

## A Study on the Public Perception in Nuclear Area in Brazil

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### ABSTRACT

During the course of the last years the need for the increase in the electric energy production in Brazil as well as in the rest of the world, has raised the tone of the debate about the environment impact of such production. As a result of these debates, both the several levels of government and some of the Non-Governmental Organizations (NGO's) have commissioned innumerable opinion researches aiming at measuring and evaluating the knowledge and perception of the public in relation of the best non-polluting energy sources. Prior to 2001 these researches would not make any sense in Brazil., however due to that year's drought, the competent authorities were faced with the necessity of developing a plan, the *Plano Nacional de Energia* (PNE2030) aiming, among others objectives, at finalizing the construction of the Angra 3 plant and implementing new nuclear plants in places still to be determined. Allowing for the complexity of the subject, this paper presents a field research conducted from 28th September 2010 to 28th October 2010 assessing the current level of perception of the Brazilian population about the nuclear area, in particular of the residents of three cities of Rio de Janeiro. As a result of this work, we suggest how the competent authorities should proceed to reach in an efficient manner a greater understanding of the population about the proposed subject, through communication campaigns being both informative and educational.

### 1. INTRODUCTION

Over the recent years much is discussed in Brazil over the need for construction of new power plants, in especial after 2001's failure in supply following a long period of drought, and also over the development of new nuclear technology in several areas, but do Brazilians know the real importance and why the authorities decided to reinstate the nuclear program? In order to answer this question and evaluate the acceptance of the public's perception on nuclear area and its popularization, some surveys were conducted considering different educational levels. [1, 2] However, unlike others researches, in the present one we included another questions (the questionnaire has a total of 11 questions) such as: which benefits the nuclear technology would bring for the people who used; if the population agree with the construction of a waste repository next their house; the degree of knowledge of respondents about the Plano Nacional de Energia (PNE2030); and which group would or would not have the credibility to

bring these discussion to the public. The sampling done by accessibility and was implemented from 09.28.2010 to 10.28.2010 in the cities of Rio de Janeiro, Niterói and São Gonçalo with 470 respondents who were stratified by gender, age and educational level. It is our expectation that this article contributes to the improvement of the authorities' plans regarding their communication with the general public.

## 2. METHODOLOGY

In order to demonstrate the inadequacies of the government's communication plans in the nuclear area (in particular the PNE 2030) an exploratory survey was developed because as it uses large samples it would ensure that greater accuracy in the results were achieved. We chose this method as the most appropriate because, as stated by Gil (1987), "exploratory researches are developed in order to provide us with an overview of the approximate kind, about a certain fact." And also because its "main purpose is to develop, clarify and modify concepts and ideas, in order to formulate more precise problems or searchable hypotheses for further studies." [3]

### 2.1. Sampling

As noted above, the sampling was done by accessibility and was implemented from 09.28.2010 to 10.28.2010 in the cities of Rio de Janeiro, Niterói and São Gonçalo with 470 respondents who were stratified by gender, age and educational level.

### 2.2. Research questionnaires

To minimize the possibility of there being tendentious research questions were developed and distributed in two different forms: firstly the questions were arranged in a structured questionnaire using the tool of *google docs*. The link to the questionnaire with a brief explanation of what it represented was sent by e-mail to several groups of people. Secondly, results from direct interviews made by me on this subject. It should be recalled that in either methods it was avoided the most to explain what it was and it was the questions sought to do so with different people in different places with different ages.

### 2.3. Treatment techniques

The responses were statistically analyzed by SPSS 17 (*Statistical Package for Social Sciences for Windows*). This program allows the performance of complex calculations and it display results in a simple and self explanatory way.

