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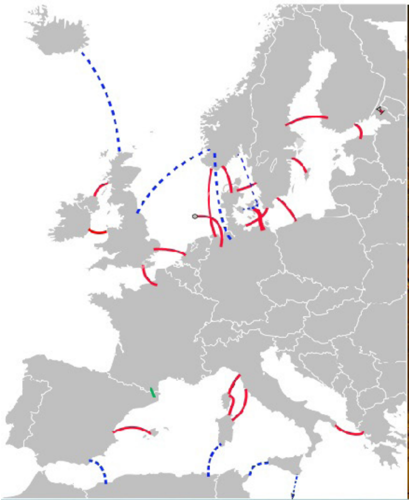

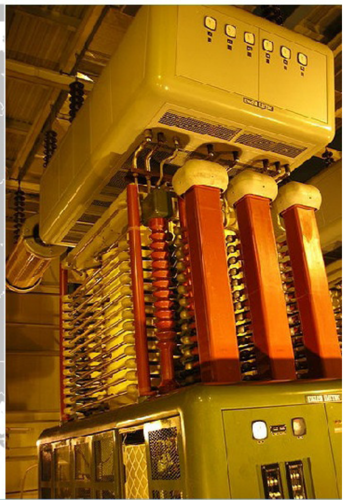

Trends in EU energy grids regulation

CONTENTS

Which regulatory tools are best equipped on the national as well as European level to create functioning EU-wide electricity and gas market infrastructures, as well as address the urgent need to make grids fit for the future? this issue looks at three topics that describe current trends in energy grids regulation. Firstly, it looks at the question whether and how the EU should be involved in the electricity and natural gas transmission grid tarification, to allow for fair competition and the right investment signals. Secondly, the issue looks at the significant role offshore wind farms play for the accomplishment of the EU energy and climate objectives and the possible EU policy actions that could support the investment in offshore wind farms as well as their connection to the grid. Thirdly, the issue proposes a cost- benefit method to evaluate and compare electricity transmission and storage projects in the context of the recently adopted Energy Infrastructure Package.

Guest editor: Jean-Michel Glachant

P.S.: If interested in contributing to one of the forthcoming issues, please send an email to: <matthias.finger@epfl.ch>

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Dossier

EU Involvement in Electricity and Natural Gas Transmission Grid Tarification[1]

Authors: Sophia Ruester***, Claudio Marcantonini*, Xian He*, Jonas Egerer**, Christian von Hirschhausen**, and Jean-Michel Glachant*
Editor: Annika Zorn*

1. Topic 6 of the EU's FP7 funded project THINK. The project report is available at: http://think.eui.eu.

I. Highlights

• Current EU involvement in the regulation of TSO revenues and transmission grid tarification is rather limited and the existing heterogeneity among national regulatory practices and transmission tariff structures might be an obstacle for functioning competition and adequate investments in the grids.

• However, we see neither the need nor solid justification for an EU-wide harmonization of the regulation of TSO revenues. ACER should take the responsibility for benchmarking national regulatory practices. Transparency standards should be extended. Innovative solutions to trigger investments (e.g. competitive tendering or a European tariff component) need to be considered. The EU shall call for the removal of legal barriers that might impede grid investments; it is notably necessary that third parties can invest where incumbent TSOs do not show interest to realize identified priority projects.

• To increase transparency, the cost components included in electricity transmission tariffs should be harmonized; they should only include costs related to transmission grid infrastructure. Locational signals providing reliable ex-ante signals should be introduced. To avoid a distortion in competition, the EU should fix an average share of the G/L-components; thus, introduce a minimum G-component. The behavior of grid users in the competitive sector must not be distorted, i.e. transmission tariffs covering the long-term cost of infrastructure should not be calculated based on energy transported (i.e. in €/MWh).

• In the European natural gas sector, there are more than 30 entry-exit zones with mainly administratively determined borders. The EU should set principles for determining the ideal size of entry-exit zones, but let concerned NRAs and TSOs agree on the result. Once market areas are merged, there are good economic reasons to implement a system of common tarification. The role for the EU here should be limited to support sound agreements between the respective stakeholders.

• We recommend some harmonization in natural gas transmission tarification to ensure that the breakdown of costs among grid users and among entry- and exit points respects the principle of cost-reflectiveness as much as possible. Adequate discounts on short-haul transports should be encouraged. Asymmetric re-allocation of costs, such that 'captive' domestic consumers have to bear disproportionately high costs, shall be prohibited.

II. Background

The current EU involvement in the regulation of TSO revenues and transmission grid tarification is limited and mainly addresses issues related to interconnection and supply security as well as the definition of underlying principles for third party grid access and capacity pricing. Heterogeneity among national, or even local transmission tariffs might be an obstacle for functioning competition and adequate investments into the grids in the context of EU energy policy goals (i.e. "2014", "2020", and "2050"). Even though transmission tariffs account only for a small percentage of final industrial consumer electricity and natural gas prices, both their level and structure can have a strong impact on infrastructure investments and on how commodities are traded within and between countries.

In what follows, we derive recommendations on the future role of the EU and a potential need for harmonizing transmission grid tarification. We ask (1) whether existing heterogeneities in regulatory practice might hamper adequate investments or impede efficient competition and, if yes, (2) whether new EU legislation in place and new EU instruments notably from the Third Package – once enforced – provide an efficient solution. Increased trans-national involvement may have benefits, such as the better functioning of markets and the facilitation of infrastructure development, but it also comes at a cost, such as increased information asymmetry between individual decision makers and higher-level coordinating or regulating institutions. Both have to be weighed carefully. Practical and political implementability of the proposed solutions (both in the near- or long-term) is one of our key concerns.

III. Analytical framework for the analysis of policy measures going beyond the national level

Any EU involvement must not go beyond what is necessary to achieve the high-level objectives in the EU Treaties, except for areas of EU exclusive competences. To discover the need and pertinence of policy measures going beyond national level, three questions are to be answered:

#1 - First, whether EU involvement is justified on the grounds of subsidiarity. Any higher European level

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of decision-making shall avoid pre-empting any area of legitimate Member State involvement. From an institutional perspective, there are shared competences between Member States and the EU regarding the achievement of the European energy policy goals – i.e. the completion of the internal market, a sustainable and environmentally friendly energy system, and security of energy supplies (Art. 194, Treaty of the Functioning of the EU). It is then legitimate to look at this more closely to see if there are substantial economic benefits to be made from a renewed EU involvement.

