The current situation and mid-term prospects for European electricity markets

Dieter Helm[1]

30th October 2013

The objectives of energy policy

1. The starting point for an analysis of the current European energy policy is the objectives. What are the questions to which it is supposed to be the answer? It might seem simple and obvious, but in fact at the heart of many of the problems besetting current energy markets is a fundamental confusion—and in some cases fundamental differences—over what the objectives should be.
2. It is fashionable to state that there are three: security of supply, low carbon and affordability. Yet this "trilemma"—how to achieve all of these three simultaneously—is far from straightforward. None of the three objectives is well defined. What does security mean? Some suggest this means self-sufficiency, yet a moment's reflection tells us that if in the last century Europe had pursued this, then not much economic development would have taken place. What would have replaced imported oil and gas? Next, what does low carbon mean? Is this an instrumental objective in respect of climate change or the binding objectives for European production of carbon? Is it conditional on others or unilateral? Over what time period should this be addressed? Finally affordability might mean low retail bills for customers, protection against fuel poverty, or it might mean industrial competitiveness. These are very different things.

[1] Dieter Helm is Professor of Energy Policy at the University of Oxford, Fellow in Economics at New College, Oxford and author of *The Carbon Crunch* published by Yale University Press.

3. It is easy to see why politicians do not want to define these objectives clearly. It requires painful decisions to be made. Security comes at a price, as does decarbonisation. But even more painful is the trade off between the objectives. Is security more important than decarbonisation? Is decarbonisation more important than affordability? Many claim that there is no trade-off—asserting that only a low carbon energy sector can be secure and cheap. But this is self-serving nonsense. The tradeoffs need to be defined—and across Europe it is notable that they generally are not.
4. The desire to avoid facing up to these trade-offs is bolstered by appealing to a whole host of sub-objectives. These include a variety of ill-defined aims, such as "green jobs", "green growth", and "industrial competitiveness". Then there are overlapping objectives, such as cohesion and regional integration, which get linked to energy infrastructures. There are clearly military objectives which feed into security and strategic stocks.
5. Multiple, ill-defined objectives almost always lead to complexity and that it turn creates obstacles to the efficient functioning of markets. Each objective needs at least one policy instrument. The interaction of each on the others is rarely considered. As each new problem arises, the temptation is to graft on yet more interventions. The result in Europe is an extraordinarily complex and overlapping set of interventions, probably beyond anyone even to describe. Not only is the question to which European energy policy is supposed to be the answer ill-defined but the answers embedded in current policy are multiple, complex and have serious unintended consequences. As we shall see, the result is that Europe's energy sector is not achieving *any* of the trilemma objectives.

The Historical legacy

6. Any energy system is the product of its past—and most investments are the result of decisions in contexts which are very different. The current structure of the electricity market in Europe is the product of the gradual evolution of national electricity systems and the gradual impacts of a series of European directives, notably those on the Internal Energy Market (IEM) and the Climate Change Package (CCP).
7. Historically, electricity supply began as a local matter with considerable input from local municipalities and local authorities. In the middle years of the twentieth century, most European countries moved to regional or national systems. France and the UK opted for integrated national publicly owned monopolies. Germany, the Netherlands and Sweden relied upon local and regional cooperation.

8. European electricity trading has gradually developed as the result of bilateral agreements, and in practice this focused on links between French nuclear and its neighbours and the sharing of hydro resources. For the most part, the European dimension of electricity has been noticeable by its absence. This remains largely the case.

9. The result is that Europe is still characterised by a large number of differing national market designs and the priorities of each country are reflected in the structure and organisation of their electricity markets. Despite over two decades of trying to create a simple European energy market, the national approach remains the dominant one. There is, as yet, no European market.

Attempts at European integration and the Internal Energy Market (IEM)

10. While coal and steel figured strongly in the formation of the European integration processes, electricity has never been seen as a core EU competence. It is still overwhelmingly determined at the national level.

11. The IEM proposals were an extension of the *Completing the Internal Market* process from the mid 1980s. Spurred on by liberalization and restructuring in the UK, the Commission attempted to extent the principles of the broader internal market to electricity and gas after 1990. Early attempts floundered on the distinction between regulated and negotiated third party access and fierce resistance to liberalization from French and German utilities, notably RWE, Ruhrgas and EDF (EON was not created until 2000). The French and German governments reinforced this resistance.

