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# Economic Theory and Electrical public Utilities Organization in the first part of the twentieth century: French and US Experiences

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The purpose of the communication is to highlight the role of economists in the institutional building of the electric systems in the first part of the twentieth century. It aims at showing how the organization of electricity sector and its regulation were largely the fruits of the economists' works not only at a theoretical point of view, but also through their individual commitment in the public regulation building.

What is the interest for economists to study the role of their predecessors one century or sixty years ago in the debates on the sector regulation, except history of economic thought considerations or the study of economic history? On my mind, the influence of the theoretical controversies led in the sixties by the Public Choice theory and in the eighties by the new public economics (especially with the works of Jean-Jacques Laffont and Jean Tirole) is very significant in the current reform of electric systems. The controversies about the efficiency of the former regulation framework and its incentive effects favoured the deregulation process both in the United Kingdom and in the whole European Union until the directive of 1996.

But, why their predecessors commit themselves in the past debates? What are the modalities of their participations? What are their normative prescriptions, now so controversial?

As welfare economics shows, the private firms' lead electricity sector encountered many difficulties in the first part of the century because of several market failures. These ones

compromised their capacities to develop optimal investment plans and to propose efficient tariffs to users. A public regulation appears to academics as the only way to overcome such difficulties and to guarantee the collective efficiency. As private and social returns of firms' decisions are different because of the presence of externalities, public good dimensions of increasing returns (natural monopoly theory), it appears that collective interest has to lead the choices relative to investment and tariffs.

Economists participate to the electricity sector re-organization by their academic researches and by their intervention in the new legislative framework building or directly in the firms' management. Both US experience of private regulated firms and French experience of a public-owned monopoly testimony of such commitment.

In the US case, we will underline the influence of (old-) institutionalist economists, in particular John Rodger Commons. He contributed to build the US model through its commitment in the Wisconsin legislation on public utilities in the first years of the century and through its theoretical works on the legal foundations of the economic system. Studying the US electricity regulation construction and the contemporary economic debates could be very fruitful in the context of the European electricity sector restructuring, especially in the field of unbundling issues.

A second case lies in the French model of the state-owned monopoly. If scholars' controversies had a minor influence upon the former electricity private groups nationalisation (except perhaps the debates on the end of liberalism during the 1929 crisis), the organization and management rules of the firms are due to the works of marginalist economists as Maurice Allais, Pierre Massé or Marcel Boiteux. The Allais' theoretical works influence upon the management of Electricité de France was strengthened by the internal works led in the firm's economic service on optimal pricing, investment rules of choices or optimal water reserve management. The career path of Marcel Boiteux, both author of seminal papers on optimal electricity pricing, president of the international econometric society and firm's CEO, testimonies of the interactions between economic theory and the practice of firm regulation and management.

If the objectives of these two economic schools are very close, it remains a lot of major differences between them.

In the US case, the industry structure remain based on private firms, which tariffs, return on equity or investment decisions were under public monitoring through regulation commissions. Conversely, the French Model was built on the basis of a single public enterprise, which benefits from a legal quasi-monopoly upon generation, transmission and distribution.

The original US regulation model mainly relies on regulation commissions, in which the different stakeholders are represented. As they have different interests, the process of decision is driven by check and balances logic. Conflicts, compromises or search for consensus. On the contrary, the French model integrates the regulator at the firm itself. As the firm is a public entity, its strategy and its investment or pricing choices are based on the general interest, which is defined on the basis of economic models. General interest comes out on top against the particular interests. The regulation has not to consider them. Its decisions are products of collective optimality and not of consensus or balance of specific interests.

In the US model of regulation, the Public Interest is considered as the product of the negotiation between the different stakeholders represented in the Commission. Conversely, the management of the public firm was seen in France as the guarantor of the collective interest, because its choices were founded on economic theory. Public economic calculations, realised by state engineers, allow defining an unchallengeable general interest.

If the US model, contrary to the French one, does not rely on an engineering conception of economics in which it is possible for a public body to define and to maximise a social welfare objective function, it is because of the influence of the pragmatism and the legacy of the German Historic School. The first one, developed in the USA by philosophers as Peirce or Dewey, considers that the objective knowledge about think is impossible. Knowledge is just a transitory consensus about a phenomenon, based upon the individuals' perceptions. The second theoretical root rely on the controversy between classical theory in economics, mainly British and French, which searches to discover general economic laws through mathematical formalisation and the German Historical School for which an economic law is always dependent from a specific context of time and space. In other words, institutions and history matter. As a consequence, there is no for the old institutionalists some optimal strategy to lead in order to maximise the social welfare. The checks and balances model is the only way to obtain a reasonable equilibrium between the several interests. If the US model relies on the confrontation of private interests to lead to a reasonable agreement, the French model tries to substitute the visible hand of the state

engineer to the invisible hand of the markets. If it is not possible to obtain the optimal allocation of resources, because of the market failures which characterise the electricity markets, the omniscient, omnipotent and benevolent public manager can however reach a second-rank optimum.

