaints from energy users. By contrast, national energy ministries in the member states tend to be more influenced by energy producers, which, everything else being equal, are interested in customers buying more not less of their product. 'Because of "agency capture" by energy interests of the department of trade and industry', claims Andrew Warren of the UK Association for the Conservation of Energy, 'almost nothing would happen in UK energy saving if it were not for Brussels.'[6]

Of the two main instruments available to encourage people to do the unnatural thing of saving energy – regulation and taxation – the EU has so far overwhelmingly relied on regulation.

Products

The EU's main recent actions are the 2003 energy labelling directive and the 2005 Eco-design directive. The first required manufacturers to put clear information about energy use on labels on their products. It also set some minimum energy efficiency standards for products, but these did not go far enough. So the Eco-design directive was passed to set energy efficiency requirements for a wide range of consumer goods ranging from water heaters to TV set up boxes. In July 2008, the Commission proposed extending this directive to all energy-related products – those that do not consume energy during use but have an indirect impact on energy consumption, such as (hot) water-devices or windows.

The first concrete measure taken under the Eco-design directive was agreement in July 2008 to cut the electricity consumption of standby devices in offices and homes by nearly 75 percent by 2020. Another decision under this directive is to phase out incandescent light bulbs by the end of 2012, replacing them with more efficient fluorescent light bulbs.

6 Author interview, 2008.

Transport

In this sector, the EU has a role of Union-wide dimension, in the air and on the ground, which has already been explored in Chapter 10. Legislation is agreed to put the emissions from all aircraft using EU airports (including non-EU airlines) into the ETS in 2012. At the same time, the Commission is helping Eurocontrol to try to create a coordinated air traffic system with the Single European Sky programme that could, by reducing aerial congestion and stacking over Europe's airports, cut aviation fuel consumption by an estimated 11 percent.

Partly because cars, or their drivers, are not, like airlines, conveniently organized into fleets that could be slotted into the ETS, legislation has been directly imposed on the car industry to reduce vehicle emissions. The approach is similar to the Corporate Automobile Fuel Efficiency (Café) standards in the US, only tougher.

Buildings

Some 40 percent of all the energy in the EU is used in buildings and the potential savings on this energy is considerable, as much as 28 percent by 2020, according to Commission estimates. In 2002, the energy performance in buildings directive was passed, though it only came into force in 2006. Even then it only required member states to have an energy performance standard of their own for large new buildings of more than 1,000 square metres or similarly sized existing buildings undergoing renovation. This, however, was progress because most of the new Central European states had no such standard, until their entry into the EU. The most important change would be to require the retrofitting of energy saving equipment to existing buildings not undergoing major renovation. Imposing standards on buildings does not deal with the fact the stock of buildings takes far longer to 'turn over' than that of products.

Public procurement

The EU institutions and the central governments of member states have amended the legislation on their public procurement – amounting to 16 percent of EU gdp – to make energy efficiency a criterion for choice when they buy goods and services. In this way Brussels has adapted one of its more powerful internal market instruments to the cause of energy efficiency.

This public procurement legislation has been used to thwart the natural tendency of national governments to award contracts to their own national companies, so segmenting the market. The legislation requires all government contracts over a certain value to be advertised electronically across the EU. In the past, it has generally required that, if all conditions such as quality and safety are equal, contracts should go to the cheapest bidder, as a safeguard against protectionism and corruption (inflated price contracts can conceal kick-backs). Such an approach can, however, discourage innovation and new energy-saving technology that is often, at least in the short run, more expensive than what it replaces.

In 2004, 'green public procurement' guidelines were introduced to encourage local authorities to factor into the costing the life-cycle costs (such as emissions escaping during the production process or the running cost of a building) of products they were tendering for. However, only a few member states – only seven according to a 2006 study – appear to have embraced this. The Commission announced in mid-2008 further efforts to promote green public procurement.

Trade

So far trade policy has not figured much in the EU's quest for energy saving or emission reduction, with the minor exception of the 2007 EU – US agreement to highlight the energy efficiency saving merits or demerits of office technology, through labelling. But trade policy will play an increasing role in policing energy inefficient imports that would undermine product standards in the EU. Sometimes external trade issues have pushed internal regulation along.

