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The legalities of a nuclear shutdown

Alexander Rossnagel and Anja Hentschel

Abstract

In July 2002, Germany amended its Atomic Energy Act so no new nuclear power plants could be built and existing power plants would continue running only for a limited time. In 2009, however, a coalition led by Chancellor Angela Merkel took control of the German government and reversed the country's nuclear phase-out policy, extending nuclear plant operating lives and announcing that risks associated with nuclear energy were insignificant. Three months later, just days after the nuclear disaster at the Fukushima Daiichi Nuclear Power Station in Japan, the German government abruptly reversed course again, closing eight older nuclear power plants and eventually ordering the nine remaining plants to cease operations by 2022, at the latest. Three out of the four operators of German nuclear power plants have since taken legal action, seeking compensation for profits supposedly lost as a result of the nuclear policy change. But due to a number of factors—including the German constitution, which places a duty on the government to protect citizens, and the nuclear operators' participation in the original 2002 agreement to phase out nuclear power—most legal observers believe these legal challenges to Germany's nuclear exit are destined to fail. The German nuclear exit includes financial compromises that allow nuclear operators to recoup investments in their nuclear power plants, and the legal protection these compromises provide to the government may be the part of the German initiative that is of most interest to other countries considering nuclear exits.

Keywords

Atomic Energy Act, compensation, constitution, Germany, lawsuits, nuclear energy, nuclear operators, nuclear phase out, nuclear power

The coalition elected to lead Germany in the fall of 1998—a union of the Social Democrats and the Green Party—focused its election campaign on the goal of phasing out nuclear power. In the spring of 1999, the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety submitted a draft of a phase-out law.¹ Federal Chancellor Gerhard Schröder, however, did not want to bring the proposal to parliament without first discussing it with the energy industry. On June 11, 2000, after more than a year of tough negotiations, the federal government and Germany's four largest energy-supply companies reached an agreement that led to the Tenth Amendment to the Atomic Energy Act, which came into effect late in July 2002.² The act established that no new nuclear

power plants would be built, and each existing power plant would be allowed a total running time of 32 years. The volume of electricity still to be generated was calculated according to this period of time, and if a plant were shut down before that amount was generated, the unused capacity could be transferred to other nuclear power plants.

The government coalition of conservatives and liberals elected in 2009 intended to cancel this phase-out plan. Chancellor Angela Merkel's wish was to continue using nuclear power as a type of "transitory technology" until demand could be extensively met through renewable forms of energy. Following a revised agreement with the four largest energy groups, the legislature passed the Eleventh Amendment to the Atomic Energy Act, and it was enacted in December 2010.³ Under the act, all 17 reactors in Germany received additional volumes of electricity to be generated. The allowable total running time of all nuclear power plants that began operation before 1980 was increased by eight years; the running time of other reactors was increased by 14 years. These changes were underpinned by the pronouncement that risks associated with the nuclear power plants were insignificant.

Just three months later, days after the nuclear disaster at the Fukushima Daiichi Nuclear Power Station in Japan, the government abruptly reversed course again. Eight nuclear power plants were temporarily closed down by state supervisory authorities, as instructed by the federal government.⁴ During this moratorium, the federal government ordered the Reactor Safety Commission to inspect nuclear power plants in Germany and appointed

an Ethics Commission to develop recommendations for the future energy supply.

In its May 14, 2011 report, the Reactor Safety Commission said that, although German nuclear power plants were robust enough to endure many severe external hazards, the power plants that had been temporarily shut down did, indeed, exhibit weaknesses. They would not, for example, withstand being hit by an airplane.⁵

Later that month, the Ethics Commission recommended that the eight temporarily inoperative nuclear power plants be shut down completely and that the regulation from 2002—that is, the original agreement to phase out the nuclear energy industry—be reapplied to the nine plants still operating, canceling the increase in volumes of electricity generation that the nuclear plants had been allotted in 2010 (Ethics Commission, 2011).