#2 - Second, whether the achievement of policy targets is hindered by profound and permanent market failures. In the presence of strong (positive or negative) externalities, decentralized decision-making will not result in the socially optimal investments from a regional or an EU-wide perspective. Distributional concerns occur as soon as multiple stakeholders are involved and diverging interests can hamper efficient decision making. Trans-national involvement can also be important to stimulate information benefits we can get from various national regulatory authorities being learning from their diverse regulatory approaches.

#3 - And finally, whether the necessary regulatory actions could be decentralized among various local players and whether objectives could be achieved based on voluntary, regional cooperation, instead of being the result of top-down, centralised decision-making to get a workable implementation process.

IV. Regulation of TSO revenues: A national undertaking?

The observed heterogeneity in general price control mechanisms and instruments used to promote new investments probably does not hamper adequate investments in national infrastructures having no strong cross-border impact. Key parameters determining investment incentives are an adequate risk-reward ratio, regulatory stability and transparency, all issues national regulators can properly address. In addition, the current heterogeneity regarding instruments used to promote investments can actually provide valuable insights into 'functioning' models and might allow to discover 'best practice' for specific situations.

Cross-country comparability, however, has shown to be difficult due to the observed heterogeneity in national regulatory practices in terms of determining asset base and level of remuneration. This could result in higher cost of capital and additional risk from the point of view of external investors, whose funds are indispensable to meet the substantial financing needs in energy infrastructures in the coming decades. Moreover, differing methodologies used to calculate the allowed revenue could actually hamper adequate investments regarding projects that have a regional (i.e. cross-border) impact. Especially in the electricity sector we face an increasing need to build long-distance transmission lines. Competition between corridors (and thus between TSOs from different Member States) can imply that the grid might be expanded where an investor gets a more favorable return. Finally, besides various exogenous factors that are beyond the control of TSOs and differences in internal operating efficiency, heterogeneity in national regulatory practices leads to a situation where for the same volume of assets different authorized revenues will be calculated, which in turn results in varying transmission costs and tariff levels.

Our recommendations for future EU involvement:

• We see neither the need nor solid justification for an EU-wide harmonization of the regulation of TSO revenues. Nevertheless, we recommend that decisions regarding the realization of projects with a pan-European impact should be taken on the EU level instead of being the result of a reaction to rates-of-return settled by national regulators in different Member States. Where a regionally specific solution has to be found (e.g. offshore grid), decentralized cooperation and coordination are appropriate.

•ACER should take the responsibility for benchmarking national practices and formulate an opinion about the appropriateness of various methodologies employed. Transparency (i.e. reporting) standards need to be extended.

•In view of the amount of predicted investment needs, innovative solutions to trigger investments (e.g. competitive tendering or a European tariff component) should be considered to become common tools, too.

V. EU involvement in electricity transmission grid tarification

There is wide heterogeneity regarding electricity transmission tariff structures among EU Member States. This does hamper both adequate investments and efficient competition. While the EU has defined general principles of tarification, there is little EU involvement with respect to tariff design except for some harmonization of the maximal average G-component. The existing ITC mechanism is an ex-post instrument which is intended to compensate TSOs for the costs resulting from hosting cross-border flows of electricity. Apart from some methodological weaknesses, it is not designed to incentivize the timely realization of grid investments or to allocate costs of new infrastructures. These issues are expected to be addressed by the proposed Energy Infrastructure Package for projects of pan-European interest; however, we identified some factors that might hamper the successful implementation and effectiveness of this new regulation.

Our recommendations for future EU involvement:

•To increase transparency, the first area of harmonization should involve the clear definition of which cost components transmission tariffs should contain. They should only include costs related to transmission network infrastructure.

•Transmission tariffs should be allocated as far as possible based on the principle of cost causality. Locational signals should be introduced, taking into account national system specificities, being calculated based on sound methodologies and providing reliable ex-ante signals. The provision of time signals can be considered, too. To give economic signals to generators, obviously a certain share of the tariff needs to be paid by them. To avoid a distortion in competition, the EU should fix an average share of the G/L component; thus, introduce a minimum G-component.

•The behavior of grid users in the competitive sector should not be distorted, i.e. transmission tariffs covering the long-term cost of infrastructure should not be charged based on energy transported (i.e. in €/MWh) but instead be paid based on booked capacity or lump-sum, computed separately for different types of grid users in different areas so that charges properly reflect the network-related relevant characteristics of the network users.

•The EU should call for the removal of the legal barriers that might impede grid investments where strong geographical asymmetries in costs (i.e. investment needs) and benefits occur. It is necessary that third parties can invest where incumbent TSOs do not show interest to realize identified priority projects.

•Finally, given the uneven distribution of benefits among stakeholders arising from increased interconnection capacities and the concern that national regulators tend to protect domestic consumers from rising prices, effective means have to be found to incentivize NRAs to support the development of identified priority projects.

VI. EU involvement in gas transmission grid tarification

In the natural gas sector, heterogeneity in tariff structures does not hamper adequate investments while it might certainly hamper efficient competition. There are more than 30 entry-exit zones with mainly administratively determined borders. Furthermore, systematic bias exists in the form of a cross-subsidization between short-distance transmission and long-distance transportation; domestic consumers tend to cross-subsidize transit flows. Other obstacles to functioning competition include contractual congestion, inefficient pricing of non-standard products, a persisting lack of backhaul capacities, or the limited compatibility of capacity products offered. The implementation of new legislation (i.e. Third Package, Network Code on capacity allocation mechanisms) will substantially increase transparency and compatibility and facilitate natural gas trade and competition. However, it does not address all obstacles listed above.

Our recommendations for future EU involvement:

•The EU should set principles for determining the ideal size of entry-exit zones, but let concerned NRAs and TSOs agree on the result. Boundaries of price zones should reflect the technical and economic conditions rather than political borders; mergers of market areas shall be evaluated on a case-by-case basis based on expected economic benefits and costs. Once market areas are merged, there are good economic reasons to implement a system of common tarification. The role for the EU here should be limited to support sound agreements between the respective stakeholders. The actual implementation of harmonization of tariff structures and definition of a mechanism to compensate TSOs can be managed at the regional level.

•We recommend some harmonization in natural gas transmission tarification to ensure that the breakdown of costs among grid users and among entry- and exit points is designed so that the principle of cost-reflectiveness is respected as far as possible. Adequate discounts on short-haul transports should be encouraged and an asymmetric re-allocation of costs such that 'captive' domestic consumers have to bear disproportionately high costs, shall be prohibited.

•The EU, through ACER, should formulate a set of 'good practice guidelines' regarding natural gas transmission tarification. Entry- and exit charges should be actively used to provide locational signals to grid users wherever this is economically reasonable. Commodity-related components should reflect short-run marginal costs in order to avoid distortions in the behavior of shippers in the commodity market and network tariffs should clearly be identified, containing only those cost elements that are related to the transmission activity (i.e. infrastructure investment and operation).

