Dangers from Proposed Belarus and Russian Nuclear Power Plants to Lithuania

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Lithuania, a country approximately the size of West Virginia, is situated on the southeast shore of the Baltic Sea. Lithuania's existence is currently being threatened by nuclear power plants (NPPs) which Belarus and Russia are planning to build adjacent to Lithuania's eastern and southwestern borders.

Figure 1. Kaliningrad and Belarus nuclear power plants (NPP1 ans 2) on the border of Lithuania

One NPP containing two reactors, will be situated in Astravets, Belarus, approximately 12 miles east of Lithuania and about 31 miles from its capital city of Vilnius. The other set of two reactors will be constructed in the Kaliningrad enclave approximately 6 miles south and west of Lithuania's border. (The Kaliningrad enclave is a small patch of Russian-administered land wedged between the European Union nations of Poland and Lithuania.) In case of a nuclear disaster, the two NPPs pose a grave danger to Lithuania.

The Kaliningrad and the Belarus NPPs, by being built on the borders of Lithuania, place the entire country in a ominous nuclear vise (Figure 1). A nuclear failure at either plant would expose large and densely populated areas of Lithuania to deadly radiation and nuclear poisoning. The NPP in Belarus would impact the entire metropolitan Vilnius region and thus more than a third of Lithuania's population (Figure 2). A failure in the Kaliningrad NPP would place approximately a fourth of Lithuania's population at risk. (Figure 3). In total, more than half of Lithuania's population would be subjected to nuclear-based devastation in the event that both plants experience concurrent nuclear disasters. While such simultaneous NPP failures may at first appear to be remote, they are not beyond the realm of the possible. One need only consider Chernobyl and the 9/11 attack as well as human error, negligence, defects in planning and construction, acts of terror, war, seismic activity and aircraft crashes.

KALININGRAD NPP

The Kaliningrad NPP will contain two third generation VVER-1200/491 pressurized water reactors in an AES-2006 standard design configuration. Each of the two reactors are to have a capacity of 1150 MWe supplied by Atomstroyexport (Russia). The first reactor is planned to be operational by 2016 (preparatory work has already started), and the second is scheduled to be completed by 2018.

BELARUS NPP

Similarly, the Belarus NPP, currently known as Astravets NPP, will also be constructed by Russia's Atomstroyexport. It would also be equipped with third generation VVER-1200 type reactors. The first reactor of the Astravets NPP is expected to be operational by 2016-17, and the second by 2018-2020. Each reactor is planned to have 1150 MWe capacity. Belarus is expected to add two additional reactors by 2025.

Lithuania is deeply concerned in that Russia and Belarus have not coordinated or reconciled the site selection with Lithuania from a safety standpoint. Lithuania deems the proposed sites as major and unnecessary risks to its survival not only in terms of potential radiation poisoning of its population, but also the consequent devastation of its land and urban areas. Any new nuclear plant construction must consider the consequences of the meltdowns in Chernobyl in 1986 and Fukushima in 2011. According to Gregory Yaczko, Chairman of the Nuclear Regulatory Commission, in his report to the American Association for the Advancement of Science Symposium in 2011, the area affected by the Fukushima nuclear disaster covers an 80 km radius, and at present it cannot be established when the displaced inhabitants could return to their homes.

Nuclear incidents do not recognize state or country borders, or even great bodies of water. As a case in point, Sweden suffered radioactive cesium contamination from the Chernobyl disaster even though it was some 500 miles distant from the site, including 200 miles over the Baltic Sea. It stands to reason that such volatile objects should not be constructed on the borders of a neighboring country exposing it to a risk of mortal danger. To preclude such an occurrence, international conventions on nuclear safety require transparency, bilateral and multilateral review, and due process leading to a resolution of disputed issues. The parties of origin, in this case Russia and Belarus, are mandated to adhere to internationally established nuclear safety standards as established by the International Atomic Energy Agency (IAEA).

Notwithstanding Lithuania's numerous requests directed to Russia and Belarus for the site selection criteria as to both NPPs, neither Russian and Belarusan authorities have produced any substantive data but for self-serving conclusory assertions that they are in compliance with safety standards. In contrast, IAEA and Espoo conventions require that there be compliance with clearly stated processes before the construction of new NPPs. They include: justification, generic design assessment, strategic siting assessment, national policy statement, licensing and planning. The sequence of these internationally established procedures are logical and necessary, and should be strictly adhered to and not be preemptively dismissed by the parties of origin.

