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Extension of the operation time of nuclear power plants in the United States and Hungary**

Abstract

This paper is about the legal regulation of the extension of the operation time of nuclear power plants. In Hungary the most important document in this respect has been the National Energy Strategy analyzed in the paper. In Hungary, the legal regulation of the extension of the time limit of the operation-permit of nuclear power plants is modelled on that of the United States. For this reason, the paper examines the rules in force in the USA on the extension of the operation time. It could be of interest for several European countries considering to extend the operation time of their nuclear power plants.

Keywords: nuclear energy, nuclear power plant, National Energy Strategy, extension of the operation

1. Introduction

The safe and continuous supply of electric power is public interest. The supply of electric power can be guaranteed in manifold ways, for example, by traditional power plants heated by fossil fuels, many of which operate in Hungary, but their majority is obsolete. The greatest problem related to traditional power plants is the high carbon-dioxide emission, therefore, the reduction of the capacity of such power plants is an objective of the European Union. On the other hand, in the medium or long term an exhaustion of the resources may threaten (especially due to an increase in utilisation). Another method of the generation of electric power may be the utilisation of alternative sources of energy, primarily of wind and solar energy. The undoubted advantage of these is that they are environmentally friendly and recently the proliferation of these has been supported by several methods. A third main method of the supply of electric power is the production of nuclear energy, which from the viewpoint of energy strategy divides not only the states, but also the society, the public. The production of nuclear energy involves several advantages (it is economical, the produced quantity can be regulated), however, the strongest counter-argument concerns safety.

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It is generally accepted that nuclear energy can incur enhanced risks (exceeding the concomitant of any other industrial facility) to the health and safety of humans and to the environment. Therefore, these risks have to be carefully managed.

Nuclear safety is an extraordinarily important and sensitive issue from an international point of view, which is substantiated by the fact that nuclear issues are the subject of several international treaties.[1] Our country is also a party to international cooperation related to nuclear safety. The Convention on Nuclear Safety was signed on 17 June 1994. The high number of states party to the procedure of the elaboration of the treaty demonstrates that the issue of nuclear safety has a prominent role both in countries with nuclear power plants and in countries having none of them.[2] Likewise, the issues of protection against physical assaults vis-à-vis nuclear facilities are also regulated under an international convention.[3] In conformity with international obligations our legal system regulates the issue of nuclear safety rigorously and in detail.

Safeguarding a high level of nuclear safety throughout the European continent is top priority for the EU. Before our EU membership in order to facilitate our accession Hungary had signed all the relevant international conventions concerning nuclear safety. These treaties along with the nuclear safety recommendations elaborated by the International Atomic Energy Agency (hereinafter: IAEA)[4] are crucial elements in the legislation of the EU member states, as well as of Hungary. The Community acquis in the area of nuclear issues today consist of a framework of legal and political instruments including international agreements. At present they address the issues of health and safety including radiation protection, the shipment of radioactive waste, investment, the promotion of research, the nuclear common market, fuel supply and international relations.[5]

2. Domestic regulation

In Hungary nuclear facilities **(**power plant, research reactor) regulated by rigorous rules of licensing (and supervision) operate. The framework of the regulation is included by Act CXVI of 1996 on Nuclear Energy (hereinafter: ANE). The complexity of the legal regulation related to nuclear energy[6] is justified by the fact that the ANE regulates exclusively the major issues requiring regulation under an act, while the regulation of the particulars are incorporated under numerous separate statutes.

The operation, the tasks and responsibilities of the Paks Nuclear Power Plant Plc. (hereinafter: Paks NPP) and the framework of its operation are regulated mainly under three acts – the Electric Power Act, the ANE and the Environmental Protection Act – and by the associated government decrees.

[1] These include the conventions related to nuclear liability. See, in detail: Lamm 2013, 21–46.; Kocsis & Szilágyi 2017.
[2] Kecskés & Silye Judit 2013, 66.
[3] See, in detail: Lamm 2013, 159–175. See, also: Lamm 2019, 61–79.
[4] About the work connected international safety of International Atomic Energy Agency for details: Kocsis 2016b.
[5] Koblinger, Lengyel & Vöröss 2001, 363.
[6] For more details about regulation see: Szilágyi 2010.

