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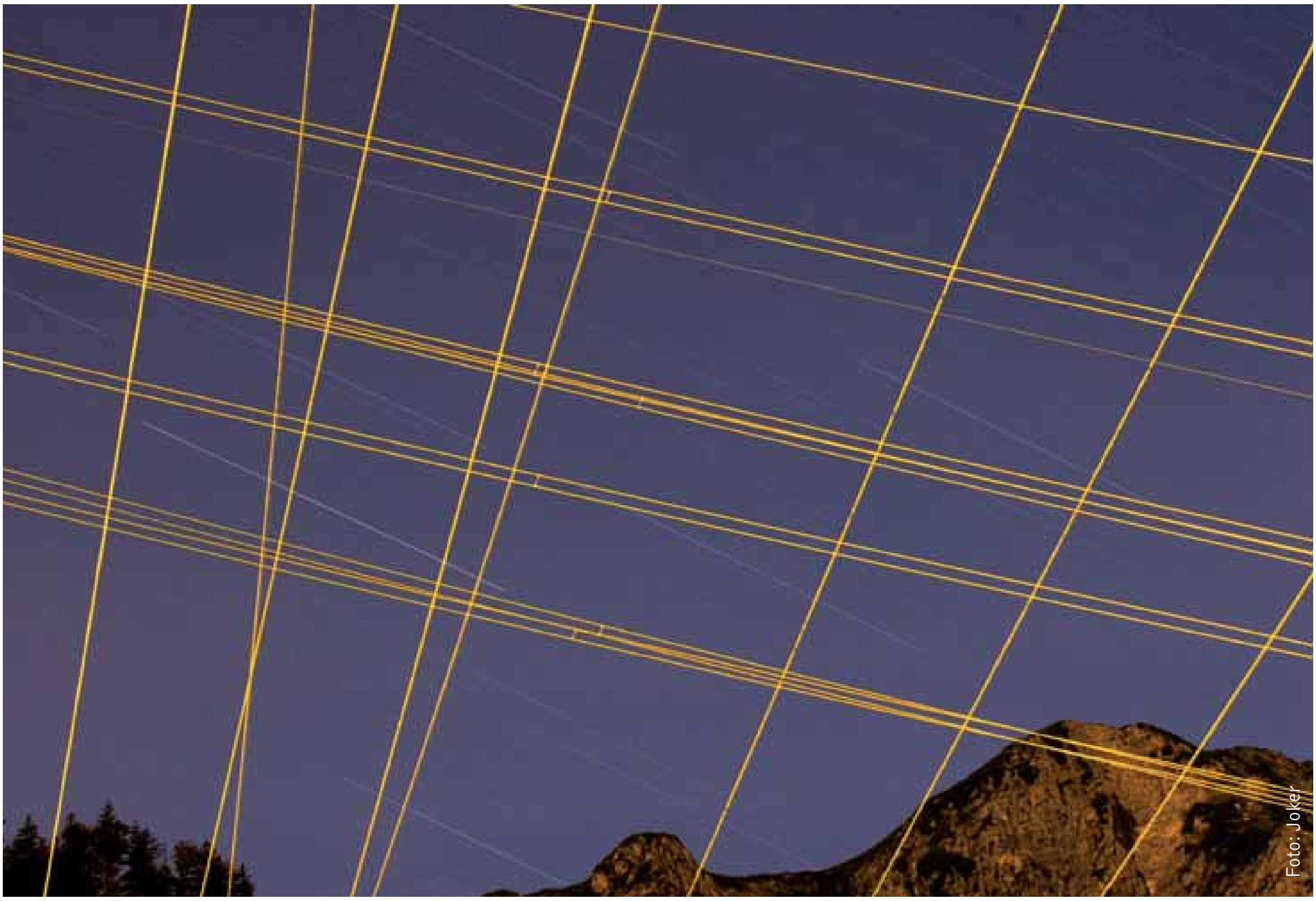


Meeting 100% of Europe's electricity needs through renewable energy by 2050 is possible – if we succeed in pooling the potential of Europe's renewable energy sources. This will require cooperation between the EU member states, as well as coherent policies and regulation at the European level. Both currently exist only in fragments, as energy policy in Europe is still shaped mainly at the national level. The Heinrich Böll Foundation therefore asked a number of experts to take stock of European policy in the sectors most important for the transition to renewable energy, to identify the areas in which European cooperation has been inadequate to date, and to propose possible solutions.

