CHILEAN DISTRIBUTION TARIFFS: INCENTIVE REGULATION

Hugh Rudnick V.
Ricardo Raineri B.

I. INTRODUCTION

Chile became a pioneer worldwide with the introduction of reforms during the early 80’s in the electrical sector regulation.

One of the fundamental reforms was the introduction of market principles in electrical generation, thus reducing the economic regulation requirements and facilitating the privatization processes of important State assets (Rudnick et al., 1995). In practice, the regulating State was replaced by the competitive market that stimulates the private sector, in its search to maximize its profits, to offer the best service at the best price. In that same line, and increasingly, many economies in the world are creating competitive electrical generation markets, where the power producers are disputing to supply large consumers, both distribution companies or industrial consumers.

Nevertheless, these same deregulations have sought in a first stage to “protect” the large number of small consumers, with low price elasticity, regulating their tariffs and leaving competition for those users that have the capacity to negotiate with producers. In Chile, the limit condition was fixed by Law Decree N° 1, 1982
(Ministry of Mining, 1982) in consumptions above 2000 kW. Nevertheless, the trend has been to slowly reduce such condition and in some countries it eventually will be eliminated (in England today it is 100 kW and will be taken to zero in 1998).

A second fundamental reform in the Chilean case was the introduction of what we could call "pseudo" market principles in the electrical distribution activity for end customers, stage of the electrical chain where competition is not considered feasible. The legislator socially considered that it was convenient for this activity to be developed through geographic monopolies, given some important scope economies shown by the distribution technologies. The unique aspect of the Chilean reform was the definition of a tariff regulation process in these monopolies that tries to grant economic efficiency incentives to the provision of this end service. Different from United States, or different from Chile itself before the reform, where the distributors are paid in function of their accounting costs, the new tariffs try to make the private monopoly to "compete" with a reference efficient model firm, with a "yardstick competition" or "benchmark regulation" approach. It basically corresponds to a competition by comparison with a reference firm, where a specific profitability for each distributor is not assured nor limited, depending on the results of its relative efficiency compared with the reference model upon which base the tariffs are calculated.

Nevertheless, this methodology is complex to apply, as shown by the different tariff processes in Chilean's distribution. This work describes such methodology, the variables that condition it, and the results of its application in the country.

II. DISTRIBUTION ACTIVITY IN CHILE

The distribution activity is organized through distribution firms that have a limited geographic coverage, arranged in horizontally integrated groups, of which, five of them must be noted (Table N° 1).

These firms are supplied from the two main interconnected systems, the Central Interconnected System (SIC) and the Greater North Interconnected System (SING), as indicated in Table N° 2.

The consumption of distribution firms is essentially concentrated in the residential and light industries fields (Figure N° 1).

According to the electrical legislation in force, distribution firms
TABLE No 1
DISTRIBUTION FIRMS GROUPS (1995)
(Martinez et al., 1996 and compilation by the authors)

<table>
<thead>
<tr>
<th>Firms</th>
<th>Number of Customers (Thousands)</th>
<th>Demand (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chilectra-Río Maipo</td>
<td>1,295</td>
<td>1,171</td>
</tr>
<tr>
<td>CGE-Conafe</td>
<td>584</td>
<td>466</td>
</tr>
<tr>
<td>Chilquinta</td>
<td>325</td>
<td>178</td>
</tr>
<tr>
<td>Emel Group (Emelectric, Emelat, Eliqsa, Emelari, Elecda)</td>
<td>313</td>
<td>212</td>
</tr>
<tr>
<td>Saesa-Frontel</td>
<td>240</td>
<td>175</td>
</tr>
<tr>
<td>Emec</td>
<td>145</td>
<td>73</td>
</tr>
</tbody>
</table>

TABLE No 2
FIRMS THAT OWN DISTRIBUTION AND SUBTRANSMISSION SYSTEMS 400 V TO 23 kV
(Martinez et al., 1996 and compilation by the authors)

<table>
<thead>
<tr>
<th>Firm</th>
<th>Number of Customers in 1995 - (thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIC Firms</td>
<td></td>
</tr>
<tr>
<td>Chilectra</td>
<td>1,076</td>
</tr>
<tr>
<td>CGE</td>
<td>477</td>
</tr>
<tr>
<td>Chilquinta</td>
<td>325</td>
</tr>
<tr>
<td>Río Maipo</td>
<td>219</td>
</tr>
<tr>
<td>Emec</td>
<td>145</td>
</tr>
<tr>
<td>Emelectric</td>
<td>129</td>
</tr>
<tr>
<td>Saesa</td>
<td>121</td>
</tr>
<tr>
<td>Frontei</td>
<td>119</td>
</tr>
<tr>
<td>Conafe</td>
<td>106</td>
</tr>
<tr>
<td>Litoral</td>
<td>17</td>
</tr>
<tr>
<td>Sinel</td>
<td>10</td>
</tr>
<tr>
<td>Luzagro</td>
<td>9</td>
</tr>
<tr>
<td>Coop. Curicó</td>
<td>8</td>
</tr>
<tr>
<td>Luzpar</td>
<td>8</td>
</tr>
<tr>
<td>Codiner</td>
<td>5</td>
</tr>
<tr>
<td>Cooprel</td>
<td>5</td>
</tr>
<tr>
<td>Coelcha</td>
<td>4</td>
</tr>
<tr>
<td>Casablanca, Emelat, Til Til, Lo Barnechea, Pirque, Puente Alto, Socoepe, Gedelsa, Coopelan, Elecoop, Coop. Casablanca, Coop. Talca, Copelec</td>
<td>less than 3</td>
</tr>
<tr>
<td>SING Firms</td>
<td></td>
</tr>
<tr>
<td>Elecda</td>
<td>94</td>
</tr>
<tr>
<td>Emelari</td>
<td>44</td>
</tr>
<tr>
<td>Eliqsa</td>
<td>44</td>
</tr>
<tr>
<td>Southern Region Firms</td>
<td></td>
</tr>
<tr>
<td>Edelimag</td>
<td>39</td>
</tr>
<tr>
<td>Edelaysen</td>
<td>10</td>
</tr>
</tbody>
</table>
are defined as public service firms that have the following obligations (the corresponding article numbers of Law Decree N° 1 are indicated between parenthesis):

- to supply electricity in their concession zone to whoever requests that service (art. 74)
- to deliver a minimum quality service level and to assess the compliance of such obligation (arts. 79 and 86)
- to maintain and operate safe facilities (arts. 81 and 82)
- to interconnect with other concessionaires (arts. 32 and 81)
- to allow the use of electrical lines to transport power of any generator (open access concept) and to face arbitrary proceedings if there is no agreement with the user interested in using the lines (art. 51)

On the other hand, distribution firms have the following rights:

- to request the public service concession. Only concessionaires distribute, but legislation doesn’t assure a legal monopoly (art. 17)
- to make use of national public use goods ² (art. 16)
- to make use of rights of way granted by concession (arts. 14 and 50)
- to regulate tariffs that assure a certain return level to the industry as a whole (art. 93)
- to have the possibility to demand for reimbursable contributions to those customers that request for services implying additional installations (arts. 75 and 76)
• to charge compensations for the use of lines and to fix the amount of those compensations (art. 51).

