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UNITED STATES OF AMERICA
BEFORE THE
NUCLEAR REGULATORY COMMISSION

In the Matter of Westinghouse Electric Corporation (Exports to the Czech Republic For The Temelin Nuclear Power Plant	)	Docket No. 110-04699 Application No. XSNM-02785

PETITION FOR INTERVENTION AND REQUEST FOR HEARING OF THE NATURAL RESOURCES DEFENSE COUNCIL, FRIENDS OF THE EARTH, HNUTI DUHA, AND GLOBAL 2000

Pursuant to 10 C.F.R. §§ 110.82 and 110.84 (1993), the Natural Resources Defense Council, the Friends of the Earth, Hnuti Duha, and Global 2000 (the "Petitioners") hereby (1) petition for leave to intervene as full parties in this proceeding; and (2) request that a hearing be held on whether issuance of a license to Westinghouse Electric Corporation (Westinghouse) to export nuclear fuel to the Czech Republic for Temelin Nuclear Power Plant Units 1 and 2, should be denied because "issuance of a license to such person would be inimical to the common defense and security or to the health and safety of the public," within the meaning of Section 103(d) of the Atomic Energy Act, as amended, 42 U.S.C. § 2133(d). Specifically, the Petitioners request that the Commission hold a hearing to determine the health, safety and environmental impacts of the export of substantial amounts of nuclear fuel to the Temelin nuclear reactors, in light of serious issues about their safety.

DESCRIPTION OF PETITIONERS

The Natural Resources Defense Council (NRDC) is a national nonprofit member organization incorporated under the laws of the state of New York with a staff of over 150 lawyers, scientists, specialists, and support personnel. NRDC's principal offices are in Washington, D.C., New York City, San Francisco and Los Angeles. NRDC works to preserve, protect, and defend human health and the global environment, to gather data and inform its members and the public concerning governmental actions which threaten environmental degradation, and to take appropriate legal steps to carry out these purposes. NRDC's membership of over 110,000 includes 80 individuals who live in Europe. Many members have joined NRDC so that they may enjoy the adequate representation and protection of the environmental interest they share with NRDC.

Friends of the Earth ("FOE") is a national nonprofit environmental organization founded in 1970 with 50,000 members and supporters. Its professional staff address a wide range of pressing national and international environmental issues. FOE is affiliated with Friends of the Earth International, which has member groups in 52 nations, including the Czech Republic, Austria, the Slovak Republic, Germany, Poland, Bulgaria, the Ukraine, Georgia, and many other European countries. FOE has worked extensively on Soviet reactors in the former Eastern Bloc.

Hnuti DUHA is a nonprofit organization founded in 1990 and registered under the laws of the Czech and Slovak Republics. DUHA works to protect the environment of the Czechoslovak region and is an affiliate of Friends of the Earth-International. DUHA has 250 members organized in chapters, including an active chapter of about 50 members in Ceske Budejovice, a town located about 15 miles from the Temelin nuclear power plant. DUHA has been actively working to reduce reliance on Soviet nuclear reactors in the Czech and Slovak Republics. In regard to Temelin, DUHA has prepared and distributed reports, factsheets, and videos; sponsored public meetings; and worked closely with the Association of Towns and Villages ("SMOR") in the region of Temelin. Over half of these towns and villages are opposed to the facility.

Global 2000 is a nongovernmental organization formed in 1982 and registered under the laws of Austria with offices in Vienna and Graz and a staff of about 20 professionals. The objective of Global 2000 is to promote environmental protection in Austria. Global 2000 has about 10,000 supporters throughout the country, including individuals living within 60 miles of Temelin. A major focus of Global 2000's efforts has been public education and action regarding nuclear power in former-Communist neighboring countries. In cooperation with its Czech counterparts, Global 2000 has established a radiation monitoring system around the Dukovany Nuclear Power Plant in the Czech Republic. Global 2000

conducted research and published reports on Western assistance to address energy and environmental problems in the former Eastern Bloc.

NRDC and FOE have a long-standing active interest in the security, health, and environmental hazards posed by U.S. nuclear export activities. The members of NRDC and FOE have substantial interests in the common defense and security, the public health and safety in the United States, and the potentially global impact of nuclear accidents. In this post-Chernobyl age, they have a substantial interest in the impact of exports of nuclear fuel to plants such as Temelin, which is located in the heart of Central Europe, and which will be based in substantial part on a Soviet design which has not yet been demonstrated to satisfy generally-recognized safety standards. Members of DUHA and Global 2000 have a substantial interest in this proposed export since they live near to Temelin and would be most immediately and potentially most severely at risk from its proposed operation. The interests of the members of Petitioners cannot be adequately represented by any other party.

PETITION FOR LATE INTERVENTION

Although this petition for intervention is untimely pursuant to 10 C.F.R. § 110.82(c)(2),[1] good cause exists for granting this petition to intervene. The interests which they represent, and the issues they seek to raise in this proceeding, are substantial. Moreover, to the best of our knowledge the Commission has not yet received the comments on Westinghouse's application from the Executive Branch, pursuant to 42 U.S.C. § 2155 and 10 C.F.R. § 110.44. The Commission does not act on any petition to intervene or request for a hearing until it has received and reviewed the Executive Branch's comments. 10 C.F.R. 3§ 110.84(d). Thus, granting Petitioners' untimely petition would not unduly prejudice any party. See Westinghouse Electric Corporation (Exports to the Philippines), 11 NRC 631, 633-34 (1980), aff'd, NRDC v. NRC, 647 F.2d 1345 (D.C. Cir. 1981) (petition for intervention and hearing granted; petition filed 29 months after the filing of the initial export application and eight months after the filing of a second export application; the petition for intervention and hearing was filed after the Executive Branch had commented on the first license application, but before the Executive Branch had commented on the second application). Moreover, granting their untimely intervention and

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[1] That regulation states that a petition for intervention and a request for hearing is timely if it is filed within 15 days after notice of receipt of an export license application in the Commission's Public Documents Room. The Westinghouse application was filed on or about December 1, 1993.

hearing request would not unduly broaden or delay the proceeding, because evaluation of the health, safety and environmental effects of the export of nuclear fuel to Temelin are squarely within the Commission's mandate.

REQUEST FOR HEARING

Petitioners submit that, in light of information which has only recently become publicly available, the public interest requires a hearing into the health, safety and environmental effects of the export of nuclear fuel to Temelin. Without such a hearing, we respectfully submit that the Commission cannot fulfill its obligation, under the statute and under its regulations, to determine whether granting the license would be injurious to the common defense and security and to the public health and safety.

Within the past several weeks, Petitioners have for the first time become aware of a number of documents which raise substantial questions about whether the Temelin plant is being or can be upgraded to meet generally-recognized safety standards. These documents include an October, 1992 report resulting from an audit of the Temelin site by Halliburton NUS; a report issued by a 1990 Temelin Design Review Mission of the International Atomic Energy Agency (IAEA); and 1990 and 1992 reports of an IAEA Pre-OSART (Pre-Operational Safety Review Team) Mission to Temelin.

These and related documents have been analyzed at length by Technical Advisors to the Special Delegation Of The Austrian Government To The United States Regarding The Temelin Nuclear Power Plant. See Attachments A-F hereto. This new evidence shows, inter alia:

* Basic documentation and information necessary to understand the design of already-constructed components and systems at Temelin appears to be difficult, if not impossible, to obtain. Without a thorough understanding of the as-built plant design basis, it is not clear whether the necessary safety analyses can be conducted.

* Many basic deficiencies in Temelin's systems and processes, as originally designed by the Soviets, must be analyzed and remedied. These include the Emergency Feed Water System, the Equipment Qualification program, core and containment designs, and an inadequate design from the standpoint of Fire Protection requirements.

* More generally, no adequate Preliminary Safety Analysis Report or Probabilistic Safety Assessment has yet been completed, and the underlying Soviet design for reactors such as Temelin was not based on an adequate analysis of severe accidents.

* There has been an absence of an adequate Quality Assurance program.

* CEZ (the Czech Republic utility which is constructing and will operate Temelin) and its contractors have lacked an adequate safety culture, and CEZ has failed to devote adequate management or engineering resources to the project.

Although there have been assertions that these problems have been or are being rectified, to date no documentation has been provided to demonstrate what progress, if any, is being made. See Attachment F hereto. There has never been an environmental

impact statement prepared on Temelin, nor has there been public technical reviews of safety and economics of the plant.

Moreover, neither the IAEA nor the U.S. DOE have yet determined that the VVER-1000 reactor design can be upgraded to meet Western safety standards. The IAEA is still at work on a generic safety assessment of VVER-1000 reactors. A DOE official was recently reported as stating the following:

> [T]here is a lot variability from unit to unit, depending in part on the extent of how each conforms to Soviet design specifications. ... Some units have defects. Before we can say that Temelin or any other plant can be brought up to western levels, we must take a hard look at all documentation on its configuration management.

"IAEA, DOE Quietly Deny Saying VVER-1000 Can Meet Western Norms," Nucleonics Week (March 10, 1994) (emphasis supplied) (Attachment G hereto). This information contradicts a previous statement of the Commission, in a February 28, 1994 "Fact Sheet," that DOE and IAEA have "conclu[ded]... that the upgraded Temelin design can meet a level of safety acceptable to western countries." Attachment H hereto.

The Petitioners are aware that in 1993, the Commission granted three licenses to Westinghouse for export of nuclear equipment and components and test fuel to the Czech Republic.[2]

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[2] License No. XSNM02749, issued September 3, 1993; License No. XCOM1082, issued September 3, 1993; License No. XCOM1078, issued April 16, 1993.

However, the application at issue in the instant proceeding is the first in which Westinghouse has specifically stated that the export is intended for Temelin. Moreover, under the Commission's regulations, prior licenses for Westinghouse to export to the Czech Republic do not justify granting the current application if there are "material changed circumstances." 10 C.F.R. § 110.44(a)(2). The new information which recently has come to light constitutes "material changed circumstances" which warrants a hearing, and perhaps denial or imposition of conditions on Westinghouse's current application.

In Westinghouse Electric Corporation (Exports to the Philippines), 11 NRC at 631 the Commission largely relied on a 1976 generic assessment of the environmental impact of U.S. nuclear (ERDA-1542) exports[3] to conclude that Westinghouse's export of a reactor to the Philippines would not have adverse effects upon the global commons. That holding should not control the questions presented by export of nuclear fuel to the Temelin site in the Czech Republic. In the Philippines export case, the Commission acknowledged that the 1976 generic assessment "does not address... site specific impacts." Id. at 659. The 1976 ERDA-1542 assessment concluded "that there should not be significant adverse global impacts from radioactive... effluents

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[3] U.S. Energy Research and Development Administration, Final Environmental Impact Statement on U.S. Nuclear Power Export Activities, ERDA-1542 (1976).

resulting from the projected volume of nuclear power and fuel cycle activities throughout the end of this century" (p. 1-3). This conclusion clearly has been rendered obsolete by the 1986 accident at the Chernobyl reactor in the Ukraine, which resulted in radioactive fallout throughout the Northern Hemisphere, including the United States. Excess cancers due to Chernobyl are estimated to be higher in Europe (10,400) than in the former Soviet Union itself (6,500). In the United States, roughly 140-160 additional cancers may result from Chernobyl. See Affidavit of Dr. Thomas B. Cochran (March 14, 1994). Attachment I hereto.

