NUCLEAR ENERGY IN SPAIN: IMAGE AND KNOWLEDGE OF STAKEHOLDERS

LA ENERGÍA NUCLEAR EN ESPAÑA: IMAGEN Y CONOCIMIENTO DE LOS GRUPOS DE INTERÉS

JOSÉ MANUEL MARTÍN-HERRERO
Universidad Alfonso X el Sabio
jm.martinherrero@outlook.com

Summary

Introduction: Spain is a country with a strong energy dependence. In recent years, in an attempt to alleviate this dependence, policies related to renewable energies have been favored, but those that promoted traditional methods of electricity production, such as hydroelectric or nuclear power, have been left aside. Moreover, nuclear energy has not had a positive image among stakeholders. Methodology: This qualitative and quantitative research aims to determine the knowledge that stakeholders have about nuclear energy and what would be the causes that enhance that image. To determine them, and based on the Critical Accident method, a survey is carried out in which the participants select the reasons that condition that image. Results: In general, stakeholders do not have much knowledge about nuclear energy. Although one of the reasons that generates a bad image is nuclear accidents, most of the respondents only know about two of them. Conclusions: More than half of the respondents give a positive opinion of nuclear energy, between 4 and 5 out of 5, finally obtaining an overall score of 3.22 out of 5. In addition to nuclear accidents, there are other factors that contribute to this negative image, such as lack of knowledge, lack of information or the image projected by television.

Key words: nuclear accident, energy, nuclear power, stakeholders, image, reputation.

Resumen

España es un país que tienen una fuerte dependencia energética. En los últimos años, para intentar paliar esa dependencia, se han favorecido las políticas relativas a las energías renovables, pero se han dejado de lado aquellas que potenciaban los métodos tradicionales de producción eléctrica, como la hidroeléctrica o la nuclear. La energía nuclear además no ha tenido una imagen positiva por parte de los grupos de interés. Metodología: Con esta investigación cualitativa y cuantitativa se pretende conocer el conocimiento que los grupos de interés tienen sobre la energía nuclear y cuáles serían las causas que potencian esa imagen. Para determinarlas, y a partir del método del Accidente Crítico, se lleva a cabo una encuesta en la que los participantes seleccionan los motivos que condicionan esa imagen. Resultados: En general, los grupos de interés no tienen mucho conocimiento sobre la energía nuclear. Aunque uno de los motivos por los que genera una mala imagen son los accidentes nucleares, la mayoría de los encuestados solo conoce dos de ellos. Conclusiones: Más de la mitad de los encuestados da una opinión positiva de la energía nuclear, entre 4 y 5 sobre 5, obteniendo finalmente una nota global del 3,22 sobre 5. Se comprueba que además de los accidentes nucleares hay otros factores que contribuyen a esa imagen negativa, como el desconocimiento, la falta de información o la imagen proyectada por la televisión.

Palabras clave: accidente nuclear, energía, energía nuclear, grupos de interés, imagen.

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1. Introduction

Historically, Spain's energy situation has been that of a country with a high dependence on foreign energy. This is due, above all, to the scarcity of internal resources to produce the energy necessary to supply the total population. It is also due to the use that has been made of oil. It is an energy model that has been implemented in the European Union and that in the future could cause a serious situation of instability if it is not oriented towards efficiency in consumption and production.

As recognized in the Vision Document for Energy Efficiency in Spain, published by the Ministry of Science and Innovation in 2009:

> The current development model that predominates in our society, of continuous growth and based on energy consumption, cannot be sustained indefinitely. The progressive depletion of fossil fuels, the concentration of fossil reserves in politically unstable geographical areas, the lack of short-term alternatives, the strong growth of GHG emissions[1] and an increase in international fossil fuel prices and volatility make it necessary to change course towards a new model based on sustainable development.

This is a sustainable and necessary development to address Spain's dependence percentage, which less than a decade ago exceeded 80% of the energy[2] used. Although there has been a significant drop in Spain's dependence in recent years, it is still above 70%.

