Triple Helix in R&D&I - Research, Development and Innovation – of Brazil´s Electric Energy Distribution Sector

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ABSTRACT
We study the arrangement of the R&D Programs – Research and Development – in Brazil's energy concessionaires (power facilities). The sample summarized 20 out of 84, being considered the most significant in terms of annual Research Projects volume in these Programs and their economical importance. In addition to the research made by sampling, one specific concessionaire was studied in order to understand the internal and external relations in its R&D Program.The objective of this analysis was to establish a non-competitive benchmarking, in order to allow the evaluation of the structural transformations and the development of management proficiencies, both in R&D Programs – Research and Development – and in innovation management, in a way to allow future comparatives in researches, given the construction/establishment of a set of indicators.
The management of Research and Development Programs (R&D) is a critical action of the regulatory obligations of the concessionaires of electrical energy, in the settlement of Aneel's sector regulation – a national agency. The companies' relative lack of experience in this activity, around just one decade, made these concessionaires appeal to research projects ran in Universities. At the same time, the recent change in the R&D Programs orientation from Aneel towards Innovation, with the publishing of its Manual of R&D in May 2008, brought up the perspective of market introduction of the results from Research Programs accomplished in these R&D Programs, what makes Concessionaires to be always looking towards perfecting their organizations and infrastructure to accomplish this activity, not to mention the tracing of a new role for research managers inside Universities. Such managers are required to become partners and also in charge of the innovation process – by the means of involving suppliers or even industries in the research and innovation projects, or by prompting market deliberations in their projects. Such a role is opposite to the previous role of a research executor that ends in result delivery.Considering the new roles taken by the different actors: government agencies, concessionaires and industries, as well as universities, we developed a qualitative research of such relations, in order to proceed to suggest another set of indicators to be added to those investigated in the benchmarking done which considered the open innovation.

Key-Words
R&D&I,Management; Research, Development, Innovation

1. Introduction

The management of Research and Development Programs (R&D) is a critical action in the regulatory obligations of the power facilities in the establishment of Aneel's sector regulation. The companies' relative lack of experience in this activity, about just one decade, in addition to the recent changes in the R&D Programs orientation from Aneel towards Innovation, with the publishing of its Manual of R&D in May 2008, direct Power Facilities to be always looking towards perfecting their organization and infrastructure to accomplish this activity.

Considering this situation, the comparative analysisbetween how power facilities structure their units, the human resources they allocate to run R&D management activities and the benchmarking from the results obtained is an important source of organizational learning for the power facilities. The current benchmarking has been ran under demand of DISTRIBUTOR (incognito) power facilities, inside a R&D project that aims to formulate an agenda of development of R&D indicators to the strategic planning integrated to the technological innovation. Twenty nation-wide power facilities participated in this benchmarking, selected in non-probabilistic manner with the collaborationfromAbradeeGT-P&D (Electrical Energy Distribution Companies Association). The report, based on a questionnaire asked to the mentioned companies, explored the aspects of organization and hierarchy formalization of the R&D management, the quantity of human resources involved in such management and the project briefcase in R&D and the funding routines. Thus, based on the results obtained from data processing, the report developed and analyzed four performance indicators for R&D: 1 – ROL ($) / Number of Projects; 2 – ROL ($) / Equivalent Human Resources; 3 – Number of Projects / Human Resources; 4 – BALANCE ($) / ROL ($).This study is known as a non-competitive benchmarking.

As main conclusions, we could point that the majority of the distributors hold a formal and individualized section for R&D management; only one-fourth of these sections are located in a hierarchical high-level; in most of the distributors the Energy Efficiency is found in a different section from the R&D management; most of the companies possess internal normative guidelines ruling over the activities and procedures of R&D, but none of them has the specific management certification for the area; and that the R&D area, in most of the companies, is related to the levels of Management and Superintendence.

The article is structured in three main points: a brief description of the triple helix (TH) development; the benchmarking application with methodology applied and the description of the results obtained with the benchmarking; and finally a description of results concerned to the triple helix over three research projects: two inside the DISTRIBUTOR and the third one about the sector electrical suppliers.

2. Triple Helix Development

- The ideal role of Government

In a direct innovation policy, in templates from top to bottom, government keeps all process of innovation under its control, a system of Technological Innovations focus on industry issues and the results are applied with the approval of a central planning agency. There is a range of templates. The Finn case is about a line model of public resources focused injection in R&D (Research and Development). The Swedish template is based on the motivation of change from disciplinary research to interdisciplinary, focus of research in the main universities and resources to regional universities and capabilities of different areas. We will consider that the civilians are the base of the triple helix and the relation between scientific policies and democracy and that the innovation dynamics occur in a TH usually developed in a regional level. In addition, a State entirely coordinated TH provides only a limited source of ideas and initiatives. Bottom to top initiatives and top to bottom may be seen in countries that leave military dictatorship, such as Brazil. An indirect and decentered innovation policy can be more effective in places where there is resistance to a more amplified role of State. University has been chosen as an agent of an indirect perspective: in agriculture (half of XIX century), in military forces (2nd World War) and in industry (1970). It can be observed in USA as distinct answers to specific problems (consortium); or even with the government as a risk capitalist. In industry, the perspective is to allow new rules and products. In this policy the role of the state governments is increased. In the financial development based on science the states create secretaries of S&T (Etzkowitz, 2009).