Temelin is located in the heart of Central Europe. It is less than forty miles from the Austrian and German borders, within 150 miles of Vienna and Munich and 250 miles of Berlin and Stuttgart. The international environmental, economic, and social impacts of a major accident at Temelin could be substantially greater than those associated with Chernobyl.

ERDA-1542 qualified its own conclusions by acknowledging the need for reevaluation in the light of subsequent experience (p. 1-3):

> However, as the world-wide use of the nuclear option increases, as more operational experience is gained,and as new nuclear power technology develops, there will be a need to periodically assess these impacts.

Although the Commission's determination in the Philippines export case was affirmed by the D.C. Circuit, Judge Robinson's opinion,

which was crucial to that affirmance, seriously questioned the NRC's reliance on the 1976 generic environmental assessment -- even in 1981, before the Chernobyl tragedy.

> NRC should be aware... that at some point reliance on aging, generic analyses may no longer be acceptable. ... [S]hould the agency persist in questionable practices and eventually push beyond reasonable limits, a court would be compelled to find an abuse of discretion.

NRDC v. NRC, 647 F.2d at 1383-84 (Robinson, J., concurring in the judgment). Judge Robinson noted that in 1980, the Council for Environmental Quality "stated flatly that ERDA-1542 is 'insufficient for considering the environmental effects of the proposed Philippine reactor expert ....'" Id. at 1388.

Although the Commission's decision in the Philippines export case was upheld by the D.C. Circuit, Judge Wilkey, the author of one of the Court's two opinions,[4] acknowledged that the Commission's mandate to ensure that nuclear exports are not "inimical to the common defense and security or to the health and safety of the public" (Section 103(d) of the Atomic Energy Act) might include consideration of health, safety, and environmental impacts in the presence of "unusual circumstances." NRDC v. NRC, 647 F.2d 1345, 1363 (D.C. Cir. 1981). This first major U.S. nuclear export since the Chernobyl accident, and the proposal to substantially modify a potentially dangerous Soviet reactor

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[4] Only two of the three Judges on the panel participated in the disposition of the case.

design in the apparent absence of adequate information regarding the as-constructed design basis, clearly constitute "unusual circumstances" warranting a hearing. Moreover, Judge Robinson, whose vote was essential to the affirmance of the Commission, made clear that the Commission should take a broad view of its authority to consider the safety of nuclear projects involving U.S. exports, in an appropriate case:

> The [Commission] plurality... made short shrift of petitioners' suggestion that risk of a nuclear accident here is increased by the nature of PNPP-1's site, and that such an occurrence would injure the foreign policy interests of the United States and damage its reputation as a reliable supplier of nuclear technology. In his dissenting opinion, Commissioner Bradford pointed out the questionable wisdom of this omission, noting that "an accident as severe as Three Mile Island would be inimical to the common defense and security. ..." Consistent with this view is an opinion by Ambassador Sullivan, United States Ambassador to the Philippines, who stated that
>
> > the Embassy considered a great deal of American prestige [to be] riding on Westinghouse performance, and that therefore we intended to follow the project closely. I pointed out that this was in effect the Filipino Aswan Dam, being the largest and most expensive construction ever undertaken in this country.
>
> While NRC should not be required to explore the intricacies of foreign policy, it takes little to realize that a significant accident attributable to a readily discoverable defect in a reactor exported by the United States--or even a far less egregious malfunction that could have been prevented by NRC during the course of the licensing procedure--could damage the foreign policy interests of the United States. Perhaps most significantly, the reputation of this country as a dependable supplier of nuclear technology could be harmed irr parably.

Id. at 1381-82 (footnotes omitted).

Moreover, in the Philippines export case, Commissioner Gilinsky, the swing vote, stated that the NRC should evaluate health and safety issues in the context of advising the U.S. Export-Import Bank. 11 NRC at 664. To the best of our knowledge, the NRC has not yet undertaken any Temelin-specific safety analysis. The need for such an analysis is underscored by the recent revelation that the IAEA has not concluded at this time that VVER-1000 reactors such as Temelin can be made safe, and by a recent statement of a DOE official that Temelin could not be judged safe without a thorough review of configuration management. See Attachment G; compare Attachment H.

In Westinghouse Electric Corporation (Exports to the Philippines), 11 NRC 672 (1980), the Commission stated that as a policy matter it would not evaluate health, safety and environmental effects on the global commons when there is an application to export nuclear fuel (as opposed to a nuclear reactor). The Commission stated (11 NRC at 672) that "[t]he health, safety, and environmental impacts from individual fuel shipments... are generally de minimis and the Commission has consistently taken the position that individual fuel exports are not 'major federal actions.' See Edlow International, CLI-76-6, 5 NRC 563, 584 (1976)." However, in the instant case Westinghouse has applied not for an "individual fuel shipment," but to export core and reload fuel for two large nuclear units under unprecedented circumstances. In any event, the 1980 policy

declaration was issued on a 3-2 vote,[5] and its continued viability should be carefully re-examined in the wake of Chernobyl. We submit that the Commission should -- indeed, must -- investigate the substantial questions about Temelin's safety before it approves the export of first core and reload fuel to Temelin. The Commission's 1980 policy declaration should not be applied to these proposed exports. Loading fuel into a plant that may not be designed or constructed in accordance with Western safety standards clearly poses more than a "de minimis" threat to Central Europe, the international environment, or the United States.

SUGGESTION FOR RECUSAL OF CHAIRMAN

The Petitioners have a concern as to whether the Chairman may have prejudged the issues raised in this Petition for Intervention and Request for Hearing. Their concern is based on reports that the Chairman has been personally and very actively involved in urging the U.S. Government to support Westinghouse's involvement in the proposed completion of Temelin. See Attachment G. Therefore, Petitioners respectfully request that the Chairman either recuse himself from this proceeding, or explain why his personal involvement in Temelin matters over the past months does not demonstrate that he has prejudged issues regarding Temelin's safety.

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[5] Technically a 2-1 vote, see 11 NRC at 673 n.1.

CONCLUSION

For all of the above reasons, Petitioners request that they be granted intervention as full parties in this proceeding, and that the Commission initiate hearing procedures regarding the effects of exporting nuclear fuel to the Temelin Nuclear Power Plant on the global commons, on the common defense and security, and on the public health and safety.

Respectfully submitted,

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Attorney for Petitioners Natural Resources Defense Council, Friends of the Earth, Hnuti Duha and Global 2000

DATED: March 17, 1994

UNITED STATES OF AMERICA
BEFORE THE
NUCLEAR REGULATORY COMMISSION

In the Matter of Westinghouse Electric Corporation (Exports to the Czech Republic For The Temelin Nuclear Power Plant	))))	Docket No. 110-04699 Application No. XSNM-02785

PETITION FOR INTERVENTION AND REQUEST FOR HEARING OF THE NATURAL RESOURCES DEFENSE COUNCIL, FRIENDS OF THE EARTH, HNUTI DUHA, AND GLOBAL 2000

ATTACHMENTS

SPECIAL DELEGATION OF THE
GOVERNMENT OF AUSTRIA TO THE
UNITED STATES OF AMERICA
REGARDING THE
TEMELIN NUCLEAR POWER PLANT

c/o EMBASSY OF AUSTRIA
3524 International Court, N.W.
Washington, D.C. 20008, USA
Telephone (202) 895 6700
Telefax (202) 895-6750

February 28, 1994

Via Hand Delivery

Hon. Kenneth D. Brody
President and Chairman
Export-Import Bank
of the United States
811 Vermont Avenue, N.W.
Washington, D.C. 20571

Re: Temelin Nuclear Power Plant Loan Guarantee

Dear Mr. Brody:

On January 27, 1994 the Board of Directors of the Export-Import Bank ("Eximbank") voted to approve for referral to Congress the final authorization of a $317 million loan guarantee for goods and services needed to complete the partially completed Temelin Nuclear Power Plant ("Temelin"). Temelin is located in the Czech Republic, close to the Austrian border, and about 120 miles from Vienna and its almost 2 million inhabitants.

On behalf of the Special Delegation of the Government of Austria Regarding the Temelin Nuclear Power Plant ("Special Delegation"), we would like to thank you for the opportunity you have afforded us to meet with you and share our concerns regarding this important issue.

You have stated Eximbank's willingness to consider new information prior to rendering a final decision. The Special Delegation welcomes this opportunity. By this letter, we submit:

- **The February 1994 Technical Memorandum** prepared by the Advisors on the Special Delegation (Attachment 1). This Memorandum identifies and reviews significant documents and facts not addressed in materials made public by Eximbank regarding the decision.[1]

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1. The public materials consist of your January 27 transmittal to Congress, which appends a twelve-page "Environmental Evaluation" by Eximbank's Engineering Division,

(continued...)

♦ **An analysis of technical studies** (Attachment 2) which address the Temelin project. Eximbank's decision relies fundamentally on an "Audit" of Temelin by NUS Halliburton, and on reviews by the International Atomic Energy Agency ("IAEA"). However, to the extent that we could obtain them, the very analyses on which Eximbank's health, safety, and economic conclusions rely contradict any decision to proceed; or, at the least, any decision to proceed in the absence of new information that answers the numerous questions raised by these materials.

♦ **Documentation** underlying the February 1994 Technical Memorandum and further relevant documentation not addressed in the Eximbank materials (Attachments 3-9).

We respectfully submit that, in the context of the analyses made public by Eximbank, the enclosed information is new and raises several basic and serious questions which require open and expert discussion in advance of any final decision.

Therefore, we would respectfully request that no final decision to approve the loan guarantee be made until the basic technical, safety, and environmental documents relating to the project are made available for public and expert examination, and meaningful opportunity for public and expert comment is provided.

In summary, these questions are:

FIRST, HOW CAN THE DECISION PROCEED WHERE THE TECHNICAL DOCUMENTS AND ANALYSES RELIED ON TO SUPPORT IT RAISE BASIC AND UNANSWERED QUESTIONS THAT CONTRADICT IT?

The Eximbank Environmental Evaluation states, at page 2, that an analysis by NUS Halliburton ("NUS") "found Temelin to be fundamentally sound and in conformity with U.S. safety principles save for the Russian Instrumentation & Control system." The NSC Report calls the NUS "audit" the only "independent Western review of the licensability of VVER-1000 Reactors" (Technical Analysis, at 6). In addition, Eximbank materials cite reviews of Temelin by the International Atomic Energy Agency.

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1. (...continued)
and a September 29, 1993 National Security Council Memorandum to you, which appends a ten-page "Technical Analysis" and a five-page bibliography. In addition, Eximbank has released summary information for the press and public.

As the technical analysis that is Attachment 2 analyzes in greater detail, NUS reported that:[2]

- Years after construction had started, CEZ [the Czech utility] lacked the basic information needed to understand the Soviet design. "[T]he Audit Team was informed that in the past, the performance of the Soviets in responding to Temelin requests for information has not been good, either with respect to the timeliness of the responses or their technical content." Attachment 3 (NUS Report), at A-15. NUS made clear that if design information, and the Soviet designers needed to explain it, is not available, then it will be most difficult or impossible to determine design adequacy, to correct design flaws, and to successfully engage in the major undertaking of integrating Western and Soviet technology.

- In addition to the major work needed to integrate Soviet and Westinghouse technology, deficiencies in basic Soviet systems and processes must be addressed and remedied. These include, for example, the Emergency Feedwater System, the Fire Hazards Assessment, the Equipment Qualification program, and the core design. Attachment 3, at A-3, A-5-6, A-13-14. Because, once again, of the absence of needed studies and/or design documentation, NUS could not identify the magnitude of the problem, much less the terms and cost of remedies.

