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IDENTIFICATION OF ECONOMIC AND FINANCIAL DECISION-MAKING STEPS FOR AN ELECTRICITY CONSUMER WHO DECIDES TO BECOME AN ELECTRICITY GENERATOR TOO

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În ultima perioadă un număr semnificativ de consumatori de energie electrică au luat decizia de a deveni şi producători; această tendinţă a determinat autorii să definească momentul iniţial al unei astfel de decizii, precum şi să analizeze care sunt etapele de decizie din punct de vedere economico-financiar.

Lucrarea generalizează o serie de cazuri concrete şi poate fi utilă atât consumatorilor care în acest moment doar se gândesc cum să abordeze problema, dar şi autorităţilor/companiilor din domeniu, care sunt afectate de aceste decizii, clarificând câteva aspecte economice şi financiare luate în considerare la argumentarea unei astfel de investiţii.

In the last period a significant number of electricity consumers decided to become also electricity generators; this trend has led the authors to define the baseline of such a decision and to analyze which are the stages of decision in economic and financial terms.

The paper generalizes a number of specific cases and could be useful both to consumers who currently just thinking how to tackle the problem but the authorities/companies in the field, which are to be affected by these decisions, clarifying a number of economic and financial arguments taken into account in such an investment.

Keywords: investment, investment decision, electricity generator, renewable

1. Introduction

In recent years it was seen an increasing interest of Romanian electricity consumers to develop their own generation capacities.

It is just a trend? It can be a strategic decision?

It is only a company's strategic decision to enter into the energy area more as a consumer?

Or it is also based on economic and/or financial factors?

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Below, we try to identify their reasons, to follow the logic and the elements of the initial decision of such a step, and also to ask the major questions from economic and financial point of view that must be answered. **2. The problem**

An increasing number of electricity consumers, especially large industrial ones but not only, began to be interested in energy from another position than a simple consumer. But the decision to invest in electricity generation is a complex one and requires some detailed analysis.

Let's admit that, from the very beginning, the consumer has made all the economic analysis for his core business that let to his electricity demand for the period in question and also streamlined this demand. [1]

The first question to be asked is whether "deserves" to own their own generation capacities or it is enough to find suppliers and acceptable long-term contractual arrangements and whether the own production capacities have to cover only their own consumption or to be higher than this?

To be clear, they tried to find answers to these questions:

A. ***What they want?*** Just to cover the own electricity consumption and/or the development of an adjacent business based on electricity generation?
B. ***Possible benefits?*** Which situation brings greater benefits: the mere consumer, the (auto)producer, the electricity producer which is covering the own consumption and sells the surplus or the energy trader for himself and other consumers?
C. ***What is the best technology?*** Which is the most convenient generation technology for his particular situation, according to their consumption or according to their available resources?
D. ***Other potential customers?*** There is already a portfolio of contracts or it is possible to build a portfolio of contracts for the energy in excess of their consumption?

All subjects will be reviewed.

3. The preliminary analysis

A. ***What they want?*** Just to cover the own electricity consumption and/or the development of an adjacent business based on electricity generation?

The investments in electricity generation have two very important financial characteristics, namely:

- there are very significant investments, not only at the inception stage but to be sustained also ongoing;

- it is required to sell the electricity produced over the own consumption, and to find customers to pay for it.

For these causes, the reason for a consumer decision to become also generator is extremely important and should be carefully supported by arguments.

Moving the business's own interest area to the electricity generation is not necessarily a wise decision in the short term and, often, not in the long term too. Because, even it may be an actual trend for investments into the electricity generation field, it remains two very very important questions to get answers:

- it is needed all the electricity which is produced?
- the business in power generation can be sustained long term enough in order to ensure the recovery of money invested?

B. ***Possible benefits?*** Which situation brings greater benefits: the mere consumer, the (auto)producer, the electricity producer which is covering the own consumption and sells the surplus or the energy trader for himself and other consumers?

The potential benefits take into consideration also economic and financial aspects, and, not least related to the own strategy, for example for the production guidance/development, for the approach to a new business area, for the savings with own electricity expenses etc.

To answer these questions, the analysis must be conducted so as to take into account the behavioral effects of the long-term decision, namely the possibility that, once became his own producer and supplier of electricity at an affordable price, the consumer will start to use more, not necessarily with as much efficiency.

C. ***What is the best technology?*** Which is the most convenient generation technology for his particular situation, according to their consumption or according to their available resources?

This step too becomes very important. Because the first choice is, usually, between renewables, in general, and conventional technologies, eventually with high efficiency.

In this decision moment, the consumer's own consumption is a key argument in sizing the necessary/desired generation capacity. And lead easily to the next question.