The construction of a European grid is a prerequisite for the joint exploitation of renewable energy sources in Europe. But although the necessity to construct such a grid is now widely accepted, the construction of this grid and especially of the interconnectors between the different European countries is progressing slowly. In this paper, Antonella Battaglini and Johan Lilliestam explore what could be done – especially on the European level – to speed up the construction of a European grid.

By Antonella Battaglini and Johan Lilliestam

On Transmission Grid Governance

A SuperSmart Grid

The potential electricity supply from renewable sources is essentially unlimited, seen as an integral over time and vast areas (DLR, 2005; 2006). However, renewable power has two important characteristics that make it different from fossil fuels or nuclear power. First, it is not constant and demand-controlled, but fluctuating and supply-controlled. This requires us to think about ways to handle these fluctuations and adapt the supply and demand curves to each other. Second, renewable power has a low energy density and requires vast areas of land, which is problematic both due to cost reasons and due to land-use conflicts. This should cause us to seek and utilize areas with as high a renewable energy density as possible, with as limited an amount of land-use conflict as possible for the electricity supply of the future (Luther, 2010; MacKay, 2008). Within the broad field of renewables, two main approaches to solving these problems exist: the decentralized Smartgrid and the centralized Supergrid.

Up to now, the decentralized, non-utility scale renewables have shouldered the lion's share of the renewables expansion. Many ecologists suggest that a decentralized approach to decarbonizing the electricity sector would be efficient as it does not necessitate huge investments in transmission grids and, as such, this approach would reduce the influence and market power of the big utilities. The power system would consist of largely independent and energy-autarkic regions, each utilizing the renewable resources available in the region. The system stability would be ensured through Smart technologies, load management and load shifting – for example, triggered by price signals – and storage facilities, such as batteries. In times of local abundance, electricity would be fed into the regional grid and its storages, and in times of scarcity, electricity would be withdrawn (Scheffer, 2008; Willenbacher and Hinsch, 2009). However, the overall potentials and the availability of good production sites are limited in many regions: Some of the densely populated countries in continental Europe may not have large enough potentials for 100% renewables (DLR, 2006). Furthermore, storage technologies are expensive and the available sites are limited (Leonhard et al., 2008). Therefore, a purely decentralized European power supply based on autarkic regions or countries may be technically possible, but it would be expensive (SRU, 2010).

With increasing maturity, the renewable generators have become larger and the energy giants are increasingly stepping into the renewable scene: The large investments in, for example, centralized offshore wind farms and concentrating solar power (CSP) installations fit well into the business profiles of the big power companies. Accessing areas with high energy densities for power generation, such as the North Sea for offshore wind and the Sahara for CSP, will lead to lower production costs and a less fluctuating supply (Club of Rome, 2008). Constructing a Supergrid – a highly efficient power grid (typically high-voltage direct current, HVDC) capable of transporting electricity over vast distances – would allow for the stochastic smoothing of both the demand and the renewable supply, greatly reducing the need for expensive storage and backup capacities and further reducing the system costs (Czisch, 2005; ECF, 2010; ENTSO-E, 2010b). A Supergrid, possibly also with stretches outside Europe, is technically possible with existing technologies and is «a particularly cheap, but politically extraordinarily demanding» way to completely decarbonize the European power sector (SRU, 2010: 66, own translation).