- The construction has taken place in the absence of the Quality Assurance ("QA") practices required in the West. In the absence of good past QA procedures, it is impossible to assure the integrity of work previously done. Attachment 3, at A-8.

- The project suffers from many basic management deficiencies. "Without firm management action to address these project management issues," NUS stated, "there is little assurance that the project can be effectively controlled." Attachment 3, at A-8.

- Management deficiencies are coupled with cost control problems. "There is," NUS reported, a "respectful 'hands off' attitude on the part of CEZ-ETE [the branch of the Czech utility that deals with Temelin] that places excessive trust in the contractor's commitment to CEZ. . . ." Attachment 3, at A-8.

- The project lacks requisite "safety culture." Attachment 3, at A-2.

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2. Eximbank has not made public the NUS analyses it relies on. We have only had access to the October 1992 "Progress Report" which we enclose as Attachment 3.

It appears that Eximbank/NSC may only have possessed and/or considered earlier NUS materials. The Bibliography attached to the NSC memorandum refers to February and March 1992 NUS presentations, but not to the October 1992 Report.

The NSC and Eximbank memoranda do not address these NUS findings. This is so even though, as the attached analysis shows, NUS findings echo findings made by international review team studies of Temelin and the VVER-1000 reactor. *See* Attachment 2. The Eximbank decisional documents assert that these reviews support the decision, but do not refer to their critical contents.

SECOND, HOW CAN EXIMBANK DETERMINE THAT TEMELIN WILL MEET WESTERN TECHNICAL AND SAFETY STANDARDS WHEN, AT THIS LATE STAGE IN THE PROJECT, THE PROCEDURES WHICH ASSURE THESE STANDARDS HAVE BEEN DENIED?

The Eximbank decision appears to be based on the promise that Temelin must ultimately meet U.S. license conditions. In the United States, the construction of any civilian reactor, much less such a novel plant, could only proceed after the potentially affected public has been provided access to, and opportunity to provide meaningful and expert comment on, the health, safety, and environmental analyses on which approval will be based.[3] New documentation confirms that neither the Czech Republic nor Eximbank have made available, for open public and expert comment, the key technical analyses and documentation on which the decision relies.

By letter to you of January 26, 1994, Dr. Petr Pithart, the first post-Communist Czech Premier, stated that there is not enough reliable information in regard to cost, need for power, and safety to support a decision to proceed. Dr. Pithart's letter further explains that the decision to proceed in the Czech Republic has not been accompanied by measured public discussion, with access to critical documents and opportunity for comment (Attachment 4).

By letter of February 23, 1994 to Ambassador Tuerk, you confirmed that Eximbank will not release to the Austrian Delegation the basic analyses and documentation underlying the conclusion that the project can be completed safely (Attachment 5).[4]

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3. We understand that in U.S. domestic licensing proceedings, NRC rules and precedents provide for expansive discovery of important facts and documents from license applicants and other parties. *See* 10 C.F.R. § 2.740(b)(1); *Pacific Gas & Electric Company (Stanislaus Nuclear Project, Unit 1)*, 7 N.R.C. 1038, 1040 (1978).

4. The letter further stated that "the documentation that we have received regarding the Temelin project . . . includes a substantial amount of information" that is, in Eximbank's view, not releasible to the public under the U.S. Freedom of Information and Trade Secret laws.

(continued...)

At this late stage, years after the beginning of construction, neither Eximbank nor the Czech Republic have performed according to the U.S licensing process. Eximbank appears to have taken the position that public disclosure of critical technical and safety documentation is not permitted. What basis is there for suggesting that it can be adequately accomplished at an even later date?

In summary, we respectfully submit that it is inconsistent for Eximbank to finance the Temelin Project on the grounds that the plant can be licensed in accord with United States and Western safety standards, while basic documents relevant to the safety determination have not been made available for public and expert analysis.

THIRD, HOW CAN THE DECISION PROCEED WHEN CRITICAL PREMISES HAVE NOW BEEN CONTRADICTED BY THE PUBLIC RECORD?

For example,

♦ The issue of spent fuel disposal is a question of obvious importance in proceeding with any new reactor. The Eximbank information release accompanying the January 27th decision states:

> WHAT PROVISION HAS BEEN MADE FOR DISPOSAL OF SPENT FUEL?
>
> There is an interim storage facility at the Dukovany nuclear power station. This facility will be expanded to accommodate all future spent fuel and radioactive waste from both Dukovany and Temelin. . . .

The enclosed February 22, 1994 letter from the Mayor of Dukovany to Congressman Frank states: "There is no spent fuel interim storage facility in the Czech Republic at present, not at all at Dukovany" (Attachment 6).

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4. (...continued)
However, U.S. NRC rules provide:

> it is the policy of the Commission to achieve an effective balance between legitimate concerns for protection of competitive positions and the right of the public to be fully apprised as to the basis for and effects of licensing . . . actions. . . .

10 C.F.R. § 2.790(b)(2).

The letter states that while there is a licensing procedure ongoing for interim storage at Dukovany, it is exclusively for fuel from the Dukovany reactors.

- The Eximbank materials rely on the premise that the meeting of Western and Soviet technology may be achieved because it has been accomplished in Finland, with an underlying VVER-440 reactor. However, in the Finnish circumstances cooperation between Soviet and Finnish teams was measured and assured. That is not comparable to the Temelin situation. *See* Attachment 1, at 13-14.

More relevant is the situation regarding Stendal, another partially completed VVER-1000 in the former East Germany. A safety evaluation by the German Commission for Reactor Safety ("GRS") found many deficiencies that would require remedy, and instances where the remedy is not viable. As shown by the enclosed letter from the German Democratic Republic Office of Radiation Protection ("BFS"), no private investor could be found to underwrite Stendal's completion, and work at the site has been suspended. *See* Attachment 7.

FOURTH, HOW CAN POTENTIALLY AFFECTED PARTIES BE ASSURED THAT SUMS WILL BE AVAILABLE TO COMPLETE THE PROJECT SAFELY, AND THAT THE PROJECT IS THE MOST ENVIRONMENTALLY SUITED, LEAST-COST ALTERNATIVE?

The Eximbank decision appears to presume that Temelin is the least-cost option. However, Eximbank states that it did not "analyze whether the project is the least-cost option."[5] Moreover:

- Eximbank does not address the strong probability that the total project costs (if the project is to meet Western standards) will exceed current estimates. It is well known that the costs of nuclear plants often substantially exceed the amount estimated. The NUS analyses, and the further documentation we enclose, shows that the costs required to bring the project into compliance with Western safety standards are not known. Until further studies are done, it will be impossible to know the total costs of completing a plant that will be "licensable" under U.S. standards.

The Eximbank materials do not consider what will happen if more money than presently estimated is required to meet Western standards. What assurances

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5. *See* Ex-Im Bank Information Release. The release states that:

> The Czech government made the determination that the nuclear power project would best meet their needs, after considering other available options.

does Eximbank have that this money will be made available? Has Eximbank considered the potential risk that, if money is not available, the reactor may be completed and operated in a way that does not meet Western standards?[6]

♦ Documents show that Temelin power is not needed and, in any event, there are important alternatives. In particular, the analyses relied on by Eximbank did not compare Temelin to the abundant potential for conservation in the Czech Republic. Nor does there appear to have been analysis comparing the Temelin project to the retrofitting of Temelin for natural gas-fired generation. *See* Attachment 1, at pages 16-19, and materials referenced therein.

♦ The Eximbank decision assumes that the loan guarantee will be coupled by the shutdown and/or retrofitting of environmentally hazardous Czech coal plants. However, the material made public by Eximbank does not show any documented commitment to the linkage of coal cleanup and the loan guarantee. We enclose documentation indicating that the World Bank "project preparation [for $350 million of Czech coal cleanup projects] has been discontinued pending receipt of confirmation of government interest." Thus, the Temelin project may be undertaken at the expense of coal cleanup. *See also* Attachment 1, at pages 19-20.

In addition to the material enclosed, additional relevant material may be forthcoming, which we shall provide to you.

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6. Of particular concern is the possibility that in order to complete the project, construction management will be under pressure to cut corners and costs. This concern is heightened by the statement by NUS that implementation of NUS recommendations have "been, and continues to be slow," and that progress "must be accelerated if the current plant schedule is to be maintained." Attachment 3 (NUS Report), at 4.

In conclusion, I look forward to discussing this material with you and the Eximbank staff. In advance of this discussion please feel free to contact me should you have any questions regarding these materials.

Very truly yours,

Manfred Heindler
FOR THE SPECIAL DELEGATION OF
THE GOVERNMENT OF AUSTRIA TO
THE UNITED STATES REGARDING
THE TEMELIN POWER PLANT

Attachments

cc: Carol F. Lee
General Counsel, Export-Import Bank of the United States
Hon. Kathleen McGinty
Special Assistant to the President and
Director, Office of Environmental Policy
Hon. Leon S. Fuerth
National Security Advisor to the Vice President
Hon. Eileen B. Claussen
Special Assistant to the President for Global Environmental Affairs
Hon. Dana M. Marshall
Senior Advisor to the Vice President for International Economic Affairs
Hon. Jim Bacchus, U.S. House of Representatives
Hon. Peter Deutsch, U.S. House of Representatives
Hon. John D. Dingell, U.S. House of Representatives
Hon. Lauch Faircloth, U.S. Senate
Hon. Eric D. Fingerhut, U.S. House of Representatives
Hon. Barney Frank, U.S. House of Representatives
Hon. Henry B. Gonzalez, U.S. House of Representatives
Hon. Michael Huffinton, U.S. House of Representatives
Hon. Joseph P. Kennedy II, U.S. House of Representatives
Hon. J. Robert Kerrey, U.S. Senate
Hon. Patrick J. Leahy, U.S. Senate
Hon. Alfred A. McCandless, U.S. House of Representatives
Hon. Bill Orton, U.S. House of Representatives
Hon. Claiborne Pell, U.S. Senate
Hon. Donald W. Riegle, Jr., U.S. Senate

INDEX OF ATTACHMENTS TO LETTER FROM MANFRED HEINDLER TO HON. KENNETH D. BRODY
DATED FEBRUARY 28, 1994

No.	Description
1.	TECHNICAL MEMORANDUM REGARDING THE TEMELIN NUCLEAR POWER PLANT Prepared by the Advisors on the Special Delegation of the Government of Austria to the United States [dated 02/94]
2.	THE SAFETY ANALYSIS UNDERLYING THE TEMELIN NUCLEAR POWER PLANT LOAN GUARANTEE [dated 02/28/94]
3.	PROGRESS REPORT ON THE AUDIT OF THE TEMELIN NUCLEAR POWER PLANT Prepared for ČEZ, a.s. by HALLIBURTON NUS [dated 08/92; revised 10/06/92]
4.	ENGLISH TRANSLATION OF LETTER FROM PETR PITHART (CZECH PRIME MINISTER FROM 02/90 - 06/92) TO HON. KENNETH BRODY (PRESIDENT, CHAIRMAN OF U.S. EXPORT IMPORT BANK) [dated 02/94]
5.	LETTER FROM KENNETH D. BRODY (PRESIDENT AND CHAIRMAN, EXPORT-IMPORT BANK OF THE UNITED STATES) TO HIS EXCELLENCY HELMUT TUERK (AMBASSADOR, AUSTRIAN REPUBLIC) [dated 02/23/94]
6.	FACSIMILE TRANSMISSION FROM MAYOR OF DUKOVANY TO HON. BARNEY FRANK [dated 02/22/94]
7.	BUNDESAMT FÜR STRAHLENSCHUTZ (BfS) LETTER [dated 02/28/94]
8.	DOCUMENTS CITED IN TECHNICAL MEMORANDUM REGARDING THE TEMELIN NUCLEAR POWER PLANT Prepared by the Advisors on the Special Delegation of the Government of Austria to the United States
9.	DOCUMENTS CITED IN THE SAFETY ANALYSIS UNDERLYING THE TEMELIN NUCLEAR POWER PLANT LOAN GUARANTEE