D. ***Other potential customers?*** There is already a portfolio of contracts or it is possible to build a portfolio of contracts for the energy in excess of their consumption?

Only in extremely rare cases the own consumption is sufficiently covered by one's own production capacity, even where a holding company (different consuming entities but having the same shareholder).

Approaches such as „bilateral contract with other consumer/consumers' community/supplier" and/or „sell on the spot market" and/or „export" are very risky a priori.

There are, also, risky the partnership with the local distributors/suppliers or with organizations or other economic entities. Usually, this risk comes from almost impossible perfect overlap of the „generation curve" (probable or possible) with the „consumption curve" which is resulted or could be the result of the consumers portfolio and which determines the economic and financial parameters that could support the profitability of the project to be deficient.

And, keeping in mind the above preliminary answers, we proceed to a detailed analysis of problems.

4. Detailed analysis

A. ***What they want?*** Just to cover the own electricity consumption and/or the development of an adjacent business based on electricity generation?

If the objective is only to cover the own electricity consumption, in the first phase it have to be determined the characteristics of this consumption. Respectively, it have to be defined as accurately possible the own consumption curve, present and future if possible. So, it have to be considered the amount of energy required to be consumed, on time levels and, if applicable, there have to be identified those special conditions which may be imposed by their underlying industrial production. Moreover, in addition to their actual consumption that has to be covered, it should be produced sufficient additional energy, which, delivered and invoiced, to cover their additional expenses.

For an easy analysis, the authors consider a real example of an industrial customer who wanted to know if and under what conditions can become also an electricity producer.

His load curve has been anonymized in order to ensure his privacy.

The analysis was performed with data for the same period, one characteristic month.

All the graphics have the time in abscissa, respectively the 720/744 corresponding time levels for a calendar month (30/31 days x 24 hourly levels/day). In the ordinate are represented either electricity quantities (in MWh) or financial resources (in lei).

Further, the consumption curve was defined, simplified, on three "layers" [3]:

- as quantity;
- economic;
- financial.

The quantitative load curve is similar to the load curve and is representing the amount of electricity consumed on a time level, during a time unit: day/month/quarter/year or, sometimes, seasonal.

For the industrial consumer which was analyzed, we considered his hourly curve for a characteristic month on 30 days (720 hours) as shown in Fig. 1:

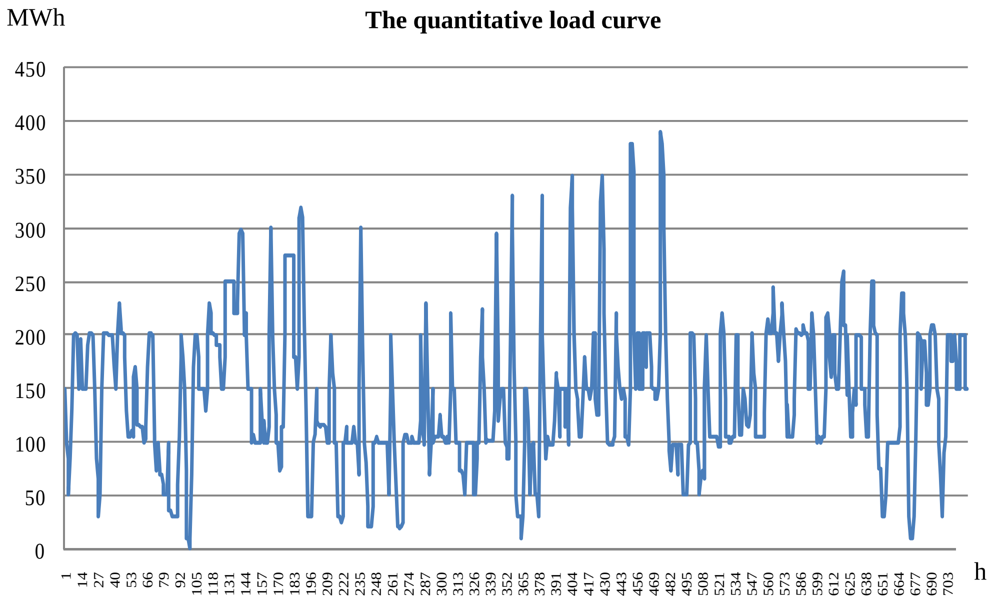

Fig. 1 – The quantitative load curve

The total amount of electricity consumed and paid in the computational month was 101.618 MWh.

In this situation, due to the optimisation of the quantitative load curve we meant to minimize the mean square deviation for the hourly consumption values from a minimum number of consumption levels, that is in a formal way as follows:

Notations:

$x_j, j = 1....M -$ the hourly consumption values, M being the maximum extension (monthly, yearly etc.)

