INTRODUCTION

The Brazilian electricity industry option for the big plants on the expansion of energy sources has been the result of the strong Constructors Lobby, which was used to introduce the big ones to benefit this group.

The environment costs introduction are related to the preparation of Environment Impact Studies (EIA) and Environment Impact Report (RIMA); the admission of these documents in the official committees; and, the preparation and execution of an environment project, which make viable the plant implantation by the mitigation or compensation of identified impacts on the studies. This introduction resulted in important costs portion, and this consideration, at least, might change the projects ordination [1].

The inheritance of this period was the consolidation of the technology used for the big plants, forming the Brazilian conception of hydraulic generation, with merit indexes associated to the big hydroelectric plants. It resulted, in the end, at the unfeasibility of small hydroelectric generation plants, which present unitary energy costs higher than the average of big plants, but with small environmental impacts.

The electricity industry reorganization has introduced a significant number of new procedures, rules and actors, such as the Energy Independent Producer (PIE) and the Self-Producer; and also, the State role change, from utility to now regulator and inspector[2][3]. It made viable the offer expansion in different forms, distributed and competitive in the energy market, through the small and medium plants (hydraulic and thermal) and, also the unconventional plants (wind and solar ones), with the government incentives like PROINFRA.

The utilities and the regulator ANEEL – National Electric Energy Agency – need to promote the new agents introduction, demanding trustable and insure operation of the energy generated by them.

SUPPLY OF THE MARKET

The integration of production and demand curves limit the problem to be solved by the generation dispatch, including the losses of transmission and distribution systems and the allocation of spinning reserve to the generation system.

The time load evolution control is of fundamental importance in order to promote new generation plants to the market requirements.

An average-sized hydro power plant, regardless the environmental issues or other problems, needs 5 to 10 years to be built.

Thus, the load requirements must be known for longer period than the necessary one for the plant implementation.

This is the main explanation of the research result, answered for specialists and entrepreneurs of the electricity industry, [4] fearing for new crisis of supplying in biennium 2006/2007. Currently, due to the low level market consolidation caused by the energy conservation during the last energy rationing, an unfavorable condition of supplying for year 2008 has been identified.

Considering a coincident programming of generation expansion with the growth of market and with the reserve allocation for eventual deficiencies for transmission or generation systems and the Programmed Maintenance, the ideal production of the system would have to coincide with the load curve, including the electric energy losses due to the transport of energy as far as the consumption points, at every moment [5].

This is not possible, especially in Brazil, due to the dimensions of the generating units, emphasizing their individual characteristics of “Great Size” [6]. Thus, the firm energy, the requirements of maximum generation power, the supplying of load peeks are all conditional parameters due to the characteristics of the affluent outflows in the accumulation basin, associated to each plant, as well as the plant dimensions to be introduced.

The production curve will be, therefore, function of the availability of the generation (machines) and the hydraulic diversity of all basins that compose the linked system, resulting in different capacity factors at each period.

A more rational alternative to support the time load requirements is to use units of several dimensions and a diversity of sources, which characterize the hydrothermal supply system, or at least, a bigger diversity in the
dimensions of the available hydraulic units, for the constitution of the production curve (dispatch) required by the load.

The hydrothermal system makes possible the option for the most adequate unit to be introduced, associated to the power or energy requested by the load, to the availability of hydraulic resources or others, and to the strategy for the allocation of energy system reserve.

This new situation is more feasible after the Brazilian electricity industry restructuring, because the energy competition in the generation and the commercialization has been responsible for the introduction of new generating plants, which should be characterized for short time of maturation and for not being capital intensives.

As examples, there are the not conventional small hydroelectric plants (PCH’s), the small thermolectric plants (PCT’s) and, other alternative sources, associated to the assumptions of the profile of the new private investor of the electricity industry, which allow greater cohesion of the production (dispatch) with the electrical system load curve.

The government incentives make these alternatives attractive to the entrepreneurs. The Law nº 10,848, of 15th March 2004 and the public-private partnerships, in approval process in the Legislative, makes possible the consolidation of new market environment for the utilities (Regulated Market) through auctions of shares to the entrepreneurs (Free or Regulated Market), making then possible the introduction of the new plants.

Thus, the entrepreneur may opt for a safe investment with little risk and return, which would be the energy auctions, or for risk market, that would be the commercialization of his production to the free consumers.

Obviously the market scenario for the investors in these stimulated alternatives has changed, because the competition will not happen for the great enterprises, with lesser cost for associated MW, but for the paid tariffs by the consumers. Thus, an average-sized consumer or a set of contiguous consumers, who present demand equal to 500 MW or above, may opt to acquire energy from a PCH, Wind or Biomass sources, through a lower price than his paid tariff as a tied consumer.

