The Foreign Policy of Nuclear Reactors in Central and Eastern Europe

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An important policy consideration of the European Union and its member countries is the continued operation of nuclear power plants in Central and Eastern Europe. Five of the ten applicant countries produce electrical power for their own and export use with Soviet-designed nuclear power plants whose design and operational safety characteristics are vigorously debated. The scheduled closing of "non-upgradeable units" was an EU Agenda 2000 goal and a key dispute in enlargement negotiations, with important economic and political repercussions for the countries concerned. This paper reviews the nuclear power plant status and commitments of EU aspirant countries and EU intervention in this regard, arguing that the issue is likely to remain volatile for some time to come, despite agreements at Copenhagen in 2002 and elsewhere.

One of the more difficult issues encountered by Central and Eastern European (CEE) countries in their EU accession negotiations concerned nuclear power stations. Between them, the aspirants had 26 operating nuclear power reactors, 24 of which were Soviet-designed. But the 1986 Chernobyl disaster made Western Europeans leery of nuclear reactors in general and Soviet designed reactors in particular, with analysts generally considering RBMK 1000 and VVER 440/230 reactors "non-upgradeable," i.e., unsafe even after hundreds of millions of dollars of safety upgrades. While VVER 440/213 and VVER 1000/320 designs may approach Western nuclear power stations in operational safety, the eventual closure of all Soviet designed nuclear plants remains a nonnegotiable goal for a substantial percentage of the Europe's electorate and elite. But for the Central and Eastern European countries concerned, nuclear power stations are a key measure of economic development, providing relatively low cost electrical power and good paying jobs in a high technology industry – rare benefits for the region. Their closure could cause significant hardships.

Soviet-era nuclear power plants in Central and Eastern Europe are important arenas of EU foreign and security policy – although generally outside normal CFSP activity – and have significantly affected the relations of member aspirants with the European Union and EU member countries. Public demonstrations and governmental initiatives in countries like Austria have been disruptive to bilateral relations and to the EU common policy apparatus, sometimes placing the European Commission at odds with individual EU member states.

This paper examines the nuclear power station status of Central and Eastern European aspirant countries as a security issue. It contains a description of the nuclear reactors concerned and the status of negotiations and agreements between aspirants and the European Commission and EU member states on reactor disposition. Despite previous agreements, Soviet-designed nuclear power stations remain an important and still open issue between the European Union, its members, and Central and Eastern Europe.

The Environment as a Security Issue

The security concerns in Central and Eastern Europe have moved beyond the military threats of the Cold War and previous eras to include environmental concerns, economic hardship, minority conflict, and political instability – i.e., the "security sectors" discussed by Barry Buzan, Ole Wæver, and Jaap de Wilde in their book, *Security: A New Framework for Analysis*. Issues can be labeled "security" when actions "beyond the established rules of the game" are essential for their management or resolution.[1] Environmental issues might emerge as security problems if they threaten the vital interests of a country or its neighbors.

Activist organizations such as Greenpeace may press to securitize the environment because of their commitment to the issue itself and their desire to give it the greatest attention possible. Other organizations, such as political parties, may securitized it for instrumental reasons – as a way to gain attention and perhaps increase influence, regardless of their commitment to the environment. As pointed out by Buzan, the actors who suffer the consequences of environmental problems are often not the ones who cause them. The operation of nuclear power stations is local or national, but the effects of an accident can be regional or worse; the 1986 Chernobyl disaster began in Ukraine but had worldwide effects.

Most of the environmental problems of Central and Eastern Europe have not been securitized because of the persistence of more immediate economic and social concerns. The long-running dispute between Hungary and Slovakia over the Gabcikovo dam project, however, is a good example of an environmental issue that has entered the security dialogue between the two countries. There are other bilateral environmental concerns in Central and Eastern Europe, but of generally lesser significance. The region's foremost environmental security relationships are not with each other, but with Western Europe. The continued operation of Soviet-designed nuclear reactors by Central and Eastern European countries has been a major impediment to the integration of Central and Eastern Europe with the West, where their security future lies.[2]