$p_i, i = 1....P -$ the hourly levels from a maximum number of levels P.

$$F(x,p) = \sum_{i=2}^{P}\sum_{j=1}^{M}\left(x_j - p_i\right)^2, \forall\left(\frac{p_{i-1}+p_i}{2}\right) \le x_j \le \left(\frac{p_i + p_{i+1}}{2}\right) \qquad (1)$$

With conditions:

$$p_1 = 0; p_P \le \max_{j=1}^{M}\left(x_j\right)$$

In these conditions we are looking to minimize the function $F(x, p)$ by finding a minimum number of levels for which the double sum from (1) to be less than a predefined limit. [2]

In practice we choose a number of levels (1,2,3, 4 or 8), which is convenient also for the energy supplier, so the double sum does not fluctuate significantly from a number of levels to a higher number. In practice the number of levels most suitable proved to be 4.

There are special applications for determining the minimum number of significant levels and also for the minimum of the double sum. Excel can be used successfully.

We have to note that the consumption values are grouped by levels, the limits of each group being given by the arithmetic average of a level with the next highest.

In a rigorous analysis, and for many data (hourly values for full years) the question is to define scenarios and, especially, to find some really significant levels, with or without to detect the seasonal items.

In order to define ***the economic curve***, we included all necessary expenses in order to support the quantitative load curve. This assumes that, for an hourly level, the expenses includes not only tariff or contracted price, but also other expenses: the fare/tariff type (for transmission, system, distribution etc. services), expenditures to support consumption (with own substation or own equipments), other expenses in order to maintain the own equipment and/or consuming-equipment availability etc.

The economic curve is expressed in lei/MWh if it is taken into account the unit price/tariff to be paid for that hourly level or in lei for the total amount payable for the electricity according to the purchasing tariff/unit price. Typically, for the consumer it is an important indicator of the utility’s own costs.

Systematically, the economic curve has the same shape as the quantitative one, but it she is the originally underlying the first investment decision, because the difference between this curve and the economic curve for the electricity generation allow to focus on the favourable situation that will be analysed further.

We are analysing the subject considering the load curve presented in Fig. 1 and we assume that it may be covered by a bilateral contract, at a fixed hourly price, regardless of the timing and consumption amount. As a result, the economic curve would be as in the Fig. 2. The figure shows the distribution of amounts billed for hourly electricity consumption for each of the 720 hours of a generic 30 days month. Values billed are considerate for the case of a bilateral supply contract.

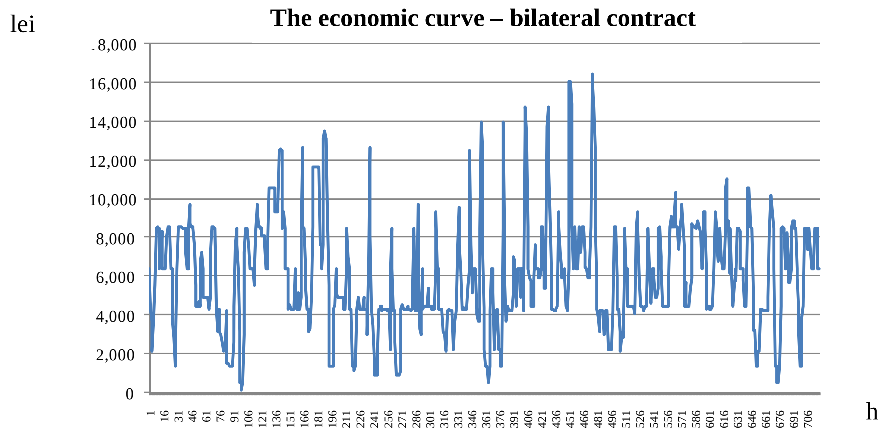

Fig. 2 – The economic curve – bilateral contract, fixed price

The economic curve has the same shape as the quantitative load curve.

Such a contract is, however, unlikely in real life for such a consumer. In real terms, this consumption was covered by a contract with separated unit prices for different time levels.

Therefore, we assumed a contract that has had established two levels of consumption.