III. SCHEMES USED TO CHARGE FOR DISTRIBUTION SERVICES

A tariff scheme for a monopolistic activity, in essence, must fulfill the following strategic objectives:

i. to limit welfare losses when fixing prices for the monopoly;

ii. to provide economic efficiency signals in relation to investment and operation;

iii. to adequately respond to market developments (both at the supply and demand level);

iv. to be stable, but also flexible, allowing an adequate development of the activity;

v. to offer a symmetrical risk and opportunities condition for the regulated firm.

It is not easy to simultaneously achieve these objectives in distribution tariffs and frequently it is necessary to sacrifice some objectives in function of others. Various electrical distribution tariff schemes have been experimented throughout the world. The following ones should be noted (Bitu and Born, 1994; Kahn, 1995; Laffont and Tirole, 1993):

3.1 Tariffs for Cost of Service (Rate of Return or Cost Plus Regulation)

The tariff is defined based on the cost of the service, covering operating costs (operation and maintenance), facilities depreciation and capital return (this system is in force in most of the United States and until the 60's in Chile). Thus, this service cost is estimated for a period based on accounting information. Generally, capital costs are attributed to the power component and variable costs are attributed to the energy component.

3.2 Tariffs by Tendering

Through a tender, firms compete offering a distribution tariff. The firm that offers the lowest price is granted the distribution service concession. Adjustment formulas are established, but the
uniqueness of this tariff is that it does assure the returns of the business.

3.3 Marginal Tariff

The marginal cost tariff is determined from the supply marginal costs (or their average in time). A short term and long term marginal cost tariff can be considered. The short term marginal cost or the operational marginal cost is the cost of supplying an additional demand unit, considering the electrical facilities as fixed. The long term marginal cost or expansion marginal cost is the cost of supplying an additional demand unit, considering an expansion of the electrical facilities in the future (this scheme is currently in use by Electricité de France, in France).

3.4 Tariffs by Incentives (Benchmark or Incentive Regulation)

The tariffs by cost of service have been criticized as they don't provide economic efficiency signals to the electrical distribution firm in the same measure they are assured a return on their investments, whatever it may be. A set of tariff alternatives that combine signals that motivate cost reductions with greater freedom in the regulated firm has been considered.

One of the models used under the price-cap scheme, also known as the RPI-X (Beesley and Littlechild, 1989; Brown et al., 1991), has been broadly used in the telecommunications industry. The core idea behind the price-cap regulation is to control the prices charged by the regulated firm instead of controlling its profits. Essentially, the price regulation plan requires that the average real prices of the regulated firm be annually reduced in a defined percentage (Kridel et al., 1996), known as factor X or productivity offset. Two of the challenges that this methodology has are the requirement for the regulator to know the service costs reduction technologies and the fact that cost reduction is initially economic, but it progressively grows, making it difficult to define the long term signal.

A second model corresponds to the tariffs by comparison, or "yardstick competition" scheme (Schleifer, 1985), where the regulated tariffs of an industry are determined from a model theoretical firm, that provides a service with certain quality characteristics and is efficient both in the expansion of its facilities and in their operation and maintenance. This is a scheme that defines the competitive-
ness rules against which real firms are measured. The possibility of regulating by comparison is feasible given the technological characteristics of the distribution activity, where it is possible to identify standardized facilities that provide similar services in different firms.

IV. DISTRIBUTION FACILITIES COSTS

A fundamental step in the calculation of various of the tariffs indicated is the determination of the physical distribution facilities cost (in accounting terms, the fixed assets) upon which the return tariff is applied. Given the capital intensity of the electrical business, this is one of the most controversial in a tariff process (in fact, that’s the case of the Chilean scheme). Essentially, there are four procedures to assess the locked-up capital: to use the historical cost, the substitution cost, the replacement cost or the “fair value” (Bitu and Born, 1994).

The historical cost corresponds to the value that was effectively paid by the distributor for its facilities and equipment, minus the accrued depreciation. The substitution cost is the current cost to acquire the facilities and equipment with the most recent technologies that allow to provide a service identical to the one provided by the facilities the firm owns. The replacement cost represents what it would cost today to build the same facilities and equipment. It’s different from the substitution cost, because it refers to the same facility, disregarding the fact that it’s obsolete or not. Lastly, the name of “fair value” is given to the locked-up capital subjectively assessed by the regulatory agency, and frequently it is a measure that is weighed between historical costs and replacement costs.

V. REGULATION OF DISTRIBUTION TARIFFS IN CHILE

The tariffs scheme developed in Chilean legislation in 1982 tries to provide cost reduction incentives to all the participants in the production and distribution chain of the two main electrical products: energy and peak power. On top of a competitive market that supplies free customers, higher than 2000 kW, there is a scheme of regulated prices for smaller customers that combines generation-transmission regulated prices with regulated distribution prices (defined through voltages smaller or equal to 23 kV).
The regulated generation-transmission price called nodal price corresponds to the marginal costs' expected projection (that reflects the short term conditions and an optimal social plan for generation and transmission works for a period of ten years in the future), seemingly equaling an average of short term marginal costs of a competitive generation market.\(^7\) The implicit model considered in this tariffs scheme assumes that, under economic optimality conditions in the generating installations and in the absence of large scale economies or diseconomies, the revenues arising from all the peak demand at the marginal cost of installing peak units (kW price) and from all the energy at the generation marginal cost (kWh price), cover all operating costs and produce a surplus that covers the total investments of the generating group. The nodal prices are fixed twice a year (in April and October) and, in order to consider variations in the main parameters that control them, they are expressed in indexation formulas.