DOCUMENTS CITED IN THE "TECHNICAL MEMORANDUM REGARDING THE TEMELIN NUCLEAR POWER PLANT"

PREPARED BY THE SPECIAL DELEGATION OF THE GOVERNMENT OF AUSTRIA TO THE UNITED STATES FEBRUARY 1994

1) "Evaluation of the Energy Efficiency of the Czech and Slovak Iron and Steel Industries," Report by B. Vallance, UN-ENERGY/SEM.12/R.17, March 23, 1993.
FOOTNOTE 4

2) "Opportunities to Improve Energy Efficiency in the Czech Republic," UN-ENERGY/SEM.12/R.28, March 23, 1993.
FOOTNOTE 4

3) "World List of Nuclear Power Plants," *Nuclear News*, September 1993, pp. 43-62.
FOOTNOTE 6

4) Letter from Dr. Petr Pithart to Kenneth Brody, January 26, 1994.
FOOTNOTE 7 (SEE ATTACHMENT 4)

5) "WWER-1000/320 Generic Safety Issues Developed from Codes and Standards Comparison (IAEA-SC-071)," Report by Chengge Lin , IAEA Extrabudgetary Programme on the Safety of WWER NPPs, SAS/NENS/IAEA, April 1993.
FOOTNOTE 14 (SEE ATTACHMENT 9)

6) "Progress Report on the Audit of the Temelin Nuclear Power Plant," prepared for CEZ, a.s., by Halliburton NUS, August 1992 (as revised October 6, 1992).
FOOTNOTE 15 (SEE ATTACHMENT 3)

7) "Buyers Participation and Well Developed Domestic Infrastructure - Keys to Successful Introduction of Nuclear Power in a Small Country (IAEA-CN-42/34)," report by K. Numminen and P. Laine, in *Lovissa Nuclear Power Station - Pioneer in East-West Cooperation*, presented at the Third International Conference on Emerging Nuclear Energy Systems, Imatron Voima Oy, Consulting Engineers LTD., Helsinki 1983.
FOOTNOTE 17

8) "Co-Operation between Finland and the U.S.S.R. in the Field of Nuclear Engineering (FORATOM III, Session 6)," report by Perttu Simola, in *Lovissa Nuclear Power Station - Pioneer in East-West Cooperation*, presented at the Third International Conference on Emerging Nuclear Energy Systems, Imatron Voima Oy, Consulting Engineers LTD., Helsinki, 1983.
FOOTNOTE 17

9) "Temelin Costly and Unnecesary," *Nucleonics Week*, June 25, 1992, pp 4-5.
FOOTNOTE 26.

10) "Supporting Material for the Czech Republic Government Decision about the NPP Temelin," Report by I. Benes, Power International, May 23, 1992, in Czech and English.
FOOTNOTE 26

11) "Czech Republic Energy Sector Mission Aide-Memoire," Report by Dale Gray, The World Bank, 1992.
FOOTNOTE 27

12) "Generation System Study for the Czech Republic," Final Report: Volume 2 of the Demand Study for the Czech and Slovak Republics, Commission of the European Communities Phare Programme, Tractebel Energy Engineering, April 1993.
FOOTNOTE 28

13) "Power Sector Least Cost Development Study for the Czech and Slovak Republics," Final Report: Volume 1 of the Demand Study for the Czech and Slovak Republics, Commission of the European Communities Phare Programme, Tractebel Energy Engineering, April 1993.
FOOTNOTE 28

14) "Trojan Decommissioning Cost Disparity Linked to Assumption Differences," *Inside the NRC*, November 29, 1993. See page 7.
FOOTNOTE 35

15) "Remarks of Czech Republic Prime Minister Vaclav Klaus to the Bretton Woods Committee," Washington, DC, October 15, 1993.
FOOTNOTE 39

16) "Monthly Operational Summary of Bank and IDA Proposed Projects (As of January 15, 1994)," from the Vice President and Secretary, International Bank for Reconstruction and Development, International Development Association, February 4, 1994.
FOOTNOTE 40

ADDITIONAL DOCUMENTS WILL BE PROVIDED AS THEY BECOME AVAILABLE

INDEX OF DOCUMENTS REFERENCED IN "THE SAFETY ANALYSIS UNDERLYING THE TEMELIN NUCLEAR PLANT LOAN GUARANTEE" DATED FEBRUARY 28, 1994

A. Letter from Kenneth D. Brody, President and Chairman, Export-Import Bank of the United States, to Hon. Thomas S. Foley, Speaker of U.S. House of Representatives [dated 01/27/94]

B. Memorandum to Kenneth Brody, President and Chairman, Export-Import Bank, from William H. Itoh, Executive Secretary, National Security Council, Regarding Temelin Nuclear Power Plant [dated 09/29/93]

C. Progress Report on the Audit of the Temelin Nuclear Power Plant Prepared for ČEZ, a.s. by HALLIBURTON NUS [dated 08/92; revised 10/06/92]
See ATTACHMENT 3

D. International Atomic Energy Agency Temelin Design Review Mission Report, Reportr RER/9/004-17 [dated 08/20/90]

E. International Atomic Energy Agency Operational Safety of Nuclear Installations, The Czech and Slovak Federal Republic, Pre-OSART Mission [dated 07/90]

F. International Atomic Energy Agency Operational Safety of Nuclear Installations, Czechoslovakia, Pre-OSART Mission Follow-up Visit [dated 07/92]

G. International Atomic Energy Agency Extrabudgetary Programme on the Safety of WWER NPP's, entitled, WWER-1000/320 Generic Safety Issues Developed from Codes and Standards Comparison [dated 04/93]

This letter and accompanying documents are being submitted by the firm of Spiegel & McDiarmid, 1350 New York Avenue, N.W., Suite 1100, Washington, D.C. 20005, on behalf of its client, The Special Delegation of the Government of Austria To The United States of America Regarding the Temelin Nuclear Plant, c/o. Embassy of Austria, 3524 International Court, N.W., Washington, D.C. 20008. Since The Special Delegation is a foreign organization, Spiegel & McDiarmid is registered with the Department of Justice under the provisions of 22 U.S.C. § 611, et seq., as an agent of such foreign principal. Copies of this letter and accompanying documents are being filed with the Department of Justice, and copies of Spiegel & McDiarmid's registration statement are available for public inspection at the Department of Justice. Registration does not indicate approval of this material by the United States government.

TECHNICAL MEMORANDUM

REGARDING THE

TEMELIN NUCLEAR POWER PLANT

PREPARED BY THE
ADVISORS
ON THE
SPECIAL DELEGATION
OF THE
GOVERNMENT
OF

AUSTRIA

TO THE

UNITED STATES

WASHINGTON D.C. - FEBRUARY 1994

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TECHNICAL MEMORANDUM
ON THE
TEMELIN NUCLEAR POWER PLANT

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February 22, 1994

INTRODUCTION

We are technical advisors on the Special Delegation sent by the Austrian Government to the United States regarding the proposed completion of the Temelin nuclear power plant in the Czech Republic. We have prepared this report to present our views regarding safety and environmental impacts of the proposed Temelin nuclear reactors.

The Czech government now plans to complete construction of the Temelin Nuclear Power Plant - which was initiated by the former Communist regime - with the help of U.S technology, equipment, and financing. The facility, which is less than 40 miles from the Austrian border, consists of 2 partially-constructed Russian-designed VVER 1000 pressurized water reactors.

In May 1993, the owner of the power plants, Czech Electric Utility ("CEZ"), contracted with Westinghouse Electric Corp. to supply (1) instrumentation and control equipment and services, and (2) advanced-design nuclear fuel, to complete and start up both Temelin units. A Citibank consortium agreed to issue a $400 million loan for the project.

On January 27, 1994, the U.S. Export-Import Bank ("Ex-Im Bank") notified the U.S. Congress of its tentative approval of a $317 million loan guarantee for the Temelin project. Ex-Im Bank submitted in support its 12-page Environmental Evaluation ("ExIm EE")[1] and a Memorandum from the National Security Council and accompanying 10-page "Technical Analysis" on safety and environmental issues to the Ex-Im Bank, dated September 29, 1993 ("NSC Memo").[2] The U.S. Congress has a 35-calendar-day period to review this Ex-Im Bank action.

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[1]Export-Import Bank of the United States, Engineering Division, Environmental Evaluation, Temelin Nuclear Power Station (January 26, 1994).

[2]National Security Council, Memorandum for Mr. Kenneth Brody, President and Chairman, Export-Import Bank (September 29, 1993).

As a team, we have over 50 years of experience working on nuclear safety, energy policy and environmental issues. Four of us serve as members of the Federal Chancellor's Nuclear Advisory Council. Also contributing to this study is a legal expert who has represented two Austrian states in extensive discussions with Czech officials regarding nuclear matters. We have been involved in technical exchanges with our counterparts in the Czech Republic and have studied the safety of operating and planned nuclear facilities in the Czech and former Czecho-Slovak Republic and other neighboring countries.[3] We are also involved in cooperative research on energy efficiency policy in the Czech Republic.[4]

Before leaving for the United States, we reviewed as much documentation and information as we could assemble from Czech, Austrian, and other sources regarding Temelin. We were able to gain access to parts of two of the key technical studies by Halliburton NUS and Tractebel which are relied upon in the U.S. Government's consideration and review of the proposed exports as reflected in the Ex-Im EE and the NSC Memo.

In the first instance, we, as experts, remain very skeptical regarding all the assurances about Temelin's safety, benign or even positive environmental impacts, and solid economics. The reason is that relatively little information on these questions is publicly available. Moreover, the material we have reviewed, including the studies noted above, provide strong evidence of very significant hazards posed by the proposed facility.

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[3] Evaluation of the Safety of NPP Jaslovske Bohunice V-1, Sponsored by the Austrian Chancellory, Vienna 1991, (updated edition in print, Springer Publishing Co., Vienna - New York); International Commission for Independent Safety Analysis of the Nuclear Power Plant Krsko (ICISA), Ljubljana, November, 1993; Study on the Safety of the Dry Cask Interim Spent Fuel Facility at NPP Dukovany, The Academic Senate's Project on Nuclear Safety of the University of Vienna, Sponsored by the Austrian Chancellory, Vienna 1994.

[4] M. Muehlberger, Opportunities to Improve Energy Efficiency in the Czech Republic, UN-ENERGY/SEM.12/R.28, March 23, 1993; B. Vallance, Evaluation of the Energy Efficiency of the Czech and Slovak Iron and Steel Industries, UN-ENERGY/SEM.12/R.17, March 23, 1993.