About indirect innovation policies, the role of universities in local development is seen in the development of the physical traditional structure and in economy directed by knowledge, where the direct support to industries wouldn't be possible anymore. Universities start to be seen as a source of a new economical development. There is, then, the paradox of innovation: financing knowledge without a structure to use it. The North-American innovation policy was based on the development of the ability of transferring technologies from universities to industries based on the creation of new companies from academic research. There was, then, a change in the role and activities of the "public worker teacher". During the war, in USA, the R&D, the test, the production, the demand, the clients and universities were integrated in a network. The problem of obtaining results (paradox) was solved by severe monitoring of the projects supported in the university. That, in the long run, was the reason for financial flux. In relation to companies, there is emphasis on the creation of a public system of venture capital as an extension of basic research. The research for innovation in small companies would express the consciousness-raising of technology as an important factor in economical development. The increased role of the government (USA) in a society of laissez-faire meant: for the transfer of technology, the creation of a research system supported by the federal government in universities; the high rate of overhead as a method of financing research in universities; the competition for research funds increased at the same time that the federal research budget meaningfullyincreased. The appearance of a "bottom to top" system means: the federal government is prevented from playing a direct role in civil technological innovation, but supports and develops, in a collaborative manner, companies to work together with universities and government labs. In this system, there is the discussion of critical technologies by general agreement and this stimulates the specific financing: an immanent triple helix with both top to bottom and bottom to top characteristics. (Etzkowitz, 2009)

- Enterprising University

Introduction: a strategic vision, a juridical control over intellectual property that results from research, transference of technology and enterprising ethos are the base to support it. It must attract support and meaningful external funds, understand and reach problems of a broader society. The enterprising university: extends its teaching capabilities, going from the teaching of individuals to the formation of organizers, use tradable technology in transference offices, coming from research, searches for external financial resources for research, understands knowledge production both as an economical and epistemological enterprise. Research in university must benefit the community but, on the other hand, the university must be aware of commercial issues

and use commercial expertise. The second academic revolution is the one where the university is guided by the mission of both economical and social development. The first academic revolution was a transition between the university as a teaching institution to a university of teaching and research (half of XIX century). The internal logic has been broadened: from the preservation of knowledge (teaching) to the creation of knowledge (research) and then to apply the knowledge (enterprise). Academic enterprising becomes universal and in USA, the teacher must finance his own research and studies. In Europe, the marketing of research comes as a mission, from top to bottom, by the action of national governments. In Africa, as involuntary consequence of university intervention in technological crisis, creating spin-off companies. The enterprising university has its base over polyvalent knowledge. The univalent knowledge follows a sequence from basic research to applied research in time, places and different people. The polyvalent knowledge – theoretical, technological and commercial potentials, at the same time – has already established the concept of translational research (Etzkowitz, 2009).

The development of relations between universities and industries is based on interests linked to basic research and financed by research councils and similar organs; an industrial project under request; basic and applied research programs, united, and many sources of financing. The scientists start to worry about fund raising as a requirement to research success. The sensibility to potential practical results is broadened. Enterprising university is linked to a reverse dynamic line of contribution to society – the definition of the problem of research comes from external sources – against to the classic line template of disciplinary advance. It designs agreements with companies of intense R&D participation, considering the gathering of resources and patent negotiation. It regards the existence of four aspects: research groups, connection offices (linear innovation template); technology transfer offices (takes the technology out of the research groups and searches for a market demand) and company incubators (the knowledge and technology are built in a company and are removed by an enterpriser). To understand the role of the enterprising university, we must also consider that the industry of knowledge in modern societies is not a small topic managed by an intellectual elite anymore; that the implications of research appear in a smaller time lapse after discovered or invented, transforming the position of research in a relevant political question to global economy; that the gaps between science, technology and industry happen in different situations; and that developing countries have a broader range of gaps, because their institutional infrastructures are more fragile (Etzkowitz, 2009).