With the Thirteenth Amendment to the Atomic Energy Act,⁶ the legislature decided by an overwhelming majority to revoke the licenses of the eight older, shut-down reactors when the law came into force on August 8, 2011. The licenses of the nine newer reactors were limited to staggered remaining times of operation, with each license expiring when its remaining volume of electricity was generated, or, at the latest, on a date set out in the act. The last of the power plants would be taken out of the network by December 31, 2022.⁷

The federal government justified the phase-out plan by stating that the Fukushima disaster made it necessary to "reassess the risks associated with using atomic energy" (*Bundestags-Drucksache*, 2011a, 2011b). If it is not

possible to avoid such huge accidents in a country that is technologically as highly developed as Japan, the government argued, then the generation of electricity from atomic energy is fundamentally put into question. That reassessment cut the life span of German nuclear plants dramatically, reversing government nuclear energy policy in a matter of months. Three out of the four operators of German nuclear power plants have since taken legal action, attempting to obtain compensation for profits supposedly lost as a result of the policy change. But because of a number of factors—including the German constitution, which places a duty on the government to protect citizens, and the nuclear operators' participation in the original 2002 agreement to phase out nuclear power—most legal observers believe these legal challenges to Germany's nuclear exit are destined to fail.

The German nuclear phase-out had overwhelming political support, and it definitively and quickly ends the country's participation in nuclear power generation. But the phase-out agreement also includes compromises with nuclear operators that allow them to recoup their investments in power plants, and the legal protection these financial compromises provide to the government may be the part of the German initiative that is of most interest to other countries considering a departure from nuclear power.

The constitutional basis for atomic energy use and regulation

Das Grundgesetz, the basic constitutional law of the Federal Republic of

Germany, neither promotes nor prevents the use of atomic energy. The legislature makes the basic decision for or against atomic energy use and has the power to amend the legal framework for nuclear power at any time.⁸ Still, the *Grundgesetz* does require strict regulation of the risks that industrial technology such as nuclear power poses.

If the legislature authorizes atomic energy use and its risks, it must, under the *Grundgesetz*, find that doing so protects a fundamental right to human life and physical integrity. Given the type and severity of the potential hazards associated with atomic energy use, even a slight probability of damaging events is enough to initiate this national duty to protect citizens. The Federal Constitutional Court is guided by two considerations in determining the limit of permissible risk: a skeptical view of the reach of human knowledge and an understanding of freedom that assures society has the capacity to act and the possibility to develop. The risk limit should be determined through what the court calls "basic practical rationality" (*Massstab praktischer Vernunft*), a requirement that "it appears to be—in a practical sense—almost impossible, according to state-of-the-art science and technology, that such damaging events could happen." The court didn't premise this "basic practical rationality" on constitutional reasoning, but with an epistemological argument: Uncertainties beyond the limits of human cognitive ability are inescapable social burdens to be carried by all citizens.

Following from this argument, the Federal Constitutional Court has developed criteria for permissible residual risks in regard to technical

systems regulated by the government: "Demanding from the legislature, in view of its duty to protect, a regulation which eliminates, with absolute certainty, all threats to fundamental rights ... would mean ignoring the limits of human cognitive ability and would ban, to a large extent, every state authorized use of technology."⁹ Two conclusions follow from this description of error and understanding.

First, in the process of developing technical systems, the risk of failing to see possibilities that damage might occur is the unavoidable price of using industrial technology. Those responsible can only evaluate the risks to the extent that they are known at the time. The possibility of unrecognized danger has to be accepted as residual risk. The Federal Constitutional Court does not regard a certain amount of damage or a certain probability of damage as admissible. It does accept risks that society cannot avoid due to limited human cognitive ability.

A second conclusion flows from the first: In the German legal view, the only risks that the legislature can authorize are those that cannot be avoided, because they are not discerned. As they become better defined over time, the risks that were previously unavoidable, because they were not recognized, become avoidable. In other words, large damage potentials are only acceptable as long as everything possible has been done to recognize and avoid the possibility of them occurring.