12. In the case of France, it was not surprising that, with its overwhelming commitment to nuclear and the associated sunk capital costs, the prospect of the aberration of long-term contracts and the exposure of the nuclear assets to spot competition and switching caused concern. The British experiment had demonstrated how vulnerable long-term nuclear investment would be. Indeed, as is currently being witnessed in Britain *volte-face*, long-term contracts turn out to be essential to nuclear investment unless underwritten by governments.

13. In the case of Germany, the politics of the key industrial *Lander* and the history of dependence on imported energy, notably from Russia, made energy a more serious matter of national concern than, say, for Britain with its abundant North Sea reserves.

14. Notwithstanding these national constraints the Commission ploughed on with the IEM, and by the end of the 1990s it had agreed key directives on liberalizing both electricity and gas markets. The key features were: regulated third party access, unbundling and liberalization of supply.

15. Gradually EU member countries have been implementing the *letter* of the directives, though not all have followed the *spirit*. So slow has the progress been that 2014 is now the target date—a quarter of a century after the Commission started on this path. As we shall see below, developments in other areas of policy, and responses by the companies have, to a considerable degree, undermined the IEM, such that it is now more a sideshow than the main action the Commission envisaged for it. To the extent that competition remains an objective, it is the broader elements of European competition policy—tackling abuse of dominance, discrimination and state aids—which tend to dominate. Recent actions against Gazprom are a case in point.

The Coming of the Climate Change Package

16. The Climate Change Package grafted a whole raft of policy interventions on top of the IEM process. These included: the EUETS, the renewables directive, the energy efficiency directive (eventually) and the carbon target. In the process, the CCP transformed the structure and design of the market. Little or no thought was given to the relationship between the IEM and the CCP, and in fact the CCP has had unintended consequences which have significantly weakened the IEM.
17. The CCP is a mix of measures based upon the overall ambition of the EU to provide "world leadership" on climate change. If the IEM was a product of the liberalization agenda of the 1990s, the CCP was a product of the boom years before the credit crunch and economic depression which kicked in from 2007/2008. As Europeans had got ever richer, and as politicians convinced themselves that the business cycle was a thing of the past, the costs of the CCP were regarded as easily affordable.
18. A further key assumption behind the CCP was that the rise in fossil fuel prices which had begun in 2000 would go on—that oil and gas prices would continue ever upwards, and indeed many political leaders supported the various "peak oil" hypotheses. Added to this were the concerns about dependency on gas imports from Russia, reinforced by the two Ukrainian crises in 2006 and 2009.
19. The assumption about fossil fuel price increases—important in making the case for the CCP—was that these higher prices would in due course render the renewables cost-competitive and hence any subsidies would be temporary. Indeed, investing early in renewables would, it was argued, give the EU a competitive advantage over economies like the US, which remained heavily fossil fuel dependent.

20. These two core assumptions—economic prosperity and growth; and rising fossil fuel prices—both turned out to be at best misguided almost immediately after the CCP was launched.

21. To these a third assumption turned out to important too—that nuclear power would continue to play an important role across the EU. The German *unilateral energiewende* was, in particular, no part of the CCP package—indeed it was assumed that existing nuclear plant lives would be extended and that new nuclear would be fairly common across Europe, rather than being confined to Britain, Finland, France and some former eastern European countries.

The impact of the world economic and Eurozone crises

22. It was almost inconceivable back in the middle of the first decade of this century that the spectre of mass unemployment, major falls in GDP and the possible implosion of the Euro would become the backdrop to the IEM and the CCP. The economic crisis had significant impacts on the energy sector. It reduced demand sharply, reduced emissions through lower industrial output, reduced consumers' ability to pay for the CCP measures, constrained credit provision and left the incumbent utilities with weak balance sheets. The more general effect was to refocus political debate away from climate change towards jobs and competitiveness.

The impact of shale gas and the new world of fossil fuel abundance

23. The shale gas revolution in the US was entirely unforeseen by the architects of the CCP—though the IEM was conceived in a world of low oil and gas prices. Many European politicians initially denied there would be any effect, claiming that shale gas was a temporary and wholly US phenomena.

24. Shale gas has in fact turned out to be massive in its impacts, and only the first of a whole stream of unconventional fossil fuels. Its impacts stretch from the geo-politics of coming North American energy independence to the falls in world coal prices.

25. It is this latter effect, as US coal producers search for new markets as gas squeezes coal out of US electricity generation, that has had the most immediate impacts in Europe. Abundant cheap coal has been burnt in Europe's power stations, and indeed Germany and the Netherlands have led the way in building *new* coal power

stations. The result has been a squeeze on gas in Europe and an increase in carbon emissions.