This mechanism has also stimulated the consolidation of the “energy dealer”, that has begun to search for suppliers and consumers, constituting a business alternative of the type “earn - earn”; that is, the entrepreneur earns for the characterization of a significant portion of the market defined now as free and the consumer also earns, because he is given an alternative of acquisition more propitious than that one imposed by his condition of tied customer.

This condition could be observed by the Commission of Energy Public Services (CSPE), associated to a great number of new enterprises, thermal and PCH’s, during the regularization phase in that Commission, evidencing that the customer himself tries to be an entrepreneur, aiming at to maximize his profit.

This has also motivated the utilities to promote energy commercialization alternatives through more interesting prices to the big tied consumers, mainly during the peak hours. This initiative is due to the necessity of the utilities to reduce the financial loss associated to the consumption efficiency (reduction in the foresen market), which was learned in the 2001 rationing, in the northeast and southeastern regions of the country.

THE ELECTRICITY INDUSTRY AND THE GENERATION OF ELECTRIC ENERGY

It is a usual practice in the electricity industry planning of the nations, the search for the supply expansion alternatives through the optimization of the natural energy resources.

In the Brazilian case, the generation of electric energy is mainly based on hydraulic sources, due to a great availability of this resource, being responsible for about more than 96% of the total generated electric energy.

The thermal generation is considered as a complement, except in southern Brazil (Rio Grande do Sul - coal) and in isolated systems of the northern region (oil). The other units are kept as an alternative during a possible dry season and accidents that make unavailable to meet fully the market with the hydraulic sources.

The generation of electric energy by hydraulic source despite being considered as a clean process, implies in diverse aggressions to the environment.

The reservoirs of hydroelectric plants, however, have been suffering changes by many ways in their main objectives, in view of the possibility of their many uses, characterized for the several purposes imputed to their reservoirs, such as the fluvial navigation, irrigation, overflow control, urban supplying, fish culture, leisure, etc.

In relation to the electric energy, the hydroelectric plant has as main aspects, its characteristics of accumulation capacity and regularization of the outflows, which qualifies the constant supply guarantee at any period of the year, even during a dry season.

As one can notice, the hydroelectric plant should be managed as in relation to the demand (instantaneous value) as in relation to the consumption (upstream associated to the time requirement, daily load curve), which requires different characteristics of machines and reservoirs installed in the electrical system to meet the most diverse conditions of load.

ADVANTAGES ATTRIBUTED TO THE DECENTRALIZED GENERATION

With the sector restructuring, the mission of supply expansion and operation includes new agents, who will have to submit themselves to the regulation of the State, but they will influence in a way to include plants and generation dispatch with a more located character and
more restricted performance, which would characterize a new option of generation of electric energy, called decentralized generation.

In this direction, some advantages usually are attributed to the decentralized generation, as follows:

- Investments minimization and overall costs reduction of production and transport of electricity;
- Reduced construction period for small plants. It is, in general, significantly reduced in relation to the conventional alternatives;
- Use of alternative energy sources with lesser commercial values. It allows the minimization of the operational costs of an multi-utilization project;
- Promotion of the regional development, through the usage of local resources. This makes possible advantages under the economic and social approach for the region;
- Environment impact minimization due to the installation size and greater spatial dispersion;
- More flexible electrical systems by the introduction of minor steps of production. It makes possible closer integration of generation to meet the requests of the market in the time;
- Greater mix in generation. This may take to a bigger reliability and security in energy provision;
- Bigger efficiency in the use of the energy of the co-generation, with reflex in the environment, considering aspects of heat and power production, for example [7].

THE NEW CONFIGURATION OF SUPPLY

The electricity industry restructuring has allowed the introduction of new agents who should participate in the competition of the electric energy offer market, characterizing the offer decentralization, however with perspectives of control, auditing, and regulation for the new agencies, such as ANEEL, CCEE (Chamber of Commercialization of Electric Energy) and ONS (National Operator of the Electric System).

The sector restructuring does not introduce significant changes in the operational questions. The participation of the utilities exclusively in the energy supply auctions, which will be divided in shares and distributed to all participants and acquired by the best bid. It implies in cost reduction and better prices for the consumer.

In this way, the introduction of the independent energy producer (PIE) and the self-producer should keep and evolve to a specific regulation, aiming to allow an effective control by ONS and the utilities that make viable the introduction of the potential offered for these agents.

The acquisition of exceeding energy from self-producers was first regulated in 1981 in relation to the supplying of isolated regions, being characterized by a conflict of interests, as from part of the electricity industry as from part of the new agents. It was basically restricted to the alcohol sector, which faced, in that period, distortions associated to the "PROALCOOL" crisis (an alternative Brazilian fuel plan).

