Defining a post-2020 implementation framework for energy infrastructure

From Roadmaps To Reality: Briefing note for discussion
Theme 1 Infrastructure - 19 September 2012

This briefing note is drafted by Jonatan Gaventa (E3G) with support from the group of lead authors in the 'Roadmaps to Reality' process. The note serves as the basis for the discussion at the 1st Core Working Group seminar on 26 September 2012 on theme 1 (Infrastructure). The options identified in the note are non-exhaustive and put forward to be tested and further developed along with new insights and ideas with the Core Working Group at the seminar and in consultation with the expert panel throughout the 'From Roadmap to Reality' project.

Summary

'More and smarter infrastructure' has been identified as a 'no regrets option' in the European Commission's 2050 Energy Roadmap and many other quality reports on the same topic, as Europe moves from drafting 2050 Roadmaps for decarbonisation towards developing implementation frameworks for post-2020 energy policy.

Energy network infrastructure will play a critical role in opening up pathways for decarbonisation and creating energy system options, for example through transmitting electricity from sites of clean electricity generation to locations of consumption, integrating renewable energy, enabling demand-side participation in electricity markets, and transporting waste CO2 from power stations and industry to permanent geological storage. Building an effective approach to infrastructure development will need to be a key consideration for post-2020 European energy policy frameworks.

A review of the role of energy infrastructure networks in the recent 2050 Roadmaps, however, points to several major challenges facing European infrastructure policy:

- *Scale, speed, deliverability*: The pace of infrastructure development foreseen (particularly for electricity and CO2 networks) considerably outstrips recent build rates and puts pressure on delivery systems
- *Predictability and uncertainty*: While the overall importance of infrastructure is clear, there are large differences in infrastructure requirements between different pathways, and major risks and uncertainties facing investment in specific projects
- *Consistency*: Differences in approach between jurisdictions (e.g. EU vs member states, or between member states) and between infrastructure types (e.g. electricity vs gas) further clouds the picture of what infrastructure is needed and forms a potential barrier to delivery.

In light of these challenges, an approach that relies on waiting for certainty on generation and demand before investment in infrastructure can take place, would lead to the risk of insufficient infrastructure becoming the major brake on the transition to decarbonisation. In this context, the key functions for infrastructure policy post-2020 would be to:

- Proactively secure viable options for energy system decarbonisation, while continuing to ensure security of supply and competitive markets
- Deliver adequate and timely infrastructure investment at an acceptable cost.

In short, the key requirements of infrastructure policy frameworks are deciding what to build, and then successfully building what has been decided. There are multiple options and approaches that may help to deliver these requirements. These include:

Deciding what to build

- Targets for infrastructure and/or renewable generation
- A formal role for Roadmaps as an input into system planning
- A more regional approach to system planning and operation
- Proactive market creation for CO2 networks, electricity highways, offshore grids and smart grids).

Rethinking delivery

- Activating the demand side to limit infrastructure investment need
- Shifting mandates and frameworks for regulators
- Enabling independent investment
- Using public finance to bring forward strategically important projects.

The options identified in the note are non-exhaustive and put forward to be tested and further developed along with new insights and ideas with the Core Working Group at the seminar and in consultation with the expert panel throughout the 'From Roadmap to Reality' project.

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1. Introduction

Moving to a low carbon European economy will entail far-reaching changes to the European energy system over coming decades. Several decarbonisation 'Roadmaps' have recently been published to scope out pathways for the transition to a low carbon European energy system by 2050. While the exact route varies between scenarios, the central message from the Roadmaps is that the transition is feasible, and can be achieved securely and affordably if the right implementation frameworks are in place.

A common theme across the Roadmaps is the critical importance of energy infrastructure networks in securing options for decarbonisation, in controlling the cost of the transition and in enabling functional integrated European energy markets.

In response to the Roadmaps, the European Commission and European Council have both identified 'more and smarter' infrastructure as a 'no regrets option'[1]. However, implementation of energy infrastructure networks commensurate with the transition to decarbonisation remains a major challenge, and significant uncertainty remains on what infrastructure is needed, where it is to be sited and when it should be built.

Given these challenges, infrastructure development must be a key consideration for any post-2020 European energy policy. This briefing paper seeks to help structure thinking on how a possible 2030 framework for infrastructure may evolve. It proceeds in two parts:

- The first part reviews the lessons on infrastructure that can (and cannot) be drawn from the roadmaps, and the key challenges that can be identified;

- The second part develops a set of hypotheses for discussion about the core functions a 2030 framework for infrastructure must deliver, how these functions may be addressed, and the consequential implications for governance and policy.

The paper is designed as a starting point for discussion, and the core ideas will be further developed through the seminars and discussions on other aspects of the papers and during the rest of the 'From Roadmap to Reality' process.

2. Lessons from the roadmaps

Roadmaps are not predictions, but rather ways of exploring implications of different possible futures. For a given set of assumptions, they can illustrate implied costs and investment requirements, emissions and fuel consumption, expected security of supply performance, and infrastructure needs and constraints.

Collectively, the 2050 Roadmaps demonstrate that there are a number of viable options and pathways that could enable decarbonisation constraints to be met. The scenarios and sensitivities that have been developed show differences in terms of generation mix and timing of deployment, geographical variations including member state versus EU renewables deployment, centralised versus decentralised energy pathways and a range of assumptions on technology and fuel costs. A 'metastudy' has been performed to unpack these differences (SEFEP 2012).

[1] Presidency conclusions of the 15 June 2012 European Council meeting

The role of policy in 'implementing' the roadmaps is not to select a favoured pathway, but instead to manage risks facing a secure, affordable zero carbon power system through keeping multiple options open. All pathways face significant uncertainties: policies fail or have unintended consequences; prices and demand levels are subject to change; some technologies may develop more slowly than expected while others may achieve unforeseen breakthroughs. As a result, policy approaches must be resilient against changing circumstances.

Recent roadmaps relevant to this discussion include:

- DG ENER (2011) 'Energy Roadmap 2050'
- DG CLIMA (2011) 'Roadmap for Moving to a Competitive Low Carbon Economy in 2050'
- ECF (2010) 'Roadmap 2050: A Practical Guide to a Prosperous, Low Carbon Europe'
- ECF (2011) 'Power Perspectives 2030: On the Road to a Decarbonised Power Sector'
- Eurelectric (2009) 'Power Choices'
- Greenpeace (2012) 'Battle of the Grids: How Europe can go 100 % renewable and phase out dirty energy'
- European Gas Advocacy Forum (2011) 'Making the Green Journey Work'
- SUSPLAN (2012) 'Development of regional and Pan-European guidelines for more efficient integration of renewable energy into future infrastructures'
- Numerous national and non-governmental roadmaps and scenarios.

Infrastructure development is at the heart of this process of managing energy system options. Infrastructure decisions open up or close down potential future energy system pathways. For example, without 'smart grids' the potential for demand side participation remain be limited; without a CO2 pipeline network CCS will be restricted to sites with easy access to storage; and large scale solar resources in North Africa can only be an energy option for Europe if the transmission infrastructure can be developed to import it. Generally speaking, however, power sector network infrastructure is long-lasting, capital-intensive, and irreversible – and may be slower to develop than generation.

This section therefore sketches out the expectations from within the roadmaps for future infrastructure requirements within different scenarios and identifies the key challenges and risks associated with delivering infrastructure in line with these expectations.

2.1 Infrastructure in the Roadmaps: themes and expectations

2.1.1 Power transmission and distribution

A first common expectation across most of the Roadmaps is the need for a major upgrade of power transmission and distribution networks to underpin decarbonisation. While the capacities and locations of lines vary by scenario, overall up to a doubling of power transmission networks is foreseen by 2030 (ECF Power Perspectives 2030) alongside significant expansion in local distribution networks.

This expectation is driven by several factors. First, while *energy* consumption as a whole is expected to decline in most decarbonisation scenarios as a result of efficiency measures, demand for *electricity* is expected to increase as fuel switching in transport and heat offsets savings from efficiency. This effect ranges from a 21% increase in electricity consumption in the Greenpeace Energy Revolution scenario to a 61% increase in Eurelectric's 'Power Choices' (SEFEP 2012). Without active demand management, these effects from electrification are likely to compound existing daily and seasonal peaks (Poyry 2010) – considerably increasing requirements particularly for distribution networks as well as overall generation capacity.

Secondly, as well as increasing consumption, the Roadmaps point towards a likely increase in the distances between generation and load, requiring increases in transmission capacity. Most large scale clean generation technologies are geographically limited by resource constraints, and in general may be further from populations and sources of demand. For example, Europe's wind and solar resources are most heavily concentrated at the periphery of Europe, whereas the largest demand for energy is at Europe's centre. As offshore wind becomes developed further from shore it implies the need for new offshore transmission infrastructure – a challenge not just of distance but of difficult operating conditions and limited shore landing points[2]. Similarly, the potential for CCS generation is geographically limited by the need to link to appropriate geological storage (either directly or via a CO2 pipeline network); public acceptance concerns mean that the most probable sites for CO2 storage will be offshore. The prospect of bulk electricity transfer has led to the concept of 'Electricity Highways', particularly as a means of accessing large-scale renewable resources.[3]

This overall trend towards increasing distances may also however be accompanied by an increase in smaller scale or decentralised generation. The ENER Roadmap decarbonisation scenarios foresee an increase in decentralised power generation (connected to low and medium voltage grids) to increase from 6-7% in 2020 to 13-17% in 2030 and to 21-31% in 2050. This points towards a strong need for investment in distribution-level grids and smart grid solutions alongside long distance transmission.

The third driver for power network development from the roadmaps is the increasing need for flexibility resources for system balancing a result of the increase in variable generation (particularly wind and solar) and changing consumption patterns. All of the scenarios point towards a significant increase in RES, and renewables are among the largest contributors to decarbonisation within the models (SEFEP 2012). The ECF Power Perspectives 2030 report foresees wind and solar representing 28-38% of the power mix by 2030, while in the ENER Roadmap 2050 report the percentage of power from wind, solar and tidal ranges from 42.5% in the 'diversified supply technologies' scenario to 65% in high RES scenario – compared to 2.2% in 2005. Connecting and integrating renewables is seen as a central driver for grid expansion: ENTSO-E suggests that 80% of lines in the 2012 Ten Year Network Development Plan contribute to RES integration ('either for direct connection or serving RES energy movements across Europe') (ENTSO-E 2012). In parallel, changing uses for electricity (transport, heating, cooling) risk changing demand patterns but also potentially offer new sources of flexibility.

