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REGULATORY ISSUES IN MERCHANT TRANSMISSION INVESTMENT

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Abstract: Driven by fear of underinvestment in network assets, merchant investment in electricity transmission networks (MTI) is now legally allowed. Given that MTI is a real possibility, regulators face a new set of questions. After classifying different types of MTI, the paper raises and analyses regulatory questions, concentrating on the effect on competition, ownership questions, third-party-access regimes and must-offer provisions. Basically, the paper concludes that the light-handed approach of *unregulated* MTI supports a light-handed approach with respect to complementary measures as well. In many cases, it is justified to refrain from sector-specific arrangements because competition law, if necessary at all, will suffice. However, details matter.
Keywords: Electricity, Investment, Regulation, Transmission, Merchant
JEL classification: L94, L43, L5

1. Introduction

Transmission investment is no longer the exclusive right of the designated transmission system operator (TSO) with merchant investment taking place in for instance the USA, Australia, Latin-America and Europe. For a variety of reasons, among which the concern for underinvestment, regulators attempt to stimulate transmission investment by allowing third parties to invest in the transmission network. This is called merchant transmission investment (MTI),[2] which is basically funded by trading between differently priced markets; a more precise characterisation follows in section 2. The specific details of MTI depend quite strongly on the institutional framework and differ quite sharply between the USA on the one hand and Australia and Europe on the other hand. This paper focuses on the developments with respect to MTI in Europe and only occasionally draws comparison with the USA.

The European approach is laid down in the EU Regulation on Cross-border Exchanges which will enter into force July 1st, 2004.[3] In first instance, the regulation prescribes rules for

[1] The author is grateful to Paul Joskow, Stephen Littlechild, Karsten Neuhoff and David Newbery for useful comments. Support from the CMI project 045/P *Promoting Innovation and Productivity in Electricity Markets* is gratefully acknowledged.
[2] Alternatively, it might be called Market-Based Transmission Investment.
[3] Regulation 26 June 2003 (1228/2003) (1/7/04).

scarce capacity on *existing* cross-border interconnectors,[4] but art. 7 of the regulation allows for *new* interconnectors to be exempted from art. 6(6) of the regulation and arts. 20 and 23 of the EU electricity directive.[5] The former specifies regulation of the revenues of allocation of scarce interconnector capacity, while the latter requires (regulated) third party access to the network.

With this provision, the EU regulation in effect allows unregulated MTI, provided a set of conditions is met, of which the following are the most important. First, the new interconnector must enhance competition in the energy market. This condition will receive detailed attention in section 3.1. Second, following the unbundling requirements of the EU electricity directive, the interconnector should be legally unbundled from the system operators to whose networks the line is connected. Notably, ownership separation is not required. This can be criticised as will be argued in section 3.2. Third, the exemption normally applies to direct current (DC) lines, but exceptions are made for alternating current (AC) lines, if DC technology would be prohibitively costly.[6] This seems to be a sensible condition, although it carries the danger that one technology unduly crowds out the other.[7]

A fourth condition requires that the project is risky, such that it is unlikely to take place if regulated. This condition presumably finds its roots in the Australian discussion on regulation of risky significant new investment. The argument basically boils down to a regulatory hold-up problem leading to underinvestment in case of risky regulated projects with sunk investment [cf. Helm & Thompson, 1991]. The Australian approach, apparently copied by the CEC, is to grant a "regulation holiday" [cf. Gans & King, 2003 and 2004 and the literature quoted therein]. This is a controversial argument in which the causes and consequences need further examination. The argument relies upon the notion that a regulator, given that one exists, cannot credibly commit to refrain from claw-backs once the investment is sunk. On the other hand, regulators in the USA effectively succeeded in building up a credible reputation. This may induced, however, by the difference between rate-of-return regulation, which explicitly relies upon a fair rate of return and price-cap regulation where a fair rate of return is only implicit. Moreover, it is not well understood how a situation without formal regulation affects uncertainty. On the one hand, no regulation implies high uncertainty because potential

[4] Interconnectors are high voltage transmission lines connected different systems. These can be direct current (DC) and alternating current (AC).
[5] EC Electricity Directive 2003/54/EC, 26 June 2003.
[6] This exception, laid down in art. 7(2), seems to open up the door for MTI on the continent; for instance MTI lines between Germany and the Netherlands or France.

new rules (concerning regulation but also reliability rules) are unknown. On the other hand, implementing new regulation will require a high-level political process with parliamental control which reduces uncertainty due to political inertia. Lastly, regulatory risk is only one aspect of a larger discussion. Unregulated MTI derives revenues from market-based price difference which creates a high commercial risk; regulated lines are at least partly funded from the pool of regulated revenues, which reduces commercial risk. On balance, a potential reduction in regulatory risk might be offset by an increase in commercial risk. Experience so far points into this direction.

Currently planned unregulated MTI projects in the USA include the New York Harbor Project, the Lake Erie Link, the Neptune Transmission System and the Empire Connection Project. They all go into the New York area importing cheap hydro power, because alternatives in this area are expensive. None of these is actually in operation yet and it must be emphasised that none has succeeded to get long-term funding yet. The US projects are fairly large DC projects, ranging in scale from about 200 to 2000 MW. In Australia several relatively small projects, among which Directlink and Murraylink, raised regulatory controversy (see section 2). In Europe the first explicit example of an unregulated MTI relying on art. 7 of the EU regulation is still to come, but an interesting case, called BritNed, is in preparation. BritNed is a planned project of a 250km subsea DC cable connecting the UK and the Netherlands, aiming at trading between APX in Amsterdam and UKPX in London. Planned capacity is between 1 and 1.3 GW. BritNed is a legally separated joint subsidiary of the TSOs on both sides: NGC in England and Wales and TenneT in the Netherlands. Furthermore an old plan to connect the Netherlands with Norway (NorNed) found new prospects early 2004, although it is as yet unclear whether this will be market-based project. The regulators are currently preparing their policies should a project like BritNed be formally proposed.[8]

This paper addresses the regulatory discussion: what are regulatory issues with respect to MTI and what would constitute a consistent policy? Both the question whether unregulated MTI is desirable at all and the question whether it can be commercially feasible will be left for discussion elsewhere.[9] This paper will take the existence of MTI for granted and then ask what this means for regulation- and competition policy. The regulatory issues to be discussed

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[7] The argument goes back to the loopflow problem with AC technology; internalising these effects requires a system of incremental financial transmission rights, which does not exist in Europe [cf. further section 3 and Brunekreeft, 2003a].