The problem comes down to different, interests, values, and perceptions. Many in Western Europe are unwilling to risk the tremendous damage that could result from another Chernobyl-like disaster, only this time closer to home, no matter how low the probability of its occurrence. Many in Central and Eastern Europe, on the other hand, consider the small risk of a nuclear reactor accident well worth the hazards because of the economic benefits the nuclear power stations provide, providing the chance for a better life for themselves and their families. The contrast in opinion also relates to different attitudes toward risk from particular types of dangers, a topic explored by Mary Douglas and Aaron Wildavsky in *Risk and Culture.*[3]

The concerns of Western Europeans about nuclear power stations are not without foundation. Nuclear reactors contain enormous quantities of highly radioactive material that would injure people and damage landscapes for decades, as Chernobyl demonstrated. The threats can be separated into two categories. The first is a reactor accident where the highly radioactive material contained within the nuclear fuel escapes to the environment. In the Chernobyl disaster, an overpowered reactor exploded and destroyed the reactor complex itself and its surrounding structure, releasing a tremendous amount of radioactive material to the environment. Containment structures or other systems such as the Soviet-designed bubbler condenser (discussed below) may prevent all or most of the radioactive material from a reactor accident from escaping to the environment. The other type of threat comes from radioactive waste. Much of the waste created by operating nuclear reactors is of low level and can be processed into relatively easily stored products. More difficult is spent nuclear fuel, i.e., uranium fuel rods that have already been used to produce power and now contain highly radioactive isotopes from the nuclear fission process. Spent fuel is usually stored at or near the nuclear power station of origin for three years or so to allow a reduction of radioactivity and heat generation. Long-term storage problem is a greater problem that no country has really solved and there are thousands of spent fuel rods in temporary storage awaiting permanent disposition. In the United States, this is what the Yucca Mountain, Nevada, controversy is all about; in Europe, storage concerns have precipitated European Commission direction on establishing a "burial solution" to the nuclear waste problem by 2018. Spent fuel may also be reprocessed, i.e., dissolved and converted into useful products (this is a broad definition of useful that includes plutonium that may have bomb-making potential) but also creating large quantities of highly radioactive and toxic waste – a difficult disposal problem in its own right.[4]

Types of Soviet-Designed Nuclear Reactors

RBMK Reactors. There are the Chernobyl-style reactor plants, with eleven currently operational in Russia and two in Lithuania. RBMK is a Russian acronym for "high-power pressure-tube reactor," so-called because the reactor fuel is sealed in aluminum tubes that can be easily installed or removed from the reactors. The design was derived in part from Russian plutonium production reactors and features graphite (a form of carbon) as opposed to water moderation. Moderation is the process of reducing fission neutron speed by collision with inert material, e.g., graphite or water molecules, so the neutrons can be more readily absorbed by uranium atoms. This is step necessary to sustain nuclear chain reactions and produce usable energy in a nuclear reactor. RBMK units were to be part of a complex fuel and reprocessing cycle and are relatively efficient providers of electricity.

According to most analysts, however, the design's flaws greatly out weight its advantages. RBMK reactors do not have a containment structure surrounding the reactor plant, an integral part of most Western-designed nuclear power stations. Containment structures help to prevent large-scale releases of radiation in the event of a reactor accident, as in the Three Mile Island disaster in 1979. In contrast, Chernobyl Unit 4's "accident localization system" could not withstand the force of the 1986 explosion, resulting in enormous and widespread contamination to the environment. RBMKs also have unfortunate operating characteristics. The reactor has a "positive void coefficient," meaning that when water is lost from the system or turns to steam – as in a major leak – reactor power would increase perhaps to the point of core damage; with water moderated reactors, the opposite effect generally occurs and the reactor tends to shut down – perhaps before core damage can occur. Other safety problems include inadequate fire protection systems and insufficient redundancy of electrical and safety systems.[5]

VVER Reactors. VVER is a Russian acronym for "water-cooled, water-moderated reactor," the same type of reactor most frequently used in the United States and Western Europe. The oldest variant is the VVER-440/230. Western analysts have concluded that these reactors are potentially hazardous because their accident analysis standard was not very high. Specifically, Soviet designers took into account failures of piping connected to the main reactor piping, but not failure of the main piping itself. Like the RBMKs, the design does not have a Western-style containment structure. In addition, there are concerns about reactor vessel embrittlement and that natural hazards – such as floods and earthquakes – were not adequately considered in the design.

