Pushing European power transmission: private investment in priority interconnections?

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This paper reflects on European transmission investment and particularly discusses the actions recently proposed by the European Commission to support the development of an effective electricity infrastructure.

Transmission infrastructure plays a key role in the present stage of European market integration. However, in order to select the optimal investment projects from a social perspective, a regional assessment of required projects is needed to balance national and international interests. This process will require strong cooperation between the TSOs and regulatory authorities involved. In addition to projects increasing transmission capacity between national systems, attention should be paid to investment projects alleviating congestion within national transmission networks as such congestion may just as well cause international trade limitations. Finally, it is important for TSOs and private investors that the criteria which will be applied for regulatory approval of new interconnections and the related procedural steps are transparent from the outset.

Until today, the solution of opening interconnection investment to private parties has not led to a significant increase in transmission investment projects. In fact, no real merchant investments in transmission have been realized in Europe as both the Estlink and the proposed BritNed interconnections involve TSO holding companies. In addition, one should realize that the incentives for private parties to invest in interconnection may clearly deviate from common public interests, which may lead to lock-in effects and long-term inefficiencies.

1. Introduction

Since the European Council meeting of March 2002 in Barcelona, where an agreement was made about a specific target for the volume of cross-border capacity and priority investment projects in the framework of the trans-European network were proposed [1], the European Commission has called frequently for additional interconnector investment.

The proposed priority projects, which have priority for Community financial aid, were formalized in 2003 [2] and updated in 2006 [3]. In order to further address the perceived problem of underinvestment, the European Union opened transmission investment to profit-motivated ('merchant') investors in 2003 by means of Regulation EC 1228/2003 ('the Regulation') on conditions for access to the network for cross-border exchanges [4,5].

In spite of these measures taken, the European Commission recently concluded both in its sector inquiry report [6] and in its proposed energy package of January 2007 [7] that market integration in the European electricity sector is still hampered by insufficient interconnection capacity.

This paper discusses the Priority Interconnection Plan published by the Commission as part of its proposed energy package of January 10, 2007 [7]. First, we reflect on the European transmission investment regime as well as the economic rationale of interconnector investment. Hereafter, we discuss the specific actions proposed by the Commission to support the development of an effective energy infrastructure in Europe [8]. The paper concludes by identifying and discussing some regulatory issues around regulated and merchant interconnectors.

2. Interconnection investment in Europe

2.1. Regulated versus merchant investment

According to European law, an 'interconnector' is defined as '*a transmission line which crosses or spans a border between Member States and which connects the*

national transmission systems of the Member States'.[2] Investments in interconnector capacity are part of the more general issue of transmission investment. In Europe, 'transmission' is an activity under responsibility of transmission system operators (TSOs). Their task includes, in principle, the construction, maintenance and operation of interconnectors.[3]

In general, in Europe investments in new transmission capacity, including interconnector capacity, are done by TSOs under supervision of their national regulatory authorities (the 'regulators'). The procedure to get the investment accepted in the rate base for regulated transport tariffs includes an assessment of the new capacity to be socially beneficial [10]. However, the costs of regulated congested interconnectors may also be (partially) recovered by the revenues a TSO has collected out of the allocation of interconnector capacity (Article 6(6) of the Regulation[4]). Revenues resulting from the allocation of (scarce) interconnector capacity are to be used for one or more of the following purposes: (i) guaranteeing the actual availability of the allocated capacity; (ii) network investments maintaining or increasing interconnector capacities, or (iii) as an income to be taken into account by the regulatory authorities when approving the methodology for calculating network tariffs, and/or in assessing whether tariffs should be modified.[5]

In addition to regulated TSO investments, the Regulation allows for a commercial alternative. In particular where lasting congestion and therefore a prolonged price difference between markets exists, market parties may be interested themselves to invest in new interconnector capacity in order to capture the congestion rents. Such interconnector investments by private parties are commonly referred to as 'merchant interconnectors'.

Within the European context, merchant interconnectors may differ on three main points from regulated interconnectors. First, the most fundamental difference is that the costs of merchant interconnectors are not recovered through regulated (transport) tariffs (which somehow relate to the costs of providing the transmission service) but from revenues from the future use

[2] Article 2(1) Regulation (EC) 1228/2003.
[3] For this chapter, see also De Jong *et al* [9].
[4] A regulation is directly binding, and does not need any implementation (Article 249 EC: "A regulation shall have general application. It shall be binding in its entirety and directly applicable in all Member States.").
[5] Capacity allocation of interconnector capacity (e.g. in the form of auctions) are allowed if congestion exists on an interconnector. See Articles 4(4) and 6 Regulation (EC) 1228/2003.

of the interconnector, i.e., the revenues that are induced by the electricity price difference between the two ends of the transmission line. Because of such price differences, the use of the interconnector has value for market parties (since it allows transportation of power from a lower priced market to a higher priced market). As the future price differences are to a large extent uncertain, the investor takes a commercial risk – hence the indication 'merchant'. A second difference is that merchant interconnectors are generally developed by other parties than TSOs [10]. In the European Union, the legal entities that have been designated as TSOs are not allowed to participate in a merchant interconnector. Third, the regulatory regime for merchant interconnectors may deviate as exemptions from third-party access are allowed.[6]