[8] Cf. Newbery, Von der Fehr & Van Damme [2003]; Kuijlaars & Zwart [2003] and Brunekreeft & Godfried, [2004].

[9] Cf. Brunekreeft [2003a]; Rosellón [2003]; Gans & King [2003]; Hogan [2003]; Joskow & Tirole [2003]; Littlechild [2004]; and Woolf [2003].

are collected under the four following headers: the competition-effect (as a criterion for a regulation holiday), ownership, third party access, and must-offer provisions. These will be discussed in detail in section 3. Section 2 will first define and classify different types of MTI. Section 4 concludes.

2. Classification

Table 1 classifies different types of MTI according to two aspects. First, whether or not there is some sort of cost-benefit check: this may be called a capacity test. Second whether or not the line is eligible to part of the common pool of (regulated) fixed connection charges, or relies entirely on market-based prices. Genuine unregulated merchant transmission investment is as in cell D: the investor decides on size, technology and timing of the investment and relies exclusively on the revenues made from trading between the different market prices. Importantly, the investment does not have to be approved.[10] This is similar to the status of new generation investment in liberalised markets, which explains the expression "as-if Genco". This is the primary aim of the considerations in this paper, because unregulated MTI would result from application of art. 7 of the EU regulation.

		Eligible to Regulated Revenues	
		YES	**NO**
Capacity check	**YES**	**A**: Regulated MTI "as-if TO"	**B**: Hybrid/Tender
	NO	**C**: Conversion?	**D**: Unregulated MTI "as-if Genco"

Table 1: Merchant transmission investment (MTI)

Cell A is close to business as usual. The investment is (partly) funded from regulated charges and thus requires something like a cost-benefit test. Cell B addresses the concern that unregulated MTI might result in inefficient investment. To have a check on the efficiency of the investment, a central authority decides on the investment, but revenues would be market based. Cell C marks a transformation from cell D to cell A, called conversion; an option which exists in Australia. This is a safety net by which unregulated MTI can fall back on regulated revenues. Note that cell C is not a permanent state. The two aspects and thereby the four cells will now be discussed in detail.

[10] It is to say, the investment does not require an economic approval. Of course, environmental, technical and safety requirements remain valid.

2.1 Capacity check

Unregulated MTI may be suboptimal for (at least) two reasons. First, in a meshed AC network, a new line (financed by link-based price differences) can be privately profitable but socially detrimental due to loopflow effects [cf. e.g. Bushnell & Stoft, 1996]. The answer to the problem pointed out by Bushnell & Stoft [1996] and Hogan [2003] and applied in the USA is to reward the lines by a set of must-accept point-to-point incremental financial transmission rights (FTRs), which internalises these network effects. The set of incremental FTRs is determined by a central institution (TSO) running a power flow model. As pointed out by Joskow & Tirole [2003], defining a set of incremental FTRs may internalise the network effects but marks a step away from the invisible hand. Using incremental FTRs requires an underlying system of locational marginal prices (LMPs). Since such a system does not exist in Europe, incremental FTRs cannot be used, which makes a strong case for restricting unregulated MTI to DC interconnectors of different systems [cf. Brunekreeft, 2003a]. Even then there will be network effects, but these may no longer be convincing to prohibit unregulated MTI. To the extent that the network effects can be attributed, deep connection charging (for e.g. network upgrades) can internalise these effects. Moreover, an interconnector is in many respects comparable to a new power plant; they too cause network effects, which in the discussion do not make an argument against market entry. The same reasoning should apply for a new interconnector.

A second problem of suboptimal capacity is induced by scale economies in line expansion. MTI basically relies on trading on the price difference between different nodes. It is well known from the literature on congestion pricing that at the optimum the price difference between the two ends of the line is equal to marginal expansion costs. If MTI with economies of scale relies exclusively on congestion revenues, capacity must be lower than optimal to retain a sufficiently large price difference to recover all costs. The natural way out of the problem is two-part pricing, but this is a problem. The variable leg of the two-part tariff is the price differential on the energy markets. The prospects for a fixed charge for usage of the line are bleak, while funding the fixed part from (regulated) connection charges would lead back immediately to the regulated situation (the left column in table 1). The elegance of MTI is the decentralised aspect by relying on decentralised revenues from trade. Settling for second-best capacity to deal with the cost-recovery problem may be the price paid for relying on decentralized MTI. The problem of inefficiently small capacity will be more severe to the extent that the investment is a monopoly.

As a response to (real or perceived) efficiency problems with new investments, the regulator might wish to have a capacity check. This is essentially the first criterion in table 1: a central institution would be authorised to assess the timing and/or size of the investment. A capacity check in the unregulated scenario (cell B in table 1) might have different forms. An explicit option is a regulatory test as in for instance Australia,[11] which has been defined by ACCC [2003a, p. 6] as follows:

> "A new interconnector or an augmentation option satisfies this test if it maximises the net present value of the market benefit having regard to a number of alternative projects, timings and market developments scenarios; .."

Market benefit is defined in the test as total net benefit of the proposed augmentation to all those who produce, distribute and consumer electricity. The problems involved in an administrative procedure like this are substantial, strongly illustrated by the Australian case of Murraylink (see below).

