The International Journal of Engineering and Science (IJES)
|| Volume || 7 || Issue || 6 Ver. II || Pages || PP 31-37 || 2018 ||
ISSN (e): 2319 – 1813 ISSN (p): 23-19 – 1805

Nuclear Law And Service Life Of Nuclear Installations

Santiago A. Bello Paredes
Professor of Administrative Law
Universidad de Burgos, c/Hospital del Rey s/n, Burgos 09001, Spain
Corresponding Author: Santiago A. Bello Paredes

----------*ABSTRACT*----------
Supranational organizations in the field of nuclear energy, such as the IAEA and the NEA at a global level and EURATOM at a European level owe their existence to international treaties that regulate the operation of nuclear installations in the various member states that subscribe to these international organizations. These treaties have generated a common and binding regulatory framework that is similar in all countries. The 'Convention on Nuclear Safety', adopted on June 17, 1994, refers to the regulation of the different stages in the life of a nuclear installation, including the design, construction, operation and decommissioning phases, which are of special relevance to this article. The 'service life' of a nuclear installation will be defined in accordance with the safety, which will have to be studied and assessed by 'regulatory bodies' in each circumstance; without any reference to a statistical or a pre-set life span, nor to it being of a 40-year duration.
KEYWORDS: *Nuclear Law, Service Life, Nuclear Installations, Safety Nuclear, Regulatory Bodies, Fukushima.*
Biographical notes*: Santiago A. Bello Paredes graduated in Law at University of Valladolid in 1989, Doctor in Law at University of Burgos in 1997. She is specialist on the area of social, environmental and energy law and more specifically, on (i) the role of transparency and accountability on the implications of sustainable development to organizations; (ii) the role of atomic energy and (iii) evaluating environmental law.*
---------- ----------
Date of Submission: 06-06-2018 Date of acceptance: 21-06-2018
---------- ----------

I. INTRODUCTION

The Spanish Ministry of Industry, Energy and Commerce [*Ministerio de Industria, Energía y Comercio*] approved the Ministerial Order of 3rd July, 2009, which contains the decision adopted by this ministerial department on the immediate future of the 'Santa María de Garoña' nuclear installation in Spain. It gives July 6th, 2013, '*as the date on which the nuclear installation of Santa María de Garoña has its decommissioning'*.

I shall now centre on one particular aspect of this ministerial decision that refers to the content of the first point of its explanatory memorandum, which establishes that: '*the main components and structures of the Santa María de Garoña nuclear installation were designed under the hypothesis of a design life of 40 years. This appeared in the documentation that the company Nuclenor, SA, presented when it applied for and received authorization for its construction'*. This affirmation can be understood that the decommissioning of this nuclear installation is motivated by the course of this time period of 40 years.

In Spanish Law is no regulation in force that specifies an equal period for the 'design life' and the 'service life' of a nuclear installations; nor indeed that the extent of its 'service life' be precisely 40 years. All of which converts this time span of 40 years into an authentic 'myth'.

Also the Spanish regulatory body, the Nuclear Safety Council [*Consejo de Seguridad Nuclear or* CSN] has not certified this life span as specific to the 'service life' of nuclear installations, which is of enormous relevance as this organism has exclusive authority in Spanish law over competencies in matters concerning nuclear safety – art. 1.1 of the 'Nuclear Law 15/1980, of April 22nd, on the establishment of the Nuclear Safety Council' [*Ley 15/1980, de 22 de abril, de creación del Consejo de Seguridad*][1].

In fact, all Spanish nuclear installations, with the exception of the nuclear installation of Garoña, have the following history with regard to the start of their operations and compliance with the time span of 40 years:

Nuclear Installation	**Almaraz I**	**Almaraz II**	**Ascó I**	**Ascó II**	**Trillo**	**Cofrentes**	**VandellósII**
40-years	2020	2023	2022	2025	2027	2024	2027

(Source: author's compilation from data published in the Official State Gazette and the relevant Ministry responsible for issuing the operating licences for these nuclear installations.)

