

CONVENTIONAL ENGINEERING AND REGULATORY ENGINEERING IN DISTRIBUTION COMPANIES IN ARGENTINA

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SUMMARY

The deep transformation of the Argentine electric power sector, which started in 1991 and which, among other things, is characterized by the privatization of most of the companies, the vertical separation of the generation, transportation and distribution companies, the simultaneous existence of a Term market and a Spot Market, a model for the expansions of the transportation nets based on the decisions of the market and a policy of Service Quality through which the Distributors are punished even for halts in the delivery to their customers although the problem may be originated in the transportation or the generation, has brought the need to review the concept of engineering of the companies belonging to the sector in general and the distribution companies in particular.

This need is increased by the changes in the regulation which, in spite of not being in breach of the principles of the basic Law of transformation of the sector, must correct deviations and mistakes spotted according to the experience accumulated. Precisely, the crossed interests among companies with different activities, and even among companies within the same type of activity, makes it necessary to study in depth the projects of Resolutions of the "Secretaría de Energía de la Nación" (National Department of Energy) and the new Technical Procedures developed by "Compañía Administradora del Mercado Eléctrico Mayorista S. A." (Administrative Wholesale Electric Market Company), aimed to fully rule the observance of the resolutions. All this needs to be complemented by a detailed analysis of each of the resolutions of the "Ente Nacional de Regulación Eléctrica" (National Entity of Electric Power Regulation) (ENRE) and the "Entes de Regulación Provinciales" (Provincial Regulatory Entities).

In practice, what has been described has allowed the creation of a real Regulatory Engineering within each company of the sector, especially within the distribution companies, due to the variety and the difficulty of the issues to face.

Nevertheless, after a period during which the regulatory and market subjects had the most outstanding place and the most important professionals of the companies, it was noticed that the issues regarding conventional engineering did not receive the same attention and this had to be corrected.

In order to orient the issues regarding regulatory engineering and to activate the studies of conventional engineering, the "Asociación the Distribuidores de Energía Eléctrica" (Distributors Association of the Argentine Republic) (ADEERA), has faced a series of actions, as, for instance, the following: Realization of Graduate Courses for professionals of the associated companies, in charge of outstanding professors of the country and from abroad; granting of scholarships for a post-graduate course on Electric Power Market Management at the "Instituto Tecnológico de Buenos Aires" (a technological university); encouragement for the presentation of works and attendance to congresses of international importance; contacts with prestigious Argentine universities, which allow them to improve their perception of the needs of the sector and to consequently change their syllabuses.

The Argentine Committee of the CIRED, the National Committee of the CIGRE, and the Argentine Committee of the CIER (Commission for the Regional Electric Power Exchange) have also started actions oriented to improve the engineering profile within the Argentine electric power sector, in both the regulatory aspects and the traditional aspects.

The success of the actions briefly described above, has allowed us to put forward a proposal tending to favor the integration of said actions, to save efforts and to make them more systematic and continuous. In this way, we think the creation of a Permanent Committee for the Education and Updating of Professionals of the electric Power Sector is appropriate. This committee could be formed by representatives of the Associations of Distributors, Transporters, Generators, Great Users, ENRE, CIRED, CIGRE, CIER, and the interested universities.

The purpose of this Committee would be to: a) Collaborate with the universities in the preparation of modern syllabuses; b) Promote specialization courses and seminars for graduates; c) Make and propose post – graduate programs to the interested institutions; d) Identify seminars and congresses which might be of interest for the goals pursued; e) Collect and advertise information regarding the needs for professionals and specialists that the companies and institutions of the sector may have; f) Make contact and propose ways of collaboration with institutions from abroad that have a relation with the before mentioned enunciation .

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1- INTRODUCTION

As of the year 1991, the Argentina Republic has made a deep transformation in its electricity sector. Said transformation was one of the first in Latin America (only Chile carried out its change before Argentina did) and it was also pioneer worldwide, where, in those years, only a few countries had reformed their sector, at least as drastically as this country did.

The deepness of this transformation and the little experience gained up to the moment of same at that time constituted two determining factors for a current reality, which is characterized by a continuous revision of the engineering concept to be applied in the electricity sector in general, and in the distribution sector specifically. This concept has been and is being continuously modified on the grounds of the experience gained and the needs of the business. This does not mean that all the changes have been successful or that we do not have to make important corrections. For instance, after a period in which all the professional efforts focused intensely on the interpretation of the effects of the regulations over the business of each company, it was detected that certain traditional technical aspects had not been taken care of, showing economic effects, in some cases very serious.