The requirement for the protection of fundamental rights that changes as the understanding of risk changes is also the basis for a legislative duty. To protect life and physical integrity, the legislature must react to any changes in what

is known about the risks posed to the public by any regulated industry, including atomic energy. This dynamic protection of fundamental rights must be observed in the licensing of individual nuclear reactors.¹⁰

This reasoning made a reassessment of the uses and hazards of atomic energy not only constitutionally permissible, but in a circumstance as unprecedented as the Fukushima disaster, perhaps even required. In Germany, the political scope of the legislature's discretion is vast. It must take into account the fundamental rights of both the population and the operators of nuclear power plants. It must also consider the security of the country's energy supply, the projected levels of energy prices, and the protection of the climate. The Federal Constitutional Court can examine the outcome of the weighting of these factors only in a very limited manner.

Nevertheless, each reassessment of atomic energy requires an amendment to the Atomic Energy Act that precisely regulates the conditions of the adjustment. As the act guaranteed operators unlimited licenses for the operation of nuclear power plants, a limitation to these licenses makes it necessary to amend the law. Neither the executive branch of government nor the regulatory authorities have the competence to change the legal framework for using nuclear energy; only the legislature has that authority.

International and European treaties are likely to have almost no effect on the phase-out process in Germany. In agreements such as the European Atomic Energy Community Treaty and the Nuclear Non-Proliferation Treaty, the Federal Republic of Germany agreed to cooperate with other countries

for as long as and insofar as it uses atomic energy. Germany has never, however, committed itself to using atomic energy in the commercial production of electricity, and so the exit from the nuclear power industry has not required the termination of international treaties.

Legal challenges to the German nuclear phase-out

Three out of four operators of German nuclear power plants—Germany-based E.ON and RWE and the Swedish firm Vattenfall—have appealed to various courts against the limitation of their licenses and the immediate shutdown of eight reactors in March 2011. Their goal is not exactly to reverse the energy turnaround, but to get compensation for financial losses they claim. E.ON quantifies its loss as at least 8 billion euros, RWE claims a loss of at least 2 billion euros, and Vattenfall says it lost more than 1 billion euros.

On April 1, 2011, RWE filed an action against the state of Hesse to the Higher Court of Administration in Kassel, seeking to reverse the temporary shutdown of the Biblis A and B reactors ordered on March 18, 2011. Later, RWE altered the action, demanding the court find that the shutdown was illegal. If it receives such a finding, RWE wants to proceed through a civil court with its demand for compensation from Hesse. The Higher Court of Administration has deemed the claim admissible, but the substantive constitutional and administrative legal issues have not yet been decided.

In November 2011, E.ON filed a constitutional complaint with the Federal Constitutional Court. RWE filed a

similar complaint in February 2012, and Vattenfall submitted its version in July 2012. (The fourth operator, EnBW, has not yet filed any constitutional complaints, perhaps because, since the end of 2010, approximately half of its shares are held by the government of Baden-Württemberg, a state now controlled by the Green Party and the Social Democrats, both of which are proponents of phasing out nuclear power.)

The three operators that are suing claim their fundamental rights to property and to occupational liberty have been violated. The firms complained that Article 14 of the *Grundgesetz* not only protects the nuclear power plants and their operational licenses, but also the remaining volumes of electrical generation assigned to them, as well as the value of shares in the operating companies. The operators also complain that the sudden energy turnaround violates their right to rely on existing law. The Federal Constitutional Court is not expected to reach a decision before the *Bundestag* election in 2013. If the Thirteenth Amendment is found to be unconstitutional, the operators want to proceed to civil court and sue for compensation for their losses.