The reactors also have inherent advantages, such as a very large water volume which could mitigate certain accidents and reactor transients. And, except for the installation of a Western style containment structure, many of the safety concerns can be removed by upgrading although at great expense and effort. If upgraded and considering their designed operating characteristics, the Western European Nuclear Reactor Agency (WENRA – made up of representatives from the national reactor monitoring organizations of countries in the European Union that operate nuclear reactors) has concluded that "the proven inherent safety margins and moderate response in connection with potential design basis accidents of the VVER-440 compensate for the remaining shortcomings of an adequately upgraded confinement structure."[6]

An improved variant is the VVER-440/213, designed with Western reactor coolant system leak criteria in mind. Although they do not have Western-style containment structure, they have a bubbler condenser pressure suppression system that may provide equivalent protection in a reactor accident – although testing and evaluation are still being conducted. The 213 has numerous safety improvements over the 230 while retaining its inherent advantages.[7] Note that EU-member Finland operates two VVER 440/213 reactors at Loviisa, about 90 miles east of Helsinki. Built in the 1970s, they were greatly modified with Western equipment, but do not have a containment structure and still rely on Russia-designed confinement systems.[8]

The newest variant is the VVER 1000/320, designed with international safety practices in mind. They are similar to Western nuclear power stations with massive containment structures and comprehensive safety systems. Western analysts point out, however, that the design has substandard plant instrumentation and control systems and may have quality control and construction problems. The operating characteristics of VVER 1000/320 reactors are also somewhat less forgiving than 230 and 213 units.[9]

EU Accession and Nuclear Reactors

The European Union is the largest importer and second largest consumer of energy in the world, with real concerns about the availability of future energy sources. To help meet its needs, several EU countries operation nuclear power stations. This collides, however, with memories of the 1986 Chernobyl disaster and the potential hazards of Soviet designed reactors in Central and Eastern Europe.

The end of the Cold War provided the opportunity to address Western concerns. Soviet designed nuclear reactors were most prominently addressed at the 1992 Munich G-7 summit. A program was approved to improve the safety of the reactors. Its focus was on rapid closure of all RBMK and VVER 440/230 reactors, deemed the most dangerous and too difficult to upgrade to satisfactory safety standards. Aid programs were developed, often through the Phare and Tacis programs, that promoted shutdowns while simultaneously funding improvements to operating reactors based on International Atomic Energy Agency (IAEA) recommendations. As the price and difficulty of closure and upgrades became apparent, aid was increased and the timeframe for expected closure or upgrade extended.[10]

EU Agenda 2000, approved in 1997, established a framework for negotiating membership in the European Union with the countries of Central and Eastern Europe. Accession discussions and Europe Agreements formally began on 30 March 1998.[11] On 6 December 2000, the EU Atomic Questions Group (AQG) submitted a report suggesting the reactor safety criteria to be used for evaluating membership readiness, to include legislation affecting nuclear issues, organization and management of regulatory authorities, and the design and operation of nuclear installations. From this came a list of recommendations for aspirant countries, some to be completed prior to admittance to the European Union and others required on a more flexible implementation schedule. The report also established a "peer review" monitoring process under a group called the Working Party on Nuclear Safety (WPNS) whereby EU aspirants would provide regular reports on their progress.[12]

It is important to note that nuclear power station accession negotiations were part of Chapter 14 on Energy, not Chapter 22 on Environment, and were carried out by the European Commission's Director General for Transport and Energy. Chapter 22 covers radiation protection but leaves nuclear reactor operational safety issues to the energy chapter. Chapter 14 is mostly concerned with energy alignment policies to prepare candidate countries for the internal market and to improve their energy distribution networks. With regard to nuclear issues, the chapter requires applicants to "ensure the safety of nuclear power plants in order that electricity is produced according to a high level of nuclear safety" and to "ensure that nuclear waste is handled in a responsible manner; and prepare for the implementation of Euratom Safeguards on nuclear material."[13]