The basic question is thus – how must the companies' engineering be outlined and which should the profile of the engineers be in order to be able to adapt themselves to the new functioning of the area, without leaving the traditional engineering in a type of business which clearly has a high technical content aside? Undoubtedly, the Argentine model is the most demanding in this aspect and the experience already gained may be used in other countries where the transformation is still in the development process or where it is just starting. However, in order to transmit this experience, it is essential to describe this model in its most significant parts and which regulation necessarily suffers some continuous changes with effects that cannot always be detected with enough anticipation.

2- THE CURRENT REGULATORY FRAME

-WG CNA CIGRE (1)

One of the main characteristics of the transformation of the electricity sector in Argentina was the privatization of most of its generation, transmission (transportation) and distribution companies, which were previously owned by the National or Provincial States and were

vertically integrated, i.e., that within each company three activities were performed. Precisely, another important characteristic of the transformation was the vertical separation of the activities in such a way that a transportation company cannot be controlled by the generation or distribution companies.

The regulatory frame in force as of the year 1991 and which has the "Ley 24065 de la Nación" (24065 National Act) as its fundamental basis, has the following outstanding features:

- ❑ Generation is a risk activity, subject to the market rules.
- ❑ Transportation is a public service, given in concession by the National State.
- ❑ Distribution is also a public service given in concession by the National State in the Federal District and in the Greater Buenos Aires area (around 45% of the electric energy distributed in the country) and by each of the Provincial States.
- ❑ The purchase and sale of energy may be made through term agreements, freely agreed upon between the parties (Term Market) and / or in the Spot Market, in which the prices are fixed in a marginal way by an Economic Dispatch of the machines and through which the machines are dispatched according to their operational cost, without taking into account the term agreements that the generation companies (Generators) may have.
- ❑ The transportation companies (Transporters) are remunerated for the services they render to the users of the transportation system, taking into consideration the connection points to said users, the transportation capacity of their net and the electrical energy transported. The before mentioned remuneration is fixed for a 5 – year period and it is calculated through a forecast of the energy transported and the evolution of the net, after which it is discussed at a Public Hearing called by the National Regulatory Entity. The transportation tariffs do not include expansion charges.
- ❑ The distribution tariffs are also regulated by the National States in the area of the Federal District and Greater Buenos Aires, and by the pertinent Provincial States in the rest of the country. Within those tariffs, the wholesale cost is directly transported to the users, being the Spot Market price recognized for said energy, although distributors are free to buy in the Spot Market and / or the Term Market. Even though the Spot Market

price varies every hour, the Distributors receive it in a stabilized way in seasonal periods and making use of a Stabilization Fund in order to compensate the deviations between the forecasted average value and the actual average value of the period. The net expansion costs are included in the Distribution's Value Added. The Distribution's Value Added is fixed for a 5- year period, after which a revision which includes a Public Hearing called by the pertinent regulatory entity is carried out.

- When the components of their net are out of service, the Transporters are punished according to a ranking of importance and proportionally to the time said component is kept out of service. This punishment is independent from the effects caused to the users of the transportation system.
- The Distributors are punished for the interruptions to each of their customers, proportionally to the number of interruptions and to their duration. The punishment does not discriminate the origin of the interruption and it is identically applied if it is created in the Distributor's net, or in the transportation and generation net.
- The Generators are not punished when their machines are out of service, whether these service interruptions are programmed or not.
- Besides the Generators, the Transporters and the Distributors, the Great Users are recognized as Agents of the Electricity Market. To be considered a Great User, either a private person or a company of any type must enter into a supply term agreement directly with a Generator or through a dealer. A Major Great User (GUMA) must buy at least 50% of the energy through agreements and the rest at the Spot Market; the lowest power limit for a GUMA has been fixed in 1 MW. A Minor Great User (GUME) must have 50 KW to 2 MW of power and must buy all the energy through agreements. A Particular Great User (GUPA) must also buy all of its energy through agreements and its lowest power limit has been fixed in 30 KW.
- The "Free Access" principle, which makes Term Agreements possible, is the one in force for the transportation and distribution nets. Of course, the use of the nets implies the payment of the toll tariff, which is fixed by the national State and which is identical for transactions made in the Spot Market and in the Term Market.
- As the transportation tariffs do not include expansion costs, the expansion of the transportation nets must be made due to the initiative and interest of the users (Generators, Distributors and Great Users). Only the Transporters must make a Reference Guide, which is an "indicative planning". That is to say that the Market Agents receive signals through prices and punishment, and they decide on their investments and expansions according to said signals. The mechanisms to carry out the expansions are varied and they include the determination of the "beneficiaries" and a Public Hearing, which in certain cases may determine the