Summary of Issues

The Lithuanian American Council (LAC) is concerned that once the construction of the Belarus and Kaliningrad NPPs has commenced, Lithuania will be confronted with an irreversible situation. LAC agrees with Lithuania's authorities that NPPs planned at the currently designated Belarus and Kaliningrad sites, constitute a threat to Lithuania's existence. The following considerations summarize our concerns:

1. **Consequences from structural damage to the reactors caused by seismic disturbances, external impacts, and acts of terrorism;**
2. **Questionable structural, electrical and mechanical integrities of subject NPPs;**
3. **Sufficiency of water and other physical resources needed to contain the effects of a nuclear disaster;**
4. **Safety of Lithuania's population in the event of minor and major NPP failures;**
5. **Provisions for notification of emergencies and evacuation of the populace;**
6. **Effects on water, vegetation and habitat over the entire land area of Lithuania, and Kaliningrad and Belarus regions;**
7. **Availability of funds to cover shelter and subsistence for evacuees;**
8. **Plans and provisions to resolve long term contamination effects;**
9. **Short term and long term storage and removal of spent nuclear fuel;**
10. **Consent of the populations at risk**

Figure 2. Zones of nuclear endangerment by the Belarus nuclear power plant.

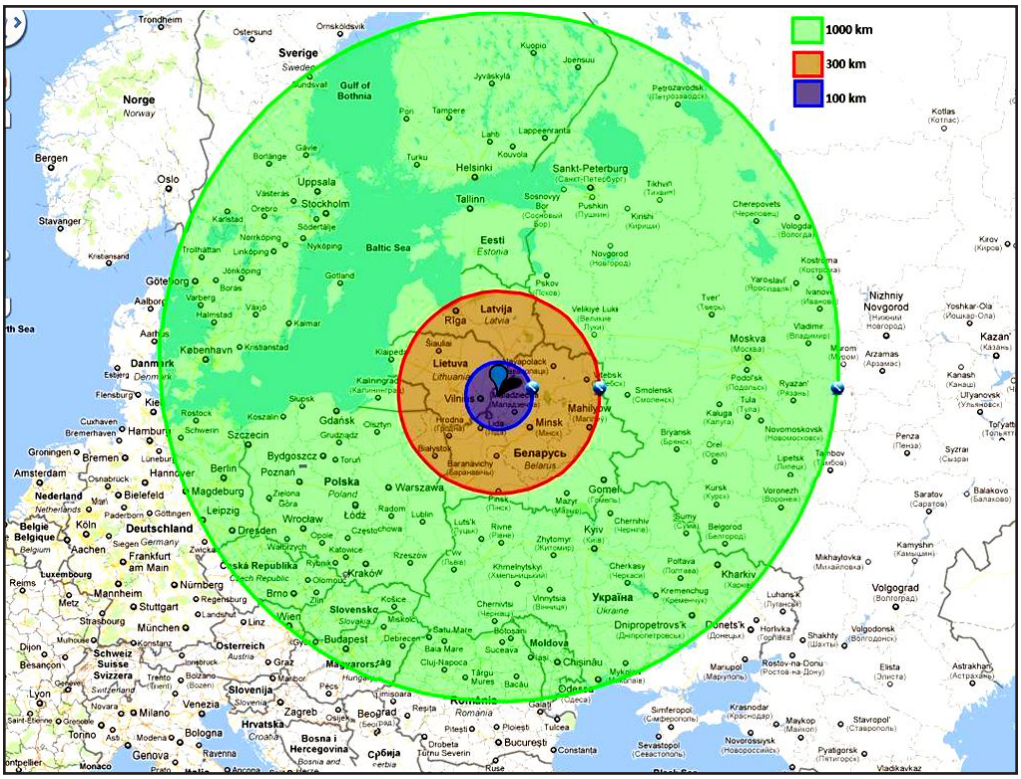
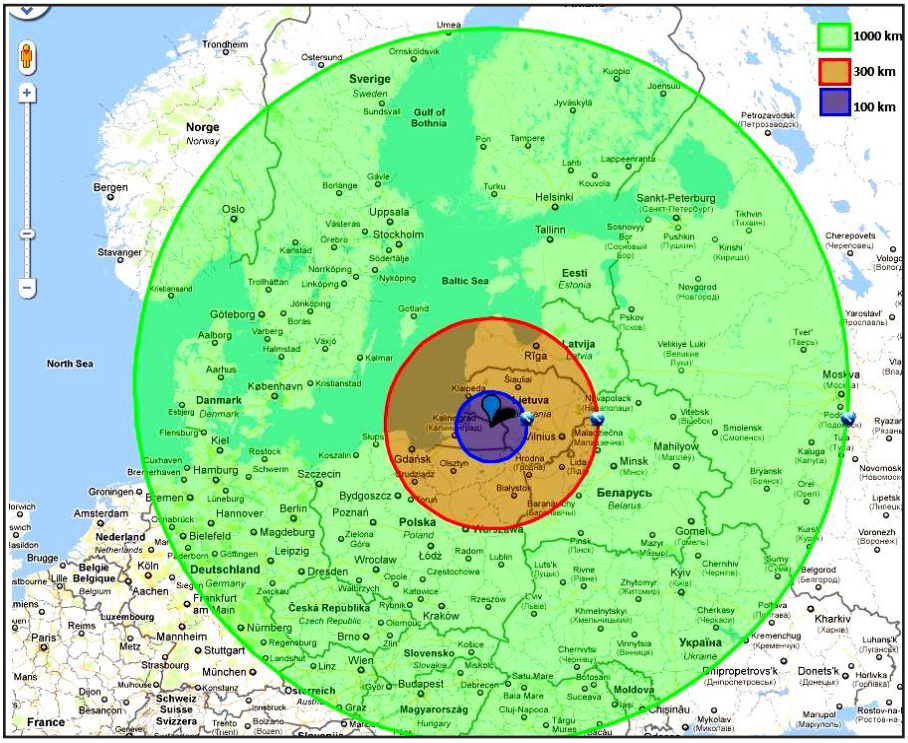