Through these two examples, the communication will aim at putting into relief the dynamics between scholar debates and electricity sector reforms and the links between economic history and history of economic thought. Finally, the purpose will be to highlight to what extent these two historical experiences and the related economics debates can help us in the current European reform.

## **A – The Role of the American Old Institutionalism in the Building of the Electric Utilities Regulation**

For the old institutionalists, there is no social welfare objective function to maximise. Contrary to the French model of regulation based on the marginalist theory, economists are not considered as able to design optimal institutions, which could correct market failures. Institutions are not some products of a conscious design but are seen as fruits of a social process. Institutions play a central role in the economic process by offering efficient devices of coordination between the stakeholders, which help them to overcome the market failures<sup>1</sup>.

As law is seen by Austrian Economists as Friedrich Hayek as the product of a spontaneous order, called *catallaxia*, American institutionalists consider the regulation must not be define by an omniscient, benevolent and omnipotent economic agent, in other words, the Government, but must derive from a selection process driven by social interactions and especially by legal conflicts. As rules constitute strategic resources for economic agents, their use in the framework of conflicts of interests resolution help to bring out evolving compromises or consensus. A Check and Balances approach is the key point to favour the emergence of institution, which constitute some reasonable compromises between the different social interests.

The specificity of this approach and its link with Austrian Economics could be explained by the influence of the German Historic School, which contested, in the nineteen century the approach of classical economists. The German school was opposed to its mathematical approach and to its

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<sup>1</sup> Dutraive V., (1995), «De l'analyse contemporaine des institutions aux institutionnalistes américains: un cheminement rétrospectif», introduction à Corei T., *L'économie institutionnaliste. Les fondateurs*, Economica, Paris.

claim to universality. It rejects the concept of general economic laws, which apply in every place and at every time. For the German school, an economic law can only rely on an historical observation. In this sense, its method is typically inductive, based on the facts and not on mathematical models. Its influence on institutionalist economists came from the fact that a lot of US economists made a part of their degree course in Germany in the end of the nineteenth century.

Such influence is very strong in the case of the social gospel movement, which was animated by economists who reject the laissez-faire approach, dominant at the end of the nineteenth century and which advocate for a project of voluntary transformation of economic processes. Such progressive project was particularly strong in the domain of law, especially with the movements of legal realism and sociological jurisprudence<sup>2</sup>. Some American lawyers consider that the Common Law process could induce a conservative treatment of social and economic conflicts. For example, the clause of due process of law was used since 1868 in a very restrictive way in economic litigations. The Supreme Court rejected all legislation, which could infringe property rights or contracting freedom. The purpose was to bend the court's decisions and by the way the case law in order to take into account the actual social and economic experiences and not only the principles of the Common Law.

So this approach leads economists and lawyers to involve themselves in social debates and in judicial controversies in order to influence the common law evolution process. The purpose was to favour a more reasonable functioning of the markets, even if it could induce an infringement of the property rights. Two examples could be highlighted. The first is the regulation of tariffs with the Supreme Court decision *Minnesota Rate* in 1890. The second is the very controversial theory of the mandatory right to access to essential facility induced by the *Terminal Railroad* decision of 1912.

In the *Minnesota Rate* decision in 1890, the Court recognises the legality of a tariff regulation despite its effects on property rights. The right to set tariffs is submitted to a federal monitoring, in order to guarantee their reasonability as soon as it concerns a general interest activity.

In the same way, the *Terminal Railroad* decision in 1912 introduced another cut within the sanctity of property rights. If an infrastructure can be considered as impossible to bypass by

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<sup>2</sup> Kirat T., (1999), *Economie du droit*, Repères- La Découverte, Paris, 120p.

competitors, it's could be defined as an essential facility and its owner could be obliged by the Court to allow an access for competitors. In the framework of this very controversial jurisprudence, the courts have to set the access charge. The owner loses both its contracting liberty (mandatory access) and the right to freely set the price.

The institutional economics movement had both a theoretical purpose, which tried to analyse economics by taking into account institutional and legal dimensions, and a normative (or performative<sup>3</sup>) project, which aimed at inflected market process in a more “reasonable” way by judicial actions<sup>4</sup>.