rejection of the expansion, if 30% of the beneficiaries oppose to the construction. The Free Access principle is also in force for the expansions, even in the redemption period; i.e., the construction pioneers have not usage priorities, although those who incorporate to the use must pay the pertinent cannon during the redemption period left.

3- THE INSTITUTIONS FOR THE REGULATION, OPERATION AND ADMINISTRATION OF THE MARKET

It is clear that a complex regulatory frame like the one described in the previous point requires highly developed and specialized institutions in order to work correctly. We hereby distinguish the following:

The "Secretaría de Energía de la Nación" (National Department of Energy) (SE).

The Regulatory Entities: National (ENRE) and Provincial (EPREs).

The "Compañía Administradora del Mercado Mayorista Eléctrico S. A." (Administrative Wholesale Electric Market Company) (CAMMESA).

The "Secretaría de Energía de la Nación" is the one who issues the regulatory standards, based on "Ley Nacional N° 24065" (24065 National Act) . It is also the appeals organism for the ENRE's decisions. Moreover, based on the calculations of CAMMESA, it passes the wholesale tariffs.

The "Ente Nacional de Regulación Eléctrica" controls the observance of the rules, determines the punishment and decides on the transportation tariffs throughout the country and the distribution tariffs in the Federal District and the Greater Buenos Aires area. The "Entes Reguladores Provinciales" take part only in the control of the rules, tariff fixing and distribution punishment in the pertinent areas.

CAMMESA carries out the Economic Dispatch of the Generation, determines the Spot Prices, is the highest operational hierarchy of the transportation and generation nets, and carries out the administration of the Spot Market transactions and the administration of the transportation remuneration. It is very important to explain how CAMMESA is constituted. It is a mixed company in which the "Secretaría de Energía del Estado de la Nación" has 20% of the shares, two members of the Board and the chairmanship. The other 80% of the shares is equally distributed among "Asociación de Generadores" (Generators Association) (AGEERA), "Asociación de Transportistas" (Transporters Association) (ATEERA), "Asociación de Distribuidores" (Distributors Association) (ADEERA), and "Asociación de Grandes Usuarios" (Great Users Association) (AGUEERA), each of which has two

representatives in the Board. The SE holds the power to veto the Board's resolutions.

4- THE CHANGING REALITY OF REGULATION

Although the transformation of the Argentine electricity sector has been considered successful in both the private and the state environments, it has been necessary to make continuous adjustments to the regulation that, without falling in breach of the grounds established in "Ley 24065", correct deviations and improve the signals. Examples of this are power price signals in order to encourage the installation of Generators, the signals for the expansion of the transportation nets, the great lowering in the requirements to become a Great User (from 5 MW in high tension at the beginning of the transformation to the current 30 KW in low tension), the rules for energy export/ import (only established in detail and in depth in 1998/9), etc.

Even where the effects of certain regulatory changes are more or less easy to detect, most of them have economic and legal effects difficult to spot, many times opposed for the different types of Market Agents and even for a same type of Agent (for instance, changes that improve the position of thermo-Generators may harm the hydraulic-Generators)

5- HOW TO IMPLEMENT REGULATORY CHANGES

Even though the SE is the one entitled to make regulatory changes as long as they fit within the frame of "Ley 24065", and if they are not opposed to the concession agreements of the distribution companies, it is normal to consult the Generators, Transporters, Distributors and Great Users Associations in order to obtain consensus to avoid conflict.

On the other hand, once the SE has issued the pertinent Resolutions, CAMMESA must carry out the so called "Procedimientos Técnicos" (Technical Procedures) (PT). The object of said PT is to regulate the way these Resolutions shall be applied, taking into account the practical aspects. The Associations are also consulted regarding this matter.

