How regulatory risks may affect security of electricity supply

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1. Introduction

"Regulatory risk" is an expression which may arouse misunderstanding. It implies that risks created by the regulatory activity can be perfectly distinguished from other risks, and that there is no connection between the former and the latter. But in fact the mission of a regulator includes the reduction of risks. So is it correct to talk about regulatory risks or should one talk about risks on one side and regulatory approach to risk reduction on the other?

An elementary example is tariff setting: the power of introducing an administered tariff protects the consumer against sudden changes of the price by the provider, so in a way it reduces risk from the point of view of the consumer; yet in so doing it increases the risk for the energy supplier, who may be facing cost increases which cannot be passed on to the consumer. So the risk of one stakeholder is reduced by regulation, while the risk of another is increased.

Moreover: knowing that cost increases cannot be balanced by revenue increases, companies may decide not to invest. Lack of investment may increase the risk of future service disruption. So regulation may decrease some risks while increasing other risks, even for the same stakeholder (the consumer in this case).

The whole game is based on evaluating and balancing different risks, and on distinguishing risks inherent in the economic activity, which a regulator may try to reduce, and risks created by the regulatory activity itself.

Clarification of these issues is preliminary to examination of remedies.

2. Risks from (the regulation of) energy prices

Traditionally regulators have been setting the price or tariff of the service to the final consumer. Even in a liberalised setting they set tariffs for access to and use of the networks, and maintain a right to intervene on the privately set price of service by imposing limitations such as ceilings.

From the side of investors this creates a risk. The regulator may set prices too low and so discourage economic activity in the sector, and in particular new entries and investment. The reason may be an excessive zeal for consumer's protection and search for consensus; additional pressure may be applied by political forces and even by an incumbent company which may enjoy particularly low costs.

This risk is generally associated to the existence of a regulatory institution endowed with power on tariffs; the "regulatory risk" can be understood as the risk originated by the existence of regulation or of a regulatory institution. One might hastily conclude that the risk could be easily eliminated by eliminating the regulator, or by curtailing his powers so that the actions which are at the origin of the specific risk become impossible.

One should follow the alternative hypothesis and check whether suppression of the regulatory action would really produce a better world for all (of course it would produce an improvement for one or a few companies, but the issue is about the general, not the particular, interest).

If this exercise is performed, one would probably recognise that the specific risk derives from the monopolistic or oligopolistic character of energy services and from the fact that they meet a demand essential to life. Under such conditions, it is a generally shared belief that prices cannot be left to the companies to be set, and that some sort of political control is necessary. So the point is rather: which type of political control? Performed by whom? Is it not that a dedicated regulator presents advantages for the companies themselves since his actions will be more transparent and easier foreseen with respect to discretionary intervention by government? In fact, if the professional regulator is powerless or absent, political institutions such as government and parliament might interfere sooner or later, since they will react to inflationary trends of the economy or to a largely shared belief that the service companies have excessive power; they will set prices at a discretionary level, under pressure from interested parties or from public opinion in an effort to build consensus which may suggest demagogic choices.

So the risk is not originated by the existence of a specific regulatory activity or of a specific regulatory institution and cannot be eliminated by a simple act of deregulation. The structure of the industry and the nature of the services provided have to be seriously analysed, with adequate consideration

of the technical constraints, and the most advisable, or less risky, institutional solution has to be selected. The experience of almost all countries in the world[2] is that a specialised, dedicated and reasonably independent regulatory institution provides a more reliable frame for private economic activity that any alternative setting.

2.1. How to reduce the risk

The regulatory risk can be reduced, not eliminated altogether. Market opening is one basic component of such a policy.[3]

On the basis of what I have written above, it should be considered as not paradoxical that regulation is itself a remedy to the regulatory risk. Of course, it has to be honestly and competently performed. A "good" regulator provides a stable and certain frame and helps assuring free entry into the market for energy. A "free market" approach would leave so much power in the hands of the company in control of the network that free entry would be allowed in principle but not practically available.

