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Connecting Europe's energy systems

By Stephen Tindale

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- ★ Europe's energy infrastructure urgently needs to be modernised and extended to increase economic growth, improve efficiency and maximise renewable energy use.
- ★ The European Commission is providing strong leadership on energy policy. The Council of Ministers and the European Parliament should adopt its proposals on construction permits and finance for energy infrastructure.
- ★ The Commission's proposals should be strengthened by a clear statement that unless a planning decision on priority projects is made within three years, all European financial support will be withdrawn.

Europe's energy infrastructure urgently needs to be extended and upgraded. The harnessing of more wind power, both on and offshore, in northern Europe, and more solar power in southern Europe, will require substantial electricity grid expansion. Since both wind and solar power are intermittent, Europe needs more capacity to store electricity. In addition, gas infrastructure needs expansion in order to complete the internal energy market and increase the energy security of many member-states. Better gas infrastructure would also reduce the use of coal, so contributing to Europe's climate objectives. Finally, new pipelines are needed to transport carbon dioxide from power stations to locations where the gas can be stored: depleted oil and gas fields or saline aquifers.

Europe's energy infrastructure also needs to be modernised and made more efficient. The existing electricity grid, most of which was constructed decades ago, loses five to eight per cent of electricity during transmission and distribution. A modern grid – generally referred to, somewhat inevitably, as a 'smart grid' – would enable power firms to manage flows more smoothly and more cheaply. Linked with 'smart meters' in homes and offices, a smart grid would give consumers cheaper electricity off-peak, making demand more even; cut energy suppliers' costs (and therefore reduce consumer prices); and increase consumer convenience by removing the need for meter readings (smart meters can be read electronically).

A modern energy infrastructure will increase economic growth over time, by giving companies cheaper, more reliable energy. Building new energy infrastructure will also create many thousands of jobs. But it will not be a cheap investment. The European Commission has estimated that the cost of gas and electricity infrastructure improvement over the next decade will be €200 billion – two-thirds of this for electricity and most of the rest for gas.¹ This amounts to a 70 per cent increase in

electricity infrastructure investment compared to the last decade, and a 30 per cent increase in gas infrastructure investment. The Commission believes that only half of this amount will be delivered by the market on time unless governments speed up land-use planning and leverage in the necessary private capital.

Action on construction permits is necessary because finance is not the main obstacle to the expansion and modernisation of Europe's energy infrastructure. The main obstacle is public opposition, on environmental and health grounds, and consequent delays in obtaining planning consent. To take just one example, the existing electricity grid between Spain and France over the Pyrenees can only carry a small amount of electricity. A trans-Pyrenees grid expansion was proposed in the 1970s, leading to widespread and strong opposition. Public authorities, including the French government, caused very significant delays. The new grid will only become operational in 2014 – if there are no further delays.

The Commission has published sensible infrastructure proposals which would speed up permits issuance

¹: European Commission, 'Energy infrastructure investment needs and financing requirement', June 2011.

and increase investment. These proposals should be adopted by the Council of Ministers and Parliament as soon as possible. The rest of this policy brief outlines the Commission proposals. It considers why and where new

energy infrastructure is needed, what the key obstacles to infrastructure expansion are and what should be done to overcome them. It then suggests some ways in which the Commission approach could be strengthened.

The Commission's infrastructure proposals

The importance of energy infrastructure is widely recognised by politicians, at least rhetorically. Less widely recognised in the past has been the importance of pan-European energy infrastructure. Member-states have tended to see energy infrastructure as their competence. However, recent years have seen a welcome increased emphasis by politicians and policy-makers on the EU's role. The Commission has provided the leadership on infrastructure, as it has on energy issues more generally. In late 2010, the Commission accepted the need to overhaul the policy and financing framework for trans-European energy networks. In February 2011, Council President Herman van Rompuy convened an energy summit with the heads of government. At the summit, European Commission President José Manuel Barroso highlighted the opportunity to reduce the EU's annual bill of around €300 billion – equivalent to 2.5 per cent of GDP – for oil and gas imports, by using energy more efficiently and boosting renewable energy. The European Council agreed that a more efficient and extensive electricity grid was essential if Europe were to increase the use of renewable energy substantially, and that public financial support would be required to get the new infrastructure built. It also promised that no member-state would remain isolated from European gas and electricity networks after 2015 – which will require new infrastructure to connect Cyprus and Malta to the rest of the Union.