A justified question seems to be why governments should allow merchant investment in the first place. After all, electricity transmission is generally considered to be an essential service subject to economies of scale. Hence, regulation of such a natural monopoly is considered necessary to secure, amongst others, open access and a certain quality of service. It has been suggested that addressing the perceived problem of under-investment in transmission forms the main reason for opening transmission investment to profit-motivated investors [5]. Indeed, merchant initiatives may be necessary in markets where vertically integrated utilities have poor incentives to invest in new transmission capacity [11]. A second reason could be to address a lack of transmission capacity in a situation where a high-price and a low-price market are connected. The authorities at the side of the low-price market might be reluctant to increase the transmission capacity, since the local market price is likely to increase (cf. [12]). However, as long as merchant investments also need regulatory approval, the force of this argument may be limited. Third, a lack of political willingness to invest in a particular transmission line may provide an additional reason. If other priorities are defined considering the usage of regulated revenues and in case of insufficient political support to raise the regulated tariffs, only by means of merchant initiatives an expansion of the transmission capacity may be achieved.

However, as an argument against merchant interconnection it must be noted that, in general, the limited increase in interconnector capacity in Europe is probably more related to the difficulty of obtaining the necessary

[6] Article 7 Regulation (EC) 1228/2003.

planning and environmental licenses than a lack of willingness of the TSOs involved or the difficulty to get regulatory approval for the investment. Additionally, it may even be easier for a public TSO than for a private party to get the required licenses due to the fact that it discharges public functions.

2.2. Merchant investment: the special regime of the European Union

Article 7 of the Regulation provides for a special regime for merchant interconnectors. New direct-current ('DC') interconnectors may, upon request, be exempted from Articles 20 and 23(2), (3), and (4) of the Directive (concerning regulated third-party access) and Article 6(6) of the Regulation (concerning the use of the collected congestion rents). These exemptions can only be granted by the national regulatory authority on a *case-by-case* basis. A significant increase of capacity in existing direct-current interconnectors or, in exceptional cases, alternating current ('AC') interconnectors can also be eligible for the exemptions provided for in Article 7 of the Regulation.[7] The exemptions may however only be granted under the conditions listed in Article 7(1) of the Regulation.

Exemptions can be granted in several 'modes'.[8] First, two categories of exemptions are possible: (i) an exemption from the obligation to provide regulated third-party access, and (ii) an exemption from the obligation to use the collected congestion rents for the purposes listed in Article 6(6) of the Regulation. A regulatory authority may grant a full exemption from third-party access or only a partial exemption (e.g., with the effect that third-party access must be provided, although *not* on the basis of regulated and published tariffs or by a regulatory prescribed allocation method). It is also possible that only an exemption from Article 6(6), the prescribed use of congestion rents, of the Regulation is granted [10].

Any exemption decision may (only) be taken after consultation with the Member States or regulatory authorities concerned.[9] In this way, some cross-border coordination concerning the future regime for a proposed merchant interconnector is secured. Moreover, the exemption decision(s)

[7] Article 7(2) and (3) Regulation (EC) 1228/2003.
[8] Article 7(1) and (4) Regulation (EC) 1228/2003, further elaborated in DG TREN [13].
[9] Article 7(4)(e) Regulation (EC) 1228/2003.

must be notified to the European Commission, which may request that the national regulatory authorities concerned amend or withdraw the decision to grant the exemption.[10] If the regulatory authority or the Member State concerned does not comply with the Commission's request, a final decision shall be taken in accordance with the 'comitology procedure'.[11] This authority of the European Commission provides an important instrument for European coordination with respect to merchant interconnectors.

2.3. The economic rationale of interconnector investment

If additional transmission capacity is established between two nodes (with a price difference), the project benefits from a private perspective and a social perspective will differ. Consider a two-node network (assuming perfect competition in the generation and supply market) with relatively inexpensive generation in node A and relatively expensive generation in node B. Based on the aggregated supply and demand curves for each node, the import and export price dependency curves (PDC) can be constructed. These price dependency curves depict how the price in each node is affected when power is transported between nodes A and B [14]. Figure 1 visualizes by means of the prices dependency curves both the social and private value of new interconnector capacity.

In Figure 1, the curve Ex_PDC_A represents the price dependency curve of exporting node A. This curve shows how the price in the node A would increase as a function of exported capacity. Curve Im_PDC_B represents the price dependency curve of importing node B showing a price decrease in node B when importing a given capacity.

[10] Article 7(5) Regulation (EC) 1228/2003.

[11] Comitology procedure refers to the procedure by which the European Commission may adopt implementing measures (e.g. specifying certain provisions laid down in a European Directive of Regulation) after an implementation committee, composed of representatives from the Member States, has given its opinion on or approved the Commission's proposed measures.