- Company evolution

In companies that searched for new products through research, selecting the purchasing strategyor there lacked search for innovation, therefore inspiring employees to quit and settle a new company (spin-off) or thus diminishing the size of industrial companies ornew companiesbased on knowledge or companies developed by advanced local research, start-up companies from universities and technology institutes and companies transferred to incubators or tech parks – become central topics in innovation strategies. The company in TH is characterized by the search of incubation and academic innovation. In regions with high technology in USA, there are research groups and companies in university campus, with representatives from the government visiting them or operating in nearby offices. The rising of the TH company means: the integration of the research group with a organizational network of transference offices, incubators, venture capital companies or even a network of patents can be example of how an innovation strategy can be created with cooperation; the gestation time of a high technology company is high, a decade at least, usually is apart from private venture capital, using public venture capital – moderately unknown – and the R&D funds of the government support, in a broad brush way, the crossing of "death valley" until the company reaches a stable income; the credibility of such company raises with the connection of a university teacher as a collaborator, such as an investment bank; university and government could be strong sources of economic initiative(Etzkowitz, 2009).

There are two different kinds of high-tech company: market oriented – apply research to improve products, and research oriented – that search a market for their research results. Research oriented companies: produce research and technology results under government demand, for instance; they have little know-how of how to proceed into selling a product; occasionally, they may need to hire consulters or a business manager, or ally with other companies; and spread their existence through the customary routine of articles and patents. Companies that are market oriented: have a small amount of time to develop products and usually don't get involved in advanced research, even though they are high-tech companies; work with an incremental perspective; to reach balance in income they search for external financial sources; before accepting a R&D project, they try to secure the alignment of these with the companies objectives. To know both the technical and business sides, to combine the two fields, became the competence of individuals with "double life", known in this way because they are essential to innovation, creating a transversal bridge for their colleagues. The requirements for the formation and growth of the company based on knowledge are related to the following factors: human, material and organizational capitals. The company would expand from a competitive unit related to other companies only by the means of market, to a triple helix entity, with relation to the other companies, with the academy and the government(Etzkowitz, 2009).

3. Benchmarking

A benchmarking can be made between competitive companies; can be made upon practices, internal or external or even between non-competitive companies, being called non-competitive benchmarking in many situations. The identification of the source of information is usually one of the most challenging steps. In our study, the companies didn't show great resistance into revealing their information; this happened because they share such information to ABRADEE – *Associação de EmpresasDistribuidoras de EnergiaElétrica* (Electrical Energy Distribution Companies Association) and do not dispute market inside allowance area.

The research was fulfilled in 20 distributors acting nationwide, selected by non-probabilistic means. The sample, even though being uniform in sectors, ended by being intentional and constituted by 10 distributors among the first 20, which answered the questionnaires by e-mail. The report is part of the Project called "Agenda" between a private university and the DISTRIBUTOR that aims to develop a set of routines and methodological procedures to define and establish new Annual R&D Programs that converge to the objectives and yearly or multi-yearly goals established in strategic planning of this power facility.

We searched for information related to R&D in organization, considering: organization; structure; procedures; human resources and information related to the R&D program in its strategies.

3.2. Results

The results shown here are structured in four sections: the formalization of R&D management; the evaluation of human resources and R&D; the characteristics of the projects in R&D; a set of indicators in order to guide the efforts and performance in R&D in time.

3.2.1. Formalization of Management in R&D – key indicator K1

Around 60% of the distributors declared to have a formal and individualized section of R&D management, in other words, the activity of management of R&D occupy alone a formal and functional section in the organization chart of the company. The research didn't reveal if such section has R&D as its only and exclusive activity.Concerning the organizational level in which the management in R&D is located, we verified that in 26,7% of the companies such management is situated in the second hierarchical level (linked to the layer just below Vice-Presidency or Directory) and in 73,3% in the third or fourth level (below the layers of Department, Division or Management).Even though in 60% of the interviewed distributors there is a specific Energy Efficiency area located in the same hierarchical level as the R&D, research revealed that in most of the distributors (70%) the Energy Efficiency area is located in a diverse sector than the R&D. Thus, we do not notice a tendency into consolidation from both activities in an unique management sector.In 60% of the participants, we could notice an internal normative guideline, ruling on activities and procedures of the R&D. However, in only one of the management sector we could find a specific management certification.

None of the distributors has common adopted certifications in project management units for the area of R&D, such as PMP (Project Management Professional) or CMMI[1].R&D area, in most of the companies, is related to the levels of Management and Superintendence. "Daily" relationship with hierarchical entities is common for 70% of the companies, mainly on the attainment of extraordinary activities such as the strategic planning of R&D and critic analysis previous to yearly control accounting.

3.2.2. Human Resources (HR) in R&D– key indicator K2

Distributors have an average of 5,5 equivalent human resources acting in R&D management. Only two of the distributors have a HR equivalent[2] superior than average (Chart 1).