Often, these two approaches are perceived as conflicting: The decentralized community has accused the centralized community for wanting to perpetuate the existing market dominance of the energy giants and block the greening of the power sector. On the other hand, the centralized community claims that although incremental system changes can be done by small actors, the big transformation with its massive investments must be done by large, financially potent actors, and that the key to overall efficiency is an efficient transmission grid. However, the European power sector must be completely decarbonized by 2050 if it wishes to reach its long-term climate obligations of at least -80% emissions compared to 1990 (ECF, 2010). This is a staggering task and to achieve this, Europe will need all renewable resources, regardless of size, location or owner, and it will need to do this in as efficient a way as possible. This means that Europe needs both a Supergrid and a Smartgrid – a SuperSmart Grid – that integrates small-scale and large-scale generation, interconnects regions, countries and areas of strong centralized and decentralized generation, and operate load shift and demand management.

Building grids

The key to the power system of the future will be a grid allowing for both decentralized and centralized generation to be integrated – a SuperSmart Grid. As the lifetime of transmission assets spans over many decades, the grid of the future is built today. Already today, the need for new transmission is massive and growing: In its Ten-Year Network Development Plan (TYNDP), the European Network of Transmission System Operators for Electricity (ENTSO-E) reports that the planned priority projects – new or refurbished transmission lines of European importance – bound for completion by 2020 amount to 42,000 km, of which 23,000 are new high-voltage alternating current (HVAC) overhead lines and 10,000 are new high-voltage direct current (HVDC) submarine or underground cables (ENTSO-E, 2010b). This is slightly more than the existing high-voltage grid of Germany. However, ENTSO-E and many others warn that already achieving the mid-term (2020) transmission targets may be difficult, not to mention the long-term transformation of the entire power sector, mainly due to regulatory and legal aspects. In the following, we will discuss a number of key questions, identify the main barriers to a large-scale transmission grid expansion in Europe and propose solutions to these. We will investigate the macroeconomic incentives and the regulation of new transmission lines in Europe, as well as the microeconomic incentives for the transmission system operators (TSOs) to build new interconnectors. We then investigate the questions of whether a TSO can build new lines if it wants to and whether such lines are likely to lead Europe onto a firm path toward a completely renewable power supply.

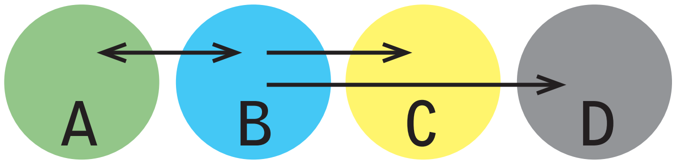
Why would a TSO want to build new transmission lines?

Incentives in a national regulatory environment

The base of the different European national regulatory environments is a belief in the basic principles of economics: Transmission lines that are considered to be profitable and necessary to the country will «automatically» be proposed by the TSO to the regulatory authority, which will approve them and the lines are constructed. The investment costs are recognized by the regulator, which ensures the full recovery of these costs, as the capital costs are fully included in the grid-access tariffs. The cost recovery is typically calculated on the basis of the expected economic lifetime of the line, which stretches over several decades. The risk of such an investment is theoretically low – society will always need electricity, and thus it will always need to access the grid. As a consequence, interest rates and capital costs are assumed to be low, leading to – compared to other investments – low rates of return for the investor. Often, the return on capital can be as low as 5 to 6 percent, and the depreciation time may run for up to 50 years (De Nooij, 2010; ICF, 2002). If a line is economically inefficient to the TSO or to the national system, or not necessary for the country, the regulator either denies the application or sets the recovery rate at a level that does not allow the TSO to recover the investment costs; in this case, the TSO is unlikely to proceed and invest.
One should therefore expect that under this model, all domestic new lines that provide economic benefits to the country will be included in the national development plan and will be constructed. Moreover, all interconnection lines that provide economic benefits to two neighboring countries will, in this model, be included in both national plans and will be constructed. However, despite this theoretical attractiveness of the national regulatory model, Europe currently sees much too low transmission investments, also for domestic lines.

In the future, with strongly increasing shares of renewables, which is likely to take place where the best resources are, irrespective of national borders, the need to flexibly move electricity in different directions over long distances and across borders will increase rapidly.