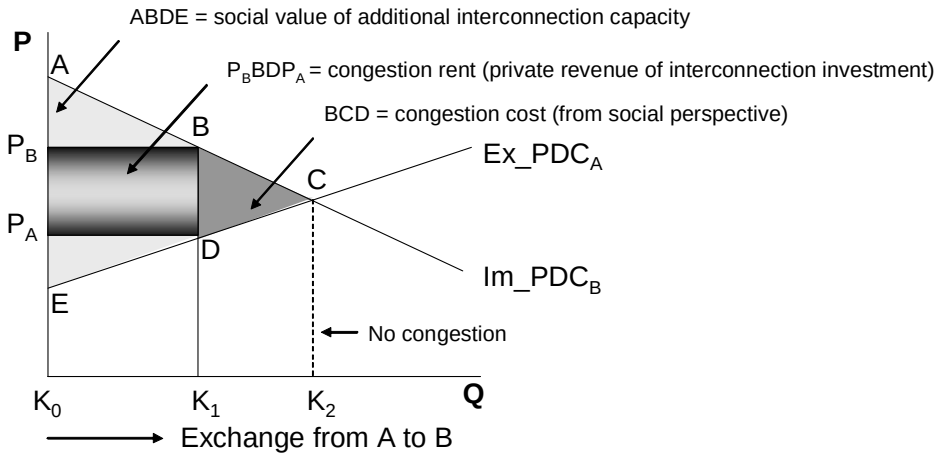

Figure 1. Social vs. private value of an interconnector investment. The horizontal axis represents the interconnection capacity between two nodes A and B, whereas the vertical axis gives the price in each node.

K_0 represents the situation in which no interconnector capacity exists between node A and node B. If the available transmission capacity between node A and B increases to K_1, the price in exporting node A rises to P_A and the price in importing node B falls to P_B. The triangle BCD in Figure 1 then reflects the cost of the remaining congestion, i.e., the deadweight loss caused by a lack of sufficient transmission capacity. From a private perspective, the benefits related to the new interconnector with capacity K_1–K_0 consist of the congestion rents[12] in situation K_1, i.e., the marginal price of congestion P_B–P_A times the capacity of the new interconnector K_1–K_0, i.e., square P_BP_ABD). From a social perspective, however, the value of the new interconnector is higher. It consists of the reduction of the congestion cost, i.e., the net increase of producer and consumer surplus which is represented by area ABDE. Due to the new interconnector an additional amount of demand (in node B) and supply (in node A) can be matched, which also contributes to the social value. The distribution of this social value to the consumer and producer surplus depends however on who actually pays for using the interconnector and who then benefits from the revenues collected. Here, it is important to notice that from a social perspective other elements may contribute to the value of the new interconnector as well, such as a higher level of market liquidity, price stability or a higher level of security of supply.

[12] The exact private revenues depend however on the allocation procedure used.

If there were no transmission capacity constraints, i.e., an available transport capacity K_2 in Figure 1, both markets would clear at the same price P_C. Here the difference between a private interconnector and a public interconnector becomes clear, since from a private perspective the benefits related to the new interconnector (the marginal price of congestion P_B–P_A times the available interconnector capacity K_2–K_0) would equal zero since there is no remaining price difference. Hence, it is unattractive for private investors to invest in interconnector capacity beyond a certain point. However, the social value, which is represented by (ACE) is maximized in this situation (since all costs of congestion are eliminated). Nevertheless, also in case of public interconnectors, the benefits of investment should be carefully balanced with the costs before a decisive position can be taken on the attractiveness of the investment. Nevertheless, the example above makes clear that investments which eliminate all congestion will never be attractive for merchant interconnectors, since they would not yield any revenues (unless the investment costs are recovered based on some regulated return on investment, which is a completely different case).

Here, an interesting regulatory dilemma appears. Merchant transmission investment is generally considered an effective instrument to stimulate market integration yielding an increase in available transmission capacity. However, as the merchant investment must be recouped from exploitation of the trade potential across the transmission facility, the merchant parties involved have a considerable interest to prevent the markets at both sides from fully integrating – otherwise all congestion rents would disappear [15]. This observation gives rise to possible strategic behaviour in optimizing the capacity of merchant interconnection in such a way that the total benefits minus costs are maximized, preferably in such a way that no attractive business case for investment in an additional interconnector capacity will be left (at least by other merchant investors). Now we are back in the situation of monopoly firms optimizing their returns on investment in a strategic manner – the basic reason why regulation of essential services has been developed in the first place.

2.4. Recent cases of European interconnector investment

At present, there is yet some experience in cross-border interconnector investment. The cases of NorNed, Estlink and BritNed will be concisely described.

2.4.1. NorNed

In 2004, TenneT and Statnett submitted an application for a 600 MW DC submarine cable (also referred to as the 'NorNed cable') between the Netherlands and Norway in order to get regulatory approval from the respective authorities to recover the investment in the interconnector from their regulated income. On December 23, 2004, the Dutch Office of Energy Regulation approved (after the Norwegian authorities had already granted earlier permission) the construction of a 700[13] MW DC regulated cable between the Netherlands and Norway [16]. The cable is expected to come into operation at the beginning of 2008. The cable is owned and operated by TenneT and Statnett while a large part of the investment is financed from the revenues from auctions at other congested borders of The Netherlands.

2.4.2. Estlink

The only merchant (electricity) interconnector project to date for which an exemption pursuant to Article 7 of the Regulation has been granted is the Estlink interconnector between Estonia and Finland. The Estlink interconnector will be a merchant interconnector until it will be transferred to the Finnish and Estonian TSOs somewhere between 2011 and 2013 when it becomes a regulated transmission link. The transmission capacity of the link will then be opened to third parties without any preference clause. In the period between the start of Estlink (Estlink was taken into service on 4 December 2006) and its transfer to the TSOs (somewhere between 2011 and 2013) the interconnector's capacity will be distributed by contractual arrangement among the project parties. These project parties are the owners of the company NEL (see table 1 below) which in turn is the owner (and operator) of Estlink.