Summary of the findings:

	Regulation of TSO revenues	Electricity transmission tariffs	Natural gas transmission tariffs
Heterogeneity hampers adequate investments?	Probably no for purely national infrastructures Probably yes for infrastruc-tures with regional impact	Probably yes	Probably no
Heterogeneity distorts competition?	Possibly yes	Probably yes	Probably yes
New legislation – *once enforced* – solves the issues?	Probably no	Probably no	Probably no
Recommendations on future EU involvement in a nutshell	# No need for EU-wide harmonization # Decisions on realization of projects with pan-European impact to be taken at EU level; decentralized cooperation of all relevant stakeholders where a regionally specific solution is required (e.g. offshore grid) # Benchmarking of national practices through ACER # Consideration of innovative solutions to trigger investment (competitive tendering, EU tariff component)	# Definition of cost compo-nents to be included in tariff # Allocation based on principle of cost causality → implemen-tation of locational signals and consideration of time signals # Introduction of a minimum G-component # Transmission tariffs covering long-term infrastructure costs not to be charged in €/MWh # Removal of legal barriers that might impede investment # Incentivization of NRAs to support development of identified priority projects	# EU-wide principles for determination of ideal size of entry-exit zones # Breakdown of costs among grid users and among entry- and exit points such that principle of cost-reflectiveness is respected as far as possible # Formulation of 'good practice guidelines'

Offshore Grids: Towards a least regret EU policy[1]

Authors: Leonardo Meeus, François Lévêque**, Isabel Azevedo*, Marcelo Saguan and Jean-Michel Glachant*
Editor: Annika Zorn*

1. Policy brief for topic 5 of the EU FP7 funded project THINK. Project reports available at: http://think.eui.eu.

I.Highlights

•The objective of the 5th report of THINK has been to formulate policy recommendations to the European Commission (DG Energy) on offshore grids, and this brief is derived from that report.

•The development of an offshore grid is able to play a significant role in the accomplishment of the EU energy and climate objectives. The total installed capacity of offshore wind farms is expected to increase from the existing 3 GW to about 40 GW by 2020. The number one priority project in the recently proposed EU infrastructure package is the Northern Seas offshore grid.

•There are two possible offshore grid developments (Figure 1): there could be a multiplication of standalone lines, which already exists today; or there could also be a transition towards combined solutions, which requires more advanced grid technology than what is currently on the shelf. The first would correspond to an increase of shore to shore investments to exchange energy across borders or to relieve congestion within an onshore grid, and an increase in farm to shore investments to connect offshore wind farms to the existing onshore grid. The second instead would imply mixed investments, combining the connection of offshore wind farms with the creation of interconnection capacity.

•The potential for EU added value depends on which of these alternative offshore grid developments will prevail. The economic case for combined solutions is still uncertain, but regulation needs to be proactive to avoid compromising this possible offshore grid development. It means that we have to address the fact that the currently mainly national regulatory frames for farm to shore and shore to shore investments are unsound, and the difficulties to design and develop combined solutions are tremendous.

•We recommend the European Commission to take initiatives to: 1// harmonize into economically sound regulatory frames for offshore transmission investments; 2// harmonize the renewable support schemes for offshore wind farms; 3// facilitate the ex-ante allocation of costs and benefits of offshore transmission investments; 4// speed-up offshore grid technology development; 5// adapt the Community-wide transmission planning to offshore grids, while also allowing regionalized solutions for the implementation of some of these remedies.

•A least regret EU policy on offshore grids indeed also implies giving a chance to regional initiatives, such as the North Seas Countries' Offshore Grid Initiative.

II. Standalone lines

There are two types of standalone lines, i.e. shore to shore to exchange energy across borders (with a so-called interconnector) or to relieve congestion within an onshore grid (with a so-called bootstrap), and farm to shore to connect offshore wind farms to the existing onshore grid.

Shore to shore

The economic features (i.e. the network externalities, cost and technology uncertainties, and economies of scale) of shore to shore investments are similar to onshore transmission expansions so that the regulatory frame offshore can be the same as onshore. The currently mainly national regulatory frames that apply to these investments are however economically unsound, i.e. they do not follow the three guiding principles to minimize the total investment cost of transmission and generation.

1. *Planning principle:* Planning is about coordinating transmission expansions with the demand for transmission, taking into account the strong economies of scale

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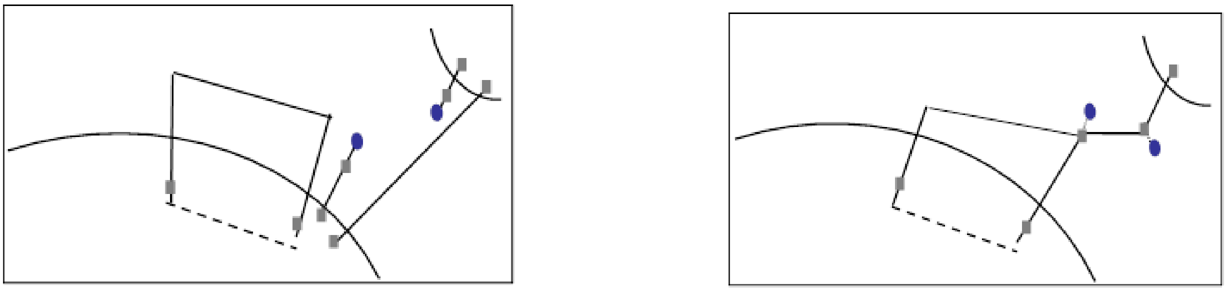


Standalone lines Combined solution
(Legend: ● wind farm; ■ converter station; —— HVDC cable; – – HVAC)

Figure 1 – alternative offshore grid developments

and network externalities of transmission investments. The most common procedure is that the Transmission System Operator (TSO) presents the costs and benefits of the proposed investments to the regulator who then decides which projects to approve. Despite the strong interdependencies between national grid investments, planning is currently done mainly at the national level, except for an indicative Community-wide planning procedure that has recently been introduced.

2. *Competition principle:* Tendering can be used to introduce competition, which is especially opportune when there are cost and technology uncertainties. Tendering for the participation of third parties in part of the investment decisions incentivizes innovation and reduces the problem of information asymmetry between the TSO doing the planning and the regulator. Note that transmission expansions onshore, contrary to offshore, are typically incremental investments in an existing grid, which can be many small investments that are more difficult to delegate. The coordination cost of tendering could therefore be higher than the potential gain from adding competition, but an element of competition can also be added by allowing third parties to propose projects to the regulator so that the TSO can be contested. This is currently only possible for merchant projects, while it is also being considered for regulated projects in the UK.