26. The indirect effect of the coming of shale is the large gap between US and European energy prices that has now opened up. Whilst few energy intensive industries have left Europe (so called 'carbon leakage') new investment in these industries is taking place in the US rather than in Europe. The US is re-shoring energy intensive industries, and Europe has little place in this investment activity. The knock-on impacts to Europe's economic growth may be significant.

27. The impact on coal and on investment is reinforced by the impacts on the prices of oil and gas. It is fashionable to claim that US gas prices will have no impact on world gas prices because LNG is more expensive than pipeline gas. The impacts will initially be modest, but the build up of US LNG exports will have impacts as yet poorly understood. In part this depends on whether US shale gas exports lead to an increase in internal US gas prices. But it also relieves quantity constraints. Already Japan has benefitted from a lack of demand in the US. US imports have fallen away. Further effects will come via the impacts on LNG investment in Qatar and Australia.

28. The longer-term impact of shale oil and gas will be geopolitical. The US reliance on the Middle East will decline. Its willingness to provide a military umbrella for the Gulf region will gradually decline. Europe's exposure will rise. There is a major security issue here for Europe, and the role of very geographically central countries like Turkey will be important for Europe's future security of oil supplies.

The impact of renewables on emissions

29. Renewables are the big winners (along with coal) from the CCP. The Renewables Directive has provided subsidies on a large scale, and because it has a short time period (2020) and is based upon target shares for energy rather than electricity, it is a binding constraint on electricity systems across Europe.

30. There have been three main renewable technologies deployed: wind, solar panels and biomass. It is important to recognize that none of these can make much difference to climate change. The first two are low density and intermittent—and there is not enough land and shallow seas to provide sufficient aggregate energy output against the growth of world energy demand. Furthermore since electricity's share of the final energy demand is growing, and will over time encroach into transport too, the gap between total demand and the contribution these technologies in their current forms can make will probably get bigger. Wind and

current generation solar technologies are, at best, marginal in a context in which global emissions continue to rise—and have continued to rise since 1990.

31. Regarding biomass, the extent to which it is carbon neutral is open to serious debate. In the case of wood burning, since trees are in effect Carbon Capture and Storage (CCS) assets (they store carbon), there is, at best, a time lag. Where the wood is a waste product, there are often alternative uses, like the paper and pulp industry. The knock-on effects of displacing supply sources to these industries feeds into other carbon emissions. Some local wood sources may be better from a carbon perspective but none is strictly carbon neutral. Regarding energy crops it is much harder to make any serious case that these are genuinely renewable. It is extraordinary that there has been no analysis of the impacts of renewables on global emissions, accounting for the intermittency, the full carbon cycles and the substitutions of carbon production for carbon consumption that the consequent higher prices cause.

The impact of renewables on electricity markets

32. Given the overriding emphasis placed upon achieving the renewables targets, many EU members have not only provided subsidies to renewables but also given them priority access to the electricity networks. When combined with the peculiar cost characteristics of wind and solar—the marginal costs are zero—whenever these technologies generate, they displace everything else.

33. There are two consequences: wholesale electricity prices fall when zero marginal cost generation comes onto the systems; and by displacing other technologies, the intermittency of the renewables causes everything else to become liable to intermittency too.

34. It is this combination of reducing wholesale prices and imposing intermittency which has caused great problems for conventional electricity generation. These factors have made investment in conventional power stations much less attractive, and already seriously impacted on the major energy companies.

35. A new gas-fired power station cannot now rely on being able to run base load—and hence depreciate rapidly the sunk and fixed cost investments. In addition it now requires interruptible gas supply contracts—and therefore has higher fuel costs.

36. The impacts on gas have been further exacerbated by the fall in coal prices, which has led to a gas-to-coal substitution. As noted below, the carbon price has been unable to bridge the gap.

37. The result across Europe of this combination of policy measures (and the German nuclear decision) has been to switch from gas to coal, and from nuclear to coal. Gas power stations have been mothballed, new gas investments curtailed and emissions have risen as a result.

38. The overall impact has been to render investments in almost anything—other than technologies supported by direct government-based feed in tariffs and contracts for differences—uneconomic. The investments in renewables (and in Britain in nuclear) require long-term contracts: IEM explicitly encourages short-term switching and hence undermines long-term contracts. Only if customers are *compelled* to pay will the long-term contracts stick—and compulsion is exactly what the IEM opposes through its liberalization measures.

39. The renewables dimension of the CCP thus undermines the IEM. It is a fundamental conflict of objectives and policy design.