John Rodger Commons played a major role in this process. If its main interventions took place in the industrial relations debate, he had contributed to the regulation of the electricity sector both by its commitment in the Wisconsin utilities legislation in the first years of the twentieth century and by two papers published in the *American Economic Review* in 1907 and 1910.

The purpose was to regulate public utilities through the confrontation of the different stakeholders' interests. The solution proposed by Commons was to form regulation commissions, independent of government, which have to power to set tariffs and to settle litigations.

The Wisconsin utility regulation law, in which Commons intervened, rely on a model of exclusive concessions of defined duration, which monitoring was realised by independent commissions, endowed with significant investigation and coercive powers. For Commons, regulation commissions have to play the role of a fourth power, which had to frame economic relationships<sup>5</sup>, by promoting the fairness of the competition and to ensure the reasonability of the result of the market process.

The regulation model defined by Commons in 1907 for Wisconsin was not an isolated phenomenon. It took place within a general contestation about the excess of big enterprises, which were considered at the end of the nineteenth century as a major threat for the competition

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<sup>3</sup> Deschamps M., (2008), « L'hypothèse performative », *Mimeo*, CNRS-GREDEG- Université de Nice Sophia-Antipolis, avril.

<sup>4</sup> Kirat T., (2001), « Le pragmatisme, l'économie et l'intelligence des règles juridiques : leçons de la méthode institutionnaliste de John Rodgers Commons », *Revue Interdisciplinaire d'Etudes Juridiques*, n° 47, décembre, pp 1-22.

<sup>5</sup> Commons J.R., (1939), « Twentieth century economics », *Journal of Social Philosophy*, October, pp.29-41.

and for the economic liberties<sup>6</sup>. In this sense the antitrust legislation introduced by the Sherman Act in 1890 and completed by the Clayton and the FTC Acts of 1914, belonged to the same logic to the regulation of the tariffs of public utilities.

In 1905, the State of Wisconsin formed a regulatory commission in order to monitor railways and a general regulation framework for utilities was also introduced by the State of New York in 1907. The building of the regulation institutional scheme was the result of a long process of negotiation between the different stakeholders<sup>7</sup>. According Commons, in its 1907 paper published in the *American Economic Review*, several texts were discussed. The first extended the railways' regulation to urban and fluvial transportations, to telegraph and to electricity. The second introduced a public regulation in water distribution, telecommunications and energy sectors. A last proposal was refused. It proposed a mandatory interconnection of networks and a prohibition of public utilities duplication. By the way it would induce a public control upon the investment choices of the firms and introduce a mandatory access to the network for the thirds. In other words, this last proposal announced the essential facility doctrine.

The commission has to monitor the reasonability of the tariffs charged by the utilities. The accounts of the firms have to be monitored and their assets valued in order to define a tariff, which covers their costs and guarantee a reasonable level of return for the capital invested. Such return must preserve the incentives to invest for the regulated firms. The regulation must not be intrusive. The commission must only control the profitability level of the firm investments. The commission must not directly set the tariffs. In this sense the US model is really different than the French one where even before the nationalisation of 1946, the Government imposed to the firms a price for the electricity sold, as the decree-law Laval of 1935 demonstrated. The regulation must preserve the private initiative and the incentives to invest. Its role is to limit the profits realised by private operators in public utilities' sectors.

The functioning of the Commission was based on the principle of checks and balances and on the principle of representation of the different social interests. But, if the conflict of interests was considered as natural and fruitful, the Commission of regulation was not mainly a judicial arena and try to prevent legal litigation between stakeholders. The model relies in fact more in negotiations and in the search of a reasonable consensus, which must be readjusted according to

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<sup>6</sup> Debouzy M., (1972), *Le Capitalisme "sauvage" aux Etats-Unis (1860-1900)*, Points Seuil Histoire, Paris, 275p.

<sup>7</sup> Commons J.R., (1907), « The Wisconsin public-utilities Law », *The American Economic Review*, 36, August, pp.221-224.

the circumstances (costs, level of consumption,)<sup>8</sup>. Another specific feature of the commission's model is the fact that both private and public entities are submitted to the same regulation. Accounting principles must be the same, an unbundling must be realised between the accounts of the municipal utility and the accounts of the municipality and the monitoring of tariffs follows the same principles.