3. *Beneficiaries pay principle:* Making the beneficiaries pay is important to signal the costs of their demand for transmission services. A combination of transmission access rights (making users of a line pay) and transmission tariffs (sharing costs among grid users) need to be used to allocate costs to beneficiaries. Transmission tariffs are however national, while these types of projects create winners and losers beyond national borders. The ex-ante allocation of costs and benefits of offshore transmission investments is currently not facilitated at EU level, while it is clearly needed. The infrastructure package that has recently been proposed by the European Commission is a step in this direction.

Farm to shore

The national regulatory frames to connect a generator are economically unsound. This was already a problem onshore, but is especially problematic offshore because the economic features of the investment to connect a generator can be stronger offshore than onshore, especially for the most recent development of farm-to-shore connections (Box 1).

1. *Planning principle:* The commonly used first-come-first-serve procedure to connect generators is not in line with this principle. The potential negative impacts offshore are stronger than onshore due to the significant economies of scale that can be achieved when clustering offshore wind-farms, i.e. to use a single line to connect several wind-farms to shore, and the strong impact that such projects might have on the existing grid (because of their larger scale compared to onshore investments).

2. *Competition principle:* Contrary to this principle, TSOs design and develop the connection of a generator in most member states. Onshore, the disadvantage is limited due to the relatively limited cost level and limited cost and technology uncertainties of an onshore connection, but this is not the case offshore where connections tend to be more costly and based on less known technologies.

3. *Beneficiaries pay principle:* Regulatory practices in allocating these investment costs differ widely between member states, but so-called super shallow charging whereby the generator almost does not pay for its connection is not uncommon, while the generator is the main beneficiary. Generators that do not pay for their connection, do not have an incentive to proactively participate in connection planning, which is especially a problem offshore because offshore there are more opportunities to reduce the cost of connecting generators with planning.

Box 1. Borwin project (Source: Tennet)

Cost and technology uncertainties: Because of the large distance from shore, the traditional High Voltage Alternating Current (HVAC) transmission system cannot be used, instead, the lesser known High Voltage Direct Current Voltage Source Converter (HVDC VSC) systems need to be used.

Network externalities: There is a strong impact on the existing grid because 1200 MW in total needs to be connected close to shore where the existing grid is weak and often already congested. Note that Borwin will cost about 1200 m Euros, i.e. 400 MW in phase 1 in 2009 and 800 MW in phase 2 in 2012

Economies of scale: HVDC systems consist of a DC cable with two converter stations, one to convert the AC output of the wind turbine into DC, and one to reconvert the DC output of the cable into the AC of the existing onshore grid. By coordinating the connection of three wind farms in Borwin in two phases, only 3 converter stations and one cable to shore need to be used, instead of 6 stations and 3 cables.

Offshore wind pioneering member states have recognized the stronger economic features that farm to shore investments can have, and started to adapt their regulatory frames for these investments. The models of Germany, the UK and Sweden are good examples of how the first, second and third guiding principles can be implemented, respectively, but they are economically unsound from the perspective of at least one of the other principles.

1. *German model:* This is a good example of how advanced connection planning can be implemented. Planning for the impact of offshore wind on the existing grid has been initiated in Germany by the so-called DENA studies, and clustering of offshore wind farms has for instance already been proactively implemented in the Borwin project (Box 1). The model is however far from being perfect because offshore wind farms do not pay for their connection and there is no competitive tendering for the design and/or development of connections.

2. *UK model:* This is a good example of how the competitive tendering can be implemented. Tenders have already been organized in the UK for the ownership and operation of connections developed by offshore wind generators, and they are envisaged to also include the design and development of future connections. The model is also sound from the perspective of the third principle because generators pay for their connection. The inclusion of advanced connection planning in this model is ongoing.

3. *Swedish model:* This is a good example of how the beneficiaries pay principle can be implemented. Generators in Sweden pay for their connection; they are even responsible for designing and developing their connection so that the Swedish model is also sound from the perspective of the second principle. The model is however misbalanced because connection planning is missing.

III.Combined solutions

Combined solutions are mixed farm to shore (connection of offshore wind farms) and shore to shore (creation of interconnection capacity) investments. This type of offshore grid development is an alternative to standalone solutions and implies different recommendations in terms of regulation and EU involvement. Therefore, we first discuss the rationale for combined solutions and then provide recommendations for combined solutions.

Rationale

The rationale to combine is the same as to cluster, i.e. the possible reduction in the volume of assets, like in the Borwin project (Box 1). Contrary to clustering, the economic case for combined solutions is however uncertain because this alternative to standalone solutions requires more advanced grid technology than what is currently on the shelves.

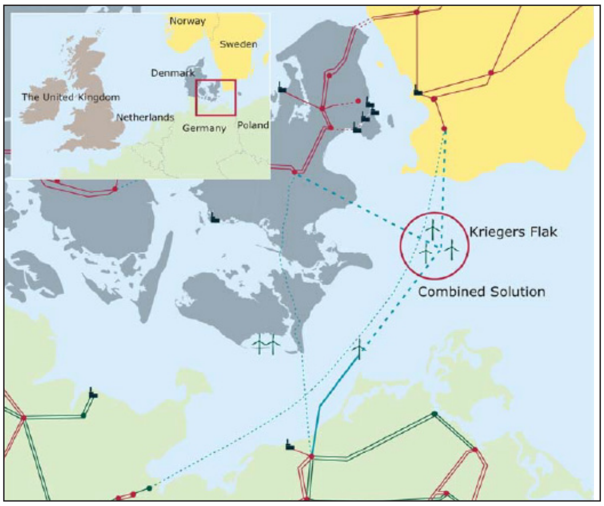
In existing HVDC systems, the whole infrastructure stops working if a fault occurs in one of its components. A more sophisticated operation of HVDC systems would require more advanced grid technology that has not yet been tested in practice, i.e. including hardware (e.g. HVDC circuit breakers) and software (e.g. HVDC control systems). In relatively small offshore grids, like Kriegers Flak (Box 2), it would still be manageable to shut down the entire grid to isolate a fault before reactivating part of it, so that combined solutions might already be opportune today. They may also become opportune on a wider scale in the future, depending on how the advanced grid technology develops.