In this memorandum, we briefly describe the reasons for Austrian concerns about this reactor just across our border. We describe the lack of normal open procedures for technical and public review of such a project. We describe Austria's bilateral cooperation on energy with the former Czecho-Slovak and the Czech Republic. We review the serious safety and feasibility issues associated with this novel attempt to graft U.S. technology onto Soviet-designed, partially-completed reactors. Finally, we outline the less costly alternatives available to meet energy needs.

AUSTRIA'S INTEREST IN TEMELIN

While Temelin is located in another country, its potential hazards to the people and land of both the Czech Republic and Austria are very similar, if not equal. The reactors are both 60 miles from Prague and from Linz, Austria's third largest city. Vienna is 120 miles southeast down the prevailing winds from Temelin.

An accident at Temelin could result in devastating health, environmental, economic, and social consequences for all of Austria's almost eight million citizens. The Chernobyl experience has shown that nuclear hazards do not respect national borders. Although Chernobyl is some 700 miles away from Austria, the 1986 accident led to radioactive fallout in large regions of our country at levels higher than most other countries in Western Europe.[5]

BACKGROUND AND STATUS OF TEMELIN

In the 1970s, the Communist Government of Czechoslovakia made a decision to build a nuclear plant at Temelin. In 1982, a number of governmental ministries participated in an environmental study of the suitability of the site. The Czechoslovak Atomic Energy

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[5]Report on the 1986 Chernobyl Nuclear Power Plant Accident and its Radiological Impact on Austria, Federal Ministry of Health (Vienna, 1987).

Commission ("CzAEC") issued a construction permit in 1986, licensed according to the 1982 Soviet regulations.

Work began that year on the first of four planned units. Construction of Units 3 and 4 was suspended in 1990. As of Fall 1993, it was reported that Temelin Unit 1 is 65 % complete and Unit 2 is 45 %.[6] According to CEZ, the level of completion was, as of spring 1993, 96% and 80% for structures, respectively, and 60% and 30% for technology components, respectively.

Unlike the United States where President Clinton is both Head of State and Head of Government, President Vaclav Havel is only the Head of State of the Czech Republic. It is the Heads of the post-Communist Federal and Republic Governments which have the responsibility for decisions regarding nuclear power.

The first post-Communist Czech government of Premier Petr Pithart considered the Temelin issue in early 1992. According to Pithart, there was not enough reliable information to support a decision, particularly in regard to costs, need for power, and safety. The Pithart government urged the incoming Klaus government to make a thorough investigation of all relevant facts before deciding on Temelin's fate.[7] **Premier Pithart is critical of the Klaus Government, which "made it clear from the very beginning that its position [in favor of Temelin] was already fixed, thus it de facto refused public debate."[8]**

There is strong local opposition against the Temelin project. **Fifty-four of 60 city councils in the Temelin area, representing 76,850 inhabitants, have passed resolutions against**

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[6]36 Nuclear News 45 (No. 11, September 1993).

[7]Letter from Dr. Petr Pithart, former Prime Minister of the Czech Republic, to Kenneth Brody, President and Chairman, Ex-Im Bank, 1 (January 25, 1994).

[8]Id.

completing the nuclear power plant.[9] They have asked the Czech government to prepare an environmental impact statement with public participation.[10]

The Klaus Government decision was made in the absence of technical and public procedures used to assure the soundness of decisions regarding nuclear projects. **There has not been an environmental impact statement prepared on Temelin; nor has there been any independent public technical review of the safety and economics of the plant.** The Czech government has not officially released any of the primary technical information underlying their decision.

AUSTRIAN-CZECH COOPERATION ON ENERGY

For several years, Austria has been actively engaged in a dialogue with Czecho-Slovakia and its successor states, the Czech Republic and the Slovak Republic, on technical and economic energy matters. Nuclear power has been a focus of common interest.

Austria recognizes that the Czech Republic must rely for the time being on its existing nuclear plants to meet its current demands for electricity. Austria has sought to provide the Czech Republic with technical and other assistance. In 1991, after an in-depth safety study by Austrian and international experts,[11] the Austrian Government offered to supply Czechoslovakia with the electric power needed to permit the shutdown for safety upgrading of two operating reactors at Jaslovske Bohunice V-1. This offer had a value of about $300 million per year.

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[9]Letter of the Association of Cities and Communities in the Temelin Region to Mr. K. Dyba, Czech Minister of the Economy, 1 (March 1, 1993).

[10]Id.

[11] See footnote 3.

Since 1992, Austria has been supporting a series of joint efforts to develop alternatives to nuclear power. These continuing endeavors include upgrading fossil-fuel plants and district heating. Austria has been preparing a study with the Czecho-Slovak/Czech experts to identify options for energy efficiency and to develop an appropriate legal and policy frameworks.[12]

In 1992, then Premier Pithart asked the Austrian Chancellor to assist the Czech Republic in addressing the Temelin issue. In response, Austrian experts prepared a study of the conversion of Temelin to a gas-fired combined cycle power plant. Similar conversions of nuclear plants have been carried out at Midland and Zimmer in the United States. However, resulting bilateral top official and expert discussions did not reach agreement on conversion.[13] Austria has offered to fund further technical investigation of this option, but efforts to arrange additional bilateral expert meetings have not succeeded.

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[12]M. Muehlberger, supra n. 4.

[13]Meetings in Prague, February 9, 1993, and in Vienna, March 29/30, 1993.

CONCERNS ABOUT THE SAFETY OF THE TEMELIN REACTORS

Based upon our review of available data about plans to add U.S. technology to the units Temelin, we have considerable doubts that the reactors can meet Western safety standards.

The Temelin reactors are based upon the flawed Soviet VVER-1000/320 reactor design. An April 1993 International Atomic Energy Agency (IAEA) report[14] identifies 16 areas where the VVER-1000 design standards and codes are deficient when compared to U.S. regulations and IAEA standards. These include:

(1) Severe Accidents;
(2) Common Mode Failure;
(3) Missile Protection;
(4) Fire Protection;
(5) Classification of Components;
(6) Reactor Core Design;
(7) Core Power Distribution and Xenon Oscillations;
(8) Heat Transfer to an Ultimate Heat Sink;
(9) Radiation-Induced Embrittlement of Pressure Vessel Steels;
(10) Containment Design Basis;
(11) Hydrogen Control;
(12) Instrumentation and Control;
(13) Overpressure Protection;
(14) Safety Analysis Report;
(15) Quality Assurance Program;
(16) Component Failures and Human Errors Data.

The proposed upgrade of Temelin will purportedly address a number of these issues with regard to the VVER-1000 design. However, it is not clear whether some of these safety concerns - particularly common mode failure causes such as fires, floods, and internal missiles - can be adequately addressed because critical structures have already been completed. Another critical upgrade problem involves the flaws in Temelin's existing steam

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[14]IAEA-SC-071, WWER-1000/320 Generic Safety Issues Developed from Codes and Standards Comparison, Ch. Lin auth., SAS/NENS/IAEA (Vienna, April 1993).

generator headers. They do not meet U.S. or international safety standards and their upgrading would require extraordinary expense.

The Ex-Im Bank relied on an interagency technical review, coordinated by the National Security Council (see NSC Memo) "of the design of the VVER 1000 reactors"(Ex-Im EE, at 2). However, it appears that neither the U.S. Department of Energy nor Nuclear Regulatory Commission ("NRC") sought to perform a safety analysis of the specific design and plans for the Temelin project. In brief, the only systematic Temelin specific study relied on by the Ex-Im Bank appears to be that performed by NUS Halliburton ("NUS."). According to the NSC Memo, this report is "the only independent Western review of the licensability of VVER-1000 reactors." Attachment, p. 6) The Ex-Im EE (p.2) states that NUS "found Temelin to be fundamentally sound and in conformance with U.S. safety principles save for the Russian Instrumentation and control systems."

We have been unable to secure access to all of the NUS reports in spite of promises from Czech authorities. However, the NUS Progress Report we have obtained shows that their Audit Team found serious design questions.[15] Even more importantly, the NUS Progress Report found that there has been, and is, a lack of the basic information needed to understand the Soviet design. As NUS explains, if the information, and the experts needed to explain it, is not available, then it will remain impossible to understand the adequacy of the design, much less to correct safety flaws.

The NUS progress report surprisingly concludes that the plant is "licensable in the mid-1990s." (Report, p. 2). This conclusion further presumes that the "Audit Team's technical

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[15] We have access to the "Progress Report on the Audit of the Temelin Nuclear Power Plant" (August, 1992; Revised October 6, 1992). The introduction states (at 1):

"This Report 1) summarizes the results of the Audit of the Temelin Nuclear Power Plant conducted by the Halliburton NUS Environmental Corporation; 2) describes the subsequent major follow-up actions taken by Halliburton NUS on behalf of CEZ... and 3) presents Halliburton NUS major conclusions and recommendations based on the Audit results and the follow-up tasks."

and programmatic recommendations are implemented." NUS itself immediately proceeds to state that "implementation progress has been, and continues to be slow. It must be accelerated if the current plant schedule is to be maintained." Moreover, the remainder of the NUS report shows why the implementation of the changes will be difficult.

First, NUS Progress Reports identify a number of specific design difficulties. For example, "Temelin's reliance on a single containment sump located in an extension of containment is not consistent with Western practice. In addition, the design of the sump and associated piping exhibit several design weaknesses." (Report, p. A-4) These flaws could contribute to a failure of the emergency core cooling system under recognized accident scenarios. Design flaws were also uncovered with respect to the Emergency Feedwater System. As stated by NUS,

> [t]he Audit Team could not reach a final conclusion as to the adequacy of the Emergency Feedwater (EFW) system, because all of the necessary design documentation was not available. However, the conceptual design of the system is consistent with Western standards and includes considerable strengths...However, there is no documented evidence that the system can withstand a single failure, and the system exhibits certain design weaknesses including the lack of diversity in the power supply, availability of flow instrumentation and isolation capability for only two out of four steam generators, and potentially inadequate tank capacity for plant cooldown." (Report, pg. A-13)

Such system specific concerns can only be rectified with access to complete and accurate data on the underlying design. However, NUS found that "there is inadequate amount of information from the original Soviet reactor supplier concerning the technical basis and underlying analyses of the plant design. Obtaining such information is considered to be an important factor in the successful economic completion of the plant and its future safe operation." (Report, pg. A2-A3) Ukraine is already experiencing severe problems in securing such information from Rosenergoatom and other Russian VVER-1000 equipment suppliers for its existing VVER-1000 reactors, which raises serious questions as to the data's future availability to CEZ.

The problems of melding Soviet construction processes with western standards -- coupled with the lack of necessary data -- are described by NUS with respect to implementation of needed modifications. As stated by NUS:

> Implementation of the new fuel/core design and I & C replacement projects will require a major design integration effort, not only between these projects but with the remaining nuclear island and balance of the plant design. (Report, p. 5-3)

NUS stated that this effort "would normally be assigned to the plant architect/engineer." However, as NUS noted, changes in the Soviet Union make it unlikely that the original designers can be relied on in this case. Similarly, NUS notes that

> Important concerns raised by the I&C replacement are the need to assure adequate cooperation of the original Soviet design organization .... The Audit Team was informed that in the past, the performance of the Soviets in responding to Temelin requests for technical information has not been good, either with respect to the timeliness of the responses or their technical content." (Report, p. A-15)

Under Western practice, nuclear plants are not permitted to operate until a comprehensive Probabilistic Safety Analysis (PSA) has been prepared, reviewed, and approved. Regarding existing Temelin VVER-1000 accident analyses, NUS reported that the "assumptions made in the analyses appear to be conservative, but the analytical tools used are generally outdated and in many instances would be considered in the West to be unsuitable for a thorough accident evaluation." (Report, p. A-4) In addition, the proposed blending of Western technology will require substantial new design work, leading either to a substantial delay in the startup of the reactors or unexpected design flaws which could not be corrected.