There are multiple options for managing the variability, all with very different implications for infrastructure. The IEA 'Harnessing Variable Renewables' report notes that stronger grids are not in themselves 'flexible resources' but nevertheless facilitate system balancing. The report identifies 4 basic options for flexibility:

- Dispatchable power plants
- Demand side management and response
- Energy storage facilities
- Interconnection with adjacent markets

Operationalising these resources will depend both on the infrastructure 'hardware' and on the 'software' of power market design that can incentivise and efficiency deploy these resources[4].

Modelling for the ECF R2050 and PP2030 reports explores the system balancing challenge in detail, and finds that large-scale interconnection is among the cheapest ways of managing variability, as it enable the aggregation of supply and demand curves, the pooling of reserve capacity, and the linking together of different resource types (e.g. offsetting southern solar against northern wind). The ECF studies also pointed out that Demand Side Management and load shifting can reduce overall costs and bring down the need for transmission and backup generation by 20 to 30%. Enabling this however requires smart grid development to support more sophisticated power management.

Storage features less heavily within the ECF Roadmap 2050 scenarios due to relative cost, but in the DG ENER Roadmap storage – including pumped storage, concentrated solar power (CSP) and converting excess electricity to hydrogen – plays a significant role in managing variability in the High RES scenario, reaching 6.5% of gross final energy demand.

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[2] See for example Offshoregrids.eu

[3] Electricity highways have been identified as a priority corridor in the Energy Infrastructure Package, and ENTSO-E are currently leading a 3-year study on 'e-Highways' development.

[4] The issue of power market design for managing variability will be a key theme within the third seminar of the 'From Roadmap to Reality' series.

A final driver for increasing investment in power transmission – related to the three factors listed above – is an expectation for several of the Roadmaps is for increasing cross-border trade, enabled by increasingly integrated European power markets. Currently cross-border trade in electricity represents a relatively small proportion of overall energy usage in most European countries. However, overall volumes of electricity trading are expected to increase, particularly in decarbonisation scenarios. In the DG ENER Roadmap, in 2030, volumes of cross-border trade are two to three times higher than in the reference scenario – rising to 3-5 times higher in 2050.

These general trends evident in the Roadmaps, however, are accompanied by a number of major caveats. While an increase in transmission and distribution investment is foreseen in all scenarios, both the quantity and location of infrastructure needed varies between scenarios which makes generalisations difficult and increases the risk to specific investments. The ECF Roadmap 2050 80% RES scenario, for example, entails additional transmission investments three times higher than the scenario dominated by CCS and nuclear generation.

Even among high renewables scenarios, infrastructure requirements vary according to the type of renewable generation utilised and whether a centralised or decentralised approach is taken. The Greenpeace 'Battle of the Grids' report sets out 'low grid' (decentralised renewables) and 'high grid' (centralised renewables) scenarios – with an order of magnitude difference in cost of grid investment (Greenpeace 2012). Similarly, infrastructure requirements will vary sharply according to whether deployment of renewables is optimised at a European or at a member-state level. The ECF PP2030 report suggested that a European approach to RES deployment post-2020 lead to overall cost savings, but a country-by-country approach would require less transmission.

All of the scenarios are also contingent on a set of wider uncertainties relating to technology development, policy implementation and economic variables. For example while the overall effect of energy efficiency and electrification are expected offset each other at an aggregate level, there remains major uncertainty on the success of energy efficiency policies and on the timing and extent of electric vehicle and heat pump uptake – leading to considerably wider ranges in potential demand profiles and therefore infrastructure requirements over time than is apparent from the central scenarios

2.1.2 Fuel transport and storage

In contrast to the expectation for power, overall fossil fuel consumption is expected to decline over time as the European energy system moves away from carbon-based fuels. However the timing and extent of this shift – and therefore the implications for infrastructure needs - remain highly uncertain. This applies across fuel types, but there are particular questions over the future role and volumes of gas. In addition, new fuel types entering the generation mix such as biomass and biogas each have their own supply chain and infrastructure requirement.

It is commonly suggested that security of supply and security of demand are 'two sides of the same coin' (de Jong et al 2012). However the Roadmaps point to significant uncertainty for future European gas demand, which complicates the picture for both future infrastructure need and upstream investment. Expectations in the roadmaps for increasing renewable generation and electrification of heat reduce gas demand; coal to gas switching increases it. The DG ENER roadmap points to between -9% and -21% reduction in gas consumption in 2030, depending on the decarbonisation scenario. ECF PP2030, meanwhile suggests a range of between 406 and 523 bcm (again dependent on scenario). Decarbonisation scenarios modelled for the European Gas Advocacy Forum found an even larger range of between 307 and 580 bcm gas demand in 2030, dependent on gas price, abatement measures and limits to nuclear deployment (EGAF 2011). Scenarios that do not meet the decarbonisation constraint point to even higher but still uncertain levels of demand for 2030 - 470-680bcm (IEP Berlin 2011).

The future need for gas import infrastructure is further compounded by uncertainty on European domestic production. The overall expectation is for an overall minor increase in imports due to declining domestic supplies. For example in 'diversified supply technologies' scenario in the DG ENER Roadmap, gas imports are at or above 2010 levels out to 2045, despite falling gas usage. However the potential for unconventional gas reduces the certainty of this picture and increases the risk of underutilisation of new gas import infrastructure. Proponents have suggested shale (and other unconventional) gas is a 'game changer' for energy security with technical potential to provide 60 years of consumption (Kuhn & Umbach 2011). The IEA has a much more limited view of this potential, and suggests that exploitation of unconventional gas will lead to only minor changes in Europe's gas import needs out to 2030 (IEA 2012).

Overall gas consumption is, however, only a partial indicator of infrastructure need. Significantly, the Roadmaps foresee a significant shift in the way gas is used, particular in the power sector. While gross gas *consumption* may remain stable or decline out to 2030, overall gas generation *capacity* may increase – albeit operating at lower load factors. In ECF Power Perspectives 2030, baseload gas capacity increases from 233GW in 2020 to 244GW in 2030, and backup capacity increases from 164 GW to 206 GW over the same time period. This suggests a continuing need for maintaining gas infrastructure even as gas consumption and utilisation of specific gas infrastructure assets fall. However the PP2030 analysis identified that the planned infrastructure within the ENTSO-G Ten Year Network Development Plan should remain adequate out to 2030.

At the heart of this uncertainty seems to be competing visions for the role that gas will play within decarbonisation pathways. These has been characterised as 'gas as a transition fuel', where gas has a temporary and limited role (particularly as a backup for renewables); 'gas as a destination fuel', where an increasing share of gas from switching away from coal is followed by the adoption of gas CCS; and 'gas as a fuel of consequence', where the failure of efficiency and other policy measures leads to a default role for gas generation (De Jong et al 2012).

The implication is that the future utilisation levels of gas infrastructure rest of the commercialisation and competitiveness of CCS technologies, alongside the future relative costs of gas CCS to coal CCS (as well as other low carbon technologies). Perhaps unexpectedly, this means that higher RES pathways could lead to more predictability over future gas infrastructure requirements, as volumes of gas consumption are less exposed to fuel and CO2 price fluctuations.

Finally, it should be noted that there is currently considerable heterogeneity between member states in terms of gas consumption – ranging from zero consumption in Malta and Cyprus to 85 Mtoe in the UK (European Commission 2012) – and this diversity should be expected to continue. However it will not necessarily follow the same patterns as at present: countries with a high proportion of coal in their energy mix may seek inexpensive early emissions savings opportunities through coal-to-gas switching, while emissions reductions in countries that currently utilise substantial proportions of gas generation may ultimately depend on switching to alternative zero carbon sources of generation and deploying efficiency measures.

2.1.3 CO2 networks

A final infrastructure type foreseen in the Roadmaps is the development of CO2 pipeline networks to connect power plants fitted with carbon capture to permanent geological storage sties. CO2 pipeline networks are a new infrastructure type and but have been designated a 'priority corridor' in the European Energy Infrastructure Regulation..

The DG ENER roadmap notes that 'widespread penetration of CCS will require dedicated CO2 transport grids that need to be financed, constructed and accepted'. However estimates vary as to the required extent of these pipeline networks and quantities of carbon to be stored. Overall the ENER Roadmap points to potential range of CO2 storage from 3bn t CO2 to 12.80bn t CO2 by 2050, while other scenarios point to CCS representing between 0% and 30% of the power mix by 2050 (ECF Roadmap 2050).

Suitable geological formations for CO2 storage within Europe have been identified[5], and several studies have mapped out potential pipeline networks (JRC 2010, Arup 2010, CO2 Europipe). In the highest scenarios, by 2030 these networks could extend to over 12,000km of pipelines (Arup 2010 'high' scenario) – a challengingly rapid development of a network 'comparable to the existing oil and gas pipeline capacity' (GA 2012).

To reach these levels, initial pipeline investments would need to begin after 2015 in parallel to CCS demonstration projects, and pipelines would need to be 'oversized' to accommodate the future connection of additional CCS sources. However, beyond the initial CCS demonstration projects, the governance arrangements for who would design, finance, operate and regulate CO2 pipelines are not yet clear.

The prospects for the development of CO2 pipelines face significant risks as the capacity requirements depend not only successful demonstration of the technology but also on ongoing policy and economic conditions leading to uptake of CCS for power and industry and the clustering of these CO2 sources in locations suitable for pipeline connection. In addition both storage sites and pipelines face uncertainties regarding public support, planning and permitting (Herold et al 2010).