Before beginning the study of the evolution of nuclear energy production in Spain, it is interesting to consider the concept of nuclear energy. According to the Royal Spanish Academy, nuclear energy is: "That obtained from the fusion or fission of atomic nuclei". The Spanish Nuclear Industry Forum defines it as follows: "Energy contained in the nuclei of atoms, which is released in a nuclear reaction, such as fission, fusion or radioactive disintegration". The Nuclear Industry Forum (2007) gives a more complex definition:

1 Greenhouse Gas Emissions, those gas emissions that when in the atmosphere cause the so-called greenhouse effect.

2 The energy consumed in Spain comes from coal; oil; natural gas; nuclear energy; hydroelectric energy; wind, solar and geothermal energy; biomass, biofuels and renewable waste; and non-renewable waste. Source: The Energy Book 2013.

Energy generated in a nuclear power plant; this is a thermal power plant in which a nuclear reactor acts as a boiler. Thermal energy originates from nuclear fission reactions in nuclear fuel consisting of a uranium compound.

The nuclear fuel is contained inside a hermetically sealed vessel. The heat generated in the reactor fuel and then transferred to a coolant is used to produce steam, which travels to the turbine, where its energy is converted into electrical energy in the alternator.

As usually happens at the dawn of any discovery, nuclear energy became the most promising and active field in the scientific context. Its research received great financial support from the states involved (Sanchez, 2010).

2. Problem definition and state of the art

2.1 Nuclear energy in Spain

In Spain, nuclear energy could not begin to be developed until the forties of the twentieth century, after the years of the Spanish Civil War and once the dictatorship of General Franco had been established. In addition, we must take into account the repercussions of the atomic bombs dropped on the Japanese cities of Hiroshima and Nagasaki in the press at the time.

It was in 1945, as recognized by the Spanish Nuclear Industry Forum, when the Government reserved to the State the power to carry out the exploitation of uranium deposits, declaring them to be of National Interest[3].

In 1946, commissions on nuclear issues were created at the Centro Superior de Investigaciones Científicas (CSIC) and at the Instituto Geológico y Minero (Geological and Mining Institute). “These were the years in which the group that led first the Atomic Research Board (JIA) and later the Nuclear Energy Board (JEN), a state body created to direct nuclear development and policies in Spain, was beginning to take shape” (Romero de Pablos, 2012).

During the following years, several research projects were developed in this area, which were made possible by the acquisition of reactors for testing. The acquisition of the first reactor, JEN 1, was made possible by the bilateral agreement signed by Spain and the United States[4] and included three topics on which to exchange information: the design, construction and operation of research reactors; health and safety problems related to the operation and use of reactors; and the use of radioactive isotopes in physical and biological research, medical therapeutics, and agriculture and industry.

3 Source: Nuclear Industry Forum in Spain. Available at: http://www.foronuclear.org/es/el-experto- te-cuenta/el-desarrollo-del- programa-nuclear-espanol. Accessed 15.04.2015.

4 Signed on July 19, 1955 in Washington. Spain was represented at the signing by the Spanish Ambassador, José María de Areilza; the United States was represented by the Assistant Secretary of State for European Affairs, Walworth Barbour; and the Chairman of the U.S. Atomic Energy Commission, Lewis L. Strauss.

Leaving behind a period in which several tests and new research reactor acquisitions were carried out, it was in 1965 when the first project to build a nuclear power plant in Spain was initiated and which would conclude three years later, with the connection to the electrical grid of the José Cabrera plant, also known as Zorita, on July 17, 1968.

That project marked the beginning of the production of energy through nuclear reactors. A total of 25 nuclear power plants were planned in Spain, although many of them fell by the wayside without being built. The most significant case was that of Lemónitz[5] in the Basque Country.