For this, new lines and especially interconnectors will be required. However, under the country-wide regulatory model, interconnection development that provides long-term economic benefits to one country but fewer benefits to the neighboring country are unlikely to be constructed, and congestion at the border will increase. Moreover, also all internal new lines that provide economic benefits to the European system, but not to the concerned country, will not be approved nor constructed. The picture below represents the current shortages of the national model.



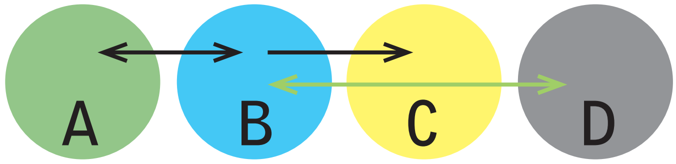
In order to expand and integrate renewable energy sources, Country B needs to export to A, C or D in case of abundant renewable resources in the system. In days with low renewable generation, Country B needs to import from Country A. We can expect that the interconnection between A and B will be built, as both benefit from it. The interconnection between B and C/D will not be built, as the TSOs in Countries C and D would have to bear the costs of lines they do not need. One can conclude that under the national regulatory model, a SuperSmart Grid will not be constructed.

Incentives to build merchant interconnector lines

As an alternative, third-party actors – i.e., actors other than the TSO with the grid concession – can be exempted from the regulation and may be allowed to build cross-border merchant power lines (Regulation 1228/2003, 2003). Today, many interconnectors are built and operated under this model, for example Estlink (2006) and the planned Italy-Tunisia cable link. Although a merchant line has to be approved by the regulator, these interconnector lines do not underlie the regulated tariff system. Thus, the owner of the merchant line can either use the line himself or auction the available capacity to interested parties on his own economic conditions. As a consequence, the profits – or losses – of a merchant line may be high or low. Usually, the investment decisions are made under relatively high risk and generally no investments are made unless the estimation for recovering the costs is very favorable. Due to the higher risk profile of these investments, investors usually expect a recovery time that is substantially shorter than the lifetime of the line. Often no more than 10 years cost-recovery is accepted, which gives considerably higher rates of return than what the regulated lines are allowed to achieve.

The main driver for these investments is the differences in electricity price between two countries: Electricity flows from the low-price to the high-price market, and the merchant line owner makes his profits from this difference. In the future, increasing production of renewables in some regions may strengthen the case for merchant cables for two reasons. First, attractive support schemes in one country will increase the generation, forcing the electricity market prices down. Exploiting the price difference and exporting low-price electricity to neighboring countries may be the task of merchant lines. Second, some countries may choose to fulfill their renewable electricity targets by importing electricity from their neighbors, and transporting this electricity may equally be the task of new merchant lines.

We can therefore expect that some interconnection lines that would not be constructed under the national model will be constructed under the merchant line model, if the expected market conditions are beneficial. These conditions may be caused by differences between national renewables incentive schemes, CO2 emission limits, etc., as long as they create electricity price differences between two countries. In the situation illustrated below, a merchant line between low-price Country B and high-price Country D will be constructed by Country C, which makes a profit on the price difference between B and D. The producers in Country B profit because they can export their surplus electricity, and the consumers in Country D profit because they can import lower-price electricity.



However, in order to maintain the value of the merchant interconnection, a price difference must remain, and thus not all the required capacity from Country B to D will be constructed: Costs are maintained at a macroeconomically suboptimal – artificially high – level. Under this model, it may be possible to build interconnection lines between two European countries and also between a European and a non-European country, but the induced capacities are likely to be too low to produce system-wide optimal efficiencies. Therefore, also the merchant line model is not sufficient to deliver a pan-European SuperSmart Grid.

Incentives to build interconnections under uncertainty and in vertically-integrated oligopolies

TSOs earn their money by transmitting electricity and thus have an intrinsic interest in transmitting as much electricity as possible. Still, too few new transmission lines are being built and there is a large lack of interconnectors (European Commission, 2007a). It seems that the incentives for TSOs to build new lines and, especially, interconnectors, are insufficient, although «low investment is surprisingly at odds with the increased private-sector appetite for investment in long-term infrastructure projects» (European Commission, 2007b: 14). This lack of willingness to invest in new transmission lines has a number of reasons.