6- THE PROFESSIONAL TEAMS OF THE DISTRIBUTORS ASSOCIATION AND THE DISTRIBUTION COMPANIES

It is clear that what has been said in points 4 and 5 demands a great effort on behalf of the Associations, which must carefully analyze the regulatory changes projects carried out by the SE and the technical Procedures Projects carried out by CAMMESA. ADEERA has solved this matter creating a Commission which is in charge of analyzing the changes and the PT projects. This Commission is formed by representatives of the associated companies and the permanent Technical Advisers of the Association, whose job is also

to collaborate with ADEERA's Directors in CAMMESA, studying the topics brought up by the Board of said Company.

However, the topics of general interest for the Distributors are not limited to what has been said; there are also Resolutions of the ENRE and the Provincial Regulatory Institutions which must be studied and that are matters referred not only to distribution but also to other activities of the sector which affect the distribution companies in one way or another. The before mentioned Commission is also responsible for analyzing said matters.

Besides the general interest matters for the Distributors, there are matters which affect particularly certain distribution companies and which are normally originated in the Regulatory Entities. In such cases, the companies count with their own professional teams who analyze these matters and who, in most cases, are supported by the Commission of the Association. At the same time, the professional teams of the biggest companies in many cases collaborate with the Commission, making specific estimates, simulations through models and supplying statistical data.

One outstanding feature of the Commission is that it is formed by different types of specialists (engineers and economists). This implied an effort to reach a common language and to complement tasks.

7- THE REGULATORY ENGINEERING

The experience gained in Argentina shows that the conventional preparation of the engineers in power systems is far from satisfying the current requirements of the companies in the electricity sector. Thus, adapting professionals to analyze regulatory aspects, with their technical, economic and legal implications, requires additional efforts on behalf of the companies, together with the problem of having to do it with texts which do not exactly have a pedagogical orientation and without the order and universality necessary to obtain a wide vision.

It is obvious that we are facing a new field, which in Argentina has received the name of Regulatory Engineering and which, even when it involves very important technical aspects difficult to be understood by economists and lawyers, it also includes certain organizational, economic and legal aspects of great importance.

The question is – how can we achieve the necessary preparation? One answer might be to influence in order to change the University syllabus. Another one could be to launch post – graduate courses. Our experience tells us that the right thing to do is to search a combined solution. On one hand, it is impossible to think that University students finish their graduate programs without basic knowledge of the regulation and the

organization of the electricity sector and the different general solutions reached worldwide and the specific solutions reached in the country. On the other hand, it is also unthinkable that the graduate programs provide the students with all the necessary knowledge in order to hold certain positions in electricity companies without any problem. These assumptions constitute the grounds of our proposal, which we will discuss further ahead.

8- CONVENTIONAL ELECTRIC ENGINEERING

The novelty and importance of the organizational and regulatory aspects have brought the attention of the companies to those matters for several years, dedicating their best professionals and their highest intelligence to this aspect. The result was that the emphasis on the conventional electric engineering aspects was not the same, neither in the selection of professionals nor in the adequate training and updating. Evidence of this is the delay in Argentina in the application of digital techniques to the control and protection of the electricity nets – M. V. González Sábato et al (3).

Although the general problem was finally spotted, especially due to its effects in the quality of the service, the poor quality of the diagnosis of disturbances, and the lack of detection of modern technological solutions, the re-composition of professional teams dedicated to the conventional aspects of electric engineering also offers problems of difficult solution. This is worsened by the few people qualifying in said field in Argentine Universities – M. V. González Sábato and A. Alvarez (2).

9- PROPOSALS FOR SOLUTIONS

Summarizing, the problems detected are the following: a) the need for engineering professionals with a systematic and ordered education in the regulatory and organizational aspects of the electricity sector; b) the need to re-compose the teams of engineers with the pertinent education and continuous updating in traditional aspects of electric power engineer; c) The need for more people qualifying in the electric power engineering field at universities. It is necessary to add to these three problems the fact that the companies of the sector do not consider adequate to re-compose the expensive internal sectors the state companies had for the training and updating of their personnel.

Facing this reality, ADEERA is launching solutions and the actions described below are being created.