The international agreements and commitments concerning the safety of the power plant and the handling of the nuclear fuel are of high importance. [7]

2.1. The safety of nuclear power plants

Besides the development of international and domestic legal regulation the nuclear industry spends enormous amounts on PR activities and the increase of the safety of nuclear installations. Nonetheless, these efforts cannot entirely convince the public. International nuclear energy organisations carry out significant activities targeting nuclear safety, but in fact they have limited credibility in the eyes of the public and they are often considered to be the extended hand of the nuclear industry.[8]

2.2. The National Energy Strategy

The National Energy Strategy (hereinafter: Strategy) was adopted in 2011, which delineates the major directions of domestic energetic developments for the period of 2011-2030. In the energy supply of Hungary nuclear energy has a significant role, which has been produced by Paks NPP for decades. According to the Strategy the Paks NPP has a definitive role in the production of domestic electric power, in 2009 it supplied 42%, whereas in the same year 8% of the electric power derived from renewable resources. Concerning renewable energy resources the creation of encouraging circumstances is an important objective, as a result of which the share of renewable energy has to be increased at least in the proportion in conformity with international obligations.

The Strategy establishes in connection with the Paks NPP that it produces energy supply at the lowest sale price in Hungary, its safety system is regularly checked by Hungarian and international organisations. As a result of safety-increasing developments in the 1990s it is considered to be one of the safest power plants in international terms.[9] The Strategy sets forth that the application of nuclear energy contributes considerably to the safety of energy supply. The Paks NPP is an almost totally emission-free energy generator, therefore, it contributes to the achievement of the objectives of climate protection. The cost of a nuclear heating unit equals 10-15% of the cost of electric energy, which in the long term compensates for high investment costs. All things considered the proportion of nuclear energy and renewable energy is likely to increase in the region as well as in Hungary.[10]

The Strategy considers the Nuclear-Coal-Green scenario as an objective to be achieved, according to which the maintenance of nuclear energy in the future is justified. The extension of the life-time of Paks NPP is by all means necessary, since according to the Strategy the replacement of the electric power produced by the nuclear

[7] Vámos 2001, 335.
[8] Lamm & Orton 2001, 448.
[9] Ministry of National Development 2020, 34.
[10] Ibid. 44.

power plant is not feasible, furthermore, the Strategy reckons with nuclear capacity at the new site (Paks 2) only subsequently to 2030.[11]

The strategy emphasises that in the context of nuclear energy both during its peaceful utilisation and upon decisions related to nuclear energy the most important aspect is the safety of the health, life and property of the population, therefore, nuclear safety needs to have priority over anything else. Nonetheless, the Strategy unambiguously reckons with the medium-term utilisation of nuclear energy, since the gaining ground of nuclear energy in the future may considerably improve supply-safety, the storage of nuclear heating units is easy (at present Paks NPP has two years' reserves of fuel cells) and the utilisation of natural gas in the generation of electric power can be decreased.[12] Thus, both in case of currently operating and of new investments an especially important aspect is guaranteeing operation according to the most rigorous safety requirements. This can be secured by the fulfilment of obligations assumed under international agreements,[13] rigorous licensing requirements and high-standard, continuous surveillance. This is also true in the context of the production of nuclear energy for the final disposal of waste with low and medium activity as well as the provisional storage of burnt nuclear fuel for some decades.

The Strategy mentions that some experts do not consider the increase of the proportion of renewable energy to be feasible, but they recommend the enhanced utilisation of nuclear energy. This, at the same time requires the increase of the safety of nuclear power plants and of the disposal of radioactive waste and the widespread proliferation of fourth generation nuclear reactors.[14]

According to the forecast of IAEA in 2050 1,400 reactors will be operating instead of the current 439.[15] Of the energy resources with high capacity only nuclear energy can be considered carbon-dioxide-free, so such an increase in nuclear energy could guarantee the decrease of carbon-dioxide emission expected also by the UN.[16]