Figure 3. Zones of nuclear endangerment by the Kaliningrad nuclear power plant.



1. Consequences from structural damage to the reactors caused by seismic effects, external impacts, and acts of terrorism

The recent Fukushima nuclear accident has focused the international community on the need to evaluate the risks and consequences of all possible scenarios potentially placing nuclear reactors at risk. Notwithstanding this international consensus, Belarusan and Russian authorities continue to ignore, or at best minimize, the risks of earthquakes on the reactors at the proposed NPP sites.

Belarus in the EIA states that:

> There is a zone in the southwest part of the region (...) In 1908, according to the archives and literary sources, a big earthquake took place in Ostrovetsky district with the epicentre being near the settlement of Gudoai. It measured 6-7 on the MSK-64 scale and the effects were substantial in magnitude.

However, in the following sentence, Belarus authorities assert that the "....maximum probable earthquake magnitude would not be expected to exceed a level of 5," based on their own self-serving and unsubstantiated evaluation that there exists a "...low probability of stronger earthquake."

Russia has not made any public earthquake assessments in the Kaliningrad region, even though in the immediate vicinity of the proposed NPP a Richter 5 level earthquake was recorded as late as 2004.

Furthermore, Ivan Grabelnikov, the chief engineer overseeing the Kaliningrad NPP project, in the course of a technical conference conceded that neither the VVER-1200 reactors nor its buildings have undergone simulation testing with respect to potential aircraft crashes at the site. On the other hand, nuclear facilities operating in Western Europe are currently required to substantiate that new reactors will be able to withstand such impacts. A direct plane crash into a reactor containment building would not only destabilize the reactor, but would also jeopardize the integrity of the onsite storage facilities housing the spent but still radioactive nuclear fuel. To the best of LAC's knowledge, no protection is provided against such incidents at either the Kaliningrad or Belarus sites. This is especially disconcerting as there exists a major north-south flight corridor over the planned NPP site in Belarus. It is also a matter of record that in 2005, a Russian fighter jet actually crashed in Lithuania near the planned Kaliningrad NPP site.