The final decisions of the Finnish regulatory authority approving of Estlink were taken on February 2 and 4, 2005, while the Estonian decision dates from February 9, 2005. On February 23, 2005, the Directorate General for Energy and Transport was notified of the decision by the Estonian Ministry of Economic Affairs and Communications and by the Finnish Energy

[13] During the regulatory assessment and in order to improve the likelihood of acceptance, the TSOs guaranteed that the cable would have a nominal capacity of 700 MW instead of the original 600 MW without causing any additional cost [16].

Market Authority to exempt the above mentioned project from certain provisions of the Regulation and of the Electricity Directive 2003/54/EC [17,18,19]. The Commission assessed the notification within three months, resulting in an approval of both (national) decisions on April 27, 2005 [20].

Table 1 Ownership structure of Estlink

Merchant Project 2006-2011/2013	***Regulated Project 2011/2013 onwards***
• **Powest Oy 10,1% (Finland):** joint venture of Pohjolan Voima (60%) and Helsingin Energeia (40%), both private parties • **Eesti Energeia 39,9% (Estonia):** vertical integrated state-owned utility • **Latvenergo 25% (Latvia):** vertical integrated state-owned utility • **Lietuvos Energija 25% (Lithuania):** TSO (owner transmission grid and system operator), market operator and trade organizer	• **Fingrid 50% (Finland):** TSO • **Eesti Energia 25 % (Estonia):** vertical integrated state-owned utility • **Latvenergo 12,5% (Latvia):** vertical integrated state-owned utility • **Lietuvos Energija 12,5% (Lithuania):** TSO (owner transmission grid and system operator), market operator and trade organizer

2.4.3. BritNed

BritNed is a proposed merchant interconnector between the electricity transmission systems of the United Kingdom and The Netherlands. BritNed is a joint venture between National Grid International Ltd, a 100% owned subsidiary of National Grid plc, and NLink International B.V., a 100% owned subsidiary of TenneT Holding B.V. BritNed is seeking an exemption from regulated third-party access for a period of 25 years [21]. BritNed proposes that access to the interconnector is based on day-ahead implicit auctions and short-term (maximum of one year) explicit auctions of

physical capacity. The exemption request is presently under review by the regulatory authorities concerned.

3. Interconnector investment in the 10th January EC energy package

3.1. The 2007 Priority Interconnection Plan

As a part of the European Commission's proposed energy package of January 10, 2007 [7], the Commission published a Priority Interconnection Plan (hereafter: PIP). The overall conclusion of the PIP reads that with the energy infrastructure investment as it currently stands:

(i) the EU will not be able to realize a real single market;
(ii)
(iii) it will not be able to integrate the required increased production of electricity from renewable sources;
(iv)
(v) it will continue paying higher costs as a result of congestion and of maintaining inefficient capacity in each of the insufficiently interconnected energy areas.

The PIP formulates a series of policies (actions) aimed at supporting the development of an effective energy infrastructure in Europe [8]. These actions will be discussed below.

3.2. The Barcelona 2002 ('10%') target

'At the Barcelona European Council in 2002, it was also agreed to increase minimum interconnection levels between member states to 10%. Today a significant number of Member States have still not achieved this target' **(PIP, p.3)**

In March 2000, the European Council urged to speed up liberalization in the gas and electricity markets to achieve a fully operational internal energy market [22]. Already in its 2000 Green Paper focusing on a strategy ensuring security of supply [23], the European Commission identified

underdevelopment of transmission infrastructure as a security of supply problem and pointed at interconnectors as the key factor to achieve a higher level of competition.

In its 2001 Communication on European Energy Infrastructure, the European Commission put forward a number of measures for the wider European electricity and gas market to function more effectively [24]. In 2002 during the annual spring meeting on the economic, social and environmental situation in the Union, the European Council agreed on a target value for electricity interconnection capacity equivalent to 10% of installed generation capacity [1].

Whereas the Commission put pressure on Member States to simply realize the 2002 univocal target of 10% minimum interconnection levels by identifying key bottlenecks, one may observe a more nuanced viewpoint in the 2005 European Directive concerning measures to safeguard security of electricity supply and infrastructure investment [25]. With regard to investment in new interconnections, recital 13 of the Directive refers to the 2002 '10%' target although it adds that the relation between the potential benefits of new interconnection projects and the costs of such projects should be reasonably balanced. The latter viewpoint implicitly supports a (social) cost-benefit analysis with respect to proposed interconnector investments. The fact that congestion exists on an interconnector does no longer automatically imply underinvestment. In theory, for a particular Member State, a 10% interconnection level could be inefficient even if congestion exist. This could happen, for example, when (i) no significant price differences exist nor are expected to develop between this particular Member State and its neighboring countries ('low benefits'), when (ii) the investment cost are disproportionate, e.g., due to geographical circumstances ('high costs'), or when (iii) other investments, e.g., in the national grid or in gas transport instead of electricity transmission, are more promising with respect to market integration ('alternative projects').

3.3. Actions 1 and 2: The TEN-E guidelines

***Action 1: 'Identification of the most important infrastructure encountering significant difficulties has been made'* (PIP, p.8)**

***Action 2: 'Appointing European coordinators; the Commission will propose early in 2007 the designation of European Coordinators to facilitate the completion of the following projects…'* (PIP, p.10)**

To stimulate trans-European network investment projects, Decision No 1229/2003/EC laid down a series of guidelines for trans-European energy networks ('TEN-E'), specifying which projects are eligible for Community funding [2]. A modification of the 2003 guidelines was adopted in 2006 to identify which projects should be assigned the highest priority [3], the so-called 'Projects of European Interest'. Projects of European Interest are given special attention regarding Community financing funds. Furthermore the European Commission will closely monitor these projects and when a specific project encounters significant delays, the Commission may designate (in agreement with the Member States concerned), a European coordinator to speed up implementation.