The regulation model of which Commons was the promoter tried to preserve the interests of stakeholders against abuses from Government. The due process of law principle must guarantee the property rights of the economic agents. Contrary to legal scholars of the end of the nineteenth century, Commons admitted that general interest considerations justify limiting such rights. But, in such case a fair compensation must be realised. In the US Common Law, it corresponds to the opposition between the "eminent domain" theory, which imposes a compensation for an expropriation, and the "police power" theory, which allows, under specific circumstances, to limit property rights without compensation. It is very interesting to note that Commons was very critical about the Tennessee Valley Authority Project during the New Deal because he considered that such direct public intervention penalised private interests, because it allowed to replicate infrastructures without compensation for the firms which already realised this kind of investment and which could not expect by the way a reasonable rate of return from them.

We must also note that the general interest notion is not absent from the US regulation model. It is this one which justifies the public intervention in economic affairs and allows government to restrict property rights. The general interest was invoked for the first time by the US Supreme Court in 1877 in its decision *Munn v. State of Illinois*<sup>9</sup>. The Court considered that if an economic good has a strong influence on the collective economic welfare, its using must be submitted to a public monitoring.

The US model of regulation partially influenced by the theoretical works of Commons and its direct involvement in the Wisconsin law must be deeply analysed in order to study its historic development and its possible pitfalls.

One of its first purposes was to guarantee a fair and efficient competition process between firms. As we will show this objective must be put in perspective with public choice analysis for which

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<sup>8</sup> Commons J.R., (1910), « How Wisconsin regulates her public utilities », *The American Economic Review*, n°42, August, pp.215-217.

<sup>9</sup> Matheu M., (2000), « L'Europe à l'école américaine et britannique », *Dossier Régulation, Sociétal*, n° 30, 4<sup>e</sup> trimestre, pp. 55-60.

this regulation was in fact asked by private firms in order to escape from competitive pressure and to benefit from a comfortable financial rate of return, preserved from market risks.

Since 1885 US municipalities grant licences for electric utilities<sup>10</sup>, but these ones are not exclusive! As a result, the competition between operators was very destructive because of the weight of the investments in networks. In economics terms the level of entry in the market was suboptimal. In 1885, five companies operated networks in Duluth. Six firms competed in New York in 1887. The worst situation was in Chicago where 45 firms proposed electricity to consumers in 1907, each with its own distribution network. As we seen, 1907 constituted an inflexion. The model of the regulation commission, which monitor at the state level investments and tariffs, was introduced. Two phases of development can be distinguished: A first one, before the First World War and a second after the liberal parenthesis of the twenties. In this second period the influence of federal government grown because of the interconnection of the networks.

If the main purpose of such regulation was to promote a reasonable functioning of the electric markets, a controversy about the risk of a capture of regulation arouse in the sixties with the Public Choice Theory. For Public Choicers, the regulation of US utilities was nothing except the result of a fruitful campaign of lobbying lead by the private firms themselves. Regulation was very useful for firms because it provides to them a protection against competition<sup>11</sup>. First, the public regulation protected firms against new competitor. It induced a shift of the concession contracts to exclusive ones. There was from this moment no reason to fear a destructive competition process by an excessive rate of entry. Second, firms benefited from a tariff based on a cost reimbursement mechanism, which allowed them to recover their costs and to realise a very reasonable rate of return. There was still no commercial risk and the return of the investment became certain. As the return is without risk, the financing cost can be lowered. Comparative assessments realised between the regulated states and the non regulated ones in the twenties also show that the prices tend to be higher in the first ones than in the second one, just because the lack of competitive pressure<sup>12</sup>.

However this interpretation is certainly excessive, especially in the case of the Wisconsin Public Utility Law of 1907. The regulation was first the consequence of the election of a progressist

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<sup>10</sup> Knittel C., (1999), « The Origins of State Electricity Regulation: Revisiting an Unsettled Topic », *Boston University, Department of Finance*, September, 18p.

<sup>11</sup> Jarrell G, (1978), « The Demand for State Regulation of the Electricity Utility Industry », *Journal of Law and Economics*, October, 21(2), pp. 269-295.

<sup>12</sup> Kirat T. et Marty F., (2007), *Economie du droit et de la réglementation*, Memento LMD Gualino, Paris.

governor La Follette. This political movement not only concerned the Wisconsin. A same process can be observed for the State of New York, where as early as 1903 an investigation committee about the tariffs applied by gas and electricity companies was created and presided by Charles Hugues, who will become state governor in 1906. The conclusions of the committee plead for a public regulation. As Knitell quotes : « *the gross abuse of legal privilege in overcapitalization and in the manipulation of securities for the purpose of unifying control and eliminating all possible competition shows clearly that there can be no effective remedy by general legislation or through ordinary legal proceedings, and that for the protection of the public should be created a commission with inquisitorial authority, competent to make summary investigations of complaints, to supervise issues of securities and investment in the stocks or bonds of other companies, to regulate rates and to secure adequate inspection, or otherwise enforce the provisions of the law* ».