On May 31, 2012, Vattenfall also filed an investor-state arbitration action against the German government at the International Centre for Settlement of Investment Disputes in Washington, DC.¹¹ Vattenfall argues that it invested approximately 700 million euros in nuclear power plants in Germany, trusting that the plants would be able to continue running. In the proceedings, Vattenfall refers to its rights under the Energy Charter Treaty¹²—an agreement, signed by Germany, 50 other countries, the European Union, and the European

Atomic Energy Community—that went into effect in 1998. The treaty aims to protect foreign investors from expropriation and other unfair treatment and gives them the right, without inclusion of the state courts of the host country, to take direct legal actions heard by ad hoc, appointed international arbitration panels. Vattenfall is expected to demand well over 1 billion euros of compensation due to the shutdown of its Krümmel and Brunsbüttel reactors.

Constitutional admissibility of the phase-out

In the wake of the Fukushima disaster, the federal government argued that a general reassessment of the risks of atomic power was absolutely necessary. The argument was buttressed by two reports presented in the spring of 2011. On the one hand, the Ethics Commission reported that it is necessary to phase out atomic energy to eliminate the chances of unjustifiable accidents and to protect citizens' fundamental right to life and physical integrity; on the other hand, the Reactor Safety Commission found that the newer reactors in the German fleet are safe and robust enough to be allowed to run for up to 11 more years.

The German government's phase-out of the nuclear industry must also, however, comply with the operators' fundamental rights to occupational liberty and to property.

A restriction to the fundamental right to freely exercise one's profession is allowed under the *Grundgesetz* if it is proportional, which is a specific and well-defined legal requirement for a constitutional restriction to a fundamental right. Such a restriction is only

proportional if it is suitable, necessary, and appropriate to reach the goal of public welfare. License limitation is suitable and necessary to ensure a dynamic protection of fundamental rights to human life and physical integrity. The restriction is appropriate if it is founded on reasonable considerations of public welfare. License limitations obviously could benefit the public welfare by preventing huge nuclear accidents involving thousands of deaths and injuries.

Whether or not a restriction to property is admissible under German constitutional law is a complex matter that involves, among other things, determinations on whether an expropriation has occurred and, in the case of the nuclear phase-out, whether operating licenses and electricity allotments can be considered property, in the constitutional sense. Generally speaking, however, when the legislature restructures a field of law, it is also authorized to exclude or restrict certain forms of property. The legislature is also allowed to restructure its prior legal positions without having to pay compensation. It must only make sure that a new regulation of the use of property is proportional. The new regulation of the nuclear law is suitable and necessary in order to fulfill the duty of dynamical protection. To be appropriate, it, above all, must be fair to the owners of the reactors in a financial sense and provide them an adequate transitional period.

With the Thirteenth Amendment to the Atomic Energy Act, which sets the terms of Germany's nuclear phase-out, the legislature simply returned to the year 2000 agreement it had reached with the nuclear power plant operators, including those who are currently taking

legal action, and to the statutory regulation of the Tenth Amendment from 2002. In so doing, the legislature only slightly intensified the terms of the earlier act by fixing final times by which nuclear plants must cease operation. And it has allowed unused allotments of electricity generation to be transferred from closed reactors to those still operating.

The operators and their legal supporters argue that the calculation of volumes of electricity not yet used, based on an average running time of 32 years, is unreasonable. The operators should be entitled to a longer running time and, therefore, more profit, they claim.

The government and the vast majority of German legal observers, however, believe the reform that will shut down the German nuclear power industry over time is constitutional. The right to profit is not recognized by the German constitution, and a limitation on business activity is considered appropriate if it enables the amortization of capital employed. The average amortization of a nuclear power plant is reached after approximately 19 years. After 27 years of operation, at the latest, investments in nuclear power plants have yielded a profit that corresponds to the running yield of government bonds (Federal Ministry of Environment, 2000). In selecting an operating time of 32 years and allowing for flexibility through the transfer of remaining electricity volumes, the legislature has done more than necessary to accommodate the interests of energy suppliers, most legal observers believe.