Remedies for the key difficulties

There are five key difficulties to develop combined solutions under the current regulatory frame, which we will illustrate by referring to the Kriegers Flak project (Box 2). For each of these difficulties, we have also identified a remedy:

1// Harmonizing into economically sound regulatory frames for offshore transmission investments

Non aligned national frames for transmission invest-



Box 2: Kriegers Flak project

Project: the Danish TSO (Energinet.dk), a German TSO (50-Hertz), and the Swedish TSO (Svenska Kraftnätt) studied a combined solution, involving the connection of up to 1600 MW of offshore wind farms in an area that crosses the waters of their countries (Energinet.dk, 2009; E-Bridge, 2010; Jørgensen, 2011).

Economic case: The feasibility study argues that in this specific case, there is a net gain, but the study did not demonstrate that the net gain of this combined solution is superior to the net gain of a multiplication of standalone lines: "It is not within the scope of this pre-feasibility study to make detailed comparisons between a combined solution at Kriegers Flak and other ways of providing additional transmission capacity across the Baltic Sea."

ments make it difficult for stakeholders to cooperate in the development of combined solutions. For instance in the case of Kriegers Flak, the Danish and German TSOs are responsible for the interconnectors as well as for the connection of offshore wind farms in their waters, while the Swedish TSO is only responsible for interconnectors. A promising remedy would therefore be to harmonize the national frames towards the guiding principles of an economically sound regulatory frame for transmission investments (see above), which would include more harmonized planning responsibilities.

2// Harmonizing the renewable support schemes for offshore wind farms

Non aligned national renewable support schemes for offshore wind farms also make it difficult for stakeholders to cooperate in the development of combined solutions. For instance in the case of Kriegers Flak, this is not necessarily an issue, but the current project design only integrates three national solutions, whereby each country continues to import the offshore wind produced in its waters, which is not necessarily the best design. Therefore, a promising remedy would be to harmonize renewable support schemes for offshore wind farms, or at least to improve their compatibility.

3// Facilitating the ex-ante allocation of costs and benefits of offshore transmission investments

Even if the regulatory frames and renewable support schemes were harmonized, the development of combined solutions still requires cooperation between several stakeholders that do not necessarily benefit from this solution. For instance in the case of Kriegers Flak, three TSOs, three wind developers and three national regulatory authorities are involved. This multi-stakeholder setting is problematic because the distribution of benefits of offshore infrastructure is dispersed between many countries and between generators and consumers, with winners and losers that might need to be compensated. A promising remedy would therefore be the facilitation of the ex-ante allocation of the costs and benefits of the investment, which could prompt the implementation of the beneficiaries pay principle for combined solutions.

4// Speeding-up offshore grid technology development

The dependency on offshore grid technology development further complicates combined solution projects because this development is hampered by the typical market failures that apply to RD&D. For instance, the technology to use in combined solutions would typically be HVDC VSC, which is relatively new technology that has already been used for standalone lines, but not yet in a combined solution. As mentioned previously, the combined solution systems require more advanced hardware and software that still need to be developed and tested. Therefore, a promising remedy for the required offshore grid technology development would then be to coordinate and speed-up their development.

5// Adapting the Community-wide transmission planning to offshore grids

A final complication is that all the above difficulties have to be overcome in a context of uncertainty and irreversibility (e.g. dimensions of the offshore platform, cost of combining HVDC technologies that operate at a different voltage, etc.), while combined solutions are typically phased grid developments. For instance in the case of Kriegers Flak, the complete international solution with all offshore wind turbines spinning, all modules of the grid connection in operation, and electricity being traded, is still some years in the future, while the first building blocks and the most important decisions to enable a combined solution are not that far away. Therefore, a promising remedy could be to do more than only include offshore grid development in a Community-wide connection and transmission plan. We also need to develop new transmission planning methods, for instance to capture the value of investing today to create more options for possible incremental offshore grid investments.

V. Recommendations

Our analysis shows that the added value of additional EU policy actions for offshore grids depends on whether the offshore grid will develop as a multiplication of standalone lines or whether there will be a transition towards combined solutions. Therefore, we provide recommendations for standalone lines and combined solutions separately in what follows.

Standalone lines

Even though there is no need for a specific EU intervention for standalone lines, it is important to continue the following policy actions that are ongoing for grids, onshore as well as offshore:

1) It is important to continue the implementation of the third package, comprising a Community-wide transmission planning that already includes shore to shore investments. Additionally, it is worth mentioning that this still needs to be backed-up by an EU level facilitation of the ex-ante investment cost and benefit allocation, as proposed by the infrastructure package.

2) It is important to continue the experimentation with novel regulatory frames (e.g. Germany, the UK and Sweden) that have been fine-tuned for the connection of offshore wind farms. Note that, even if the currently imperfect fine tuning is not a problem from the EU perspective, the EU could add value by supporting this learning process, for instance, by benchmarking existing practices.

Combined solutions

The least regret EU policy strategy would be to implement remedies for the tremendous difficulties faced by combined solutions (see above), while also giving a chance to the ongoing regional initiatives. So, where opportune, the EU should opt for a soft intervention, guiding and supporting the national and/or regional policy implementation of the remedies; and, where a regional solution is not viable, a stronger EU involvement is already recommended today. In the report we consider both options for each of the remedies, but here we only list the resulting recommendations for initiatives to be taken by the European Commission, in addition to the third package and the infrastructure package proposal:

1) Harmonizing into economically sound regulatory frames for offshore transmission investments: By providing indicative guidelines that encourage member states to follow the guiding principles of an economically sound regulatory frame (i.e. planning principle, competition principle, and beneficiaries pay principle) to reduce the distortions coming from the national frames (i.e., soft type of EU involvement, supporting regionalized solutions).

2) Harmonizing the renewable support schemes for offshore wind farms: By promoting the use of the renewable support scheme flexibility mechanisms for offshore wind farms (i.e. joint project and joint support scheme mechanisms) to reduce the distortions coming from the national schemes (i.e., soft type of EU involvement, supporting regionalized solutions).

3) Facilitating the ex-ante allocation of costs and benefits of offshore transmission investments: By organizing the approval of transmission investment project packages, complemented with a new mechanism to implement the beneficiaries pay principle for combined solutions (i.e., strong type of EU involvement that could be complemented by partly regionalized solutions).

4) Speeding-up offshore grid technology development: Through the inclusion of an offshore grid technology roadmap in the SET-Plan, within an industrial initiative driven by HVDC manufacturers, focused on the speed-up of offshore grid technology development required for large scale combined solutions (larger than projects like Kriegers Flak). (i.e., strong type of EU involvement).

5) Adapting the Community-wide transmission planning to offshore grids: By developing improved transmission planning methodologies and applying them to elaborate on a twenty or thirty year network development plan that considers combined solutions (i.e., strong type of EU involvement).