2.2 Challenges for infrastructure development

This brief review has highlighted that the infrastructure investments and choices implied by the Roadmaps are far from trivial, yet successfully managing these choices will be a core element of realising the decarbonisation pathways. However there are a number of major challenges facing infrastructure development in line with the roadmaps, including: the scale, speed and deliverability of infrastructure development; predictability and uncertainty; and consistency between approaches. Responding to these challenges will need to be a key element of infrastructure development to 2030 and beyond.

2.2.1 Scale, speed, deliverability

Particularly for power infrastructure, the first challenge that can be foreseen is the near-unprecedented scale and speed of infrastructure investment required and the consequential challenges for deliverability:

- The DG Clima Roadmap 2050 suggests that rates of overall grid investment would need to double by 2025, and triple by 2040. Electricity TSOs are currently planning to increase their rate of investment by 70% out to 2020 (Roland Berger 2010).
- Central scenarios in the ECF Roadmaps point towards a near doubling of all existing transmission capacity by 2030 and a trebling of capacity by 2050. While the overall cost of the upgrades remain minor relative to generation investment requirements, this would nevertheless require large amounts of capital investment, in the range of €114-184 bn by 2030 (ECF Power Perspectives 2030). The DG ENER decarbonisation scenarios point to between €273 and 420 bn of transmission investment out to 2050.
- Investments requirements for distribution grids are several times larger than transmission grids and could exceed €700 bn by 2030 and €1400 bn by 2050 (ENER Roadmap 2050).
- For CO2 networks, smart grids, electricity highways and integrated offshore grids, new infrastructure systems will need to be created over relatively short timeframes – an issue not only of physical construction but also of developing governance and system planning regimes and delivery frameworks.
- The projected future need for infrastructure development is set against a context in which existing infrastructure development programmes are already facing significant delay. ENTSO-E notes that a third of projects from its 2010 Ten Year Network Development Plan have been delayed, largely as a result of lengthy permitting procedures (ENTSO-E 2012)[6].

[5] However most have not been assessed in sufficient detail to be considered 'bankable' (Green Alliance 2012)
[6] ENTSO-E TYNDP 2012

Developing infrastructure at this speed and scale is likely to face considerable implementation difficulties:

- Financing: For regulated investments, system developers will need both to raise additional funds from capital markets and to persuade regulators to approve major increases in capital expenditure at a time when rising energy bills have become a politically-charged issue in many European countries. The complexity arising from trans-boundary, innovative or long term projects may present particular difficulties for financing (Roland Berger 2011a/b; DG ENER roadmap IA).
- Supply chains: Where there is insufficient forward visibility of future infrastructure requirements or illiquid markets, supply chain constraints can lead to cost increases or delays to network development. Concerns have been raised for example on HVDC cable availability and cost (ENTSO-E 2011; UKERC 2010).
- Planning and permitting: Planning and permitting delays have been cited as a major constraint on the speed of infrastructure development as processes can sometimes last a decade or more (see Roland Berger 2011b)[7].
- Environmental impact and public support: Successful development of infrastructure will require an active approach to mitigate environmental impacts (e.g. to habitats and landscapes) and involving the public at an early stage, in order to pre-empt problems and concerns (see the 'European Grid Declaration' – RGI 2011). Such processes take time to be conducted successfully, however may help to prevent future delays.

2.2.2 Predictability and uncertainty

A second key challenge is one of predictability and uncertainty on future pathways and infrastructure requirements. Collectively, the roadmaps demonstrate that a number of technical pathways for decarbonisation are viable. However, there are considerable variations between them and all face a range of significant risks and uncertainties affecting future infrastructure need and delivery rates. While the roadmaps indicate broad potential directions and themes, they are less able to provide certainty on the need for specific investments, in specific locations, at particular times.

The uncertainties facing infrastructure investment are partially driven by market risks including unpredictable future fuel, technology and commodity prices - which may lead to large differences in future energy demand and generation profiles and locations. Such factors (particularly commodity prices) are notoriously difficult to foresee in advance. The IEA's World Energy Outlook 2000 for example projected: "the international crude oil price is flat at $21/barrel … until 2010, but then rises steadily to $28 through 2020". Eight years later the oil price peaked at $147/barrel.

Market risks can also be positive as well as negative: unforeseen disruptive innovations in low carbon technologies or business models may occur, swiftly and radically changing expected energy pathways. Infrastructure systems will need to be open to positive disruption as well as resilient to downside risks.

This market risk is further compounded by extensive political risk. There remains considerable uncertainty on national and European-level future energy policy objectives, targets and remuneration regimes, including the degree to which governments will choose specific generation technologies to support or exclude. In addition there is a lack of clarity on future power market designs – as a number of countries are currently undergoing electricity market reform processes – and the degree to which the envisaged integration of European energy markets will occur in practice. Finally, long-tail 'black swan' events are by their nature unforeseeable but invariably occur (Taleb 2007; de Haan 2011). Yet the outcomes of these decisions and events can fundamentally change the future needs and configurations of energy infrastructure networks.

While a degree of uncertainty may be inevitable, it nevertheless causes significant difficulties for future network development. Infrastructure tends to be capital intensive (compared to lower

[7] In response to this issue, the Energy Infrastructure Regulation proposes mandatory time limits.

ongoing operational costs) and is long lasting – once built, transmission lines may remain in place for up to 40 years, and the spatial corridors created may last even longer. This means that major infrastructure investments are 'essentially irreversible' (Blythe 2010), and will continue to operate in future conditions very different to those for which they were initially optimised.

In addition, long distance infrastructure including electricity transmission and gas and CO2 pipelines often take significantly longer to develop than generation investments (particularly those with short planning and construction times such as gas, onshore wind and solar) (ITRE 2011). Given the rapidity of the changes to the generation mix foreseen, it will be increasingly difficult for a 'grid follows generation' approach to be maintained. In these circumstances, more proactive or anticipatory approaches to network investment may be required (Rious et al 2010). Yet this begs the question of which future network designs should be optimised for – a question for which there are few easy answers.

2.2.3 Consistency

The third key challenge flagged up by the Roadmaps is one of consistency, given the complexity of governance arrangements for European energy markets and policy. There are several dimensions to this issue:

- Consistency between levels and jurisdictions: European-level Roadmaps tend to provide an overall European-level snapshot and often presume a functional integrated European energy market. Energy infrastructure is a shared competency under the Lisbon Treaty and has become for European energy policy in recent years[8]. However there is currently considerable heterogeneity between policy approaches and market conditions in different European member states, and these differences are likely to continue to persist as Europe decarbonises. Different national and sub-regional decarbonisation roadmaps take contrasting strategies to – among other issues -projected energy demand and energy efficiency deployment, paces of power decarbonisation and approaches to energy imports. For example, while the overall decarbonisation objectives are similar for Germany and the UK, national roadmaps for Germany point to a reduction in electricity consumption of between -9% and -33% by 2050 (BMU 2011), while similar scenarios for the UK point to a doubling of electricity generation by 2050 (HM Government 2010).

  These differences in approach cause several complexities for infrastructure planning and development. First, differences between member state-focused and European approaches can lead to materially different overall infrastructure requirements (c.f. ENTSO-E 'Vision 2030'). Second, governments and regulators are only likely to support cross border infrastructure development where it enables clearly-perceived benefit at national level, yet cross-border infrastructure likely to have differential socioeconomic impacts on different sides of the interconnector (e.g. see Egerer et al 2012). Cost allocation mechanisms (e.g. as proposed in the Energy Infrastructure Package) can facilitate agreement where there is shared benefits, but are only ever likely to be approximate values and so may not fully resolve the challenge.

  Third, cross-border infrastructure will only be fully utilised if it is trusted as reliable. If states anticipate 'hoarding' of resources by other countries at times of system stress they are likely to view imports as insecure potentially leading to less utilisation of interconnectors and lower levels of market integration.

  Collectively this points to the importance of a clear shared understanding and direction of energy policy on a regional or European basis. However, a recent review of national roadmaps and long-term decarbonisation policies in North West Europe found 'not the faintest glimmer of a shared vision on a European infrastructure' (Notemboom et al 2012).

[8] See Annex B briefing note from Client Earth for a full discussion of the implications of this.

- Consistency between options and approaches: A second aspect of the consistency issue is that there is complex interplay between different infrastructure types (e.g. between pipes and wires, transmission and distribution), and between infrastructure and alternative policy options. Disruptions in gas networks, for example, will affect electricity flows across Europe (Abrell & Weigt 2010) – suggesting that alignment between the infrastructure types will be needed. Similarly, policy decisions on issues such as power market design and energy efficiency will materially affect the need for infrastructure investments, yet are often made in isolation from infrastructure planning – risking inconsistency or inefficiency if the areas are not aligned.

- Time consistency: A third aspect of the issue is consistency over time, in the transition to decarbonisation. European energy systems must be functional not only in 2050 but at every moment until then, with continuous balancing of power demand and generation. This provides particularly challenging for long-lived assets as it requires a focus on dynamic efficiency as well as optimising systems for a particular point in time. Particular problems may arise where options (e.g. gas generation) are seen as 'transitional' – as in some cases long-lasting infrastructure investments would be needed in order to secure a more temporary option.

3. Towards a post-2020 framework

In the first half of this paper, a brief assessment of the implications of the Roadmaps for energy infrastructure identified two key underlying lessons:

- First, a number of different technological pathways towards decarbonisation are currently possible. To remain viable, each option critically depends on substantial infrastructure investment - yet the precise requirements vary enormously between scenarios.

- Second, there are a number of difficult challenges to implementing infrastructure networks commensurate with the roadmaps. These include the speed of the expected transition, the scale of infrastructure development required, the continued uncertainties on energy pathways, the complexity of the governance context and the length of time infrastructure takes to develop.

This points towards an emerging choice for future European energy infrastructure policy. A continued reactive approach, in which infrastructure investment decisions are only made after generation volumes and locations are fully known, risks becoming a key limiting factor on the pace of decarbonisation and the system options that remain available. By contrast, a proactive approach involving more anticipatory investment would require difficult decisions on what to build, (and - by implication - choices on which options should remain on the table) and introduces greater risk of underutilised assets. Ultimately, this more proactive approach may be more effective in managing the risks and costs of decarbonisation.