NUS apparently shares our concern about practices followed in the construction of the Temelin reactor during the Communist past. There may already be problems due to poor practices and quality assurance which could compromise the safety of the plant. NUS reported that:

> the Team frequently found...two factors adverse to safety that appear to remain from work practices under the previous Czechoslovakian economic system:
>
> - the widespread absence of a questioning attitude, especially below the senior management level, which tends to result in the acceptance without challenge of safety decisions or representations by other parties; and
>
> - the lack of aggressive management action to investigate and control conditions adverse to the company's [CEZ's] objectives." (Report, pg. A-2)

In the same vein, NUS found that the plant staff was mismatched to the needed functions, and that there was a lack of safety culture at the construction site.

NUS's findings with respect to construction practices in the more recent past present a picture of a plant organization which remains out-of-touch with the most basic nuclear management practices. While sound construction management is a cornerstone of successful and safe plant construction, the NUS report makes clear that the requisite standard is not being met at Temelin. NUS states expressly that

> CEZ-ETE lacks a strong on-site engineering organization to manage and control the overall design effort .... This is important on any technical project as complex as a nuclear power plant, but is especially important at Temelin....(Report, p. A-7)
>
> * * *
>
> CEZ headquarters is insufficiently involved in overseeing, monitoring and reviewing the progress of the project. An organized program of independent safety oversight, similar to those found in Western utilities, has not been established at Temelin. This should be done to promote the development of an appropriate safety culture. (Report, p. A-7)
>
> Without firm management action to address these project management issues, there is little assurance that the project can be effectively controlled. (Report, pp. A-7, A-8)

In the same vein, NUS concludes that "[e]xisting technical and financial oversight of the Temelin project is not adequate." (Report, p. 6).

Subsidiary inadequacies are identified by NUS in many areas of plant construction management. For example, NUS concludes that the Temelin quality assurance (QA) organization is woefully inadequate:

> **the QA procedures for the performance and inspection of construction work are inadequate to provide instruction on how the tasks should be performed, and there is no provision for analysis of deficiencies to determine their root causes and identify potential adverse quality trends. (Report, pg. 6)**

The failure to identify "root causes" means that when a problem arises only the symptoms of that problem -- not its underlying cause -- are being addressed. The same can be said of the failure to identify adverse "trends." Thus, there is no assurance that significant, detrimental conditions are being identified and corrected.

The NUS proposed remedy for this problem which is identified as a Priority A or "immediate" action matter is to:

> Accelerate the completion and implementation of Temelin QA programs with emphasis on self-audits. (Report, pg. C-1, Item No. 4)

With the plant half finished, it is long past the time when QA programs should have been adopted and implemented. Even more important, there is no assurance that work-to-date has met the requisite quality standards.

NUS determined in late 1992 that the plant lacked an adequate equipment qualification (or "EQ") program. In fact, as of that time the plant's EQ program was so deficient that Halliburton/NUS recommended the performance of a separate audit just to identify all of the problems. NUS stated:

> **the equipment program for Temelin does not meet Western standards. A number of potentially significant weaknesses were**

> **identified, but a detailed audit of the program would be needed to determine the extent of the deficiencies. (Report, p. A-6).**

While obviously significant, this finding takes on even greater importance when it is recalled that there is a considerable amount of Soviet-supplied equipment in the facility. As stated by NUS:

> Examples of the weakness found [in the EQ program] included a lack of definition of the environmental qualification program performed by the Soviets for the equipment they supplied, and the absence of any indication that age-related or potential accident-caused equipment degradation were adequately considered in the design and specification of equipment. (Report, p. A-7).

The NUS Report calls for the establishment of a "program for the environmental qualification of safety related equipment," (Report, p. C-2, Item No. 14). However, it is not clear whether -- and if so, how -- this program would be applied covering all accident conditions to be considered with the equipment which has already been supplied.

The findings made by NUS with respect to other subsidiary issues are no more assuring. Regarding a radwaste and radiation protection ALARA concept (As Low As Reasonably Achievable), NUS finds that a "formal ALARA program for system and plant design has not been instituted for any of Temelin's radwaste management systems; its absence is particularly noticeable in the liquid radwaste management systems." (Report, p. A-12).

It is far from certain whether the combination of Westinghouse and Czech built reactor components will work as planned. Westinghouse still has to do a great deal of engineering and analysis to attempt to adapt U.S. equipment and Soviet and Czech hardware to each other. These daunting problems of component interdependence may impair safety and lead to cost and schedule overruns.

The ExIm EE points to Finland's Loviisa Nuclear Power Station as a precedent for Temelin. (p. 6). Loviisa's 2 VVER 440s were upgraded with western I&C technology in the 1970s and

have run safely since then, according to the ExIm EE.[16] However, Loviisa involves a totally different situation from Temelin. At Loviisa, the western I&C was introduced in an extended design phase during the general redesign of these unique plants.[17] At Temelin, this task is to be carried out in an almost fully designed and partially completed plant. Finnish experts also evaluated the VVER 1000 design in 1977-1980, but recommended not to build such a plant in Finland.[18]

Aside from a specific "Hot-Test", there will be no comprehensive review whether the combination of Westinghouse and Czech built reactor components will work as planned. The Westinghouse software will set certain technical criteria the Czech reactor hardware has to meet in order for the combination to work. Even Ex-Im Bank concedes that Westinghouse still has to do a great deal of engineering and analysis to adapt U.S. equipment to the existing Czech hardware. These unresolved problems of component interdependence may impair safety and lead to cost and schedule overruns.

The actual costs of completing Temelin remain uncertain. It is well known that the actual costs of nuclear reactors more often than not exceed the initially estimated costs by hundreds of millions, even billions, of dollars.[19] The NUS Audit, as quoted above, makes plain that the likelihood that the plant will be completed within budget is extremely remote. According to CEZ, Temelin will cost $700 million to complete for a total of $2.3 billion for two

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[16]ExIm EE at 6

[17]Loviisa Nuclear Power Station - Pioneer in East-West Cooperation, IVO Consulting Engineering Ltd. (Helsinki, 1983).

[18]Id.

[19]Experience shows an average 420% overrun and 5 year delay in completion for the 52 nuclear plants built by Westinghouse in the US. The original plans for the Bataan NPP in the Philippines, also built by Westinghouse, priced the two reactors at $500 million. Construction costs on only one of the two reactors totalled $2.2 billion.

plants.[20] This figure appears to be too low since a single comparable plant in the West costs $6-7 billion.[21]

A German study estimated the cost to complete and upgrade to German standards the Stendal A VVER-1000 reactor (in the former East Germany) to be from $2.3 to 2.9 billion.[22] **In light of this experience, it appears that upgrading the Temelin reactor may cost $1 billion or more than estimated by CEZ. It is notable that Germany cancelled construction of VVER 1000s in the former German Democratic Republic after determining that safety enhancements would not be economically viable.**

CONCERNS ABOUT RADIOACTIVE WASTE AND REGULATORY CAPABILITIES

The Czech Republic does not have an interim storage facility for spent fuel or radioactive waste.[23] Although a storage facility is currently under licensing at Dukovany, it is designed for 600 t waste from NPP Dukovany only.[24] Waste from Temelin is explicitly excluded from

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[20]Information Confirmed by the Czech Governmental Expert Group to the Austrian Government, March, 1993.

[21] If comparable international costs are applied for completion, with the assumption that 50% of the remaining equipment will be supplied by the Czechs at 30% of standard Western costs, the cost for completion is $1.7 billion instead of $770 million. Additional costs may arise from delays, additional fundamental redesigns, or a lower stage of completion than claimed by CEZ.

[22]Sicherheitstechnische Bewertung des Kernkraftwerkes Stendal, Block A, vom Typ WWER-1000/W-320, GRS-99; Supplementary Facts to the Press Conference, March 20, 1991, NPP Stendal Ltd, Management (March 27, 1991).

[23] Study on the Safety of the Planned Dry Cask Interim Spent Fuel Facility at NPP Dukovany, The Academic Senate's Project on Nuclear Safety of the University of Vienna, Sponsored by the Austrian Chancellory, Vienna 1994.

[24] From the ongoing licensing procedure for the dry cask interim spent fuel storage facility at NPP Dukovany: Minutes of the EIA Public Hearing, Rouchovany, October 29, 1992, pp 9, 10, 77; Document from CEZ, Meeting of the Councils of Dukovany and Rouchovany, December 16 & 17, 1992, pp 25, 26; Siting Decision of the District Council Office, Trebic, April 1, 1993, pp 3, 4.

this site, contrary to the statement of the Ex-Im Bank.[25] In addition, plans for interim waste storage facilities have met with strong local opposition.

Any judgement as to the adequacy of Czech governmental capability to assure the safe construction of the Temelin Reactors must take into account the fact that substantial work at Temelin occurred under the supervision of the previous Communist Government. The CzAEC did not follow international standards and was constrained in carrying out its responsibilities.

In January 1993, the new Czech Republic established the State Office for Nuclear Oversight to assume the responsibilities of the commission. Since this agency is so new, it appears that it would be difficult to determine whether it will be able to perform its functions properly.

QUESTION AS TO WHETHER TEMELIN IS THE LEAST-COST OPTION

The Ex-Im Bank relies upon a seven-volume energy study by the Belgian "Tractebel Nuclear Consultants" for its conclusion that Temelin's completion is the least-cost alternative. The study is seriously flawed and completely fails to consider measures to reduce electricity demand.

Tractabel did not address the absolute least cost option which is no new construction, but assumed a need for additional electricity. However, a 1992 U.S. consultant prepared for the Czech Ministry of Economics and Privatization found that CEZ can meet demand easily for the next ten to fifteen years. The study concluded that "the continuation of construction [of Temelin] makes no economic sense".[26]

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[25]Ex-Im Bank, Office of Public Affairs, "Ex-Im Bank Financing for Temelin Nuclear Power Plant Questions and Answers," January 27, 1994.

[26]Nucleonics Week, 4 (June 25, 1992); Power International, Supporting Material for the Czech Republic Government Decision about NPP Temelin (I. Benes auth.) (May 23, 1992).

Second, a World Bank economist has raised doubts about the accuracy of data on electrical demand and costs supplied by CEZ for use in the Tractebel study.[27] The study employed an overly simplistic model of the relationship between economic growth and electrical consumption. Tractebel used a regression analysis for the five years ending 1991. This is too brief a period to provide meaningful results under any circumstances and obviously so when Czechoslovakia was undergoing a major economic transformation.

Third, in contrast to Integrated Resource Planning as practiced widely in the U.S., the Tractebel study does not compare demand-side with supply-side alternatives. This failure is critical because of the Czech Republic's substantial conservation potential. Volume 6 of the Tractebel study finds that it is technically possible for the Czech Republic to save 3,500 MW (and 15,000 GWh) by the year 2010---i.e., more than Temelin's net capacity.[28] The study finds the "realistic" savings potential to amount to 1200 MW. The study states that the cost of these savings would be less than the long-term marginal cost of generating electricity from any source, including Temelin. However, the study fails to include this least cost option into its final conclusions.