2.3. Paks-2

In 2005 Parliament acknowledged the information on the extension of the life-time of Paks NPP (30 years) by twenty years.[17] Pursuant to Decision no. 25/2009. (IV.2.) OGY[18] Parliament granted its preliminary consent in principle to the commencement of the preparation of the new unit(s) on the site of Paks NPP.[19]

[11] Ibid. 73.
[12] Ibid. 77.
[13] The Convention on Nuclear Safety encompasses among others nuclear power stations for civil purposes and besides basic obligations it deals with the safety of nuclear facilities from a technical viewpoint. Kecskés & Silye 2013, 69.
[14] National Energy Strategy, 114.
[15] Data from 2011. Source: Ministry of National Development 2020, 114.
[16] Ibid. 114.
[17] Ibid. 34.
[18] In connection with the Decision came out that it can offend the right to healthy environment, for more details see: Kocsis 2016a, 146–149.
[19] Decision no. 25/2009. (IV.2.) OGY pursuant to Para. (2) of Article 7 of ANE on granting the preliminary consent in principle for the commencement of the activities related to the

This has outstanding significance since pursuant to Para. (2) of Article 7 of ANE of 1996 the preliminary consent in principle is required for the commencement of the preparation of the establishment of a new nuclear facility or of the storage of radioactive waste or of the extension of an existent nuclear power plant by a unit containing a further nuclear reactor.[20]

At the same time, we need to emphasise that the preliminary consent in principle does not replace any licences, therefore, the licensee is obligated to submit to the necessary licensing procedures. The consent in principle only justifies that the majority of the members of Parliament supports the establishment of the nuclear facility or the storage of radioactive waste. Regarding its character, it tends to be a political declaration, what renders it legal force is its stipulation under ANE as a condition of any preparation. Thus, the preliminary consent in principle is the prerequisite of all licences, which facilitates in principle the commencement of the planning of the investment by the Hungarian Electricity Works (hereinafter: HEW), for example, the planning of technical aspects, what type the planned unit should be, with what capacity it should operate, what investment cost it incurs and when it can be put into operation.

The next essential legal step related to the increase of the capacity of Paks NPP was Act II of 2014 on the promulgation of the Agreement between the Government of Hungary and the Government of the Russian Federation on cooperation in the area of the peaceful utilisation of nuclear energy, by which Parliament authorised the acknowledgement of the binding effect of the international agreement between the Government of Hungary and the Government of the Russian Federation.

2.4. The licensing organ

The nuclear energy supervisory organ is the National Atomic Energy Authority (hereinafter: NAEA). The NAEA annually frames a report for the Government and Parliament on the safety of the domestic application of nuclear energy including the activity of the preparation of the establishment of a new nuclear facility and of the storage of radioactive waste, furthermore, of the extension of an existent nuclear power plant by a unit containing a further nuclear reactor.[21]

Subsequently to the preliminary consent in principle the applicant needs to obtain all the licences. Concerning the licensing procedures a separate government decree provides.[22] Issues related to licensing have cropped up in two aspects concerning Paks NPP in recent years. On the one hand, the extension of the life-time of the existent power plant units, on the other hand, the establishment of new nuclear power plant units have required licensing procedures.

preparation of the establishment of new unit(s) of the nuclear power plant on the site of Paks NPP.

[20] See in detail, the critical comments related to the consent in principle: Fodor 2013, 23–42.

[21] Para. (3) of Article 8 of ANE.

[22] Government Decree no. 118/2011. (VII.11.) on the nuclear safety requirements of nuclear facilities and the related activities carried out by the authority.

3. The extension of the life-time of Paks 1

Unit 1 of Paks NPP received the licence for the extension of its life-time on 18 December 2012, whereas Unit 2 was granted an identical licence on 24 November 2014 from NAEA.[23] The operation licence and the life-time of Unit 3 of the power plant would have expired on 31 December 2016. At the request of HEW Paks NPP, NAEA granted the licence for an extension of the operation period by further 20 years in a licensing procedure conducted according to rigorous rules. As a result of a similar procedure Unit 4 of the power plant was granted the licence for an extension of the operation period at the end of 2017, which completed the program of the extension of the life-time of HEW Paks NPP Plc. Thereby, Paks NPP may continue operation with four units, the extended operation licence of which will expire between 2032 and 2037.[24]