As significant pressure is put on individual Member States to realize the identified priority projects and Projects of European Interest as soon as possible, on the process by which these projects are defined should be agreed on:

- *Consultation process*: The proposal regarding the 2006 modification of the TEN-E guidelines [26] has been formulated using a public internet consultation on DG TREN's website between July 25 and September 15, 2003. During this period only a limited number of stakeholders reacted [27].

- *Selection of priority projects:* The first list of TEN-E priority projects was adopted by the Essen European Council in 1994. The initial selection was based on a report of the Christophersen research group [28]. However, it has never been made transparent neither how the Christophersen research group identified these 'initial priorities' nor according to which criteria and considerations the list has been adjusted over time. However, it can probably be safely concluded that the initial

selection and later adjustments[14] to the list of priority projects were not founded on a thorough project-by-project cost-benefit analysis.

- *Comitology process (final decision):* The Commission may modify the detailed description of the priority projects or projects of European Interest following a so-called 'comitology' procedure (which bypasses the co-decision procedure by the Council and European Parliament) as often happens in the case of implementation measures under the executive duties of the European Commission.[15] For modification of the TEN-E guidelines in 2006, the decision process prescribes a mandatory consultation of the 'European Economic and Social Committee' which consists of employers, employees and various interest groups, and an optional consultation of the 'Committee of the Regions' consisting of representatives of regional and local public bodies [31]. As the definition of priority projects and Project of European Interests requires specific knowledge and expertise, it is advisable suggested to also formally involve relevant national electricity and gas regulatory authorities in the comitology procedure as well.

3.4. Action 3: Coordinated planning at regional levels

***Action 3: 'Coordinated planning at regional levels; the Commission will propose in 2007 a strengthened framework for TSOs responsible for coordinated network planning'* (PIP, p.12)**

EU energy policy dedicates significant attention on cross-border transmission investment to alleviate congestion on transmission lines which hampers market integration. Whereas interconnectors were originally built to provide mutual assistance in case of a national emergency, in 2006 the European Commission clearly stated: '*Concerning electricity networks, its main function is to create and foster a real European electricity market. The existing capacities of the electrical interconnections are largely insufficient for the further increase of exchange and trade. For this objective, additional interconnection capacity between Member States is essential.'* [32].

[14] Findings of relevant studies available seem to be used to define necessary upgrades [29].
[15] Such regulation can be adopted when the Council has conferred executive powers on the European Commission and after an implementation committee, composed of representatives from the member states, has given its opinion on or approved the Commission's proposed measures [30].

However, the European transmission system does not only consist of cross-border interconnectors but also of national networks. The bottlenecks hampering cross-border trade may just as well be located within national networks [9]. For example, due to the weak national North-South link in the German internal network, Dutch and German TSOs have to reduce the available capacity (for market transactions) on the Dutch-German border in order to be able to cope with unexpected loop flows.

Consequently, the costs and benefits of investments may be unevenly distributed. It is possible that specific investments in (national or cross-border) grids have higher costs than benefits for one Member State even though the benefits exceed the costs when the entire region is considered. Especially in such a situation, coordinated network planning seems to be required. Therefore, the position of the European Commission to stimulate a supra-national decision-making process makes sense.

The development of a 'Regional Transmission Capacity Plan' (hereafter: RTCP) may form a first step towards such coordinated investment planning (comparable to the existing national transmission plans regularly submitted to the regulator in many countries). An RTCP should at least include:

(i) a clear overview of the existing regional grid and already planned investments, including the time path foreseen for these investments;

(ii) an overview of existing congestion in the regional transmission grid (including the national transmission grid), and

(iii) an indication to what extent these bottlenecks are structural.

The RTCP will provide a basis for evaluating regional bottlenecks and prioritizing investments, e.g., by means of indicative social cost-benefit analyses. After identification of the most promising projects, an in-depth evaluation can be made jointly by the TSOs involved after which a go/no-go decision comes into sight. However, in addition to TSO coordination, also close cooperation of (national) regulatory authorities is required for jointly assessing the investment proposals in order to reach agreement on the allocation of the project cost (which may be based on an assessment of the distribution of the project benefits for each system). Finally, RTCPs may also provide for a more transparent basis for selecting priority projects and Projects of European Interest.

3.5. Action 4: Streamlining authorization procedures

Action 4: 'The Commission will in 2007 begin revising the TEN-E Guidelines with a view to requiring the Member States, with due regard to the subsidiary principle, to set up national procedures under which planning and approval processes for projects of European interest should be completed in a maximum time span of five years' **(PIP, p.13)**

The European organization of Transmission System Operators (ETSO) has indicated that, even without major obstacles, the period between the first planning of a new high voltage transmission line and its entry into operation is about 10 years [33]. In the presence of obstacles and when opposition is faced, the process may easily be extended to 20 years.