Independent analysts have further confirmed that improved energy efficiency is the least cost solution to the Czech Republic's energy and air pollution problems. The SEVEn group, an independent research institute in Prague, found that the Czech Republic could cut its electricity demand in half if it implemented energy efficiency measures developed in

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[27]D. Gray, Aide Memoire with two Attachments, World Bank, Energy Sector Mission, November 2 - 14, 1992.

[28]We were given access to this portion of the Tractebel study by the European Union's program PHARE, which funded it.

1991.[29] Even a World Bank views as feasible a 30% reduction in electricity demand through low-cost efficiency improvements. [30]

Fourth, while the study considers the alternative of building new gas units, it fails to consider the alternative of retrofitting Temelin to operate as a gas-fired combined cycle power plant.[31] The failure to consider the reuse of the existing structure is especially critical because, as noted below, Tractebel's preference for nuclear power assumes that substantial sums will otherwise be required to tear Temelin down (20.1 vs. 26.1 billion CZK for completing the reactor).

Fifth, the chosen inputs for the price of coal and other fuels are unreasonably high.[32] This skewed the comparison since fuel accounts for 70 to 80% of the total life-cycle costs. The costs for retrofitting coal-fired power stations with scrubbers have also been overestimated.[33] External costs of emissions were included for coal-fired power stations, while costs of routine and accidental emissions associated with Temelin were ignored.

Remarkably, even by its own limited terms, the Tractebel analysis found that the total system costs of a scenario without Temelin (i.e., if Temelin is completely demolished and replaced by gas units) is only 8% higher than of one with Temelin. For the period 1994 through 2010, the costs would be 223.7 billion instead of 210.8 billion CZK. A cost difference of this magnitude - which is only 65% of the assumed cost to demolish Temelin - is hardly enough

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[29]Vladimir Prochazka, Potential for Electricity Savings in the Region of Former Czechoslovakia (SEVEn, Prague, 1993).

[30]World Bank Study: Czechoslovakia: Transition to a Market Economy, May, 1991.

[31] We have performed such analysis. See M Heindler, A. Koniak, H. Lechner: "Conversion of Temelin into a gas-fired combined cycle power plant." Vienna, February, 1994.

[32]Gray, supra n. 27.

[33]Id.

to justify a recommendation for or against the project. This is especially clear in light of the uncertainties portrayed by the NUS Audit.

In fact, to arrive at even this margin in Temelin's favor, the study was required to assume that, if the nuclear project did not proceed, 20.1 billion CZK ($670 million) would be required to demolish the plant and restore the site.[34] This number seems extraordinarily high--much higher than is required in the U.S. to decommission a nuclear plant, and store the spent fuel.[35] For example, an official statement by the Prague branch of Power International noted that the demolition of the U.S 1000-MW WPN-1 and WPN-3 reactors had been estimated at $3 to 80 million each. When these reactors were cancelled in the mid-80s, they had been 65% and 75% complete, respectively.[36]

QUESTIONS AS TO WHETHER TEMELIN WILL REPLACE COAL-FIRED PLANTS

CEZ states that Temelin is critical for diversifying the country's energy supply and meeting future electricity demand. 10.1 out of 15.2 GW of the total CEZ generating capacity comes from thermal plants.[37] These plants use lignite which has a low caloric value and high

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[34]CEZ, Temelin Nuclear Plant. Material for the Meeting of Members of the Economic Committee of the Czech Parliament at Temelin, 17 (CEZ, Prague, 1992).

[35] For example, in the NRC review of decommissioning costs. Battelle projected the radiological decommissioning costs of the reference PWR (Trojan) at $124.6 million. Inside NRC, November 29, 1993, at 7. Labor and fuel storage costs are the two primary components of decommissioning costs. In the Czech Republic labor costs are far lower than in the U.S. In the U.S., decommissioning cost estimates assume that productivity may be reduced by 50% or more, because of precautions that must be taken in the presence of radiation. If Temelin is demolished before completion, the radioactive hazard will not exist to decrease productivity.

[36]Ivan Benes, Statement of Power International on the Comments by the Directors of CEZ-ETE and Skoda Prague, dated May 26, 1992. (Prepared at the Request of the Spokesman of the Czech Government) (Prague, May 31, 1992).

[37]CEZ, supra n. 34, at 4.

sulfur content. Winter air pollution inversions in Northern Bohemia are greatly exacerbated by vast quantities of sulfur dioxide, ash, and particulate emitted by the coal-fired plants.

The NSC Memo states that a "very important consideration" for it was that the completion of Temelin might permit CEZ to decommission some of the coal-burning plants.[38] However, the Temelin foreign loans may in fact postpone cleanup of CEZ fossil plants and other environmental improvements. Facing a constitutional limit for granting state loan guarantees[39], the Klaus government discontinued negotiation of a $200 million World Bank loan. The main components of this transaction would have been (a) improvement of high voltage transmission and substations; (b) upgrading of load dispatching facilities; and (c) retrofit of several lignite fired power stations.[40] The government also discontinued negotiation of a $150 million loan for reclaiming strip-mined land and other environmental projects.[41]

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[38]International Environment Reporter, Feb. 9, 1994. See also NSC, Memorandum to Kenneth Brody, President and Chairman, Ex-Im Bank, 9 (September 29, 1993).

[39]Remarks of Czech Republic Prime Minister Vaclav Klaus to the Bretton Woods Committee, Washington D.C. (October 15, 1993).

[40]International Bank for Reconstruction and Development (World Bank) / International Development Association (IDA), Monthly Operational Summary of Bank and IDA Proposed Projects (as of January 15, 1994), SecM94-116, 79 (February 4, 1994).

[41]Id.

CONCLUSION

The above review of the documents and data now available amply demonstrates that there are still many significant safety, environmental and economic questions about the Temelin reactors. These matters should be addressed with full opportunity for open technical discussions and public participation.

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Feb. 22, 1994

THE SAFETY ANALYSIS UNDERLYING THE TEMELIN NUCLEAR PLANT LOAN GUARANTEE

February 28, 1994

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February 28, 1994

THE SAFETY ANALYSIS UNDERLYING THE TEMELIN NUCLEAR PLANT LOAN GUARANTEE

INTRODUCTION AND SUMMARY

On January 27, 1994, the President and Chairman of the Export-Import Bank of the United States (Eximbank) submitted a Statement to the Speaker of the United States House of Representatives, announcing loan guarantees in the amount of $317,393,863 for limited upgrades to the Temelin Nuclear Power Plant in the Czech Republic. The Eximbank proposes to guarantee loans to finance Westinghouse Electric Corporation's supply to CEZ, the Czech national utility, of initial nuclear fuel and a new instrumentation and control (I&C) system for Temelin. The technical documents which are available to the government of Austria at this time, including documents which are cited by the Eximbank, raise serious questions about Temelin's safety and ultimate cost.

The Eximbank states that

> a U.S. Government interagency review .... concluded that the equipment and technology being supplied will bring the safety and reliability of the plant up to western standards before going into operation, consistent with technical recommendations by the International Atomic Energy Agency (IAEA).

January 27, 1994 Statement at 4. The "interagency review" is documented in a September 29, 1993 memorandum from the National Security Council (NSC) to the Eximbank's President and Chairman. That memorandum asserts (page 1) that "[a] technical mission of the IAEA . . . did not identify any major safety issue or problem in the Temelin design." In addition, the Environmental Evaluation which the Eximbank submitted to the House of Representatives with the President and Chairman's January 27, 1994 Statement

asserted that a safety audit of Temelin conducted by Halliburton NUS Environmental Corporation (NUS)

> found Temelin to be fundamentally sound and in conformity with U.S. safety principles save for the Russian Instrumentation & Control system. Procurement of the Westinghouse I&C system will eliminate this inadequacy.[1]

The Eximbank/NSC conclusion that Temelin is licensable under Western standards is not consistent with the documents upon which Eximbank and NSC rely, and also is contradicted by relevant NUS and IAEA documents which are discussed in neither the Eximbank or NSC analyses. The NUS and IAEA documents demonstrate that the Temelin Project is not presently licensable under U.S. standards. Moreover, they detail deficiencies so fundamental as to raise basic questions about whether the plant can ever meet U.S. safety and environmental standards. The reports also provide strong indication that, if safety is to be assured, expenditures well beyond those now contemplated will be required.

The concerns identified by NUS and the IAEA include:

1. The NSC's assertion as to the adequacy of the Temelin design is contradicted by the specific IAEA report referenced by the NSC.[2] That report identified a number of potentially serious safety concerns, including an inadequately documented design for plant systems and components that had already been constructed; failure to perform an adequate Safety Analysis Report; an incomplete Probabilistic Safety

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1. "Environmental Evaluation, Export-Import Bank of the United States Engineering Division, Temelin Nuclear Power Station," January 26, 1994, at 2.

2. Temelin Design Review Mission Report, Report RER/9/004-17 (Aug. 20, 1990).

Assessment; and failure to incorporate severe accident analyses into the design. None of these findings are acknowledged in the NSC memorandum or in the NSC technical paper which accompanied the memorandum.[3]

2. The NSC memorandum, and the accompanying technical paper and bibliography, do not specifically mention two reports of the IAEA Pre-OSART Mission, which conducted on-site inspections of Temelin in 1990 and in 1992.[4] These reports identified a number of issues relevant to the safety of Temelin, including the lack of an adequate Quality Assurance (QA) program; inadequate management of Temelin engineering and construction to assure safe operations; and the possible need for a containment filtered venting system to assure containment integrity in the event of a severe accident.

3. The Eximbank's Environmental Evaluation refers to an NUS determination that the plant is "fundamentally sound" (page 2). However, the NUS Progress Report on the Audit of the Temelin Nuclear Power Plant, prepared in August 1992 and revised October 6, 1992, concluded that at Temelin there were numerous inadequacies with safety ramifications. The problems included an unknown design basis for the Soviet-designed safety features of the plant; an inadequate QA program;

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3. "VVER 440/230 and VVER 1000 Nuclear Power Reactors; Technical Considerations for a Decision Framework."

4. Pre-Operational Safety of Nuclear Installations, Czech Power Works, Temelin Nuclear Power Plant, IAEA Report NENS/OSART/90/36 (July 1990); Operational Safety of Nuclear Installations, Czechoslovakia, Pre-OSART Mission Follow-up Visit, Temelin Nuclear Power Plant Construction Site, IAEA Report NENS/OSART/92/59 (July 1992).

inadequate project management and the lack of an aggressive safety culture; inadequate attention paid to Fire Protection; and unsuitable plant safety analyses.

NUS concluded "that Temelin can be licens[a]ble in the mid-1990's if the Audit Team's technical and programmatic recommendations are implemented." NUS Progress Report at 4 (emphasis supplied). The Audit Team's recommendations included: "Level 1 and 2 probabilistic safety assessments . . . as soon as possible"; "a Western fire hazards analysis . . . as soon as possible"; "[c]ritical[] examin[ation] [of] the equipment qualification program"; "a comprehensive design review"; and the collection and, if necessary, creation of "Temelin design basis documentation and supporting design information." Id. at A-17 -18. These activities are likely to be major, time-consuming and costly undertakings, far beyond the scope of the two specific upgrades which the Eximbank proposes to guarantee at this time (nuclear fuel and the I&C system). Moreover, the NUS Progress Report concluded that with regard to its technical and programmatic recommendations, "implementation progress has been, and continues to be slow." Id. at 4.