The preparation of long-term operation had commenced much earlier. Paks NPP and other participants of the Hungarian nuclear energy industry were among the first to determine and implement measures necessary for evaluating the safety of Paks NPP and to eliminate the deficiencies concerning safety. This process started in 2001 during the period of the accession process of Hungary to the EU. As a consequence of the safety enhancement measures the core damage frequency, which shows the level of safety of the units, has decreased in an unprecedented manner.[25]

The conditions of the long-term operation of Paks NPP, which are the most important issues, have to be maintained at the level of safety in compliance with international safety requirements so that they follow the tendencies of development. One of the most important long-term objectives of Paks NPP is to operate the units as long as possible in accordance with technical, economic and safety requirements. The objective was to extend the life-time of the operating units in accordance with international trends. On the basis of technical tests it could be established that there was no technical or safety limitation against the extension of the operational life-time of Paks NPP by 10-20 years.[26]

During the technical-scientific preparation of the extension of the life-time of the power plant the high-standard Hungarian technical-scientific background had a definitive role, such as the Centre for Energy Research of the Hungarian Academy of Sciences, the National Research Institute for Radiobiology and Radiohygiene or the Institute for Nuclear Research of the Hungarian Academy of Sciences. International institutions also participated in the preparation of the extension of the life-time of Paks NPP, primarily the IAEA in the scope of a cooperation project since 2003.[27]

[23] MVM Paks NPP 2020a.
[24] MVM Paks NPP 2020b.
[25] Vámos Gábor 2001, 336.
[26] Ibid. 337.
[27] MVM Paks NPP 2014, 29.

On the nuclear safety requirements of nuclear facilities and the related authority requirements a government decree provides,[28] which includes the authority requirements related to nuclear facilities, such as the rules of licensing and the provisions related to supervision by the authority. The effect of the decree encompasses nuclear facilities already operating or which are planned to be established in the territory of Hungary, their systems and system elements, the activities related to nuclear facilities and the performers of the activities.[29] The effect of this decree encompasses the nuclear facility from the point of the obtainment of the preliminary consent in principle of Parliament to the cessation of the nuclear facility or until the time the decision of NAEA on the termination of its competence of supervision becomes binding.[30] This entails that the decree includes the rules on the particulars concerning the extension of the life-time of existing nuclear power plants and the licensing procedure of the establishment of new nuclear power plant units.

3.1. The domestic regulation of the extension of the life-time

The government decree stipulates that in case the licensee intends to operate the nuclear power plant unit beyond the planned operation time, they need to commence the necessary preparatory activity well before. The decree prescribes as a general condition of operation beyond the planned operation time that the licensee shall carry out the activity designed to maintain the technical condition, in compliance with prescriptions, of the systems and system elements important from the viewpoint of nuclear safety as well as systematically check and assess the efficiency of the activity. Furthermore, the licensee shall identify and accomplish by a deadline the safety increasing measures – feasible in case of the given unit of the power plant from a reasonable budget – deriving from up-to-date international requirements within the framework of Periodical Safety Supervision.[31] In the interest of the licensing of the operation beyond the planned operation time the licensee shall implement comprehensive supervision to justify that the deterioration processes requiring ageing management have been identified, they are adequately managed during the extended operation time so that the ageing effects do not endanger the functions of system elements.[32] On the basis of the results of the comprehensive supervision it needs to be identified what kind of new ageing management programs need to be elaborated and implemented, furthermore, which of the existent programs need modifications.[33] The actualisation of analyses valid for a limited period and on their basis the necessary measures shall be scheduled so that they can be finalised before the issuance of the licence for operation beyond the planned operation time.[34] Within the framework of

[28] Government Decree no. 118/2011. (VII.11.) on the nuclear safety requirements of nuclear facilities and the related activity carried out by the authority.
[29] Ibid. Article 1 Para. (1).
[30] Ibid. Article 1.
[31] Supplement 4, Volume 4, 4.15.0.0100.
[32] Ibid. 4.15.0.0500.
[33] Ibid. 4.15.0.0700.
[34] Ibid. 4.15.0.1000.

the preparatory activity the Final Safety Report shall be actualised,[35] the modifications to be implemented under the Conditions and Limitations of Operation need to be elaborated,[36] moreover, the modifications of further documents need to be effectuated.[37] These prescriptions demonstrate that the preparations related to the extension of the operation time of the nuclear power plant need to be commenced well before the licensing procedure.

