SECURING CASTOR TRANSPORTS AND NUCLEAR ENERGY MATERIAL: THE CASE OF GERMANY

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ABSTRACT: The year 2022 will probably mark the end of the German nuclear age. Nevertheless the question of how to secure the transport of nuclear energy material will remain relevant for an indefinite period of time: neither does the Federal Republic of Germany have final repository nor is it building one. The transport of nuclear material includes a high number of risk factors, e.g. terror threats and the risk of natural disasters. The article analyses the specific case of the German nuclear policy by looking at the past and current situation and by taking future developments into account.

KEYWORDS: castor container; castor transportation; nuclear energy; nuclear waste; nuclear phase out; final repository; security policy; terror threat;

Introduction

The use of nuclear energy, the transport of radioactive material and especially the question of how to find a final repository for nuclear waste isa frequently discussed issuein German media, society and the political debate.

The discourse started together with the anti-nuclear-movement in the 1970s and led to the foundation of the German Green Party (Bündnis 90/Die Grünen) in 1980. The Greens, which first were seen as a short-term interlude, soon became an established player in the German political landscape and finally joint the coalition

of Chancellor Gerhard Schröder (SPD) in 1998. The Atomic Energy Act of January 2, 2002 marked the starting point of a gradual nuclear phase out without specifying a definitive date.

In 2010, Schröder's successor Angela Merkel (CDU) pushed towards an extension of the operational life spans for nuclear power plants by passing the amendment of the German Atomic Energy Act. Nevertheless, in March 2011 the Federal government of Chancellor Merkel did the most significant step towards the post-nuclear age: Only a few days after the Fukushima nuclear disaster in Japan, the Federal Government pledged the nuclear phase put by the end of 2022. In the following months, eight out of seventeen German nuclear reactors were permanently shut down without causing an energy crisis, as critics of this policy had predicted it. Surveys showed that the announcement of a nuclear phase out was backed by a large majority of the German society: according to the polls of the ZDF-network from April 2011, 72 % of the Germans supported a fast exit from nuclear technology.

But even so the Federal Republic of Germany will most likely reach thisstated goal and shut down the last nuclear power plant in 2022, the question of how to secure the carriage of castor container and nuclear energy materials is not going to disappear simultaneously due to following reasons:

(1) Nowadays 26 German castor containers with high-radioactive nuclear waste are still stored in the nuclear fuel reprocessing plant of La Hague in France and Sellafield in GreatBritain, which have to be returned to Germany over the next few years.

(2) The remaining reactors in Germany are producing about 250 t of spent fuel elements each year. This high-risk waste has to be brought to one of the interim storage facility.

(3) So far, the Federal Republic of Germany does not have a final repository at its disposal nor are there concrete plans to build one, even so the discussion started as early as in the 1980s. Due to these circumstances, each of the nowadays existing castor containers, which are stored now in one of the interim storage facilities in

Gorleben, Ahaus and others, have to be transferred to a final repository in the near or far future. This actually may take more than a while. According to the assessment of Michael Müller, Chairman of the "Commission for the disposal of high-level radioactive waste" at the German Parliament, the search for such a facility will last at least until the year 2170.

It is for this reason that efficient concepts for a safe and secured transportation of castor containers are deeply required and won't lose their relevance after the German nuclear phase out in 2022.

In principle, the transportation of nuclear material and radioactive waste is an every day business in Germany. According to the Federal Ministry of Transport, about 800.000 radioactive packages are shipped between two spots each year. However, the high majority of those elements belongs to the sector of low-level or medium-level nuclear material and are by-products e.g. of nuclear technology, nuclear fission, research and medicine.

Only less then 10% of the transports is to be defined as high-level radioactive material and most of them don't take place on public transportation routes but only within the power plant's facility.

Risks and challenges of castor transports: The German Case

High-level radioactive material are mainly generated in the reactor core, e.g., spent fuels, and include more than 99% of the total radioactivity which is produced during the nuclear power process. For this reason it requires a special radiation shielding during usage and transport. In Germany, high-level nuclear material is only transported in Castor Containers[1], a trademarked brand of dry casks used to store spent nuclear fuels and other high-level radioactive waste for a certain amount of time, before it is transferred to a final repository.Castor containers are manufactured by GNS, a German provider for nuclear services. In the long run, the Castor containers have to be replaced by other receptacles, since they are not suitable for a permanent disposal, which would last at least 100.000 up to 1.000.000 years.