The second half of this paper explores the implications of this choice and develops hypotheses for discussion on the key requirements and options that could be included within a post-2020 policy framework on energy infrastructure.

The underlying hypothesis is that a more strategic approach to infrastructure planning and development will be needed to secure options for decarbonisation. The pace of change foreseen in the power sector out to 2050 means that some degree of anticipatory investment in infrastructure will be needed in order to keep multiple options open and prevent inadequate infrastructure becoming the main brake on the pace of transition. However it would be neither feasible nor affordable to keep all options open forever (or to build a 'copperplate' grid). Therefore, clarity is required on which options should be kept open and which should be foreclosed. In essence, this means moving towards longer term network planning informed by strategic choices for the energy system as a whole.

Developing such a framework, however, raises difficult issues on system planning, governance and operation. It would also require a continued focus on deliverability and affordability of infrastructure investments.

3.1 Functions and objectives

Within the context outlined so far, the key functions required from a 2030 infrastructure policy framework are:

- To proactively secure viable options for energy system decarbonisation, while continuing to ensure security of supply and functioning and competitive markets; and

- To deliver adequate and timely infrastructure investment at an acceptable cost.

In short, the key requirements of infrastructure policy frameworks are deciding what to build, and successfully building what has been decided.

3.2 Options - Deciding what to build

Several potential policy and regulatory options exist in line with a more proactive approach to infrastructure development:

3.2.1 What role for targets?

A first policy option available for providing strategic direction at the European level is the adoption of targets. As described in a THINK Network report, targets can "create added value by setting an objective for the EU as a whole, and by sharing the effort among member states, for instance, to ensure that every member state contributes to a European common interest" (Hafner et al 2011).

At their most effective, target-setting approaches work through identifying clearly-defined collective outcomes to be achieved and through facilitating alignment and effort-sharing between national approaches. For infrastructure, targets can create forward visibility for network planners on potential outcomes, and the associated effort-sharing provisions can increase transparency on expectations for market developments between countries – helping to manage the consistency challenge.

The history of setting targets for energy at European level has seen mixed success. There are currently targets in place for both energy infrastructure and generation. For electricity infrastructure, the 2002 EU Council meeting in Barcelona agreed a (non-binding) target for all Member States to have a level of electricity interconnections equivalent to at least 10% of their installed production capacity by 2005. As of 2010, 9 member states had yet to meet this threshold (European Commission 2011), and the target does not seem to have been a material factor in influencing decisions for transmission expansion. The target has also been criticised because "import capacity" is difficult to define and measure. In addition, broad targets have also been agreed on smart meters – an objective of 80% roll-out of smart meters by 2020, subject to a positive cost-benefit assessment.

By contrast, the targets agreed on carbon reduction and renewable energy under the '20/20/20 package' do appear to have a material impact on European energy pathways. The European Commission notes that "the RES Directive has created the world's most ambitious policy framework for renewable energy deployment up to 2020", and growth rates are expected to move from 1.9% p/a from 1995-2000 and 4.5% p/a from 2001-2010 to 6.8% p/a from 2011 to 2020 (European Commission 2012b).

Such targets help to facilitate coordination between generation and infrastructure. ENTSO-E's Ten Year Network Development Plan, for example, uses the targets and the associated National Renewable Energy Action Plans (NREAPS) to develop generation scenarios as a basis for assessing need for cross-border transmission. However, current targets only last until 2020 – a short-term time horizon for infrastructure investments that can last 40 years or more.

As a result, post-2020 targets for GHG reduction and renewables are currently under active discussion in Europe. This issue goes well beyond that of infrastructure planning – but the role of targets in infrastructure planning for decarbonisation should nonetheless be a material consideration.

<u>Options for discussion</u>:

- Interconnection targets
- 'Smartness' targets
- Renewable generation or other technology targets

3.2.2 Institutionalising the roadmaps

Even if explicit targets for infrastructure or for generation are not adopted, a parallel option would be to formalise the link between European Roadmaps and infrastructure planning tools including Ten Year Network Development Plans and the cost-benefit assessment methodologies in the 2012 Energy

Infrastructure Regulation. This would necessitate periodic updates to the Energy Roadmap – for example once per Commission term - according to agreed criteria.

The Roadmaps would then form planning inputs to inform the scenarios for system development plan, in order to give clarity on the objectives that network designs are expected to meet and the range of future energy outcomes foreseen at European level.

Currently, network operators have a central role in system planning. They are uniquely placed to understand market conditions and to assess the infrastructure requirements associated with current or expected energy flows. They cannot, however, be expected to predict the future or second-guess future policy decisions - among the major sources of uncertainty facing future network development. Best practice in risk management calls for those best able to influence outcomes to bear responsibility for controlling risks. Governments are better placed to manage political risks than private sector actors, as they directly set policy direction. They would also have greater legitimacy to set long term direction for decarbonisation through identifying the range of options to be kept open. In addition to the decarbonisation scenarios, it is expected that network designers would continue to run other sensitivities (including policy failure) for security of supply planning.

A shared set of scenarios could boost the alignment between different infrastructure types. While gas and electricity infrastructures interact with each other in complex ways, there appears to be little in the way of explicit coordination between ENTSO-E and ENTSO-G network development plans.

European-level roadmaps are, however, often insufficiently granular to capture national-level outcomes, and there is a risk of continued inconsistency between the European and national level without further explicit coordination.

This suggests that European-level roadmaps should be supplemented by the publication of national-level decarbonisation roadmaps or strategies to give clarity and transparency on potential national trajectories. The National Renewable Energy Action Plans (NREAPs) required under the RES Directive have proven to be useful inputs into the development of scenarios for system planning. A requirement for continued updates of NREAPs past their current expiry date of 2020 could provide useful steers for longer term infrastructure development.

This would not fully resolve the potential mismatch between European and national-level expectations; it would at least however expose any conflicting assumptions between member state and European roadmaps.

Options for discussion:
- A formal role for regularly-updated European Roadmaps as input into Network Development Plans
- Post-2020 National Renewable Energy Action Plans

3.2.3 Regional planning and operation?

One potential approach to managing the consistency challenge between member states (and between European and national level) is through moving towards more regional approaches to system development and operation.

A significant degree of regionalisation has already been occurring on an incremental basis for both electricity and gas transmission. Examples include:

- ERGEG Regional Initiatives, aimed at promoting regulatory and market convergence
- ENTSO-E regional working groups, which produce Regional Investment Plans as part of the Ten Year Network Development Plan process
- The North Seas Countries Offshore Grid Initiative, which brings together governments, regulators and TSOs to address offshore grid development issues

- Regional coordination initiatives such as CORESO, which monitors electricity flows and electricity on a regional basis on behalf of a group of TSOs, and the Central Allocation Office for electricity which runs auctions for allocating cross border transmission capacity in Central and Eastern Europe[9].

In addition, the currently-proposed Energy Infrastructure Regulation sets up a system of Priority Corridors for strategic infrastructure, overseen by Regional Groups led by member state governments.

As currently framed, the impact of the Regional Groups approach is likely to remain fairly limited. Twelve Priority Corridors have been identified; however, their definitions are somewhat vague. Collectively, they collectively cover the whole of Europe, so it is unclear what projects would be excluded. The role of the Regional Groups is limited to ranking project proposals for 'Projects of Common Interest'.

A more proactive role for Regional Groups, however, could facilitate development of cross-border infrastructure and enable identification of projects or corridors that are strategically important for decarbonisation. Regional Groups could be empowered to set objectives for corridors and could potentially be option to commission priority lines if suitable proposals do not otherwise come forward. If priority corridors are made more specific in geographical location and scope, it would become possible to accelerate infrastructure development by incorporating them into national spatial planning policies. Priority corridors could also be subject to strategic environmental assessment and early consultation before specific projects are proposed. This would allow any concerns to be addressed before detailed proposals have been developed.

A regional approach could also be applied to system operation through a move towards a (Regional Transmission Organisation) approach. In the US, independent RTOs are organised across state boundaries, and are tasked with organising wholesale and realtime power markets as well as transmission capacity allocation and planning. In Europe, there are elements of such a system in Nordpool (which is an organised cross-border market but without a single System Operator) and in Scotland, where the System Operator is independent from the Transmission Owners, but no unified cross-border system operation has yet been developed[10]. Merging transmission operators across borders "could reap significant efficiencies of scale and scope" (Zachmann 2010). It could also help develop greater consistency between national approaches and work to remove any implicit incentive to move congestion to country borders.

Options for discussion:
- Proactive identification of strategic investments by regional groups
- RTO-style regional network planning and operation

3.2.4 Proactive market creation

For new infrastructure types (such as CCS infrastructure, electricity highways, offshore grids and smart grids), active intervention may be needed to support market creation and development. The risks and regulatory uncertainties facing first movers in each of these are significant, and a 'hands-off' approach would be likely to delay investment.

For carbon dioxide networks, there are likely to be significant benefits from 'oversizing' early pipelines associated with demonstration projects so that further emissions sources could connect to the network in future. However it is far from clear who will bear the risks associated with 'user commitment' – ie if future network users fail to turn up. If an extensive network is to be developed rather than a handful of individual pipelines, more detailed governance arrangements – covering how

[9] See http://www.coreso.eu/ and http://www.central-ao.com/

[10] There has been a degree of consolidation however following the acquisition of TSOs in Germany by Netherlands' TenneT and Belgium's Elia.

such networks should be planned, financed, operated and regulated – will need to be drawn up in consultation with the industry, well ahead of network need. In the absence of such a framework, regulatory uncertainty and policy risk on pipeline infrastructure could slow the development of CCS deployment.

Similar issues apply to other new infrastructure types. While electricity highways are – to some extent – larger-scale extensions of existing transmission networks, the regulatory and design challenges are complex, and will be key themes in the 3-year 'e-Highways 2050' study led by ENTSO-E.

For offshore grids, a lack of resolution to the user commitment problem and the regulatory complexity from crossing different regimes have been key impediments to developing integrated offshore hubs that combine offshore wind connection and interconnection. These issues are now being reviewed by the North Seas Countries Offshore Grid Initiative, but are more difficult to resolve as established offshore connection and transmission regimes are in place in different countries.