On the other hand, the regulated distribution price corresponds to the mean added value by this activity determined from model firms operating in the country. The final price paid by a regulated consumer integrates the regulated generation-transmission price with which the generators supply the distributing firms and an added value for the distribution service (hereinafter called distribution tariffs).\(^8\) In the application of the legislation, the regulator has also introduced an added value for the subtransmission service that produces a bridge between the generation-transmission and distribution as such, and that is calculated by the regulator simultaneously with the distribution tariffs.

The regulation mechanism existing in Chile determines its distribution tariffs from the optimization of a real firm that originates a model firm, and such model firm is benchmarked with all the distribution concessionaire firms. Thus, this scheme corresponds to an incentive tariffs model of the yardstick competition type, where the relative performance of the industry is assessed, assuring in theory a specific minimum return to those firms that have a performance similar to the model firm.

The Chilean electrical legislation determines the distribution tariffs based on the added value for the concept of distribution costs (VAD, in its Spanish acronym for Valor Agregado de Distribución), value that is based in a model firm and that considers the three main components that form part of the distribution business cost: infrastructure and equipment costs, energy and power
losses, and operating expenses such as administration, operation and maintenance expenses. The law groups them in:
1. Fixed costs for administration, invoicing and user service expenses, independent from their consumption;
2. Mean distribution losses in power and energy;
3. Standard investment, maintenance and operating costs associated to the distribution by unit of power supplied. The annual investment costs will be calculated considering the New Replacement Value (NRV), the facilities adapted to the demand, and a discount rate equal to a real 10% per year.

The components indicated are calculated for a specific number of typical distribution zones fixed by the National Energy Commission, with a previous consultation with the firms. The process to determine the NRV has the objective of calculating the "cost to renew all the works, facilities and physical goods dedicated to provide the distribution service in the respective concessions". The concept of New Replacement Value used by the Chilean legislation to be applied to distribution activities has been a hybrid between the substitution and replacements costs, as indicated further on this article.

VI. PROCESS TO DETERMINE THE DISTRIBUTION ADDED VALUES

Distribution tariffs are fixed every four years, and the legislator has estimated that this is a reasonable period for the firms to have time to internalize their efficiency improvements. The Ministry of Economy is the body that determines the Distribution Added Values based on information collected by the National Energy Commission.

6.1 Stages in the Process

The process, summarized in Figure 2, is started with the NRV calculation for the year before the fixation of tariff formulas, as specified by Article 118 of Law Decree No. 1. This computation is made jointly between the Superintendency of Electricity and Fuels and the firms involved. If there is no agreement between them, a technical arbitration commission is established to determine the NRV before December 31st in the year in question.
In a second stage, before six months of the ending of the valid period of the tariffs' formulas, and as established by article 111 of the Law Decree No. 1, the National Energy Commission (CNE) must notify the distribution concessionaire firms about the bases that will be used to establish the tariffs' formulas for the next period, including the definition of typical distribution zones. Also, there is an agreement about the consulting firms eligible by the concessionaire firms to make the study required by them. CNE also selects the real distribution firm or real firms that serve as a base to determine the model firm in each typical zone.

The added values are determined in a third stage for each typical zone and they are calculated based on a costs study requested to a consulting firm by CNE. The distributing concessionaire firms, jointly or individually, can contract the same study, applied to the
same typical distribution zones defined before, to another consulting firm selected by them from the list of firms agreed with the CNE. In this case, the CNE can review the study or studies asked for by the firms and, with their previous approval, can make the corrections necessary according to that review. If no agreement is reached, preference will be given to the firms' criteria about the values obtained in the study or studies requested by them.

In a fourth stage, CNE calculates the weighed arithmetic average in each zone for the resulting added values from the CNE's and the firms' studies. The weighing coefficients are two thirds for the values resulting from the CNE's study and one third for the values resulting from the firms' study as a whole, or for the average of the values resulting from the studies requested individually by the firms, if applicable.

With the added values resulting from the former methodology and the corresponding nodal prices, the CNE, in the fifth stage, structures a set of preliminary basic tariffs, where there must be as many basic tariffs as the number of distribution firms and sectors that have been defined. If the preliminary basic tariffs determined in this manner allow the aggregated group of distribution facilities of the concessionaire firms to obtain a before income taxes economic return rate that is between 6% and 14%, the weighted added values that originate that type of rates are accepted. If that doesn't happen, the values are proportionally adjusted to reach the nearest upper or lower limit. To determine the economic return, the NRV determined the year before by the Superintendency of Electricity and Fuels will be used together with the operating costs corresponding to the distribution activity, also determined by the Superintendency.

Essentially, the tariff calculation process is based in two core concepts: technical and commercial efficiency of the distribution activity and the concept of tariff adequacy for the industry. The idea is to generate distribution tariffs that, giving efficiency signals, are adequate for, in an horizon of thirty years, taking the value discounted of the operational margins of the industry, before profit taxes, to be equal to the new replacement value of the existing facilities.9

The process ends when the Ministry of Economy publishes the tariffs.
6.2 Model Firm and Determination Methodology

A core element to determine distribution tariffs in Chile is the dimensioning of the model firm. In the international application of the yardstick competition mechanism, the regulation of monopolistic activities is determined through the comparison of costs and performance of similar firms or mirror firms or the reduced comparison of heterogeneous firms corrected for differences (Schleifer, 1985). In the Chilean distribution monopoly regulation model, there is a hybrid benchmarking scheme between different firms. On one hand, groups of firms (or firm sectors) of similar characteristics are compared, identified through typical zones, with a model firm. Then, the performance of heterogeneous firms is compared in an integrated manner, with an assessment of the global adequacy of the industry with a single standard. In the former case and through a theoretical model and through direct comparison, efforts are made to provide the efficiency signal of similar firms and in the latter case efforts are made to produce a horizontal comparison that fits the theoretical model with the average reality of heterogeneous firms.

One of the problems presented in all tariff studies of monopolistic firms is the information asymmetry that commonly exists between the regulator and the regulated. As better information about the cost structure of the monopoly the regulator has, more effective the tariff fixation process can be, whether it is a tariff model based on service cost or an incentive tariff. A tariffs process through model firms allows to importantly reduce such deficiencies in such a manner that it's possible to standardize parameters and costs for the model firm. The regulator doesn't need the real costs information from all the regulated firms, but it can, based on standardized parameters, generically define the typical efficient costs.