Even though the research hasn't applied any coefficient to express the proportional reason between the equivalent HR and the amount of balance in account (balance of resources owned by the company) or the amount of project briefcase, the average 5,5 makes us wonder, taking into account the critical nature of R&D management, how do they deal with a reduced staff dealing with obligations such (i) adequacy to the rules,Lei 9.991/2000, (ii) "physical" monitoring of projects and (iii) sending final reports to accounting and auditing, just to mention three examples.

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[1] The PMP is the certification handed by the Project Management Institute (PMI®), allowing public recognition and ratifying the responsible Project Management professionals according to methodology and international behavior guidelines of PMI. The certificate CMMI (Capability Maturity Model Integration) attest the ability of the company to comply to a setting of integrated models of maturity and capability for disciplines in integrated development of product and Project management.

[2] We use equivalent HR as the average rate between the full time and part time working hours, distributed between the work force owned by the company (including the R&D Manager in the distributors with formal structure of the R&D sector), trainees and external consultants.

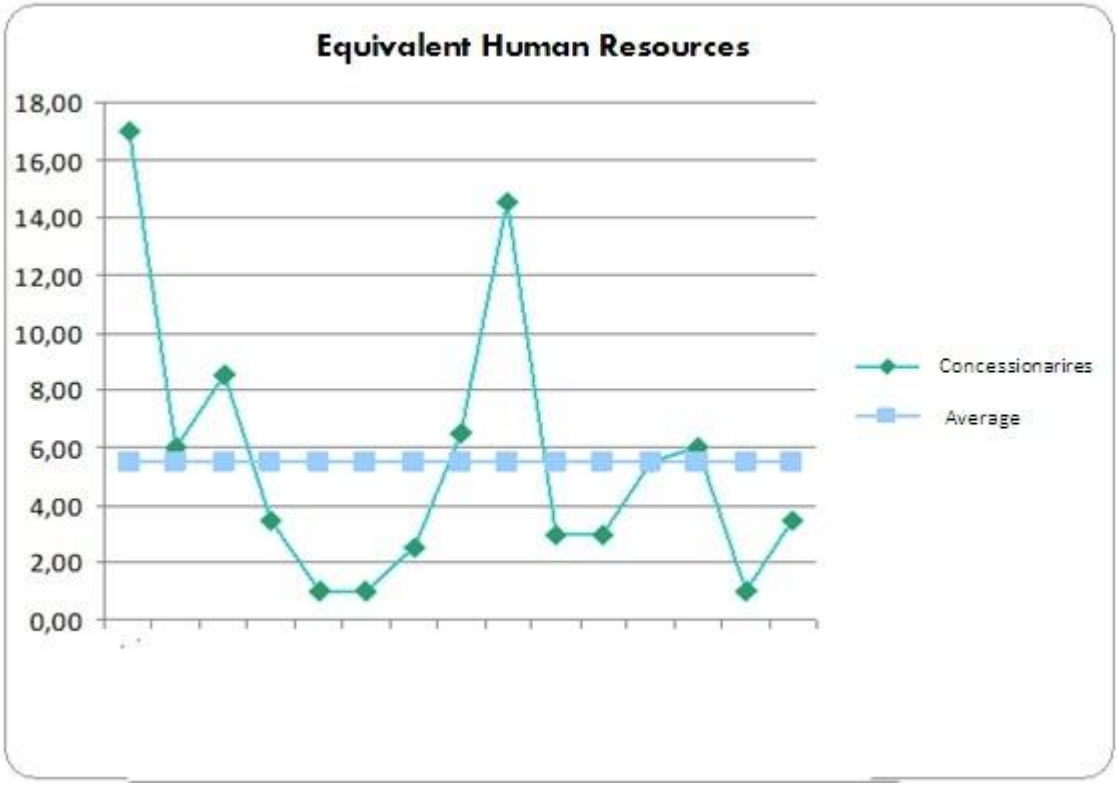

Chart 1 – Equivalent HR (RH Equivalente) => K2

3.2.3. R&D Projects – key indicator K3

About the periodicity of project solicitation, 70% of the companies realize annual calls and the remaining is divided between semestral, every four months or according to specific needs. Considering the new legislation of R&D Programs from ANEEL, which gives the facilities more autonomy, the use of annual call for projects seems counterproductive, revealing a process of technological prospect that seems slow or revealing a restriction in operations, since the small staff of R&D units.

Without evaluating the performance of briefcase management in Projects of the studied distributors, Chart 2 reveals the quantity of projects managed by the companies.The chart shows only one outlier in terms of current projects. The research doesn't compare the data informed in this topic and the ones reported to ANEEL.