Chapter 14 was formally closed for the ten countries invited to join the European Union at the December 2002 summit in Copenhagen. It was provisionally closed for Bulgaria at the same time, but remains open for Romania. In both cases, remaining issues in the chapter concern the buildup of oil stocks and the implementation of gas and electricity directives – not nuclear power station safety issues.[14] The EU Accession Treaty will be signed in late March 2003 and will enter force on 1 May 2004 – presumably at the same time the ten "chosen" will join the European Union.[15]

Bulgaria

Bulgaria, however, was not among those chosen to join the European Union, despite its progress in closing accession chapters. It was passed over at the 2002 Copenhagen round of enlargement largely because of its relatively low level of economic development, although nuclear reactors may have played a role. Bulgaria's only reactor nuclear power station is located at Kozloduy on the Danube River 120 miles north of Sofia, but it is a massive one containing six reactors and providing over 40 percent of the country's electrical power. The country has also become an electrical power exporter to the region, including both Greece and Turkey in its market.

Kozloduy Units 1 through 4 are VVER-440/230 reactors that were declared non-upgradeable by Agenda 2000, although they have been undergoing a slow but extensive improvement program since the end of the Cold War. Units 5 and 6 are VVER-1000/320 reactors that are not considered serious safety problems. After a modernization is completed, their safety should be comparable to Western European reactors of the same design period.[16]

To conform with the pre-accession promises Bulgaria made to the European Union in 1999 and at the Copenhagen summit in December 2002, Kozloduy Units 1 and 2 were shutdown permanently on 31 December 2002. The closure of the two reactors should not cause energy shortages or higher electricity prices, but may curtail Bulgarian energy exports.[17] In addition to keeping its membership hopes alive, Bulgaria's decision to shutdown the reactors makes it eligible for funds of approximately $400 million from the European Bank for Reconstruction and Development (EBRD) and other European sources to help defray the decommissioning costs of Units 1 and 2 and to upgrade Units 5 and 6 to Western standards.[18]

Units 3 and 4 were constructed in the 1980s and have already received some of the improvements associated with VVER-440/213 reactors, such as the segregation of safety systems, establishment of an emergency control room, and the addition of a low pressure core cooling systems. The reactors also have a bubbler condenser-style containment systems, although concerns remain whether the systems can cope with a large primary pipe rupture.

The European Commission was not sufficiently impress with the upgrades, however, and concluded that "only by the early and satisfactory completion of the planned upgrading program that the existing limitations for safety requirements and practices widely applied in the EU can be limited to such an extent that the continued operation of Units 3 and 4 could be justified for a limited time."[19] In a 1999 settlement, the Bulgarian government would not commit to shutdown dates for Kozloduy Units 3 and 4 although the Commission said it "expected" them to be shutdown in 2006. In mid-2002, EU enlargement commissioner Guenter Verheugen said that Bulgaria must shut down Units 1, 2, 3, and 4 to have any chance of joining the European Union.[20] Finally in November 2002 and just prior to the Copenhagen enlargement summit, Bulgaria agreed to close Units 3 and 4 in 2006 – helped no doubt by a "pre-accession" aid package of $1.5 billion.[21] It asked, however, for a peer review of the reactors after the completion their upgrade programs in hopes of showing "there are no unresolved issues" concerning their safety.[22] The European Union has made not as yet accepted this proposal, although it has expressed its readiness to consider additional financial assistance for reactor upgrades.[23] In the meantime, the World Association of Nuclear Operators (WANO) has itself committed to a peer review of Units 1 and 2 in June 2003, but it is not clear what effect if any this would have on EU expectations.[24]