Another problem that can arise from the comparison with a model is that the model itself can be excessively theoretical and far from the empirical reality. To prevent this, Law Decree No. 1 in its Article 107 specifies that the cost study of the model firm for each typical zone "will be based on an efficiency assumption in the investment policies and in the management of a distributing company operating in the country". With this, the analysis will be limited to a model firm that works in an environment similar to the one existing in reality and that faces the same restrictions. The
bases upon which the tariff studies have been made\textsuperscript{11} have sought for this objective and the Authority has interacted with the firms to define the dimensioning of the model firm. A core element in the fulfillment of this objective has been given through the formulation of the model firm's dimensioning from the empirical analysis of a real firm for each typical zone. As will be explained further on, even with this joint effort of limiting the analysis, there are different subject matters where differences could arise and where an ongoing effort must be made to integrate the definitions of an "efficient" firm in terms of its investments and operations.

The methodology to determine the model firm and the steps to be followed in the analysis can be essentially grouped in four stages (see Figure N° 3): a first stage of collection, processing and validation of the information of the real firm, a second stage of definition and dimensioning of the efficient firm and its organizational structure, a third stage of cost determination and their designation to three fields (High voltage, Low Voltage and Customers)\textsuperscript{12} and, ultimately, a fourth stage to determine the added distribution values and the corresponding adjustment indexes to be used in the following four years, together with the identification of special circumstances.

**FIGURE N° 3**

STAGES TO DETERMINE THE MODEL FIRM AND THE ADDED VALUE

<table>
<thead>
<tr>
<th>FIRST STAGE</th>
<th>COSTS OF REAL FIRM (validation)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="#">Diagram</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SECOND STAGE</th>
<th>DIMENSIONING OF MODEL FIRM (definition of optimizing criteria)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="#">Diagram</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>THIRD STAGE</th>
<th>COSTS OF MODEL FIRM (installations, O&amp;M, losses, clients)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="#">Diagram</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FOURTH STAGE</th>
<th>ADDED VALUE DETERMINED, FORMULAS &amp; SPECIAL CASES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="#">Diagram</a></td>
</tr>
</tbody>
</table>
In the first stage of information processing, the data delivered by the real firm are collected, sampled and processed. A review is made to the organization of the firm, to human resources and remuneration costs, to the customers universe and sales, to the new replacement value of physical facilities and to the operating costs. A first distribution of equipment, electrical costs and losses is made among High voltage, Low voltage and Customers.

In the second stage, the model firm is dimensioned based on the customers’ information and sales. This dimensioning is made in relation to the electrical system’s facilities, the maintenance and operation of this system, the firm’s organization and management, and ultimately, the physical facilities and their premises. The dimensioning is directly associated to each typical zone and to its electrical consumption density and volume characteristics.

The third stage of cost determination for the model firm assesses the facilities costs, their maintenance and operation and the customers service based on a unit price study. It also assesses the mean energy and power losses, both the physical losses and the losses due to theft or uncollectable supplies. The designation of equipment, electrical costs and losses among High voltage, Low voltage and Customers is made for the model firm that has been previously dimensioned.

With the dimensioning, the resulting costs and their designation, in the last stage, the distribution of added values and the corresponding indexation formulas are determined. These values are the base of the final tariffs that are separated in payments for the use of facilities (this corresponds to a charge for capacity, divided in peak and off-peak power), energy payments (consumption of each customer and the corresponding losses) and payments for customer service.

The study about distribution added values was characterized by the authors of the law as a study to determine the distribution marginal costs (National Energy Commission, 1989). It is established that the global objective is to transfer the supply marginal cost to the end customer considering the generation-transmission marginal cost (reflected in the nodal price) plus the distribution marginal cost, mainly associated to the capacity, its operation and expansion (in terms of energy, distribution only adds up the losses costs). Actually, the added values study is a study of mean costs, but the authors of the law assume that in this case and, except for high density conditions, marginal costs are equal to mean values.
This is so if the added values study is made separately for each typical zone and in each one of them there are no scope economies (see discussion further on).

It is worth mentioning that in the process to determine the final tariffs, apart from the distribution added values determined by the CNE's and the firms' consultants, additional essential parameters that are not requested to the consultants have been used and that in the practice have been independently determined by the CNE. Particularly important is to determine the coincidence of each type of consumption with the maximum demand of the system together with the maximum power-energy ratio of residential consumers. Also, the consultants' analysis doesn't consider the determination of the tariff recognition of the subtransmission systems, that historically has been fixed by the CNE with criteria that have been modified through time. The distribution firms argue that the law is not being followed in this matter.

VII. DIFFICULTIES IN THE PROCESS TO DETERMINE DISTRIBUTION TARIFFS

The problem the yardstick competition mechanism has in its application in Chile, where the firms compete against a theoretical firm, is in the possibility of determining in an effective manner which are the distribution costs in a efficient real firm operating in the country. The historical trend of tariff calculations has been increasingly diverging (in 1996 this process is reverted, as it will be illustrated further on), with accusations about the Authority's attempt to manipulate the concept of a model firm and on the other hand of the regulated firms' attempt to capture the regulator.

One of the reasons for these differences is that the interests of the different parties involved in the tariffs, regulator and regulated process are mostly antagonistic. Traditionally, the regulating Authority tries, with social objectives and in some cases for political or redistribution objectives, to reduce distribution rates, in the measure that is considered socially attractive. With interests that could be contradictory to the former, the electrical distribution firms, as private corporations, try to increase their profits with the higher rates allowed by law. Nevertheless, there are common interests that can contribute to reach a balance; the Authority is interested in letting the electrical distribution service to survive as such, supply-
ing energy with minimum quality levels; but the firms are also interested in staying in the business and not to be substituted by others in their public service function.

Another reason for the differences is given in terms of the information asymmetries. The yardstick mechanism is more attractive in this subject matter compared to the cost of service where there is simple reimbursement of total distribution costs. But definitely, the mechanism is effective to motivate the firm to produce at the least cost, provided there is good information about the firm's cost structure, and where any cost reduction that doesn't negatively affect the revenues from current and/or future sales, is for the benefit of the firm. Nevertheless, the information asymmetry problems existing about the cost structure of the firms can take the authority to underestimate the costs faced by a real firm operating in the country, and on the other hand, to make the firms to generate bulky cost structures.

But not only interests are antagonistic and information asymmetries are the cause for differences. By definition, the process is complex and there are various topics that in spite of the different tariff processes occurring during the last 14 years, they have not been circumscribed at all and where there are various interpretations that give rise to conflicts. Some of the most relevant topics are:

- Historical costs versus economic cost
- \textit{Ex-ante} versus \textit{ex-post} efficiency and technological obsolescence
- Prudence in investments: useful and non utilized investments
- Sunk costs and threats to drop capital returns
- Scale economies and scope economies in distribution systems stand alone firm
- Indivisibility of investments

Below there is a description of the manner in which the differences have been presented and the way in which some of them have been overcome.