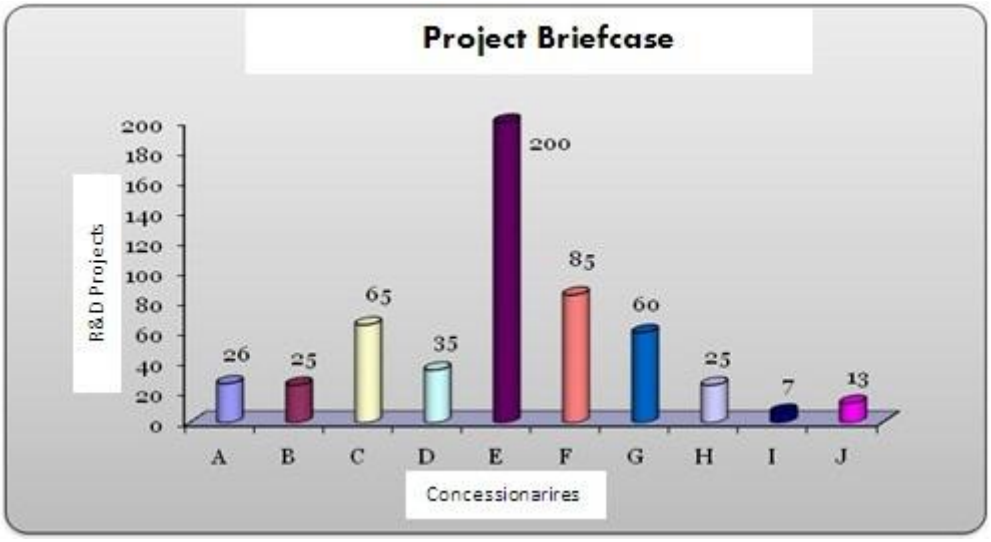

Chart 2 – Project Briefcase => K3

3.2.4 Indicators (KPIs)ofR&D

This study established 4 general performance indicators in R&D, as follows:

3.2.4.1 ROL ($) indicator / Number of Projects- key performance indicator K4

We obtained the average project value of about R$270.000,00 (U$160,000.00). Three distributors didn't declare and once again it was not the main point of this research to check the declared values and the values obtained by the control Agency. Since the chart of this indicator (Chart 3) presented only 2 outliers, it is possible to realize a general tendency in the sampled companies for projects up to R$300.000,00 (U$176,000.00), versus the two distributor outliers that choose projects that are obviously structure oriented, with values about R$900.000,00 (U$530,000.00). The annual average of R$270,000.00 per Project is considered low due to the great volume of developed projects in power facilities, suggesting a possible incremental trace of innovation in the studied cases.

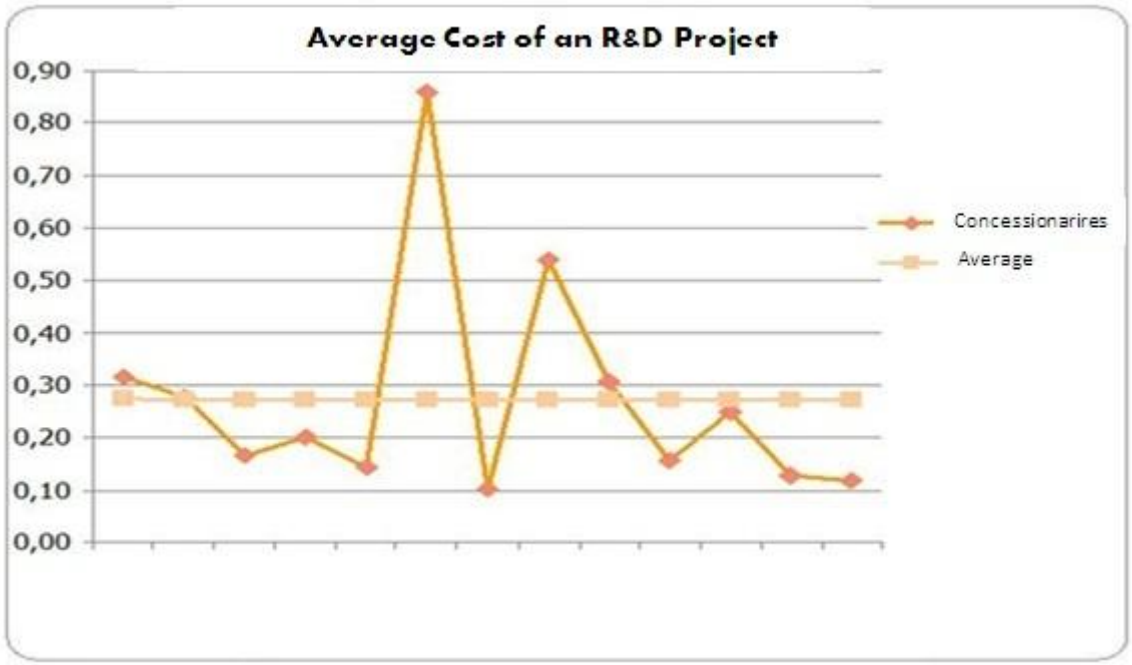

Chart 3 – ROL ($) / Number of Projects => K4

3.2.4.2 ROL ($) / equivalent HRIndicator– key performance indicator K5

The average project value by equivalent human resource is R$2.210.000,00 (U$1,300,000.00) and R$1.770.000,00 (U$1,106,000.00) without the extreme superior outliers.Two distributors had the average rate of project value by equivalent human resource of more than the double average.