In this case, the economic curve becomes as in Fig. 3:

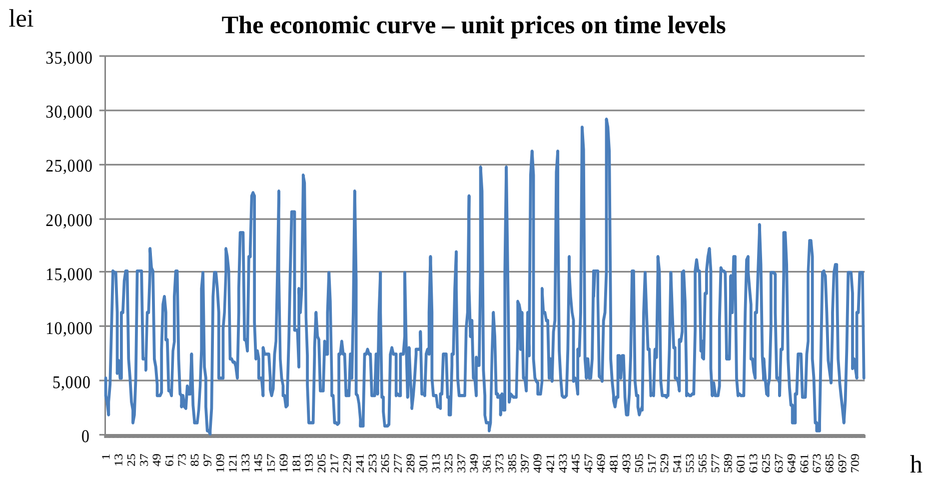

Fig. 3 – The economic curve – unit prices on time levels

By optimising an economic curve we understand to minimize the mean square deviations of the payments for hourly consumption values to a minimum number of consumption levels, which means, formalized:

Notations:

$x_j, j = 1....M -$ the hourly consumption values, M being the maximum extension (monthly, yearly etc.)

$p_i, i = 1....P -$ the hourly levels from a maximum number of levels P.

Vi – value (price, tariff) for the substitution energy, that is the energy that have to cover the difference between the hourly consumption value and next below level value;

Vs – value (price, tariff) for the additional energy to be transferred to the electricity system, that is the difference between next above level value and the hourly consumption value;

$$F(x, p) = \sum_{i=2}^{P} \sum_{j=1}^{M} (x_j - p_i)^2, \forall \left(\frac{p_{i-1} \times Vi + p_i \times Vs}{Vi + Vs} \right) \le x_j \le \left(\frac{p_i \times Vi + p_{i+1} \times Vs}{Vi + Vs} \right) \quad (2)$$

With conditions:

$$p_1 = 0; p_P \le \max_{j=1}^{M}(x_j)$$

In these conditions we looked to minimize the function $F(x, p)$ by finding a minimum number of levels for which the total energy cost is minimal, that means that the double sum from formula (2) to be minimum.

We have to note that the consumption values are grouped by levels, according to the monetary value of the level; the limits of each group is given by the average level with the next above one, weighted with the values for the substitution energy and respectively additional energy.

An additional objective for the optimisation is the accepted or acceptable amount for the additional energy and/or the substitution energy. The optimisation is already important because it allows to estimate the maximum allowable amount of energy consumed and correspondingly the total cost of energy consumed.

Further, ***the financial curve*** includes together the economic expenses from the economic curve and all other financial expenses related to the consumption: penalties, actual savings, credit related expenses (fees, interest etc.) or other payments related expenses (guarantees, commissions etc.).

The financial curve has a different shape than the quantitative or/and economic ones. It is usually used for timing the electricity expenses, and is affecting the consumer’s cash flow.

Continuing the example above, the financial curve becomes as in Fig. 4, and contains the hourly distribution of total expenses with the energy consumed in a generic month of 720 hours:

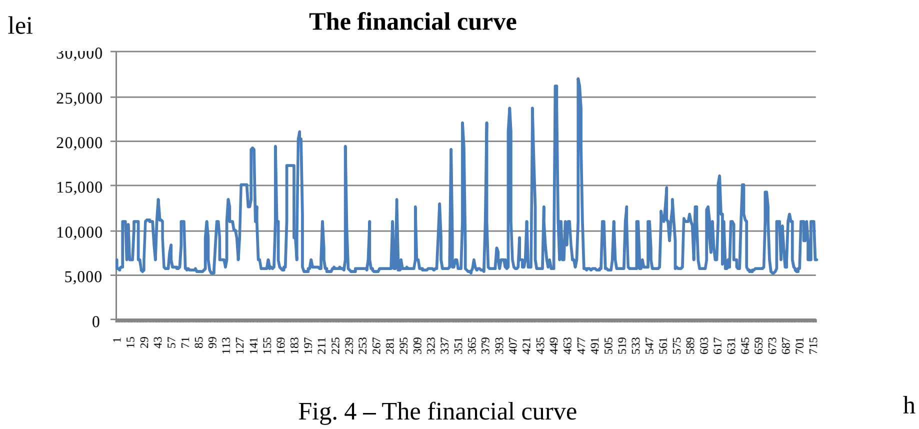

Fig. 4 – The financial curve

Optimising the financial curve is, in fact, the next step and it is extremely important for the consumer because of the need to find a balance of payments for electricity (which may be the financial curve), especially for significant consumption or for consumptions with a high weight in other consumer spending.