Also, other regulatory issues that are necessary to consider in the Chilean regulatory model analysis are covered:

- Regulatory risk
- Incentive for the sector's development

7.1 \textbf{Historical Costs Versus Economic Cost and Substitution Cost Versus Replacement Cost}

As indicated before, the determination of the distribution facilities' cost is one of the most controversial stages in a tariffs process.
In Chile, differences have arisen on how to interpret the concept of "new replacement value" (NRV); in other words, to consider it as a substitution or replacement cost.

The historical cost of a capital good dedicated to provide a specific service corresponds to the value of all the resources invested at the moment of acquisition in order to provide the service for which that capital good was bought for. Nevertheless, the historical cost of a work made in the past doesn’t necessarily reflect the cost to be paid today to reach the same objective. Multiple reasons can explain the natural difference between the historical cost of a capital good and the cost that today would be necessary to incur for that same capital good. Among them, it’s worth noting:

- Changes in relative and absolute prices of the inputs required to produce the capital good. This is the case of the equipment value, land value, skilled and unskilled labor necessary to execute and supervise the works, changes in the construction time costs and changes in the construction schedule, changes in engineering costs or overhead, changes in the value of engineering studies and other studies required to develop a same project in a more complex environment.

- Changes in tariffs and municipal rights that try to motivate a more efficient use of public use spaces in densely populated zones.

- Changes in regulations that impose new design demands or environmental requirements implying, but definitely, they don’t affect the type of service offered but increase costs.

- Changes in technology or more modern equipment technical standards that discards from the market older technologies that have become economically obsolete.

Law Decree No. 1 defines the concept of NRV as the cost of renewing today all the facilities.\textsuperscript{14} This concept is closely linked to the economic concept of opportunity cost, that is the alternative cost that investors would have today to again create the distribution network, without the previous restriction of assuming sunk costs. The alternative cost determines the total resources that investors have to sink today to build the same network. In this sense, the historical cost is a reference that is valuable only in terms of knowing what happened in the past, but that has no relationship whatsoever with the economic concept of opportunity cost that, according to regulations, must be considered in the decision making process.
The second debate arises from the interpretation of the opportunity cost as a substitution cost or as a replacement cost. It should be remembered that the substitution cost corresponds to the facilities and equipment acquisition cost with the latest technologies, while the replacement cost represents what today it would cost to build the same facilities, even if they are obsolete or not. This issue was initially solved by the Authority, relating it with the concept of depreciation considered in the tariffs setting process. Effectively, to calculate distribution tariffs in a thirty years horizon, the NRVs are equaled with the discounted value of the operating margins before taxes of the industry taking care that the discount rate necessary to make these flows equal remains in the 10 ± 4% range. In this calculation are the distribution tariffs, the ones that directly affect the operational margins of the industry. The assumption that the facilities should be depreciated at most in thirty years together with the "discount rate" requirement to be in the range of 6% to 14% sets a minimum efficiency floor for the technologies that are adopted by the companies. The idea is that the depreciation horizon plus the "discount rate" in general, take the firms to choose technologies that offer an internal rate of return that is higher or equal to the "discount rate" and also, for a rate of return that's equal to the "discount rate" to recover the investment in no more than thirty years. Thus, the thirty years depreciation ceiling plus the "discount rate" impose a minimum technological basis upon which, in principle, the firms of the sector must compete. Now, for those technologies superior than the ones defined by this technological basis, such as state of the art technology, distribution firms have no restriction to incorporate them. This is explicit in a document issued by the Authority in 1983,¹⁵ where it specified that the criterion is to value the facilities with the same technology with which they were built, provided that the technology exists in the market; and if it doesn't exist, they are valued through the existing normal technology. Nevertheless, the exception to this recommendation arises for those firms that want to head the market, trying to incorporate the latest generation technologies, available only at an experimental stage, that are not available in the market for general usage. In this sense, the norm could impose some restrictions on research and development investments that's target to create new technologies.¹⁶

In a second instance, within the tariffs fixation process during 1996 and in relation to the discussion about the aluminum electrical conductors technology, the regulator and regulated firms agreed
to consider the gradual incorporation and not a complete substitution of the new technology as an efficient performance of the model firm. In the practice, no replacement nor substitution cost was used, but a mixed cost was considered, where recognition is given to the impossibility of considering an ex-post efficiency, concept that will be discussed below.

7.2 Ex-Ante Versus Ex-Post Efficiency and Technological Obsolescence

When discussing concepts of optimality or economic efficiency, it's important to distinguish between the meaning of the ex-ante efficiency and ex-post efficiency. In this subject there is an opportunity of increasing divergence between the regulator and the regulated firm in terms of their interpretation of these terms and on the designation of the resulting risk.

The concept of ex-ante efficiency is a concept of efficiency that lays on the expectations we have about events expected in the future. In this sense, and considering the trajectory determined by our history, and incorporating all the information available today, the ex-ante economic efficiency means to make the best possible decision to optimize the objective function of the social planner. The concept of ex-post efficiency is a concept of efficiency that lays on the knowledge of events that were uncertain in the past, and that affected the decisions made at that moment. Thus, the concept of ex-post economic efficiency means that today a decision made in the past under uncertainty conditions is still the best decision made because it optimizes the objective function for a social planner. In this case, uncertainty is about events that have been only known today. An extreme interpretation could be that the ex-post efficiency judges the past decisions with information that is fully absolute today.

In terms of decision making under conditions of uncertainty, the most relevant concept is the economic ex-ante efficiency. This is so because for a social planner the important factor is that when individuals are confronted to an imperfect information situation, their decisions must be rational. Rational in the sense of caring at that moment and in the best manner possible for all the information available. To make ex-ante optimal decisions doesn't necessarily mean that they are also ex-post. In any activity it may occur that the plan has been considered as optimal under uncertainty condi-
tions, but it stops being optimal once the results of the events are known. Nevertheless, the important thing here is that the *ex-post* errors must not be constant. This point must be emphasized, because this doesn’t mean that the decision was made wrongly at the moment its was made; what happens is that the expectations, albeit rational, were not fulfilled *ex-post*.

The economic *ex-post* efficiency is a concept that is not less relevant, but the problem that exists with it is that it can’t be guaranteed beforehand. Achieving an efficient *ex-post* planning will depend on the fulfilling or not fulfilling the expectations on uncertain future events. For example, this is the case of demand forecasts or future costs forecasts.