If we contextualize these figures in a global scenario it should be underlined that one of the major problems that is increasingly conspicuous in international nuclear law is the scenario for nuclear installations with an operational life of over 30 years or their '*Long Term Operation*' (LTO). And the fact is that, at the May 2018, of the 450 nuclear power plants operating in the world, 301 had been in operation for more than 30 years, and 98 for more than 40 years. The operational reactors by age are[2]:

Age [Years]	Number of Reactors	Total Net Electrical Capacity [MW]
49	6	2.477
48	3	2.234
47	7	3.690
46	8	5.202
45	11	8.311
44	18	12.771
43	10	7.621
42	14	10.920
41	10	7.754
40	11	10.226
39	5	4.620
38	19	14.846
37	21	18.705
36	16	14.076
35	19	14.783
34	32	31.074
33	32	31.922
32	24	24.607
31	21	21.464
30	14	13.885
29	11	10.386
28	10	10.702
27	4	3.688
26	6	4.806
25	9	9.080
24	5	4.347
23	4	3.320
22	6	7.030
21	3	3.627
20	4	3.080
19	4	2.768
18	6	3.207

Age [Years]	Number of Reactors	Total Net Electrical Capacity [MW]
17	3	2.740
16	6	5.206
15	2	1.675
14	5	4.785
13	4	3.662
12	2	1.480
11	3	1.842
10	0	0
9	2	1.068
8	5	3.775
7	7	4.013
6	3	3.012
5	4	4.054
4	5	4.673
3	10	9.505
2	10	9.622
1	4	3.373
0	2	2.122
Total	**450**	**393.836**

In conclusion, in line with economic and energy supply growth and environmental quality, a number of States have started to consider extended operation of their nuclear power plants beyond the time frame originally anticipated (LTO)[3].

II. THE REGULATORY LEGAL FRAMEWORK FOR THE OPERATION OF NUCLEAR INSTALLATIONS IN THE CONTEXT OF INTERNATIONAL LAW

Supranational organizations in the field of nuclear energy, such as the IAEA[4] and the NEA[5] at a global level and EURATOM[6] at a European level owe their existence to international treaties that regulate the operation of nuclear installations in the various member states that subscribe to these international organizations. These treaties have generated a common and binding regulatory framework that is similar in all countries.

Furthermore, a European association, the '*Western European Nuclear Regulators Association*' (WENRA) has also been set up that groups together regulatory bodies, adding a further element of harmonization to nuclear security standards through the studies and reports they publish.

The 'Convention on Nuclear Safety'[7], adopted on June 17, 1994, refers to the regulation of the different stages in the life of a nuclear installation, including the design, construction, operation and decommissioning phases, which are of special relevance to this section.

This Convention establishes an obligation for each Member State to create a 'regulatory body' defined as '*any body or bodies given the legal authority by that Contracting Party to grant licences and to regulate the siting, design, construction, operation or decommissioning of nuclear installations"*, art. 2 ii; these licences being understood as, '*any authorization granted by the regulatory body to the have appliclant to have the responsibility for the siting, design, construction, commissioning, operation or decommissioning of a nuclear installation'*, art. 2 iii.

Thus, this regulatory body has a broader set of competences than those contained in the Council Directive 2009/71/Euratom, of 25 June, establishing a Community framework for the nuclear safety of nuclear installations; and in this Directive this authority is expected to hold the '*powers and resources to: (a) require the*

licence holder to comply with national nuclear safety requirements and the terms of the relevant licence; (b) require demonstration of this compliance, including the requirements under paragraphs 2 to 5 of Article 6; (c) verify this compliance through regulatory assessments and inspections; and (d) carry out regulatory enforcement actions, including suspending the operation of nuclear installation in accordance with conditions defined by the national framework referred to in Article 4(1)', art. 5.3.

Thus, the regulatory authority will not hold powers in the area of the concession of licences, according to the content of the Community Directive, although they should hold them in compliance with the IAEA Convention. The regulatory body therefore has competence to, '*issue, amend, suspend or revoke, as necessary, authorizations for the management of radioactive sources',* as established in art. 20 d) of the '*Code of Conduct on the Safety and Security of Radioactive Sources*', approved on September 8, 2003, and drawn up with the aim of serving '*as guidance to States for — inter alia — the development and harmonization of policies, laws and regulations on the safety and security of radioactive sources*'.

Moreover, the IAEA Convention on Nuclear Safety requires that each Contracting Party take steps to ensure '*an effective separation between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy*', art. 8.2. A functional independence that is reiterated in art. 5.2 of Council Directive 2009/71/Euratom which states that '*Member States shall ensure that the competent regulatory authority is functionally separate from any other body or organization concerned with the promotion, or utilization of nuclear energy, including electricity production, in order to ensure effective independence from undue influence in its regulatory decision making*'.