2. Questionable structural, electrical and mechanical integrities of subject NPPs

Recently Russian authorities claimed that comprehensive stress tests (allegedly applying standards beyond those adopted by the EU) were performed on all NPPs in the Russian Federation with positive results. However, the structural collapse of the Leningrad-2 NPP containment building in the summer of 2011 raises questions about the veracity of such claims and the validity of the tests. Russia's own internal reports confirm that equipment failures at nuclear power plants are fairly frequent because of "...such underlying causes as mismanagement, flaws in maintenance organization, manufacturing and design defects."

Furthermore, the VVER-1200 reactors belong to a completely new Russian reactor series, dubbed as AES-2006. They are touted by Rosatom as the latest and safest technological achievement. But the fact is, this reactor model has no extensive history of operation to substantiate such safety or reliability claims. During the construction of a similar reactor in China, the Russian contractor received repeated complaints from the Chinese concerning the quality of materials used and equipment employed. These concerns eventually led to a significant delay in the NPP construction. During the first year of operation, the reactor in China had to be stopped twice to deal with unplanned maintenance procedures.

Both, the Russian Federation and Belarus ought conduct risk and safety assessments for these particular reactors applying IAEA test and evaluation protocols and provide documented assessments for review by the European Commission as well as to the Republic of Lithuania, as the principle affected and aggrieving party.

3. Sufficiency of water and other physical resources needed to contain the effects of a nuclear disaster

Sufficient water resources are needed at NPPs not only to cool reactors in the course of normal operation, but also to contain nuclear fires and reduce the escape of nuclear contaminants into the atmosphere in the case of an accident. The Fukushima nuclear disaster required several million cubic meters of water merely to limit the spread of fire. During the nuclear fire, even the quantity of water in the large Fukushima cooling basin was insufficient. A significant quantity of water had be pumped directly from the ocean to the site.

Limited water supplies at the Belarus NPP are a particularly critical issue. There are no significant water resources in the region. The nearest sizeable stream that is to provide and fill the cooling basin is several miles away. It is approximately the size of the Rock Creek in Washington, D.C., flowing more in the rainy season and nearly dry during summer droughts. Furthermore, the stream's water level is some 42 m. lower than the plateau of the terrain of the NPP. This further limits water availability to contain critical reactor events. While the size of the proposed cooling basin is not known, it is obvious that short of creating a very large lake, a limited size cooling basin would not be sufficient to contain a reactor meltdown.

It also needs to be pointed out that down-flowing waters from the nearby creeks merge into the Neris River which is less than 30 miles downstream and meanders through the center of the city of Vilnius. The river, before reaching Vilnius, becomes the principal source of potable water for nearly a million people living in the metropolitan Vilnius area. In the event of leakage or fallout of nuclear contaminants into the area's waterways, Vilnius and the surrounding area would become uninhabitable and the land unsuitable for agricultural use. It would decimate the wildlife in the region, and for many miles would poison the entire downstream river basin that is situated entirely within Lithuania's borders.

With regard to water resources for the Kaliningrad NPP, Russia is planning to divert part of the sizeable Nemunas River to fill the cooling basin. The river, 6 miles north of the NPP, constitutes a common border between Lithuania and the Kaliningrad oblast, until it reaches the delta area, some 40 miles to the west. LAC has no knowledge of how much water would be diverted to accommodate the Kaliningrad NPP, the size of the proposed cooling basin, and whether the volume of water would be sufficient to con-

tain a nuclear meltdown. However, it is certain that any down-flowing return of contaminated water from the NPP into the river Nemunas would seriously endanger the downstream part of the entire river basin and the inhabitants living along its shores. Of even greater concern is the ecological impact on the Nemunas river delta, merely 40 miles downstream from the NPP site. The delta area is located entirely within the territory of Lithuania, with water flowing extremely slowly or not at all. Atomic residue from the Kaliningrad NPP would accumulate in significant quantities, creating a cesspool of irradiated nuclear waste. The delta area is not only densely populated, but it is also a major wildlife sanctuary, particularly as a stopover point for migratory birds between Europe's northern nesting grounds in summer and southern grounds in Africa during the winter season. In case of nuclear poisoning of the delta waters, the entire ecosystem of central Europe would be jeopardized.