[1] Short for: „cask for storage and transport of radioactive material"

The responsibility for the transportation of high-level radioactive material lies with the German Federal Office for Radiation Protection, which gives the authorization for transportations of Castor containers.

The transportation of high-level radioactive material includes a number of risk factors:

The risk of transportation: Critics claim the high risk of castor transportation due to the defective quality of the container's material. Although safety tests proved that Castor container could resist a heat of 800 degrees for more then 30 minutes, this might not be enough in several possible real-life scenarios. A major traffic crash during the transport could cause a fire with much higher temperatures: for example during an accident in the Mont Blanc Tunnel in 1999, burning trucks caused a fire of more than 1.200 degrees which lasted for several hours. It took more than five days before the tunnel cooled sufficiently to start repairs. Until today, no tests have shown that a Castor container could survive such an accident unscathed.

The risk of terror attacks: The risk of terror attacks is hardly taken into consideration within the German debate regarding castor transportation, even so acts of sabotage, e.g. damaging the railway line or power lines and blocking access roads, are part of nearly every castor transport since 1995. However, those acts are performed by anti-nuclear activists, who don't intend to damage the containers seriously butwant to slow down or stop the transportation.

Indeed, during the long-distance transportation, the castor containers are travelling partly through difficult to monitor remote areas and forests, before they reach their destination. A full protection cannot be guaranteed during this time and the containers becoming easy targets for potential terror attacks. For example, expert opinions showed that castor containers would suffer serious damage in case of being hit by an anti-tank missile or similar transportable weapons. Anti-terror concepts to secure castor transportation are not very advanced. Protection is mainly maintained by a growing number of police and security officials, who are escorting the transports.

Even so the route of a castor transport is never published in advance, experts usually can estimate which route the

transport is taking because the streets and railway roads, which can be used for such a venture, are limited. Unlike in France, the German law does not formally forbid the advanced release of the castor containers' travel route.

Emerging of radiation: The risk of castor containers lies not only in traffic accidents and potential terrorist attacks. Also human failures, e.g. during the preparation of the containers, material weakness or material fluctuations and natural disasters as earth-quakes are high risk factors which could cause a leak of radiation and endanger the security guards, the demonstrators and the environment.Emerging radiation is a serious threat and can be caused by a number of unpredictable factors.

The question of democracy: Beside those risk factors, another aspect has to be taken into consideration regarding castor transportations: the acceptance or not-acceptance of those transports within the population and civil society.

The German opposition towards the use of nuclear energy and the transport of nuclear material and its storage in interim facilities has always been strong and neither new technology, different government's policy approaches or a generational change caused a change of mind within the German society. The anti-nuclear-movement is one most persistent German grass-root-movements, which are influential both on the local and national level. For the government this means a continuous balancing act: the castor containers with the nuclear waste have to be brought to interim storage facilities, but the loud voice of civil society can not be completely ignored.

The German opposition towards the use of nuclear energy and especially the establish-ment of an interim or even final repository has been highly strong since the early beginning. The northern German town Gorleben played a key role in that movement and became famous both nationally and internationally because of the populations constant fight against the plans to establish a deep geological repository for radioactive waste along with interim storage units.

The above ground cask storage site for Castor containers in Gorleben was already com-plated in 1983 but it took until 1995 before the first containers arrived at the facility

due to a number of lawsuits, which tried to prevent this development.

The first transport of Castor containers, which arrived in Gorleben on April 25, 1995, caused large protests and resistance among local residents. In the weeks ahead, protesters damaged the railway line between Lüneburg and the final loading station of Danneberg and tried to dismantle parts of the tracks. Altogether about 15.000 police officers and officials of the German Federal Border Police secured the transport. In Danneberg, the containers were loaded on trucks to be carried 18 kilometers to their final destination in Gorleben. Due to large protests and roadblocks, it took more than five hours before the castor containers arrived at interim storage facility.