A tender for building and operating the line serves as an implicit capacity test. The three-step procedure in the US PJM illustrates this. First, unregulated MTI as in cell D can start projects. Second, PJM-ISO identifies projects and lets the market respond. Third, if the market does not respond, the ISO can order TOs to invest as a regulated project provided the project passes a social cost benefit analysis.[12] Provided operation of the line is in the unregulated domain (i.e. market-based revenues), the criterion for winning the tender would be offering the largest capacity. Assuming sufficient bidders, the winning capacity should be close to the second-best capacity where the remaining price differential is just sufficiently high to recover all costs. If monopoly MTI is considered to be a serious problem then this appears to be a promising approach: it tackles the problem of monopoly capacity while centralised decisions remain at a minimum. The main elegance of the tender is that it replaces a first-mover advantage by simultaneous moves. However, the tender for capacity with unregulated revenues of trade may result in overinvestment because ex-post profits are bid away by increasing the capacity bid, which is subsequently withheld in the trading. This option requires additional regulatory measures (see below).

Concluding, unregulated MTI may result in inefficient capacity, but one should be careful with policy implications. The arguments are theoretical and in practice it will be quite difficult to determine whether a project is efficient or not. Moreover, even if it is inefficient,

[11] It should be remarked though that the regulatory test in Australia is applied only for regulated MTI and not for unregulated MTI. This corresponds to cell A in table 1.
[12] Cf. 105 FERC 61,123; Oct. 24, 2003.

the alternatives may be worse. If it is perceived to be a problem then for instance a tender would tackle the problem while retaining many of the virtues of MTI.

2.2 Regulated versus unregulated revenues

The second criterion in table 1 is eligibility to regulated revenues. Unregulated MTI captures two aspects. On one hand, unregulated means that the revenues are not capped, as is usually the case with designated TSOs. On the other hand, unregulated means that the MTI is not eligible to the (regulated) pool of fixed connection charges, implying that unregulated MTI relies exclusively on revenues from trading over the line. The key difference between regulated and unregulated thus is that the former contains a "public-good" aspect: the revenue-allocation problem in the regulated case is essentially the same as funding of public goods of which the problems are well known. The fact that unregulated MTI avoids these difficulties by relying on market-based charges is a major advantage.

Regulated MTI requires a regulatory test of some sort to determine whether the investment is actually beneficial for society. If the investment falls back on socialising part of the costs then it seems reasonable to test whether it contributes to social welfare. In other words, regulated MTI requires a capacity check and thereby takes along all the difficulties associated with it. Moreover, determining the amount of regulated revenues has similarity with cost-plus regulation and here as well takes along all the associated problems. Regulated MTI may have advantages but these do not come for free.

A tender or auction for funding may be a workable alternative, for which the difference between cells A and B should be noted. In cell B, there is no funding from regulated revenues, and the tender is the capacity test; the rule of the tender would that the winner is the bidder offering the highest capacity (given that revenues are derived from price differentials). In cell A, a centralised authority determines the investment project; a tender for funding will subsequently determine the amount of funding from regulated revenues. The winner of the tender being the bidder requiring the minimum of funding. If an explicit capacity test is desirable and funding from regulated revenues necessary, then a tender for funding seems workable. Clearly this approach is close to current practice and is quite far away from merchant transmission investment.

Cell C is rather specific for Australia and is part of the so-called "safe harbour" program as laid down in the National Electricity Code.[13] An unregulated MTI has the right to apply for conversion to the status of regulated MTI. The option is controversial. The Australian case of Murraylink illustrates and has been discussed extensively by Littlechild [2004].

Until its conversion in Oct. 2003, Murraylink was an unregulated 180 km long underground 220 MW DC line MTI connecting Victoria and South Australia.[14] While Murraylink was under construction, the designated TSO Transgrid requested building the regulated interconnector SNI between South Australia and New South Wales, which is largely parallel to Murraylink. SNI would decrease the price differential between Victoria and South Australia and thereby decrease the revenue base for Murraylink. The test compared the so-called options bundled SNI and the unbundled SNI. The latter would have upgraded the network in especially New South Wales *without* an additional line between the two areas. The bundled SNI planned to build the line. Cost benefit analysis suggested that the unbundled option resulted in a higher net benefit than the bundled option; i.e. upgrading the network in NSW and not building the line was more efficient than building the line given the existence of Murraylink. The critical point of the unbundled SNI, as argued by Transgrid, was that network upgrading without building the line would leave the new investment vulnerable to market power of Murraylink. This risk according to Transgrid would make the unbundled SNI commercially unfeasible and could thus not qualify as an alternative project. The authorised institution, NEMMCO, agreed and by lack of a better alternative the bundled option was approved and built. This decision was controversial [cf. for extensive discussion Littlechild, 2004]. Subsequently, Murraylink requested conversion from unregulated to a regulated status which was granted in Oct. 2003 [ACCC, 2003b].

The right of conversion is essentially a risk reducing provision [cf. ACCC, 2003b, p. ix]. If the project fails the conversion can make it fall back on the pool of regulated revenues. Thereby it promotes investment. A provision like this is at least unusual in a market setting. Another interpretation is offered by stranded cost. The argument against MTI is sometimes voiced that allowing commercial profits creates a "lock-in", because it will be hard to change the system if the change adversely affects these profits. The argument is particularly relevant for sectors in transition as is the case for electricity transmission. The right of conversion would then provide a safeguard against this indirect "hold-up".

[13] The National Electricity Code can be found on the internet site of NECA: http://www.neca.com.au/.
[14] The reader may be referred to the websites of ACCC and NEMMCO in Australia for further documents.

Seen as a stranded-costs argument, the criterion to qualify for conversion should be that the institutional framework is changed beyond control of the firm. Or one step further, the criterion should be that the investment had been made to fulfil state-imposed obligations which are unprofitable after the change in legal rules. This is typically what stranded-cost bail-outs are for: it gives governments the flexibility to change the rules without frustrating private new investment.