40. There are two ways out of this: either the CCP has to be made market-friendly (by reliance on market-based mechanisms and without specific technology directives) or the IEM has to facilitate long-term contracts and hence limit customer switching and liberalization. If the former, the route is to replace the renewables directive with an effective carbon price. If the latter, then capacity markets organized by some central buyer agency will be required. The European dimension of the IEM can only be preserved in this context if the capacity market design is Europe-wide, and not as at present on a country-by-country basis. So far, the Commission appears unwilling to give up on specific renewables targets or to enforce a common design on capacity markets.

The EUETS and the renewables and the electricity markets

41. As part of the CCP package, not only was the renewables directive designed to promote and protect certain chosen technologies, but it also had the EUETS as its market-based mechanism.

42. The EUETS relies on a carbon cap. This is the reason the EU has been so concerned to have a second commitment period for the Kyoto Protocol framework—as agreed at Durban. The cap sets the umbrella within which the EUETS allowances are allocated.

43. Given the CCP set a 20% carbon target for 2020, and given the economic crisis and the structural decline of energy intensive industries in the EU, the price of carbon under the EUETS should be inversely proportional to the likelihood of hitting the target. Indeed if the target is met, the price should be zero (unless there is another commitment period and there can be banking of emissions reductions

between periods—or there is *ex post* intervention to reduce the number of permits).

44. The Renewables Directive has further undermined the EUETS. Since renewables reduce emissions in Europe (but not necessarily at the global level), and since the cap relates to total emissions, an increase in renewables reduces the EUETS price which in turn encourages an expansion of the coal burn. In theory, the renewables are cancelled out by the EUETS.

45. The EUETS price has been volatile and low—too low to make any difference to either the dispatch order of existing power stations or to influence investment. In particular, the EUETS has had no impact on the dash-to-coal referred to above, resulting in modern low-emission gas plants being mothballed to make way for old coal plants.

The coming of capacity crunch in some cases

46. For some European countries, there is now a cyclical need to replace power stations. Since the end of the 1970s and in particular following the sharp recession at the beginning of the 1980s, there has been a trend away from energy intensive industries. The fall of the Berlin Wall at the end of the 1980s exacerbated this trend. The result was that the relationship between energy demand and the demand for electricity changed. Much of the capacity built on the assumption of a strong positive correlation between electricity demand and economic growth turned out to be surplus to requirements. Hence, with the exception of nuclear France, investment requirements were much weaker, with capacity margins comfortable across much of Europe.

47. The economic crisis from 2007 further bore down on demand, postponing the need for new capacity.

48. From 2015/2016 the EU Large Combustion Plants Directive (LCPD) will bring about the closure of a significant amount of coal-fired generation in a number of countries, having already impacted on the hours these plants can run—unless they are fitted with anti-pollution equipment.

49. Early generation nuclear plants are beginning decommissioning in a number of countries, with Germany deliberately speeding up this process. Both Germany and Britain are on similar paths to close most of the existing nuclear capacity by the early part of the next decade, and both have already started the closure process.

Capacity markets

50. Now that investment needs are in some cases pressing, and with many energy companies in poor financial shape as a result of the large scale M&A boom of the last decade and the economic crisis, it has become apparent that there are few mechanisms to ensure the required investment under the IEM, and the CCP is undermining the investment incentives for conventional plant as described above.

51. Whilst the feed-in tariffs have provided the long-term contracts for renewables, there is no parallel mechanism to provide such contracts for conventional plants. Indeed, as described above, the IEM actively undermines any incentive to contract for the sunk and fixed costs of new investments. There are no deep, liquid, transparent and long-dated future markets to hedge the risks.

52. The result is a major effort in a number of EU members to graft long-term capacity contracts onto the existing markets.

53. In theory, capacity contracts are not inconsistent with competitive markets. But they do require a key intervention: someone has to set the required capacity margin, someone has to auction the contracts, and someone has to force customers to pay.

54. Whatever the precise institutional allocation of these interventions, the essence of this mechanism is a central buyer. It is ironic that the central buyer model was proposed and rejected in the debate which brought forward the IEM directives.

55. Given the separating out of a System Operator (SO) in the rules in respect of unbundling, it is inevitable that the SO is involved in this process. Competitive auctions to meet the required capacity margin can be run by a different body, but there needs to be enforcement of the outcomes of the auctions. Making customers pay must mean they cannot switch out of the obligation. Whether this is facilitated through an administered levy, by supplier obligations or by the use-of-system charges is an important but secondary consideration.

56. The auction design is complex, and the details matter greatly in the consequences for the IEM and the extent to which the process is national or European. The first issue is the domain—who can bid? Is it just certain technologies? Can FiT-subsidised technologies bid as well? What about the demand side? Storage? Is it just national or European?

