

# Special services that are not remunerated in rates

Sebastián Soto, *Tariffs and Wholesale Electric Market Dept. – EDELAP S.A.*

**Introduction— The purpose of this paper is to analyze, from the technical, regulatory and economic perspectives, the impact of the design of electric installations to answer the special needs of those customers that consume a considerable load in a very brief period of time (at least a second) considering this type of load as disturbing the grid.**

**First, we will deal with the special needs of customers from the technical point of view and this will let us provide a solution to this kind of request; for this, we have the electric values measured in field, examples of real cases and software to simulate start-ups of electrical engines.**

**Second, we will analyze the economic impact on the Distributing Company, consequence of the over-dimensioning of its grid, to provide the electric service according to the needs of the customer and to avoid the detrimental effects over the other customers connected to the same grid.**

**Finally, and as corollary of our analysis, we will study the tools offered by the regulation in force, proposing alternatives to the said regulation to provide an integral solution to this type of customers.**

## I. INTRODUCTION TO THE TECHNICAL ANALYSIS

As starting point for this paper, it is necessary to provide a brief summary of the different kinds of disturbances that may affect an electric service grid.

Different causes may alter the ideal characteristics (amplitude, shape, frequency and symmetry) of the voltage wave generated by power plants. These deviations from the parameters of the ideal sinusoidal wave are known as disturbances.

Disturbances may be generated by several causes; one of them is the connection to the electric grid of certain types of loads (disturbing loads) that may be used by the customers of the company.

### A- Type of disturbances

The main disturbances are:

- Voltage holes
- Temporary Surge
- Transitory Surge
- Subvoltage
- Voltage Flickers
- Harmonics
- Voltage unbalances

### 1) Voltage Holes

A voltage hole is a sudden reduction of the feeding voltage at a value between 90% and 1% of  $U_n$  nominal voltage, followed by a recovery after a short period of time. Conventionally, the duration of a voltage hole takes between 10 ms and 1 minute. The depth of the voltage hole is defined as the difference between the minimum RMS value during the hole and the nominal voltage. Those changes that do not reduce the feeding voltage to less than 90% of the  $U_n$  nominal voltage are not considered as holes.

### 2) Temporary Surge

A temporary surge is a relatively long over-voltage at the frequency of 50 Hz. As way of example, we can mention the temporary surges usually generated by the closing or opening of circuit breakers, or failures (e.g.: sudden reduction of load, asymmetrical failures or non-linear load connection).

### 3) Transitory Surge

It is a short over-voltage, oscillatory or not, usually highly attenuated and with a duration of milliseconds. Some examples: transitory surges are normally caused by lighting bolts, commutation or operation of fuses. The duration of a transitory surge may vary from less than a microsecond to some milliseconds.

### 4) Subvoltage

It is a descent of the efficient value of voltage to a value below the one specified in the Voltage Level Standard of UTE.

### 5) Flicker

The voltage fluctuations may cause changes in the luminance of incandescent lamps, which may create a visual phenomenon known as flicker. The flicker becomes noticeable when it surpasses a certain threshold. The said perception grows fast with the amplitude of the fluctuation. At certain frequencies of the phenomenon, even very small amplitudes may be perceived.

## 6) Harmonics

### a) Voltage Harmonics

It is a sinusoidal voltage with a frequency that is equal to a whole multiple of the fundamental frequency (50 Hz) of the supply voltage.

### b) Current Harmonics

It is a sinusoidal current with a frequency that is equal to a whole multiple of the fundamental frequency (50 Hz). The current harmonics flowing through the impedance of the system give rise to voltage harmonics. Current harmonics and impedances of the system, and consequently voltage harmonics at the supply terminals, vary with time.

## 7) Voltage Imbalances

In a three-phase system, it is a condition where the efficient values of phase voltages or the angles between consecutive phases are not equal.

### B- Disturbing loads and equipment sensitive to disturbances

Below, we will introduce a brief summary of the main loads generating the above-mentioned disturbances and, on the other hand, we will mention the equipment that is most sensitive to them.