There are currently seven nuclear reactors in Spain, producing energy at five sites. The following graph shows the path of the nuclear power plants, in which it should be noted that the dates of authorization are those on which the Administration permits construction and, likewise, the date of start-up, although they do not necessarily coincide with the start of construction or with the coupling to the electricity grid:

Table 1. Nuclear power plants in Spain

Name	Province	Year of construction	Authorization
José Cabrera	Guadalajara	6 / July / 1965	17 / July / 1968
Sta. M. de Garoña	Burgos	May 2 / May / 1966	30 / October / 1970
Vandellós I	Tarragona	1967	March 6 / March / 1972
Almaraz I and II	Cáceres	2 / July / 1973	10 / March / 1980
Ascó I and II	Tarragona	16 / May /1974	22 / July /1982

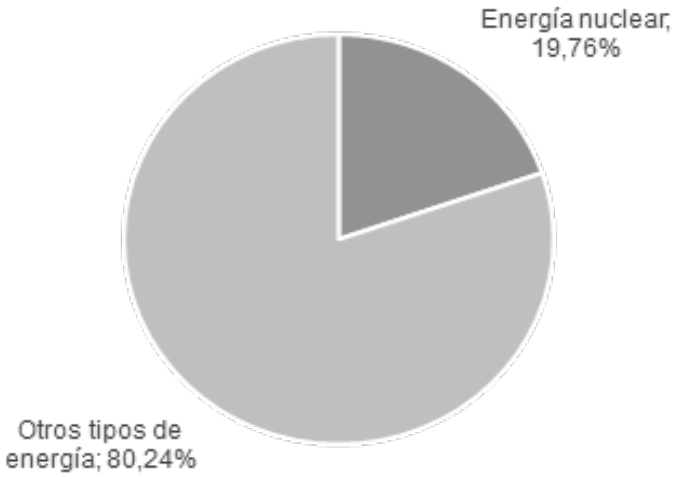
At this point, it should also be noted that not all nuclear power plants operate in the same way, as this depends on the type of reactor installed.

Currently, there are two types of reactors in Spain. On the one hand, the PWR (Pressurized Water Reactor), which has a pressurized water system and uses water as a coolant and neutron moderator. And the BWR (Boiling Water Reactor), designed by the General Electric Company in the 1950s, is a light water reactor, in which common water is used as coolant and moderator, which reaches boiling point in the core, whose water vapor will reach the turbine, which will drive the electric generator. Of the seven reactors currently in operation, only the one located at Cofrentes uses this last type of boiling water reactor.

5 The works at the Lemóniz nuclear power plant were stopped on March 28th 1984 due to a nuclear moratorium. Up to that moment, the terrorist group ETA had perpetrated several attacks calling for its stoppage, which resulted in the death of five people. Source: http://www.20minutos.es/ noticia/2225330/0/central-nuclear-lemoniz/paralizacion-obras/30-anos/. Accessed 15.05.2015.

Finally, and in order to know the real contribution of the energy generated in nuclear plants compared to other types, the following figure is interesting:

Figure 1. Percentage of nuclear energy with respect to the total produced in Spain.
Source: Own elaboration based on data from the Spanish Nuclear Industry Forum.



Entities in charge of ensuring the safety of nuclear energy production in Spain

In the years in which nuclear energy was discovered, there was great interest in its research and use. This interest, with the passage of time, has been declining until the present time, where about half of the population is against its use, as we will see below. As Muñoz Martínez (2012) recognizes, the production of electricity from nuclear energy provokes a debate that does not leave indifferent.

In this social debate on their use, there is an issue that takes center stage: the safety of plants with respect to citizens. For Muñoz Martínez (2012), the concept implies an aspect that is not, and should not be under any circumstances, negotiable, and that is safety.

In view of the above, it is necessary, at this point, to go deeper into two basic institutions as regards safety: the Nuclear Safety Council and the General Directorate for Civil Protection and Emergencies.

2.2.1 The Nuclear Safety Council

In Spain, as we have seen above, the nuclear industry began to develop and take off with the José Cabrera nuclear power plant at the end of the 1960s. However, it was not until the beginning of the 1980s that the Nuclear Safety Council (CSN) was created.

The CSN was established as the first regulatory institution for technological risks in our country. Moreover, it is independent from the Public Administration, and is only accountable to Parliament (Muñoz, 2012).