### 2.4. Questionnaire structure

The structured questionnaire has a set of 11 questions ranging from dichotomous to the order of preference, as follows:

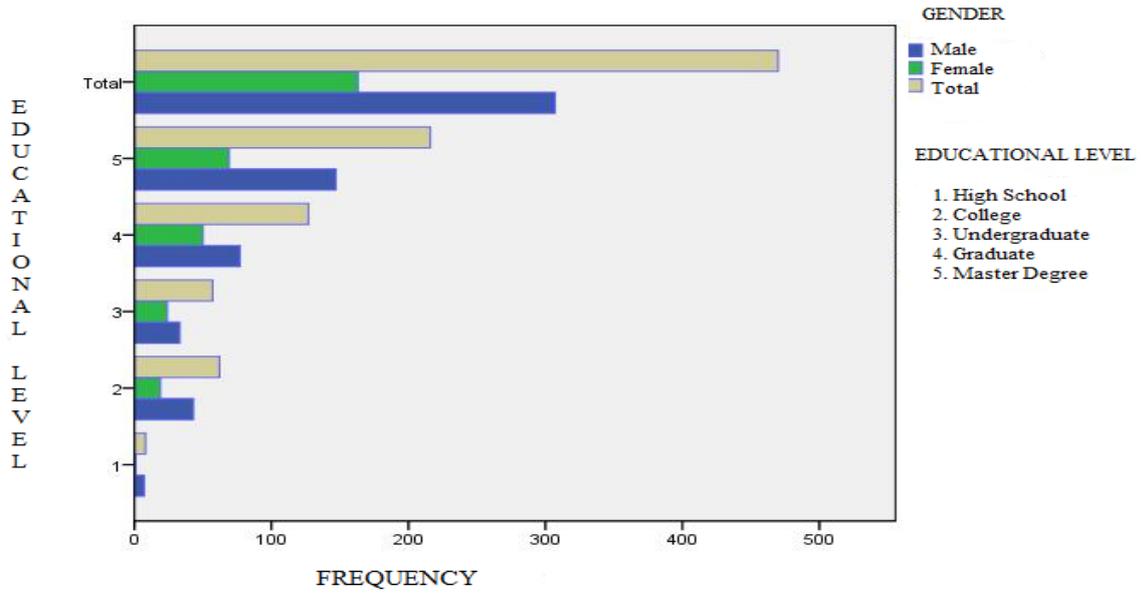
- The first three questions were designed to record the gender, age and educational level of respondents.
- The fourth question: verifying knowledge on the part of respondents on the radiation identification symbol.
- The fifth: verifying knowledge and concern about the political issues surrounding the nuclear theme in Brazil and worldwide.
- Question number 6: investigates, quantitatively, the three sources of power that people believe will be most used in the next 20 years.
- Questions 7, 8 and 9: seek to identify the degree of acceptance/rejection of the population to produce nuclear energy and its waste in Brazil.
- Question 10: verifies that the Brazilian population is aware of the energy plans that the government hopes to develop by the year 2030.
- Question 11: seeks to identify the agents of communication that are more likely to disclose the nuclear issue.

### 3. RESULTS

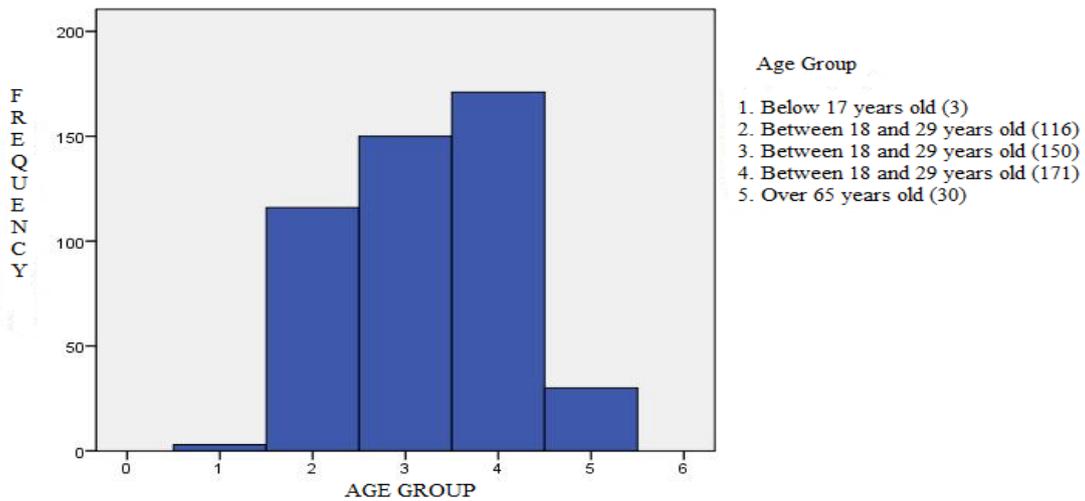
The figures and tables below show the results in both percentage and frequency obtained in the exploratory research developed, keeping in mind perceptions regarding nuclear energy. During the analysis of variables there was a slight predominance of male viewers (65.3%), people with graduate degrees (216 respondents) and aged above 30 (351 respondents), as seen in Table 1 and Figures 1 and 2.