With an adequate regulation in relation to costs, reliability and quality of the services to be rendered, these new agents have changed their relationship characteristics, including new energy sources alternatives, stimulated by a specific legislation (PROINFRA) and in face of the characteristics of adequacy of a competitive market for a voracious demand and weak offer, due to the departure of the State, and doubts of the private sector related to the Brazilian regulation history.

In this way, the consortia involving private, governmental agents and the utilities themselves, who expand the new plants of medium and greater sizes, up to the limit of their strength, opening opportunities for the inclusion of new partners in each enterprise, have been being the most practical way of insertion in the last years in Brazil.

With this agents association in the electricity industry, the industrial processes with co-generation characteristics, supported by gas, oil or biomass may also make the electric energy selling as an additional product to be offered, constituting exactly an independent producer or a self-producer, depending on the characteristics of the installations and steam production. For example, the necessary steam for industrial processes would include the alcohol sector agents, who already have a long-term relationship with the Brazilian electricity industry.

The auditing, regulation and control agencies should identify the minimum parameters to be followed by the producers in order to promote the definitive insertion of these new agents to the Brazilian electrical system, diminishing the pressures coming from the initial operation delay of the great plants, and characterizing a new platform of operation cost, index of merit and area of performance of the new supply spectrum provided by the new agents.

In this scenario, the sellers and the consumers with demand contracted between 500 and 3.000 kW would play the role of preferential customers of the small producers, in view of the physical characteristics of integration of these small production plants.

The introduction of generation plants nearer to load may result in significant operative improvements, as well as promoting the postponement of significant plants in the distribution and transmission systems.

Examples of these benefits may be verified in the contingencies of bigger extension where one could characterize preservation islands of the supplying, even during "Black-out", as in the case of priority zones of supplying of great centers, like Sao Paulo and Campinas or even New York City, during the latest important happenings in those electric systems.

The main aspects to be considered when introducing new sources in the system are related to the
The technical studies that should be carried on to insert a new source in the primary system of electric energy have already been equated. After certain reluctance of the utilities, one has promoted of a simple way the integration of new plants to the Basic Network or to the distribution system, attributing to the players their responsibilities regarding the connection facilities.

The consolidation of the supply expansion, in these terms, is facing problems associated to the environment licensing, although it is a characteristic of lesser impact.

However, the mechanisms and requirements still present lack of adequacy, since the assumptions of environment impact analysis are associated with the history of the productive sector, i.e., of the great plants.

In this way, it might be said that, currently it is easier to get the licensing for the great plants than for the small ones. The imposed restrictions to the former ones are compensated by their dimensions, whereas for the latter ones, the same restrictions make them impracticable.

An excessive amount of projects in the Sao Paulo State are in waiting status, due to unsolved matters regarding environmental issues.

Thus, CSPE, the State Secretary of Energy and Hydraulic Resources and Sanitation (SERHS) and the State Secretary of Environment (SMA), have promoted a survey of the remaining hydraulic potential of the State, aiming at the supply expansion, considering the public politics and the remaining opportunities [8].

In the year 2003, CSPE started to analyze the constraints imposed to the projects, showing alternatives with distinguished focus, where basic questions as the $Q_{7-10}$ indexes (Minimum Outflow Identified in the hydraulic series of 10 years, at the foreseen point for the enterprise) were substituted by other references, including the monitoring of these new references for the PCH's.

In 2004, standards have been established for the minimum required outflows, still associated to the index $Q_{7-10}$, assigning to the Secretary of Environment, a definition after a period of experience that, according to CSPE, was a progress [9].

**FINAL COMMENTS**

The society searches for ways and solutions for the sustainable growth problem, as in relation to the techniques, economic and social affairs, as related to the environmental issues.

These transformations, without a doubt, will reconfigure the planet, imposing a new face, as a result of the changes in implementation process.

The maintenance of regions in perpetual process of development and others in precariousness conditions, with despairing mutilations of the population for basic requirements of life, as feeding, housing and security, does not find endorsement in the social-economic arrangement of the modern global economy, based on the sustainable development.

The electricity industry, as an integrator of the development, search ways to offer the energy required by the society and should provide, together with other agents, the way to extend to everyone, the inherent benefits of the availability of the electric energy as vector of consolidation of social evolution to the whole country.

The privatization of this sector in Brazil makes this mission, a bolder one, keeping, however, the viability and the commercial objectives of the diverse agents of the new electricity industry.

In this scenario, the small generation plants (distributed generation) develop important function, since these can associate in such a way with the whole linked system or with isolated or even non-existing systems, constituting in such a way as a development vector.

The context demands the integration of the agencies in search of reduction of the contrasts in the States and in the Country, prioritizing the environment and the society in the effective consolidation of a "Sustainable Development".

**BIBLIOGRAPHY**