The institution was created by Law 15/1980, of April 22nd , 1980, on the Creation of the Nuclear Safety Council, amended by Law 33/2007, of November 7th , 2007. With this last modification, mechanisms for improvement were included in two fundamental aspects: the independence of the Council itself and transparency in terms of information and communication.

The following are the functions attributed to the CSN, as set out in the regulations:

- Monitor the environment: to maintain the radiological quality of the environment.
- It grants personnel licenses: it grants authorizations for workers to access the facilities. It supervises training courses, and checks the level of knowledge of those aspiring to become reactor operators.
- Reports on facility projects: the CSN is responsible for preparing reports to determine the suitability of new facility projects.
- Controls the operation of the facilities: by means of a strict control and surveillance program. At each nuclear power plant there is a CSN group that constantly evaluates both the development and the safety measures at the facility itself.
- Acts in case of emergencies: providing technical support.
- Controls workers' doses: workers have their own cards detailing their radioactivity dose, thus ensuring that the limits are not exceeded.
- UnderConducts and promotes research plans: the CSN has its own R&D&I plan.
- It informs the public opinion and the Cortes: the Congress and the Senate oversee and control the Council.
- Maintains relations with other international organizations.
- Proposes regulations and standards: with regard to safety and radiation protection, it can propose to the government that specific regulations be adopted and implemented.

2.2.2 The General Directorate of Civil Protection and Emergencies

The General Directorate of Civil Protection and Emergencies, which reports to the Ministry of the Interior, is the other institution that has a direct relationship with safety, although in this case its field of action is outside the production plants, to ensure the safety of citizens who may be affected by a nuclear accident.

The specific functions of the General Directorate are established in Royal Decree 1181/2008, of July 11, 2008, which modifies and develops the basic organic structure of the Ministry of the Interior, previously regulated by Law 2/1985, of January 21,1985[6].

Nuclear power plants require special attention, a focus that must be placed on possible nuclear accidents, since these can cause serious situations of collective risks and catastrophes. For this reason, the facilities and the public authorities are obliged to have emergency plans.

There are, therefore, two types of emergency plans. The Site Emergency Plans, which are those governing the operation inside the nuclear power plant in the event of a nuclear emergency; and the Site Emergency Plans (PEN), the design and preparation of which is the responsibility of the Directorate General.

The latter establish the procedures to be carried out in the event of a nuclear emergency in each of the five nuclear areas. Currently, there are five PENs:

- PENGUA: Emergency Plan Outside the José Cabrera and Trillo Nuclear Power Plants (Guadalajara).
- PENTA: Emergency Plan Outside the Ascó and Vandellós Nuclear Power Plants (Tarragona).
- PENBU: Off-site Emergency Plan for the Santa María de Garoña Nuclear Power Plant (Burgos).
- PENVA: Emergency Plan Outside the Cofrentes Nuclear Power Plant (Valencia).
- PENCA: Emergency Plan Outside the Almaraz Nuclear Power Plant (Cáceres).

There is also a Central Level Nuclear Emergency Response and Support Plan, approved by Order INT/1965/2005, of May 27th , the objective of which is materialized in Article 2[7]:

6 Source: http://www.proteccioncivil.es/web/dgpcye/funciones. Accessed 22.04.2015.

7 Source: http://www.boe.es/diario_boe/txt.php?id=BOE-A-2005-9607. Accessed 23.04.2015.

The objective of the Nuclear Emergency Plan for the Central Response and Support Level (PENCRA) is to establish the mechanisms for coordinated action to carry out the functions of the Central Response and Support Level organization in accordance with the provisions of Title III, section 2 of the Basic Nuclear Emergency Plan.

Although the Nuclear Emergency Plan of the Central Response and Support Level focuses on the actions for response in the event of a nuclear emergency, Annex I also includes the main criteria for the development of activities for the implementation and maintenance of the effectiveness of this plan.

2.2.3 Spain's nuclear industry

Traditionally, when we speak of "nuclear facilities", the popular imagination resorts to nuclear power plants. But there are other types of facilities where activities are carried out that are not directly aimed at obtaining energy.