Kozloduy has become an important national issue in Bulgaria. In early 2002, 500,000 Bulgarians signed a petition demanding a referendum on the closures, "fear[ing] power shortages and an economic downturn."[25] Opposition socialist leader Sergey Stanishev warned that the European Commission's "strong-arm approach" on Kozloduy could provoke anti-European feeling by Bulgarians who are proud of their nuclear capability and oppose the plant's closure. Bulgarian energy ministry official Slavtcho Neykov noted the impact on jobs in a region where unemployment rates were 20-30 percent.[26] In official actions that can only be read as acts of defiance, on 9 January 2003 Bulgaria's Supreme Administrative Court ruled that the 2006 of Units 3 and 4 was unconstitutional and in February 2003 the country's Nuclear Regulatory Agency extended Unit 4's operating license to 2013.[27] Bulgaria's ruling coalition, however, plans to appeal the court's ruling while Bulgarian Foreign Minister Solomon Passy has called any move to reopen EU energy negotiations "insanity."[28]

There is also Russian factor in the current debates. Because Kozloduy is a Soviet-era nuclear power station, Russian enterprises are involved in its operation and maintenance and have offered to assist Bulgaria in further modernizing the Kozloduy plant, perhaps as a way to pay off Russia's Soviet-era debts to Bulgaria.[29] Russia is also engaged in discussions concerning construction of new VVER-1000/320 reactors at Belene, located in northern Bulgaria near Pleven. Belene was 40 percent completed but abandoned in 1992 because of environmental concern over apparently unsuitable soil and seismic conditions.[30]

Czech Republic

The Czech Republic has two nuclear power stations. The Dukovany site in Moravia became operational in the 1970s and contains four VVER 440/213 reactors. All have been substantially modified since the end of the Cold War and will complete additional upgrades by 2004. Dukovany has a good reliability and safety record according to the WENRA, though disputed by environmental activists who point to a history of fires and emergency shutdowns.[31]

Temelin is the other nuclear power station, located 35 miles from Austria's northern border. It has two VVER-1000/320 power plants modified with US technology (Westinghouse) and, according to WENRA, with safety standards comparable to Western designs.[32] The first unit began testing in 2000 and will enter commercial use at the end of 2003; the second achieved full power in early-March 2003 and should be ready for commercial use in early 2004.[33] Both plants have had some problems during their testing and workups to commercial operation, generally involving non-nuclear systems.

Temelin has been enormously controversial. Broadly, it introduces two large new reactors into the center of a Europe that many hope would lessen dependence on nuclear power;

specifically, Temelin is close to nuclear-free Austria where a vigorous opposition to nuclear reactors has developed at both the governmental and non-governmental levels. Diplomatic initiatives have been frequent and protests almost continuous, including blocked border crossings and instances of violence. The protests have at times been tinged with anti-Americanism because the Temelin upgrades were accomplished by Westinghouse. Note that Westinghouse, which established the world's first commercial power reactor in Western Pennsylvania and became a major supplier of nuclear power stations, is now part of BNFL – a British firm. Protest groups, such as the Upper Austrian-Czech Anti-Atomic Commission and "Stop Temelin," argue that Temelin is unsafe precisely because it combines Soviet reactor design with Western fuel and safety technology.[34] Opponents of Temelin are not limited to Austria, with many in Germany and elsewhere in Europe also unhappy about the power station. The Czech Republic has many of its own anti-Temelin activists as well, some who argue that the plant is unnecessary. And indeed, CEZ (the Czech Republic electricity utility) has been attempting to build a regional network to export excess power from Temelin once both units are operational.[35]

The Austrian government has attempted to link Temelin with the Czech Republic's efforts to join the European Union. This became even more of an issue when Jörge Haider and his Freedom Party entered the Austrian government in coalition with the People's Party in February 2000. Haider made Temelin a key part of the Freedom Party's public dialogue, with apparent but unstated links to the party's anti-foreigner and anti-EU agendas. One can speculate that Haider's was not a principled stand, but a gambit to use an environmental issue for political gain. Notable was the right wing party's use of nuclear reactor safety to mobilize support since "the environment" usual find's a home with the left. Notable as well was that the European Union was also instrumental, with Austria using EU membership for the Czech Republic as leverage for the national goal of Temelin's shutdown.