Cost Benefit Analysis in the context of the Energy Infrastructure Package[1]

Authors: Leonardo Meeus****, Nils-Henrik M. von der Fehr**, Isabel Azevedo*, Xian He*, Luis Olmos***, and Jean-Michel Glachant*
Editor: Annika Zorn*

1. Policy brief for topic 10 of the EU FP7 funded project THINK. Project reports available at: http://think.eui.eu.

I. Highlights

•Cost Benefit Analysis (CBA) has proven to be a useful tool to support the economic appraisal of important projects in many sectors. In the energy domain, a single CBA method has been proposed at EU level to evaluate and compare electricity transmission and storage projects from different countries, which is unprecedented anywhere in the world.

•The objective of the 10th report of THINK has been to advise the European Commission (DG Energy) on the development of this method in the context of the Energy Infrastructure Package. This brief is derived from that report. We provide recommendations for the scope of the analysis as well as the calculation of the net benefit. We also discuss how the method can be used to rank projects.

•Regarding the scope of the analysis, our recommendations are: (1) interaction between projects must be taken into account in the project and baseline definition; (2) data consistency and quality should be ensured; (3) the conventional time horizon is 20-25 years; (4) CBA should concentrate on a reduced list of effects and those should be monetized; and (5) distributional concerns should not be addressed in the calculation of net benefits.

•Regarding the calculation of the net benefit, our recommendations are: (6) infrastructure costs need to be disaggregated; (7) the model used to monetize the production cost savings and gross consumer surplus needs to be explicitly stated; (8) a common discount factor should be used for all projects; and (9) a stochastic approach that is consistent with the Energy Roadmap 2050 should be used to address uncertainty.

•Regarding the ranking of projects, our recommendation is: (10) the ranking should be primarily based on the monetized net benefit.

•ENTSO-E has already proposed a draft method for electricity projects. We will analyse to what extent this method is in line with our recommendations and will conclude that it is an important step in the right direction. However, improvements could still be made, as proposed in this brief.

II. Introduction

The European Commission estimates that about €200 billion needs to be invested in electricity and gas infrastructure in order to achieve the 2020 energy and climate objectives. There is a risk that almost half of this expected investment will be too late or not at all. The aim of the Energy Infrastructure Package is therefore to accelerate the development of selected projects by: (1) facilitating their permit granting process; (2) providing an enhanced regulatory treatment for these projects; and (3) providing EU financing assistance for the selected projects that are important to achieve the EU energy objectives, but which are not commercially viable.

The Energy Infrastructure Package has established a process to identify Projects of Common Interest (PCIs) in priority corridors and areas . First, promoters nominate their projects to the Regional Groups which will be set up for each corridor or area. Member states and the European Commission will then rank the proposed projects in each Regional Group based on individual Cost Benefit Analyses (CBA). Finally, the European Comission will adopt an EU-wide list of projects based on the regional lists.

The Energy Infrastructure Package has also introduced a procedure to develop a CBA method for electricity and gas which promoters will be required to use when they nominate their projects. The ENTSOs are expected to propose a method, and ACER, the European Commission and member states will provide opinions on these methods. The ENTSOs will then review the method and finally the European Commission will then approve it. ENTSO-E has already proposed a draft CBA method in anticipation of this procedure.

In this Policy Brief, we will focus on electricity (i.e. transmission lines and storage). We will provide recommendations for the scope of the analysis as well as the calculation of the net benefit of electricity transmission and storage projects. We will also discuss to what extent the ENTSO-E proposal is in line with our recommendations. We will recommend how the method should be used to rank projects, but do not discuss the other uses that have been foreseen for the CBA method in the Energy Infrastructure Package (i.e. cost allocation and regulatory

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incentives for infrastructure investments).

III. Cost benefit analysis

We first define the scope of the analysis, to then discuss how the net benefit of transmission and storage projects should be calculated in the context of the Energy Infrastructure Package.

Scope of the analysis

Project & baseline definition

The purpose of CBA is to evaluate the economic effects of adding a project to a forecasted future, i.e. the so-called baseline. Therefore, scoping the analysis starts with the definition of the project and the definition of the baseline.

1. Interaction between projects must be taken into account in the project and baseline definition

In network industries, projects typically interact, i.e. they can be (1) complementary, or (2) competitive. Complementary projects should be dealt with in the definition of projects, i.e. they should be considered as a single project. Competitive projects should be dealt with in the definition of the baseline. Each project should be evaluated against two baselines (one with and one without all proposed projects) to detect competing projects.

The ENTSO-E proposal ensures that only projects that significantly contribute to the common goal of increasing the capacity on a certain border can be grouped. However, the objective should be to group together projects which are complementary in terms of their net benefit, i.e. the net benefit of both projects together is higher than the sum of the net benefit of the individual projects. Project promoters should be made responsible for providing evidence on the complementarities between investments that are proposed as a single project.

2. Data consistency and quality should be ensured

A public consultation is a good way to ensure the quality of the data that will be used in the baseline. ENTSO-E has already proposed such a consultation to validate the data, following the current practice in the context of the Ten Year Network Development Plan. It is also important to ensure the consistency of the scenarios with the Energy Roadmap 2050, which we will discuss along with the calculation of the net benefit.

3. Conventional time horizon is 20-25 years

There is a trade-off between capturing longer-term effects and increased uncertainty. The ENTSO-E proposal is already in line with the convential time horizon.

Effect mapping

The economic effects of developing electricity transmission or storage projects include (1) the impact on the power system, as well as the effects beyond the system, i.e. (2) externalities and (3) macroeconomic effects. The impact on the power system can be categorised into production versus consumption effects, infrastructure costs and other market benefits, such as improved competition and liquidity. The externalities are related to the impact of these projects on greenhouse gas emissions, renewable energy, local environmental and social costs, and the early deployment of innovative transmission or storage technologies (Box 1).