This procedure did not change during the following years. In March 1997 the third castor transport to Gorleben was guarded by about 30.000 police officers and 10.000 protesters who tried preventing the containers from arriving at the interim storage facility by using burning straw bales, road blockings and sit-ins. The expenditures were summed up to 18 Million DM, which did not include the large number of extra hours of the security staff.

In 1998 the castor transports were stopped for several years until 2002 after it became known that a transport from La Hague exceeded the allowed value of radioactive substances.

The 13th and so far last German Castor transport arrived in Gorleben in November 2011. It took more than five days for the containers to reach their final destination at the interim storage facility and marked a new negative all-time high in the history of German castor transports: the police proceeded with water cannons and pepper spray against the demonstrators; the protesters used fireworks and burning straw bales.133 policemen and 355 protesters were injured, 27 tractors confiscated, 43 protesters arrested. The total costs went up to 33,5 Million € and caused protests of the state government of Lower-Saxony, which had to cover those bills.

Conclusion

By looking at the history of German Castor transportations, one thing becomes obvious: over a

period of 20 years, nothing has changed. The transport of nuclear energy material, the use of interim storage facility or the establishment of a final repository are not accepted within the German society and led to huge protest movements. The arguments of the nuclear opponents are the same: the fear of long-term, irreversible health impairments and environmental damages due to uncontrollable nuclear radiation.

Neither politics, new technology or security concepts nor a growing amount security forces could make the transport of Castor containers more acceptable within the Ger-man society, nor did the responsible officials find a way to make the transport of Castor containers faster, safer or cheaper. In fact, the opposite turned our to be the case: the transportation of castor containers became more expensive, took constantly more time and was unable to find a more efficient security concept, which would prevent opponents from damaging railway roads, blocking streets or climbing on the containers.

Nevertheless, it is unquestionable that the produced nuclear waste has to be stored somewhere. The search for a final repository already started decades ago but did not led to any results yet. In general, Castor containers have to be stored in interim storages for at least 20 to 30 year to cool down before they can be transferred to an underground facility. During this period, they are kept in aboveground interim storage facilities, e.g. in Gorleben, Ahahus and Nord-Lubmin. The interim storages are hardly secured. Radioactivity can easily be released, either due to a technical problem, a damaged container, an accident like a fire or an environmental disaster like an earthquake or a terror attack. Also with regard to the interim storage facilities, the question of how to prevent natural or human-made disaster is only raised since a few years.

A long-term solution for the storage of the existing Castor containers is not yet found, even so the Federal Government encourages the search for a final repository. So far, Finland is the only country in the world that started to build a final repository for its high-radioactive nuclear waste.

The search for a final repository is not only slowed down by the protest of the local population, who don't want such a facility being build in their neighborhood, but it

faces also a number of challenging criteria to guarantee a long-term safety:

(1) Depending on the material, the storage need to be kept safe for 100.000 up to 1.000.000 years to store the material until it decays into non-radioactive material.

(2) A strong and steady seismology has to be guaranteed during that period: the storage needs to be safe from earthquakes, intrusion of water or effects of the climate change.

(3) The insulation capacity should not change during this period of time.

(4) Also the risk of terror attacks and wars has to be taken into account.

By looking back 100.000 years in human history, it is very obvious that 100.000 years are an amount of time where nothing could be guaranteed or excluded.

What remains to say by looking at the German case? Most likely, the next Castor transport in Germany will arrive during 2016. There are no signs that the protest movement will decline and the up-coming Castor transport probably won't differ from the previous one.

The anti-nuclear movement in Germany is well established and can be found in nearly any social strata. Nevertheless, a final repository for high-radioactive waste is deeply required. To convince the population from this necessity and building confidence in the safety of new technology are one of the central tasks and challenges of the responsible companies and the government.

Also the security concept of castor transport has to be reworked. The growing threat of terror attacks need to be taken into consideration to prevent irreparable damages. New security concepts might also help to gain trust within the population and to pave the way for a future final repository.

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