

Future structure and regulation of transmission networks in Europe

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Two views

- “the short term problem is easy; the long term interaction between generation and transmission is the real difficulty in a restructured system”
 - (a conversation in EdF 15 years ago)

- “.. competitive wholesale markets provide the price signals necessary for the TSO and regulatory agencies to identify when market participants should transmit energy from one zone to another and furthermore to identify when and where additional interconnection capability should be cost effective”
 - (the Sector Inquiry, I.3.1 in 2007)

The method

- “If you want to learn about something, first doubt everything; then try to remove the doubts”
 - (Thomas Aquinas said something like that in the 13th century)

- Doubts and their removal should be rational: the basis of my attempted rationality
 - Joskow’s paper on regulation of transmission companies (2006)
 - Bjorndal and Jornsten on Nordpool (EBL2001 - NVE 2005-2007)
 - EU existing and proposed legislation
 - ERGEG and ETSO papers

Classifying doubts

- Regulation of costs
 - Transmission companies incur congestion, loss and investment costs (+ other operation costs)
 - Regulation of OPEX (SO+others)
 - Regulation of CAPEX (TO+others)
- Regulation of prices
 - Transmission companies are monopolies that charge for access to and usage of infrastructure
- In a progressively more difficult grid environment
 - High penetration of renewable energy

Analyzing the doubts

- The old engineering view: the planning model
 - Expand transmission capacity so as to minimize the discounted sum of investment (CAPEX) and operation (OPEX) costs

- An economic view: two sided market
 - Transmission is a platform aimed at facilitating the encountering of generators and consumers and competition in generation and supply

- And the usual subsidiarity question
 - Thinking must be multijurisdiction/multizone

The old engineering view

What does the old capacity planning thinking tell us?

Total grid cost

- Is a mix of capacity, loss, congestion (system balancing) (+ other operation) costs
 - That have to be minimized simultaneously
 - Subject to many, sometimes difficult and non standardized constraints
- Actions by one TSO (e.g. investment in a line or maintenance of a line) has an impact on the possible actions of other TSOs (externalities) and hence on costs
- Some new policies, like wind expansion, may significantly modify the needs for line capacity and congestion costs

Doubts

- OPEX and CAPEX are generally subject to different incentive regulations
 - Can one separate them ex ante (will wind influence their relation?)
 - Given that there is a tradeoff between (congestion+ losses) (OPEX-other) and capacity (CAPEX)
 - And that accounting may allow some shifts from one to the other
 - Can the theory of regulation help do this separation?
 - Models are static, or if multiperiod (succession of regulatory periods), do not distinguish capacity expansion and operation
 - Can benchmarking techniques help?
 - They are also static
 - And sometimes adopt strange representations of transmission

Removing the doubt

- A conjecture
 - Only planning models can give insight on the separation of OPEX and CAPEX in a progressively more wind intensive system
 - Because they embed both OPEX and CAPEX and their tradeoff; they determine capital and operating expenses
 - This is different but not incompatible with Joskow 2006's description of NGC: different sets of incentive mechanisms
 - CAPEX in the sense of TO: existing asset + investments
 - Consultation and discussion between NGC and Ofgem consultants for investments (**no benchmarking possible**)
 - OPEX in the sense of SO, today: year by year adaptation
 - Dependence on investment and hence recourse to capacity model likely to become more important with wind.