4. CBA should concentrate on a reduced list of effects and those should be monetised

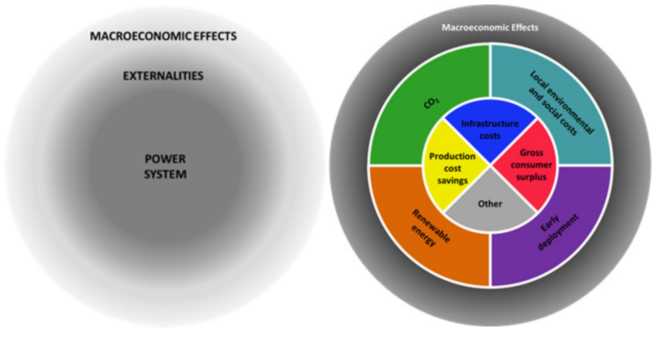
There are several effects that can be disregarded for different reasons: (1) macroeconomic effects, such as economic growth and employment effects, are relatively similar for most projects so they will not significantly affect their ranking; (2) infrastructure investments can result in a more efficient dispatch of power plants so that greenhouse gas emissions are reduced. However there is a carbon price so this effect has been internalised in the production cost savings; (3) infrastructure investments can also reduce the spilling of renewable energy, which will reduce the renewable energy capacity that needs to be installed to achieve the 2020 renewable energy target. In other words, considering greenhouse gas emissions and renewable energy as a seperate effect would imply double counting.

There are also effects that can be dismissed for most projects, with exceptions: (1) infrastructure costs include local environmental and social costs because promotors have to do an environmental impact assessment and take measures to fullfill certain requirements, although the visual impact of a project for instance is not yet covered by these regulations; (2) early deployment benefits have also already been internalised in the infrastructure costs as there are several EU programs to support innovative infrastructure projects, although there can of course be exceptions in innovative projects that have received relatively limited support; (3) other market benefits are relatively similar for most projects and are usually very small compared to other relevant effects. Exceptions could be projects that significantly change the market structure in an isolated area.

To sum up, there remain three effects that should be monetized for all projects, i.e. (1) infrastructure costs, (2) production cost savings and (3) gross consumer surplus. There are additional effects which may be relevant to specific projects and indicators should be used to identify these projects and to justify additional analysis to monetize also these effects. This can be the case for projects with an exceptional visual impact (e.g. projects in densely populated, protected or tourist areas) or for projects that significantly change the structure of a market (e.g. projects in isolated areas) or for projects that are exceptionally innovative (e.g. first of a kind projects, such as offshore infrastructures).

The ENTSO-E draft proposal lists nine benefits to be considered for all projects. A distinction is made between effects that are to be monetized, i.e. "total project expenditures, social-economic welfare, and variation in losses", and effects that are to be quantified as additional

Box 1: Comprehensive list of effects (own depiction)



indicators, i.e. "social and environmental sensibility, security of supply, RES integration, variation in CO2 emissions, technical resilience, and robustness". If projects are then ranked based on the monetized net benefit in combination with these indicators, it implies an implicit monetization of effects that have not been monetized explicitly. Such an implicit approach is less transparent and allows for subjective judgment.

Distributional effects

5. Distributional concerns should not be addressed in the calculation of net benefits

The economic analysis of efficiency gains from infrastructure projects should be done without consideration of distributional effects. If there are concerns, they should be resolved with explicit political decisions by relevant authorities. The European Commission could for instance use regional quotas when defining the EU-wide list based on the regional lists.

The ENTSO-E draft proposal does not explicitly discuss distributional effects, but it does refer to the EU Regional Policy Guide. The guide proposes the use of social discount rates, which implies that the rates of developing countries are higher because they have a higher economic growth outlook. As a result, the projects of these countries will be ranked lower than projects with similar benefits in developed countries, which exacerbates distributional concerns. Below, we argue in favor of using a common discount factor for all projects.

Calculation of the net benefit

Monetisation

6. Infrastructure costs need to be disaggregated

There should be a predefined list of cost components that promoters are required to report separately. The list of items proposed by ENTSO-E can be the starting point, but the costs incurred for mitigating environmental or social impact of the project should also be presented separately and included in the total project expenditure.

7. The model used to monetize the production cost savings and gross consumer surplus needs to be explicitly stated

There is no single model that adequately captures all the production cost savings and gross consumer surplus of all transmission and storage projects. It is therefore important that the assumptions of the model are clearly explained to allow for a proper interpretation of the CBA results. The choice of the model should also be coordinated with the data validation process of the baseline.

The draft ENTSO-E proposal leaves certain modeling choices to the Regional Groups, while also providing some model specifications.

ENTSO-E has proposed a minimum consideration of technical characteristics of power plants ("efficiency rate and CO2 emission rate") and a minimum geographic scope ("all member states and third countries on whose territory the project shall be built, all directly neighbouring member states and all other member states impacted by the project"). Note that Regional Groups may choose a sophisticated model, for instance including more detailed technical characteristics of power plants. It will therefore be important to coordinate these modelling choices with the data validation process for the baseline.

ENTSO-E has also proposed an indicator to estimate the changes in the volume of energy non-served during contingency periods i.e. "security of supply". ENTSO-E referred to the lack of reliable data across Europe as the reason not to monetise this effect. The CEER has already provided guidelines on how these values should be established at a national level, and an intermediate solution could be that a value is agreed upon as part of the data validation process for the baseline.

Inter-temporal discounting of costs and benefits

8. A common discount factor should be used for all projects

Projects of Common Interest will have a similar regulatory treatment and might also be eligible for EU financial support. The label can also improve the confidence of potential investors and thereby facilitate access to capital. These projects are therefore likely to have similar access to capital so that a common discount factor should be used for all projects. The factor should be agreed upon through open consultation, together with the parameters of the baseline.

The ENTSO-E draft proposal is partially in line with this recommendation because there is a single discount rate for every region. However, ENTSO-E also proposes to follow the EU Regional Policy Guide, which would exacerbate possible distribution concerns across regions.

Uncertainty

9. A stochastic approach that is consistent with the Energy Roadmap 2050 should be used to address uncertainty

The Energy Roadmap 2050 already provides possible extreme scenarios for the future that are consistent with the EU energy and climate objectives. Based on these scenarios, a stochastic approach should be followed to capture the robustness of projects across these possible futures, which would result in a net benefit distribution.

The ENTSO-E draft proposal already refers to the use of multiple scenarios and the use of sensitivity analysis, but not yet a stochastic approach. Nevertheless, it has already been implemented by several TSOs in Europe for electricity infrastructure projects. We argue that this approach should be adopted at EU level and be consistent with the scenarios of the Energy Roadmap 2050.

IV. Ranking projects

10. The ranking should be primarily based on the monetized net benefit

The method we recommend above is a stochastic approach that calculates a net benefit distribution against two baselines, i.e. one with and one without all proposed projects. However, to rank projects we need a single monetized value. This value could be obtained by taking the mean value of the net benefit distribution of a project against one of the baselines, but adjustments might then be needed for (1) competitive projects and (2) uncertainty.