What should be the proper benchmark of the regulatory test in case of conversion? The regulatory test as interpreted above is a capacity check in case merchants fall back on regulated revenues: the project should maximise net benefit with regard to a number of alternative projects. The capacity check is only useful *before* the investment has been made. With conversion, the investment has already been made per definition. One criterion would be whether the project *as it is* maximises net benefits in the current situation (call this the *current test*). This may run into the problem that the project was the best alternative at the time of its building but is no longer the best alternative because the situation has changed. The Murraylink case seems to qualify for this problem, because the conversion was requested as a result of SNI. Alternatively, the criterion might be the situation *as it was* at the moment of investment (call this the *historic test*). However, because the investment was unregulated MTI and did not have to pass the test at the moment of building, it seems implausible that it maximised net benefit.

The following seems to be a compromise: if a project requesting conversion passes either the current test or the historic test or both, it will pass the regulatory test and qualify for conversion. If it fails both it will not qualify for conversion. Going through the options. If a projects passes the historic test (in two cases) it seems reasonable to grant conversion, because it would have been the preferred choice anyhow. In both cases (historic) own costs can serve as the regulatory asset base. The option to fail the historic test but pass the current test seems to lack relevance; should it occur, then it seems reasonable to grant conversion and use own cost as the regulatory asset base. In case the project fails in both tests, it seems reasonable not to grant conversion. Granting conversion in this case is likely to set perverse incentives for initial investment, unless the design for determining the regulatory asset base on which the revenues are based would repair this but this seems difficult. If there is a real problem with stranded costs in these cases, then it seems superior to compensate the firm directly as a negotiation between government and firm, rather than using the conversion.

The regulatory test was applied to the conversion of Murraylink, in a way which is not satisfactory. The project was not required to maximise net benefit with regard to a number of

feasible alternatives. Instead, the alternatives were chosen such that they provide the "exact same level of technical service" as Murraylink provides [ACCC, 2003b, p. xiv]. This eases the analysis but misses out on possible other options. The least-cost alternative then served to determine the RAB for Murraylink. A key assumption in this step was that the least-cost option was an overhead line, whereas Murraylink is an underground line, creating a cost difference of AUS$ 100m (on a total cost of Murraylink of AUS$ 240m). Thus ACCC in other words claims that, given the "exact same level of technical service", the commercial enterprise Murraylink simply missed an opportunity of AUS$ 100m. Murraylink's objection was not awarded [ACCC, 2003b, p. xvii].

3. Regulatory issues

MTI raises further regulatory issues, to be discussed below. Although occasionally references will be made to the other cells from table 1, the primary target of the discussion is unregulated MTI as in cell D: this reflects the background of a project like BritNed, which would qualify as unregulated MTI. Specific regulatory issues can be captured under the following headers: conditions, ownership, access and must-offer.

3.1 Conditions for qualifying as unregulated MTI: competition versus welfare

As stated above, with art. 7.1 the EU regulation lists a number of conditions for qualifying for exemption from regulation. The first condition states that: "the investment must enhance competition in electricity supply". There are a number of problems with this criterion.

It is unclear whether competition on one side only or on both sides of the line or competitiveness overall is meant. A further difficulty is that demand elasticity may be low implying that the welfare effect of increased competition would be rather small, which seems counterintuitive. A social cost-benefit analysis may underestimate the competition effect. First, increased competition may decrease regulatory costs which are not captured here. Second, market power might induce excessive entry. Third, underlying the analysis above is an implicit assumption of equal social weight for consumer and producers. Higher relative social weights for consumers ceteris paribus increases the competition effect.

More importantly, determination of the change of competitiveness is highly problematic and the EU regulation is silent on details. A concept which is appealing for power markets is the Residual Supply Index (RSI). With the RSI, competitiveness increases due to the additional capacity, even if a dominant generator owns the new line. The Residual Supply Index for firm j is formally defined as:

$$RSI_j = \sum_{i \neq j} Q_i \Big/ D,$$

where $\sum_{i \neq j} Q_i$ is the sum of capacities of all firms others than firm j, and D is market demand. If $RSI_j < 1$, then firm j is pivotal, meaning that this firm on its own could reduce available capacity below demand. The concept, which gained interest in the course of examination of the price spikes in California [cf. CAISO, 2000], reflects the idea that competitive pressure increases with excess capacity (expressed as capacity-over-demand ratio) and reverse. The ISO in California estimates the effect of the RSI on the Lerner index by regression [cf. CAISO/LEI, 2003 and ACCC, 2003a, p. 41]. This is done for each hour and each zone. Given high data availability (bids and marginal cost) this seems promising. The approach is criticised by ACCC [2003a, p. 41] in that it "ignores the possibility that some suppliers could be capacity constrained", which is strange because this is exactly the point which is captured by the RSI and which has proven to be relevant in power markets [cf. CAISO, 2000, p. 50 ff.].

Electricity market models will be of support, as they simulate the effect on prices and quantity, but do not solve the problem of an assessment of the change in competitiveness. For power markets a supply function approach [cf. Green & Newbery, 1992 and Newbery, 1998] is promising, because it can capture both the number of players and, roughly speaking, the effects of capacity relative to demand. The endogenous supply function approach, however, suffers from formal difficulties. Specifically, the optimisation problem may be non-convex, difficult to solve analytically and (pure strategy) equilibria may not exist or there may be multiple equilibria. To by-pass these problems, for example Hobbs et.al. [2002] apply conjectured (i.e. exogenous) supply functions, meaning parametrically changing the slope of the conjectured supply functions. This approach is quite general and is for instance followed, although rather simplified, by the Californian ISO [cf. CAISO/LEI, 2003].[15]

A more fundamental problem is that a line can improve competition and lower welfare at the same time, because a positive competition effect may be a the expense of high importing costs [cf. Brunekreeft & Newbery, 2004]. Consider figure 1. Assume two regions A and B, where region B is the importing region. A new line with capacity Q_F connects export market A and import market B. Market A is assumed to be large such that the new line has no impact on market A. The price of imported power is p_A and the line's constant long-run marginal capac-

[15] The linearised approach in the CAIOS/LEI model does not really capture strategic bidding with scarcity. Perhaps this can be captured by including the results of the RSI regression on the Lerner Index as behavioural conjectures, which are exogenous anyhow.

ity costs are ß. The marginal cost of producing power in B is MC_B. *D* is demand for power in market B and *MR* is marginal revenue.