Then, the US model of public utility regulation, which generalises the pioneer experience of regulation of the railways tariffs by the State of Illinois in 1870, is not the fruit of an anticompetitive strategy led by the firms. Nevertheless, Public choice theory has perhaps right for one point. The high level management of private firms very soon understand that for such industries a public intervention is necessary or inexorable. It was the case of the president of the NELA (national electric association), who said in its official speech of 1898 that a public intervention is the only way to prevent the competition process from destroying itself.

We will observe in our second part the same kind of discourses from French CEO just before the Second World War. Just an example, just for quoting the most famous: the discourses of Auguste Detoef in 1936 titled “The End of Liberalism”<sup>13</sup>. Detoef, then CEO of Alsthom (now Alstom) delivered a conference in a cycle organised by an economic think-tank, called X-Crise (also named Centre polytechnicien d’études économiques). He considered that developed economies (especially industries capital-intensive) have reached a level of development in which competition between private firms is not still viable. It appeared necessary to him to encourage the coordination between firms, a set of agreements (but not anticompetitive ones) in order to prevent the destroying tendencies of competition and the risk of political intervention, which could compromise the individual liberty. Its proposal was to accept a public intervention (but oriented by an agreement between firms in order to avoid “demagogic” choices) in order to correct what we could call market failures induced by the scale of production.

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<sup>13</sup> Groupe X-crise, (1981), *X-crise, de la récurrence des crises économiques*, Economica, Paris.

If we analyse in our second part, the nationalisation of the French electricity, we will see nevertheless that political concerns or theoretical-driven policies had played restricted roles in the decision to build the Electricité de France. Circumstances are the main explicative variable of the nationalisation. In the same time, the need to rationalise choices in the framework of political controversies was the first purpose of the economic model built by the firm.

## **B – The Role of the French Engineer-Economists in the Definition of the Electricity of France Model**

If pragmatism, negotiation between stakeholders and the search for consensus were some key aspects of the US model, the French one relies on economic theory. Economics was considered as a mean to define the optimal management of the firm in the sense of the general interest. As we will see, the result of this faith is to isolate the decisions of the firm from social and political pressures. The engineer defines with its economic model the optimal level of tariffs and investments in an inter-temporal logic. What's the optimal couple for both maximising the production level and minimising its cost, in the long run<sup>14</sup>?

Such influence of economic theory is in fact paradoxical. The French nationalisations, in general, were not based on theoretical concerns (correcting market failures,) but were based on circumstances or political decisions. The SNCF or Air France were created after the bankruptcy of the former private companies. After the Second World War, the nationalisation of Renault was the result of the behaviour of its CEO. In the cases of Gas and Electricity, the nationalisation was not the consequence of economic or political considerations but the product of circumstances. The former private electricity companies were not able to realise the needed investments. Only the State had adequate capacities, especially at the financial point of view, for realising them.

What is very surprising in such context is to observe that if the decision to nationalise was taken without economic rationales, the management of the nationalised firm will be exclusively based upon an economic theory; partially build for its concerns and by its own services. If the economic model elaborated by Maurice Allais during the war was so perfectly appropriated by the management of the firm, it is partially because it helped to minimise the influence of political pressures on its choices.

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<sup>14</sup> Bungener M., (1996), « L'EDF, un modèle de gestion et de programmation de l'économie électrique », in Morsel H., sd, *Histoire de l'Electricité en France*, tome 3, 1946-1987, Fayard, Paris, pp.343-416.

Economic theory was the mean for the management of the firm to set tariffs and to decide about investments on a scientific basis. The mathematical objectivity of the underlying model was taken as a mean to refuse other objectives imposed by Government, as social or local specific prices. In other words, the firm was protected by a coherent economic doctrine against the opposite requisites of the stakeholders. The economic optimality defines the general interest, which is considered by the firm as the sole criterion of decision.

I will just give some insights about the underlying theoretical model established by Maurice Allais, his theory of social return, first published in 1942<sup>15</sup>. The Allaisian model was based on the co-existence of two distinct economic sectors<sup>16</sup>. The differentiated one constitutes the common case. The returns of scale are decreasing. The theory of pure and perfect competition applied itself. The firms set their price at the marginal cost at the equilibrium. As the returns are decreasing, the marginal cost is superior to the average one. As a consequence, the firms cover their costs. Things are different in the non differentiated one. As returns of scale are increasing, a unique firm is more efficient than several. We are in a situation of natural monopoly. If this firm does not want to abuse of its market power and set its price at the collective optimal level, the marginal cost must be chosen. But in this case the firm goes to bankruptcy. As the returns are increasing with the scale of production, an additional unit of good is cheaper to produce than the last one. As a consequence the marginal cost is constantly inferior to the average cost. Then, a firm which adopts a marginal pricing system never will cover its costs. A public intervention is needed in such economic sectors. Everybody can understand that electricity is an emblematic case of such non differentiated sector.