In order to achieve its strategic objectives Paks NPP needed to establish and maintain a more flexible employment policy. The company has established and operated an integrated system of human resources, including the system of selection, assessment of performance and career planning. Along with maintaining high-standard technical training Paks NPP operates an advanced system of education and training in order to prepare the replacement of employees and develop managerial skills. The company contributes to the development of organisational culture by the achievement of human strategic objectives and the development of the managerial level, values, communication, working morale and commitment. [38]

The government decree provides for the licensing conditions related to the extension of life-time separately, according to which the licensee shall announce to the nuclear safety authority its intention to renew its licence at least four years before the expiry of the planned life-time and shall simultaneously submit the scheduled program for the establishment of the conditions of operation beyond the planned life-time. The nuclear safety authority approves of the program and supervises its implementation. So far as the licensee is delayed with the announcement obligation or the submission of the program, or if the program contains deficiencies which cannot be eliminated, or the omissions during implementation cannot be rectified, the licensing of operation beyond life-time shall not ensue. The licensing of the operation beyond life-time shall supervene under a new operating licence issued at the request of the licensee.[39] Supplement 1. of the Decree expressly specifies that in case of a nuclear power plant the licensing of the establishment, putting into operation, operation beyond lifetime, final cessation and dismantling takes place by nuclear power plant units. In the request for the licence the existence of the conditions of licensing need to be justified for the specific unit of the nuclear power plant.[40]

During the licensing of the operation of the unit of the nuclear power plant beyond planned life-time the following basic principles need to prevail: (a) safe operation needs to be permanently maintained during the preparation of the licensing of the operation beyond the planned life-time and during the planned operation of the

[35] Ibid. 4.15.0.1300.
[36] Ibid. 4.15.0.1400.
[37] For example, the documents of maintenance, trial and supervisory programs, the status-oriented management instructions regulating the removal of breakdown, the accident management instructions, the measures scheme for the case of averting nuclear accident in the facility. Ibid. 4.15.0.1500.
[38] Vámos 2001, 338.
[39] Article 20 of Government Decree no. 118/2011. (VII.11.) on the nuclear safety requirements of nuclear facilities and the related activity carried out by the authority.
[40] Supplement 1. Volume 1, 1.2.1.0400.

nuclear power plant, (b) during the operation of the unit beyond its life-time the exhaustion of the necessary safety reserves specified in safety analyses may not be allowed with reference to the imminent termination of the operation time, (c) the licensee shall commence the activities designed to maintain the technical condition within the planned life-time and shall implement them continuously, furthermore, the licensee shall systematically check and evaluate the the efficiency of these activities, (d) considering the above principle the justification of adequacy for operation beyond the planned life-time is restricted to the justification of the suitability of passive and long-life system-elements, (e) the safety increasing measures deriving from up-to-date international requirements shall be determined within the framework of Periodical Safety Supervision according to the relevant rules.[41]

A program scheduled to implement the conditions of adequacy for operation beyond the planned life-time of the nuclear power plant unit (hereinafter: AO) shall be submitted, in which a minimum of 20 years' operation experience shall be analysed.[42] The AO program shall contain the planned period of the extension of the life-time.[43] In the AO program it shall be justified that the requirements of the Nuclear Safety Standards will prevail throughout the entire extended life-time.[44] Thus, from among the licensing documents the AO program is of outstanding significance from the viewpoint of nuclear safety.