In each case, the challenge is not just building ahead of need, but developing governance structures that are open to future market changes.

Options for discussion:

- Development and formalisation of governance, financing and delivery structures for CO2 pipelines, including clarity on any third party access or unbundling provisions.
- Creation or nomination of a design authority for Electricity Highways and development of appropriate regulatory oversight.

3.3 Options – Rethinking delivery

As well as focusing on overall direction, policy frameworks for infrastructure must also concentrate on ensuring deliverability and affordability. Four broad options are set out here:

3.3.1 Activating the demand side

While the overall scale and pace of infrastructure investment foreseen in the Roadmaps is challenging, this delivery challenge can be managed through demand-side interventions to reduce the overall level of infrastructure hardware required. The potential of the demand side, however, can often be overlooked and is unlikely to be fully exploited unless specific incentives are provided.

There are several potential options for consideration. The first option is to enable network operators to make regulated investment into energy efficiency and other demand side measures as an equivalent alternative to building physical wires or pipelines. This approach has been adopted in several jurisdictions in the USA (particularly for distribution networks), with a significant degree of success (Neme and Sedano 2012). However bringing forward such measures requires both appropriate financing arrangements and often a shift in organisational culture.

An intensification of this approach would involve placing a mandate on regulators and/or TSOs to demonstrate that all cost effective demand-side alternatives had been fully examined before new infrastructure investment is agreed. However given the significant risks that underinvestment in infrastructure would present, such provisions could risk inhibiting the construction of new lines without achieving the demand-side objectives either.

A second potential option is to seek to increase the utilisation of existing networks through operational efficiencies. A number of different technological and operational options exist that could achieve this, from 'probabilistic' security standards and dynamic line ratings to 'flexible AC transmission devices (FACTS)' than can enable circuit flows to be controlled (Baker 2011). However in the absence of specific incentives to encourage network operators to adopt new approaches, a risk-averse approach focuses on investing in primary network assets is likely to be maintained.

A third option for lowering the infrastructure development challenge through reducing the need for new investment is to introduce market designs or tariffication structures to encourage generation to site closer to demand centres and to locations with spare network capacity. Potential measures range from locational surcharges on transmission charging to full nodal pricing for power (Neuhoff 2011).

Options for discussion:

- Efficiency as a T&D resource
- Incentive regulation to back efficiency outcomes
- Locational signals

3.3.2 Reorienting the regulators?

National regulators will play a critical role in facilitating the development of energy infrastructure for decarbonisation. Regulators oversee market operation and approve investment plans. As a result, it is essential that the objectives regulators are working to are in line with overall European decarbonisation, and that the assessments used facilitate the appropriate investment. The DG ENER Roadmap 2050 expresses concern that the "necessary expansion and innovation of grids for decarbonisation may be hampered if regulated transmission and distribution focuses on costs minimisation alone".

This risk raises important questions on the role and configuration of energy regulators as Europe decarbonises:

- Mandate: Regulators currently operate under national mandates set by governments, and these vary between country. While some give considerable focus to sustainable development, others focus more narrowly on cost and security of supply. Collaboration between European regulators is enabled by the Council of European Energy Regulators (CEER) and the Agency for the Cooperation of Energy Regulators (ACER). One potential option would be for member states to incorporate a common minimum set of objectives within national mandates on regulators, covering decarbonisation and a duty to consider cross-border consumer welfare.

- Valuation: The move towards allowing more anticipatory investment outlined in previous sections places strain on the evaluation of projects and investment portfolios, as it implies changes to what is considered as 'commercial' investment by regulators. Regulators will need to take into account not just the resilience of an investment to multiple possible future scenarios, but also the social value of the energy system options infrastructure investments can open up. In addition a multi-criteria approach including 'economic, social and environmental viability' (in the phrasing of the Energy Infrastructure Regulation) remains essential for ensuring deliverability and broad support during the implementation phase. Attention to the distributional impacts of cross-border infrastructure will also be needed to ensure it is supported at both ends of the interconnector.

- Regulatory model: Where network developers are expected to meet multiple objectives, a move to performance-based regulation (based on a clearly defined set of outputs or grid services) may be preferable to cost-plus or 'RPI-X' regulation. In the move to smarter transmission and distribution grids, such objectives could include the integration of renewable energy and facilitating user participation as well as a specific regime for promoting innovation (Meeus et al 2010). Currently, however, price-cap regulatory regimes are hindering R&D investment into smart grids (Eurelectric 2011).

Options for discussion:
- Common mandates for national regulators to facilitate decarbonisation and cross-border welfare
- Revised valuation criteria for evaluating investment
- A move to performance-based regulation that factors in innovation, sustainable development and new system services

3.3.3 Securing sufficient investment

Increasing network development commensurate with the Roadmaps will require significant new financial investment, and the scale of investment foreseen means that this will increasingly come from different sources such as corporate bonds or project bonds (Roland Berger 2011a). There is currently considerable demand from investors for real assets with long-term stable returns (Deutschebank 2012 / E3G 2012). Tapping into this financing on a sufficient scale, however, depends on ensuring appropriate regulatory frameworks are in place.

There are two basic options for enabling this. The first would be to enable additional investment directly into network companies. Despite the general appetite for secure long-term investment, TSOs and DSOs compete for capital (both within their own parent companies and in international capital markets) and require sufficient rates of return to ensure the investment is attractive (Roland Berger 2011a). This is particularly an issue where projects or investment programmes face higher risks due to their innovative or cross-border nature. The currently-proposed Energy Infrastructure Regulation makes provision for additional incentives to be granted where “a project promoter incurs higher risks for the development, construction, operation or maintenance of a project of common interest”. However it is not yet clear how widely this will be applied in practice nor whether measures will be needed.

A second option would be to enable more independent investment in specific projects, through providing independent projects access to regulated returns. Moving towards a more competitive approach to infrastructure delivery could also potentially help to limit overall cost to consumers (Baker 2011). Examples include the ‘contestable approach’ in the US where incumbent operators no longer have the right of first refusal to build new lines, and the UK’s offshore transmission regime, where the right to build lines are auctioned to independent investors. The latter approach has, according to OFGEM, delivered savings of £350 million in the first tender round of nine projects – but has also led to criticism for lacking a clear design function. This suggests that a movement towards an ISO model that splits out ownership from network design and operation would be needed if this model were to be used more widely.

Option for discussion:
- Risk-adjusted returns on regulated investment
- A ‘contestable approach’ incorporating independent investor access to regulated returns as an alternative financing model for projects or corridors identified as strategic

3.3.4 Public finance for strategic projects?

A final option to ensure that strategically important infrastructure for decarbonisation is built is to use public financing to support a limited number of projects. This may be needed in particular where projects are innovative or where benefits are more regional than national.

The Connecting Europe Facility, proposed within the 2014-2020 Multiannual Financial Framework, is aimed to addressing this gap. While the exact budget is currently under negotiation, it is currently foreseen that €9.1 billion would be spent on energy infrastructure out of a total fund of €50 billion. This represents a small fragment of overall investment need (the Commission estimate €200 billion by 2020), but a major increase over the previous TEN-E financing facility.

The Connecting Europe Facility faces multiple challenges if it is to play a significant role in promoting infrastructure development in line with the Roadmaps. First, as currently drafted, supported projects do not explicitly need to follow a decarbonisation objective – which means higher carbon projects could be prioritised above those needed to facilitate renewables and other clean generation. Secondly, agreement of the budget is under political pressure given the current emphasis on fiscal austerity and competing demands for European funding – and similar political battles may be faced in future budget rounds.

A second option – raised by DG ENER in its 2050 Roadmap Impact Assessment – would be to use ETS auction revenues for infrastructure investment. However there are a number of competing calls on this money – from energy efficiency to international climate finance.

A final option is to require congestion revenues to be re-invested in new transmission projects. Under the Third Package provisions, this revenue may be used to guarantee availability of capacity, invest in new capacity or reduce network tariffs. In practice, network operators and regulators may be inclined towards the latter option, which could lower bills in the short run but prolong underinvestment in cross border capacity (Jacottet 2012).

Options for discussion:

- Targeted use of Connecting Europe Facility
- Carbon auction revenues
- Recycling congestion revenues for new infrastructure

4. Conclusions and next steps

This briefing paper has aimed to set out a review of the implications of the 2050 Roadmaps for energy infrastructure and the significant challenges that infrastructure development will face in this context. It has also outlined a hypothesis that post-2020 energy infrastructure policy should focus on proactively securing options for decarbonisation and ensuring adequate infrastructure can be built at an acceptable cost. There are a number of different policy options that could contribute towards these objectives, and several have been identified here.

The objectives and options for infrastructure policy will be discussed in depth at the *From Roadmap to Reality* seminar in Brussels on 26 September, and the content will also be reviewed by the expert panel. This will help to generate new ideas and proposals options as well as testing and evaluating the options already on the table.

Several of the themes identified within this paper will also recur in the papers and seminars on carbon pricing and complementary measures and on power markets later this year. The options identified here will be tested for consistency with the proposals that emerge from the other topics, and the deep dives in the early part of next year should help to develop and test a coherent set of propositions.

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Annex A: ‘Menu’ of potential approaches and challenges addressed

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Annex B: Client Earth Background Note

EU energy networks infrastructure: the legal basis for balancing Member State and Union level action

Background note

Current energy infrastructure policy across Europe is characterised by a patchwork of different national regimes. In order to stand a chance of achieving the Union's goal of reducing greenhouse gas emissions by 80-95% by 2050,[11] this heterogeneity needs to be reconciled at some level. Reaching an optimal balance between national and European level action is one of the major challenges in attempting to do so. On one hand, a piecemeal domestically coordinated approach is likely to miss the value that can be created through cross border infrastructure and an efficient internal energy market; whereas on the other hand an entirely top-down European-level approach is unlikely to be able to encapsulate the difference between national approaches, and as a result could lead to inefficient outcomes. Where this balance can lie legally-speaking requires an investigation of EU constitutional law and the identification of the space in which the Union has the power to act and legislate. Explicit competence for the EU to develop energy policy and to act in the field was introduced only in the Lisbon Treaty – and decarbonisation and sustainability are relatively new concerns that challenge traditional national concerns of energy security and cost.