As recognized in the 2013 Annual Report of the Spanish Nuclear Industry Forum, a large number of Spanish companies have focused their activity on the nuclear sector, basing their experience on the development of the Spanish nuclear program since its inception and creating a competitive industry.

Two facilities should be mentioned here: the Juzbado Fuel Elements factory, which since it began operating in 1985, has produced a total of 6,388 tons of uranium as of 2013, which has been supplied to the nuclear power plants for their operation. In addition, the Low and Medium Level Waste Storage Center at El Cabril, which received a total of 769.64 m3 of waste during 2013.

It is essential at this point, and once the above facilities have been described, to delimit the field of study, which in this research will focus exclusively on nuclear power plants as electricity producing industries.

3. Hypothesis and research objectives

Society in general has a negative concept of industries that produce energy through fuels such as uranium. Historically, this bad image has been justified by nuclear accidents in plants such as Chernobyl or, more recently, in the Fukushima Daiichi plant after the earthquake and subsequent tsunami in Japan on March 11, 2011.

In order to carry out this research, we start from the hypothesis that the reasons that have led to and established a bad image of nuclear energy in Spanish society, in addition to the accidents that have occurred throughout history, are of another nature: such as the lack of information, or the biased communication that has been given from certain television programs about the social reality of the municipalities located in areas of influence of nuclear power plants in Spain.

What, then, are the main causes that have fostered and favored this bad image? What can the companies that own nuclear power plants do to reverse this situation?

The basis is based on knowing the causes of the negative image and its reputation, and on seeking the necessary communication mechanisms and actions so that the companies that produce energy with nuclear fuels can face these causes in the best way possible. The following objectives are to be achieved through the investigation of the issue:

- To know the causes that condition society's negative image of nuclear energy.
- To deepen stakeholders' knowledge of nuclear energy.
- Validate whether these other motives have a real basis or are built on the imaginary.

4. Research methodology

Taking into account the complexity of the subject, and the ineffectiveness that the use of techniques closer to the empirical verification of scientific disciplines would imply, I have resorted to the method known as Critical Accident to obtain qualitative information.

According to its inventor, John C. Flanagan (1954), the Critical Incident Technique (TIC) is:

> A set of procedures for collecting direct observations of human behavior in such a way as to facilitate their potential usefulness in solving practical problems and developing broad psychological principles.
>
> It does not consist of a single rigid set of rules that direct or control such data collection. Rather, it should be viewed as a flexible set of principles that must be modified and adapted to suit the specific situation at hand.

Based on direct empirical observation of human behavior with respect to nuclear energy in Spain, the following would be the causes that have led to the negative image we have been talking about since the beginning of this paper:

- Accidents that have occurred throughout history.
- The possible endangerment to which citizens are subjected by their use.
- The pollution it causes and the subsequent problem of what to do with nuclear waste (it uses polluting methods).
- The excessive cost of electricity.
- The lack of information on the matter and the opacity in its treatment.

- Television programs have portrayed a negative reality in nuclear-influenced populations.
- Lack of knowledge about what to do in the event of a nuclear accident.
- Revolving doors between the Public Administrations and the companies that own nuclear power plants.
- Tensions between the different governments (national, regional, national, regional and
- and the production plants themselves.
- The benefits are only felt in the surrounding villages, not in society as a whole.
- Legal issues related to tax domiciles and payment of taxes.

The above issues are of different importance; some of them also affect electricity as a whole, such as revolving doors or consumers' perception of the excessive cost of electricity, as we will develop further below.

Once each of the possible causes of the bad image of nuclear energy among Spanish citizens has been analyzed, it is necessary to specify the real importance of each one of them, and to get closer to the reality of these data, to investigate which ones have more influence and if there is any unimportant one in the generation of this social imaginary. In order to obtain these data, we resorted to one of the most widely used quantitative research methods: the survey.