An example of this has occurred in the greater light bulb switchover, which will eventually see Thomas Edison's incandescent light bulbs phased out and replaced by fluorescent light bulbs. The EU's Eco-design of Energy-using Products of 2005 gave the Commission the choice of either accepting industry promises of self-regulation or tabling mandatory legislation. Somewhat counter-intuitively, the industry represented by the European Lamp Companies Federation (ELC) quickly opted to have compulsion imposed on it, and crucially on its foreign competitors. ELC's secretary general, Gerald Strickland, said, 'we decided that the voluntary route would offer no control over, or sanction on, importers continuing to undermine our efficiency efforts with inefficient products.'[7] Of course the great majority of new energy-saving bulbs will come from China, mainly from ELC company subsidiaries there.

The hard part of trade policy will be to ensure that legitimate policing of imports for observance of EU standards stops short of protectionism. Moreover, it would probably overstrain trade policy if, in a bid to equalise carbon controls, the EU were to start evaluating the emissions not just of foreign products, but also of the process by which these products were made. For instance, what if import into the EU of fluorescent light bulbs from China were blocked or penalized because the EU judged there was insufficient control on the carbon emitted during the manufacture of those bulbs?

Tax

While trade is an area of coming involvement for Europe's energy policy makers, energy taxation is one of EU member states' older battlefields – and one that may soon have to be revisited. EU governments accept the need for some harmonization of indirect tax rates on motor fuels in order to prevent serious distortions in the markets for these valuable, mobile and

7 Author interview, April 2008

generally highly taxed commodities. So there is an EU system of minimum tax rates on petrol, diesel and other mineral oils, and the 2003 Energy Taxation Directive extended these floor rates to other energy sources such as coal, gas and electricity.

But the EU only taxes energy when it is used as fuel or for heating, and not as raw materials in industrial processes, or as input in the making of other energy products (in refineries) or even as inputs for electricity generation. The European Commission tried to remedy this back in 1991, in the run-up to the United Nations conference in Rio de Janeiro that put climate change on the political map. It proposed a wide-ranging energy tax, calculated on both energy content and on proportion of carbon emissions. The proposal foundered, mainly on opposition from the UK (on the political grounds of fiscal sovereignty) and from Spain (arguing such a tax would cramp its development).

Yet, very tentatively, the Commission is trying to return to the issue. In spring 2007 it ventured the thought in a green paper that 'the explicit identification of an environmental element in the minimum levels of taxation (differentiating between greenhouse gas and non-greenhouse gas emissions) would enable energy taxation to complement other market-based instruments at EU level.'[8] And there is a good argument for doing so, particularly to reach parts of the economy that the emissions trading scheme (ETS) itself cannot easily reach.

As the main framework for controlling climate change, the quantity allocation method is peculiarly apt, for both technical and political reasons. Technically, because the science has given us a ballpark figure of the amount of greenhouse gases we want to take out of the atmosphere, or rather the level of so many parts per million that we want to limit greenhouse gases to. So the ETS works on the basis of the authorities setting the quantity of carbon to be reduced, and letting the market set the price of doing that.

Politically, too, this has several advantages. One is simply that while the ETS is effectively a tax, it is not called one. This enables it to be swallowed in the EU context by the UK, and

8 Green Paper on market-based instruments for environment and related policy purposes, COM (2007) 140 final, p. 8.

perhaps one day in the context of an extended post-Kyoto system by the US, a country even more jealous of its fiscal sovereignty. The other political plus is the opportunity to smoothly phase in schemes like the ETS by initially giving out some pollution permits for free, though eventually most or all permits must be auctioned if they are to have a real cost that changes the polluter's behaviour.

However, an ETS involves calculating, and controlling, individual permit levels for individual polluters or energy users, and this becomes quite impractical for the likes of small businesses, households and car drivers. So there is a case for reviving the idea of a carbon tax (from which sectors/companies covered by the ETS might be exempt). It would also keep the cost of energy services constant despite any efficiency improvements, and would therefore minimize 'rebound' effects.

Returning to an old theme it first raised in 1993, the Commission likened such a carbon tax to 'an environmental tax reform shifting the tax burden from welfare-negative taxes (e.g. on labour) to welfare-positive taxes (e.g. on environmentally damaging activities such as resource use or pollution)', and therefore producing 'a win-win option to address environmental and employment issues'.[9] Taxing environmentally damaging consumption might also help governments replace revenue from taxes that, in the era of globalization, are getting harder to levy on capital. Environmental taxes would be regressive (because higher energy charges would take more out of the pocket of the poor than of the rich). But this effect could be offset if governments cut labour and social security charges at the lower end of the income scale.