During the last years, some countries simplified authorization and licensing procedures with respect to new high voltage lines. In 2004, The Netherlands, for example, introduced the so-called 'Rijksprojectenprocedure (RPP)' for projects of national interest (to include high-voltage lines) in order to speed up the process of changing the zoning plan from several years to (possibly) one year. Furthermore, it bundles several licensing procedures by limiting public consultation to a single public inquiry moment when all appropriate licenses are simultaneously discussed [34]. Also in Italy, the authorization processes concerning strategic infrastructures have been reviewed leading to a simplified authorization procedure as well as a single consultation process and public debate for the requested formal advices of all authorities concerned [33]. In Portugal, a special legal instrument has been put into place for 'Projects of National Interest' accelerating the overall environmental and administrative procedures by mandating the decision to a single committee [33].

Despite these developments, additional actions are needed to significantly speed up transmission investment processes. In the PIP, the Commission states that it will require Member States to complete authorization procedures within a maximum time period (see Action 4 quoted above). Nevertheless, although pressure is put on individual Member States, sometimes the procedures prescribed by EU law are limiting progress. For instance, the requirements regarding Environmental Impact Assessments (for individual projects) and Strategic Environmental Assessments (for

plans, programs and policies) are becoming more and more strict in terms of prescribed public consultation procedures, assessment requirements and the like [36].

3.6. Action 5: EU funding

An important aspect of any investment proposal is the question how the investment will be financially covered. If a TSO submits a transmission investment proposal to its national regulatory authority, one may assume that, once approved, national public resources will be made available for this investment (in principle, from existing congestion revenues or by including it in the rate base). A relevant question now is whether TSOs have the right incentives to submit investment proposals. Two categories of transmission investment projects may be distinguished here: (i) investments for reasons of security of supply or network reliability, and (ii) investments for reasons of economic welfare.

With respect to the first category, one may assume that TSOs have sufficient incentives to invest as they are under political pressure to maintain a high level of security of supply and network reliability. Regarding the second category, however, one may wonder if the current congestion framework provides the proper incentives. Presently, TSOs receive a congestion income equal to the price difference times the capacity allocated, which will go down if this price difference is reduced (as a result of new transmission capacity). Although the Regulation prescribes ring-fencing of congestion revenues (in order to make the TSO insensitive to the amount of congestion revenues)[16], in practice the incentive may continue to exist: As the ring-fenced money is available at limited cost for both the TSO and the regulator, it may result in easier investment decisions (as the tariffs need not increase). Consequently, the existence of congestion revenues may (in theory) alleviate the process to gain regulatory approval for selected investments and thus may provide an incentive to keep at least some congestion in existence.

Apart from this discussion, it is questionable whether there is really any need for EU funding of priority interconnectors. Given the fact that many new investments by TSOs may be recovered from congestion revenues presently available (after almost a decade of auctioning congested capacity),

[16] Article 6 (6) Regulation (EC) 1228/2003.

the major bottleneck might not be the issue of financing new investments, but the difficulty to get administrative approval from municipalities and environmental agencies (given the present 'NIMBY' and 'BANANA' tendencies).

4. The question of regulated versus merchant investment

4.1. Issues concerning regulated interconnectors

4.1.1. Social cost-benefit analysis: consumer or producer surplus?

As has been shown above, a cost-benefit analysis of new regulated interconnectors should include all social benefits associated with the investment. The social benefits of an interconnector could for example consist of a higher level of security of supply, a positive effect on market liquidity, an overall price decrease or an increase in price stability (reduction of price peaks). However, in general, the larger part of social benefits is gained through an increase in welfare – in terms of an increase in consumer and producer surplus – as an additional amount of demand and supply can be matched (see section 2.3).

A regulatory authority deciding on a regulated investment should clearly define its position on how to assess this effect on social welfare, as a distributional choice is involved: How much of the benefits are to be allocated to producers, and how much to consumers? A regulator may opt for limiting the assessment to the net effect on consumer and producer surplus (remaining indifferent to the question who will actually benefit most), or it may assess the combined net effect of the consumer and producer surplus under addition constraints (e.g., the requirement that consumers may not become worse off, as has been applied by the Dutch Energy Regulator in the NorNed project [16]) or it could solely assess the effect on consumer surplus (and leave producer surplus out of the analysis). Although this choice may have a political component, it should nevertheless be transparent in advance.

4.1.2. Weighted Average Cost of Capital (WACC)

The financing cost (as reflected by the interest rate) for a merchant project relying on variations in (spot) market prices as a major source for the revenues are significantly higher than for a regulated project for which the costs are recovered through regulated tariffs. Because of this fact, some have argued that in the cost-benefit analysis related to a regulated investment project (initiated from economic prospects) a significantly lower discount rate should be used than for a merchant investment project.

The argument is that the regulatory regime in place assures full cost recovery, thereby reducing the project risk for the financial investor, thus warranting a low interest and therefore discount rate. However, a guaranteed cost-recovery regime does not make the risk disappear (which mainly depends on the future market development); it just shifts risks from the regulated investor to the grid-users (who will pay for the investment, regardless whether the benefits will be realized). Unless a transmission investment is considered to be required from the perspective of an essential service (in which case it must be paid for anyway), it seems fair to perform the social cost-benefit analysis from the perspective of the party who bears the risk, i.e., the network user [16]. For assessing the WACC, a regulated transmission investment for improving the internal market should be treated as a private investment without cost-recovery guarantees.