It is often inevitable that discretionary decisions affecting prices have to be taken or controlled by some public institution: either because of the "natural" monopoly in network services, or because of an overwhelming market power by one company in providing a service essential to the life of people. In these cases, it is advisable that such delicate decisions be put in the hands of an independent technical body, institutionally dedicated to fair treatment of all[4] and to facilitating progress towards competition. Appropriate techniques can be used in setting tariffs, such as price cap methods, so as to balance incentives to efficiency improvement and to investment on one side and the interest of consumers on the other.

An essential ingredient of good regulation is a high-quality technical work (of data gathering, analysis and simulation) and an open process of

[2] The website www.iern.net provides a continuously updated description of energy regulators around the world. They are now over 300.
[3] The effect of globalisation and, specifically, of European integration on national institutions and on their behaviour is analysed in Thatcher (2007).
[4] This is not to imply that governments are unfair. The advantage of a regulator is that fairness in regulatory decisions and progress towards competition fully define his mission while government has to deal with a variety of goals such as industrial strategy, regional development, redistribution of income, foreign economic policy. Some of these goals may interfere with regulatory decisions and induce government to compromise.

consultation with the interested parties and of transparent decision-making, fully subject to judiciary review. If regulation is reasonable, reliable and foreseeable, then the risk is greatly reduced.

2.2. Understanding the market

A peculiar aspect of the electricity industry deserves mentioning here: costs of generation, transmission and distribution are mainly fixed while demand fluctuates significantly. Short-run marginal costs are lower than average costs most of the time. If prices or tariffs reflect marginal costs, then total costs can only be covered by relatively high peak-load prices or tariffs.[5] This is standard textbook tariff theory. Yet this is not quite understood by political and public opinion in practice. High peak-load prices are seen as an indicator of market power and of exploitation of consumers by energy companies, who take advantage from scarcity. When laymen see very high prices for the same energy that is usually priced far lower, they believe that the same energy must present the same costs as usual, and consequently they see these high prices as a clear proof of excessive profits.

There are two distinct consequences of this misunderstanding: one relates to day-to-day tariff management and the other relates to policies to face risk.

Ordinary tariffs are usually set with reference to average rather than marginal costs. Yet they can be interpreted as resulting from a weighted average of peak and off-peak long-run incremental costs. Due to the cost of real-time meters, not only administered tariffs but also private contract prices for small and medium-size customers are set as two-part tariffs, without reference to the time of the day and day of the year. Consequently, the behaviour of the consumer does not take the actual cost structure into account and does not produce an efficient use of the fixed capital. The cost of real-time meters has fallen dramatically due to the development of electronics, yet the industry is very slow in spreading their usage and in adopting peak-load pricing.

Even more serious are the consequences of ignoring the structure of costs on the management of risks, with particular respect to the risk of inadequate capacity. Since electricity can hardly be stored, generation capacity can be considered as adequate only if it is large enough to face the highest peak

[5] Theory is well explained in Green (2007) and application problems in Lévêque (2007).

demand that may be foreseen. Consequently, reserve generators are necessary which are normally not utilised and will be used only in presence of exceptional demand peaks or breakdown of normally used plants. Reserve generators will be economical only if electricity prices can reach very high levels in the short periods in which such plants are called to operate. Periods of emergency are rare and short by definition, consequently it is only natural that they are characterised by prices many times higher than normal.[6] But public and political opinion is not prepared to understand this necessity, and if an emergency develops and prices go very high, there will probably be a reaction against what will be seen as a speculative attitude of greedy companies: in such circumstances, political action will be taken to set compulsory ceilings to prices. Only a very well established and reputed regulator can resist the political temptation and provide assurance to consumers that, although spot prices may go sky high, average prices in the medium run will be reasonable. Expectation that an emergency price control may be introduced creates regulatory risk, and makes investment in reserve capacity unattractive.