3.2.4.3 Number of Projects / equivalent HR – key performance indicator K6

Chart 4 indicates that the average number of Projects by equivalent human resource is 13. These results suggest that the R&D structures in power facilities are still small and in process of generation.There would be necessary comparisons of this indicator between the distributors, the power plants and transmitters to realize if the volume of projects under the responsibility of each equivalent HR is high or low. At least we can notice is the extreme responsibility of an equivalent HR to take responsibility for the management of the average 13 projects per year, without considering the possible build up caused by the enrollment of Projects that can last more than 12 months in the fiscal exercise of one year, compelling the equivalent HR in R&D to manage projects with different schedules and timelines, with risk of latency.

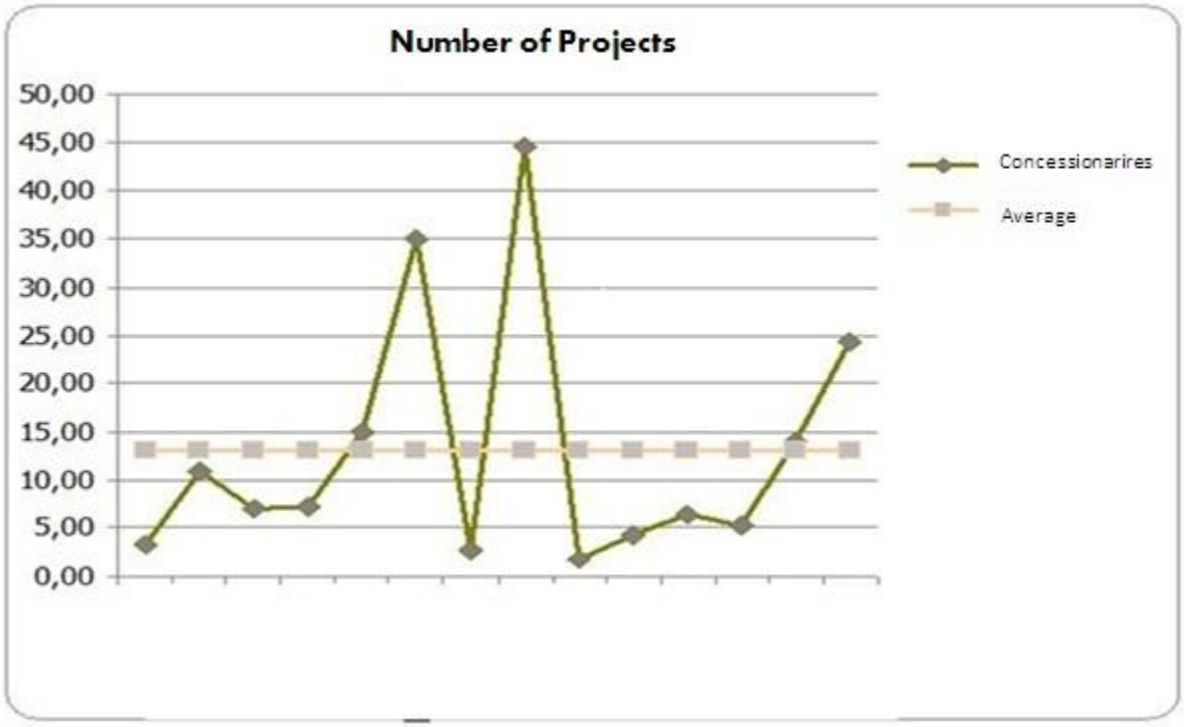

Chart 4 – Number of Projects / equivalent HR => K6

3.2.4.4 BALANCE ($) / ROL ($) – key performance indicator K7

The indicator mentioned in the research referring to the account balance (balance of the resources under the power of the company) marked an average 3,38 years.Most of the interviewed companies still show an elevated balance, apparently because of the control hindrances. Only two distributors have values close to the control rate (Chart 5).