Energy project bonds

For the last three years the Commission has been proposing energy project bonds – in essence loans from the European Investment Bank (EIB), which would be leveraged with private capital, to co-invest in energy and reduce the cost of capital for developers. Energy project bonds have strong support from Barroso. In 2009 he tried to allocate €5 billion of unspent EU money to energy and broadband programmes, but this proposal was rejected by member-states.

In June 2011 the Commission's proposals for the 2014-20 multiannual financial framework proposed €9.1 billion for energy infrastructure as part of the 'Connecting Europe programme'.² This money would be used to provide energy project bonds. In addition, Connecting Europe would allocate €10 billion of grants, drawn from the structural funds – though this would cover transport and information technology as well as energy.

2: European Commission, 'A budget for Europe 2020', June 2011.

3: European Commission, 'Proposal for a regulation of the European

The energy project bonds initiative has won more support this time round. In May 2012 the Council of Ministers and European Parliament agreed to launch a pilot of project bonds for energy, transport and information technology in the summer of 2012. The pilot is being implemented by the European Investment Bank. This is a good start, though small: EIB capital of €230 million, leveraged up to about €4.1 billion.

The Commission's planning proposals

In October 2011 the Commission published an excellent proposal for a regulation on trans-European energy infrastructure.³ This aims to reduce the time priority projects take to get planning permission. The proposal identifies nine trans-European 'priority corridors': four for electricity (North and Irish Sea offshore grid, north-south interconnection in western Europe, north-south interconnection in central and eastern Europe, and Baltic interconnection), four for gas (north-south interconnection in western Europe, north-south interconnection in central and eastern Europe, southern gas corridor, and Baltic interconnection) and one for oil (interoperability of pipeline networks in central and eastern Europe). The Commission also proposes three 'priority thematic areas': smart grids, electricity highways (transmission lines with significantly more capacity to transport power than existing high-voltage transmission grids) and cross-border carbon dioxide networks for carbon capture and storage.

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The Commission then proposes rules to select, within these 12 priority corridors and areas, 'projects of common interest'. This selection will be made by the Commission itself by July 2013, following advice from regional groups set up for this purpose. Regional groups will comprise representatives of national governments, national regulatory authorities, energy network operators and project promoters, plus the Commission and the Agency for the Co-operation of Energy Regulators.

The Commission proposal seeks to reduce the time taken for planning decisions to be made for such projects of common interest. The Commission suggests that each

Parliament and of the Council on guidelines for trans-European energy infrastructure', October 2011.

member-state should establish one public authority to take the decision on planning permission, with other arms of government only offering advice. This would provide developers with a 'one-stop shop' rather than making them apply for planning permission to local, regional and national government.

The most radical part of the Commission proposal is the suggestion that planning decisions should only take three

years for all projects of common interest. The Commission also proposes that it should be able to appoint "European co-ordinators for projects facing particular difficulties". These are described informally as 'grid tsars', but that description overstates their proposed powers. They would only be able to ask the competent planning authority within the member-state about what progress is being made and when a decision is possible. They would not be able to take decisions.

Why new energy infrastructure is needed

The European energy market remains incomplete, due to insufficient interconnections between member-states. Where interconnections exist, they are often too small to carry sufficient electricity or gas for a fully functioning single energy market. Such a market would only appear if generators with surplus energy in one country could sell it to another member-state. This would put downward pressure on consumer prices.

Europe's plans for renewable energy can only work if electricity infrastructure is expanded and upgraded. The EU has an oft-stated ambition to reduce its reliance on fossil fuels, in order to reduce its bill for imported gas and oil and to meet greenhouse gas reduction targets. Member-states already use substantial amounts of hydro-electric power, but in most countries there is limited scope to expand this as the most appropriate locations have already been used. EU countries also use significant quantities of bioenergy (energy from plants). There is scope for expansion of bioenergy, but there are also active debates among policy-makers about whether this should be expanded. Some bioenergy is less damaging to the climate than natural gas. But some is more damaging, due to the chemicals used in its production. In addition, the use of arable land for energy crops means that food has to be grown elsewhere, which can result in deforestation.