4. Safety of Lithuania's population in the event of minor and major NPP failures

Radioactive materials escaping from a nuclear power plant can have varying effects depending on the type of failure and the distance of populated areas from the failure site. In the case of the Chernobyl disaster, 30 workers died within a month after being exposed to high levels of radiation at that site. Many others, in the thousands, sustained serious injuries from radioactive exposure. Some of them died later, but many suffered ongoing illnesses, traumatized for the remainder of their lives. In the Fukushima radiation zone in the wake of the meltdowns high death rates were recorded among the abandoned livestock. Of the 3,500 cattle that remained in the radiation zone, 2,500 died, and the remaining appear terminally ill.

Large doses of ionizing radiation can cause cell death, while lower doses may interfere with cellular proliferation. Response to radiation depends on rapidity and the portion of the body exposed. Significant illness is certain, and death is possible, when a whole-body dose exceeds 4.5 Gy delivered over a short time interval.

Children and pregnant women are more susceptible to radiation injury because of their higher rate of cellular proliferation. After the Chernobyl meltdown, over the period of 1990-1998, 60% of children tested were found suffering from radiation effects; 1,981 of them were diagnosed with thyroid cancer.

Victims subjected to a high level of radiation either die shortly after exposure (cerebrovascular syndrome) or, if they survive, will sustain incurable longer term damage to their intestines, suffering vomiting and diarrhea, and to their bone marrow resulting in weakened red cell production and eventual onset of cancer.

Lower dose damage in the first thirty days rarely cause immediate danger to human life (GI syndrome), but symptoms of radiation can be felt as chronic fatigue, headache, fever, nausea, vomiting, anorexia, incurable sores, loss of hair, and eventually may develop into leukemia or other forms of cancer. Other effects could include genetic mutation, premature aging, and disorders of the nervous and mental systems.

The toxins and long term effect of radiation poisoning make it imperative that the impacted populace be immediately evacuated from the affected area to assure minimal exposure to radiation. It is also essential that needed medical assistance including medications be held in readiness and be made available to counteract the effects of radiation exposure.

Neither Russia nor Belarus has offered to discuss preparation and provision for such eventualities, and to date, the potential radiological impact of a nuclear accident on Lithuania's population has not been properly addressed, let alone evaluated, by either of the project sponsors.

5. Provisions for notification of emergencies and evacuation of the populace

Early warning and extensive emergency evacuation provisions need to be established in bilateral discussions and treaties. Lithuania currently has a bilateral treaty with Belarus on early notification of nuclear accidents. Lithuania has also proposed such a treaty with the Russian Federation, but so far it has failed to respond. Furthermore, there are no discussions on how Russia and Belarus would facilitate, in the event of a nuclear disaster, the evacuation of Lithuania's capital Vilnius and other densely populated areas. In the case of the Chernobyl accident, immediate evacuation of some 120,000 people during the first 24 hours had to be effected. Similarly, the Fukushima accident resulted in the evacuation of 170,000 people within a similar period. Since any Belarus and/or Kaliningrad NPP failures would affect mostly the people of Lithuania numbering in many hundreds of thousands, clear evacuation plans and adequate means to do so must be developed in bilateral agreements as required by the Espoo Convention.

6. Effects on water, vegetation and habitat over the entire land of Lithuania, and Kaliningrad and Belarus regions

In the Chernobyl and Fukushima nuclear disasters, large tracts of land were found to be contaminated. None of the agricultural products, be it vegetation or livestock, were suitable for human consumption. Even now several decades after the Chernobyl meltdown, the soil remains unsuitable for growing vegetation and raising animals. Inasmuch as a significant nuclear leakage would involve contamination of major parts of Lithuania's territory, bilateral agreements must be concluded, before any construction work is to commence, on procedures to avoid or minimize damage, and, on methods of compensation, including restitution of contaminated sites to their original condition. A model fund for restitution of contaminated areas has been developed by the United States. It is known as Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or Superfund. The model could be used as a basis for negotiation between Lithuania and Russia/Belarus. The statute assures that parties or organizations responsible for contamination are held accountable for costly cleanup and restitution of the contaminated sites.

7. Availability of funds to cover shelter and subsistence for long term evacuees

The Chernobyl accident resulted in some 330,000 people being permanently displaced, sustaining loss of their homes, places of business, and employment. The Chernobyl accident and the measures taken to deal with its consequences have cost the Soviet Union at that time – and later Belarus, the Russian Federation and Ukraine – hundreds of billions of dollars. Today, social benefits are paid to some 7 million people who have sustained harm from by the Chernobyl accident. Such payments are a huge burden on national budgets and, because of their size, in the long run, may not be sustainable.