In order to carry out this quantitative research, a survey structured in 39 questions was proposed, including several multiple choice, short essay and reflection questions. In addition, the survey focused on the reasons that the 11 causes mentioned above would have for the respondents. In this sense, questions have been added to verify whether these causes are considered real or just chosen at random.

At first, a total of 100 surveys were answered, of which 75 were finally taken to establish this quantitative research, once some of them had been purified, eliminating the repeated ones, and those that showed a clear and intentional inconsistency in some of their answers.

5. Results

In the survey, citizens are asked to designate the main causes of the negative image, giving as an option the 11 that have been determined in the qualitative analysis; and they can choose up to a maximum of 7 causes.

To process the data, one point was given to each of the causes proposed by the respondents, the total number of which was given 100% of the score and, from this percentage, the value of each of the different causes proposed was determined. It should be added that in

addition to the proposed causes, a space has been provided in which the participants in the study were able to determine another unspecified cause[8].

A total of 264 opinions were collected on the causes, which translate into an equal number of points. Although each participant could choose up to 7 causes, which would have translated into 7 points to be distributed among the selected causes, not all respondents believed, and therefore selected, that total number. Let us see below the final results, and the percentage obtained:

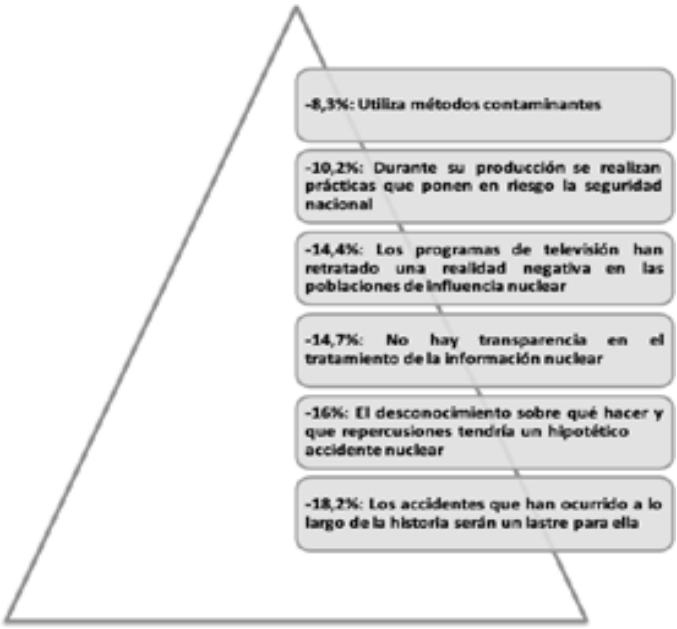
Table 2. Analysis of causes

Cause	Percentage
The accidents that have occurred throughout history will be a burden for her.	18,20%
Lack of knowledge about what to do and what the repercussions of a hypothetical nuclear accident would be	16%
There is no transparency in the treatment of nuclear information.	14,70%
Television programs have portrayed a negative reality in nuclear-influenced populations.	14,40%
During its production, practices that jeopardize national security are carried out	10,20%
Uses polluting methods	8,30%
Revolving doors between the public administration and companies owning nuclear power plants	6,40%
The excessive cost of the electricity bill	5,40%
Tensions between the different governments (national, autonomous, or local) and the plants themselves	2,60%
Only the surrounding villages benefit and the risk is assumed by the State.	2,50%
Legal issues related to tax domiciles and tax payments	2,30%

8 Only one respondent gave an alternative answer, indicating “Waste treatment”, which was not considered as a different answer since it was considered to be included in “Uses polluting methods”.

With the data obtained, and setting the barrier of 20 points, 8.30%, to consider that the cause has a real impact on the creation of a negative image of nuclear energy among the citizens of Spain, we can determine that the main causes of the same would be:

Figure 2: Main quantitative causes of negative image.
Source: Own elaboration



Having identified the main causes identified by the respondents, we will analyze their interrelation with other data obtained.