The key assumption for the argument is market power on the energy market in B. Assume a generation monopoly in region B, setting a high price which induces construction of the line with the aim to import power from A to B. Now assume that marginal costs in A (equal to the price in A) plus the long-run marginal line capacity costs ß are higher than the production costs in B: $MC_A + ß = P_A + ß > MC_B$. To simplify the point to be made, the marginal costs in B are assumed to be constant. The pre-entry monopoly outcome is Q^M_B and P^M_B. Many different behavioural conjectures will suffice to make the point, and assume here the following. The line investor invests in lumpy (fixed) capacity Q_F. The incumbent producer observes the line capacity and marginalises its residual demand. The incumbent's post-entry output is Q_I*. Total post-entry output is $Q^C = Q_I^* + Q_F$ and corresponding price P^C. Since $P^C > P_A + ß$ the line can be profitable.

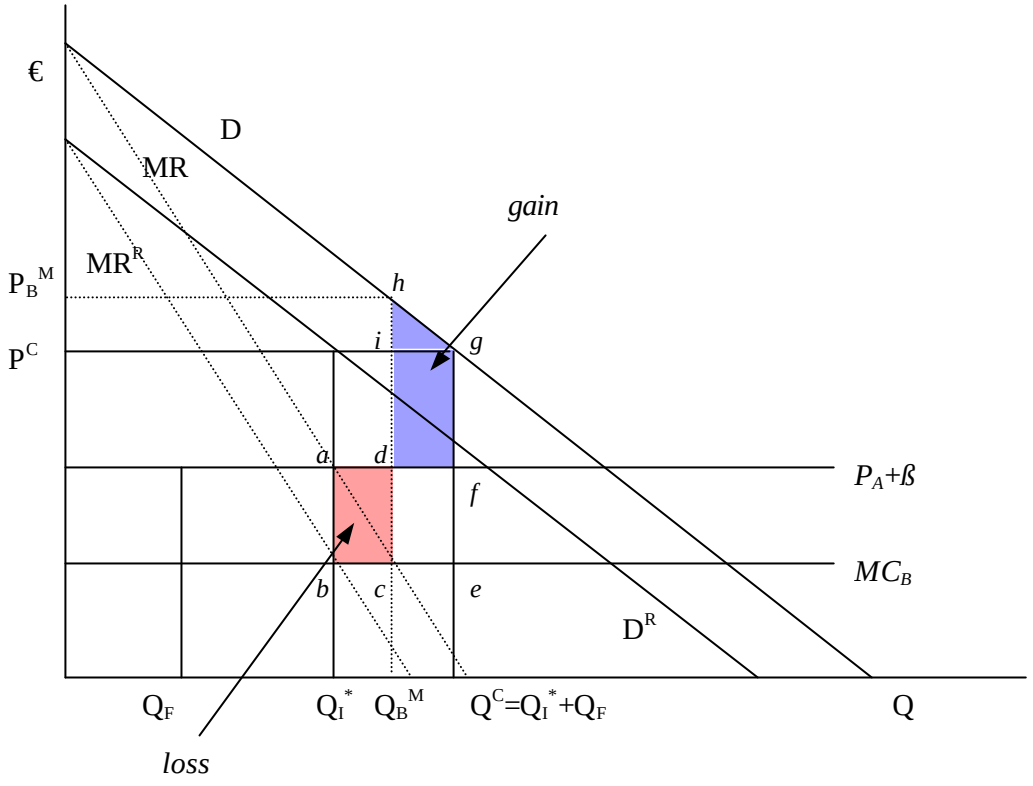

Figure 1: Market power on the low-cost market.

In this scenario, the new line would trade high-cost power from region A to the low-cost, but high-priced region B. The market power in region B drives a wedge between cost and price in

region B to which traders respond.[16] This results in a negative import effect which may offset the positive competition effect; if so, then the line would be detrimental overall. In the figure the negative import effect is the area *abef* and the positive competition effect is the area *hceg*. Thus, the area *dcef* cancels out. The areas to be compared are the shaded areas: if *abcd* is larger than *hdfg*, the over welfare effect is negative.[17]

It can be seen from the figure that the overall effect is determined by a number of factors. First, the higher the difference between the costs in both regions the more likely it is that the overall effect is negative. This includes the costs of building the line *ß*. Second elasticity of demand, which is closely related to the competition effect. If demand is inelastic, the competition effect of the line will be small, whereas the import effect remains. Third, if the weight on producer surplus gets smaller, the welfare effect is more likely to be positive. This reflects the fact that the overall price falls and the import effect is transformed in a change of producer surplus. The change in consumer surplus is the area $P^M{}_B P^C gh$, which is of course always positive if the price falls. Fourth the size of the line, which is roughly in the same direction as the effect shown in figure 1. It may be noted, however, that as the size of the line increases, the increase in welfare brought about by the competition effect decreases (due to downward sloping demand) whereas the decrease in welfare due to the negative import effect is constant (with the assumption of constant marginal costs). Thus in this scenario, the overall welfare effect is likely to be welfare decreasing beyond some critical size of the line capacity.

Thus, the condition in the EU regulation that the investment should increase competition is problematic for different reasons. It is not clear how to determine the change in competitiveness. Moreover, an increase in competition need not be the same as an increase in welfare. More fundamentally, for genuine unregulated MTI one is tempted to question whether a test is at all desirable; again the comparison with new generation assets emerges, where these conditions are no longer applied.

3.2 Ownership

A TSO can be thought off as combining system operator (SO) and transmission owner (TO), which can principally be separated resulting in the so-called SO/TO split. Although a split is discussed, an SO/TO split has drawbacks. In particular, the SO hardly has an asset base which

[16] The argument underlies the same principle as put forth by Joskow & Tirole [2003]. They argue that the capacity of a merchant line will be too large if the price differential is too large due to market power on the importing side. As a side remark, this effect may be countered somewhat in as far as the line investment itself has market power.