#### 1) Disturbing Loads

- Large loads with high connecting and disconnecting frequency.
- Point and arc furnaces
- Arc welding
- Large engines with variable loads
- Grinding mills
- Frequent commutation of the compensating steps of reactive power.
- Power electronic equipment
  - Controlled rectifiers
  - Frequency variators
  - General converters
- Electronic load regulators
- Saturated ferromagnetic equipment

## 2) Sensitive Equipment

- Power electronic devices: frequency converters, rectifiers for DC engines.
- Controlling electronic circuits
- Electric or electronic measuring circuits
- Protections
- Controlling circuits, with relays or contactors
- Sensors
- Discharge lamps
- IT equipment

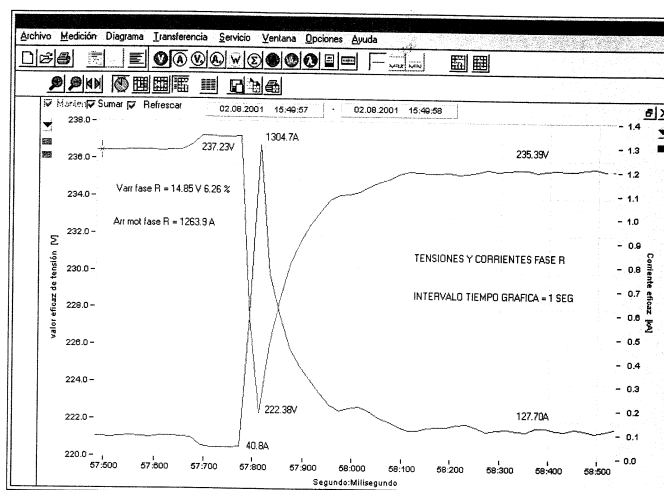
## II. ANALYSIS OF CNG (COMPRESSED NATURAL GAS) STATIONS

To continue analyzing the problem, we will use CNG stations as our example. For this particular case, we chose a CNG station with a three stages ASPRO Compressor, 380 V voltage supply, star-delta starting and a working power of 110/147 kW, the contracted power for the customer is 160 kW.

Considering the contracted power and using the power of transformers standardized by the company, we installed a bank of transformers of 3x75kVA (225kVA), 13.2/0.38 kV. When testing the CNG compressor, it did not start as a consequence of the bank of transformers' not tolerating the starting current of the compressor.

To give a fast answer to the customer, we replaced the bank of transformers for a mobile bank of 500kVA, 13.2/0.28 kV and installed a TOPAS 1000, LEM recorder. As an example, we can observe in the recorded values the current and the voltage for one of the phases at the moment of starting the compressor:

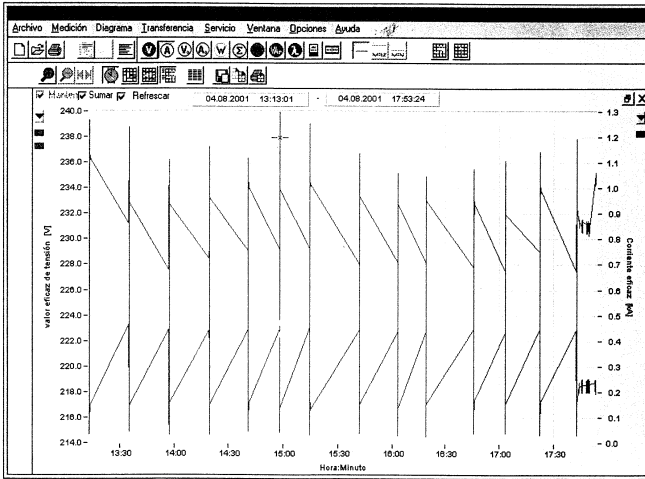
GRAPH 1



The starting curve shows that the voltage suffers a decrease of 6.2%, while the current increases 30 times, reaching 1305 A regarding the current prior to the starting.

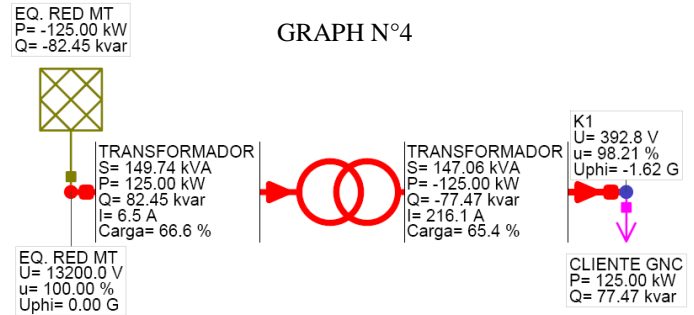
On the other hand, the following graph shows that the starting-ups of the compressor take place, in a repetitive manner, in lapses that oscillate between 15 and 30 minutes.