In many countries, the likelihood of reserve capacity being insufficient to face emergencies is considered by policy makers to be too high to be neglected. The cost of service not provided is much higher for consumers than it is for energy companies; hence it may be rational for companies not to invest while it may be rational for society to subsidise some extra investment in generation capacity. As a protective measure, some compulsory or incentive-oriented regulation is usually introduced in order to assure that enough reserve capacity is put in place, and a corresponding surcharge on consumers will be necessary.

2.3. Political options

Of course, even if fully understood, reliance on the price mechanism at times of crisis may be rejected by a majority opinion; a mix of obligations and incentives to reserve capacity may be preferred. But some understanding and some acceptance of price flexibility is necessary if we want to have an electricity market and not a state-controlled vertically integrated monopolist in charge of the service. The regulatory risk and the consequent burden on tariffs can be lower if the working of the price

[6] In the early months of 2003 electricity prices in the wholesale Norwegian market hit levels seven times higher than the average of the previous years.

mechanism are better understood and accepted.

If the problem of adequacy of generation capacity is not addressed properly and is left to the market altogether, it is very likely that political interference will be adopted on an emotional basis at times of emergency; it is also likely that some genuine speculation will develop, based on abuses of market power such as capacity withholding,[7] inducing further political action moved by emotions and probably oriented to further restrictions to the working of the market; direct political action will be much quicker than the reaction of the antitrust authority to the abuses of market power, which are difficult to detect and prove.

Once again, what appears to be a regulatory risk is in fact a risk inherent in the character of the electricity industry: this type of regulatory risk cannot be dealt with by simply doing away with the regulator. On the contrary, a coherent policy of risk reduction requires a well established and competent regulator who fully understands the working of the market and explains it to the public; who performs the tasks of monitoring prices, preventing speculative behaviour, hedging small consumers in front of price fluctuations, but also convincing political institutions and opinion makers that price fluctuations provide a healthy safety valve and are necessary to induce companies to maintain some reserve capacity.

Of course regulation, once in place, may stick and resist suggestions to adapt to the changing conditions. A process of periodic review of the regulator's activity, performed by an external evaluator, is advisable and can contribute to further reducing the regulatory risk.

3. Risks from (the regulation of) networks

One key variable in the management of an electricity system is the extent of network development. We know from theory that the economically optimum development of a network is lower than the one which will eliminate all congestion; it will be reached at the point where the marginal cost of the residual congestion equals the marginal cost of network expansion.[8]

[7] Capacity withholding was one component of the Californian crisis (Joskow, 2001)
[8] The "Zero-congestion Fallacy", see Stoft (2006) p.91.

It is not easy to assess whether the actual development of the energy networks exceeds or fails to reach the optimum; some scholars believe that traditional regulation relying on a rate-of-return network tariff has generally led to overinvestment.[9] On the other side, network planning has been operated at the national level in the first place, with international interconnectors as extensions whose usage is limited to cooperation among largely self-sufficient systems. If we consider the influence that the incumbent, vertically integrated companied have long exerted on the regulatory offices in the past, and their interest in protecting the national market, we can guess that the networks may have been overdeveloped inside national systems but not among them.

The new context, characterised by market opening, new regulation and an increasing sensitivity to environmental issues, is so radically different from the old one that it is difficult to conclude whether the risk of security of energy supply being jeopardised by an insufficient investment in the networks is increasing. Even more difficult is it to disentangle the role of regulation. But the issue is too important to be neglected, and some considerations may be advanced.

3.1. Some redundancy is desirable

In general, security of supply is enhanced by a network which is well developed beyond national boundaries.[10] Theoretically, this goal can be taken into account within the above-mentioned balancing of marginal costs, by carefully calculating the social costs of interruptions and the probability of their happening. But risks are difficult to assess and they are changing over time: the increasing dependence of our economic systems on a regular and uninterrupted flow of energy may be underestimated by models built just a few years ago. In practical terms, it is customary to conclude that, from the point of view of security of supply, overinvestment is socially preferable to underinvestment.