First, the TSO cannot be economically punished for not building an interconnector and alleviating a congested line. Thus, not building a new line preserves the status quo, but does not bring any harm to the TSO. Throughout Europe, the interconnector capacity is auctioned or allocated in another, non-discriminatory fashion, and this income is higher for congested lines. The revenues from the auctioning has to be used to either build new interconnector capacity and alleviate the congestion, or to lower the general grid-access tariffs in the TSO's grid area (Regulation 1228/2003, 2003: Art. 6(6)). In practice, most TSOs choose not to build new interconnectors but to lower the grid tariffs: Only some 20 percent of the revenues are used for new interconnections (European Commission, 2007a).

Second, most TSOs are not ownership unbundled – only 15 of 41 are (European Commission, 2009; 2010; Schellekens et al., 2010). Although the TSO gets all its income from transmitting electricity, a vertically integrated concern – a company that owns both generation and transmission assets – does not. As the power generation and sales sections generally create higher turnovers and profits than the transmission section, the concern may be inclined to accept lower profits in transmission in order to keep competitors out of their electricity market, securing the concern's market power. Vertically integrated TSOs thus «have no incentive to develop the network in the overall interest of the market with the consequence of facilitating new entry at generation or supply level» (European Commission, 2007a: 4). During the preparations of the new energy legislative package, Germany and France – influenced by the strong ties to their former state monopolies, which still totally dominate the national power markets – together with a coalition of other Member States succeeded in blocking further energy market liberalization measures. Due to the resulting power constellation in the European Council, the Commission was not able to prevail with its position to force vertically integrated companies to sell their transmission assets. Thus, the third energy package will not significantly change the existing, insufficient unbundling requirements, as it allows vertically integrated companies to keep ownership and remain in control of the transmission networks, and therefore in control of investments in grid expansion. Currently, there are no signs that stricter unbundling requirements will be implemented. However, although it is clear that unbundling would be beneficial, as it would remove the problem of strategically withheld investments, it is questionable whether unbundling alone would be sufficient to trigger more investments in transmission and interconnections (see Brunekreeft, 2008).

Third, the TSO has to perceive new lines as being sufficiently profitable and sufficiently risk-less, or they will refrain from investing. Transmission capacities need to be constructed based on the anticipated development of generation and demand. Transmission assets typically stand for several decades, typically much longer than the generation assets. Thus, decisions taken when construction starts – decisions taken under significant uncertainties about the future – have a large impact on the future system and the possibilities of this to adapt to new situations. These uncertainties have always existed, but were magnified by the market opening and the – still imperfect – unbundling of generation and transmission in 1999 and are further intensified by the ongoing transformation to a green power system (ENTSO-E, 2010b). Obviously, a TSO can expect wind power expansion in windy regions, e.g., in and at the North Sea, and solar power expansion in sunny regions, e.g., in Spain. However, the TSO cannot know whether this expansion will actually happen, or when it happens. Normally, such a situation would trigger higher risk premiums, but this is not possible, as the rates of return are regulated in the natural grid monopoly. Thus, TSOs need to be risk-averse and, as a consequence, may adopt a wait-and-see position and delay their investments, or avoid building new lines altogether. Here, there is a clear mismatch between the assumption that new transmission is a low-risk endeavor (see above) and the current highly uncertain policy environment in the European power markets.

Can a TSO build transmission lines if it wants to?

In the current regulation and legal setting, it is difficult and time-consuming for a TSO to build a new transmission line. This problem has two main components: local, social and political acceptance of transmission lines; and long, complex and inefficient permission processes.