GRAPH N°2



The modelling of the said situation clearly shows that the 3x75 kVA bank was not capable of supporting the demand from the starting-up of the compressor, the voltage dropped 54V reaching only 86% of nominal voltage and, considering that the engine torque or, in this case, the starting torque is proportional to the square of the voltage, the low value it reached did not allow the starting of the machine.

We also modelled the event, with the values of nominal power at which the machine operates, once the starting transient was over. We inputted the nominal power of 125 kW:



### III. SIMULATION OF STARTING UP OF COMPRESSOR AND ANSWER FROM THE BANK OF TRANSFORMERS

Even when we did not have the records of the starting-up of the engine and answer of the transformer, at the time of connecting it with the 3x75kVA bank of transformers, we modelled the answer of the said bank with 4.2 NEPLAN software, using the starting-up records from Graph 1.

$$U_i = \sqrt{3} U = \sqrt{3} 222 V = 385V$$

$$I = 1304 A$$

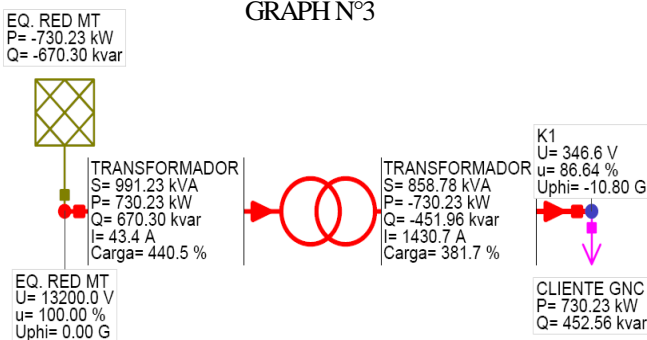
$$\cos \phi = 0,84$$

4.2 NEPLAN requires the three-phase starting power as input data, which is calculated below:

At nominal power values of the compressor, the transformer answered adequately, delivering a voltage in accordance with the requirements of the compressor ( $U_n = 392.8V$ ).

The modification of the capacity of the bank to 500kVA, even when making it possible for the compressor to star up, did not provide an integral solution to the problem of the customer, since every time the compressor started up, the voltage drop damaged the electric and electronic gadgets, the lamps went out and the functioning of the computers was altered, affecting the controlling and billing systems of the CNG station. The solution adopted by the Distributing Company to solve this new inconvenience was to separate the load of the compressor from that of the mini-shop, feeding the first one from the 500kVA bank of transformers and the second one from a direct connection from the Distributor's grid.

GRAPH N°3



### IV. ECONOMIC ANALYSIS

Based on the chosen technical solutions, we will calculate the economic impact of installing a 500kVA bank of transformers as compared to the 3x75kVA bank of transformers which, although adequately answering the load of the compressor at nominal regime, it did not stand its electric demand at the start-up time.

Below there is a chart comparing the costs of installation of a 500kVA and a 3x7kVA transformer banks.

GRAPH N°5

TRANSFORMADOR DE 500 KVA EN POSTES DE HªAª			
DESCRIPCIÓN	CANTIDAD	PRECIO	VALOR
POSTE SIMPLE 9/600/3 R1800	1.00	851.00	\$ 851
POSTE SIMPLE 14/R2400	1.00	1833.00	\$ 1,833
DADO P/PLATAFORMA BIPOSTE NORM	2.00	217.00	\$ 434
SECCIONADOR LABT 1 x 600 A	6.00	41.68	\$ 250
SECCIONADOR AUTODESC 100A 13,2	3.00	115.37	\$ 346
DESCARGADOR ZnO 13,2 kV 10 k	3.00	117.19	\$ 352
CABLE CU T/KSV 1KV.150MM.361HI	22.00	19.14	\$ 421
HERR.SOPORTE 3 AISL.P/ACOM.TRA	1.00	337.00	\$ 337
HERR.P/MJ.TRA.POS/MAD.HªPUN 14	1.00	1540.00	\$ 1,540
AISL.L.P.33KV.ANSI 57-4 BIL 20	8.00	107.00	\$ 856
TRAFO 500KVA.13.2/0.4KV.Dy11	1.00	23000.00	\$ 23,000
OTROS MATERIALES MENORES	1.00	1917.00	\$ 1,917
<b>TOTAL MATERIALES</b>			<b>\$ 32,137</b>
<b>TOTAL MANO DE OBRA</b>			<b>\$ 3,300</b>
<b>TOTAL</b>			<b>\$ 35,437</b>