Doubt about past EU regulation

- Regulation 1228/2003
 - Does not mention incentive regulation
 - leaves to Member States to select their mode of regulation and its power
 - But imposes some capacity planning based notion (LRAIC (5(6))) and locational signals (4(2))
 - Which have never been implemented (ERGEG)!!!!
 - Because one did not know how to implement them (Frontier Consentec)!!!!
 - Possibly because one did not try capacity expansion models

Doubt about past EU regulation

- Regulation 1228/2003 imposed an impossible objective
 - In the current organization of decentralized TSOs and Regulators: the goal was (almost) right but the means were not there
- The planning model tells us
 - About the interactions of actions of decentralized TSOs
 - Both in the short and long term
 - About the difficulty of computing notions like LRAIC (except by using MW.km in a centralized way)
 - And about conceptual problems with “linear” (per Mwh) locational long-term signals (goal almost right but not quite)
- The institutions responded in a very unsatisfactory way
 - Things that could not be implemented properly (LRAIC; inter TSO compensation; locational prices) were simply discarded by ad hoc arrangements or arguments (various texts): one gave up the goal

The new package removes some doubts

- The proposed revision of Regulation 1228/2003 explicitly introduces
 - a 10 year investment planning of the grid (article 2c)
 - A “Network of European Transmission System Operators” in charge of conducting this planning exercise (article 2a)
- A new Regulation proposal introduces
 - The “Agency for the Cooperation of Energy Regulators” (the Agency) in charge (among others) of supervising this plan
- This enables a rational common ground to determine investments and hence delineate CAPEX and OPEX and hence introduce separate incentive regulations
 - Whether one likes it or not, one is today unable to expand the grid by pure market based methods. Recall the discussion on merchant lines (e.g. Joskow & Tirole))
- Is this global plan a return to socialism (as will likely be argued)?
 - Not more than moving from NETA to BETTA
 - It is just a technical requirement of an integrated electricity market

But it does not removes all doubts

- What does one do with such statements
 - “because competitive wholesale markets provide the price signals necessary for the TSO and regulatory agencies to identify when market participants should transmit energy from one zone to another and furthermore **to identify when and where additional interconnection capability should be cost effective**
 - (the Sector Inquiry, I.3.1 in 2007)
- The proposed global governance structure is complex
 - And may lead to difficult agency (in the economic sense) problems
- But legal constraints do not permit to simplify it
 - Hence we have to do with what we have

Conclusion

- One can doubt that it is possible to properly separate OPEX and CAPX targets (and hence their regulation) in a more wind intensive system without a long term view of the network expansion at EU level
- The new package, if it goes through, could in principle remove this doubt
- It remains to see how its complex governance will be implemented
 - This is the residual doubt

The price structure

What does observation tell us?

The positions of generation and transmission have changed

- Before:
 - One first planned for generation; the grid and the location were developed after
- Today:
 - The grid makes some assumptions of developments of consumption and generation on the long run
 - It builds
 - and sends price signals: access and usage charges

The “leader” and “follower” have changed

- Before:
 - generation was the “leader” and the “grid” the follower
 - Interactions took place through quantities (e.g. locate 3 GW of nuclear)
- Today:
 - The grid is a “leader” with respect to generation
 - It is subject to different regulatory controls (as it should be in this organization)
 - Interactions between the grid and generation take place through price signals (e.g. the G and L in Regulation 1228/2003))

Doubts

- The fundamental: regulation has moved from quantities to prices. Are we sure we can regulate the price structure well?
 - Is the current organization more vulnerable to errors?
 - What if one is wrong of the location of some GW?
 - What if one is wrong on the price signal (e.g. G or L)?
 - Does (possible) vulnerability depends on the type of transmission company
 - ISO and the TRANSCO have different incentives
 - Does (possible) vulnerability increase with the penetration of environmentally friendly but “network unfriendly” technologies like wind energy?

Thinking about the regulation of price signals?

- A trivial observation: the grid is a platform
 - that facilitates the encountering of generation, suppliers and consumers
 - facilitates competition of generation and supply
- The less trivial observation: it is subject to “network externalities”
 - Some are short term and “easy” (for given infrastructure)
 - Congestion, losses; + questions of public good like reliability
 - Some are long term and “deep”:
 - Investing in a line in a meshed network changes the PTDF of all injections and withdrawal nodes
 - And hence raise very serious questions of long term price signals

Reasons for doubting

- The current laws (D 2003/54 and R 1228/2003) do not seem to be aware of these problems
- The same is true for the new package

What does economics tell us about “network externalities”

- Create markets to internalize them when possible and transaction costs are not too high
 - Short term externalities: losses, congestion, price reliability (as in the now defunct Pool)

- Create a price structure (access and usage charges) otherwise
 - Where one socializes some short term externalities (losses and congestion (system balancing)) if transaction costs are too high
 - because one needs to deal with LONG TERM (investment caused) deep EXTERNALITIES

What does practice tell us about “network externalities”?