Similar experience is facing the people of the Fukushima region. Of the 170,000 evacuated, some 70,000 people are unable to return to their former living areas as they are deemed too dangerous for habitation.

Any significant Belarus and Kaliningrad NPP failures involving a major radiation leakage or meltdown, would predominantly impact the people of Lithuania. Accordingly, adequate funds or insurance must be set aside by owners of the reactors and escrowed by a third party to pay for possible long term losses. Considering past experience, reluctance to acknowledge such events and even their severities, and refusal to honor agreements and promises, verbal assurances by the governments of Belarus and Russia to assume financial responsibility are inadequate. This question can only be resolved through ironclad commitments before any NPP construction is started.

8. Plans and provisions to resolve long term contamination effects

The Chernobyl accident involved the discharge of substantial quantities of radioactive substances into the environment. An area of 76,100 km2 was contaminated mostly with high concentrations of radioactive nuclides such as iodine 131, cesium-137 and strontium 90. The contaminations required mass evacuations of people. It disrupted the way of life and economic activity in various parts of Russia, Ukraine and Belarus. In just the first year after the accident, 144,000 hectares of farm land were taken out of use, forestry work was stopped in an area of 492,000 hectares, and most industrial and agricultural enterprises ceased operations in the affected area.

Assuming a uniform circular dispersion pattern within a radius of 70 km., a Chernobyl level accident at the Belarus NPP could contaminate approximately 6,000 km2 (approx. 10%) of Lithuania's territory by high concentrations of nuclides. The affected area would include the entire city of Vilnius with some 600,000 inhabitants. A Chernobyl level meltdown at the Kaliningrad NPP could affect more than 10,000 km2 or about 16% of Lithuania's area. Since radiation contamination of buildings and land would have long term effects and prevent their use, agreements must be reached on how the contaminated objects would be restored to their pre-damage state, or what other type of remedies need to be considered. While the likelihood of a Chernobyl-type accident is small, nevertheless, Lithuania's concerns must be addressed and consideration given to alternative sites. Minimal acceptable distances from the NPP to Lithuania's borders must be established and assurances given that drainage and down-flow of any contaminated waters into its territory will be prevented. This all must be determined by mutual agreement between parties before construction of the NPPs commences.

9. Short and long term storage and removal of spent nuclear fuel

Used nuclear fuel is a solid material that is initially securely stored at nuclear plant sites. This temporary storage is one component of an integrated spent fuel management system that addresses all facets of intermediate and long term storing of radioactive nuclear fuel.

Spent nuclear fuel that remains stored at nuclear power plants, is normally contained in steel-lined, concrete pools or basins filled with water. Upon initial cool-off period of some 5 to 10 years, it is transferred to massive, airtight steel or concrete-and-steel containers. Eventually, after several decades the spent fuel rods may be transferred to a permanent geologic repository unless recycled for reuse, or a new technology is discovered for their use in other applications.

The stored spent material, similar to virgin nuclear material used by the NPP, is subject to terrorist attacks, natural disasters such as power failures, overheating due to coolant leakage, destruction by acts of war, and accidental or targeted plane crashes. Any damage to containers and their content can result in a dangerous release of radioactive contaminants. While it may be assumed that eventually spent nuclear materials would be transferred from the Belarus NPP by way of safely packaged railroad containers to some permanent storage sites in Russia, LAC has no information confirming that such will occur.

Of equal concern is the handling and storage of radioactive materials at the Kaliningrad site, since it is less than six miles from Lithuania. LAC has no information as to Russia's plans concerning the storing of the spent radioactive materials at the NPP site. Neither is there any information on the transportation provisions which will be employed to transfer the spent nuclear waste for permanent storage. Russia's EIA report on the Kaliningrad NPP provides a statement that a route of transporting the spent materials from the NPP in Kaliningrad to a burial site will be defined in the working documentation. In as much as railroad transport of such materials through Lithuania might not be admissible, the only other way to remove the materials would be either by sea transport or air. Some Russian publications imply that spent nuclear fuel would be transported from the Kaliningrad NPP by the Baltic Sea to the nuclear waste repository in Sosnovy Bor, near Saint Petersburg. However, if such a transport mode would be employed, Russia's current EIA is silent on possible perils to all of the Baltic sea countries in case of a shipwreck or partial cargo loss.