As a first step in the procedure targeting the extension of the life-time of the Paks NPP units the AO program was elaborated, which was submitted to the NAEA Nuclear Safety Board. The government decree facilitates that the AO is elaborated in relation to more than one unit. In case of Paks NPP benefitting from this opportunity the AO program was elaborated and submitted jointly for Units 1-4 on 15 December 2008, that is, 4 years before the expiry of the life-time of Unit 1.[45]

The decree determines the obligatory substantive elements of the request for a licence and the scope of the documents to be enclosed. The purpose of these rigorous prescriptions is that the licensing authority can make sure that the safety conditions will prevail completely during the extension period of the life-time in case the licence is renewed.

One of the main requirements while operating a nuclear power plant is to provide accurate information for the local inhabitants and the whole population of Hungary.[46] In the licence renewal procedure that was an important requirement as well.

The purpose and the principle of the participation of the public in the decision-making procedure in the nuclear field were the obtainment of the consent and the support of the public for the formulation and implementation of nuclear policy.[47]

[41] Ibid. 1.2.6.0500.
[42] Ibid. 1.2.6.0600.
[43] Ibid. 1.2.6.0700.
[44] Ibid. 1.2.6.0800.
[45] MVM Paks NPP 2020a.
[46] Vámos 2001, 337.
[47] Lamm & Orton 2001, 448.

The request for the licence needs to be submitted for each nuclear power plant unit at the latest one year before the expiry of the operating licence valid for the planned period of operation.[48] With respect to the nuclear safety of operation and other circumstances the nuclear safety authority determines the temporal effect of the licence, which may not be longer than the scheduled and justified period in the documentation substantiating the operation beyond the planned life-time.[49] The requests for the extension of the life-time of all the units of Paks NPP were submitted in time, thus, according to the above the NAEA licensed the extension of the operation of all the units. It is to be noted that upon the emergence of the issue of the extension of operation the American model could be considered authoritative since in the European countries there is no established practice of the extension of the period of operation.

4. The American model

In 1946 the first Atomic Energy Act was adopted in the United States, which was amended in 1954. As a result of the amendment a new regulation was incorporated into the act, which stipulated that nuclear power reactors can be licensed only for a specific period determined by the Nuclear Regulatory Commission (hereinafter: NRC), but not exceeding a licence term of 40 years.[50]

Despite the fact that licensing for 40 years was neither based on technical experience or operating practice, nor did it rely on the protection of the safety of the public, the planning of nuclear power plants was implicitly based on a 40-year life-time.[51]

It became an important issue how the development of the safe generation of large quantities of low-cost bulk electricity with high reliability is feasible. It was necessary to take into account two other factors: the capacity to supply electricity at a stable and predictable price in the future and the reduction of environmental risks, for example of carbon-dioxide emission and the protection of the quality of the air.[52]

In the United States at the beginning of the 1980s, the Commission of NRC started to do research into the effects of the ageing of nuclear power plants.[53]

As a result of the research in 1991 the Commission of NRC adopted the document titled 'Requirements for the Renewal of Operating Licences for Nuclear Power Plants.'[54]

The NRC established that the operation of nuclear power plants over 40 years can be allowed with the issuance of a operation renewal licence. The operation renewal licence is not the amended original licence, but a new – other – licence. [55] This issue – as we could see above – is regulated in the same way in our domestic regulation.

[48] Supplement 1. Volume 1, 1.2.6.1000.
[49] Ibid. 1.2.6.1200.
[50] Kimberly 2018, 34.
[51] Bishop 2001, 82.
[52] Kimberly 2018, 35.
[53] Ibid. 36.
[54] Ibid. 37.
[55] Ibid. 39.

The next important question was to decide how long the renewal licence can be valid. The NRC decided that the renewal licence can be issued for a maximum of 20 years. Upon the determination of the period of time the most important points of view were the technical questions. The ageing of nuclear power plants may not endanger public health or the environment. Furthermore, the 20-year period can facilitate long-term planning. [56]

Hungarian legal regulation followed this model upon the determination of the period of the renewal licence. Paks 1. NPP received the operation renewal licence for 20 years.