For a social planner, and considering the concepts of *ex-ante* efficiency and *ex-post* efficiency, we have that the relevant factor is that the additions to the distribution network must be *ex-ante* efficient. This is because considering the history of the distribution network in the past and also the best forecasts that can be made about future events, the only thing that can safeguarded, in the light of the information available today, is that the decision made today about the network expansion is the best *ex-ante* decision, fact that absolutely assures that it also is an *ex-post* decision.

Concretely, the former implies that to evaluate a model firm operating in the country with efficient investment policies means, for example, to evaluate the investments efficiency based on the supply of technologies available in the period of time in which they were a reality and not based on future technologies that had not been in the market or weren’t economically efficient. It’s necessary to model a real and efficient firm operating in the country that will be permanently making decisions to incorporate the technology that is most economically convenient with the best information available at the moment of making the decision. In the dimensioning of the facilities, it’s necessary to analyze the proportion of these technologies that the model firm must have in virtue of a technical-economic assessment. The latest technology available must only be considered as a technological alternative for those investments made after this technology is available in the market and for those cases where it is efficient to get rid of a technology for a more modern technology where investments have been already made. This case was the procedure agreed between the principals of the studies during the 1996 tariff setting.
7.3 Prudence in Investments: Useful and Non Utilized Investments

Another concept associated to the former concepts and that arises in the debate about the efficiency of the model firm is prudence in investments. Prudence in investments is a concept that refers to the fact that the investments made should respond to *ex-ante* efficiency criteria, but not necessarily *ex-post* efficiency criteria. In this sense, the investments made will be made with prudence if they respond to the efficient development (*ex-ante*) of the distribution system. Nevertheless, to make investments with prudence doesn’t guarantee at all that they can be used *ex-post*. Thus, we could verify that some investments that were considered useful at a specific moment have not been used *ex-post*.

The problem existing with investments made with prudence is that they generate perverse incentives in the authorities; they want to drop those investments considered useful at the moment of their construction, but that *ex-post* were not used by the distribution firm. Fortunately, if the Authority wants to motivate new investments in the sector, it must also comply with a certain minimum commitment with their reputation. For those investments that are considered as prudent but that can’t be used *ex-post*, the Authority must guarantee if it wants to care for its reputation in front of future investors. These forces, on one hand a perverse incentive and on the other hand a problem of reputation, put the Authority in a constant situation where it must weigh the dropping prudent but not used investments and the achievement of a minimum reputation required to motivate new investments in the sector. On the other hand, to accept the concept of prudent investments can’t justify all historical investments of the regulated firm. The balance can’t be easily reached.

7.4 Sunk Costs and Threats to Drop Capital Returns

The distribution facilities are characterized for having investments in equipment that are specific to distribution networks, and that means that the alternative cost of dedicating this equipment to other uses is practically zero or nil. Thus, distribution networks are characterized for having an important fraction of investments made as sunk costs. In this case, the main feature of sunk costs is that for the Authority, they are irrelevant in terms of the future develop-
ment of the network. In this manner the authority faces, in the same manner as in the case of useful but not utilized investments, a perverse incentive to drop the return on the investment made. Nevertheless, and also as in the case of prudent investments, an element that plays in the opposite direction from this perverse incentive, it is the reputation the Authority must show in front of future investors if it wants to motivate new investments in the sector.

7.5 Scale Economies and Scope Economies in Distribution Systems-Stand Alone Firm

The issue of scale economies and scope economies in distribution systems has had a limited treatment in literature, with the main identified references coming from the World Bank's research and from Nordic countries, mainly, The Norwegian Research Institute of Electricity Supply and The Norwegian Water Resources and Electricity Board. The conclusions of those studies indicate a depletion of scale economies as such in distribution networks in developed countries. Nevertheless, the existence of scope economies is not discarded. They are recognized and in fact, they make the presence of a single concessionaire firm per distribution zone to socially recommendable, thus avoiding the unnecessary duplication of investments. In spite of the social benefits obtained through these scope economies by having a single firm for each concession zone, the regulating bodies search for mechanisms that, for example, through the market, will satisfactorily compensate the market power of the distributor firm over its concession zone.

With the presence of a single firm by concession zone, it would also be socially recommendable in the short term to over-invest in facilities and equipment. These would be facilities and equipment that in the short term represent an idle capacity, but in the long term they would allow to supply the future demand at a lower cost. Again, and in spite of the benefits of having a single firm by concession zone, the regulatory bodies search for mechanisms that prevent concessionaire firms from making idle capacity investments in which the sole ultimate purpose is to eliminate the entry of potential competitors in their respective concession zones.

One of the relevant issues in the scope economies realm necessarily arises from the discussion if regulated distribution tariffs must or must not consider the economies of simultaneously serv-
ing customers without regulated tariffs (Rudnick, 1996). This discussion, associated to the concept of a stand-alone firm, arises in Chile both in distribution tariff regulations and the telephony and potable and sewage water services. While the discussion has not been resolved in the electrical field, the telephony regulation develops the tariff calculation considering a firm that only serves the regulated market.

7.6 Indivisibility of Investments

The standards with which the equipment used in the industry are built make the investments made in the sector not to be always divisible. This indivisibility associated to the investments made in infrastructure and equipment can generate in certain areas idle capacity that will be only used when confronted to higher power demands in the zone in question. Nevertheless, and in the same manner as in the case of scale and scope economies, the regulating bodies must search for mechanisms that prevent the concessionaire firms from making idle capacity investments which ultimate purpose is to eliminate the entry of potential competitors in their respective concession zones.

7.7 Regulatory Risk

The regulatory risk is the risk that arises due to possible actions from the regulating bodies and that affect the possible value distribution of the firms. From the discussion of the former paragraphs, we have that an important source of regulatory risk arises from the potential threat from the regulating bodies in terms of dropping capital returns, expropriating revenues that correspond to a legitimate right agreed previously with the investors. Another form of regulatory risk is the imposition of new technical standards that directly affect the costs of the works, but that are not recognized as costs associated to the investment in the business. The regulatory risk is a hidden expression about the abandonment of the right to private property.

7.8 Incentive for the Development of the Sector

The healthy development of the electrical distribution sector requires the existence of stable rules and transparent procedures
that allow to adequately safeguard the investors' interests, preventing stress conditions where the regulatory risk threatens the stability of future revenues. Also the investors must be assured with an adequate profitability that considers the risk existing in the sector; risk that not only arises from the regulatory bodies, but also from the structure and environment that surround the companies in the sector. For example risks associated to technical failures, natural risks, demand and/or costs forecasts risks, technological obsolescence, etc.