While an EU-wide carbon tax complementing the ETS would have many advantages, the requirement of unanimity among the EU's 27 governments on tax issues is not one of them. Some governments, notably the UK and France, are showing interest in reshaping EU level taxation in a green way. At their March 2008 summit, EU leaders invited the Commission to 'examine areas where economic instruments, including VAT rates, can

9 White Paper on Growth, Competitiveness and Employment, COM (93) 700 Chapter 10.

have a role to play to increase the use of energy-efficient goods and energy-saving materials'. But reducing VAT on some energy efficient products or services – which might get the required government unanimity – would not create the widespread change that an economy-wide carbon tax would bring.

National action

Part of the 20 percent efficiency improvement – a saving only compared to what energy use would otherwise be – is supposed to come from national programmes. This is in addition to whatever energy and emissions saving are made as a result of the ETS or other EU-wide measures. Under the 2006 Energy End-Use and Energy Services directive (which like every directive, of course, had to have governments' agreement), member states have been required to file national strategies on how they planned to achieve a (non-binding) goal of reducing energy consumption by nine percent over nine years.

The lackadaisical way in which many member states have implemented this directive gives the impression that they do not care much about energy saving, or, if they do, that they do not regard the EU as very relevant to this task. The National Energy Efficiency Actions Plans (NEEAPs) were all supposed to be filed by July 2007. But Commission had to chivvy governments with threats of court action, and it was July 2008 before the last (from Greece) of the 27 plans straggled in.

These plans may be of some use to the Commission as an information exercise of what is or what is not being done at national level. This directive could, in the words of a Commission official, 'provide us with the means to look into member states' backyards in terms of energy saving and to see what more could be done at EU level'.[10] But in mid-2008 the Commission still had 16 infringement proceedings against member states for failing to transpose the directive, correctly or at all, onto their statute books. For the most part the national plans are distinctly unimpressive in their ambition, though the Commission has

10 Author interview, 2008

been gentle in its public assessment of them. In January 2008, it reported on the 17 plans it had received by then. The nearest it got to any criticism was to say that, while 'several present comprehensive strategies and plans are likely to deliver savings beyond the required nine percent, many seem to present a business-as-usual approach.[11] This was hardly the naming-and-shaming tactics that Brussels uses against member states that drag their feet on single market legislation.

Yet, while the Commission should get tougher in prodding member states into energy conservation, decisions on what measures to take must very often be made at national level, taking advantage of simpler local procedures and better local knowledge. Acts of individual leadership, such as the decision of Ken Livingstone to run for mayor of London virtually on the single issue of a traffic congestion charge for the UK capital and to carry it through, are hard to envisage in the more complex, collective context of EU policy-making. The same could be said of the Irish government's decision to place a green tax on plastic shopping bags. The wisdom of devolving decisions downwards wherever possible, and only taking them at the EU level where necessary, got formal recognition when the subsidiarity principle was enshrined in the 1992 Maastricht Treaty.

Despite the increasing degree of compulsion applied to it, energy saving remains something of a cultural issue (and as regards climate change, a moral issue in the sense of a moral obligation to future generations). Attitudes towards energy conservation will therefore evolve in the way they have towards smoking. There is no collective European conscience about energy saving, as there is against the death penalty that every European government has repealed. Some countries care more than others about energy saving. It would be tempting to generalize that northern Europe cares more than southern Europe, which generally sees itself as more in a catch-up phase of energy-driven development. But inside the northern belt of EU countries, indeed inside Germany, there is an odd contradiction. Germans are model recyclers of household and consumer product waste and have led the way in

11 'Moving Forward Together on Energy Efficiency', Commission communication, COM (2008) 11 final, p. 12.

renewable energy. But they are apparently addicted to conspicuous energy consumption in the shape of big, therefore heavy, and therefore CO_2-emitting, cars – and to the freedom to drive these cars as fast as they like on their autobahns.

Kicking the energy waste habit is likely to evolve unevenly across Europe. Only gradually may climate change concerns permeate into a common consciousness about energy wastefulness. Ironically, one factor promoting a common consciousness in general among Europeans has been their ability to fly all over their continent on budget airlines, a phenomenon created by EU aviation liberalization but which now, awkwardly, adds to global warming.

However, because of the urgency of climate change, regulation of energy waste will have to run ahead of social attitudes to it. This will be tricky for politicians at the EU and national level. They will dare not get too far ahead of voters. Leadership in energy policy is especially difficult, because energy policy changes entail lifestyle changes, and usually an element of personal sacrifice.