This paper sets out the legal basis of the European Union's competence to take action in the field of energy infrastructure, the application of the principles of subsidiarity and proportionality in this area, and how this might affect the balance reached between national and Union- level action on energy infrastructure.

1. The EU's competence to act on energy policy

According to the principle of conferral, the European Union has no competencies by right. Rather, in order to be able to legislate in any particular field, the Union must have been conferred competency by the Member States within the Treaties.[12] Therefore, for any policy action to be permitted at the EU level it must be linked to at least one article of the Treaties.

a. The Energy Chapter TFEU

Under Title XXI (Energy), Article 194 of the Treaty on the Functioning of the European Union (TFEU) the Union has the right to act in the area of energy policy. This would provide a clear basis for Union level action on energy networks infrastructure. Article 194(1) states:

> "In the context of the establishment and functioning of the internal market and with regard for the need to preserve and improve the environment, Union policy on energy shall aim, in the spirit of solidarity between Member States, to:
> a) ensure the functioning of the energy market;
> b) ensure security of energy supply in the Union;
> c) promote energy efficiency and energy saving and development of new and renewable forms of energy; and
> d) promote the interconnection of energy networks."

b. Energy policy: a shared competency

Energy policy area is a 'shared competency'.[13] Both the Union and individual Member States have the competence to act and legislate in this field,[14] and for any particular action to be justified on the EU-

[11] European Commission, 2011, Energy Roadmap 2050, COM(2011) 885 final of 15 December 2011.
[12] Article 4(2) TEU.
[13] Article 4(2) TFEU.
[14] Article 2(2) TFEU

rather than Member State-level the principles of subsidiarity and proportionality must be satisfied. How these principles relate to energy infrastructure policy will therefore play an important role in determining the balance that can be reached between Member State and Union-level action. The rest of this paper addresses the principles of subsidiarity and proportionality and how they might apply to regulating this balance.

At this point, it is, however, worth noting another potentially significant limitation on the Union's ability to act in this area. Union measures that would affect a Member State's '...right to determine the conditions for exploiting its energy resources, its choice between different energy sources and the general structure of its energy supply...' can only be adopted through the special legislative procedure.[15] The special legislative procedure requires a unanimous vote from the Council, in contrast to the qualified majority required by the 'ordinary' procedure. In practice, this limitation may have a significant impact on the willingness of the European Commission to bring forward extensive or comprehensive proposals in the field of energy infrastructure policy that may affect national choices about energy which may not find unanimous support among Member States.

2. Subsidiarity

a. Subsidiarity: defining Union and Member State competence

The principle of subsidiarity was first explicitly introduced as a general principle of Community law in the Treaty of Maastrict in 1993. Restated within the Lisbon Treaty, the principle is currently defined in Article 5(3) of the Treaty on European Union (TEU) (see Box 1). Its application seeks to ensure that Member States retain the capacity to make decisions and take action domestically, whilst authorising Union-level action where the objectives of particular proposals cannot be adequately achieved on a national level 'by reason of the scale and effects of proposed action'. In other words, the principle strives to ensure that action is only taken on an EU level when it is most efficient and necessary to do so, and that powers are 'exercised as close to the citizen as possible'.[16]

As stated within Article 5 TEU, subsidiarity is only considered in policy areas in which competence is shared between the Union and Member States; and not those of exclusive Union competence. The policy areas of relevance to energy policy and energy infrastructure development - the internal market, environment, trans-European networks, and energy - are all listed within the TFEU as areas of shared competence.[17] Subsidiarity requires that in these areas, in order for EU-level intervention to be justified in any particular instance, two preconditions must be fulfilled:

1. The objectives of the proposed action cannot be sufficiently achieved by the Member States (the "necessity test").

2. The action can, by reason of the scale or effects of the proposed action, be implemented more successfully by the Union (the "test of EU added value").

[15] Article 194(2) TFEU. Note that the environment chapter (Article 191 TFEU) will remain relevant for aspects of climate change mitigation and decarbonisation, for example, as the legal basis for the EU emissions trading scheme. Under Article 191, the special legislative procedure is triggered only where the proposed measure would *significantly* affect a Member State's choices with regard to energy.
[16] European Parliament, 2012, "The principle of subsidiarity", available online: http://www.europarl.europa.eu/ftu/pdf/en/FTU_1.2.2.pdf [accessed: 03/09/2012]
[17] Article 4(2)(a);(e);(h);(i) TFEU respectively.

Box 1: Article 5(3) of the Treaty on European Union (TEU):

> "Under the principle of subsidiarity, in areas which do not fall within its exclusive competence, the Union shall act only if and in so far as the objectives of the proposed **action cannot be sufficiently achieved by the Member States**, either at central level or at regional and local level, but can rather, **by reason of the scale or effects of the proposed action, be better achieved at Union level**. The institutions of the Union shall apply the principle of subsidiarity as laid down in the Protocol on the application of the principles of subsidiarity and proportionality. National Parliaments ensure compliance with the principle of subsidiarity in accordance with the procedure set out in that Protocol." [emphasis added].

Subsidiarity is an established principle of European Union law. However, the clarity of its definition and the instruction of how it should be applied within the EU legal framework is limited.[18] Although the Treaties provide mechanisms through which the compliance of EU legislation with subsidiarity can be assessed, both *ex ante* - through the required consideration of the principle during the development, and before the adoption, of draft legislative acts - and *ex post* - through scrutiny of adopted legislation by the Court of Justice of the European Union (ECJ) - they fail to provide any objective criteria against which compliance with the principle can be judged. Thus, an assessment of whether any particular measure can be 'implemented more successfully by the Union' (as required to fulfil the test of 'EU-added value') is bound to be highly subjective. Does 'successfully' mean more efficiently, more economically, more democratically?[19] As a result, in practice the application of the principle of subsidiarity has widely been described as being heavily political;[20] and thus relatively unpredictable.

2.2. European Commission Impact Assessments: ex ante assessment

According to Article 5, Protocol 2 of the TEU (the Protocol on the application of the principles of subsidiarity and proportionality),[21] any draft legislative act should 'be justified with regard to the principles of subsidiarity and proportionality' and 'contain 'a detailed statement making it possible to appraise compliance with the principles of subsidiarity and proportionality'. The Protocol also provides that proposals should include 'the reasons for concluding that a Union objective can be better achieved at Union level...substantiated by qualitative and, wherever possible, quantitative indicators', as well as 'some assessment of the proposal's financial impacts'.

In line with these provisions, the European Commission's impact assessments of envisaged EU policy proposals include a discussion of the EU's right to act and the justification for the specified EU action according to the principle of subsidiarity. For this purpose, the Commission has published impact assessment guidelines which include guidance on how to assess whether a proposed intervention fulfils both subsidiarity tests (i.e. the necessity test and the test of EU added value). These guidelines state that the assessment should be directed by consideration of the following questions:

1. Does the issue being addressed have transnational aspects which cannot be dealt with satisfactorily by action by Member States? (for this question the guidelines provide the explicit example of "the reduction of CO2 emissions in the atmosphere".)
2. Would actions by Member States alone, or the lack of Community action, conflict with the requirements of the Treaty?

[18] Constantin, S., 2008, "Rethinking subsidiarity and the balance of powers in the EU in light of the Lisbon Treaty and beyond", *CYELP* 4: 151-177.

[19] De Sadeleer, 2012, "Principle of Subsidiarity and the EU Environmental Policy"*, Journal of European Environmental Planning Law*, 9.1; 63-70.

[20] G De Burca, 2010, "Proportionality and subsidiarity as general principles of law", in U Bernitz and J Nergelius (eds), The General Principles of EC Law (Kluwer International Law, The Hague 2000).

[21]Protocol on the Application of the Principles of Subsidiarity and Proportionality, Protocol 2., TFEU.

3. Would actions by Member States alone, or the lack of Community action, significantly damage the interests of Member States?
4. Would action at Community level produce clear benefits compared with action at the level of Member States by reason of its scale?
5. Would action at Community level produce clear benefits compared with action at the level of Member States by reason of its effectiveness?[22]

The guidelines further stress that the application of the subsidiarity principle to any particular policy issue will evolve with time. It is therefore important not only to assess the legality of proposed new action on the EU level, but also to continually reassess ongoing activities. Additionally, in the context of proposals in areas in which Community action is new, or has been previously limited, the guidelines provide that justification must be 'the clearest possible'.

Although these guidelines provide some structure around which an assessment of compliance with the subsidiarity principle can be made, there are evident difficulties involved with applying them in any objective way. As stated by Professor Hix when questioned as part of a House of Lords European Scrutiny Committee Report, "...it is impossible to define in purely legal terms subsidiarity criteria and it is really ultimately a political question."[23] There are no objective criteria against which compliance with the principle can be assessed. This creates significant uncertainties in predicting its application by the Commission in any particular instance. It is therefore worth looking at examples of how the principle of subsidiarity has been considered within the context of past Impact Assessments to get a feel for how the principle might be applied in practice to energy infrastructure policy.

Examples of subsidiarity impact assessments of proposed energy policies:

The impact assessment accompanying the Commission's proposal for a Regulation on guidelines for trans-European energy infrastructure is of particular relevance:

> "Energy transmission infrastructure (including an interconnected off-shore grid and smart **grid infrastructure) has Trans-European or at least cross-border nature or impacts. Member State level regulation is not suited and individual national administrations have no competence to deal with these infrastructures as a whole. From an economic perspective, energy network developments can best be achieved when planned with a European perspective, encompassing both EU and Member State action while respecting their respective competences. A bigger market can also better encourage development of** innovative technologies for transmission and distribution of energy and financing of large-scale investments such as those foreseen among the energy infrastructure priorities".[24]

In the Impact Assessment accompanying the Commission's communication "**Renewable Energy: a major player in the European energy market"**, the discussion of the EU's right to act in the area of energy policy was discussed:

> "... From an economic perspective, many energy system developments can be achieved on an EU-wide basis, encompassing both EU and Member State action while duly considering the respective competences. The European market can encourage the most **cost-effective renewable energy production**; **facilitate the balancing of the electricity system and reduce the need for back-up capacity and energy storage**. The large scale investments needed to harness a number of renewable energy sources (e.g. off-shore wind, second generation biofuels) are also more feasible and cost effective in EU-wide markets. Finally, the large R&D

[22] European Commission, 2009, Impact Assessment Guidelines, SEC(2009)92, p23.
[23] House of Commons European Scrutiny Committee, 2008, "Subsidiarity, National Parliaments and the Lisbon Treaty; Thirty-third Report of the Session 2007-08", p5.
[24] European Commission, 2011, Impact Assessment accompanying the document: Proposal for a Regulation of the Europen Parliament and of the Council on guidelines for trans-European energy infrastructure and repealing Decision No 1364/2006/EC.