A major expansion of European renewable energy will therefore have to focus on wind power and solar power. Southern Europe receives enough strong sunlight to make solar power investment pay, while much of Europe receives enough wind to make wind power worthwhile. But even in countries like Greece or Spain the sun does not always shine. And wind speeds are highly changeable.

Solar power generation can be decentralised in urban areas – any building can have solar photovoltaic panels on its roof. But another form of solar power generation, called concentrated solar power, which uses large mirrors to concentrate sunlight and then boil water to produce steam which turns turbines, needs substantial space and is only suitable in rural areas. Small wind turbines on buildings are not economically efficient, so wind farms will also be in rural areas or offshore.

Europe therefore needs to expand and upgrade its electricity grid to take power from the rural or marine areas where it is generated to the urban areas where it is consumed. The grid will need to be capable of transmitting electricity in either direction. This would mean, for example, that when the wind is not blowing in northern Europe but the sun is shining in southern Europe, electricity can be transmitted northwards, and that when the wind blows in northern Europe during the night, electricity can travel southwards.

The benefits of connected grids have been seen in Scandinavia, where there are high-capacity connections between Denmark, Norway and Sweden. Denmark, which generates about a quarter of its electricity from wind power, can easily import hydro power from Norway when the wind is low. When Denmark generates excess electricity, it sells the power to its Scandinavian neighbours.

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Much of the discussion about gas infrastructure has focussed on how to import more gas into the EU, whether from Russia via Nord Stream, from the Caucasus via South Stream or Nabucco, or from North Africa by increasing trans-Mediterranean pipeline capacity. But, as mentioned above, the Commission recognises that there is also a need for new gas infrastructure within the EU, to promote cross-border competition and a single energy market.

Europe should also expand and upgrade district heating networks. District heating is an ideal way to capture and use the heat from the combustion of fossil fuels, which otherwise is simply wasted up chimneys and cooling towers. The Commission proposed, sensibly, to make combined heat and power technology mandatory on most new power stations in its draft energy efficiency directive, but unfortunately this proposal was rejected by the Council of Ministers.

Europe currently has no significant pipelines to transport carbon dioxide. The United States has the longest and largest carbon dioxide pipeline, the 800-kilometre Cortez pipeline which takes the gas from Colorado across New Mexico to Texas, where it is injected into oil fields in order to increase oil extraction. Pipelines for transporting

carbon dioxide will have to be constructed soon if the EU is to make progress with carbon capture and storage and win a significant share of the global market for this technology. European financial support for carbon capture and storage must not be squeezed out during the haggling about the next EU budget.

Where new energy infrastructure is needed

The electricity grid in all member-states needs to be modernised to make it more efficient. A well-functioning European energy market requires north-south electricity connections. In addition, most countries will require grid extension if they are to maximise the contribution of renewable electricity. The need for new electricity infrastructure is therefore widespread. Yet some priorities can be identified.

Increased grid capacity is needed across the Pyrenees. There are few existing connections between the Spanish and French grids. Spain installed extensive solar and wind power before its current recession. On some days Spain therefore generates more electricity than can be used in Spain and Portugal. Spain has little electricity storage capacity, so this electricity is simply wasted. A new trans-Pyrenees interconnector was commissioned in the 1970s, but is still not fully constructed and will not be completed until 2014 at the earliest.

The Baltic states require a major expansion and upgrading of their electricity interconnections with the rest of Europe. An interconnector between Estonia and Finland, constructed with EU financial support, is now operating. An interconnection between Lithuania and Poland is due to open by 2015, and another between Lithuania and Sweden has been proposed. Both are necessary.

A grid across the Mediterranean is needed if Europe is to take advantage of the immense solar energy potential of north Africa. A Mediterranean grid would also enable Greece to use its islands to generate solar and wind power, thus helping Greece's economic recovery. And a Mediterranean grid would connect Cyprus and Malta to the European electricity network.