BANCO DE 3 X 75 KVA EN POSTE DE MADERA			
DESCRIPCIÓN	CANTIDAD	PRECIO	VALOR
CONDUCTOR 70mmª AªCu DESNUDO	35.00	9.28	\$ 325
HERRAJES P/3TRANSF.EN POST/HOR	2.00	443.88	\$ 888
SECCIONADOR AUTODESC 100A 13,2	3.00	100.50	\$ 302
CABLE CU T/KSV 1KV.150MM.361HI	18.00	19.14	\$ 345
TRAFO 75 KVA 13,2/0,231 KV	1.00	6014.40	\$ 6,014
TRAFO 75 KVA 13,2/0,231 KV	1.00	6014.40	\$ 6,014
TRAFO 75 KVA 13,2/0,231 KV	1.00	6014.40	\$ 6,014
POSTE DE MADERA IMPREGNADA 14	1.00	196.00	\$ 196
OTROS MATERIALES MENORES	1.00	902.00	\$ 902
<b>TOTAL MATERIALES</b>			<b>\$ 21,000</b>
<b>TOTAL MANO DE OBRA</b>			<b>\$ 1,292</b>
<b>TOTAL</b>			<b>\$ 22,292</b>

<b>SOBREINVERSIÓN</b>	<b>\$ 13,145</b>
<b>% Incremental</b>	<b>59%</b>

It can clearly be observed that the costs increase in approximately \$13,000, 60% with respect to the original option.

Considering that in EDELAP’s concession area, there are approximately 25 CNG stations; the total economic impact reaches **\$325,000**.

We could consider a second hypothesis to value the economic impact of rendering service to such customers: to compare the costs between directly connecting the customer to the Distributor’s grid and providing it an exclusive connection by means of a bank of transformers, as it is normally done.

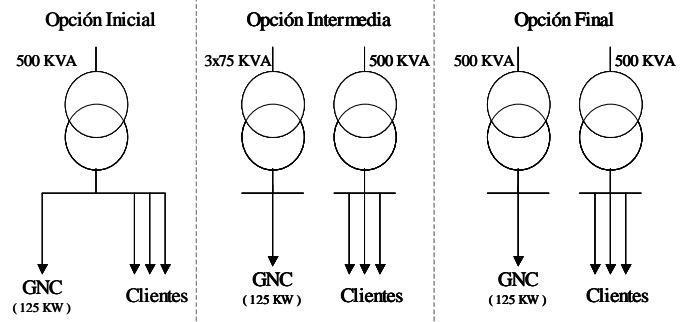
In case the customer had not had the difficult load demands of the starting-up of its equipment, as in other cases for the contracted power values, we could have supplied the regime power used by the customer (125kW) with the transformers installed in the area, without having to invest in exclusive installations.

But, since this option would be inadmissible for the other customers of the grid, since they would be affected by the disturbances introduced by the starting-up of the compressor, the Distributing Company is forced install independent connections.

Under this hypothesis, the overinvestment of the Distributing Company would not be reflected as the difference between the costs of the 500kVA and the 3x75kVA banks of transformers, but the cost to be considered would directly be the cost of the 500kVA bank of transformers -\$35,400 according to Graph 5-

for the same quantity of CNG stations already mentioned; the cost overrun would reach **\$885,000**.