Many experts, in fact, think it's all but out of the question that the Federal Constitutional Court will find the Thirteenth Amendment unconstitutional. The managers of the

operating companies are no doubt aware of their very slim chances of victory. Nevertheless, they have taken legal action in the Federal Constitutional Court and the Higher Court of Administration in Kassel, because, according to German corporate law, as representatives of management, they must leave no stone unturned in protecting their companies from loss.

The unlikelihood of compensation

The operators of German nuclear power plants face a dilemma in trying to assert a claim for compensation for losses caused by the nuclear phase-out. On the one hand, the Federal Constitutional Court could determine that the amendment is unconstitutional; then the act would be nullified and the extended operating deadlines from the Eleventh Amendment would once again apply. Any unjustifiable encumbrance would be rescinded, and there would be no losses. On the other hand, the court could determine that the Thirteenth Amendment is constitutional. Then, there would be no unjustifiable encumbrance on the nuclear plant operators and, thus, no loss for which to be compensated.

The operators may claim compensation for the older reactors that were shut down in the months following Fukushima. Just the same, the operators are allowed to transfer the comparatively small remaining electricity volumes allotted to those reactors to other nuclear plants that are still operating.

The operators have suffered, it seems, very little damage as a result of the statutory regulation that shut down older nuclear plants on August 6, 2011. E.ON

and Vattenfall each own half of the Krümmel reactor and could perhaps claim that it had the shortest running time of the closed reactors, 28 years. However, even this running time exceeds the 27-year period that, the federal government says, will allow for full amortization of nuclear plant investments *plus* an adequate profit. It seems unlikely that the constitutional court will find a violation of the fundamental right to property; without such a finding, compensation for a loss is out of the question.

There is perhaps a larger chance for the operators to receive compensation for the shortfall in production that occurred between March 15 and August 6, 2011, during the shutdown of older plants enacted through an administrative order of the supervisory authorities. To be lawful, the order would have to meet the requirements of the Atomic Energy Act.¹³ The relevant provision of the act allows for an interim shutdown if a situation “may constitute a hazard to life, health, or property.” The operators contest that there was any such hazard, claiming the disaster in Fukushima did not change the condition of German nuclear power plants (Rebentisch, 2011). The objective of the act, however, is to provide the best possible protection of citizens’ constitutional rights to life and physical integrity. For this purpose, significant new circumstances must be taken into account; that is to say, they must become part of a risk assessment that is dynamically adapted to the newest level of knowledge (Rossnagel, 1998).

According to this constitutional argument, the supervisory authorities had to take both the safety conditions of the reactors and the latest risk-assessment

findings following Fukushima into consideration. When they did so, they found the risk assessment for nuclear reactors, given current available information, was far more negative than the risk assessments made when German nuclear plants were first granted licenses.

Transferable experiences

In terms of their safety systems, nuclear reactors in Germany may be distinguished as having four construction generations for pressurized water reactors and two construction generations for boiling water reactors. The second-generation pressurized water reactors (Biblis A, Biblis B, Neckarwestheim 1, and Unterweser) and the first-generation boiling water reactors (Brunsbüttel, Isar 1, Krümmel, and Philippsburg 1) were the ones shut down by legislative action on August 6, 2011.

The design of these reactors was more or less based on the state-of-the-art of science and technology from the beginning of the 1960s. The laws under which German regulators worked¹⁴ all met the standards of state-of-the-art science and technology from the mid-1970s and early 1980s. The Thirteenth Amendment to the Atomic Energy Act thereby shut down the reactors that hadn’t met these standards since the 1980s.

