Energy's contribution to economic growth[1]

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1. The dominant theme of the Commission's Energy 2050 Roadmap is decarbonisation, with a particular focus on renewables. How can energy policy make its contribution to both decarbonisation and to economic growth? In what specific ways can energy drive economic growth in the EU?

Answer

Energy policy can contribute to decarbonisation by giving suitable market signals and incentives to decarbonise generation and energy use (e.g. by switching from fossil heating to electric or renewable heating). It does so through a combination of ***price signals*** (e.g. the carbon price of the ETS), ***taxes*** (the carbon price floor, the climate change levy), ***subsidies*** (e.g. to renewables via ROCs, the subsidy to gas and electricity via the reduced rate of VAT – although these last are perverse they influence energy use and choices), ***charges*** (deemed in the UK as taxes, but not in other EU countries, e.g. on electricity consumers to support renewables, or energy efficiency), many of which are adopted to meet ***targets*** (such as the 20-20-20 Renewables Directive that mandates a 20% EU renewable energy target by 2020, or the Emissions Performance Standard in the EMR, or various targets for fuel efficiency in transport), ***standards*** (on energy efficiency of housing and equipment) and ***prohibitions*** (e.g. on filament light bulbs). The art of delivering good energy policy is to choose the least-cost combination of instruments to meet the various goals, which include delivering the necessary research, development, and learning needed to lower the costs of low-carbon technologies. Energy policy can contribute to growth by ensuring that the resulting energy mix is delivered efficiently, at least cost, sustainably, and securely. A failure in any of these will create future economic and social costs that would harm well-being, and so avoiding such failures can be said to contribute to economic growth (and more widely to improvements in well-being, which is why growth is desirable).

The most obvious way in which decarbonisation could stimulate economic growth is by increasing the total rate of investment above what it would be under "Business as usual", particularly if, as in the next few years, the EU (and certainly the UK) is in a serious recession with under-investment. Of course, it is important to remember that public sector infrastructural investment and investment support (of the kind needed for decarbonisation) is in any case desirable to stimulate depressed economies. Once the government has recognised this, and agreed an accelerated rate of public sector investment, all investment should still be selected using best-practice social cost benefit analysis (SCBA). In that context, transport

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investment (roads, airports) almost certainly has higher returns than investment in some low-carbon options, and should not be displaced solely on the grounds of whether or not it lowers carbon emissions. Roads and airports may well relax constraints on transport that might lead to higher emissions, but if the SCBA properly includes their cost, as well as including a sensible estimate of the learning benefits of supporting immature renewables technologies and their environmental and social (visual dis-amenity) costs, then the correct choices should result.

It is a serious but common error to consider that creating "green jobs" is a way to stimulate growth – many low-carbon technologies are considerable more capital-intensive and less labour-intensive than the fossil technologies they replace and to that extent the net impact of a switch of investment on employment can be negative. (The one obvious exception is the development and employment of a trusted sector of energy efficiency installers who could improve the insulation of buildings while avoiding the label of cowboys that double-glazing sales people attracted.) In any case it is the task of macro-management of the economy to maintain full employment, not the choice of individual sector-specific policies. Holding the total volume of investment constant and reallocating it from e.g. road building to off-shore wind farms would almost certainly have an adverse impact on employment and the balance of trade, but holding other investment constant and increasing energy investment by shifting to less carbon-intensive solutions should stimulate an under-employed economy and would be neutral or slightly negative in a fully employed economy (depending on how the extra finance for the investment were raised – distorting taxes on industry as under the present system of electricity charges for renewables would have adverse effects).

Nor should one automatically assume that energy policy requires industrial policy – it will almost certainly require considerable research and development (R&D) support that in many cases is best done in partnership with industry, and it is definitely the task of institutions that allocate public funds to R&D to pick winners and kill off unpromising lines of development. In some cases where it seems unlikely that the private sector will take on the political risk of developing very capital-intensive technologies (nuclear power and CCS are the leading examples), it may be necessary for a large element of state support, and that might be considered as industrial policy, but before deciding to invent everything here one hopes that the funding body will take a long hard look at the options that it makes sense to develop, and considers what capabilities and comparative advantage the UK might have or might develop and how best this might be done. Past UK nuclear policy (especially the AGRs) has been disastrously designed and delivered, and recent choices (not to support Sheffield Forgemasters, selling Westinghouse) have not been encouraging. In many cases (PV panels, wind turbines, nuclear components) we should recognise that it may be efficient to import these, and concentrate on developing a more capable construction industry and transport infrastructure (which is almost necessarily mostly domestic, not imported) to deliver the projects.