[17] Brunekreeft & Newbery [2004] provide a more formal characterisation.

makes regulation quite problematic.[18] Furthermore, there may be quite strong synergies of coordination of investment and maintenance of the core network between the SO and TO. The SO/TO split is, at least in Europe, still largely conceptual and without application. Because the arguments below are partly different if there is an SO/TO split, it is assumed explicitly here that SO and TO are integrated in the TSO, which owns the main network and operates the entire network (including possible merchant lines). This is the case for NGC and TenneT.

The key ownership question is whether a *regulated* TSO at (one of) the connecting points should be allowed to be the owner of an *unregulated* line (as in the BritNed case). The unregulated revenues of the line depend on the flow on the line and the price differences between the connected markets. Whereas these should be determined by the markets, they can be influenced quite strongly by the TSO. It seems natural to expect that the TSO will have incentives to manipulate the dispatch to increase profits at the unregulated line at the expense of the revenues in the regulated part. The underlying difficulty is that the increased profits in the unregulated part will not be offset by decreased profits in the regulated part.[19] The short-run effects will be a distorted dispatch leading to higher production costs and possibly distorted competition. The long-run effect will be distorted investment in two directions; first, investment in the regulated network will somehow affect the line's profitability, which will be internalised by the TSO. Second, the TSO may have an incentive to invest inefficiently in unregulated MTI lines at the expense of efficient investment in the regulated part.

It should be noted that the argument is modified under strict separation of the system operator (SO) and transmission owner (TO), in which case it seems natural to allow a regulated TO to invest in unregulated MTI. Part of the firm would be regulated while another part would not be, but since the TO does not control the dispatch, it is not obvious how this regulatory mix could be abused over and above the usual regulatory problem of cross-subsidisation, which can be tackled by accounting separation. The remaining problem does not seem to justify a prohibition of the regulated TO to participate in unregulated MTI. It should be noted furthermore that the concern is only about the TSOs connected to the new line; those who schedule the flow on the line. Of course, a TSO can be a merchant somewhere else.

An ownership restriction on connected TSOs is problematic, because they are the natural candidates to invest. For the unregulated BritNed case, it would imply that both Ten-

[18] The argument loses some weight realising that the regulation of electricity retailers in England and Wales should have run into the same problems but no such experience was made.

[19] In a slightly different context similar incentives have been observed in the Nordic markets by Glachant & Pignon [2003]. The underlying concepts remind strongly of the discussion on predation under the price-cap tariff basket [cf. e.g. Vogelsang, 1989].

neT and NGC could not be owners.[20] If it is felt that the TSO should be allowed to participate it seems good policy not to grant the exemption from regulation and instead take up the line into the regulatory asset base. This situation mimics the normal regulated TSO situation, which explains the phrase "as-if TSO". This implies that the new line need not be ringfenced. In contrast, if third parties invest in regulated MTI, it should be ringfenced from the competitive activities of the investor, especially if these are generators. Alternatively, an open season auction may offer a good policy in this case. The problem is more severe if the revenues of the line depend primarily on the spot prices on the short-run energy markets. If in contrast the line revenues rely on the auction revenues of long-term contracts increasing profits by manipulation of the dispatch is less straightforward. This provides an argument for a regime that prescribes to auction off long-term access rights to third parties (i.e. an open season auction).

A second ownership question concerns participation limits of dominant generators. At stake is the question whether there should be something like an ex-ante rule or to leave the issue to competition law. For instance, the safe-harbour provisions in Australia limit ownership control to 35% of the generation capacity on either side of the interconnector.

In most cases it appears intuitive that an additional line will increase competition in the (importing) generation market. Intuitively it might be expected in the BritNed case that competition in the Dutch market increases. It can be shown, however, that the HHI on the Dutch market can increase if the dominant generator owns the interconnector capacity [cf. Newbery et. al., 2003]. This conclusion sits uneasy with the idea that the line can be seen as additional capacity. This problem would be overcome using the concept of the residual supply index as defined above, since this concept emphasises the additional capacity. Still, even if the HHI increases it does necessarily imply that welfare declines. The increase in HHI is the result of the dominant generator owning the line, meaning that the distribution of market shares gets more asymmetrical. In as far as this implies a move towards an (asymmetrical) Stackelberg outcome away from (symmetrical) Cournot, welfare may actually increase.

If the new line increases competitiveness it is not a priori clear why a dominant generator would invest in the line, unless it is to forestall that someone else will do so. In that case the argument for regulatory intervention is that the competition effect of the new line may be positive but not as large as it could be if another party had built the line. Note that this argument in turn relies on the implicit assumption that there is only restricted room for lines. The argument may be logically correct but too weak to justify ex-ante rules.

[20] In the current situation it is unclear whether other parties would take over.

There is a potential flaw to the claim to leave it to competition policy to prohibit blatant cases: the required intervention may lack a legal basis in competition law. Building a new line does not qualify as a merger and hence merger laws do not apply. In a European context, achieving a dominant/monopolistic position in itself is not prohibited. What remains would be the (ex-post) control of an abuse of a dominant position. If the abuse is "excessive pricing", European competition law seems poorly equipped.[21] This relative weakness in competition law provides an argument for ex-ante restrictions on ownership by dominant generators.

3.3 Access and usage

Usually third party access (TPA) prescribes that network owners must give access in order to allow competition on the network. Article 7 of the EU regulation also opens the possibility to exempt new interconnectors from TPA provision. The access issue has been fiercely debated in Australia, but consistent with the light-handed approach, the Australian MTI access regime has been restricted to the obligation to submit a code of access undertaking. The details are for the investor to decide, but should of course comply with general competition law.