Even the German nuclear power plants still operating have not matched these modernization standards for a long time. The third- and fourth-generation pressurized water reactors and the second-generation boiling water reactors were able to meet the safety specifications that went into effect in 1977 and

1983. Nonetheless, the youngest nuclear power plant (Neckarwestheim 2) began operation in 1989. In the 23 years since then, science and technology have continued to evolve, and the gap between what is known about nuclear power and the design concepts of German nuclear power plants has increased. In 1994, for example, the Seventh Amendment to the Atomic Energy Act established that a reactor can be licensed only if the consequences of a nuclear meltdown could be confined to the immediate proximity of the reactor.¹⁵ Not a single German reactor fulfills this requirement. In other words, no operating nuclear power plant in Germany has been licensable for the past 18 years (Renneberg, 2010).

Science and technology have not only evolved in regard to the safety design concepts for nuclear reactors, but also in reference to new risks and how to deal with them. This is especially true for the risk of a terrorist attack on a reactor through the targeted crash of a passenger airplane. In the 1960s, 1970s, and 1980s, supervisory authorities ignored such a threat, and no reactor in Germany is designed to withstand the crash of a passenger airplane (Reaktor-Sicherheitskommission, 2001). The eight reactors that shut down in August 2011 are especially poorly protected. Following the attack of September 11, 2001 on the World Trade Center and reports that Al Qaeda had engaged in planning for an attack on a nuclear power plant, the threat assessment dramatically changed. The Federal Administrative Court has reckoned with this danger since 2008, deciding that supervising authorities have to examine whether new nuclear plants (in the case at hand, an interim nuclear

waste storage facility) are able to withstand such a terrorist attack.¹⁶

It is indeed true that the condition of German reactors did not worsen because of the incidents in Japan. But the Fukushima experience has brought new information to light that must, in the German legal and regulatory system, be considered in the assessment of risks posed by nuclear power plants.

First of all, the Fukushima accident raised doubts as to whether all of what had been considered the “residual risk”—to date accepted as unknowable—really is beyond human comprehension. No tsunamis are expected to affect German nuclear plants, but German authorities have previously presumed earthquakes will not exceed a certain seismic intensity, and they do not demand evidence in safety plans regarding more intense earthquakes. Until now, such non-controlled risks have been thought of as residual, meaning no safety precautions had to be provided against them. In Japan, however, the magnitude 9 earthquake that caused huge tsunami waves had also been considered residual risks; the Fukushima accident shows that such low-probability, high-impact risks cannot safely be disregarded. And the German authorities decided that the Fukushima experience made an intensive reassessment necessary to determine whether risks that had been accepted as residual could become reality in Germany, too.

Second, the Fukushima disaster suggested that the methods used for documenting that nuclear plants are safe may be insufficient, even illusory. During the licensing process, German nuclear plant operators attempt, in hundreds of files

and on thousands of pages of paper, to prove through abstract calculation that highly complicated and elaborate safety precautions can prevent a nuclear meltdown from happening. In Japan, the Tokyo Electric Power Company offered the same sorts of proof-of-safety documentation, but an earthquake and tsunami shut down all the complicated safety systems at Fukushima Daiichi at once, leaving plant workers working at the most primitive level of safety practices, cooling overheated nuclear reactors with fire hoses. Following this experience, German authorities decided an examination of the processes by which nuclear plants are proven to be safe—evidence of safety that is, in some cases, decades old—was absolutely essential.

For all of these reasons, it seems very likely German courts will find that supervisory authorities acted reasonably when they temporarily shut down eight older nuclear power plants. During that administrative shutdown, the German authorities were able to obtain and evaluate the latest findings from Fukushima, note the examination results of the Reactor Safety Commission, and apply this new information to specific reactors. In other words, it appears that the authorities lawfully ordered the temporary shutdown, as per Section 19 of the Atomic Energy Act, and a claim by nuclear operators for compensation for losses is therefore not justified.

German authorities would likely also make the preceding arguments about the need for safety reassessments during any proceedings at the International Centre for Settlement of Investment Disputes. That arbitration panel could, however, interpret the extremely

abstract regulations on protection of investment laid out in the Energy Charter Treaty in such a way that they protect property more strongly than the German constitution. A conflict could therefore arise between Germany's democratic reorientation of its approach to nuclear energy and international investment share protection.