- NGC/Ofgem:
 - NGC subject to incentive regulation, but cannot set the price structure
 - OPEX (SO) congestion (system balancing) is socialized
 - A consultation underway on localized loss charges
 - CAPEX (TO) subject to different incentive regulation, investments budget decided after extensive consultation with Ofgem
 - Proportional (linear) long term locational charges
 - Doubt: Long-term locational price signals largely result from dominant transportation phenomena between North and South and may have little to do with the (long-term) locational signals that we might have to implement on the continent

What does practice tell us about “network externalities”?

- Regulation 1228/2003 set a common price structure
 - Congestion
 - on interconnectors: market based: implicit vs. explicit auction
 - Domestic: left (almost completely) to subsidiarity and socialized
 - Access charges: G and L should be
 - Locational: but this is not seriously implemented!!!!
 - After adaptation by TSO intercompensation charges that should have been based on LRAIC but were not
- The new package (new regulation proposal)
 - Enhances the treatment of short term externalities
 - “.... promote the development of energy exchanges, the allocation of cross-border capacity through implicit auctions and the integration of balancing and reserve power mechanisms (2h(2))”
 - But does not add anything for long-term prices

In short we are not too sure how to regulate the price structure

- We know how to create markets to handle short term “network externalities” (congestion and losses)
 - But do not necessarily do so
- But we know much less about the price structure to accommodate long term “network externalities”:
 - Find access charges that
 - Induce the right development of generation capacities
 - Induce the right development of investments in the grid
- Is this important?
 - It depends on both the generators and the consumers!!!

Conclusion

- The third package removes some doubts on the regulation of usage (short term) charges
 - It account much more for what we know
 - And pushes in the right direction

- But it remains vague on the structure of access charges; this could be expected as our current knowledge on these things is
 - limited (not elaborated here)
 - difficult to apply in the meshed continental grid (probably easier in transportation driven systems such as UK or Italy)

What about subsidiarity?

The enabling and disabling principle

Much progress but still reasons for doubts

- In principle: the recognition of the (easy) short term “network externalities” and the (still to recognize) (hard) long term (investment) “network externalities” mandates
 - A central organization of TSO
 - A central organization of regulators

- In practice
 - Regulators and the Commission finally recognized that the decentralized organization of TSOs did not work
 - The pressure to harmonize is now much stronger
 - The former “ETSO vision” of interacting markets is discredited

But doubts remain

- Wasn't that obvious from the very beginning?
 - Engineers had told about externalities created by the grid
 - And economists about the need to internalize them
- In short: there was opposition to the obvious in the past; it could still appear to remove the substance of the “Network of European Transmission Operators” and the “Agency” on the way to the EP and the Council
- Even though observation confirms the need for centralization

Illustration: from Nordpool (Bjorndal and Jörnsten 2001; 2005-2007)

- Regulatory centralization in Nordpool
 - UK is more centralized than Nordpool which is more centralized than the continent

- Grid centralization in Nordpool
 - UK is more centralized than Nordpool which is more centralized than continent

- The key observation: there are
 - different grid companies subject to different regulation, one PX
 - no single RTO
 - And hence an incentive to cheat/take a very cautious management of congestion

Nordic market splitting (Bjorndal/Jörsten) (more rigorous than market coupling (YS))