57. Next comes the form of the capacity contract. Is this firm capacity or should it include intermittent capacity? Should wind farms have to contract with peaking plants to cover their intermittency and provide reliable capacity on demand?

58. On enforcement, should bonds be put up in advance? What should the penalties be—for example, if the extra contracted capacity is not needed? What should the penalties be based upon—power costs at the time?

59. There is a question of the term structure. How often should the contracts be auctioned? Over what period should the capacity be committed?

60. Any institution which then has the obligation to fulfill the contract could enter into the capacity contract, or it could require concrete physical investment to take place.

The return of central buyers and national energy policies

61. As described above, the CCP has undermined the IEM. National governments have gradually taken on the functions of a central buyer. National governments determine which renewables will receive which subsidies. Wind, solar, biomass and nuclear depend upon government policy interventions, not the market. The practical question is whether this development should be further advanced, or rolled back.

62. Rollback to a market-based determination of the level and type of investment is very unlikely. Indeed, for many of the current investments, governments are committed up to two decades ahead.

63. As the incentives of conventional technologies are blunted by the intermittence of renewables, governments will have to design mechanisms to ensure security of supply is met. This is where capacity mechanisms come in.

64. The policy choice now confronting the EU is whether to use competitive markets to deliver the capacity levels that governments determine, or to use the same sort of contract-by-contract approach currently used for renewables.

65. In principle the central buyer could be European or at each national level. Notwithstanding the advantages of taking an EU-wide approach, in practice the EU element—the renewables targets—has been of questionable value, and there is no evidence that national governments are likely to surrender security of supply to the European Commission. It is not going to happen any time soon, whether or not it is desirable.

66. The question then becomes one of coordinating national policies and looking for bi-lateral benefits to trading between member states.

What is to be done?

67. Faced with the competitive challenge of shale gas, rising global carbon emissions and having chosen some of the most expensive low carbon technologies which

cannot do much about climate change, Europe's high-energy costs are both an inevitable consequence of the CCP and the casualty of world market developments.

68. There are three possible ways forward, depending upon the weight given to the objectives. These are:

    - Drive on with decarbonisation on a fast-track timetable,
    - Develop capacity mechanisms to ensure security of supply, and
    - Focus on lowering energy costs, both absolutely and relatively.

69. If the EU wishes to continue to drive a rapid switch to current renewables, then it follows that there will need to be permanent subsidies for these technologies, and larger capacity margins to meet the intermittency. The EU should then accept that it is unlikely to host energy intensive industries, and that its consumers will face high energy bills.

70. Delivering 40% and then 80% and even 100% shares of renewables will require a massive series of ramp-ups of investment. It is unlikely that the private sector would finance this without further support. Indeed, it is probably that there would need to be direct government investment and guarantees. National governments would be the driving forces. State aid rules would need to be ignored.

71. In theory the renewables could be driven by market mechanisms. But in practice, given the differences in costs and the political and planning dimensions at the national level, governments will carry on picking "winners". Any market-based approach would put an end to offshore wind in many areas and politicians would have to recognize the scale of their errors.

72. The problem with the (current) renewables-first approach is that it probably cannot be afforded. Any energy policy must pass two tests: customers must be able to pay; and it they can, they must vote for politicians who will force them to pay. The dash-for-renewables is likely to fail both these tests.

73. The second option is to focus on security of supply. Contrary to many advocates of the British model, and the IEM, security of supply will not automatically be delivered by the market. Security of supply is a system public good.

74. If security of supply is the overriding objective, someone has to fix the capacity margin and there needs to be payment for the provision of excessive supply relative to mean expected demand. This is where capacity markets come in. The requirement can be auctioned, and the bidders are likely to be those who can deliver capacity on a continuous basis (as opposed to most, but not all, current intermittent renewables).

75. If affordability and competitiveness are the overriding objectives, then the policy question is how to meet demand for a given—affordable and competitive—price. The budget then is fixed and given, and the task is to meet it.

76. Affordability and competitiveness drive automatically towards lowest cost. This means buying the cheapest fuel inputs, focusing on new investments which are lowest cost. Europe has choices here—it could burn coal, like China and India. It could develop shale gas, like the US. It could decide not to invest so heavily in current renewables, though it might invest in R&D to develop future renewables.

77. None of these options looks attractive. The real choice lies somewhere between these—by defining the tradeoffs between the trilemma of objectives. That should be the starting point for the reform of European Energy Policy.