A grid across the North Sea is needed to harness wind power. A North Sea grid would also make it easier for EU member-states to use Norway's extensive capacity to store electricity in hydro-electric plants. The German government announced on June 22nd that a new cable between Germany and Norway will be constructed, due for completion in 2018, in order to connect Germany's intermittent wind and solar capacity to Norwegian storage capacity. Sweden also has extensive pump storage capacity, and interconnections between Norway and Sweden are good, so the new cable will enable German power companies to use Swedish storage capacity

too. Germany itself has considerable pump storage capacity. This has not increased significantly since 1980, though several new schemes are now being proposed.⁴ Switzerland also has extensive hydro-electric storage capacity. Switzerland is already well connected to the European electricity grid, but the infrastructure could be modernised and made more efficient.

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There is also a need for new electricity infrastructure within member-states. For example, Germany requires extensive grid expansion if it is to meet its target to generate 35 per cent of its electricity from renewables by 2020. Even before the shut down of nuclear power stations in the aftermath of the Fukushima incident, some parts of the German electricity grid were transmitting a quarter more electricity than they were designed to do. Some electricity is transported from the north of the country to the south using the electricity grids of neighbouring countries. German grid operators say that in order to meet the renewables target, 4,400 kilometres of existing transmission lines will need to be upgraded, and 3,800 kilometres of new lines constructed. It is far from certain that this will be achieved, because of public opposition to new electricity pylons.

New north-south gas interconnections are needed in central and eastern Europe and western Europe. The Baltic states are in particular need of new gas interconnections. And an east-west gas interconnector is needed across southern Europe.

District heating networks need to be extended and upgraded in all member-states. Central and eastern Europe and the Nordic countries have many district heating systems. In central and eastern Europe these were extensively installed during the Communist era, and need widespread refurbishment to reduce the loss of heat. The least efficient lose around half the heat. Nordic district heating systems were in most cases installed more recently, but would nevertheless benefit

⁴: Bjarne Steffen, 'Prospect for pumped-hydro storage in Germany' Universität Duisberg Essen, December 2011.

from upgrading. In other member-states, there is scope for a major expansion of district heating networks.

Europe currently has no carbon dioxide pipelines, so these need to be constructed in all member-states.

Reasons for public opposition

New infrastructure is not being constructed because of the time it can take to get planning permission. The main reasons given for opposition to electricity grids are visual: most people do not find pylons objects of beauty. There are also some objections based on the potential impact on wildlife, particularly birds. It is possible to put the cables underground in areas where there is soil – though not where the grid needs to cross bare rock – but burying cables makes construction at least five times more expensive.⁵

There is also opposition based on the potential health impact of living near electricity grids. This has been extensively debated since the 1980s, and considerable scientific research conducted, particularly on childhood leukaemia. Most studies conclude that the risk is very low.⁶

Opposition to gas pipelines has been less widespread in Europe than has opposition to electricity grids, as pipelines are underground so not visible. Some proposals have been opposed on safety grounds. For example, in the Irish village of Rosspport there is an active campaign against Shell's proposal to transport gas at high pressure near the village. This campaign group has

also focused on issues such as the visual impact and the noise of building the pipe. The campaign has succeeded in making Shell alter the proposed route of the pipeline.

There was some environmental opposition to the construction of the Nord Stream pipeline from Russia to Germany. The Baltic Sea is a particularly sensitive area in environmental terms, partly because there is less circulation of water than in other seas such as the neighbouring North Sea. Swedish and Finnish environmental groups and political parties, and the Swedish government, insisted on rigorous environmental impact assessments and consideration of different routes.

There has been some opposition to proposed carbon dioxide pipelines, particularly in Germany, based on the landscape impact during construction – and a broader energy policy argument that carbon capture and storage will divert investment and attention away from renewables. However, most of the opposition to carbon capture and storage has been from residents living above or near locations where the carbon dioxide would be 'stored', since the storage is intended to last for thousands of years so is in reality more like disposal. One of the states where a proposed storage site is located, Schleswig Holstein, refused to agree. Residents of the Dutch town of Barendrecht, near Rotterdam, were strongly opposed to Shell's proposal to store carbon dioxide in a depleted gas field beneath the town. The most commonly cited reason for opposition was fear of a fall in house prices.⁷ As a result of the opposition, Shell withdrew the proposal.