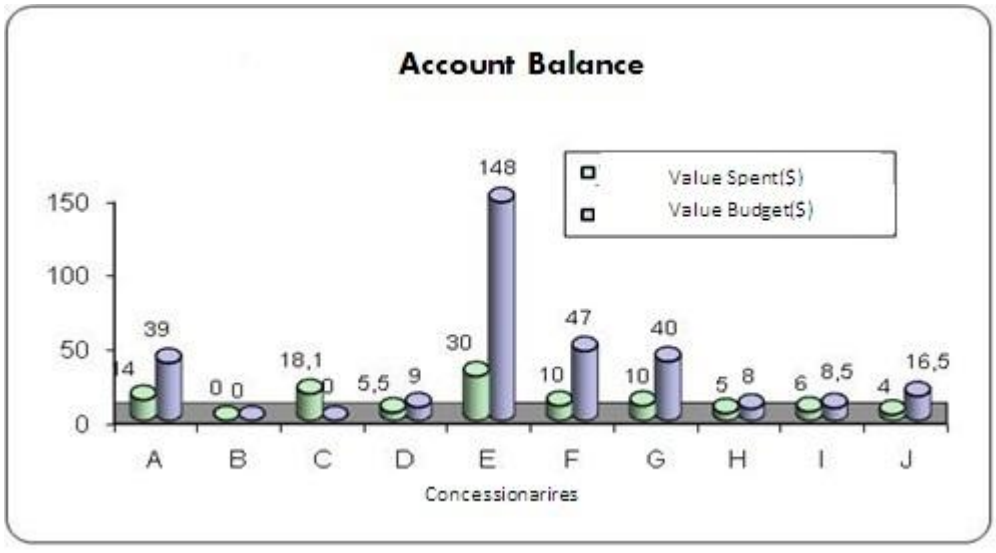

Chart 5 – Balance ($) / ROL ($) => K7

4. Thinking about

- Indicators

R&D Chart – Indicators of Power Distribution Facilities

	2009	Means
K1	Below Department	Position in Organization.
K2	5,5 eq HR.	Number of people in R&D group.
K3	Individual Project indicator (from 7 to 200 this year)	Number of projects.
K4	R$ 270.000,00 or U$ 160,000.00	Average cost of a project
K5	R$ 2.210000,00 / eq HR. or U$ 1,300,000.00 /eq HR.	Value each person has under responsibility
K6	13 projects / eq HR.	Number of projects managed by each person
K7	3,38 years	Years of value that haven't been accomplished in research

There are so much money not spent and accumulated by concessionaires (see K7) and the human resources to work in R&D management are not enough (see K2). The average value of a project is low considering the budget (see K4) but is so much response for one equivalent human resource (see K5 and K6) that at the same time work in another functions or departments.

- The ideal role of Government

A direct innovation policy for the Electric sector in Brazil was based in the creation of the AgênciaNacional de EnergiaElétrica (Aneel) [National Agency for Electric Power]. The main objective of Aneel was to fulfill the need of a specific sector with autonomy for the execution of control processes and the arbitration of conflicts created about it, originated from different interests between the Conceding Power (the government), companies (work-for-hire) and consumers. The law that gave jurisdiction to Aneel (Lei 9.427/96) qualified its juridical nature as a special autarchy, which allows the institution to enjoy some kind of freedom, what releases Aneel from direct hierarchical subordination, however linked to the sector ministry in charge of the management. Alongside its attributions, it also defends the right for competition, establishing rules to prevent market concentration in an articulated manner with the Secretaria de DireitoEconômico (Secretary of Economic Rights) and the foreseeing of the establishment of contracts with state agencies (PIRES, 2000).

Aneel guides the R&D programs of power facilities that distribute electrical power by the means of the Manual 2008 (ANEEL,2008) Guidebook of the Technological Research and Development Program of the Electrical Power Sector. The contracts of concession constrain power facilities to invest in research and development in electrical sector. Today, the mandatory amount for R&D is 0.6% of the ROL – Liquid Operational Resources of the power facility - and after 2010 the percentage will be of 0.75% of ROL.

The Guideline (ANEEL, 2008) defines that "transformation of the results of research in technological innovation is the mainspring of the R&D Program controlled by ANEEL." However, even though each power facility can establish their own research areas according to their interests to guide their research projects, a set of themes and propositions is determined by Aneel, a restrictor side for ideas and initiatives, mainly because they are based on an objective and fragmented knowledge, particularly in natural sciences, where the knowledge of electric power sector is set, what exceptionally hinders the new point-of–views from social sciences and humanities for the understanding of subjective questions that are part of the theme. The change of conception woulbe the first step to an open innovation policy. It is necessary to stimulate the creation of a bottom-to-top system to oppose the actual one, in a triple helix with the other actors. On the other hand, Aneel's actions are increasingly important, because it can set itself as an actor-network for the instrumentalization of R&D&I (research, development and innovation) in the electrical power sector in Brazil, at least in R&D.

The Aneel had oriented the concessionaires, in its Manual of R&D, to basic research projects, applied research, prototypes, etc. and innovation projects, considering a linear process of innovation, but towards to traditional industry, not considering the option of firms (start up´s) incubated at universities to support the results of all the R&D projects into the concessionaires hands. Five years is a good time for a project (Aneel, 2008), but not for an

innovation process, five years more could be spent in incubators. General, as said Etzkowitz (2009) ten years seems to be the average.