A common EU approach to transforming the energy system

2. To what extent will a common European approach help keep the costs of transforming the energy system down and assure security of EU energy supply? Where do you see economic growth and decarbonisation benefitting from a common approach to generation, transmission, distribution and storage? And what are the risks?

Answer
If the approach is well-designed it could meet these objectives, but past experience of joint-EU decision-making is not encouraging. The sub-questions can be taken in order.

Costs of energy supply
I suspect that the big question lurking behind the *2050 Roadmap* is what to do after 2020, given the long lead-times of energy infrastructure. Clearly the ETS is almost completely dysfunctional in its current state, as it signally fails to give an adequate, credible and sufficiently durable investment signal that would convince bankers to lend on 40-year investments that take in many cases nearly a decade to construct (nuclear and off-shore wind, major transmission upgrades, etc.). The response of the CEC is to set targets rather than try to modify market price mechanisms like ETS that requires unanimity to change, while harmonising carbon taxes would always encounter entrenched Member State (MS) opposition. The ETS emerges from carbon targets but these are too short-term to deal with the objective, which is to manage to cumulative total carbon emissions, not the instantaneous rate of emission that is sensitive to macro-economics as well as other policies like the 20-20-20 Renewables Directive.

The Renewable targets are a more directed attempt to decarbonise energy while devolving to MSs the task of supporting Research, Development, Demonstration and Deployment (RDD&D), particularly deployment. The major achievement of the 20-20-20 Renewables Directive is to ensure that each MS provides massive financial support for deployment, which in turn creates a market that stimulates companies to do more of the R&D part. Its weaknesses are that it undermines the ETS (which should have been at the very least commensurately tightened to reflect the increased supply of low-carbon energy) and it also over-emphasises deployment at the expense of RD&D. It also has put in place a system that makes cross-border trading of green certificates very complex and difficult.

Clearly it would be most unwise to support a 2030 Renewables Directive, when the whole point of the 20-20-20 Directive was to bring the viable low-C energy options to commercial viability (at least, at a sensible carbon price). That carbon price has to be at least adequate to support the already near-mature options like on-shore wind and generation-3 nuclear power. Two problems arise: how to support immature technologies and what to do about the mature low-C technologies that need, but do not receive, an adequate carbon price.

As to supporting immature low-C options, the Government should press the CEC for a better way of collectively supporting RD&D for promising but still non-commercial options (CCS, off-shore wind, possibly next generation bio-fuels and cheaper PV). One possibility is to translate renewables targets into financial targets, where each MS is given a financial target

(as a percentage of GDP) which can be spent on any low-C support at a rate benchmarked on the efficient solution, but also on RD&D. Thus the credit for PV would be benchmarked on best Spanish or Italian solar sites (e.g. the revenue needed to support PV generating 1600 hours per year compared to the average EU wholesale price, for on-shore wind possibly estimated as the support per MW installed capacity needed for a 25% capacity factor wind farm selling at the average EU wholesale price to be commercial, etc.). These credits should then be tradable in the sense that where governments choose to invest in other countries (including developing countries) they can be credited with these values. As the metric is already money it should be much simpler to address this tradability question that has undermined the efficiency of current renewables support.

As to supporting mature low-C technologies, on the plausible assumption that the ETS continues to fail to deliver bankable long-term investment signals, something will be needed to replace it. The logical and cost-effective solution is that all fossil fuel should require one EUA per tonne of embodied carbon dioxide (i.e. 3.67 EUAs per tonne of embodied carbon) to be transferred with each sale and relinquished at the final stage of combustion. The main problem with that solution is that it would have possibly adverse impacts on exposed traded carbon-intensive sectors and the income distribution. The current ETS fudges some of these problems (including the notion that it is a corrective tax) by expensively measuring emissions from a subset of the economy. If these constraints continue to prevent a rational solution, then perhaps an emissions performance standard for all generation might be required. This would, however, necessarily be a rather complex solution, since it would have to respect differences in MS's starting positions and resource endowments. Ideally the solution would lead to the efficient replacement of obsolete carbon-intensive plant with low or zero-C plant, while ensuring that new investment in any base or mid-merit plant is zero-C, only allowing reserve/peaking capacity with low average capacity factors to burn fossil fuel. Ideally also the investments should hold and trade emission certificates like EUAs, but confined to electricity generation (CHP would present problems). This would be a kludge to ensure efficient investment decisions while avoiding the problems of setting technology-specific targets (e.g. renewables rather than low-C energy) and dealing with the political difficulties in agreeing an EU-wide and economy-wide carbon tax or price.