Austria's threatened veto of Czech EU membership over Temelin put it in conflict with much of the rest of Europe. Under pressure from the European Commission and other EU member countries, the Czech and Austrian prime ministers, accompanied by the Commission's minister for enlargement, signed an agreement on Temelin at Melk, Austria, in December 2000. The Melk Protocol specified that the Czech Republic would allow an environmental impact assessment of Temelin before the plant went into commercial operation. In November 2001, one report stated that Temelin's impact on the environment would be "negligible and acceptable." An IAEA team of experts, with an observer from Austria, later reviewed Temelin safety issues identified in 1996 and concluded that most had been "addressed and resolved."[36]

But many Austrians remain unconvinced. Jan Haverkamp of the Czech Branch of Greenpeace dismissed the report: "The fact that nuclear power plants do pass these kind of environmental impact assessments is because certain parts of the environmental influence of nuclear power plants are counted out. In the case of this environmental impact assessment it's very obviously parts of the fuel cycle – that means the whole part of fuel production – is not part of this environmental impact assessment."[37] And the government has not abandoned its opposition. Austria tried to introduce an additional nuclear safety clause into Czech accession documents in 2002, but other countries would not approve restrictions beyond the Melk Protocol.[38] In Germany, Chancellor Gerhard Schroeder turned back attempts by his Green Party coalition partners, and particularly environmental minister Juergen Trittin, to link Czech accession to shutting down Temelin.[39] In the end, Austrian Prime Minister Wolfgang Schuessel joined his fellow EU national leaders at the Copenhagen summit to issue an invitation for the Czech Republic to join the European Union, despite pressure from the Freedom Party.[40]

But Temelin remains a sensitive and volatile issue in European politics. Upper Austrian governor Josef Puehringer hopes to use the European Court of Justice or International Court of Justice to close down Temelin.[41] Environmental activists like Greenpeace continue to protest, including a series of hunger strikes and a proposed referendum on "Europe without Atom" to take place on 10-17 July 2003.[42] And the Freedom Party has not gone away, despite a disastrous performance in Austria's November 2002 elections. It is again part of Austria's ruling coalition, although under much weakened conditions. Led by Schuessel and the Peoples Party, the new government has made it clear that still wants Temelin shutdown but would not use the issue to prevent Czech entry into the European Union.[43] Temelin opponents, however, could take comfort from remarks by retiring President Vaclav Havel of the Czech Republic: "If there is something that I cannot forgive myself for as my greatest mistake that I made in 10 years of presidency, then it would be that I did not come out sharply against nuclear plant Temelin's construction in 1990."[44]

Lithuania

In the Baltic States, Lithuania is home to the Ignalina nuclear power station containing two Chernobyl-style reactors that are among the largest in the world. The RBMK 1500 reactors are more advanced that those at Chernobyl and have been modified since the 1986 disaster with improved emergency cooling and reactor control systems, but they still lack adequate containment mechanisms.[45] While noting the extensive improvements, the 2002 "Peer Review Status Report" concluded that "it is not technically realistic to bring Ignalina up to the 'high level of nuclear safety' expected within the EU."[46]

Ignalina is an important economic issue for Lithuania. The nuclear power station is a significant employer in the country, in particular thousands of Russian speaking personnel, and produces surplus electrical power and export earnings for the country. In the difficult negotiations required to close Chapter 14, Lithuania committed to closing Unit 1 at Ignalina before 2005 and Unit 2 by 2009, while the European Union promised to provide adequate assistance for the decommissioning effort beyond 2006. The cost of decommissioning will be EUR 1 billion, with EU contributions of EUR 375 million for the period 2000-2006.[47] In the meantime, the European Commission wants Lithuania to devote "special attention" to accident-prevention measures during the period of operation remaining for the units, installations that were "very important for the justification" to operate Unit 2 until 2009. At that, there seems to be some room or at least hope by Lithuania for renegotiating the 2009 closure date.

Slovakia

Slovakia has two nuclear power stations, Bohunice near Trenčin and Mochovce near Nitra. Bohunice Units 1 and 2 are VVER-440/230 reactors and have received a number of safety improvements, but can not overcome concern about the containment system's ability to cope with reactor piping failures. Units 3 and 4 are VVER-440/213 and have received major upgrades since the end of the Cold War, in addition to their Soviet-designed bubble condenser containment system. When the modifications are completed, safety should be comparable to Western European nuclear power stations.