The State must, according to Allais, subsidise the firm in order to practice an optimal pricing policy. Only a marginal cost pricing can maximise the collective economic welfare. At this point of the demonstration, we can make two remarks.

First, the marginal cost considered by Allais is not the court-term one but the long term one. The price signal must modify individual behaviours in an optimal way. As consumption will induce new investments, it is important to give the signal about the cost induced by every additional unit. It is the famous “paradoxe du voyageur de Calais”. An additional passenger in a train induces normally a marginal cost near zero if there is no congestion. But the marginal cost of an

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<sup>15</sup> Allais M., (1943), *A la recherche d'une discipline économique*, Paris, ateliers Industria, 920 p.

<sup>16</sup> Allais M., (1947), *Le problème de la coordination des transports et la théorie économique*, Bulletin du P.C.M, octobre.

additional passenger could increase dramatically if it is necessary to add a wagon, to increase the train frequency or to build a new line of the actual infrastructure is congested.

Second, the marginal cost pricing induces a loss for the firm which has to be compensated by government. But subsidies are very poor economic tools in terms of efficiency. They reduce the incentives to be more productive for the subsidised firm. They induce new taxations which have distortive economic effects. An optimal second rank solution was found by Marcel Boiteux in 1956 and known under the name “Boiteux-Ramsey tariffs”. The solution is to charge additional tolls on the marginal cost which are equal to the inverse of direct-price elasticity of the consumption<sup>17</sup>.

The role of economic theory was not only a legitimating tool or a *sanctuarisation* device against political interferences. It was also a guide for its day-by-day management.

One very interesting point to underline is the fact that even the underlying theoretical framework was elaborated by Maurice Allais, the EDF economic model was partially built in house, in an incremental manner and in a bottom up logic. This completion was realised both by students of Maurice Allais, as Marcel Boiteux, and by managers issued from former private electricity companies, as Gabriel Dessus, who already worked on the subject until the thirties.

The seminar of econometrics of the CNRS, which had Maurice Allais as chairman, was the place where theoretical debates were confronted to empirical issues. The allaisian framework was completed by Marcel Boiteux, future CEO of the firm both at the theoretical viewpoint, with its papers upon the pricing of peak load demand<sup>18</sup>, of stochastic consumption<sup>19</sup> or on the optimal pricing of monopoly submitted to a budgetary equilibrium rule, respectively in 1949, 1951 and 1956 and as practitioner, as chief economist in 1958 (head of the economic studies service) and after as deputy director in 1967. As we will see, the pricing system defined by Marcel Boiteux is to charge a price equal to the long term social cost of the additional demand made. The marginal cost pricing model is not founded on the short term marginal cost induced by the demand but on

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<sup>17</sup> Boiteux M., (1956), « Sur la gestion des monopoles publics astreints à l'équilibre budgétaire », *Econometrica*, janvier.

<sup>18</sup> Boiteux M., (1949), « De la tarification des pointes de demande », *Revue générale de l'électricité*, tome 58, n° 8, août, pp. 321-340.

<sup>19</sup> Boiteux M., (1951), « La tarification au coût marginal et les demandes aléatoires », *Cahiers du séminaire d'économétrie*, n°1, Editions du CNRS, pp.56-69.

the cost, which would be induced in the case of generation structure optimally sized<sup>20</sup>. The consumer now knows the social cost of its decision and is incentivised to take an optimal decision. As Marcel Boiteux wrote in his autobiography in 1993, the tariff is made for giving the cost, as the clock is made for giving the hour<sup>21</sup>. In more economic words, prices must provide adequate incentives to agents for taking optimal decisions at the collective level. The tariff of the firm is nothing more than an invisible hand, which is oriented to long term considerations.

Another very interesting point about the EDF economic model is its coherence. The studies about optimal investment decisions and optimal tariff structures were in fact realised in two different services. Gibrat and Massé, heads of former electricity companies, who have worked on optimal management of hydroelectric systems, defined a rational investment decision rule. Marcel Boiteux for its part worked on the optimal tariff structure. But in fact, the investment decision is nothing just the dual of the tariff issue in the whole Economic model as we will see with the investment/ price loop<sup>22</sup>. In the two cases, what was a stake was to oppose a coherent and “scientific” doctrine to politicians, in order to conquest the firm autonomy in the name of general interest.