GRAPH N°6



V. CONCEPTS ON THE RECOGNITION OF COSTS THROUGH THE TARIFF

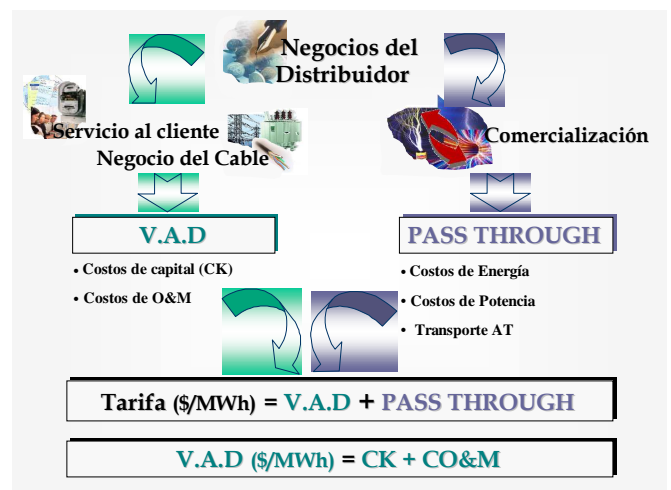
As in any business, and the electric one is not the exception, any cost generated in the production chain or, in this case, in the service, has to be passed through to the tariff so as to ensure the sustainability of the business in the long term.

The tariff of the electricity distribution is the means by which the fixed and variable costs generated in the rendering of the service are recovered. Continuing with the CNG case, Tariff T3 is the one that applies to this group of customers. This tariff allows the Distributor, through the concepts of Energy (\$/kWh) and Power (\$/kW), to recover the variable and fixed costs of the rendering. The remuneration for the concept of energy implies no profit for the Distributor since it transfers to the analyzed tariff group only the wholesale energy costs incurred into to be able to supply the demand of this group of customers.

On the other hand, the concepts of power transfer to the tariff the fixed costs incurred by the Distributor when rendering the service, through the concept known as DVA (Distribution Value Added).

DVA is the contribution of the distributor to the chain value of the electric energy; it is formed by the capital costs (CK) and the Operations and Maintenance costs (CO&M).

GRAPH N°7



When the customer requests the electric energy service it has to celebrate a contract of power with the Distributor, this contracted power will be used by the Distributor to bill the customer. The concession agreement establishes that the power must be recorded by meters, as the average power in 15 minutes; therefore the contracting of the customer is in accordance with the said concept.

Knowing the method to measure and contract the power, we can clearly observe the existence, for the presented case, of a difference between the amounts collected by the Distributor through the concept of contracted power (125kW) and the investment costs for the installed power, which are proportional to the starting-up power (500kVA).

It can clearly be observed that if the costs of Capital (CK) are paid through the tariffs by the concepts of power, these last ones should be proportional to the assets invested by the Distributor; so, there necessarily should exist a coherence between the contracted power and the installed power, otherwise, there would be no remuneration of the capital invested by the Distributor.

Later we will look into the regulatory and tariff issues, but so far, the analysis we have made shows that for this type of customers there is a difference between the capital costs invested to make the power available to the customer and the capital costs remunerated through the tariff in a proportional manner to the power contracted by the customer.

## VI. ANALYSIS OF THE PRESENT REGULATION

In 1996, four years after the takeover of the company, it started the period of the technical product quality control established for Stage 2.

The quality aspects of the technical product that would be controlled were disturbances and voltage level. Disturbances to be controlled would be the fast voltage variations (flickers), slow voltage drops and harmonics.

The Distributor would be responsible of keeping, for each kind of disturbance, a reasonable compatibility level, defined as the Reference Level; that has a 5% probability of being surpassed. The Distributor should also establish the means to determine the emission levels (levels of disturbances generated or injected into the feeding system) for its own equipment and those of users, compatible with internationally known values.

Considering that the said disturbances are mainly generated by users with consumptions that demand fluctuating intensities or with loads of non-linear answer, ENRE Resolution 99/1997 established the Admissible Limits of Individual Emissions from users for voltage fluctuations (flickers) and harmonic currents, according to the different tariffs and supply voltages.

The said resolution establishes the limits for the Individual Emission of Disturbances. Those users that do not comply with the said limit -and when an excessive emission is detected- should make the necessary corrections to reduce the level of

emission of disturbances; otherwise, and with the prior consent of ENRE, they could be penalized being it possible –depending on the case- for the Distributor to interrupt the supply.

### A. Definitions and reference levels of disturbances as established in the Regulation

Below is a list of some definitions that help us understand the manner in which the regulation pretends to solve the problem we have presented.