A separate issue is whether the business case should be based on the value of the WACC before or after taxes [36]. As long as the TSOs investing in the interconnector are state-owned, a case can be made for using the lower WACC value (since taxes paid in effect constitute an income to society, which group generally coincides with the network users who actually run the investment risk).

4.1.3. Reducing public risk: incentives for TSOs

Since for regulated interconnector investments cost-recovery is guaranteed, the TSOs run limited risk regarding cost overruns, project delays or revenue setbacks. Consequently, they experience little pressure to minimize costs and maximize revenues (by maximizing the available transmission capacity and the availability of the interconnector). To decrease end-users' risk of being exposed to higher regulated tariffs than necessary, it may be considered to impose conditions to the approval of a regulated investment

project which provide incentives to the TSOs. For example, with respect to the NorNed interconnector (see section 2.4), the Dutch energy regulator imposed a bonus/malus incentive scheme on the TSO to reduce the risk of cost overruns, project delays and the availability of the interconnector capacity [9,37].

4.1.4. Regulatory freedom: alternative projects?

A general problem with any governmental assessment of proposed projects is that the relevant authority may only affirm or reject a specific proposal. Any alternatives, even those which are more favourable than the one proposed, cannot be included in the assessment. Since network users pay for the regulated interconnector, it would however be fair that the most attractive (i.e., the most 'welfare optimizing') alternative is selected. This does not only refer to optimizing the location and capacity of a new link, but also relates to the broader evaluation where society's money could best be spent. This also comprises the evaluation whether investments in other infrastructures are to be preferred above new electricity transmission, e.g., investment in gas transport or subsidies to stimulate market investments in renewable power generation.

A related problem is that licensing procedures (e.g., environmental and planning procedures) in some cases may already have been started (given their time consuming nature) at the moment that formal regulatory approval is sought. A regulatory decision to change the proposed specific technical characteristics of an investment project might however necessitate a different license request.

4.2. Issues concerning merchant investment

4.2.1. The opportunities for merchant investment in practice

As has been discussed above, merchant investment in a public infrastructure like electricity transmission is only possible in situations where there are clear benefits for the investors (which may or may not coincide with social interests). Joskow's expectation of only "a very small contribution of merchant interconnectors in the overall portfolio of transmission investment projects" seems to be applicable for Europe [38]. Until today, no

'entirely merchant' project has come into existence. In the cases described above, either a TSO (in the case of BritNed) or a vertically integrated company (Estlink), although legally separated, is involved. Since private revenues result from locational price differences, which are highly uncertain especially on a longer term, the perceived risk for merchant investment by private parties is high.

The risk could be alleviated (somewhat) by issuing long-term capacity contracts which will provide private investors with more certainty about future revenues. However, such contracts shift (some of) the risk to the capacity buyers, who on their turn may be reluctant to enter into such agreements as price developments are uncertain. Contrary to gas (where production is associated with the presence of a gas well, which are limited geographically to a few regions within the reach of Europe, thereby increasing the likelihood that built transport capacity will actually be used) there are several threats for private electricity interconnector investment: due to new investment in generation, locational price differences may develop over time, which directly affects the attractiveness of signing long-term transmission capacity agreements. Additionally, long-term (physical) capacity contracts are generally not welcomed by policy makers as they are considered to pose a hurdle to new entrants and decrease the capacity market's liquidity.

4.2.2. National or European ('regional') perspective?

As elaborated in section 2.2 exemptions from third-party access and the prescribed use of congestion revenues can only be granted under the conditions listed in Article 7(1) of the Regulation, which include:

- "The investment must enhance competition in electricity supply." (Condition A);

- "The exemption is not to the detriment of competition or the effective functioning of the internal electricity market, or the efficient functioning of the regulated system to which the interconnector is linked." (Condition F).

These conditions seem somewhat confusing as it is not clear from which perspective both conditions should be considered. Neither the Regulation

nor the explanatory notes [13] clarify whether the conditions should be evaluated from a national perspective, from the perspective of the two linked areas, or from the perspective of the entire European market. As an example, although condition F refers to 'the internal electricity market', the explanatory note here reads: "*This is rather more difficult to evaluate. A lot will depend on the competitive status of the initial competitive position in the Member State concerned".*

4.2.3. Conflict of interest in a TSO holding company

In practice, some of the present merchant investments are being done by companies which are structurally linked to a TSO. In the Estlink project, the Lithuanian TSO is 25 % owner of Estlink (until 2011/2013), whereas both TenneT and National Grid are planned to be involved in BritNed through sister companies under the same holding company.

The (direct or indirect) involvement of a TSO in a merchant interconnector may result in a potential conflict of interest for the holding company between the commercial activities of one daughter company and the (regulated) 'public' activities of the TSO. This is an issue which should be examined carefully by the relevant regulatory authority as the conflict of interest could be to the detriment of the effective functioning of the internal electricity market. In the case of Estlink, it seems that the authorities have paid little attention to this issue, whereas with respect to BritNed, Ofgem did consider this issue and concluded in its initial view [21] that BritNed has provided adequate proof that BritNed will be operated fully independent from the system operator.

We identify four areas where a potential conflict of interest could occur between commercial activities and regulated activities performed under the umbrella of the same holding company.

First, one would like to avoid the risk that any potential financial loss of the merchant interconnector investments could have an impact on the regulated activities of the TSO. Therefore, care must be taken that all merchant interconnector activities should be financed completely independent from the TSO (which includes project staffing and provision of information by the TSO which is not available to other market parties).