Indeed, we can observe to convergent and coloured dynamics. Why coloured? Just because of the covers of the internal guidelines. We will first consider the investment side of the model. The management of the firm decided to favour hydroelectric technologies partially because of national independence matters (capacities of French firms and external trade equilibrium). This option was contested because of its costs and the delays incurred to install search generation units. It induced what was called “la guerre des filières” (the war of generation technologies), which opposed the defenders of thermoelectric technologies and the ones of hydroelectric ones. In 1951, one of the EDF administrators, G Taïx, published a paper titled “Le plan Monnet est-il une réussite?” (is the Plan Monnet successful?). In 1952, two head managers of EDF, Roger Gaspar and Pierre Massé published an article in the *Revue de l’Energie*, titled “Le choix des investissements énergétiques et la production de l’EDF”. It was an economic analysis of the firm choices and it announced the publication of the Note Bleue in 1953. Its title “essai de détermination d’un criterium pour le choix des équipements hydrauliques et thermiques » can be

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<sup>20</sup> Marty F., (2002), « Pluralité et dynamique des conventions de réglementation : Une analyse économique de la jurisprudence du Conseil de la Concurrence relative au secteur électrique », Thèse de doctorat es Sciences Economiques, Ecole Normale Supérieure de Cachan, décembre.

<sup>21</sup> Boiteux M., (1993), *Haute Tension*, Odile Jacob, Paris.

<sup>22</sup> Marty F., (2003), « Conventions de réglementation et configurations productives et institutionnelles des marchés : application au secteur électrique », *Cahiers Lillois d’Economie et de Sociologie*, CLES, L’Harmattan, n° 41-42, pp.231-249.

interpreted as an ex post rationalisation of the choice of hydroelectric technologies. But, it is also a coherent economic doctrine, which based the investment decision on a comparative economic assessment of the available technologies. All projects are compared to a benchmark, a given thermoelectric investment. The selected technology is the one which produce the greater financial returns on its whole economic life. As a consequence, the optimal choice only depends on the selected discount rate. A low one is very favorable to long run strategies, as hydroelectricity. A high one reveals a strong preference for the present – the firm strongly prefers a euro today than a euro tomorrow. It favors, thermoelectric technologies, whose costs are not concentrated at the investment stage but are distributed along its economic life. As the firm chose a rate of 4 %, which was a very low rate in the fifties, we can consider that the future was preferred to the present and by the way hydroelectric investment were favored. But, we have to note that EDF do not choose the discount rate, this one was in fact set par the Government, or more precisely by the Commissariat Général au Plan.

A same logic of colors and of economic coherence was present for the dual of the optimal investment choice model, that is to say the tariff. Le Tarif Jaune and after it Le Tarif Vert relied on marginal cost pricing system. It charged consumption with different tariffs according the hours or the seasons when the energy was called. All prices a must reveal to the consumer not only the short run marginal cost but also the long run cost, which is based to the optimal generation structure that the firm would have to install to offer electricity at the lower social cost.

Both tariffs and investment rules respond to the same objective. It is to give to the management of the firm theoretical and objectives rationales to resist to political pressures. The firm and its economic model represent the general interest. Economic theory was built and used in order to immunize its decision against external pressures or specific interests. It constitutes an original device for preventing political interferences, highlighted by public choice theory, but it also induces a risk of over-capitalization or distortions within the investment choices, especially because the firm operated within a cost reimbursement framework, as Averch and Johnson demonstrated in their paper of 1962<sup>23</sup>.

C – Lessons from history for current debates relative to European Policy

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<sup>23</sup> Averch H. et Johnson L., (1962), « Behaviour of the firm under regulatory constraint », *American economic review*, 52, December, pp.1052-1069.

We can find some similitude between the US debates on the utilities regulation and the Commission's proposals on the energy sector published in September 2007. For example, we can highlight the question of the new investments in transmission and generation. The Commission proposed to apply a specific regulation to them in order to preserve incentives for investors. The objectives of unbundling or mandatory third party access are partially forgotten for them. Such comprehensive behaviour is also present for the treatment of long term contracts. If the Commission is very critical about the competitive effects of such contracts in the case of newly liberalised industries, the Commission makes a lot of exceptions for new investments, both in generation and in transmission<sup>24</sup>. For example in its decision *Distrigas and E.ON/ Ruhrgas*, restrictions on contract duration commonly set, were not applied. In the same sense, in the case *Synergen*, the Commission accepted a contract of gas supply of 15 years in order to limit the funding cost incurred by the investors in the new generation unit. As de Hauteclocque notes "the Commission has repeatedly accepted the need of Long Term Contracts for new power plants erection and entry".