A strong contact with some Universities allows them to have the opportunity of getting the reality and needs of the sector, so that the teacher can adapt their syllabuses to those needs and to a modern international vision of the electric power sector. Some associated companies also have internship programs for recently graduated engineers or students in their last year, who, as they are still in contact with the University and their classmates,

contribute to improve the vision. Together with ADEERA's action, other Associations and the ENRE are in contact with Universities, which have made important and modern jobs for the ENRE, CAMMESA and several companies.

We think the stimulus for qualifying in electric power engineering will come from the advertisement of the before mentioned jobs, but this shall depend on the action of each University. In fact, there are some Universities that are already reaching an improvement in the registration of students in the program.

Regarding the updating of graduates, ADEERA encourages the realization of post – graduate courses. Some of these courses are given in the Association, hiring important specialists. Such is the case of a course on “Tariff Methodology of the Distribution Companies” and a course on “Voltage Quality – Disturbances”. Regarding the career programs, ADEERA has registered in three running years, relevant professionals of associated companies to obtain their post-graduate degree in Administration of the Electricity Market at the “Instituto Tecnológico de Buenos Aires” (a Technological University) (ITBA). All that is complemented by the information and encouragement given to the associated companies to register their professional in national and international seminars and congresses of renowned quality.

With reference to the re-composition and updating of the knowledge of the classic aspects of electric power engineering, ADEERA sponsors the activities of the CIREDA, the CIGRE – M. V. González Sábato et al (4), and the CIER (Comité de la Integración Eléctrica Regional) (Committee for the Regional Electric Power Integration) and encourages and orients the associated companies so that their professionals be registered and present works in their respective congresses, besides their participation in workshops and Specialization Seminars.

Although what has been described started with general proposals, the success reached allows us to go forward with an integrating proposal which will allow us to save efforts and achieve more systematic and continuous actions. In this way, we believe the creation of a Permanent Committee for the training and updating of professionals of the Electric Power Sector is adequate. Said Committee might be integrated by representatives of ADEERA, ATEERA, AGEERA, AGUEERA, ENRE, CIREDA, CIGRE, CIER, and the universities interested in the project.

The object of said Committee would be: a) to collaborate with the universities in the creation of modern graduate programs and adequate to the reality of the sector; b) to promote specialization courses and seminars for graduates in matters of both regulation and organization; c) to come up with and propose post-graduate programs to the interested institutions; d) to

identify seminars and congresses abroad which might be of interest for our goals; e) to obtain and advertise information regarding the need for professionals and specialists in the companies and institutions of the sector; f) to make contacts and propose ways of collaborating with institutions from abroad related to these topics.

10- CONCLUSIONS

We could say that we have reached such a degree of maturity in spotting the problems and implementing solutions that there shall be no difficulties in carrying out the integrating solution previously discussed. This is due to the fact that the natural steps were given, without forcing their pace and without providing means of action if they were not deemed fully necessary and convenient.

After a period of almost total inactivity regarding the activities related to the traditional electric power engineering, the Latin American Regional Meeting of CIGRE that took place in Paraguay in May 1999 counted with the attendance of more than 60 participants from Argentina and more than 30 papers from that country were presented. A Congress of the CIRED, sponsored by ADEERA, which had more than 550 participants, 350 of which were from Argentina and who presented 33 papers, took place in Argentina at the end of 1996. For the CIRED 1999, which took place in Nice, France, 10 papers of Argentine authors were accepted and presented. For the CIRED 2001 Congress, to be held in Amsterdam, 14 proposals of papers by Argentine authors have been accepted.

Four Specialization Seminars organized by the CNA of CIGRE, on Power Systems Operation and on Protection and Control Systems counted with more than 200 attendants.

Sixty-five professionals attended the Seminar about "Voltage Quality – Disturbances" organized by ADEERA. The 6 students who received a scholarship from ADEERA for the long term post-graduate course given by ITBA on "Administration of the Electricity Market" received in 1998, 1999 and 2000 their post-graduate degree. 30 professionals attended the long term course organized by ADEERA between 1998 and

2000, and from that course a book called "El Proceso de Cálculo de los Cuadros Tarifarios de Empresas Distribuidoras de Electricidad" (Calculation Process of Electricity Distribution Companies Tariffs) came out.

We understand that these activities allow us to conclude that the steps given in Argentina are solid and well-oriented, although most of the systematization and continuity are still to be implemented.

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