How to strengthen the Commission's proposals

The 'one stop shop' proposed by the Commission would be an improvement on the current situation in which developers often have to apply for planning permission to local, regional and national government. However, the Commission's proposal on permit issuance should be strengthened. When the three year deadline is missed, the Commission proposes only that the competent member-state authority would have to inform the regional group set up to advise the Commission on projects of common interest (comprising representatives of national governments, national regulatory authorities, energy network operators and project promoters, plus the Commission and the Agency for the Co-operation of Energy Regulators) of "the measures taken or to be taken to conclude the permit granting process with the least possible delay". If the regional group is not satisfied, all it can do is ask the competent authority "to report regularly on progress".

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A stronger approach would involve the Commission itself being able to award planning consent for projects of common interest if the member-state does not meet the three year deadline. But this approach is very unlikely to be agreed by member-states, for subsidiarity reasons. The three-year limit should therefore be strengthened by a clear link to financial support. Energy infrastructure projects will be eligible for both project bonds and structural fund grants. The Commission, Council of Ministers and Parliament should all agree that if a planning decision is not made by member-states within three years, all European financial support will be

5: Stephen Harris, 'Report says that underground cables are still expensive', *The Engineer*, January 31st 2012.

6: For example, Belgian BioElectroMagnetic Group, 'Health in brief', April 2012.

7: Lorelei Limousin, 'CCS Communication, lessons learnt from Barendrecht', Bellona, 2010.

withdrawn. This would not guarantee the construction of new energy infrastructure, but it would at least encourage politicians not to delay unnecessarily.

The list of priority corridors and areas should be reduced from twelve to five, to ensure that they are treated with the necessary priority and urgency. The five priorities should be:

- The trans-Pyrenees electricity grid. This would help Spain and Portugal economically as well as strengthen the EU energy market. The trans-Pyrenees grid is due for completion by 2014, but delays have been common in this infrastructure project and more are possible.
- A Mediterranean electricity grid. This would enable Europe to harness the immense solar power potential of north Africa. It would also help Greece, Italy and Spain economically.
- A North and Baltic Sea grid. This would harness extensive offshore wind power and enable the EU to utilise Norway's electricity storage capacity. It would also strengthen the Baltic states' connection to the EU energy market.
- The development of the electricity transmission system in central and eastern Europe. This would make possible a truly European electricity market, improve system security and facilitate the integration of renewables.
- The modernisation of district heating systems in central and eastern Europe. This would make a major contribution to the EU's climate change objectives, strengthen economies and improve the health and wellbeing of residents.

Private sector investment

Most of the €200 billion required over the next decade for energy infrastructure investment will have to come from the private sector. Member-states' different energy pricing rules hamper investment. Investors should be permitted by regulators to earn sufficient rates of return for infrastructure investments. Electricity and gas grids are regulated assets,

so the amount which operators are allowed to earn is set by national public bodies. Regulators set the permitted income based on capital and operating expenditure plus asset depreciation, minus any public subsidies. There is, however, considerable inconsistency between regulators about how this approach is implemented. Some regulators allow expenditure on grid extension or upgrading to be counted during construction, while others count such expenditure only when the work is completed. The second approach leaves the cost of capital during construction out. The interest that developers are paying their creditors during that time is not included in the pricing formula, and so discourages investment.

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The EU lacks a Europe-wide energy regulator. The Agency for the Co-operation of Energy Regulators is – as the name indicates – only a forum for the co-operation of national bodies. It has been given a remit to work on tariffs and regulatory reform to encourage investment, but has no powers to enforce changes. It can only issue guidelines to national regulators.

The agency should be given powers to set the permitted income level for companies which construct and then operate priority energy infrastructure projects. It should then set income levels which provide a sufficient rate of return to attract investment. The agency's approach should take account of the cost of capital during construction.

The Commission should propose this new power for the agency. To the inevitable objections from member-states on subsidiarity grounds, the Commission should respond that priority projects are cross-border and so can legitimately be dealt with by European institutions. All energy infrastructure projects which are not cross-border could continue to be regulated by national regulators. (District heating systems should be a priority, but are not usually cross-border so could be left with national regulators rather than being given to the agency.)