**Table 1. Frequency and percentage of survey respondents.**

Gender	Frequency	Percentage
Male	307	65,3
Female	163	34,7
TOTAL	470	100



**Fig. 1. Histogram frequency X educational level**



**Fig. 2. Histogram frequency X age group**

It was also observed that almost 20% of respondents, i.e. 92 persons, are not familiar with the symbol that indicates the presence of radiation (Figure 3).



**Fig. 3. Respondents answers about the symbol that indicates the presence of radiation**

The fifth question verifying the knowledge and the concern about the political issues surrounding the nuclear theme in Brazil and worldwide

**Table 2: Knowledge about the ratification of the Nuclear Non-Proliferation Treaty**

Educational Level	Do you know about the ratification of the Nuclear Non-Proliferation Treaty?		Total
	YES	NO	
High School	0	8	8
College	20	42	62
Undergraduate	28	29	57
Graduate	75	52	127
Master Degree	164	52	216
<b>TOTAL</b>	<b>287</b>	<b>183</b>	<b>470</b>

The next question analyzed, according to the respondent's opinion, which three energy sources would be the most used in Brazil in twenty years time. The results are shown in the table below.

**Table 3. Position of respondents on the three sources of energy that will be used the most in 20 years.**

Energy sources	Number of times that was chosen	Percentage
Hydroelectric	345	73,4
Solar	263	56,0
Nuclear	254	54,1
Wind	228	48,5
Coal, oil and gas	118	25,1
Biomass	91	19,4

Despite table 3 showing that 254 persons have chosen nuclear power as one of the three most used in Brazil in twenty years, 15% of respondents are against the construction of a nuclear waste deposit and about 30% claim to be against this type of installation anywhere in the world (question number 8).

It was also measured the degree of knowledge of the people about the advantages, or disadvantages, of nuclear energy and which benefits nuclear power could bring to human kind. We should bear in mind that in this item the alternatives gave several advantages to this power source and only the last alternative mentioned that this power source would not bring any advantage. The result can be seen in the following table.

**Table 4. Opinion of respondents when asked if the nuclear energy brings some advantages or not**

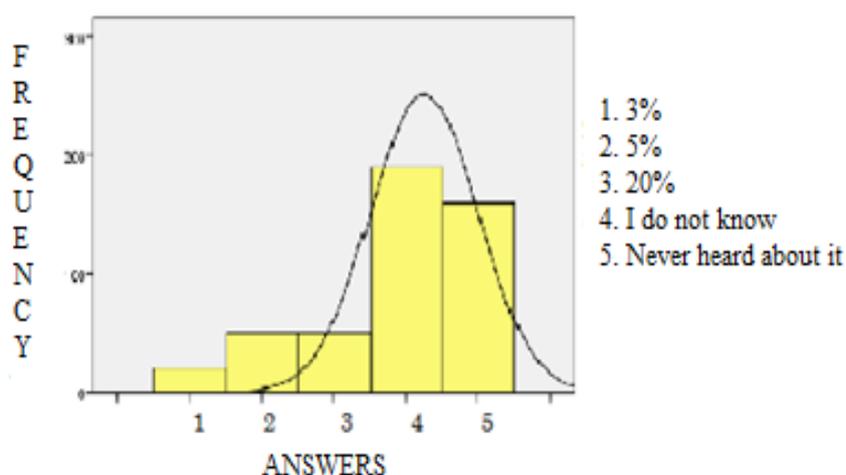
Alternatives	Number of times that was chosen	Percentage
Food preservation	105	22
Sterilization of medical articles	127	27
Renewable energy source	248	52,8
Automatic control of industrial processes	82	17,4
Diagnostic and therapy of diseases	307	65,4
Preservation of arts and crafts	48	10,1

Autonomy of the country in relation to electricity power	255	54,2
Would not bring advantages	36	7,7

To investigate if the resident population living in the cities where the research was conducted are aware of energy plans that the government hopes to develop by 2030 in the nuclear area, they were asked about what was the expected percentage increase on the overall nuclear energy production (2.9 %). The results can be seen in the table and later in the histogram below.