Finally, the licence for operation consist of an initial authorization, with the exclusive purpose of conducting '*appropriate safety analysis and a commissioning programme demonstrating that the installation, as constructed, is consistent with design and safety requirements*', in order, subsequently, to define the service life of the installation by ensuring that '*operational limits and conditions derived from the safety analysis, tests and operational experience are defined and revised as necessary for identifying* ***safe boundaries for operation***', arts. 19 i) and ii), respectively from the above-mentioned IAEA Convention.

Thus, the 'service life' of a nuclear installation will be defined in accordance with the safety, which will have to be studied and assessed by 'regulatory bodies' in each circumstance; without any reference to a statistical or a pre-set life span, nor to it being of a 40-year duration.

III. THE REGULATORY LEGAL FRAMEWORK IN SPAIN

Nuclear energy is at present regulated in the Spanish legal order through a law that dates back to the 1970s, a decade in which the nuclear industry began in Spain with the construction of nuclear plants in Zorita, Garoña and Vandellós I. Thus, the legal regime was regulated in Law 25/1964 of April 29th on Nuclear Energy (*Ley 25/1964, de 29 de abril, sobre Energía Nuclear)* or LEN, with modifications basically introduced by Law 25/1968 of June 20th, Law 54/1997 of November 27th, and Law 24/2005 of November 18th.

The regulations of this law were developed in Decree 2869/1972 of July 21, which was in turn abrogated by Royal Decree 1836/1999 of December 3, by which the Regulations on Nuclear and Radioactive Installations [*Reglamento sobre Instalaciones Nucleares y Radiactivas*] or RINR were approved, last modified by Royal Decree 177/2015 of March 13. This regulation is intended for '*the regulation of the legal regime of administrative licences, both for nuclear and radioactive installations and for specific activities related to the application of ionizing radiations (...)',* art. 1.

Thus, the administrative method employed by the LEN and the RINR is to grant licences, in order to regulate all nuclear activity, which is done in apparent harmony with the International Law that we have studied.

So, the set of authorizations existing under Spanish nuclear law are regulated in article 12.1 RINR which lists the following types[8]:

1º) Preliminary or siting licence, which means '*official acknowledgement of the proposed objective and the suitability of the chosen site, the issuance of which authorizes the holder to apply for the construction licence of the installation and to begin work on the preliminary infrastructure that are authorized'.*

2º) Construction licence, which '*authorizes the holder for the construction of the installation and to request the operating licence'.*

3º) Operation licence, which '*authorizes the holder to handle nuclear fuel and introduce radioactive substances into the installation, to carry out the programme of nuclear tests and to operate the installation under the conditions established in the licence. In the first instance, it will be provisionally granted until satisfactory finalization of the nuclear tests'.*

4º) Alteration licence, which '*authorizes the holder to introduce alterations in the design of the installation or in the operating conditions, in case the criteria, norms and conditions which form the basis for the operating licence should change'.*

5º) Execution and construction of the alteration licence, '*authorizes the holder to begin the design, execution and construction of those alterations that, due to their important scope or because they involve significant*

works or construction that require special authorization, in the opinion of the General Directorate of Energy Policy and Mines or the Nuclear Safety Council'.

6º) Decommissioning licence, which '*at the expiry of the operating licence, authorizes the holder to begin de commissioning activities, dismantlement of equipment, demolition of structures and removal of materials, in order, as a final objective, to ensure total or partial clearance of the site. The decommissioning process will end with a declaration of closure, which will end the holder's responsibility as an operator of an installation and will define, in the case of the restricted clearance of the site, the constraints that may be applicable to its use and the person responsible for maintaining them and monitoring their compliance*' (…).

In view of this set of licences, it may be affirmed that an effort has been made to establish prior control of the Administration in the face of any eventuality in the nuclear installations that might arise from the planning stage through to its closure and de commissioning.

Finally, the question of timeframe for the definitive operating licence is neither specifically regulated in the text of the RINR, nor in the LEN, but administrative practice has been to approve extensions for a period of 10 years. It may therefore be concluded beyond doubt that both legal regulations in no way expressly regulate either the service life, or the design life of nuclear installations.

IV. THE REGULATORY SITUATION IN THE UNITED STATES OF AMERICA

The 40-year term has its origin and cause in North American nuclear law, not for reasons linked to technical advances of nuclear technology, but for legal reasons arising from existing 'anti-trust' legislation in that country.