Prospects for progress

Most governments have remained quiet about the Commission's infrastructure proposals. But the Connecting Europe proposals, part of the Commission's Multiannual Financial Framework suggestions, have predictably attracted criticism.

The Commission accepts that most of the €200 billion required over the next decade for energy infrastructure

investment will have to come from the private sector. But the Commission argues, correctly, that public sector loans and grants are essential to leverage sufficient private funds. The financial support which the Commission has proposed is the minimum necessary to get significant energy infrastructure built, and must not be reduced. National governments wishing to reduce their contribution to EU spending should focus on the

common agricultural policy and the allocation of grants to poorer regions of rich member-states, not on the €9.1 billion proposed for energy under the Connecting Europe facility. If they wish to reduce the total of €50 billion proposed for Connecting Europe, they should target the €21.7 billion proposed for transport; in the past much European transport funding has been wasted on unnecessary roads, and this is likely to continue.

The UK government has criticised the Commission's infrastructure proposals and suggested timetables as too prescriptive. The German government recognises the need for major infrastructure investment, both within Germany and EU-wide. But it has yet to take a clear line on the Commission's proposals. Berlin did support the pilot programme for energy project bonds. Since Germany is a federal state, it will almost certainly oppose the 'one stop shop' proposal. Yet German energy companies are speaking out strongly about the need to speed up infrastructure development. For example, RWE has criticised Berlin for tardiness on decisions about offshore grid connections to its proposed wind farm off the north coast of Germany. RWE has also spoken in favour of a more European approach to grids. Other major European energy companies, including Iberdrola and Vattenfall, also support more European action on grids. Energy companies have considerable influence over politicians – as they demonstrated in a largely

negative manner during the negotiations of the energy efficiency directive – so their support for European infrastructure action significantly improves the prospect for agreement on this.

Environmental groups such as World Wildlife Fund, Friends of the Earth and Greenpeace are also largely supportive of the Commission's proposals. They recognise the importance of new grids to renewable energy expansion. However, the main opposition to infrastructure proposals does not come from national or Europe-wide environmental groups. It comes from local groups. Leading green groups like Friends of the Earth are internally democratic, bottom up organisations, so the fact that the national group takes a particular line will not prevent local activists taking a contrary line.

There is nothing that national governments or European institutions can do to prevent local opposition to particular developments. Nor should they seek to do so. The right to protest is an important facet of a free society. What they should do is place a time limit on how long such protests hold up decisions. The Commission's proposals seek to do this. Environmental groups are anyway not powerful enough in this debate to block progress on the infrastructure package. Greater blockages will come from opposition from local and regional governments.

Conclusion

The European Commission's infrastructure proposals are very important to strengthen the European economy, increase energy security and reduce greenhouse gas emissions. The Council of Ministers and Parliament should adopt the proposals as soon as possible.

With the eurozone crisis showing no imminent sign of ending, European leaders are talking less about issues like climate change. A few of them genuinely see climate change as a frivolous issue, while others lack the will to tackle it now, and hope future governments will deal with the problem. This is foolish. In any case, even those oblivious to climate change need to understand that energy policy is central to economic growth. The construction of new infrastructure will create many thousands of new jobs. More efficient and reliable infrastructure will strengthen European companies. Better infrastructure will also reduce energy losses during transport and distribution, so reducing the bill Europe has to pay each year for energy imports.

A European perspective on energy infrastructure – and energy policy generally – is essential. Energy Commissioner Gunther Oettinger has warned, correctly, that Europe's electricity networks are stuck in "the world

8: Barbara Lewis, 'Cold crisis shows need to end energy fiefdoms - Oettinger', Reuters, February 14th 2012.

“*With the eurozone crisis... European leaders are talking less about issues like climate change.*”

of 19th century principalities”⁸ The gas and district heating networks are at least 20th century, and should be more widely deployed. A carbon dioxide network would be 21st century, and should be created. The task of modernising and extending energy infrastructure offers European leaders an excellent opportunity to connect Europe and boost economic growth. But it requires political co-operation and co-ordinated spending, which has so far been notable for its absence.

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