Mochovce Units 1 and 2 are also VVER-440/213 reactors but of recent construction and with many modifications to the final design, including higher quality equipment and improved emergency systems. Concerns are still cited about potential embrittlement of the reactor vessel and the lack of a Western style containment structure, although bubbler condensers are installed. Unit 1 began commercial operation on in 1998 and Unit 2 in 2000. Once all modification are completed, the safety levels at Mochovce should be comparable to nuclear power stations of Western design.[48]

Like the Czech Republic, Slovakia has had confrontation with Austria over the continued operation of its nuclear power stations. They were further aggravated in 1999 when the reform government of Mikuláš Dzurinda backed out of a commitment made by the previous government to shutdown Bohunice Units 1 and 2 by 2000, arguing the that the country could not afford to do so. Disputes have subsided as the enlargement negotiations have come to an end. Slovakia has agreed to close Bohunice Unit 1 in 2006 and Unit 2 in 2008, with the European Union providing EUR 90 million of support. The European Union also acknowledged that the financial burden of decommissioning will continue well beyond 2006 and "will take this situation into account."[49]

Other Central and Eastern European Countries

Poland, Estonia, and Latvia have no nuclear power stations, but the Leningrad Power Station west of St. Petersburg place Chernobyl style reactors close to Estonia's eastern border. Hungary operates four VVER-440/213 reactors at the Paks nuclear power plant on the Danube River north of Budapest. Each became operational in the 1970s and, according to WENRA, have displayed good reliability. The reactors have been significantly upgraded since the end of the Cold War, including relocating feedwater systems for greater decay heat removal reliability, and have safety levels comparable to Western European reactors of the same vintage.[50]

Romania operates a Canadian designed Candu 6 reactor at its Cernavoda nuclear power station, located on the Black Sea Canal near Constanta in eastern Romania. Candus are operating in several countries throughout the world and are considered safe and reliable, although of unusual design for commercial power production. They use natural uranium as fuel and heavy water as moderator, unlike most commercial power reactors which use enriched uranium as fuel and light (normal) water as moderator.[51] The design results in a "positive void coefficient" and requires special shutdown systems to ensure reactor safety. Note that this type of reactor was used by India early in its nuclear program as a source of weapons useable plutonium – a capability flirted with briefly by Romania as well during the Ceausescu regime and bolstered by the country's heavy water production and uranium mining capacity.[52] The reactor has not drawn serious European criticism, except for concern about the Romanian government's ability to finance an adequate level of safety.[53] Romania is attempting to secure loans to complete another Candu reactor at Cernavoda – abandoned at 40 percent complete along with 3 other shells for the designed five reactor site. There was some controversy about whether or not Cernavoda would qualify for Euratom loans since the reactor was of Canadian instead of Soviet design, but Commission officials declared it eligible.[54]

Slovenia's one reactor Krško nuclear power station is close to the border with Croatia and is a Western designed (Westinghouse) pressurized water reactor. A major modernization program was completed in 2000, including new steam generators and improved fire protection. Krško is operated jointly with Croatia, an arrangement subject to some controversy and reconsideration. Although deemed safe by appropriate international officials, environmental groups in Europe have called for the reactor's eventual decommissioning.[55]

Conclusion

Nuclear power stations are a fact of life in Europe. While opponents hope for a not too distant day when Europe will be nuclear-free, there is little chance of this happening in the foreseeable future despite decisions by countries like Sweden and Germany to move towards eventual shutdown of their own nuclear reactors. There are several reasons for this. One is Europe's relative paucity of alternative energy sources. Nuclear power provides an alternative to European dependence on imported oil and natural gas and alternatives to nuclear power have environmental problems of there own. EU commissioners charged with the internal market and taxation have stressed nuclear power's continued importance, providing "the technical capacity to increase diversification, needed to reduce external dependence on oil and gas" and "the only way to meet Kyoto commitments for CO2, emission reduction."[56]