In the USA, the approach is more heavy handed through the use of the open season auction,[22] which in effect prescribes to sell off all usage rights of total available capacity (in a long-term, short-term combination). The system in for instance PJM is briefly as follows.[23] In PJM all Financial Transmission Rights (FTRs) are auctioned off, while network users are entitled to Auction Revenue Rights (ARRs). The ARRs (and thus implicitly the FTRs) are designed upon request of the network users, subject to network resources (maximum capacity or load) and the simultaneous feasibility test. The MTI investor is rewarded with incremental ARRs. Thus the network users effectively determine the set of incremental FTRs, taking the transmission network upgrade into account. Presumably this corresponds to full capacity of the line. At least line usage is beyond control of the line owner. In effect, this procedure is the same as a third party access regime.

For unregulated MTI it can be claimed that a third party access regime is unnecessary. Given that line revenues are unregulated, it must be in the interest of the line owner to handle line-usage efficiently. In a different context, the point has been forcefully brought by Director &

[21] The legal situation in the USA is slightly better with the Federal Power Act which prescribes "just and reasonable" charges.

[22] Cf. FERC, Docket No. RM01-12-000, p. 22; listing comments of the New York Transmission Owners. For a detailed description of an open season auction, see Neptune's "Pathway" notice of long term open season auction, June 11, 2003: http://www.neptunerts.com/.

[23] Cf. PJM's manual M-06.

Levi [1956] and Posner [1976, 1979],[24] while more recently the argument re-emerged in the debate on the parity principle in telecommunications [cf. e.g. Baumol & Sidak, 1994]. To maximise line profits it is usually in the interest of the line owner to allow the most efficient users (traders) on the line; discriminating against efficient third parties is usually profit decreasing. Moreover, given that revenues are unregulated, leverage of market power may be discriminatory, but analysis reveals that it need not be (statically) welfare decreasing.

The arguments underlying the claim are at the knife's edge and not robust. The same line of argument applies to access to electricity networks in general. The sharpness of the argument is discomforting: should the claim not hold, then the developing competition in generation and supply is seriously endangered. For unregulated MTI of new interconnectors such consequences are far less severe. Unduly restricted access to the interconnector implies restricted competition in the trade between the two interconnected areas, whereas supply competition in the respective areas is hardly affected.

This touches upon the more fundamental question about the market power of the interconnector, which depends heavily on the demarcation of the relevant market. Suppose that the relevant market is defined as the trade between the two areas interconnected by the interconnector. In that case, market power is likely because the capacity of the lines may be big compared to the market. If on the other hand the relevant market is the electricity market on either side of the line, the claim of market power of the line becomes questionable. In the latter case an access regime would seem superfluous; it would be the same as requiring a new power plant to give third party access to its capacity.

In the light of the arguments above, it seems reasonable to refrain from an ex-ante access regime for unregulated MTI, and leave it to competition law instead. In contrast to the ownership issue, for access questions competition law is well equipped.[25] European competition law contains an essential-facilities doctrine, which is designed to enforce third party access on a case-by-case basis.

For regulated MTI the situation is fundamentally different from the unregulated situation and a provision for third party access is required. If the line owner cannot make the profits with the revenues of the line it will try to do so by trading energy: leverage of market power. If the line owner does not allow third parties on the line it can reserve all trading for its own trading business and thereby shift the monopoly profits from the line to the trading business. To en-

[24] See for more detail Brunekreeft [2003b, ch. 5] and the literature quoted therein.

force regulation of the line revenues and forestall foreclosure of line usage a regime for third party access is necessary.

Rather more complicated is the case for tenders. Assume that a tender for the largest capacity implicitly regulates the revenues, such that the winning bidder would just break even. After winning the tender and constructing the line, the line owner will maximise profits of trading (i.e. using the line). It can do so by trading itself, or by selling monopoly capacity to third parties. In a competitive tender, this amount of excess profits is bid away by higher costs associated with bidding a larger capacity. Thus, for unregulated line revenues, the competitive tender leads to an inefficiently large capacity which will only be partly used (strategic capacity withholding). Various measures aiming to increase competition on the line decrease ex-post profits and will thus decrease the capacity of the winning bid (and thereby reduce inefficiency). Regulating the line revenues in combination with a third party access provision achieves exactly this.[26]

To conclude, a provision to enforce third party access is required if the line revenues are regulated. On the other hand, if the line revenues are unregulated it suffices to leave the access question to the competition authorities applying the essential-facilities doctrine.

3.4 Use-it-or-lose-it and must-offer provisions

Should it be mandatory to use all available capacity or should (strategic) capacity withholding be allowed? A similar question entered the discussion in the USA with respect to generator capacity; FERC requires generators to offer all capacity and considers withholding capacity as an abuse of market power [cf. for a critical view Harvey & Hogan, 2001]. In the European electricity market, use-it-or-lose-it (UIOLI) and must-offer (MO) provisions aim in first instance at the *existing* scarce capacity of cross-border interconnectors. The idea is to avoid that traders could acquire a dominant share of the available capacity and then withhold capacity to maximise short-run gains. The concepts UIOLI and MO are similar but apply to different stages. An MO provision applies to the line itself. It prescribes the line owner to offer all available capacity to the market, for instance as long- or short-term usage rights allocated to the market by an (open season) auction. The UIOLI provision applies to the usage rights. It prescribes the holders of the rights to use all the rights. The difference is relevant if the line

[25] This too is hardly free from problems. Depending on details, this may actually trigger incentives to discriminate against third parties [cf. further Brunekreeft, 2002].

[26] Staying in the case of a tender, if the line revenues are unregulated (and provided capacity withholding is allowed) it is not clear what an access regime would achieve.

users and line owner are not the same, and the difference loses meaning if they are. This paper does not address *existing* interconnectors but instead *new* investment, in which case these provisions have the drawback that the investor will internalise the provision into the investment decision and is likely to reduce the capacity.