In the United States the operation renewal licence is again a serious issue, since within the next 20 years half of the nuclear power plants will turn 60 and their operating licences will expire, while only two reactors are under construction.[57] In many western countries the situation is similar. According to the data of the Power Reactor Information System of the International Atomic Energy Agency in 2018 altogether 449 reactors operated all over the world. Most reactors operate in the United States, France, China, Japan and Russia.[58] About half of the nuclear power reactors have been operating for more than 30 years all over the world. This is the main reason why reactor licence renewals and long-term operation have become the focus. This is especially true in the United States where the largest number of reactors over 40 years of age operates in the world. The United States – and other countries that have had nuclear reactors for decades – has the necessary knowledge and experience for the licensing and regulation of nuclear power plants.[59]

At the beginning of the 1990s the NRC began to elaborate recommendations on how to improve the operation licence renewal procedure. The NRC obtained opinions from many different actors including industrial organizations, construction and engineering companies, Federal and State governments as well as private citizens.[60]

Based on the supervision in 1995 the NRC reconsidered the Licence Renewal Rules in order to render the former renewal rules more efficient, stable and predictable.

The new regulation identified the systems, structures and components important in the licence renewal procedure and the main factors that need to be maintained.[61]

In 1996 the NRC publicised the environmental requirements for licence renewal. Within the framework of the renewal procedure it is necessary to prepare a Supplement to the Environmental Impact Statement.[62]

The US continues to use both coal and natural gas in the production of electricity and as many solar and other renewable technologies as possible. Nuclear power plants are the principal sources of emission-free generation and this attribute will become increasingly important – and valuable – since the US Clean Air Act requires the

[56] Ibid. 39.
[57] Ibid. 31.
[58] Operational & Long-Term Shutdown Reactors 2020.
[59] Kimberly 2018, 33.
[60] Ibid. 44.
[61] Ibid. 45.
[62] Ibid. 47.

limitation of the emission by new coal-fired and gas-fired power plants.[63] Nuclear power plants are the largest contributors to the carbon-dioxide reduction program of the US.

In 2000 the NRC's new supervisory and assessing procedure was implemented industry-wide. The new procedure makes use of objective, quantitative performance indicators instead of a subjective, qualitative judgement. The new procedure secures the regulatory stability appropriate for the industry via an exemplary safety regulation. The NRC has also exercised responsible and effective leadership in licence renewal, licence transfer and in the reduction of unneccessary regulatory burdens, while seeking ways to become a more effective regulator.[64]

Safety is the most important requirement of the long-term operation of nuclear power plants all over the world. The safe operation of nuclear power plants needs to be guaranteed during the complete period of long-term operation. There are two main guarantees of safe long-term operation. On the one hand, licence renewal, on the other hand, periodic safety supervisions. Licence renewal is a prevalent legal institution in the United States and Hungary as well. Periodic safety supervision predominates in all countries with nuclear power plants, for example, in European countries, Canada and Korea. The International Atomic Energy Agency declared that "periodic safety supervision is an instrument supporting the decision-making procedure for licence renewal or long-term operation."[65]

Legal rules concerning the life-time of nuclear power plants are diverse in different countries. In some states the life-time of nuclear power plants is limited by law or by licence. Only a few states have limited the term of nuclear licences by law, for example the USA or Belarus. Mostly, the life-time is determined by licences. Some states have not limited the life-time of nuclear power plants, these include Belgium, Finland, France, Germany, Great-Britain and Spain. In Germany the federal government intends to terminate the commercial use of energy produced by nuclear power plants.[66]

In the United States since the beginning the licence renewal procedure has had two important parts: they concern safety and environmental requirements. In several countries environmental supervision is not a necessary part of the long-term-operation procedure. In countries where licences are open-ended no major work is necessary to continue operation, therefore, environmental review is not required in these countries.[67]

4.1. The procedure of licence renewal in the USA

Constellation Energy became the first nuclear energy company in U.S. history to renew its operating licence for its nuclear power plant.