The US regulatory body, the '*United States Nuclear Regulatory Commission*' (NRC), roundly states as much when it affirms that '*the Atomic Energy Act and NRC regulations limit commercial power reactor licenses to an initial 40 years but also permit such licences to be renewed. This original 40-year term for reactor licences was* ***based on economic and antitrust considerations –not on limitations of nuclear technology****. Due to this selected period, however, some structures and components may have been engineered on the basis of an expected 40 year service life"*[9].

The '*Atomic Energy Act*' currently in force, dated August 30, 1954 -which has undergone various amendments, above all in the 1970s-, enforces a strict prohibition within the United States, in Section 92, on the production or commercialization of nuclear material, except under the conditions established in the '*licence*' granted by the Regulatory Authority.

In this way, this law establishes under Section 103 c) the term of 40 years for authorizations with the possibility of renewal, as it sets out that '*each such licence shall be issued for a specified period, as determined by the Commission, depending on the type of activity to be licensed, but not exceeding forty years from the autorization to commence operations and may be renewed upon the expiration of such period*'.

Nevertheless, it was from the 1970s, and coinciding with the modification of the wording of this law, when licences began to be issued for a term of 40 years in accordance with this provision, as licences had previously been granted by the regulatory authority solely in application of Section 104 b). This administrative practice was brought about as a consequence of the legal obligation, contained in Section 102, that the regulatory body should confirm the existence '*of practical value*' in the nuclear installation that is applying for a licence pursuant to Section 103; and in none of the applications made between 1954 and 1970 was such recognition forthcoming.

In 1956, the regulatory body approved rules for the set of authorizations that established this 40-year term, with the possibility of renewal, for nuclear installations authorized under this provision, even though Section 104 contained no provision as to its possible renovation, nor a maximum term. In short, the regulation of licences under Sections 103 and 104 of the 1954 Atomic Energy Act were unified.

So, the current regulations in this law clearly determine that the procedure for the concession of licences for nuclear installations is contained in Section 103; nevertheless, nuclear installations that operate with a licence granted in application of Section 104b), may be renewed under this provision.

With regard to protection against anti-competitive practices in the nuclear energy section, the original wording of the *Atomic Energy Act of 1954* established an important set of measures; and the fact is that the original wording of Section 105 c) Anti-trust provisions envisaged a review of the situation of competence in the sector prior to the concession of authorization pursuant to Section 103. In the present wording, this review of anti-trust practices is only required for the permit to open a new nuclear installation or if significant changes occur in the plant or in the operator, which is not the case for the renewal of the licence.

Moreover, in view of this 40 year time span written into this law, the circumstance arose that the design of certain structures and components of the nuclear installations were made based on the hypothesis of a 'service life' of 40 years. Hence, once this period of time had elapsed and in order to test whether it would be possible to extend the licence for a further 20 years, the NRC designed and regulated an evaluation process for the safety of

nuclear power plants titled '*Part 54-Requirements For Renewal Of Operating Licences For Nuclear Power Plants*', initially approved in 1991 and then amended in 1995, 2010, 2012 and 2015[10].

If it is concluded from the evaluation of the components and structures of the installation, which fundamentally refer to the ageing of these components, that they are safe for use over an extended time span, an extension of the original licence for a duration of no longer than 20 years will be granted. Finally, an environmental study of the impact of the licence renewal will be carried out and it will all be made available through public information and consultation processes (through the media and participatory meetings or the public may even be called to a formal adjudicatory hearing, or a legal challenge to the plans).

This measure taken by the NRC is due to the expiry in 2009 of the first operating licences in the U.S. nuclear installations, while 10% expired in 2010 and over 40% will expired in 2015.

In the United States, therefore, the extension of operating licences from 40 to 60 years has become a standard practice for the Regulatory Authority (NRC)[11].

In short, North American nuclear reactors similar, by age and technology, to the 'Santa María de Garoña' installations in Spain already have authorization to operate for at least up to 60 years. These circumstances, for example, apply to the 'Dresden 2' nuclear plant, the 'Oyster Creek' plant and the 'Monticello' nuclear installation.

V. IN CONCLUSION: THE FALSE 'MYTH' OF 40 YEARS

In line with economic and energy supply growth and environmental quality, a number of States have started to consider extended operation of their nuclear power plants beyond the time frame originally anticipated (LTO).