If the optimisation of the networks had been calculated mainly on the basis of national systems, the calculations have to be repeated on a continental

[9] The well-known Averch-Johnson effect.
[10] I say "in general". It may happen that lack of sufficient interconnection between country A and country B prevents a shortage in A from spreading to B. If such an event is likely to be repeated, then security of supply in B will be actually reduced by an improvement in the interconnection. I disregard this hypothesis.

basis. Risks should be reduced by being pooled into a larger network and market.

Security of supply also includes facing the risk of events (of any origin) which may interrupt the flow of natural gas from one producing country into Europe for a period of time long enough to put a strain on the existing storage facilities. Such an event would dramatically hit some regions of Europe unless the European network is so developed that the sudden scarcity be spread over the whole of Europe and flows from other origins can be increased to compensate.

A shortage of gas would also hit the electricity system and impose some substitution of gas-fuelled generation with other generation, which implies a different geography of generation and substantial strain on the electricity grid.

Obviously, all sorts of compensation require a double condition: (a) that networks are developed enough to allow for compensation and (b) that legal and contractual conditions and the working of the markets produce the desired effect of letting energy flow according to price differences without any distortion. Both conditions are hard to establish, but necessary for the working of a European internal market and for European security in general.

A further reason for developing the networks even beyond the theoretical optimum level is the need to facilitate new entries and competition. Of course, the main instrument for putting new entrants on the same footing as incumbents is the discipline of access to the existing network: this is why Third Party Access is so crucial in the legal setup of reform in Europe. Yet experience shows that when a network is barely sufficient, obstacles to new entry are much greater: long-term contracts cannot be easily dealt with not only because of existing rights dating from before the reforms, but also because buyers like them. Industrial consumers will accept to give up long-term contracts only after a fully developed energy market is working, in which short term contracts are integrated by easily available futures and derivatives to reduce the risks: such a complex market will not be created in a short time. The transition to a competitive market is made difficult by a circular resistance: operators prefer long-term contracts, long-term contracts reduce the accessibility of networks to new entrants and reduce the chances of a complex and flexible market to develop. This vicious circle can be

overcome more easily if there is some spare capacity in the network. So the optimal amount of investment in networks should be calculated by planning some redundancy, and the right incentive should be made available to the network company to build it.

3.2. Plan redundancy to get what is barely sufficient

Recent experience shows that investment in networks can be substantially delayed and some time altogether impaired by local opposition, usually on environmental grounds. The planning process of any new investment will have to be much more accurate and include a much greater consideration of environmental aspects and of social acceptance than in the past.

This has important implications for network planning. When planning, the same optimum network should be calculated in more than one version, so that it will be still possible to adapt the plan to an insuperable opposition that may jeopardise some parts of it. This is tantamount to saying that networks have to be planned redundant.

Careful consideration of environmental aspects raises difficult issues. One environmentalist goal is distributed generation of electricity, which would allow for a much lighter network. The ideal world of distributed generation is attractive, but its implementation is still very slow and costly, given the significant economies of scale in generation. Therefore, a new line or a reinforcement of an existing line may appear as unjustified in a scenario of fast growing distributed generation, but necessary in a scenario of business as usual in generation.

The case of wind power makes the issue more difficult. Wind power is renewable, environmental friendly, yet geographically concentrated and intermittent so as to imply heavy new investment in the grid. The exact opposite to distributed generation. A contradiction in the environmentalist energy scenario, yet a real constraint that has to be dealt with.

Network companies face these contradictory pressures. Even if we accept that the private profit motivation can provide a socially optimal result (which is far from being warranted), they will not reach their targets unless they accurately include a forecast of delays in their plans, and the probability of some projects being halted and possibly abandoned.