**Reference level** is defined as the disturbance level guaranteed at a certain supply point (defined for each type of disturbance), that ensures that if it is not surpassed in more than 5% of the measuring period, the quality of the technical product is adequate and there exists a satisfactory electromagnetic compatibility between the installations and equipment of the user and the supply grid.

**Flicker** is defined as the subjective impression of fluctuation of the luminance, caused by a series of voltage variations, or by the cyclical variation of the voltage wave envelope.

Reference levels for voltage fluctuations are established by means of a severity index of the short Flicker (Pst), which is defined for 10 minutes intervals of observation. Pst = 1 is considered as the threshold of irritability associated to the maximum fluctuation of luminance that can be tolerated by a specific sample of the population.

**Individual emission level** by a user is the level of disturbance it can inject into the grid at its point of supply and that cannot be surpassed in more than 5% of the total time of the measuring period.

ENRE established as Individual Emission Limits the Pst values indicated in the table below:

Usuarios en BT ( $U \leq 1 \text{ kV}$ ) $\frac{SL}{SMT/BT} = K_1$	Usuarios en MT y AT ( $1 \text{ kV} < U \leq 220 \text{ kV}$ ) $\frac{SL}{SCT} = K_2$	Límites de Emisión Individuales (PST)
$K_1 \leq 0,1$	$K_2 \leq 0,005$	0,37
$0,1 < K_1 \leq 0,2$	$0,005 < K_2 \leq 0,01$	0,46
$0,2 < K_1 \leq 0,4$	$0,01 < K_2 \leq 0,02$	0,58
$0,4 < K_1 \leq 0,6$	$0,02 < K_2 \leq 0,03$	0,67
$0,6 < K_1 \leq 0,8$	$0,03 < K_2 \leq 0,04$	0,74
$0,8 < K_1$	$0,04 < K_2$	0,79

SL is the power contracted by the user and SMT/BT the power at the transforming center to which the user is connected. In case it was necessary, a COS fi equal to 0.85 should be used.

### B- Calculation of the Individual Emission Limit for a CNG Station

Knowing the PST defined by the regulator, we will determine the PST Individual Emission Limit for the CNG of our example:

Power of the Transforming Center: SMT/BT = 500 kVA  
 Contracted Power: SL = 160kW / 0.85 = 188kVA  
 $K1 = SMT/BT / SL = 188kVA / 500kVA = 0.376$

If we check this data with the table, we can obtain the Individual Emission Limit, which fro this case is equal to **0.58**.

### C. Measuring of the Individual Emission Limit for a CNG Station

Sub Annex B of Resolution 99/1997 technically defines the electronic circuit to be used for the measuring of the emission of Flickers. The said circuit was mounted in the LV terminals of the transformer of the CNG, to measure the PST emission and prove if it was above the maximum limit of PST of 0.58.

The measuring period would be a minimum of one week and, in case of detecting Pst emissions above those defined by the standards, the customers should be notified by the Distributor and should have between three to four months to carry out the corrective measures to be within the limits established by the regulation.

For the said measuring corresponding to a total of 998 records we obtained the following data:

Phase R: 189 records with PST > 0.58 (19% > 5% regulated)

Phase S: 189 records with PST > 0.58 (19% > 5% regulated)

Phase T: 192 records with PST > 0.58 (19% > 5% regulated)

We can see that the level of admitted disturbance was surpassed in the three phases in more than 5% of the total measuring time.

As way of example, below we show the PST curves recorded in Phase T:

The technical report prepared by the area of "Quality of Service of EDELAP" concludes:

"There is a phenomenon, of short duration, of voltage drops of small amplitude (0.5% approximately) and periodical repetitions in time, normally known as flicker. This phenomenon is permanently observed during the time in which the load in connected, obviously the starting transient of the connection of the said load also contributes to the said phenomenon."

Although we proved the existence of the emission of flickers that were above the values established by the regulator, for reasons we will not comment in this paper –since they exceed the purpose of this document- the Regulator not only did never apply the penalties established by ENRE Resolution 99/1997 but also it did it allow the Distributor to request the customer to adapt its installations to attenuate the emission of flickers.

As corollary of this point we can express that even when the regulation in force provides us with the tools to measure and prove the existence of a customer that creates disturbances into the grid, it does not solve the problem of overinvestment in the equipment installed by the Distributor, which is indispensable to increase the levels of Short Circuit Power of the grid necessary for the starting-up.