Security of energy supply

Renewable energy reduces import dependence but raises other security of supply issues, as renewable energy supply for electricity (RES-E) is mostly intermittent, and requires additional flexible reserves to prevent blackouts. Nuclear power avoids both problems, but is costly and slow to build. Gas is discussed further below, and with sufficiently diverse sources of supply emerging (pipelines, LNG terminals, even possibly shale gas at some future date), as well as storage, security issues can be managed without excessive cost, providing a rational and not emotive approach is taken and liquid markets allow gas to flow freely within the whole of the EU in the event of localised disruptions to pipelines.

Common approaches to generation, transmission, distribution and storage
There is an obvious logic in ensuring that energy transactions between MSs are facilitated and not made unnecessarily complicated, and to that extent grid codes and the terms for offering ancillary services offered to Transmission System Operators should be internationally harmonised. That may mean some harmonisation for connection and charging arrangements for generation and distribution at the entry and exit points of the grid (or high pressure pipeline system), but it is less clear that this is required for purely domestic arrangements such as distribution and storage, other than to ensure that the various unbundling and access requirements of past directives are enforced. It would certainly be silly to require each country to have a target share of PV or wind or gas or any specific technology. The main problem of harmonisation is to agree what and how low-C generation can be supported without running afoul of State Aids suits.

The Internal Market in Energy

3. The internal market in energy is focused on transmission. Should competition in the rest of the supply chain be given greater consideration? What economic opportunities might arise from such consideration? What risks arise?

Answer
The reason the internal market is currently focused on transmission is that the rest of the structure has already been dealt with in earlier directives; but efficient cross-border trading and investment remains problematic. As far as I can tell, the rest of the supply chain is required under EU law to be competitive (or at least its component parts are disbarred from exercising abusive market power), although the EU Sector Inquiry suggested that this was far from a reality in many cases. Clearly increasing competition is desirable where it can be done legally (i.e. by due process without violating property rights) and also clearly political lobbies, defences against transparency that appeal to commercial confidentiality, and the asymmetry of information and understanding between large energy companies and bureaucracies make this a slow and incremental process. ACER is certainly handicapped by its inability to secure adequate market intelligence.

Reducing the costs of energy for business and consumers

4. Energy is a significant manufacturing input and household cost. Is it appropriate to seek to reduce the costs of energy in order to boost EU competitiveness and, if so, how can it be achieved in addition to energy efficiency? To what extent might price reductions jeopardise attempts to decarbonise? What implications, if any, do consumer preferences over the energy mix, such as onshore wind and nuclear power, have for price?

Answer

There is a simple principle of good public finance that was enunciated by Nobel laureates Diamond and Mirrlees in their 1971 paper.[3] That is that revenue-raising taxes should as far as possible fall on final consumers, not on producers (an outcome best achieved with a VAT that can be reclaimed by producers). Corrective taxes designed to reflect the cost of externalities (like CO_2 emissions charged through a carbon tax or price) should fall on all including producers. That means that all levies designed to cover the public cost of supporting renewables and energy efficiency should only fall on final consumers and that commerce and industry should be exempt (as is largely the case in many EU countries). Further developments of public economics suggest strongly that VAT at a *uniform rate* is the efficient way to raise revenue, and that redistribution is best and already largely conducted through transfers and expenditures (on health, education and welfare), not through discriminatory tax rates.[4]

This gives simple prescriptions for almost all the various electricity levies, but there are several tricky issues remaining, of which carbon prices/taxes are the leading one, as they damage exporting industries in a world in which carbon pricing is partial and in any case too low. The preferred but politically problematic and administratively complex solution is border tax adjustment to bring the tax on embodied carbon up to the EU level, but unfortunately different MSs levy different rates of carbon tax, including *de facto* subsidies (e.g. by charging 5% VAT on gas and electricity in the UK rather than 20%). Second best solutions grant varying forms of exemption or compensation (e.g. free allowances) to carbon-intensive exposed sectors facing international competition, although these are prone to fraud, can be anti-competitive and are certainly administratively complex.