3.3. Effects of market opening, structural change and regulation

Market opening introduces new actors and changes the frame of incentives. What matters is not a conjectural picture of what would happen in a fully liberalised setting but what actually happens during a long and hardly fought transition.

A transition is characterised by uncertainty about the final picture and about the timing of each step towards it. To make an example, an incumbent facing a possible forced unbundling will not undertake ambitious new investment plans; in fact, a slowdown in investment is common in the early phases of liberalisation.[11]

Let us look at the likely behaviour of the main actors when the system enters a process of liberalisation. I shall list a number of reasoned conjectures, which expect a thorough empirical checking.

Incumbents have reasons for investing less than before.

One reason is that tariffs are less remunerative: new regulators are more sensitive to efficiency and to the price levels, since public opinion and political decision-makers expect price reductions as a result of reform: as a consequence they set rate-of-return methods aside, adopt price-caps and take a very critical view of investment expenditure.

A second reason for incumbents to restrain from investment in networks is that incumbents can still appropriate congestion rents for some time: extraction of congestion rents through competitive bidding and transfer of the auction revenue to some social destination is a very long and controversial process.

New entrants will try to remove the obstacles to their entry, even if this implies costly investment, when the market to be reached is remunerative. The clearest example is the battle around the LNG terminals: while the early ones have been built by the incumbent companies, the more recent ones are often built by new entrants.

A new breed of actors appears: the traders. Independent (i.e. not belonging

[11] This also applies to investment in generation if planned reform includes divestiture or ceilings to production.

to energy groups) traders advocate the opening of markets and the elimination of all barriers, so they provide support to all necessary investment in networks. Their influence, though, is limited.

Lastly, we must consider the crucial new actor, the independent system operator. Here we have a real problem. A new and truly independent SO does not yet exist in most countries. Legally, in many countries the SO still belongs to an energy group. Where fully independent, the SO is young and has not had much time to build its own culture, adequate to the new conditions of a European free market where changes in the flows of energy are larger than before. Not to speak of the need to understand and master the new challenges of quick adaptability of the network to the changing conditions from both sides (of generation and load) through the "smart grid" techniques.

3.4. Who is responsible?

The most worrying aspect of the reform is that ultimate responsibility for the planning of the networks may become less clear.

In the "old" times, vertically integrated monopolists took care of network development. They had a mission, defined in the statutes or in a legal act of concession. They also had an interest insofar as network development contributed to the growth of their sales. They were responsible for the overall service conditions and their maintenance over time.

In a liberalised system, even where the previous monopolist continues to maintain a dominant position, the dominant company is no longer responsible. The SO is responsible, but the SO may lack powers and independence, and may be subject to the wrong incentives.

If a major disruption of service happens, then everybody agrees that the ultimate responsibility lies with the political or regulatory institutions. So they have to take all preventive measures that are reasonable, and in case of doubt, government or the regulator have the last word in planning an adequate protection for the community. It has always been so; but the implementation of this principle is more complicated in a liberalised context, where one has to rely on the overall working of the market rather than on direct negotiation between political institutions and a well-identified company.

Companies always provide a very useful technical support to the political institutions, even more useful if the ultimate control is in the hands of political institutions lacking technical knowledge.

Where network development is beneficial to all competitors, incentives to invest in network expansion are non-existent or even negative for an incumbent-controlled SO. This is the main reason why the European Commission has made ownership unbundling of the networks the central piece of the Third Package which has been announced for adoption in 2007, on the basis of thorough inquiries in the previous years. Not equally clear are the reasons why dominant companies and governments of large member states such as Germany and France are staunchly opposing the Commission's proposals: the simple explanation that they are brutally defending market power looks too simple or even simplistic. The debate on the commission's Third Package may bring some clarification.

So the present setting is risky. The SOs are formally independent and legally responsible. Yet in many cases they are not fully free to take decisions that may reduce the parent company's revenues; in general, they are not strong enough to take full responsibility for the security of the system.