Most of the lead time of a transmission line project is during the authorization phase (ENTSO-E, 2010a; b). On the whole, the permission processes are similar in most Member States: Typically, public consultations, an environmental impact assessment, the issuing of a building permit and an approval from the regulator are the main steps, but the different process phases may be done in different order, in a different number of steps or involve different authorities (ENTSO-E, 2010b). This lack of harmonization and coordination between regulators often leads to massive delays for cross-border projects. In addition, interconnectors face stronger public opposition than domestic lines, as the local population often sees these as mainly serving the interests of the big power companies and not the public's (ENTSO-E, 2010a). The average time to get a construction permit for a new high-voltage priority line in Europe is seven years, with 25 percent of the projects requiring more than twice that time. At best, the permission process can take five years but some projects have required up to 20 years. In comparison, the typical construction time of a thermal power plant is circa two to three years. This makes transmission investments unnecessarily unattractive and risky, and has in many cases even led to projects being cancelled (ENTSO-E, 2010b; MVV consulting, 2007; Schellekens et al., 2010). Due to lower public opposition, much more technically difficult subsea links have been completed much faster than many overhead line projects (European Commission, 2007b). All in all, the lengthy and uncertain permission processes «endanger the timely completion of infrastructure projects and the achievement of European policy targets» (ENTSO-E, 2010b:39).

The difficulties with social acceptance originate, among other things, in an unwillingness of stakeholders to accept and support the TSOs' argumentation of the necessity and use of a new transmission line. Often, the local stakeholders do not see how the new line, especially cross-border lines, will benefit them. Also, the balancing of local environmental damages (e.g., disturbing the landscape) on the one side and regional or global environmental benefits and economic benefits of resolving a congestion zone on the other is difficult. Fears of devaluation of amenities and prosperity, as well as perceived health threats, are other important issues leading to «not in my backyard» attitudes across the continent. The attempts to resolve the interest-balancing problem and increase public acceptance from the side of the TSOs have not always been very successful. Public opposition is generally lower against lines built by publicly owned TSOs, but also in these cases, the resistance can be significant (ENTSO-E, 2010b; European Commission, 2007b; MVV consulting, 2007).

Will the investments lead us onto a track to 100 percent renewables by 2050?

At the current grid reinforcement and expansion pace, it is unlikely that Europe will manage to achieve 100 percent renewable power by 2050 in an economically acceptable way, mainly due to bottlenecks in the grid (SRU, 2010). Thus, the problems described above must be addressed and solved. However, it is also not clear whether a national regulation based on medium-term economic efficiency is compatible with a European long-term target.

The integration of remote European, or even non-European, renewable power resources and the efficient smoothing of intermittent supply require highly efficient, long-distance transmission networks. Today, the technology of choice for this would be HVDC, a technology that is well-known and widely used in Europe for subsea connections. An HVDC grid, or a number of HVDC feeder lines, is probably the cheapest way for bulk electricity transfer over vast distances and the integration of large amounts of renewable power in the future (Czisch, 2005; May, 2005). However, HVDC requires DC/AC converters and is thus more expensive than HVAC over short distances. The break-even point is at about 800 km (DLR, 2006), and not many countries in Europe offer stretches of this length, as they are too small. Thus, due to the current regulation framework, in essentially all cases it would be more profitable for a TSO to build an HVAC line, despite higher losses in the long run. Adding new HVAC units remains the easier, and probably cheaper, option for TSOs in the short term, but becomes more expensive in the long term if an HVDC overlay system finally needs to be installed. If this is the case in the future, the medium-term national regulation and the long-term European objectives may be in conflict.

Furthermore, the renewables action plans are developed in a national setting, and the majority of the Member States expect to fulfill their national 2020 targets alone (DG TREN, 2010). Given the very long lifetimes of transmission assets and the long lead times for their construction, this may lock the Member States into paths that are less than optimal in the longer and geographically broader perspective. This may take the form of power line stretches that are nationally optimal, but regionally inefficient, for example by ending at a national border. It may also be in programmatic form: Some countries may decide to go for centralized renewables, like the gigantic wind farms in the United Kingdom and Sweden, whereas others may decide for a more decentralized solution, like the massive growth in photovoltaics in Germany, and build grids only capable of handling one type of generation. Although there is not necessarily a conflict between these approaches, the path dependency in the power system requires us to acknowledge such potential system conflicts now in order to be able to avoid problems further on.