5.1 Knowledge of nuclear accidents

As we have seen, accidents would be the basis of the negative image. However, we wanted to investigate this further in the research, especially with regard to the knowledge that the people surveyed have of them and to elucidate what percentage of them know more about accidents than those that occurred at the Chernobyl and Fukushima plants.

The research shows that only two accidents, Chernobyl and Fukushima, are known to almost all of the respondents. In addition, 18% are aware of the accident at Three Mile Island (USA).

Percentage-wise, we can highlight that 60% of those surveyed only know of two events. A 39.33% would know three events. While 4% know 4 and 5 events, respectively. The totality of the proposed events are known only by 1.33%, the same percentage of respondents who know only one accident.

5.2 Knowledge of nuclear power plants and energy

Continuing with the causes, in second and third position are those that refer to the lack of knowledge about what to do in the event of a nuclear accident, and the lack of transparency in information. Both are related to the flow of information between the companies that own nuclear plants, the Public Administration and the public. The following cause is also related to communication: the negative image that some television programs and certain informative treatments of the populations of nuclear influence.

Firstly, it is interesting to know what percentage of respondents have visited a nuclear facility and whether respondents know the number of nuclear power plants in Spain:

Among the respondents, only 27 people, 36% of the total, have physically visited a nuclear facility, compared to 48 who have never visited one, 64%.

Those who have physically visited the nuclear facilities were asked whether these visits were not linked to the performance of any type of work inside the plant, and whether they evaluated the information obtained positively or negatively, whether sufficient information was provided and whether energy production and safety measures were clearly explained.

A total of 15 visitors indicated that their visit was for reasons not related to work and 9 rated the information received positively compared to 6; 60% therefore consider that the information received explains the plant's operation and safety measures correctly.

Asked about the total number of plants currently operating in Spain, only 15 people gave the correct answer: 5 nuclear power plants. Only 20% know the actual current situation. However, the answers for 6 plants are also high, a total of 16 respondents. This was the correct answer before the shutdown of the Santa María de Garoña plant. It should be noted that also a high number of respondents, 9, answered that there are 7, which although it does not correspond to the number of plants, it is the number of reactors that produce energy.

Next, and thirdly, let's look at how respondents interrelate with different electronic resources and web pages on nuclear content:

The research also explored in depth how the different audiences of interest interrelate with electronic resources and web pages that include and disseminate nuclear content. The data on non-access are higher in both cases, both in the last month and in the last year, although greater access is shown during the last year, reaching a percentage of 40% of those interviewed, compared to 60% who did not access this type of resources; a percentage that rises to 76% in the last month.

The second most important cause of this negative image, with 16%, is the lack of knowledge of what to do in the event of a nuclear accident. Therefore, and in fourth place, we studied the respondents' knowledge of the functions performed by organizations such as the CSN and the General Directorate of Civil Protection and Emergencies.

Among those interviewed, it is noteworthy that 62.66%, or 15.47 people, acknowledge not knowing the functions of the Nuclear Safety Council and the General Directorate of Civil Protection and Emergencies, compared to a total of 16, among those who acknowledge knowing the functions and those who also add some of them. A 12% of those interviewed know how they work and give their arguments, although these are wrong.

Finally, we analyzed the data obtained with respect to the position that the interviewees take generically towards nuclear energy; according to a score between 1 and 5, with 1 being the lowest and 5 the highest:

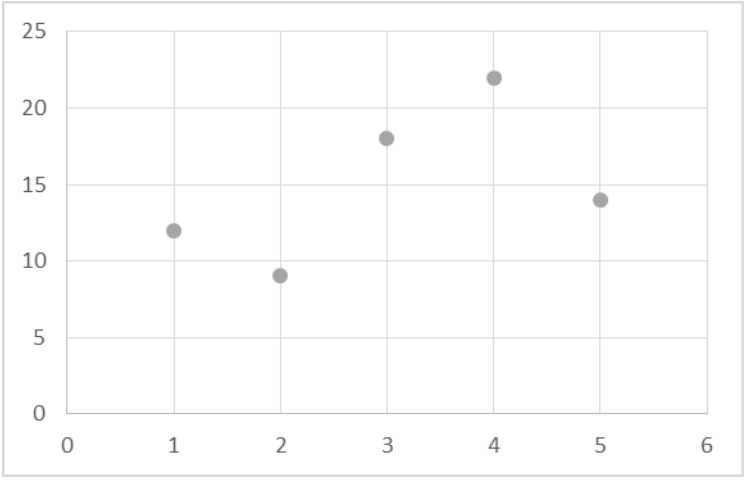


Figure 3: Assessment of nuclear energy by interviewees. Source: Own elaboration

Figure 3 shows the scores given by the 75 respondents. Almost half of the respondents, 48%, gave a positive score, 4 or 5. 24%, 18 respondents, gave a neutral score, 3. And finally, 28% gave a negative score, corresponding to scores 1 and 2.

If we leave aside the percentages, nuclear energy has an average score of 3.22 for the respondents, placing it with a minimal advantage in what would be a positive data.

6. Conclusions

At this point, we can say that the research has proven and corroborated the hypothesis planted at the beginning of this research: there are other issues, in addition to nuclear accidents, which affect the image and perception that Spanish citizens have of energy production in their nuclear power plants.

Through the investigation of qualitative data, following the Critical Accident method, it has been possible to determine the following causes as those that affect to a greater or lesser extent in the formation of this mental image:

- Accidents that have occurred throughout history.

  The possible endangerment to which citizens are subjected by their use.
- The pollution it causes and the subsequent problem of what to do with nuclear waste (it uses polluting methods).
- The excessive cost of electricity.
- The lack of information on the matter and the opacity in its treatment.
- Television programs have portrayed a negative reality in nuclear-influenced populations.
- Lack of knowledge about what to do in the event of a nuclear accident.
- Revolving doors between the Public Administrations and the companies that own nuclear power plants.
- Tensions between the different governments (national, regional and local) and the production plants themselves.
- The benefits are only felt in the surrounding villages, not in society as a whole.
- Legal issues related to tax domiciles and payment of taxes.

Through the cleaning of the data, and the application of the quantitative research method of the survey, the six main causes that would project negativity in the citizen during the configuration of his image would be, in order of importance:

- Accidents that have occurred throughout history.
- Lack of knowledge about what to do in the event of a nuclear accident.
- Television programs have portrayed a negative reality in nuclear-influenced populations.
- The lack of information on the matter and the opacity in its treatment.

- The possible endangerment to which citizens are subjected by their use.
- The pollution it causes and the subsequent problem of what to do with nuclear waste (it uses polluting methods).

In general terms, we could say that the issue is settled, since at this point the circumstances have been determined, but there are a series of aspects that have arisen in the investigation and that I believe are important to make clear:

- Nuclear accidents would be the main cause of this negative image. These have a direct impact on the perception of risk, which, as we analyzed in the theoretical framework, is a determining factor. In spite of this, Spanish citizens do not have a deep knowledge of the accidents that have occurred throughout history. Sixty percent of the people surveyed in this research only know about two events: Chernobyl and Fukushima. Bearing in mind that the accidents that are raised are those of major importance and that, therefore, according to the international INES scale, are considered accidents, it is striking that only 1.33% know about them in their entirety.
- Lack of information, information flow direction and access to information sources would be the second major cause, where we can group issues such as lack of information or lack of knowledge about what to do in case of an accident.

It is also suspicious that although these causes are mentioned, only 20% know the real number of operational nuclear power plants installed in the national territory; and that a slightly higher percentage, 21.33% select the valid option in the case of the Santa María de Garoña plant being in operation; from which we can extract that there is indeed a lack of knowledge about the current situation of the sector.

- A lack of knowledge of which citizens are aware, although they do not try to solve it, as has been seen in the interaction with web pages and electronic resources, whose percentage of access is much lower than that of non-access, both in the month prior to the survey and in the last year.

Finally, although nuclear energy arouses suspicions among the public, the general evaluation of nuclear energy obtains a score that would be within positive connotations, since it obtains a score of 3.22 points out of 5.

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