Optimising the financial curve from the above example, only by choosing a different consumption level for the contract, in the same price conditions, the new financial curves becomes as in the Fig. 5:

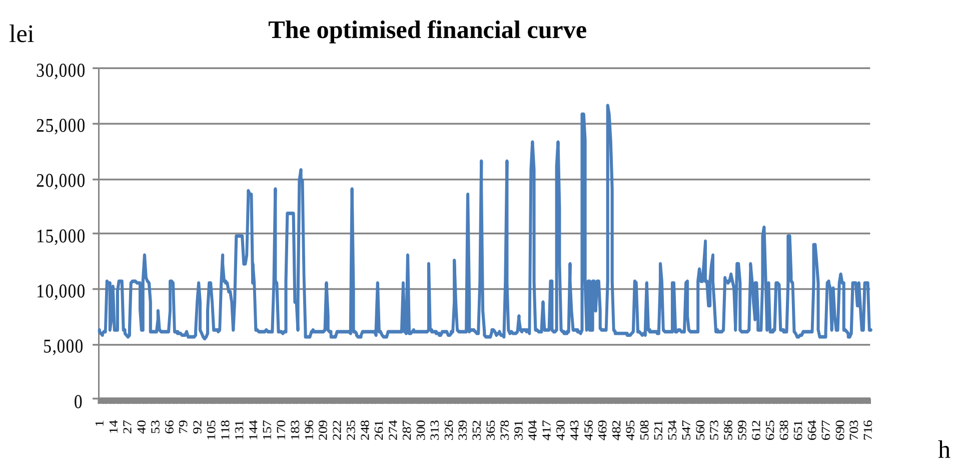

Fig. 5 – The optimised financial curve

Fig. 5 shows the optimised distribution of payments for hourly electricity consumed in a generic month of 720 hours. The payments are optimised for two-levels pricing. The optimisation refers to determine those levels of pricing so that the amount of payments to be minimal. The levels can be negotiated with the supplier, but the optimisation itself is subject to a simulation using Matlab.

It is interesting to note that the total amount for the same electricity consumed as shown in quantitative load curve in Fig.1 begins to decrease if the actual distribution of payments is optimised.

Moreover, the financial optimisation may take into consideration for contracting several levels with different prices, and even some different delayed payment terms from the consumption time, leading to higher annual savings for the consumer.

The comparison of the three curves is shown in Fig. 6:

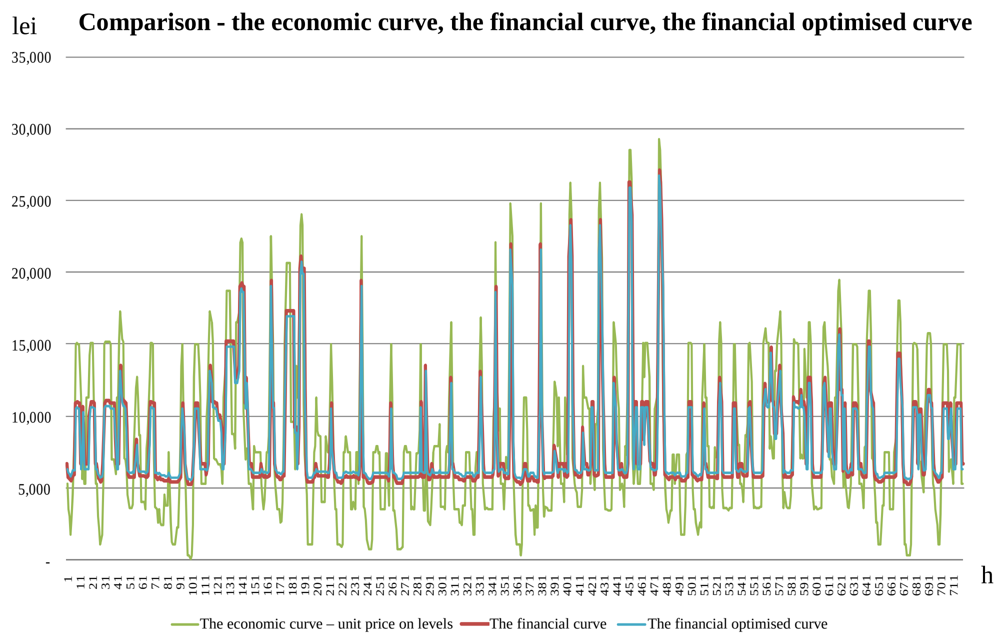

Fig. 6 – Comparison – the economic and the financial curves (simple and optimised)

Fig. 6 is overlapping the economical, financial and financial optimised curves. It can be observed a more compact shape for the optimised financial curve, which is used for optimal timing of payments.