Second, it should be safeguarded that the cross-border capacity available to

the market on the existing (regulated) interconnectors is determined in an objective and independent way. Since the available capacity influences electricity market parties, it also affects the price margin over the interconnector and hence the revenues of the merchant interconnector. The regulatory authorities could require the TSO to be fully transparent on the calculation of cross-border capacity and any situations limiting this capacity temporarily.

Third, the transmission investment plans of the TSO might be influenced by the merchant activities within the holding company. Building new regulated interconnectors (or internal transmission lines) may impact the revenues of the merchant interconnector since market prices will be affected by the amount of import and export capacity. Preferably, it should be safeguarded that any line which should be built in the public interest, will really be built. Additionally, regulatory authorities would like to prevent a situation where more lucrative investments are being carried out as a merchant activity, whereas more risky or less rewarding projects are shifted to the TSO.

Finally, the merchant interconnector needs to be connected to the transmission grid and agreements might be needed on the conditions for connection and possibly the delivery of ancillary services by the merchant interconnector to the TSO. Such agreements (between the commercial company and the TSO) should be non-discriminatory with respect to who applies for them, a sister company or a market party.

As most of the potential conflicts of interest described above relate to complex issues requiring specific knowledge, effective supervision by regulatory authorities may not be easy to perform (e.g., the objective determination of the cross-border capacity available for market parties).

4.2.4. Strategic bidding behaviour

Merchant interconnectors open the way for strategic bidding behaviour for capacity. This may, for instance, take place when the interconnector capacity is allocated by means of an open, non-discriminatory capacity auction. Since the investor in the merchant interconnector will receive (part of) the auction revenues (which actually serve to recover the investment cost), it will be indifferent to the clearing price for its own bids for capacity on the link. Especially if this company also exploits generation or supply activities, it

may increase its revenues by driving up the price of the available capacity through aggressive bidding. Consequently, although the company earns lower profits from its competitive activities (since it applies a bidding function which is not optimal from a competitive viewpoint) this bidding strategy may maximize the compound profit, i.e., the profit including its share of the auction revenues. Conversely, independent competing market participants will earn less because they are less likely to gain transmission rights and, in any case, pay a higher price for it [39].

4.2.5. Lock-in effects

Merchant interconnectors could enhance market integration by creating additional cross-border transmission capacity. However, although a merchant interconnector increases the (physical) coupling of different electricity markets in the short term, it should be safeguarded that the existence of this interconnector does not block market integration in the longer term. As the investment must be recouped from exploitation of the trade potential across the link, the parties involved have a considerable interest to keep those markets at least partly separated.

Obviously, any additional interconnection capacity in parallel to the merchant interconnection would decrease the value of the merchant interconnection, so investors in merchant interconnections would try to prevent the construction of any additional, competing capacity. Kuijlaars and Zwart [40] have pointed out that merchant investment may lead to severe underinvestment relative to the welfare optimum, as the economies of scale involved in such projects may lead to foreclosure of the market by the first mover (by constructing capacity up to the no-entry point).

Another scenario is that a merchant party is able to allow itself to invest in less capacity than the profit maximizing optimum, for example with a view of maximizing return on investment instead of maximizing the profits on this particular investment. In this case the merchant investor may aim to remove any attractive business case for additional regulated or private investment. Now a situation results where the ultimate merchant investment level is even further from the social optimum [14].

A merchant interconnector could thus have the character of a Trojan horse [10], yielding more interconnection capacity in the short term, but proving an obstacle to full market integration in the long run.

5. Conclusions

Despite the strong focus on new electricity interconnection within the European Union and the overall ambition to increase interconnection to 10 % of domestic generation, it is still open for debate how much interconnection capacity is really needed (and hence how much is still lacking). Furthermore, despite the present TEN-E list of priority links, it is still not clear which specific links really should receive priority from a social perspective. Finally, most attention is presently given to new investments linking national systems, whereas the effect of alleviating congestion within national transmission networks has not yet been extensively addressed.

The solution to stimulate the construction of more interconnection by opening investment to private parties has also been discussed. It must be concluded that the present regulatory criteria for approving a merchant interconnector are not very transparent. Furthermore, the incentives for private parties to invest in an interconnection may clearly deviate from common public interests, which may lead to lock-in effects and long-term inefficiencies. Finally, it must be noted that presently no real merchant investments in transmission have been realized in Europe as both Estlink and the proposed BritNed interconnections involve TSO holding companies.

Nevertheless, it is clear that interconnections play an important role in the present stage of European market integration. However, in order to select the optimal projects from a social perspective, a regional assessment of required investments is needed in order to balance national and internal market interests. This not only requires cooperation between the TSOs involved but also cooperation between the national regulatory authorities, who need to agree on the allocation of the costs and the distribution of the benefits.

The suggestion of the Commission to speed up national authorization procedures is very welcome, although some of the time consuming components in these procedures stem from EU legislation. Moreover, it should be very transparent to TSOs and private investors which criteria are being applied for approving new interconnections and which procedural steps must be taken.

Finally, it can be concluded that TSOs should receive the optimal incentives

to evaluate promising investments not only from a technical perspective, but also from an economic perspective. After all, TSOs hold the key for strengthening the European electricity network which forms the carrier for international electricity trade within the EU internal market.

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