VIII. ANALYSIS OF THE DISTRIBUTION TARIFF PROCESSES

Below there is an analysis of the last three tariff processes (1988, 1992 and 1996), where 1992 and 1996 are to be noted for their conflictive character. Different from the 1988 process, where most of the distribution companies still were in the hands of the State, in 1992 and 1996 they were totally privatized. Table N° 3 summarizes the essential characteristics of these last two processes.

<table>
<thead>
<tr>
<th>Process</th>
<th>October 1992</th>
<th>October 1996</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution companies</td>
<td>30</td>
<td>39 (47 sectors)</td>
</tr>
<tr>
<td>Typical distribution areas</td>
<td>4</td>
<td>5 (one purely underground)</td>
</tr>
<tr>
<td>Groups of coefficients</td>
<td>41</td>
<td>55</td>
</tr>
<tr>
<td>Studies by distribution firms</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

The 1992 distribution added value studies caused important differences between the results obtained by the CNE consultants and the Public Utilities Association's (that gathers the main distribution firms in the country) figures. This drove the parties to intense negotiations and some companies appealed before the Justice Courts, but those appeals were not accepted. This caused public turmoil and mutual recriminations through the national press and a severe impact in the Stock Exchange. The conflict had a scope that went beyond the tariffs setting due to the important presence of Pension Funds as owners of distribution firms stock values, which started to fall. A similar situation arose in 1994 in the tariff setting of telephone services.
With this information, in the 1996 tariff process all the involved parties made an important effort to revert this increasingly diverging historical trend. It was agreed to reduce the divergence spaces and to center the efforts in deep technical and economic analysis on the construction of the model reference firms. The regulator and regulated made a detailed analysis of each one of the investment and operating efficiency standards for electrical firms operating in the country and that had to use the consulting teams that made the studies of the so called distribution added values. The Authority elaborated new bases that detailed the subjects to be covered, and those bases were enhanced with the contribution from the firms (National Energy Commission, 1996). Different from former processes where there was a single study from the firms together with the CNE study, in 1996, two studies were made, one requested by the Public Utilities Association and a second one made by Chilelectric, the Santiago metropolitan distribution company. Initially, they came quite close and in fact, the differences in the studies in terms of the trend seen in former processes were eminently decreased.

The following figures illustrate the stopping of the diverging trend produced in the 1996 tariff process. Figure N° 4 compares in percentages the high voltage distribution costs obtained for a typical urban zone in 1988, 1992 and 1996 by the different consulting teams, with a base of 100% for 1988 and all values expressed in the currency of a same year (Martínez et al., 1996, and authors’ elaboration). It's worth remembering that the final value is the result of averaging in 2/3 the value resulting from the regulator's study and in 1/3 the average value of the firms' studies.

Figure N° 5 compares the low voltage distribution costs in a similar manner.

In spite of this initial positive exercise of convergence between the parties, the conflict still occurs. The parties in discussion that had coincided in a low-profile study, finally reveal the sources of the dispute to the press. Reference is made to changes made by the Authority to the bases in the final stages of the process, and that takes to non comparable studies. Serious differences appear in the determination of some technical parameters of the tariff formulation that puts conditions to the final tariffs level. The detail effort introduced by the Authority into the bases did not include those parameters as a part of the studies, and their determination was at the criterion of the regulator, as had happened in former tariff processes. Ultimately, the process ends at the Legal Courts, that
initially recognized the appeals against the regulator filed by some firms. After a lengthy process that ends in the Supreme Court, tariffs are set recognizing arguments filed both by the regulator and the regulated. Nevertheless, the Court decides mainly on procedural matters, leaving open the essential issues discussed.
8.1 Alternatives to Improve the Tariffs Process

It's clear that the distribution mechanism tariff regulation used in Chilean legislation is not simple, but as indicated before, the easy alternative of self regulation by the market in this case is not feasible. The process of studying model firms is an alternative that reduces the final negotiation between the parties, allowing to incorporate objective criteria that stimulate electrical companies to adopt the more economic technologies and in that manner to improve their management. It is a process that will always offer new challenges, new definitions, and thus, new conflicts. But both parties will benefit with a continuous improvement of the technical bases of the studies and from the addition of all the issues to such studies that, according to the law, give place to the creation of the final tariff formulas (including for example, the maximum power-energy ratio of residential consumers). There are core issues to be deeply reviewed, as the ones indicated before. This must be done early enough before the process, preventing last minute changes that give instability to what has been regulated by the Law.

Different avenues of future conflict solution have been stated. On one hand, there is a need of continuing in the improvement of the future process, improving the methodology in force. Also the idea of using, as it has been done in other cases in the electrical regulation sphere, an arbitrator arbiter has been considered. Effectively, both in the disagreements resolution on transmission wheeling and the solution of differences in the Load Dispatch Committee they use arbitrator bodies, in the former case with the ad-hoc creation of and arbitration court in the latter case with the direct intervention of the Minister of Economy as arbiter.

Independent from the creation of conflict resolution bodies, it is evident that there is the need of confining the methodology even more, reducing the scope of interpretation of the model firm and its component elements. The authors made an exercise varying arbitrarily, in the VAD calculation, the allocation of wages and sales between High voltage, Low voltage and customers in typical zones and also the allocation of customers and sales in maintenance costs. The cost results for a specific typical zone and a voltage level can vary in a range of 7%, depending on the assumptions made. This just confirms that it is possible for different sources of differences to arise, depending on the technical criteria used. Improvements to the technical bases can reduce the level of interpretation of the model firm.
There have been other changes formulated to the tariffs process, but most imply radical transformations to the law or to the regulatory process. For example, to reduce political interference, some have suggested the need to separate the regulatory body from the government structure, providing more independence from the political arena, as well as providing better funding to allow the keeping of adequate technical staff that would not migrate to the regulated firms. Others have proposed to perform a single VAD study, instead of two independent ones, as formulated in the more recent regulations of Perú and Bolivia (these regulations are in their early stages of application, so that there is no experience to prove this is a better alternative).

8.2. Efficiency Signals to Distributor Firms

The yardstick competition methodology has been effective to guide the efficient performance of distributing companies in Chile. The following figures show the evolution of some indicator parameters (Martínez et al., 1996; Arévalo et al., 1996). Figure N° 6 shows how the main firms have achieved to reduce electrical losses in the last 6 years, while Figure N° 7 shows the increase of the number of customers/employee ratio (together with the increase in staff efficiency, there has been an increase in the outsourcing volume).