The two-unit Calvert Cliffs power station received its license renewal on 23 March 2000, which extended its licence generating for generation by twenty years

[63] Bishop 2001, 83.
[64] Ibid. 82.
[65] Kimberly 2018, 48.
[66] Schattke 2001, 36.
[67] Kimberly 2018, 49.

beyond its initial forty-year term. Two months later, NRC approved of the renewal of the licences for the three-unit Oconee nuclear station of Duke Energy for an additional twenty years as well.[68]

The content of the licence renewal petition is strictly regulated in the USA – similarly to the situation in Hungary. The content of the safety part of the petition is divided into three parts: general information, technical information and detailed technical specification. Each petition has to contain an integrated assessment, which enumerates the equipment and components in need of an ageing supervision and programs managing the effect of ageing. In the interest of safety the petition has to include changes necessary to the equipment compared to current technical solutions, which are required to manage the effects of ageing during the period of long-term operation.[69]

Besides safety requirements environmental requirements also have an important role in petitions. The petition must contain an environmental document titled 'The Petitioner's Environmental Report.' This document has to include inter alia the programs for managing the effects of ageing which could affect the environment, action plans which reduce the negative effects in the following areas: land use, air quality, noise, water resources, historical and cultural resources, human health and waste management.[70] The Petitioner's Environmental Report has to be made available for the public.[71]

The licensing procedure is divided into two parts: environmental supervision and safety supervision. As the first step of the environmental supervision after filing the Licence Renewal Petition the Commission (NRC) arranges a public hearing. This first public hearing is important because this launches the supervisory procedure and the information of the public. In this phase of the procedure the members of the public can address questions or make comments.[72] This is in conformity with the basic principle of nuclear law: transparency. The principle of transparency requires that all organs involved in the development, utilisation and regulation of nuclear energy get access to all relevant information concerning the way of the utilisation of nuclear energy, including incidents and abnormal occurrences that may have impact on public health, safety and the environment.[73] The Commission (NRC) collects all information and at the end of the environmental supervision presents these to bodies making decisions on energy planning.[74]

In the framework of safety supervision the Commission (NRC) examines whether the licence renewal petition and the attached documents are in compliance with the standards for the issuance of a renewed licence. Another body, the Advisory Committee for Reactor Safeguards also reviews the Licence Renewal Petition. The Committee (ACRS) is a federal advisory organ, which is independent of the

[68] Bishop 2001, 82.
[69] Kimberly 2018, 54.
[70] Ibid. 54.
[71] Ibid. 55.
[72] Ibid. 55.
[73] Stoiber et al. 2003, 10.
[74] Kimberly 2018, 56.

Commission (NRC). The Committee examines the safety requirements, primarily the safety aspects of the licence renewal petition, then drafts recommendations for the Commission.[75]

The last part of the procedure is the administrative adjudicatory hearing. The adjudicatory hearing takes place before the three-member commission of the Atomic Safety and Licensing Board (ASLB). The panel has two technical members and one member is a lawyer. At the end of the licensing procedure the Atomic Safety and Licensing Board makes a decision of first instance.[76]

The decision of the Atomic Safety and Licensing Board can be contested before the five-member Commission of NRC. Against the decision of the Commission appeals can be made to the US Court of Appeals, moreover, as a last resort a review can be initiated at the US Supreme Court.[77]

5. Summary

The utilisation of nuclear energy shows an increasing tendency worldwide, which is as a matter of course related to the increased use of electric power. As it was briefly introduced in this study, the utilisation of nuclear power is a controversial issue. Nonetheless, in my opinion the utilisation of nuclear energy in Hungary does not have an alternative in the short or medium term, therefore, the extension of the life-time of Paks NPP was a necessary and reasonable step taken in the interest of energy-safety. The extension of the life-time was accomplished with the consideration of the up-to-date and tested American model via the safety supervision and modernisation of Paks NPP. Hungary was among the first ones in Europe to apply the technical, safety and regulatory model related to the extension of life-time. It is certain that in the future the extension of the life-time of nuclear power plants will become necessary in Europe and in more and more states in other parts of the world as well. I think that due to continuous modernisation, methods preventing ageing and increasingly rigorous safety prescriptions at present we cannot foresee the final operation time of nuclear power plants. This is likely to be influenced by the relevant continuous technical and safety developments. At the same time that much is certain in face of the American example that a considerable part of nuclear power plants are adequate to operate efficiently and safely further than the originally planned period.

[75] Ibid. 56.
[76] Ibid. 57.
[77] Ibid. 58.

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