Although the regulation in force deals with the problem of disturbances, it focuses on the flicker generated by the regime condition of the compressor and provides no solution to the voltage holes caused during the start-up. Though it would seem redundant, it was necessary to carry out the said analysis to arrive at this conclusion, since it is generally accepted, both by the regulator and the distributors, that the problem expressed here is covered by the said resolution and yet, as it has been proved, it is not so.

## VII. ALTERNATIVE PROPOSAL TO PRESENT REGULATION

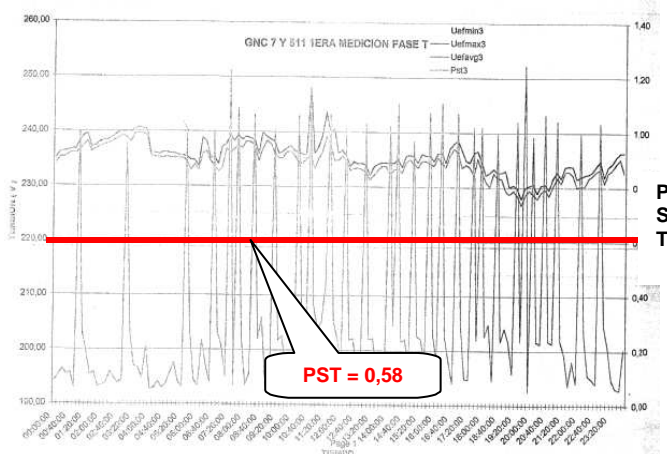
### A- Analysis from the Tariff Perspective

Below we will present some concepts related to the determination of electric tariffs, with the purpose of understanding the manner in which over-investments impact them. Once these concepts are understood, we will try to explain how the lack of regulation implies a detriment on the rest of the customers of the Distributor at the time of defining each of the tariffs.

Even when there are different methodologies for the calculation of capital costs, we will use the methodology defined as NRV (New Replacement Value) since we can assure that there exists global accord in defining it as one of the most pertinent methodologies for the calculation of the capital cost of electric service companies.

Capital cost (CK) is defined, from the economic perspective, as the cost of the capital resources necessary for the rendering of the service.

GRAPH N°8



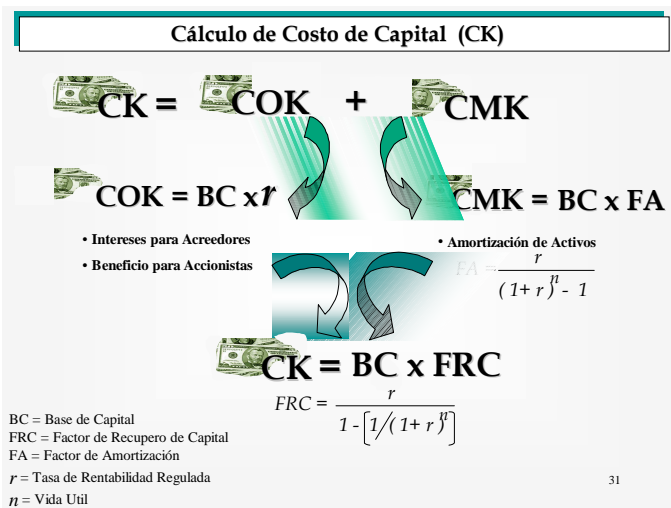


Capital cost (CK) is composed of the Opportunity Cost of Capital (COK) and the Maintenance Cost of Capital (CMK).

COK is equivalent to the addition of all the retributions for the use of capital (interests to creditors –banks- and benefits for shareholders).

CMK is the annual addition required to substitute the capital assets used during the production process.

GRAPH N° 9



CMK is calculated as the required annual saving amount for it –if collocated at a rate equal to the regulated rate- to accumulate the necessary amount for its replacement at the end of its useful life.

In Graph 9 we can observe that from the summation of COK and CMK we obtain the expression of CK as the BC (Base of capital) multiplied as the FRC (Capital Recovery Factor), which includes the profitability rate for shareholders and third parties and also the assets amortization factor.