Comparing the three curves, we can reach the following conclusion: the optimisation of the financial curves allows establishing the profile for a so-called minimum income curve, needed to support the decision to the electricity generation shift, which will be discussed next question.

B. ***Possible benefits?*** Which situation brings greater benefits: the mere consumer, the (auto)producer, the electricity producer which is covering the own consumption and sells the surplus or the energy trader for himself and other consumers?

We suppose that, in this situation, the consumer chooses to build its own generation capacity just to completely cover its own current consumption.

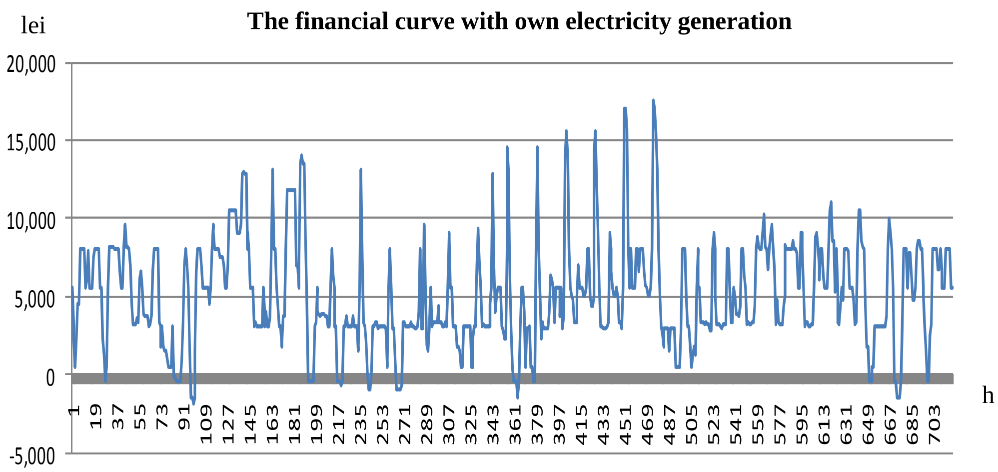

Fig. 7 – The financial curve with own electricity generation

Fig. 7 shows the distribution of actual payments for electricity consumed in a generic month of 720 hours by a consumer who has an own electricity generation capacity. The electricity produced is consumed internally, but there are moments when a part is sold, in this case the payments are "negative" (become incomes).

If the installed power in own generation capacity is equal with the maximum hourly-consumed power and if the energy generation costs are similar with the prices in earlier contracts (not necessarily small), their expenses with the consumed electricity are decreasing, often significantly.

It is sufficient for a decision of this scale?

It seems that not only the financial aspects are behind the decision to invest in own generation capacities [4] and not necessarily only savings and/or profit reasons, in a financial sense, are leading to the investment decision. In fact, the decision to invest in generation capacities is based not only on the idea to cover the energy consumption and/or to make a profit. Of course, it should not be underestimate the importance of the profit, but it is possible that the decisions are taken from other reasons, in particular strategic type, such as market maintaining or market positioning, rather than for reasons of profit.

Nevertheless, a large part of the final decision is based on the fully satisfactory answer to the question: who will consume (and pay for) all the electricity produced?

On the other hand, if we are considering a possible source of external funding for building a consumer's own capacity, we must keep in mind that most investors are banks or investment funds, which are seeking profitable investments of capital. However, not necessarily a direct and immediate profit from the investment is the determining factor. After all, a well-chosen project, possibly "trendy" (in this case "green"), which eventually enhance the image inside the investment community, but with well-established fundamental financial parameters, especially acceptable under the investment' rules of investors concerned, this cannot fail. In addition, it is only a matter of time before such a project to produce the expected effects.

As a result, projects are/can be financed if they provide capital placements for a period long enough so that it becomes profitable for investors. After all, investment funds have to put money. Their obligation to put money is the essence and the function of these funds: they must seize the money collected from small investors. However, it could occur a different kind of obligation, arising from certain aspects:

- legal or administrative, such as the obligation that the investments' portfolio to have a certain structure on types of holdings – shares, assets, deposits etc. or on types of industries – energy, banking, pharmaceutical, real estate etc. or on different geographical areas;
- good practices, such as the obligation to have investments in businesses that promote new or green technologies etc.

Moreover, the investment funds should try to place their availability so that the global value of the investment portfolio will not fall over time. As such, their profitability will be reduced to maintain the actual amount of investment without to be eroded by inflation over a longer period. Extra income is welcome. In addition, the diversification according to certain criteria is considered as necessary. Thus, for funds are useful the investments in energy projects because they are long term projects involving large amounts of money.