> budgets needed for developing innovative renewable energy technologies can be mobilized and organized more-effectively at the European scale rather than at national level."[1]

Similarly the **Energy Roadmap 2050** impact assessment justified action on a Union level in the following way:

> "From an economic perspective, as is the case with the European carbon market, many energy system developments can best be achieved on an EU-wide basis, encompassing both EU and Member State action while respecting their respective competences. An **EU wide European market can facilitate the balancing of the electricity system**, reduce the need for back-up capacities and encourage RES production where it economically makes most sense. **Large scale investments require big markets which also justify one EU wide approach**. A bigger market can also better encourage the development of innovative products and systems mainly in the area of energy efficiency and renewables."[1]

A more in rigorous analysis of subsidiarity was included in the impact assessment of the **Energy Efficiency Plan, 2011.**

> "Although much responsibility for addressing energy efficiency and savings rests with Member States, **the EU's right to act has been established because of the importance of energy efficiency and savings for realizing the EU's climate change, security of energy supply, competitiveness and environmental protection objectives**. Tackling these requires coordinated action and coherent energy efficiency and savings policy as one of the responses to these challenges. As has been demonstrated in the previous sections, the various barriers to higher uptake of energy efficiency measures and the available cost-effective potential is not sufficiently addressed at national level and thus the EU action is required to reap the remaining potential benefits. EU level action is also essential for the products that are traded in the internal market. Energy efficiency and savings can be realized in various areas of economic activities and everyday life and thus the EU's role needs to take into account the specificities of the challenges, and respect the principles of subsidiarity and proportionality. Member States are essential for the realization of the energy efficiency policy framework and the EU intervention should be very well targeted and supportive to Member States' actions. More specifically the EU's role and level of action is in:
>
> - **Setting minimum requirements in areas where there is a risk of internal market distortions** if MS take individual measures. This is applicable to policy areas where there is a single market with free movement (e.g. energy-using products, vehicles) where having 27 national rules, standards and regulations would distort its functioning. For these areas it is appropriate to provide a detailed regulatory framework at the European level. In addition, such EU action can be taken if the **costs of common approach are lower than the costs for 27 national ones** (e.g. the ETS, phase III).
> - **Establishing a common framework** which **creates** the basis for **coherent and mutually reinforcing mechanisms** for energy efficiency improvements while leaving in being the responsibility of Member States to set, in a transparent and comparable way, concrete levels that are to be met. This has been applied in areas where there are major national differences (e.g. climate**, construction traditions**, fiscal policies) and there is no need for full harmonization of the approaches but only for setting of common instruments and requirements (e.g. in buildings). This is the global policy approach also in Europe 2020 Strategy.
> - **Creating a platform for exchanging best practices and stimulating capacity building.** This is for the areas where the EU competences are limited but which can profit from dissemination of the experience of the more advanced Member States (e.g. awareness raising, professional and university training)

- **Using EU instruments to promote energy efficiency, e.g. through financing, and to mainstream it into the other policy areas.** The EU does not dispose of sufficient funds to match the need for funding but it can still play an important role in mobilizing, providing visibility and momentum to fill a critical gap of ongoing initiatives. For example, some of the EU funds can be used to leverage third party financing. Furthermore, it would create economies of scale and allow for more effective and efficient action. EU action also allows for the wide dissemination of information and a variety of effective implementation mechanisms.
- **Promoting the EU internationally as a forerunner in the area – an activity that is also beneficial for EU businesses.** In a time of emerging pressure for action on reduced energy consumption the activities at EU level are closely followed worldwide and some of the EU approaches (labelling, Ecodesign, EPBD) are being adopted by developed and developing countries. This will contribute to lower global CO2 emissions and establish the EU as a recognized player on the international scene...**"**[1]

2.3. National Parliaments: ex ante assessment

Under Article 6 of Protocol 2 TEU, any national Parliament may, within eight weeks from the date of communication of a draft legislative act from the Commission, send a reasoned opinion stating why the draft in question does not comply with the principle of subsidiarity. If reasoned opinions are submitted by the relevant threshold number of national Parliaments, the draft legislation must be reviewed, and may eventually be amended or withdrawn.[25] In 2011, the Commission received 64 such opinions relating to 28 different Commission proposals,[26] one of which was proposed Energy Efficiency Directive.[27] In none of these cases were the thresholds for triggering review of the draft proposals in question reached however. The practical effectiveness of this new procedure as a mechanism to enforce subsidiarity has been widely questioned.[28] But, introduced as part of the Lisbon Treaty package, it is a relatively new instrument and the full potential of its role in the enforcement of the subsidiarity principle is yet to be fully realised.

2.4. ECJ: ex post assessment

Under Article 263 TFEU, the Court of Justice of the European Union (ECJ) has the competency to review the legality of legislative acts on the basis of compliance with the principle of subsidiarity. Under Protocol 2 Member States, on behalf of themselves or their national Parliaments, and the Committee of the Regions can take a case before the Court. However, there have been few legal challenges based on subsidiarity, and the courts are yet to annul a measure for breach of the principle of subsidiarity.[29] Furthermore, case law to date has confirmed that there is no need for any express reference to the consideration of the compliance of the legislation with the principle of subsidiarity within Union legislation.[30] Chalmers even states that "[t]he Court's treatment of subsidiarity-based arguments has been perfunctory.....it seems that all the institutions need to do to show that a measure complies with the principle of subsidiarity is to demonstrate that an EU competence to

[25] See Article 7 of the Protocol for further details of the process.
[26] European Commission, 2012, Report from the Commission on Subsidiarity and Proportionality (19th Report on Better Lawmaking covering the year 2011).
[27] Eduskunta (Parliament of Finland), 2011, Reasoned Opinion on the application of the subsidiarity principle to the proposed Energy Efficiency Directive COM (2011) 370 final, available at: http://ec.europa.eu/dgs/secretariat_general/relations/relations_other/npo/docs/finland/2011/com20110370/com20110370_eduskunta_opinion_en.pdf.
[28] Constantin, S., 2008, "Rethinking subsidiarity and the balance of powers in the EU in light of the Lisbon Treaty and beyond", *CYELP* 4: 151-177.
[29] European Commission, 2011, Report from the Commission on Subsidiarity and Proportionality (19th Report on Better Lawmaking covering the year 2011).
[30] Germany v European Parliament and Council of the European Union, case C-233/94, *European Court reports 1997 Page I-02405*.

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legislate exists".[31] It therefore appears that, once adopted, the ex post annulment of Union legislation on the basis of non-compatibility with the subsidiarity principle is only likely to occur in extreme circumstances.

2.5. Subsidiarity in the context of energy infrastructure development

The application of the principle of subsidiarity is likely to play an important role in establishing the space in which the EU has the competency to take action in the field of energy infrastructure development, and the balance that can be reached between domestic and Union- level action. The lack of objective assessment criteria and the political nature of the principle's application negates any prediction of how exactly subsidiarity would limit Union activities in this field. However, past impact assessments and their recognition of the added-value that Union level action brings in certain areas of energy policy can still be useful in identifying areas in which the Union are likely to be willing and able to take action. Namely:

- The facilitation of the balancing of the electricity systems, as well as the reduction for the need for back-up capacity and energy storage is best achieved on a European wide level;
- The large scale investments needed are more feasible and cost-effective in EU-wide markets;
- Setting minimum Union-wide requirements may be required in areas where there is a risk of internal market distortions;
- Establishing common instruments and requirements within areas in which there are major differences in national policies – e.g. construction and planning. Although there may be no need for full harmonisation, there are strong efficiency arguments in establishing some level of common framework.

However, it is important to note again that Union competency in certain aspects of energy policy which particularly affect national sovereignty, such as Member States' right to determine the conditions for exploiting their energy resources, their choice between different energy sources and the general structure of their domestic energy supply has practical limitations that may seriously affect the Union's ability to legislate in these areas.

3. Proportionality: ensuring Union action is appropriate and necessary

Once legislative competence and subsidiarity are established with respect to Union action, the specific measure in question must also be shown to satisfy the principle of proportionality if it is to be justified. The basic premise of the principle of proportionality is to ensure that the content and form of Union action does not go beyond what is necessary to achieve the objectives of the Treaties.[32] Whereas subsidiarity informs decisions on whether EU action can be taken (i.e. who can act), proportionality is more concerned with the type and extent of such action (i.e. if competent, *how* the Union should act).[33]
Article 5.4 TEU states that ' [u]nder the principle of proportionality, the content and form of Union action shall not exceed what is necessary to achieve the objectives of the Treaties.' As a general principle of EU law,[34] proportionality acts as a basis of judicial review for both national and EU legislative and administrative acts. Alongside this role in the *ex post* review of legislation, the principle also feeds into decisions regarding the initial exercise of Union legislative competence. Proportionality is thus likely to play an important role in governing the weight of action the Union itself is able and willing to take in relation to EU energy infrastructure policy. The following discussion will look at how both the European Court of Justice (ECJ) (through *ex post* judicial review of Union actions), and the

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[31] Chalmers, D., Hadjiemmanuil, C., Monti, G., Tomkins, A.; European Union Law: Text and Materials, p224.
[32] Chalmers, D., Davies, G., Monti, G.; 2010; European Union Law; Second Edition; Cambridge Univeristy Press, p367.
[33] European Commission, 2011, Report from the Commission on Subsidiarity and Proportionality (18th report on Better Lawmaking covering the year 2010), Brussels.
[34] Case C-331/88 R v Minister of Agriculture, Fisheries and Food, ex parte Fedesa [1990] ECR I-4023, para 13. – "The court has consistently held that the principle of proportionality is one of the general principles of Community law".