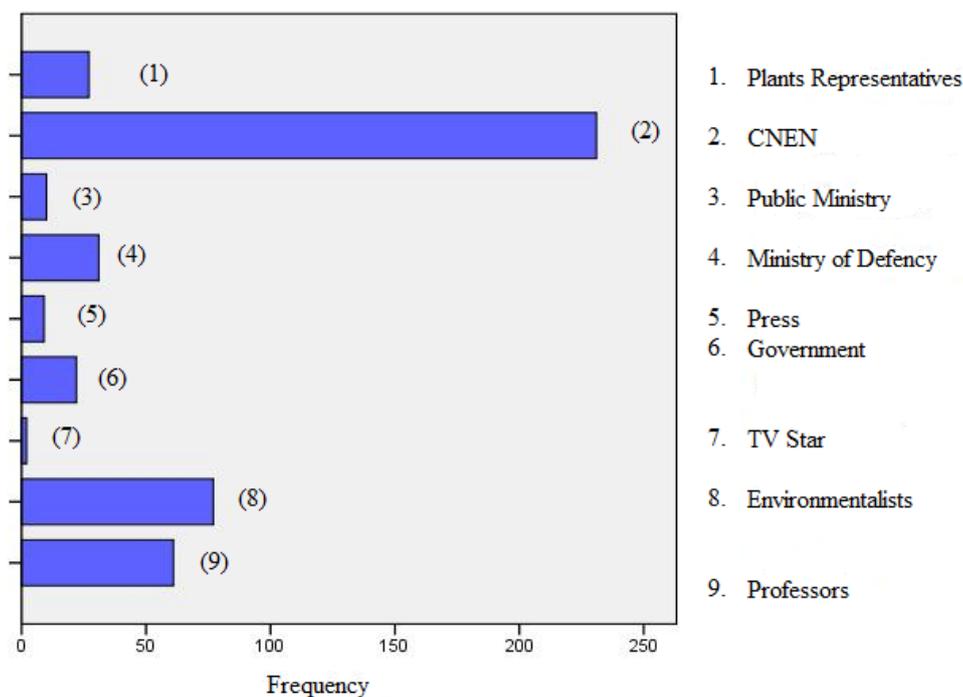
**Table 5. Degree of knowledge of respondents about the Plano Nacional de Energia (PNE2030)**

What will be the increase in energy with the PNE 2030?	Frequency	Percentage
3%	20	4,3
5%	50	10,6
20%	50	10,6
I do not know	190	40,4
Never heard about it	160	34,0
TOTAL	470	100



**Fig. 4. Histogram of the knowledge of respondents about the PNE 2030**

At the questionnaire final part it was sought to verify the credibility of some institutions and/or groups of people who supposedly understand or were involved in the development or dissemination of nuclear energy. The nuclear energy regulatory body, *CNEN (National Nuclear Energy Commission)*, was appointed as the most credible institution to talk about the safety of nuclear power plants with 49% of the votes, as seen in the figure below.



**Fig. 5. Histogram of the groups or institutions that have credibility to talk about nuclear power plant security**

#### 4. CONCLUSION

The survey results, which are presented in figures and tables 1 to 5, reveals that although most respondents were students and workers, 40.4% did not know and 34% had never heard of the *Plano Nacional de Energia (PNE 2030)*. While 15% of respondents are against the construction of a waste deposit in Brazil, 30% claim to be against this facility anywhere in the world. However, to 254 respondents nuclear energy will be one of the three most used energy sources in Brazil in 20 years, second only to hydroelectric and solar. It is regrettable that 20% of respondents are still unfamiliar with the symbol indicating the presence of radiation since this lack of knowledge can lead to serious accidents, as occurred in Goiania in 1987. The nuclear regulator, CNEN, is seen by 49% of respondents as the body that has credibility to talk about the safety of nuclear power plants. These results prove the need to implement communication plans with clear and concise goals for different segments of the society since the level of understanding differs according to each segment.

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