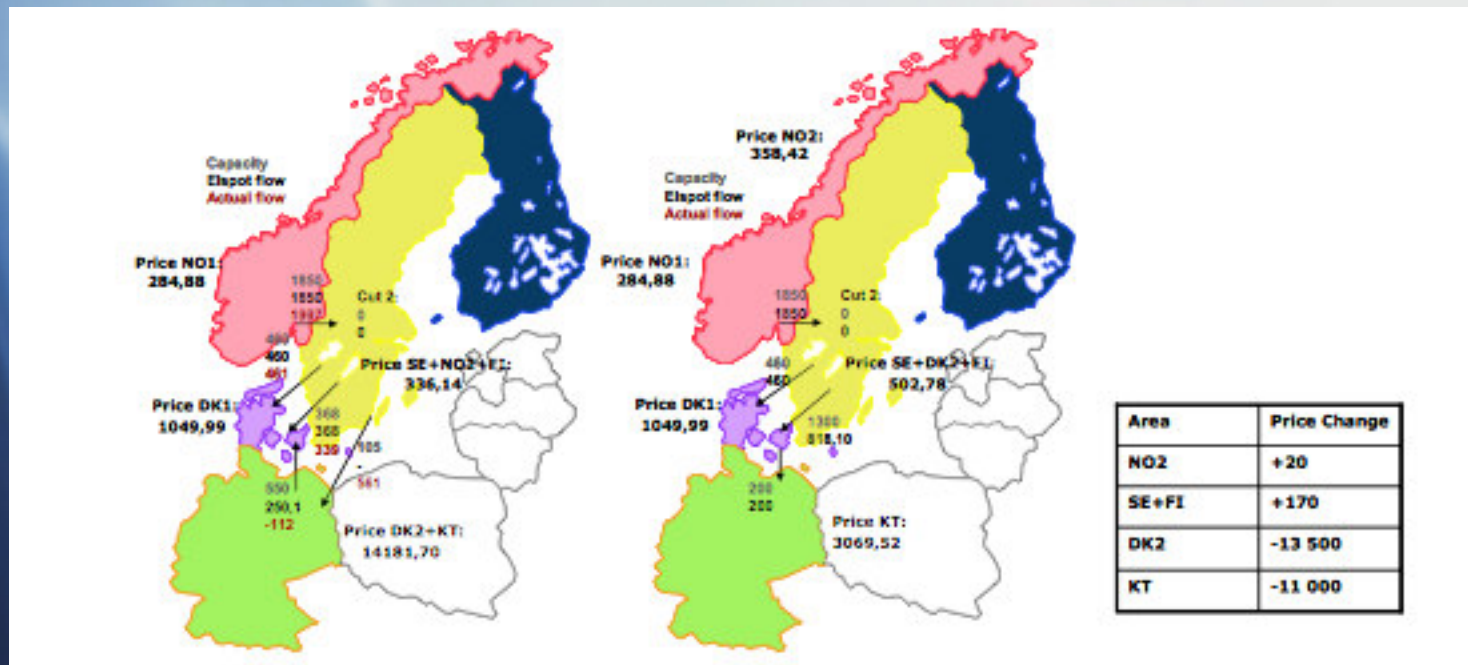
But both rely on Transfer Capacities (as Regulation 1228/2003)

- “differences in congestion costs can be substantial between different zone allocations”; “optimal handling of capacity limitations can reduce bottleneck costs considerably”
- “without flexible price areas, important to have enough fixed price areas in order to deal with special situations due to inflows and load” (think of wind power)
- “capacity limits are determined by TSOs and communicated to Nord Pool before market clearing”

⇒ problem of incentive for setting the Transfer Capacities

- Aggregate lines give considerable discretion to TSOs to manipulate transmission capacities

On 28 November 2005, a TRANSCO.....