The Commission strategy is the same than the one defended by the US institutionalists as the beginning of the last century. It is necessary to provide specific protection for new investors in order to lower their level of risk. So for new investments, socially desirable, the Commission accepts long term contracts, transitory exception to mandatory unbundling between generation and transmission activities and also mandatory third access to the network, even if it could be constitute an essential facility. De Hauteclocque highlights the cases of the England-Scotland interconnector, for which the exclusive rights granted have infinite duration, the 25 year exemption from third party access for the Viking Cable or the case of the UK-Belgium pipeline for which no third party access was asked.

If we consider now the EDF model, the state intervention in tariffs or investment choices have still a utility in liberalised markets. Just let me giving two examples: the public support to renewable energies, which lead the government to play on the tariffs in order to create adequate incentives and the problem of the generation adequacy which lead governments to create specific market disposals as payment or reserve mechanisms or to invest itself for guarantying the security of supply<sup>25</sup>.

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<sup>24</sup> De Hauteclocque A., (2008), « Legal Uncertainty and Competition Policy: the Case of Long-Term Vertical Contracts in the EU Electricity Markets », Document de travail GIS EDF-CNRS Larsen, mai, 15p.

<sup>25</sup> Marty F., (2007), « La sécurité de l'approvisionnement électrique : Quels enjeux pour la régulation ? », *La Revue de l'OFCE*, n° 101, avril, pp. 421 -452.

Indeed, the price movements in liberalised electricity markets induce several difficulties. A first one is their dramatic increasing since the beginning of the liberalisation. A second one, perhaps more critical is the volatility recorder on spot markets. Such instability produces a price signal jamming, which is very prejudicial for investors. As investment appears as more risky (what will be the cash flows produced by the power plant if prices are unpredictable?), we can fear a sub-optimal investment level. Such risk is all the more significant for peak load units that they produce during a very little of time during the year. In order to recover their costs, the price must be very high during peak load period. Theoretically, such scarcity rents are sufficient for covering the whole cost of such units. So an energy only market provides adequate signals for an optimal investment level... according to blackboard economics. In fact, scarcity rents are not socially acceptable and antitrust often fears that such rents hide abuses of market power. As a consequence regulators set price caps, which could discourage investment by erasing such rents and then increase price volatility. A public intervention appears as necessary to promote generation adequacy. Several institutional mechanisms are experimented worldwide as mandatory reserve capacities, capacity payments, capacity markets or direct public intervention, trough new investments. For all these options, it appears that public action is complementary to market signals for guaranteeing a collectively efficient functioning of electricity markets.

Finally, we can try to compare the posterity of these two economic traditions of regulation of the electricity sector. If the Allaisian model is always defended by Marcel Boiteux (its paper in *Futuribles* in 2007), its situation is perhaps the more precarious. The new public economics based on incentives model and developed by Laffont and Tirole<sup>26</sup>, shows that government failures could exceed in some circumstances market failures. In other words, if public intervention could be considered as a remedy it could be worse than the sickness. If in the Allaisian framework the public management was able to correct the market failures, it was because the public manager was seen as omniscient, omnipotent and benevolent. If one of these hypotheses is not satisfied the cost of public regulation could be higher than its associated benefits. For Laffont and Tirole a regulation based on incentives contracts can realise a second rank optimum.

If the model of the nationalised monopoly has disappeared is perhaps also because of the new economics of networks, which proposes to favour unbundling schemes. These ones, based on the emblematic example of AT&T in 1982, propose to insulate the segment in natural monopoly

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<sup>26</sup> Laffont J-J. and Tirole J., (1993), *A Theory of Incentives in Procurement and Regulation*, the MIT Press.

to the rest of the firm and to submit itself to a specific regulation. In the case of electricity, this is undoubtedly the case of transportation. So we can organise a shift in the boundary between differentiated and non differentiated sectors.

As a consequence, in a strictly neoclassical viewpoint the public intervention is now less useful... even we observe in fact not a de-regulation but a phenomenon of re-regulation with an increasing need for regulation...

Perhaps, the methods of institutional economics have still pertinence in the sense that they do not impose ex ante defined optimal rules to follow but on the contrary rely on the search for a consensus between stakeholders. By the way, taking into account collective dimensions of the electricity markets (investment choices, localisations or generation adequacy mechanisms) could plead for using this kind of method based on reasonability, consensus or compromise between the different social interests.

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