The rewards by auction revenues in PJM as explained in section 3.2 in effect is a must-offer provision, meaning that all available capacity is supplied to the market. In Australia the issue has been discussed for instance in the context of the access undertaking of Murraylink [cf. ACCC, 2002]; the approach in Australia does neither have an UIOLI- nor an MO-provision. The EU Regulation on Cross-border Exchanges includes both an MO provision (art. 6(3)) and a UIOLI provision (art. 6(4)). However, art 7 on new interconnectors does *not* allow the possibility to exempt the new interconnector from the UIOLI and MO provision.[27]

Brunekreeft & Newbery [2004] examine the effects of an MO provision for new interconnectors and thus concentrate on the effects on investment. An MO provision attempts to tackle strategic welfare-reducing capacity withholding. Three drivers of capacity withholding are examined: first, demand uncertainty, second, demand growth and third, pre-emptive investment. The main results of the analysis are as follows. If demand uncertainty is the driver of capacity withholding, an MO provision (weakly) reduces welfare. This is especially important as demand uncertainty may be a reason for allowing unregulated MTI in the first place (cf. section 1). If demand growth is the driver of capacity withholding, an MO provision reduces capacity and delays the new investment, which in the face of (perceived) fear of underinvestment appears to be an inconsistent policy. If pre-emptive investment drives capacity withholding, the MO provision has either no effect or is likely to increase welfare. The effect of the MO provision is to make pre-emptive investment more credible which increases welfare for lower fixed investment costs.

Comparative static analysis of fixed costs of line construction suggests that as fixed costs get larger, the less it can be recommended to apply an MO provision; the short-run gains of full capacity utilisation are quickly offset by the detrimental effects on capacity. For an unregulated MTI project like the BritNed case, where fixed capacity costs are high relative to variable capacity costs [cf. Kuijlaars & Zwart, 2003], the welfare-enhancing effect relying on

[27] As a detail it may be remarked that especially a UIOLI provision may not be enforceable. A (monopolistic) trader under a UIOLI rule may offer energy at prohibitively high prices at the energy market. Since this supply would not be met with sufficient demand, the trader can claim that it could not reasonably use the rights. This difficulty, which has been observed in practice, is also encountered with the generators' must-offer provision in the USA. FERC intends to apply an analysis of bid prices to determine whether capacity withholding was strategic. The argument is less severe for the MO provision, because usage rights will normally be auctioned.

the argument of pre-emptive investment loses weight. On balance, the other two arguments gain weight and overall one hesitates to apply an MO provision. The current EU regulation create an obstacle and it will interesting to await further developments

4. Concluding remarks

This paper discussed a selection of regulatory issues emerging with merchant transmission investment (MTI). The focus of this paper is against the European institutional background, where MTI is allowed by the EC Regulation on Cross-border Exchanges, which enters into force in July 2004. In anticipation, MTI projects are currently in planning as DC interconnectors. One prominent example is BritNed, connecting the Netherlands and the UK. In response to these developments, European regulators are preparing regulatory policies. The primary aim of this paper is to address this discussion.

Importantly, merchant transmission investment can have different forms which work out on the regulatory policy. Section 2 demarcated MTI with two criteria to classify these forms. A first criterion is whether the MTI investor is fully free to decide on timing and size of the investment. The alternative would be that some kind of approval is required, or that the investment decision as such is taken exclusively by a central body. This criterion is called the capacity test. The second criterion is eligibility to regulated revenues. Genuine unregulated MTI relies exclusively on the price differentials between different markets and is not eligible to the pool of regulated revenues. In contrast, regulated MTI is eligible to regulated revenues. Importantly, eligibility to regulated revenues requires a capacity check. The classification demarcates and characterises three different types. First, regulated MTI with both a capacity test and funding form the regulated revenues. One can think of a tender for the funding after the decision to invest has been made centrally. Obviously, this option is very close to business as usual. Second, unregulated MTI, where the investor freely makes the investment decision and relies on unregulated market charges only. This is the main innovation of merchant transmission investment. The option has raised controversy on the efficiency of the investment. If it is considered that potential inefficiencies are too large, then a tender for the right to build and operate may serve as an alternative. This is the third option, which relies on market charges, but contains a capacity check. The decision to build (and thereby timing) would be determined centrally, but a tender would determine the size of capacity: the winning bid is highest capacity. The fourth option in the matrix is called conversion; it is rather typical and is not a stand-alone option, but merely a transition from unregulated to regulated MTI. This classifica-

tion serves well to analyse the regulatory issues, because the regulatory approach depends strongly on the type of MTI. The discussion of the regulatory issues has been grouped under four headers: competition as a condition to qualify as unregulated MTI, ownership questions, access regimes and must-offer provisions.

The EU Regulation requires that unregulated MTI enhances competition on the supply market. Whilst this is intuitive, it can be criticised on several grounds. Importantly, welfare and competition effects may contradict and welfare should be more relevant. More fundamentally, one should question why there has to be a condition for unregulated MTI at all?

It can be argued that connecting (regulated) system operators should not be the owners of unregulated MTI. However, these will normally be the natural candidates for the investment and so the restriction may be overly severe. Furthermore, an argument for restricting the line ownership by (dominant importing) generators to some threshold value can be made if competition law is not well equipped. On the other hand, it should be questioned whether such a restriction is desirable at all.

A third party access provision seems redundant for unregulated MTI. If abuse by unduly restricting access should take place, application of the essential-facilities doctrine from general competition law will suffice. It should be stressed that even if access to the interconnector is unduly restricted, that this is not a serious impediment of competition on the market overall; it only impedes competition on the line.

A must-offer provision prohibits (strategic) capacity withholding and requires that all available capacity is offered to the market. While this increases short-run welfare, it has detrimental effects on the investment, which may offset the gains. On balance, for unregulated MTI, a rather strong case can be made to refrain from a must-offer provision. This conclusion runs counter to the current EU Regulation on Cross-border Exchanges.

Overall, for unregulated MTI, which is a light-handed approach, there is no strong case for regulatory intervention with complementary regulatory measures. Given unregulated MTI, a light-handed regulatory approach seems to improve welfare.

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