These worries are related to the uncertainties of a transition period. They may be overcome in the long run. Yet the long run may be too long to avoid risks growing in the meantime.

In a fully liberalised context, at the end of the transition, the network is held by an independent company, having no interest in market power and market shares. It is not important here to establish whether this will be the result of legally compelling political decisions or the outcome of a market process through a gradual change in the structure of the industry (whenever supply in an area evolves from a monopolistic to an oligopolistic structure, it is natural that sooner or later the new structure of the industry will be reflected in the ownership and/or governance of the network operator and an independent TSO or an ISO will be set up). The really important question is: will an unbundled network company (TSO or ISO) have a sufficient power and sufficient incentives to invest in the development of the network?

3.5. The role of regulation in network development

We have quickly reviewed the risks from lack of an adequate network and remarked the changing conditions of network functions, requirements and governance. This allows us to summarise the aspects where regulation is crucial.

The need for investing in infrastructures for energy transport has been clearly recognised by the European institutions in various ways. Regulation should be oriented to increase both security and new entry by making the networks adequate and open. This does not imply that control for economic soundness of new investment be neglected, but that some allowance be made for the desirability of some redundancy.

The main recommendation is to quicken the transition process and to reduce the related uncertainty: while the relevant decisions mostly lay beyond the powers of any individual national regulator, and also beyond the powers of the European Commission, it is important that regulators use their powers and develop some advocacy in this direction.

The incentive to network development has to be re-established on a sounder basis. No longer a rate-of-return regulation which provides a distorting incentive to any investment, but an adequate revenue from tariffs which may include a premium for new investment. All perverse incentives such appropriation of congestion rents should be eliminated by regulatory action.

It has been wise to exempt new LNG terminals from TPA, so as to ease new investment in infrastructures which are essential to reduce the risk of interruptions in the inflow of imported natural gas. The same type of discipline could prove useful for introducing innovative investment towards expansion of the electricity grid, possibly via development of new DC lines.[12]

Mostly important is definition of a clear and possibly harmonised policy towards infrastructure development and management, consisting of two lines: a general criterion for setting the targets of network development, and a clear allocation of responsibility.

[12] Interesting perspectives are described in the Economist (2007) reporting studies by ISET – University of Kassel.

A target level of infrastructures is a necessary guideline for setting incentives and using public money in general. The present target of an interconnection capacity equal to at least 10 per cent of the country's consumption is clearly very rough and should be redefined in a way that takes risk evaluation into account. European TSOs have technical knowledge and experience for advancing a rational proposal, based on probabilistic models, a technically sound indicator of risk, a formula for defining the necessary interconnection capacity.

Allocation of responsibility for the system's security must also be made very clear and as distinct from political activity as possible. Planning for security is a highly technical task and political decision-makers should set priorities and allocate responsibilities, but refrain from keeping much discretional decision power in their hands. Political institutions can hardly maintain a time-consistent behaviour in front of pressure by electoral influent groups and by demagogic or nationalistic impulses in public opinion.

4. Conclusions

Regulatory risks and regulatory activity to reduce risks have to be discussed together: many times they are two faces of the same medal.

Besides regulation, policy actions at the level of political institutions are also necessary. To make an example, European institutions and national governments must get a few important projects (like Nabucco, submarine interconnectors etc.) implemented.

But sound regulation can greatly help in reducing risks. Contrary to what some interested stakeholders and some academic supporters of an abstract idea of competition may hold, regulatory risk is not avoided by eliminating or weakening regulation. Regulation should be oriented to the reduction of risks, along ways which I have tried to describe above: it may increase risks when it is badly managed or when individual regulatory measures outlive their usefulness and are not repealed because of inertia or lack of critical review.

So an essential complement to good regulation is a well-established mechanism of regulatory review performed both by internal and

independent external reviewers, who check for the necessity, adequacy and cost-effectiveness of regulation, taking all direct and indirect burdens into account.

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