With extremely complicated justification (Svenska Kraftnät (the TRANSCO), EBL, Dansk Energy 2006-12-06)



A word on ownership unbundling

Recall what we just saw

Informal reasons for doubting

- Strong claims with little support
 - EP statement, small data sample on investment
- Advisers of the Commission in the third package
 - “ownership unbundling does not deserve the spot light it has got”
 - !!!But ownership unbundling is the core of the new directive proposal!!!
- In the explanatory memorandum
 - “Effective unbundling .. promotes TSO investment activity” (page 5)
 - “with a view to encouraging investment .. the present proposal includes the possibility of a temporary derogation to ownership unbundling rules (page 6)!!!
- From basic logic
 - Something cannot be right and wrong at the same time

Formal reasons for doubting

- The new package explains that generation companies which control transmission have an incentive to discriminate against entrants:
 - Yes
- It then asserts that the TRANSCO type company removes that incentive:
 - Yes
- It then concludes that the TRANSCO is the preferred solution but the ISO is a second best because it requires more regulation
 - ???

Formal reasons for doubting

- Both the TRANSCO and the ISO (under the conditions of the new directive proposal) equally remove the incentive to discriminate. Does the ISO require more regulation than the TRANSCO?
- An unregulated profit maximizing TRANSCO will abuse its dominant position like any other monopoly. It should thus be regulated. Is the regulation of the TRANSCO lighter than for the ISO on the meshed grid of the continent?

Formal reasons for doubting

- An Ofgem/NGC type regulation does the job very well: it controls investments and the price structure
- An Ofgem type regulation could do the same for a single Regional Grid Company (RGC) operating on the continental platform: it would control all network externalities
- But the third package does not foresees a continental Ofgem controlling a continental RGC
- It foresees an “Agency” controlling a “Network of European Transmission System Operators”, Regulators and relations between Regulators, TSOs and the Network of TSOs!!!
- Each TRANSCO operating under incentive regulation would still have a strong incentive to move its costs (both at investment and operation level) to its neighbor. Will it really be easier to regulate the set (not one) of TRANSCOs than the set (not one) of ISOs in a grid full of externalities?

The background of the slide is an abstract composition of diagonal lines in various shades of blue, ranging from a deep navy blue to a very light, almost white blue. The lines are slightly blurred and overlap, creating a sense of depth and movement. The overall effect is clean and modern.

Conclusion

For dispute: on costs

- The introduction of a global investment planning in the third package is a very positive step forward: it recognizes the deep externalities of transmission
- This could help sort out CAPEX and OPEX objectives for separate incentive regulation, taking trade-offs into account
- Stronger: an investment planning model should help sort out the endless difficulties of the intercompensation mechanism (due to externalities)

For dispute: on prices

- The construction of a long term price structure is more difficult; current economic theory does not help much
- (Not for dispute because this was not elaborated: Planning models can also help construct the two part price structure that economic theory recommends we should implement for constructing access and usage charges.)
- We thus have a problem of price structure that is treated in a simplistic way in the current law (regulation 1228/2003):
- The practice of Ofgem/NGC suggest an organization where the facets of the regulation are taken care of in a pragmatic way: apply ideas from economic theory where they make obvious sense (OPEX incentive regulation); resort to consultation approaches otherwise (investment and price structure)
- Can this degree of centralization (that is natural in an island) be extended today to the multijurisdiction, meshed grid of the continent?

For dispute: on organization

- The creation of a “European network for transmission system operators” is a very positive step forward. Still it falls short of the creation of a European grid Company (EGC) or regional grid company (RGC).
- The introduction of an “Agency for the Cooperation of Energy Regulators” is a very positive step forward. Still it falls short from a European Energy regulator; the legal basis for the latter is missing
- The result is that we may not have the degree of centralization of control found in Ofgem/NGC structure; this requires more integration than the third package foresees
- It is not clear that we can regulate a set of TRANSCOs interacting both at operation (determination of TC) and investment levels; the reason is that both operation and investments present strong externalities, some of them we cannot internalize.
- For this reason the practice of PJM suggests to retain the ISO
 - Note: this statement applies to electricity; gas is an altogether different question