As expressed, the calculation of the capital base (BC) is made using the NRV, this method consists in calculating the total value of the assets of the grid. To achieve this, it is necessary to survey the existing grids of the Distributor and value them according to the market costs of the said assets at the time of the tariff review.

Now, once the capital cost of the company is known, we have to determine the tariff structure of the company so as to distribute the CK capital costs, which have to be assigned to each tariff group proportionally to the manner in which each tariff participates in their generation.

The tariff structure is determined by the different tariff categories and there will be as many categories as consumption modalities.

The consumption modality of each category will determine the proportion in which each of them participates in the total costs of the Distributor.

For these purposes we have to consider the dispositions of Act 24065/92 and its regulatory decree 1398/92 that establishes in part b that:

“Distribution costs will be assigned to the different tariff categories considering:

- 1- the voltage of the supply and
- 2- the consumption modality for each type of user, considering their participation in the load peaks of the distribution grids.”

This helps us explain that the different categories have to participate in the payment of the costs according to their participation in their formation; and this depends on the consumption modality and also on the voltage level at which they are connected. Technically speaking, the consumption modality is determined by its load curve so, if we know the load curve of each category we can get to know the proportion in which they participate in the costs of the Distributor.

From the regulatory perspective, this problem deserves a similar treatment to the one given to those customers that require a higher quality of service with respect to the one established in the concession agreement. Extra investments made by the Distributor to achieve the quality of service that is above the one established in the regulation, are remunerated by means of a deregulated charge known as “Reserve Electric Service” (Sub Annex 1, Chapter 4, part 1 of the Concession Agreement of EDELAP). By means of this charge, agreed between the customer and the Distributor, the capital costs not included in the tariff are remunerated to the Distributor, since the tariff does not pay the Capital costs (CK) for investments to provide a quality of service that is above the one established in the regulation.

Having seen the concepts referred to the conception of tariffs of an Electric Distributor, we can affirm that the over-investment increases the capital base of the company and, consequently, its capital costs (CK) by distributing them among the different tariff categories, something that from the regulatory perspective is against the dispositions of Act 24065, since they would be applying costs to tariff groups that do not participate in their generation.

### *B- Alternative Regulatory Proposals*

For the reasons expressed in the previous point, we arrive at the conclusion that the overinvestment should not be a part of the capital cost (CK) when performing the tariff review of the company. Considering that these over-investments are caused by special requirements of some customers, as a CNG, a regulation should be created that is in accordance with this kind of special requirements of customers.

There are several alternatives that could be used from the regulatory point of view; one of them could be that the customer assumes the investment costs overrun generated by the higher power capacity installed by the Distributor. Obviously, the said capital provided by the customer should not be considered at the time of calculating the NRV when carrying out the tariff reviews.

Another alternative would be similar to the one used in the cases when the service of “Power Reserve” is rendered; i.e. to define an extra tariff to the one established by the concession agreement, to pay the capital costs generated by the overinvestment. In this manner, the Distributor is the one that finances the costs overrun and the customer pays the capital costs generated by its special requirements through a discriminated tariff concept, which could be called “Special Power Service”.

With these ideas we just pretend to align the general guidelines, which should consider the regulatory changes proposed from the tariff and recovery of income points of view. The regulation should also enter into details, to detect ex – ante this type of special requirements and grant the necessary tools for the Distributor to recover the generated costs overrun and their correct tariff assignation, for them not to be financed by tariff groups that are not responsible for the generation of the already mentioned costs overrun, by means of the creation of crossed tariffs that are clearly against the interests of users, the Distributor and the law that acts as framework for the regulation of the public service of electric energy in Argentina.

#### VIII. BIBLIOGRAPHY

1. “Metodología Tarifaria para la Distribución de Redes” (Tariff methodology for the grids distribution) – Consultora QUANTUM.
2. "Reglamento de Baja Tensión. Perturbaciones (Low Voltage Regulation. Disturbances) – UTE
3. “El Proceso de Cálculo de los Cuadros Tarifarios de Empresas de Distribuidoras de Electricidad” (The process for the calculation of tariff charts of electricity distributing companies) – ADEERA – Autor: Alejandro Sruoga
4. Concession Agreement of EDELAP
5. ENRE Resolution 465/1996
6. ENRE Resolution 99/1997
7. Act 24065/1992 – National Executive Power