- Enterprising University

The results here displayed refer to two projects in which the author has taken part in one of the power facilities which we, at first, called DISTRIBUTOR. The access to data from the research projects allowed us to understand the importance of R&D projects in this power facility. In 2009, two universities owned almost all projects in this power facility, one federal and other a private and confessional university (almost 50% each one). Both universities already had company incubators, but these incubators didn't have any participation in the projects of the power facility. The projects were carried by researchers from research groups, a characteristic of the first phase described by Etzkowitz (2009). The main characteristic of the participation of the researcher of the university was to finish his project accordingly to his objectives without intentions to work a process of innovation. The relations and objectives of the research project sometimes got distorted, since the managers of the project located at the DISTRIBUTOR power facility, in addition to coordinate their own daily affairs, received the coordination of the projects as an additional charge; this charge was passed on to other managers by section allocation of the managers in a high cycling. The main characteristic of the researches was the univalent knowledge. We must stress that the federal university has just accepted a governmental determination of implementing in each university an agency of innovation and this agency should help the researchers to defend its intellectual property rights, but didn´t do it. We could notice the contractual difficulty of joining supplying companies of the power sector in projects, particularly when the time of delimitating the coefficients of intellectual property that could result from the projects arose; in most cases, we noticed terms of full ownership by the power facility, both in basic and applied research. There wasn't any concern about property gain for the researchers and the projects and their coordinators didn't keep any information about potential demand for the results of researches. The possibility of innovation projects in the Aneel'sGuideline wasn't considered by the university researchers, who made it clear that it wasn't of their interest the process of market introduction or even the technological transfer to suppliers; they didn't have any abilities over this process. The majority of the projects were under the value that could be economically studied in its possibilities, as determined by Aneel, without technical economic evaluation studies.

- Company evolution

The evaluation of power facilities occurred during the settling of their R&D programs, considered the benchmarking created by this article. We must stress the difficulty of reaching research project database sent by the power facility to Aneel and by it managed during our research. The difficulty is based on the lack of efficient actions related to the transference of technology, among the different actors, in order to create value for the power facility. However, Felipe Pinto (2010) stresses the aspects of a possible approach between power facilities and suppliers in power sector. In his research, he evaluated a small amount of companies (13 out of 40), along micro, small, medium and big companies, and discovered interesting data for the elaboration and test of a methodology that aims to mark the companies that tend to participate in R&D&I. These data stress the concentration of such companies in the Southeast, since 77% of them knew the R&D program of Aneel and 50% of them had actually participated in one of the power facilities project call. They had also participated in union with universities (30%), and with Technological Institutes (24%). From the total amount, 50% participated in their own states, while 10% had already taken part in up to 3 research projects, but none of them had participated in innovation projects in power facilities – mainly developed applied research projects. Of the suppliers, 75% continuously developed efforts in R&D. Or they (50%) used own resources, or (50%) used public resources. 70% of them had their own research lab, and 40% a metrology lab. Only 35% of them had never developed any result in intellectual property, such as patent, brand, software registration, utility template and others.

The group of medium to big companies supplied equipments or services for the power sector for over than 7 years. Micro, small and medium companies searched for public support, and medium to big companies used their own resources. It is important to stress that companies that had results – as intellectual property - from R&D projects from Aneel are 65% of them. Micro, small and medium companies, dependent of public resources, seem to behave just like research companies that look for market, and the medium to big companies as market-oriented and look for research, but the methodology of our research would have to be changed to perceive the creation of spin-offs from companies or star-ups from universities, if they were incubated or established in tech parks, or even if they had already taken part in any of these situations. Finally, it would have to specify human resources to identify the experience of "double life" agents.

Why not adopt a corporative incubator, into the concessionaires, to develop the strategic results of research projects as a spin-off? This was a suggestion offered by Mello (2007).

5 Conclusion

The research we discussed here, a benchmarking, doesn't intend to be conclusive. It unites with other efforts to determine references for possible comparisons in R&D performance indicators. Its greatest contribution is to offer a suggestion of performance indicators for R&D Programs of power facilities and allow the managers of these programs to consider the data which are actually important or convenient to management. As references, they suit well as initial milestones that must allow repetition in their casual use and, with time, allow the creation of settings or even guide the possible interference over the dynamic of R&D programs in power facilities. In a broad brush way, they allow us to believe power facilities to have a huge amount of resources under their power; R&D structures are still being formed, given their size; considerable resources under the responsibility of few human resources; average value per project still low to oppose the uncertainty and complexity that are intrinsic to research projects.
There are so different interests among concessionaires, industry, universities and government.
The Government and its agency Aneel, should consider the incubation of the R&D results into the universities as manner to improve the electric sector innovation process.

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