The 40-year term has its origin and cause in North American nuclear law, not for reasons linked to technical advances of nuclear technology, but for legal reasons arising from existing 'anti-trust' legislation in that country. And due to this selected period, however, some structures and components may have been engineered on the basis of an expected 40 year service life.

It should be pointed out that this life span of 40 years was exclusively established as a hypothesis for the design of nuclear installations in the United States in relation to the following construction features[12]:

1º) Mechanical properties of the reactor vessel steel: 32 years at full power, as the time remaining up to 40 years was calculated as time in which the plant would be 'shut down'.

2º) Number of transitions from cooling to heating for the calculation of thermal fatigue in critical components that are compatible with that time period.

All of that with the aim of showing that this equipment could function under safety conditions, at least, throughout that period of time. This does not signify that nuclear installation may only function during that time frame. But that their 'service life' depend on the result of '*the comparison between the design conditions and the real operating conditions*', as that is the only way to determine '*the remaining life span of a system, structure or component*'[13].

In view of all the above, it can be stated that the life span of 40 years employed by Spanish Government to refer to the 'service life' of nuclear installations, is objectively false 'myth'.

In conclusion, the 'service life' of a nuclear installation will be defined in accordance with the safety, which will have to be studied and assessed by 'regulatory bodies' in each circumstance; without any reference to a statistical or a pre-set life span, nor to it being of a 40-year duration. If the intention is to introduce this timeframe into nuclear law, it should not follow motives grounded in nuclear safety, but a political decision based on the definition of national energy policy.

---

[1]. The content of which is as follows: 'the National Safety Council is created as a body of Public Law, independent of the General Administration of the State, that is a legal person and holds its own assets independently from those of the State, and as the sole organism with competence in matters of nuclear safety and radiological protection'.

[2]. Power Reactor Information System (PRIS), https://www.iaea.org/PRIS/WorldStatistics/OperationalByAge.aspx (Accessed 25 May 2018).

[3]. IAEA (2010), Report 'Nuclear Safety Review for the Year 2010' http://www.iaea.org/About/Policy/GC/GC55/GC55InfDocuments/English/gc55inf-3_en.pdf, (Accessed 25 May 2018)

[4]. The International Atomic Energy Agency (IAEA) was created under the umbrella of the 'IAEA Statute' approved on October 23, 1956, at the Conference on the Statute of the International Atomic Energy Agency, held at the Headquarters of the United Nations, which entered into force on 29 July 1957.

[5]. The Nuclear Energy Agency (NEA) was created by the Council of the OEEC, the predecessor of the OECD, which the European Nuclear Energy Agency (ENEA) established in February 1958, and its present name dates from 1972. An historic analysis of this organism may be found in the article by Echávarri, L (2008) 'La Agencia de energía nuclear en la OCDE, a través de su historia', Economía industrial, nº 369, pp. 35 - 41.

[6]. The European Atomic Energy Community (EURATOM) was created with the signing in Rome of the Treaty establishing the European Atomic Energy Community on March 25th, 1957

[7]. On November 1999, the adoption of the Eurotom Convention, through Commission Decision of 16 November 1999 concerning the accession to the 1994 Convention on Nuclear Safety by the European Atomic Energy Community (Euratom), OJ n° L 318 of 11/12/1999.
[8]. On the topic in this section, the work of Bello Paredes, S.A. (2009), 'Las autorizaciones administrativas en el ámbito de la energía nuclear: a vueltas con el tema del futuro de la central nuclear de 'Santa María de Garoña', Actualidad Administrativa, Vol 19, pp 1-14.
[9]. http://www.nrc.gov./reactors/operating/licensing/renewal/overview.html (Accessed 21 May 2018)
[10]. The full text of which may be found at http://www.nrc.gov/reading-rm/doc-collections/cfr/part054/full-text.html, (Accessed 25 May 2018).
[11]. As of October 2017, of the 99 nuclear installations in operation, 86 have a license renewed for another 20 years after the initial 40 years.
[12]. MELLADO I. (2010) Technical Director of Nuclear Safety at the CSN, 'Renovación de las autorizaciones de explotación de las centrales nucleares'. Paper Presented at the 'El futuro de la energía nuclear en España', 19 November 2010, Valencia, Spain.
[13]. Instruction IS-22 of the CSN of July 1st, 2009, https://www.csn.es/ti-english, (Accessed 25 May 2018).

Santiago A. Bello Paredes." Nuclear Law And Service Life Of Nuclear Installations." The International Journal of Engineering and Science (IJES) 7.6 (2018): 31-37