Lastly, Figure N° 8 shows the relationship between the operating results and the firms' assets, confirming a growing increase in their profitability.

More significant in the analysis is to determine which has been the impact of this process in the evolution of the tariffs for the end customer. Figure N° 9 summarizes the energy price evolution for residential end customers (tariff known as BT1) in two electrical power firms; Chilectra, that supplies the Santiago Metropolitan Region, and CGE, that supplies the zone between Rancagua and Concepción. It's possible to observe an increase in energy prices in the 1985-1990 period, and a descending trend in the period starting in 1991, so in mid 1996 there are similar tariffs, in real terms, to the ones that existed in mid 1981. The distribution added value component of these final tariffs has decreased through time, but the explanation for these changes is essentially centered in the generation/transmission nodal price variations, more than in the variations of those added values. The explanation for the increase in the nodal price is due to a severe drought that affected the Central
Interconnected System in that period, and the posterior drop in prices is due to the effect of an hyper-pluviometry added to the backlash impact of the future arrival of natural gas and combined cycle power stations to the central zone of the country.

IX. CONCLUSIONS

The tariff scheme for distribution in force in Chile corresponds to an international level fundamental reform with the application of incentive regulation. This is of particular interest in the use of the so called yardstick competition methodology that introduces "pseudo" market principles in the regulation of an activity where competition is not considered feasible.

The methodology has been successful in giving a direction to the activity and to the growth of distribution electrical firms, but it has posed various conceptual and practical challenges in its actual application in the country, in a process that is still far from being completely established. The work contributes with an analysis of the main technical and economic issues under discussion.
NOTES

1 The authors thank Engineers Mr. Manuel Soto and Miguel Pérez for their aid in the making of this work. We thank Fondecyt for its support through Project No. 1971265.

2 There is no legal prohibition to superimpose distribution concessions to different distribution companies, but in practice, except for some small amount of occasions, exclusive monopolistic concessions have been granted.

3 The distribution activity executed by an independent company, is a typical case of a classical natural monopoly. Scale economies and/or scope economies would turn the activities of two companies covering a same zone into an inefficient effort. If it were truly possible to have the coexistence of several distributing companies, it would cause a loss in the social economic efficiency, due to the increased distribution costs for end users. Traditionally, regulator's (governmental or independent) actions have been preferred, with an intervention through price and/or earnings control rather than letting superimposed distributing companies to develop.

The transmission activity also shows characteristics of a natural monopoly and strong scale economies. This also has an incidence upon the distribution companies, as they are also generally the owners of subtransmission facilities.

4 It refers to public areas, roads, streets, parks.

5 To obtain a general description of the electrical sector tariffs in Chile, refer to Erik Haindl's article in this volume.

6 Law Decree No. 1, Article 96. In electrical systems which size is larger than 1,500 kilowatts in generation installed capacity, the setting of two levels of prices will be distinguished:

1. Prices at the generation-transportation level. These prices will be called "nodal prices" and will be defined for all the generation-transportation substations from where the supply is made. Nodal prices will have two components: energy price and peak power price;

2. Distribution level prices. These prices will be determined based on the addition of the nodal price, established at the connection point with the distribution facilities, and an added value for distribution costs.

7 Law Decree No. 1, Article 97. "Nodal prices must reflect an average in time of the supply marginal costs at generation-transportation level for very low risk permanent users". Due to their own nature, these prices will be subject to fluctuations that arise from special conditions, such as hydrological, demand and fuel variations, and others.

8 Article 105. The structure of prices at distribution level will consider the nodal prices established at the connection point with the distribution facilities, and to the added value for distribution costs, adding them through formulas that represent a combination of such values, in such a manner that the price resulting from the supply corresponds to the user's utilization costs of the resources at the level of production-transportation and distribution used.

9 The operational margin is defined before taxes and it's formed by the
revenues obtained from the tariffs fixed by the Authority minus the operation costs reported by the firm on March 30th of the year when the tariff setting is made.

The technical bases for tariff processes have classified typical zones characterizing different load density levels and scope economies, segregating high and medium density urban zones, semi rural zones and proper rural zones. In 1996's process, an exclusively underground distribution urban zone was identified as a separate zone.

Article 111 of Law Decree No. 1 establishes the formulation of bases. It specifies that "Before six months of the end of the duration of the tariffs formulas, the Commission shall notify the distribution concessionaire firms about the bases upon which the study will be made to establish the tariffs formulas for the next period, including the definition of the typical distribution zones, and shall agree with them on the consulting firms eligible by the firms to make the study required by them. In a period of fifteen days after the firms receive the bases of the study, they shall communicate the Commission their observations about the typical distribution zones it has adopted to make the study. In turn, the Commission will decide in a term of fifteen days about the acceptance or rejection of the firms' observations so that they can contract, jointly or individually, the study mentioned in Article 107".

Distribution networks are typically structured in two voltage levels connected in series; a High voltage network (23 to 12 kV) and another one of Low voltage (380 kV), with consumers connected to both networks. Thus, there is a need to identify independent tariffs for both types of consumers; with the Low voltage consumers financing their use of the High and Low voltage networks. On the other hand, the tariff scheme tries to separate a charge by Customer, compensating those activities that are directly associated to each consumer, independent from its size.

In technical terms, it corresponds to the determination of the coincidence factors and the BT-I tariff hours of use.

In Article 116, paragraph five, it is specified that "The New Replacement Value of the distribution facilities in a concessionaire firm is the cost of renewing all the works, facilities and physical goods to provide distribution services in the respective concessions, including the interim interests, the rights, the expenses and indemnification paid for the establishment of the right of ways used, intangible goods, and operating capital. The rights that have been granted free by the State and the payments made in those concessions obtained through tenders are not included".

Letter sent to Mr. Alfredo Fuentes S., on September 26, 1983, by the Executive Secretary of the National Energy Commission, Mr. Bruno Philippi Irarrázabal.

For example, we could think on the case of the pharmaceutical industry and the problem that could arise in it and on the investment incentives for research and development if the Authority regulates all drug prices and at the same time imposes a limit to the research and development investments that can be recovered by the different companies.

Chilean legislation and its application by the regulatory Authority recognizes these scope economies and their various dimensions when specifying the division of the tariffs' calculation among different typical zones that reflect different levels of load densities and other features.

REFERENCES


COMISION NACIONAL DE ENERGIA (1989), El Sector Energía en Chile, Santiago, December.

COMISION NACIONAL DE ENERGIA (1996), Bases para el Estudio de Valores Agregados de Distribución, Santiago.