Commission (through *ex ante* impact assessments of proposed Union policy) assess proportionality, and how this might relate to the future development of EU energy networks infrastructure.

a. **The assessment of proportionality: ECJ's *ex post* assessment**

How does the ECJ apply the principle of proportionality?

The proportionality principle has evolved as an important basis of judicial review of both national and Union-level legislative and administrative decisions. Past case law suggests that the ECJ often applies a two-stage test in its assessment of Union measures against the principle of proportionality:

1. The **'suitability test'** – was the measure in question a *useful, suitable or effective* means of achieving the pursued objective?
2. The **'necessity test'** - was the measure in question *necessary* to achieve the pursued objective, or *could it have been attained in a less onerous way*?[35]

In some cases a third limb, commonly known as 'proportionality *in stricto sensu'*, is added to this analysis. This test requires that if the applicant's interests are affected too excessively, the measure taken will be considered disproportionate regardless of whether it is the least onerous available to achieve the objective pursued.[36] In other words, even if the suitability and necessity tests are satisfied, if the measure in question has an excessive impact on the applicant's interests it will be held as being disproportionate. In the context of Union level legislative action, this test also concerns the excessive infringement of national autonomy (as the 'applicant' can be a Member State), and is therefore closely linked to the principle of subsidiarity (see above).

It is important to note that the tests outlined above are not uniformly applied. As with subsidiarity, there is no consistently applied objective test by which the ECJ assesses the proportionality of contested Union measures, nor any practice guidelines with which to predict the ECJ's approach to a particular Union action.[37] However, examination of past case law shows that the severity of the principle's application often depends on the characteristics of the case in question and the policy area it concerns.[38] In particular, application of the proportionality principle differs according to whether the action in question is at the member state or Union level.[39] This paper, in attempting to define the space available for Union-level action on energy infrastructure, will focus on the latter.

In cases concerning areas in which Union institutions have a broad degree of legislative or administrative discretion, the ECJ often only labels action as disproportionate if the measure is '*manifestly inappropriate* having regard to the objective which the competent authority is seeking to pursue.'[40] Although initially applied to Union decisions regarding the Common Agricultural Policy, the 'manifest inappropriateness' test has been extended to other policy areas, including anti-dumping, the internal market, competition and transport.[41] This represents a high bar of disproportionality, with non-compliance with the principle of proportionality only being found in extreme circumstances. In the context of the application of the two-stage test laid out above, the ECJ is clearly not placed to carry out a full and accurate assessment of the effectiveness of a particular Union measure. The court instead tends to examine whether a measure is *evidently* unsuitable, without delving into an in-depth

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35 Tridimas, The general principles of EU law (2nd edition, Oxford, 2006) 139; Fedesa: "when there is a choice between several appropriate measures recourse must be had to the least onerous".

36 De Burca, 'The Principle of Proportionality and its application in EC law', 1993, 13 YEL 105, 113.

37 Chalmers, D., Davies, G., Monti, G.; 2010; European Union Law; Second Edition; Cambridge Univeristy Press, p368.

38 Holwerda, M., 2010, "Subsidizing carbon capture and storage demonstration through the EU ETS new entrants reserve: a proportionality test", *CCLR*, 3: 228-239.

39 supra, n.1, at p368.

40 Case C-331/88 R v Minister of Agriculture, Fisheries and Food, ex parte Fedesa [1990] ECR I-4023, para 14; also see: Case C-265/87 Schrader [1989] ECR 2237, para 22.

41 Supra, n.31.

or complex assessment of effectiveness.[42]

In the context of energy infrastructure: determining the stringency of the proportionality test applied

In an attempt to define the space for Union-level action on energy infrastructure, it is worth considering the level of discretion the Union is granted in this field of policy, and thus the approach that the ECJ might take in relation to an assessment of the proportionality of any particular measure. The objective of a measure must also be established in order to assess proportionality. Article 194 mentions the internal market and the environment. The Union's stated goal of reducing Europe's greenhouse gas emissions by 80-95% by 2050 (from 1990 levels)[43] also acts as one of the underlying objectives behind the development of European energy policy on energy networks infrastructure. Article 194 TFEU, the basis of the Union's energy policy competence, contains four main objectives of EU energy policy:

> "a) ensure the functioning of the energy market;
> b) ensure security of energy supply in the Union;
> c) promote energy efficiency and energy saving and the development of new and renewable forms of energy; and
> d) promote the interconnection of energy networks."[44]

Overall, the competence for the EU on energy policy involves relatively broad, open-ended objectives. The breadth of discretion would support the application of the 'manifestly inappropriate' test discussed above in any proportionality-based judicial review of measures adopted in this field. Furthermore, in the context of energy infrastructure, the economic and political complexity of the required developments is likely to support the application of this weak test of proportionality. Commentary on the ECJ's case law has suggested that '...it is settled case law that the Community legislature enjoys a wide margin of discretion when adapting legislative measures that involve complex political and economic choices'.[45] For example, a recent ruling concerning the design of the EU Emissions Trading Scheme (EU ETS) stated that the EU's legislative discretion in the context of the EU ETS should be seen in the light of 'the novelty and the complexity of the scheme'.[46] The novelty and complexity of the establishment of a EU energy networks might similarly support a wide level of discretion of the Union legislature.

However, it should also be recalled that energy policy and energy security are generally considered as important aspects of national sovereignty and are thus often politically contentious. It may therefore be the case that a stricter test of proportionality is applied. This would require proof of the effectiveness and necessity of the measure in question to achieving the Union's decarbonisation goals. (See below for an example of a Commission impact assessment that imposition of an EU transmission tariff would be disproportionate.)

b. The assessment of proportionality: European Commission's *ex ante* assessment

European Commission's impact assessment guidelines

Article 5 of the Protocol on the application of subsidiarity and proportionality provides that the Commission must justify draft legislative acts with regard to the principle of proportionality, providing that 'any draft legislative act should contain a detailed statement making it possible to appraise

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[42] Diathesopoulos, 2011, Ownership Unbundling in European Energy Market and Legal Problems under EU Law, Selected Works of Michael Diathesopoulos.
[43] Energy roadmap 2050.
[44] Article 194 TFEU.
[45] Jacobc, F., 2006, Role of the ECJ in the protection of the environment, Journal of Environmental Law, 18(2); 185-205, at p195; see also British American Tobacco: suggests that the a policy maker should be allowed a broad discretion as to determine appropriate measures where the objectives pursued "entail[] political, economic, and social choices" calling upon the policy maker to undertake "complex assessments".
[46] Supra n.31; and *Arcelor* [2008], Case C-127/07, I-09895.

compliance with the principles of subsidiarity and *proportionality*.'[47] As with the principle of subsidiarity, the Commission integrates the assessment of the proportionality of proposed Union action with its general impact assessment process. This usually involves the comparison of the proportionality (alongside multiple other relevant factors) of a number of different proposed policy options.

The European Commission Impact Assessment Guidelines state that:

> "…any Community action should not go beyond what is necessary to achieve satisfactorily the objectives which have been set.....Community action should be as simple as possible and leave as much scope for national decision as possible, and should respect well established national arrangements and legal systems."[48]

This statement clearly compliments the two-stage test often adopted by the ECJ (see above); highlighting the need for Community action to be both suitable and necessary. In stressing that matters should be dealt with on the national level where possible, the guidelines also further accentuate the overlap with the principle of subsidiarity.
A series of questions are also provided to help direct the discussion of proportionality in the context of any particular policy measure: [49]

Scope of instrument

1. Does the option go beyond what is necessary to achieve the objective satisfactorily?
2. Is the scope of action limited to those aspects that Member States cannot achieve satisfactorily on their own, and where the Union can do better?
3. If the initiative creates a financial or administrative cost for the Union, national governments, regional or local authorities, economic operators or citizens, is this cost minimised and commensurate with the objective to be achieved?
4. Will the Community action leave as much scope for national decision as possible while achieving satisfactorily the objectives set?
5. While respecting Community law, are well-established national arrangements and special circumstances applying in individual Member States respected?

Nature of instrument

1. Is the form of Community action (choice of instrument) as simple as possible, and coherent with satisfactory achievement of the objective and effective enforcement?
2. Is there a solid justification for the choice of instrument – regulation, (framework) directive, or alternative regulatory methods such as co-regulation or self-regulation?

Examples of impact assessments

Within the impact assessment accompanying the Commission's recent **Proposal for a Regulation on Guidelines for trans-European energy infrastructure**,[50] the proportionality (and subsidiarity) of the imposition of an EU transmission tariff (one of many different policy options proposed) was assessed as follows:

> "While operators and academia consider an **EU wide transmission tariff** as an effective solution, its degree of harmonization seems to be not proportionate and is also likely to generate significant **opposition from Member States and national regulators**. Such harmonisation seems premature, given the limited benefit provided compared to the likely difficulty to implement it and the possible distortion effects. Depending on the design, it could be perceived as a new EU energy tax added to the final energy prices which raises not only subsidiarity concerns but

[47] Article 5, Protocol on the application of subsidiarity and proportionality; Protocol 2 TFEU.
[48] European Commission, 2009, Impact Assessment Guidelines, p29-30.
[49] European Commission, 2009, Impact Assessment Guidelines, p30.
[50] European Commission, 2011, Impact Assessment accompanying the document: Proposal for a Regulation on Guidelines for trans-European energy infrastructure and repealing Decision No 1354/2006/EC.

> **ignores the differences with regard to the current level of development of grids in the various Member States**, notably as a result of past investment efforts, and hence the fact that some countries will have to invest much more over the coming 10 years than others."

This specific policy option was subsequently dismissed as a result of these subsidiarity and proportionality considerations. This is a clear demonstration how the Commission are keen to steer clear of measures in which involve a high level of harmonization, unless absolutely necessary.

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