Governance for a SuperSmart Grid

The current national regulation and the framework of fragmented national energy policies and power markets are unlikely to trigger an expansion of the European transmission grids in the necessary magnitude. Below, possible solutions to some of the most important points are discussed.

Europeanization of regulation, cost recovery and planning

A new regulatory model, designed for Europe and its electricity needs of the future, is required to create a European grid capable of integrating large amounts of renewable power from both utility-scale and decentralized generation while achieving the maximum European economic benefit. The aim is to create a pan-European grid, possibly including an overlay HVDC grid, the structure of which is defined by resource abundance and load areas, not by administrative borders.

First, the regulatory framework must stimulate the construction of lines that are beneficial from a European perspective and guarantee that the required investments can be fully recovered, regardless of national borders. For this, a set of predictable, stable and transparent mechanisms handling the tariffs on a European level are needed. The introduction of a European grid-access tariff could complement, or entirely replace, the existing national grid-access tariffs. Such a regulatory framework would guarantee cost recovery of international lines and reduce the investment risks of new interconnectors, which in turn would lower the costs of capital – and the total cost – for such investments. To oversee the European regulation and the European grid planning, a European regulator and a European planning entity will be needed.

Today, we already have the seeds for a new regulatory regime, in the form of the Agency for the Cooperation of Energy Regulators (ACER). In the future, a European Regulatory Authority (ERA) – with a European mandate to regulate the union-wide grid expansion in support of the renewable and general energy objectives of the EU in the short-, medium- and long term – will be required to manage the grid regulation on a European level. The ACER could evolve into such an entity. The ERA would supervise and approve the permission criteria (see section 3.2). It would also be in charge of converting the European planning entity's grid plan proposal (see next paragraph) into an operative and legally binding grid development plan and implement the European grid-access tariff as defined by policy. Additionally, the ERA would be in charge of developing and approving compensation toolboxes and procedures to handle public opposition to grid infrastructure extension and address the legitimate concerns of citizens and communities affected by transmission line construction.

In addition to the regulatory authority, a planning entity responsible for the mid- to long-term transmission grid planning at the European level – in line with the long-term objectives of renewable integration of the Member States – will be necessary. The first steps toward such a plan were taken with the first TYNDP of the ENTSO-E (ENTSO-E, 2010b), but it remains to be seen whether this type of planning is sufficient or if planning of a more binding nature is required. The role for the planning entity, which may remain the ENTSO-E, will be to define the future grid architecture to achieve the maximum European economic benefit in the long run and the integration of renewable electricity at the level predefined by policy.

The TSOs will still be in charge of constructing the grids, as defined in the grid development plans, within the given timetables. They will submit investment costs to the ERA, which monitors the cost recovery along the lines of a predefined, European remuneration model. The TSOs will also be responsible for applying the European and national grid-access tariffs to collect the funds to finance new grid developments, and for applying the compensation tool boxes and further develop local strategies for dealing with public opposition.

Setting the right incentives: De-risking and unbundling

Investors in many cases see the risks of a new transmission line, especially interconnection lines, as being too high for the compensation level. In addition, the vertically integrated TSOs may be willing to accept lower turnover to fend off competitors from the other divisions of the mother concern. To trigger investments at the appropriate levels, the financial incentives must be set right. One way of doing this is to allow for higher risk premiums, but doing so will create higher costs for the European economy. Still, the higher returns are one main reason for the construction of merchant lines: Here, the returns are sufficiently high to encourage some investment. Another way to set more adequate incentives for new-build without increasing the immediate costs for consumers is to de-risk the transmission investment.

De-risking transmission projects may take many forms. A core problem of transmission investment is of a chicken-and-egg nature: The main uncertainty for new lines is to know whether there are customers (loads and/or generators) that will want to be served by the line. Conversely, an important risk for generation investment is the grid connection, and generators may be reluctant to start building before the grid is there. This problem is especially accentuated for renewables, as these power stations are often constructed in remote areas with only weak or no transmission capacity available.