As well, another reason for investing in projects for the implementation/purchase of power generating capacity (especially considering renewable resources, or environmental restrictions [5], and from these wind farms in particular) is their speculative potential. This means the possibility to initiate an energy project and to sell it, in a certain stage, in order to obtain a certain gain, with or without retaining a participation in the production capacity.

During the time, the projects were sold in those stages in which it was already solved the most risky issue for the period:

- in the beginning there were speculated the projects that had the premises complete control; at that time these projects were considered the best ones, and their capitalization was considered extremely profitable. The risks for such projects were in relation with the legal situation of the land required for the project, often unclear. An important step that rose prices rapidly was related to the environmental restrictions, including in particular locations related approvals.
- then, the minimal stage of a project acceptance in order to be sold or speculated was as a project with the primary resource measurements done (wind/sunburn/calorific value), by all the rules and with all rigor. Here he quickly moved from the stage with measurements extrapolated from real measurements made for a nearby area, to the stage with own bankable measurements. By "bankable" measurements it have to be understood both effective measurements and summaries absolutely required, which are accepted by a bank as an argument and support for a project for which funding is sought. For example, measurements of the wind characteristics – the wind complete study, the map of solarization – energy efficiency study of the location, the effective and expertised structure for the waste – waste prosecare report and the electricity generation report, determining the calorific value of biomass – the energy production estimates etc.
- later, when more important or more interested investors came, from other areas, both project prices and the security need have increased. The most important point was to set as a standard for the marketable projects the projects having a technical connection approval. This approval came after the Technical Solution Study and was seen as an assurance from the energy system that the project is acceptable and can be connected to the system under certain conditions.
- then, the major investors considered that the minimum credibility threshold of Romania has been reached and that the market hardened. The placements, which were not originally oriented to the energy area and also the placements from profits from other areas (e.g. real estate), began to be considered interesting. Then came the first necessity to ensuring the project after the technical connection approval and this was the building permit. The need has been borrowed from real estate area, and was adopted by investors mainly because the offers for generation capacities began to multiply exponentially. There were plenty of problems, not so much as getting a building permit but due to the fact that there are established solutions the buyer may not take into

account (e.g. the choice of the turbine for wind projects), and the interest began to stratify. The investors could not accept the projects that already have had a certain technological solution, either because they were unprepared either because they were willing to introduce its own technology even, in substance, these investors were keen to carry out a project. At this time, the technical connection approval was considered as the initial step and all other steps were to be made in agreement with potential investors, including and especially the stage of acceptance of technological solutions.

- the next step is becoming important: to accept only the projects having a connection contract. This step is actually very expensive in terms of due diligence effort.
- there are intermediate steps that can be reached, but the final step, namely the turnkey project, is still extremely rare.

The problem, intractable and which, usually leads to the generation project price increase, is to ensure the effective energy evacuation, inside sufficient economic and financial parameters, so to ensure the existence of potential consumers, possibly with binding contracts or to ensure that the produced energy can be placed on the market; in Romania such kind of insurance is very difficult to be obtained.

In this respect, there are two important aspects, which investors considered as requirements, more or less firm:

- the possibility to obtain a PPA (Power Purchase Agreement) or, because in Romania this concept does not exist, something similar, such as a bilateral contract with continuous negotiation on medium/long term;
- the assurance that the incentives will be obtained and eventually traded, usually green or white certificates.

Both the above conditions are extremely important and most projects existing on the market do not or may not have or produce such an assurance. On the one hand, because the PPA is not supported in Romania, even if it is acceptable in the European Union, on the other hand the green certificates market is a highly sensitive and volatile issue. Only the delays on issuing the laws or the application rules rejected very many projects from funding, projects which otherwise had all approved documents. Moreover, remember the aspect that in the European Union is approved the feed-in tariff.

It should be pointed out that an investment project located in Romania, which may be the subject for a PPA outside, namely the European Union, it is considered very valuable by funding institutions. In these circumstances, and especially PPA contracts, are to be considered very important for the project.

Another reason for which private investors are the private projects are still initiating projects in energy generation is to fill a niche market or to create reserves, including reserves of power. Even if such projects appear to be non-profitable from the beginning, in fact things are not exactly like that.

In the first case, it is about the recovery of energy sources that are (already) owned by investors or that are representing the dedicated sources of some entrepreneurs. For example, landfill (organic or not), coalmines (profitable or unprofitable otherwise), biomass (owned or attracted) etc.

In such cases, income sources can be:

- to attracting bank financing sources for which the primary energy resources as exemplified above may be used as collateral, directly or indirectly;
- the own contribution to large projects, which may include (sub)projects for electricity or heat generation;
- diversifying the portfolio of a company, from the industry or not, considered as a prerequisite for participating in certain auctions in the area;
- real guarantee subject to attract grants.