Still, Germany enacted an energy turnaround that includes a phasing-out of atomic energy through an overwhelming democratic majority. The statutory regulations that shut down outdated nuclear reactors and that limited the life spans of other reactors are expressions of this political reorientation. With this decision, the German population resolved to no longer contribute to the atomic risks highlighted by Fukushima. The German constitution enables this type of democratically legitimate reorientation, so long as the interests of those disadvantaged by the decision are dealt with fairly.

By limiting nuclear power plant licenses to a running time of 32 years, the German legislature allowed for the amortization of employed capital and an adequate profit for nuclear operators. This compromise allows for a reorientation of Germany's energy policy and a safeguarding of the financial interests of those affected. To a great degree, the compromise seems to have inoculated the German government against major legal ramifications, and it is to be recommended to all other countries whose constitutions allow the flexibility for such a possibility to develop. It is an approach that could point the way toward a future without energy-related nuclear risks, if the democratic majority in a particular country wants to follow it.

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Notes

1. On the authority of the ministry, this draft was designed by one of the authors, Alexander Rossnagel. It was based on the report *Die Beendigung der Kernenergienutzung durch Gesetz* (Rossnagel and Roller, 1998).
2. Enacted on July 25, 2002. See *Bundesgesetzblatt I*: 1357.
3. Enacted on December 8, 2010. See *Bundesgesetzblatt I*: 1814. In the Eleventh Amendment, the legislature regulated only additional volumes of electricity. All legal adjustments to the longer running times for the reactors are regulated in the Twelfth Amendment of the same day.
4. On March 14, 2011, the government ordered the Biblis A, Neckwestheim 1, Biblis B, Brunsbüttel, Isar 1, Unterweser, Philippsburg 1, and Krümmel power plants shut down.
5. See http://www.rskonline.de/downloads/rsk_sn_sicherheitsueberpruefung_20110516_hp.pdf.
6. Enacted on July 31, 2011. See *Bundesgesetzblatt I*: 1704.
7. At the latest, the license of the Grafenrheinfeld reactor expires at the end of 2015, the license of the Gundremmingen B reactor at the end of 2017, the license of the Philippsburg 2 reactor at the end of 2019, and the licenses of the Grohnde, Gundremmingen C, and Brokdorf reactors at the end of 2021. The last three nuclear power plants—Isar 2, Emsland, and Neckarwestheim 2—are to be taken out of

the network by December 31, 2022, at the latest.

8. See the following decisions of the Federal Constitutional Court: vol. 49, p. 89, 135 ff.; vol. 53, p. 30, 57 ff.; vol. 77, p. 381, 402f.
9. See the decisions of the Federal Constitutional Court: vol. 49, p. 89, 141f.
10. Per Section 7 II of the Atomic Energy Act, which insists that, following the “principle of the best possible hazard prevention and risk precaution,” state-of-the-art of science and technology must be adhered to in the protection of life and health.
11. See <http://www.icsid.worldbank.org/ICSID/Index.jsp>.
12. See http://www.encharter.org/fileadmin/user_upload/document/GE.pdf.
13. Section 19 III.
14. For “Safety Requirements for Nuclear Power Plants” of October 1977, see *Bundesanzeiger* 1977, Nr. 206; for the October 1981 guidelines of the Reactor Safety Commission for pressurized water reactors, see <http://www.rskonline.de/downloads/8110dwr.pdf>; for the guidelines for assessing the construction of nuclear power plants with pressurized water reactors against incidents, October 1983, see *Bundesanzeiger* 1983, Nr. 245a.
15. Enacted in 1994. See *Bundesgesetzblatt I*: 1618; explanations in *Bundesrats-Drucksache* 896/93, p. 30f.
16. See *Bundesverwaltungsgericht, Neue Zeitschrift für Verwaltungsrecht*, 2008, p. 1012.

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