The first issue is with competitive projects. If the ENTSO-E draft proposal were to be followed, the initial ranking would be based on the baseline with all proposed projects included. If two competitve projects are proposed and ranked against this baseline, they will be ranked low and both could even exhibit a negative net benefit, even if developing one of them could be strongly beneficial. To identify these kinds of cases, the baseline without the proposed projects could be used. However, if the ranking were based on the baseline excluding all other proposed projects, we would have the opposite problem. Competitive projects would both be ranked high, even in cases where it is only beneficial to develop one of them. In other words, there is no perfect baseline and adjustments to the initial ranking may be needed regardless for competitive projects.

The second issue is one of uncertainty. Even though the initial ranking is based on the mean value of the net benefit distribution of projects, policy makers (depending on their risk averseness) might wish to adjust the ranking of projects which exhibit a significantly different risk profile to the average project.

V. Conclusion

The draft method proposed by ENTSO-E is an important step in the right direction, however improvements could still be made, as proposed in this brief. It should also be considered a success in itself that a single CBA method has been proposed at EU level to evaluate and compare electricity transmission and storage projects from different countries as this is unprecedented anywhere in the world.

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The FSR Transport Area at the European University Institute is concerned with regulation of all transport modes and markets (including the relationship among them), and it currently focuses its activities on rail, air, urban public, intermodal transport regulation as well as postal and delivery services.

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Mode/Market	Title	Date
Urban	4th European Urban Transport Regulation Forum	30 September 2013
Air	5th European Air Transport Regulation Forum	25 October 2013
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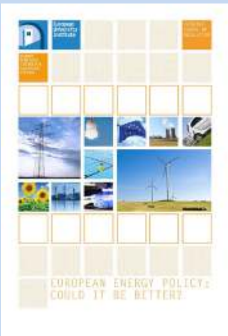

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With an introduction by Lord Mogg (President of the Council of European Energy Regulators), Fulvio Conti (CEO of ENEL) and Daniel Dobbeni (President of ENTSO-E & Chairman of the Board of Eurogrid International)
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Forthcoming Events

	Title	Date
Workshop	Enhancing the Retail Market Functioning (in Brussels)	26 June 2013
Webian	Shift, Not Drift: Towards Active Demand Response and Beyond (Register at http://fsr.eui.eu)	2 July 2013
Webianr	The Implicit Carbon Price of Renewable Energy Incentives (Register at http://fsr.eui.eu)	13 July 2013

Conference on Corporate Governance in Network Industries
30./31. October 2013, Vienna Austria

1st CALL FOR PAPERSDEADLINE FOR SUBMISSIONS: ***30th June 2013***

Overview
Network industries establish a highly interesting research area, as business operations generally need to account for both competition and regulation. Adequate performance is only reached by balancing economic efficiency and reasonable profits with public interests and investment needs. Especially the relationship between liberalization and regulation of monopolies dealing with public needs creates multi-disciplinary research questions related to corporate governance. In particular, market-orientated corporate governance mechanisms might not perfectly work in a partly monopolistic environment.

The conference intends to bring together academics, professionals, and representatives of governments and operators. The aim is to address key issues in network industries arising from the intersection of regulation and competition on the one hand and corporate governance on the other hand.

Conference Structure
The conference on corporate governance in network industries will be held at the new campus of the WU Vienna University of Economics and Business in Austria on 30. and 31. October 2013. The conference is jointly organized by the Institute for Corporate Governance (WU), the Chair Management of Network Industries (EPFL), and the Florence School of Regulation (EUI) supported by the WU Research Institute of Regulatory Economics. Accepted conference papers can be submitted to a Special Issue of the Journal Competition and Regulation in Network Industries (www.crninet.com/). The workshop will open with a Keynote Speech on new issues on corporate governance in network industries.

We would like to invite you to submit a full paper dealing with research topics, including but not restricted to:

- •The specifics of corporate governance mechanisms in infrastructure and network industries
- •Economic regulation of infrastructure industries (including Electricity, Telecoms, Gas, Water and other infrastructure industries such as airports, postal services, etc.) and its relation to corporate governance
- •Boundaries and overlaps between regulation and corporate governance for utilities and networks
- •The processes of de- and re-regulation, as well as privatization, and their implications on the corporate governance of the involved firms
- •Corporate governance of state-owned infrastructure firms

We would welcome both theoretical and empirical papers, including case study oriented work. Each presenter will have 15-20 minutes to present his/her work followed by comments from an assigned discussant, plus general discussion. If you are willing to act as an assigned discussant, please let us know.
Papers and all other queries should be sent to CGNI@wu.ac.at.

Important dates
Submission deadline: 30th June 2013
Notification of acceptance: 30th August 2013
Provisional program/start of registration: 2nd September 2013
Final program and end of registration: 17th October 2013

Fees
Conference charge is 150€. Students of the WU MBA Energy management program are free of charge.

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Call for papers

Competition and Regulation in Network Industries

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Brussels, Belgium
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6th annual conference of the multidisciplinary journal
Competition and Regulation in Network Industries

Network industries are caught between competition and regulation. To perform adequately, vital infrastructures (such as energy, water, telecom, post, railways, aviation, and transport) need to carefully balance private interests and public values, economic efficiency considerations with social service obligations, and pressures for further liberalization with the need to regulate monopolistic networks. At the same time significant innovations – notably in the field of ICT – are taking place that offer new opportunities and impediments for infrastructure operations and governance. Exploring this balance between competition and regulation in network industries provides a fascinating field of research that challenges politics and business alike.

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- Liberalization Models in Network Industries
- Measuring Network Performance
- Inter/supra-nationalization of Infrastructures
- Investments and Innovation in Network Industries
- Sector-specific issues (Electricity, Gas, Railways, Telecom, Post, Water, Aviation, Transport, Internet, …)

Keynotes
In addition to the parallel sessions, the conference will feature two keynote speeches by leading academics and/or practitioners in the fields of competition, regulation, and network industries.

With this call for papers the CRNI invites you to contribute to the conference through papers and panel suggestions.

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Please send a 600 to 1000 word proposal in a word document by 1 June 2013 to a.g.cruzvelis@tudelft.nl. The proposals will be refereed by the editorial board of the CRNI. The proposal should include:

- Title of the paper and a few keywords
- Name and full address of the (corresponding) author(s)
- The aim and methodology of the study
- Results obtained or expected

Important dates
Deadline for panel submission: 15 May 2013
Deadline for paper proposals: 1 June 2013
Notification of acceptance: 1 July 2013
Final paper submission: 15 October 2013

Fees
Members of academic / non-profit institutions: 200 Euro
Members of business community: 300 Euro
PhD students: fee waivers are available upon request

Further details
For further information about the conference, registration, submission, and program, please visit: www.crninet.com.

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Competition and Regulation in Network Industries

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