Defining areas of European interest for renewable power generation would be one way of reducing the uncertainty, and thus the risk, for transmission investments. Such increased coordination of generation and transmission will make the TSOs much more certain about where the generation will take place and roughly when the new capacities will be installed, which in turn will help initiate new types of connections (i.e., offshore HVDC grids) and new interconnectors by decreasing the risk profiles of such investments.

Another way of de-risking transmission investment could be public co-funding, which may lead to increased credibility for the project and help mobilize private funds. Such co-funding schemes must be transparent and targeted at widely accepted, «good» aims, such as integrating renewable electricity, to ensure public acceptance. The co-funding can take a number of fundamentally different shapes. The first option would be a public/private partnership: Here, the risk profile of the project is decreased by the presence of a public partner who carries a share of the investment costs. The second option would instead address the returns of a project and reduce the payback time for the investment, still within a regulated assets environment. For this option, public co-funding is required to guarantee a regulated but higher-than-normal rate of return for investors during the first years of operation of the transmission lines. A support mechanism that guarantees a rate of return between 10 and 12 percent annually for the first three to five years could be considered. Furthermore, concessional loans, marginal cost coverage by public authorities and the combination of a number of approaches may come into question: It is important that the scheme is adopted to reduce the risk – or increase the rate of return – of transmission projects in support of the expansion of renewable electricity in a cost-effective manner for European citizens. Finance for public co-funding of transmission projects could come from a variety of sources, including the EU budget, the emission trading revenues, the European Investment Bank and different national fund sources, as well as from increased grid tariffs or additional levies or fees.

Another source of risk – and a major obstacle for the timely construction of new lines – are the lengthy and uncertain permission processes throughout Europe. First, it is essential to make these processes more streamlined and predictable, for example by defining a clear and transparent set of criteria that must be fulfilled for a transmission corridor to be permitted. Any project that fulfills this is – in principle – eligible for a construction permit, which would limit the possibilities for litigation and very long legal processes. This could both fulfill the certainty requirements of the investors, and guarantee the citizens' rights. It is crucial that the criteria are set to appropriately weigh the advantages for the power system and the TSO against the disadvantages of the local stakeholders, and that the public consultation processes are strengthened. In addition, public knowledge about the risks and benefits of transmission lines should be increased. Greater knowledge about the actual health risks and environmental problems of transmission lines is likely to reduce opposition. Still, to further reduce the local public resistance and accelerate the permission processes, the ERA and the TSOs will likely need to consider how the public consultation procedures can be improved and how compensation toolboxes for affected citizens can be developed. Furthermore, a requirement to finish the permission process within two to three years following the application – with a transparently motivated acceptance or denial of the application – could be a suitable tool to accelerate the processes to more acceptable levels. All these measures will contribute to increasing investor certainty and accelerating the permission process, which in turn will be an important step toward reducing the investment risks of transmission projects.

Finally, the importance of unbundling must be stressed once more. As described in detail above, the issue of transmission grid ownership is of crucial importance for setting the incentives for new high-voltage lines, and especially interconnectors. With the third energy package, the European Union still lacks an ownership unbundling obligation. If Europe is serious about truly integrating its electricity markets and achieving very high shares of renewables in the power sector, this must change: Ownership unbundling remains a key to the electricity supply of the future.

Berlin, December 2010

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Abbreviations

ACER	Agency for the Cooperation of Energy Regulators
CSP	Concentrating solar power
ENTSO-E	European Network of Transmission System Operators for Electricity
ERA	European Regulatory Authority
HVAC	High-voltage alternating current
HVDC	High-voltage direct current
TSO	Transmission system operators
TYNDP	Ten-Year Network Development Plan

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Antonella Battaglini is a senior scientist at the Potsdam Institute for Climate Impact Research (PIK). She leads the SuperSmart Grid process, a concept she developed with her team in 2006. It explores investment and technology options for transition to a decarbonized economy and in particular to a 100% renewable electricity system.

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