Another reason is that the nuclear industry is a powerful interest group in Europe. Multinational corporations such as Cogema based in France, Siemens in Germany, and BNFL in the United Kingdom control significant capital and important expertise. They also employ large numbers of workers and are linked to important national and supranational bureaucracies. Most of the organizations used to evaluate nuclear power stations in Central and Eastern Europe tend to be pro-nuclear in orientation, such as WANO and, to a lesser extent, WENRA. WENRA excludes the non nuclear EU countries and can only advise the European Union, but it is the only European body examining nuclear issues.[57] Euratom was founded to help promote the use of nuclear energy, not to shut it down. There is also some concern that, although nuclear reactors and radioactive waste disposal are no longer glamorous technologies – having yielded to industries like telecommunications and biotechnology, Europe (and the United States) should not pull back too far and yield the entire nuclear field to Russia and perhaps China or India in the years ahead.

The reentry of Central and Eastern Europe into mainstream European affairs is also important. The environment is a relatively low priority for most Central and Eastern European countries except as it affects their ability to join the West; economic difficulties that consume daily lives are more immediate concerns. Hence the continued operation of nuclear reactors has a different resonance in the region. Nuclear reactors provide a large percentage of the power used in several of these countries which also have few energy alternatives. The alternative may be brown coal (lignite) which exists in large quantities in the region, but has immediate environmental effects because of atmospheric pollution. Another alternative is natural gas and oil from Russia. Greater use of such products would increase Europe's already significant dependence on energy resources from Russia. Slovakia, for example, is 100 percent dependent on Russia for its natural gas supplies, giving Russian the means for substantial economic and political leverage in the country. Of course, continued operation of Soviet-designed nuclear reactors also represents an indirect transfer of EU wealth to Russia because of the maintenance and fueling services it provides.[58]

Nuclear power stations also have committed opponents who keep the environmental aspects of the issue in the public eye. They are accompanied by political opportunists ready to exploit its populist appeal, allowing the issue to resurface at almost any time to threaten the integration process. Accession negotiations with Central and Eastern Europe have affected nuclear policies within the European Union as well, not just its foreign and security policy. In November 2002, the Commission to proposed the establishment of EU-wide safety standards and independent monitoring of nuclear plants, along with a timetable to dispose of nuclear waste. Energy commissioner Loyola de Palacio said: "The gaps in Community legislation on nuclear safety must be filled." "It would be paradoxical, to say the least, if the EU were to monitor nuclear safety in the new member states but not in the rest of the enlarged EU."[59]

Despite written and oral commitments leading to invitations or agreements at Copenhagen, nuclear power stations in Central and Eastern Europe remain the subject of considerable negotiation and action. Reactors at Mochovce and Temelin have just begun their useful life and in Bulgaria, Lithuania, and Romania consideration is being given to the construction of additional reactors. The foreign policy of nuclear reactors in Europe may only just begun.

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[1] The analysis of environmental security was drawn from Barry Buzan, Ole Wæver, and Jaap de Wilde, *Security: A New Framework for Analysis* (Boulder, Colo.: Lynne Rienner, 1998). This section is based on material previously published by Charles Krupnick in "NATO and Security Sectors in Central and Eastern Europe," from *Almost NATO: Partners and Players in Central and Eastern European Security*, ed. Charles Krupnick (Boulder, CO: Rowman & Littlefield, 2003), 297-324. Buzan, *New Framework for Analysis*, 23.
[2] The previous two paragraphs were drawn extensively from Krupnick, "NATO and Security Sectors."
[3] Douglas, Mary and Aaron Wildavsky, 1982, *Risk and Culture: An Essay on the Selection of Technological and Environmental Dangers* (Berkeley, CA: University of California Press, 1982).
[4] An excellent source of information on radioactive waste is Don J. Bradley's *Behind the Nuclear Curtain: Radioactive Waste Management in the Former Soviet Union*, ed. David R. Payson, (Columbus, WA: Battelle Press, 1997).
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[8] Patricia Lorenz, "How Safe is Safe Enough – Chernobyl Reactors in the EU?," October 2000, www.foeeurope.org/activities/Nuclear/howsafe.htm (2 March 2003).
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