For the case of creation power reserves from private initiative, the sources of profitability are also interesting. Excepting the creation of a dedicated power source exclusively for the purposes of reserves for power system (problematic project, in fact, but very profitable in limit conditions), certain power generation projects are dedicated for cooperation with other electricity generation project. More particularly, it is the case of the power plants for the balancing power production curves of other plants or other projects. Specially, these projects are profitable if they have or can have access, exclusively eventually, to cheap primary sources: cheap coal, cheap alternative, hydro.

A final reason, but not least, is the desire to become independent from the current energy supplier, sometimes at any cost, especially if the consumer or the consumer community is constituted around a local authority, e.g. the mayor, and especially when such plans may be supported by grants [6].

C. ***What is the best technology?*** Which is the most convenient generation technology for his particular situation, according to their consumption or according to their available resources?

In this point, the consumer can ask the question another way: what technology to choose so I not only cover my own consumption needs but also to obtain profits from the sale of energy in excess?

The option of producing energy from renewable sources is extremely present and it seems most convenient. The considerations are based on potential sources of income that, in financial terms, are more important than in other areas of power generation. In other words, it matters more the possibility of obtaining more revenues than an affordable price compared to value for the energy that can be produced.

In fact, the costs of producing electricity from renewable sources, investment and operating costs are significantly close to the income from sale of electricity. More specifically, the cumulative unit cost (investment plus operating) is significantly closer to the unit price of electricity, for example in bilateral contracts market. The difference is given by the value of green certificates and, if appropriate, white certificates. They are sometimes able to allow the recovery of investment costs within a reasonable time and volume.

As a result, the key issues of energy production can be summarized as follows:

- the investments costs in the production from renewable resources crucially depend on the green certificate market. This one essentially depends, on its turn, on the buying circuit for green certificates, for those required by law (suppliers or final consumers), respectively to obtain green certificates by renewable energy producers. Here are some problems that may, practical, to make the projects of this nature unprofitable, from which one is the circuit purchase/obtain for green certificates: on the one hand, those who have to buy consider this as an additional tax obligation, and on the other the number of green certificates is insufficient.
- the investment value in generation capacities from renewables relative to the installed capacity is much higher than for conventional power generation. This value is significantly increased due to:
  - a relatively high demand,
  - a technological risk that cannot be completely known by the manufacturer due to the novelty of the technology,
  - a resource volatility compared to the need to ensure a relatively constant production on long term.
- such kind of projects are, with few notable exceptions, relatively small-scale, relatively small as capacity. These small and medium plants have the disadvantage of depending from the dispatching rules, which tend to give higher priority to higher capacities. In addition, and this is the main disadvantage, they have a production curve dependent on natural conditions, at best, with a seasonal evolution. This makes an electricity generation capacity from renewable sources to be obliged to have the installed power of 2 to 4 times higher than the conventional sources, for the same amount of electricity actually produced and useful evacuated. This means that, in fact, one installed MW in a wind

park cost about around 2-8 times more than the same installed MW in a classic technology for exactly the same one MWh produced. Some might view a waste of resources, while others may perceive this as a necessary social cost.

D. ***Other potential customers?*** There is already a portfolio of contracts or it is possible to build a portfolio of contracts for the energy in excess of their consumption?

In fact, this key-answer should be given in the project initiation: who needs the produced energy? Or, more practically, who will pay for it?

Two major types of assurance are needed here:

- a technical and commercial one: to ensure that the produced energy will be evacuated and consumed; the law in force announces that the takeover is compulsory, but not also the consumption. In fact, what we need here is that an amount of energy which is produced (preferably completely) to be paid.
- a financial one: ensuring a certain price or, if it is possible, a satisfactory price evolution for a certain period of time (7-11 years).

In fact, the above are subject of the *Power Purchase Agreement* type-contracts.

In addition, once signed the energy sale contract, this one acquires a value of collateral, which is extremely important too.

Once more, energy production or consumption does not actually matter, but to ensure a sufficient and complete circuit of the investment.

5. Conclusions

It is clear that the answer to the general question, if a consumer can become a producer, is based on a comprehensive analysis, which mainly has to bring certainties for two major issues:

- the energy that is produced has, in turn, consumers, other than the own consumption?
- the cost of the energy produced, after the investment, will be significantly lower than the tariff/price in the current contract?

In certain conditions are possible positive answers to both questions.

Furthermore, a positive response to the first question is equivalent to fulfillment of PPA conditions type.

What are the necessary and sufficient conditions for consumers to become producers in terms of economic and financial efficiency, and what solutions may exist, these are currently being analyzed and will be presented in a future paper.

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