Even though Lithuania has posed questions to Russia and Belarus on methods of disposal of the spent fuel, the LAC notes that Russia to date has failed to address or even seriously acknowledge this critical issue.

10 Consent of affected public, alternative sites, bilateral agreements

Russia and Belarus are disregarding Lithuania's objections to the proposed construction of nuclear plants adjacent to Lithuania's border. The site locations for the nuclear reactors pose a threat to Lithuania's survival as a nation. Accordingly, the construction of both NPPs are in violation of the Espoo and IAEA conventions.

The Espoo Convention on Environmental Impact Assessment in a Transboundary Context of 1991 addresses the responsibilities of the Parties of origin (project initiators).

The Espoo Convention in Article 2 requires that:

> 1) The Parties shall, either individually or jointly, take all appropriate and effective measures to prevent, reduce and control significant adverse transboundary environmental impact from proposed activities, and
>
> 2) the Party of origin shall provide, in accordance with the provisions of this Convention, an opportunity to the public in the areas likely to be affected to participate in relevant environmental impact assessment procedures regarding proposed activities and shall ensure that the opportunity provided to the public of the affected Party is equivalent to that provided to the public of the Party of origin.

Article 5 notes that:

> The Party of origin shall, after completion of the environmental impact assessment documentation, without undue delay enter into consultations with the affected Party concerning possible alternatives to the proposed activity, including the no-action alternative and possible measures to mitigate significant adverse transboundary impact and to monitor the effects of such measures at the expense of the Party of origin.

Article 6 states that:

> The Party of origin shall provide to the affected Party the final decision on the proposed activity along with the reasons and considerations on which the decision was based.

Furthermore, the IAEA Commission decision, 1999/819/Euratom, of November 16, 1999, concerning the accession to the 1994 Convention on Nuclear Safety by the European Atomic Energy Community (Euratom) notes that "In choosing the site, one must consider, inter alia, its effect on the safety of the installation and the effects of the installation on individuals and the environment." It notes further that other contracting parties in the vicinity of the site must also be consulted if the installation is likely to have consequences for them.

While Belarus claims to have presented Lithuania with an environmental impact assessment regarding its NPP, LAC is informed that the Lithuanian government has rejected the assessment saying that questions submitted to Belarus have not been re-

sponded to properly, and that claimed public hearings in Vilnius were either a sham or fabrication, and that actually no substantive consultations have taken place.

There was even less consultation with Russia regarding the Kaliningrad NPP. Russia has neither held public hearings nor offered to participate in bilateral consultations despite Lithuania's request to do so.

It is noted that Constituents in Belarus and Kaliningrad as well as in Lithuania in a series of public demonstrations have repeatedly voiced their opposition to the construction of subject NPPs.

LAC is concerned that the NPPs' site selections were based on political considerations rather than on Espoo and IAEA established criteria requiring that the selection be grounded on sound environmental criteria and particularly by addressing the safety of the population situated near the site.

Lithuania has filed a complaint with the secretariat of the Espoo Convention stating that Belarus, contrary to its assertion, has not complied with mandated procedures of the environment impact assessment process, as is required by the Espoo Convention. Lithuania has also submitted a similar note to the secretariat of the Espoo Convention on the deficiencies in Russia's response regarding the proposed NPP in Kaliningrad. Russian authorities blatantly assert that they are in compliance with Espoo and are following its provisions, notwithstanding its failure to enter into any consultations with Lithuania.

Conclusion

Based on the analysis presented here regarding the two proposed NPP sites, it is amply clear that the EIA process has not been satisfactorily completed and that the requirements of the Espoo Convention have not been fulfilled by Russia and Belarus. Considering the potentially severe consequences for Lithuania in the event of a nuclear failure at either the Belarus or the Kaliningrad reactors, the international community must respond and insist that established nuclear standards be adhered to. LAC urges the United States legislative and executive branches to address Belarus and Russia's governments insisting that they cease any further activity on these projects until the EIA process is accomplished and all issues are resolved in accordance with international nuclear safety standards, principles, and conventions.

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