Road fuel excises pose another problem as these are very heavy compared to the environmental damage and are in part justifiable as a road user charge to pay for the road infrastructure. They are likely to require modification (road pricing) as fuel efficiency is driven up and electric vehicles and biofuels (if they remain untaxed) increase their penetration. It is not immediately clear that these need urgent reform as part of the low-C agenda, but will need forward planning for future reform.

In short, exempting all commercial and industrial companies from any renewables and efficiency charges is sound public finance and avoids harming competitiveness unnecessarily.

Gas

5. Do you agree with the Commission that "Gas will be critical for the transformation of the energy system", until at least 2030 or 2035? What mechanisms are required to boost the role of gas, securing appropriate investments, but on the proposed interim basis? Does an

[3] Diamond, P.A. and J.A. Mirrlees (1971) 'Optimal taxes and public production I: production efficiency', *American Economic Review*, 61, 8-27

[4] The Mirrlees' Review on reforming the tax system for the 21st century was published in 2011 (see http://www.ifs.org.uk/mirrleesReview) and provides adequate guidance on these matters.

active renewables policy require gas in support of it? Should the EU encourage the development of unconventional gas?

Answer
Gas is an obvious transition fuel in the sense that it can more than halve the emissions of coal-fired generation per kWh produced, and past dashes for gas in various countries (most recently from shale gas in the US) have demonstrated this admirably. It is far from clear that anything needs to be done to ensure this, as past experience if anything suggests an over-enthusiasm to invest in gas-fired plant, which is cheap, quick to build, raises few environmental or political objections, and, in a world in which gas sets the price of electricity, is also low-risk (although vulnerable to falling demand if there is adequate coal plant on the system, as was the case in the US, the UK and many parts of the Continent). As coal is retired, emissions performance standards agreed or as the carbon price is raised the ability to switch back into coal will be reduced, enhancing the attraction of gas, unless RES-E and or massive nuclear cause wholesale prices to collapse.

In any case flexible gas will continue to be needed to balance the electricity system as the share of intermittent RES-E rises, although that may require a shift to capacity and energy payment contracts to allay fears that current investments will be stranded by future low-C policy. Gas in domestic heating is likely to remain the preferred fuel at least until the 2030s.

As to encouraging unconventional gas, the main requirement is to ensure that any environmental and other restrictions are limited to those justified by the damage caused (including fully charging for any carbon or methane emissions) so that active inhibitions are not imposed. It is then reasonable to leave exploitation decisions to commercial operators, with some assurance that harm done by any future political changes to rules of operation will be adequately compensated.

Research and innovation

6. We would welcome views on how the EU can most effectively support research and innovation as catalysts for decarbonising energy and driving growth, and how EU energy policy can be sufficiently flexible to take into account emerging new technologies.

Answer
The Strategic Energy Technology (SET) Plan has mapped out a reasonably sensible path (perhaps overly influenced by powerful car lobbies and the remaining nuclear lobby). What is lacking is the mechanism to mobilise sufficient funding through collective action, and the institutions to ensure that any such money is well-spent. One such funding mechanism would be the transformation of the RES targets to financial targets as argued above. Ofgem's Low Carbon Network Fund[5] is a good example of stimulating competitively sourced near-market improvements towards smarter distribution networks. Ensuring that any research funds are awarded competitively by bodies that contain rotating groups of experts whose task is to

[5] http://www.ofgem.gov.uk/Networks/ElecDist/lcnf/Pages/lcnf.aspx

select wisely rather than build empires and circulate internal memoranda is also good practice. Leaving each MS to choose its own priorities makes sense (and the modified RES mechanism described above would allow this), with EU co-funding allocated to the extent that the research produces wider benefits.

If energy policy is evidence-based and if support interventions are market-friendly and meet good public finance criteria, it is not clear that anything further is needed to encourage emerging new technologies, other than support where these are both promising and immature.