The NSC's technical paper on Temelin stated that the NUS audit of Temelin "is the only independent Western review of the licensability of VVER 1000 reactors."[5] However, neither the NSC nor the Eximbank's Environmental Evaluation discuss any of these concerns identified by the NUS report. Indeed, the NSC's technical paper contains a "Bibliography" which lists three NUS presentations (dated February,

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5. "VVER 440/230 and VVER 1000 Nuclear Power Reactors; Technical Consideration for a Decision Framework," at 6.

March, and June 29, 1992), but not the August/October 1992 report which includes the critical findings summarized above and discussed in more detail below.

4. The concerns expressed by NUS in late 1992, by the IAEA Temelin Design Review Mission in mid-1990, and by the IAEA Pre-OSART Mission in mid-1990 and in mid-1992, are particularly significant because they pertain to several areas in which a recent IAEA report found the VVER-1000 design standards and codes to be deficient.[6]

In short, the NUS and IAEA reports do not appear to support Eximbank's conclusion that a Westinghouse-supplied I&C system and nuclear fuel, at a cost of approximately $300 million, are all that are needed to produce a nuclear power plant which meets Western safety standards.

BASIC INFORMATION NEEDED TO UNDERSTAND THE TEMELIN AS-BUILT DESIGN AND TO ASSURE ITS SAFETY IS NOT AVAILABLE

The adequacy and safety of a nuclear plant's systems and procedures cannot be assured unless there is a thorough understanding and documentation of the plant's design (often referred to as the "design basis"). The "Technical Considerations" paper attached to the September 29, 1993 NSC memorandum to the Eximbank states (at 2) that the IAEA Temelin Design Review Mission conducted "[a]n exhaustive review of the Temelin VVER-1000 . . . in 1990." This assertion does not appear to be accurate. The IAEA Design Review Mission Report RER/9/004-17 states (at 3) that the Mission "could not perform a complete design review of the Temelin plant." The Mission concluded that

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6. WWER-1000/320 Generic Safety Issues Developed From Codes and Standards Comparison, IAEA Report WWER-SC-071 (April 1993).

"the design of the Temelin plant has not been finalized yet" (id. at 5, Conclusion 3.3). The Design Review Mission's report observed that the Revised Preliminary Safety Analysis Report (RP-SAR) "is not entirely complete and. . . can sometimes present inconsistent information" (id.). The Mission continued:

> It is therefore strongly recommended that the flow of information . . . be improved and especially to try to ensure that the material exchanged is complete and consistent. It is further recommended that in the next version of RP-SAR, plant specific analyses be provided for an adequate review.

Id. at 6 (Recommendation 4.1).[7] The Mission found that design documentation problems went well beyond the RP-SAR (id.):

> The different documents presented during the review work was judged to be not well referenced, poorly documented and sometimes incomplete. Moreover the amount of documents generally available for the Czechoslovak experts seems to be insufficient.
>
> It is recommended the quality and quantity of documentation be improved. . . .

Two years later, the design basis information deficiency identified in the Temelin Design Mission still had not been corrected. The NUS August/October 1992 Progress Report stated (at A-2 -3, emphasis supplied):

> Another finding that was repeated throughout the Audit Team's investigations is that there is an inadequate amount of information from the original Soviet reactor supplier concerning the technical basis and underlying analysis of the plant design. Obtaining such information from the appropriate former Soviet organization is considered an important

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7. In April 1993, IAEA Report WWER-SC-071 concluded (at 28, Issue C14) that the "scopes and contents" of the Soviet Standard Technical Documents governing the preparation of a Safety Analysis Report for a VVER-1000 reactor "are not fully consistent with accepted international practices."

> factor in the successful economic completion of the plant, and its future safe operation. Access to such information is particularly important to support design changes now being planned or emerging in the future.

The lack of information regarding the design basis of the plant as constructed casts doubt on the efficacy of the specific projects which are the subject of the proposed Eximbank guarantee. NUS observed (Progress Report at 5):

> Implementation of the new fuel/core design and I&C replacement projects will require a major design integration effort, not only between these projects but with the remaining nuclear island and balance of plant designs.

The NUS report continued (id. at A-15):

> Important concerns raised by the I&C replacement [include] the need to assure adequate cooperation of the original Soviet design organization in providing design basis information . . . . The Audit Team was informed that in the past, the performance of the Soviets in responding to Temelin requests for technical information has not been good, either with respect to the timeliness of the responses or their technical content.

Lack of access to reliable Soviet design data has disturbing safety implications beyond the two specific projects which Westinghouse will undertake. For example, NUS performed a "detailed design review" of several aspects of Temelin, including the Emergency Feedwater system (Progress Report at A-13). Unfortunately:

> The Audit Team could not reach a final conclusion as to the adequacy of the EFW system, because all of the necessary design documentation was not available . . . . [T]here is no documented evidence that the system can withstand a single active failure, and the system exhibits certain design weakness including lack of diversity in the power supply, availability of flow instrumentation and isolation capability for only two out [of] four steam

> generators, and potentially inadequate tank capacity for plant cooldown.

Id. More generally, NUS noted that the lack of design basis information might jeopardize efforts to modify the Temelin design to meet Western safety standards:

> A concern exists that the viability and merit of some of these proposed modifications may not be capable of evaluation in the absence of relevant design information from the original Soviet designer.

Id. at A-5.

NUS recommended that CEZ "initiate immediately"[8] the documentation of the Temelin design basis. This is a potentially enormous undertaking. If the Temelin designers in the former Soviet Union are unavailable or unhelpful, then a detailed, time-consuming effort will be necessary to not only determine how the plant is configured, but why each design was adopted. Until this massive task is completed, the Western additions to the original plant will remain in doubt, safety-related testing cannot be completed, and reliable operating procedures cannot be finalized.

THE NUS AND IAEA MISSION REPORTS CALL INTO QUESTION THE ADEQUACY AND SAFETY OF FACILITIES AND SYSTEMS THAT ALREADY HAVE BEEN CONSTRUCTED AND INSTALLED

The NUS and IAEA Mission reports indicate that safety and Quality Assurance (QA) practices employed in the construction of Temelin have been inadequate. These findings are especially important because much construction has already been undertaken. There is a need both to assure that future work will be

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8. Progress Report at C-1.

performed properly *and* that existing work has been done well. In light of questions about the adequacy of construction to date, the lack of an adequately documented plant design basis is particularly troublesome.

Lack of an Adequate Quality Assurance Program. As the August/October 1992 NUS Progress Report noted, a fundamental Western nuclear licensing requirement is that "a satisfactory Quality Assurance program has been established and implemented for plant design, fabrication, construction, testing and operation."[9] NUS was critical of the Temelin QA efforts:

> There are . . . programmatic weaknesses in the QA programs of CEZ-ETE and its contractors. As compared to Western standards, the CEZ-ETE QA organization is not sufficiently involved in the establishment of quality requirements for suppliers or subcontractors, the evaluation of the QA programs of bidders, or the selection of suppliers or subcontractors. The QA management procedures of CEZ-ETE and its contractors and subcontractors are insufficient in number and detail to ensure that all personnel perform their duties. The CEZ-ETE QA organization appears to be insufficiently staffed for the current stage of the Temelin project. . . .
>
> . . . While an informal, but thorough and effective program is in place for the correction of defective work, the QA procedures for the performance and inspection of construction work are inadequate to provide instruction on how the tasks should be performed, and there is no provision for analysis of deficiencies to determine their root causes and identify potential adverse quality trends.
>
> Finally, inadequate use is being made of audits, both internal and external, to manage and evaluate compliance with QA requirements. . . .

Progress Report at A-6 (emphasis supplied).

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9. Table B-1, Item 12 (page B-4).

Two years earlier, the IAEA Pre-OSART Mission report also had concluded that "comprehensive QA programs, in particular the auditing functions, have still to be developed by CEZ-ETE and the main contractors . . . ." IAEA Report NENS/OSART/90/36 at 11. The IAEA report added (id. at 12):

> Regular auditing is needed to identify programmatic weaknesses. It would have assisted in correcting some problems observed, such as in connection with weld rod control, material control, shop inspection and storage conditions.

One problem identified was that personnel involved in QA and quality control of construction apparently had inadequate training in plant and system design (id. at 40):

> It is recommended that professionals and technicians working in quality assurance and quality control receive training on plant and system knowledge and their design basis to improve their understanding of the safety significance of the equipment they are checking.

Given these QA deficiencies, additional efforts and expenditures will be necessary to ensure that already-completed work meets Western standards.

Lack of a Safety Culture and Inadequate Project Management. The August/October 1992 NUS Report also found:

> An organized program of independent safety oversight, similar to those found in Western utilities, has not been established at Temelin.

(NUS Progress Report, at A-8.) The 1992 Report also stated (at A-2):

> [T]he Project still has to develop more fully the necessary "safety culture" that approaches plant safety with a healthy questioning attitude that avoids complacency. The Team frequently found . . . two factors adverse to safety that appear to remain from work practices under the previous Czechoslovakian economic system:

> – the widespread absence of a questioning attitude, especially below the senior management level, which tends to result in the acceptance without challenge of safety decisions or representations by other parties; and
>
> -- the lack of aggressive management action to investigate and control conditions adverse to the company's [CEZ's] objectives.

Both the IAEA Missions and NUS have also criticized the Temelin Project management's efforts to assure that the plant is properly engineered and constructed. In late 1992, the NUS Progress Report listed among its "Major Conclusions and Recommendations" (at 4) the following:

> 2. The current site organization and the general site staff is not matched to the present nature of the project. The organization should be changed to centralize responsibility and place more emphasis on the engineering, construction, project control, and the safety analysis and licensing activities. The Temelin staff should also be strengthened in these areas so that the major design changes now planned can be successfully and efficiently managed.

Id. at 5. NUS elaborated (id. at A-7-8):

> The Audit Team found that construction was continuing to be behind schedule, and that strong integration of engineering activities was not evident.
>
> CEZ-ETE lacks a strong on-site engineering organization to manage and control the overall design effort and the interfaces among the various design groups as well as the technical demands of the major ongoing design changes. This is important on any technical project as complex as a nuclear power plant, but is especially important at Temelin because of the complicated arrangement of contractors and the ongoing major reevaluations and design changes . . . .
>
> * * *
>
> CEZ headquarters is insufficiently involved in overseeing, monitoring and reviewing the progress of the project. CEZ headquarters should . . . participate directly in the

> oversight of the project. This is imperative in light of the many design changes currently underway. . . .

Two years earlier, the IAEA Pre-OSART Mission had expressed similar concerns:

> CEZ headquarters does not have an organization with the necessary resources whose main function would be to provide the oversight and technical assistance to its nuclear power plants. . . .
>
> The distribution of the decision making authority in respect of the Temelin project . . . is such that changing the originally approved implementation is complicated and time consuming. This constitutes an impediment to introduction of upgradings necessary to meet international standards of safety . . . .

IAEA Report NENS/OSART/90/36 at 8. The Mission reiterated its concern two years later, in a report issued a few months before the NUS report:

> The Pre-OSART review identified the need for CEZ headquarters (in Prague) to consolidate and strengthen its nuclear functions to provide improved oversight and technical support to the nuclear units.
>
> This has not occurred; in fact, this support has been weakened. . . .
>
> CEZ is strongly encouraged to reassess the need for forming a strong nuclear support organization at the central headquarters. The CEZ-ETE project is at a critical construction phase. Many decisions in the areas of design, financing and in the operating programme are being made that will affect the overall project and its future operations. . . .

IAEA Report NENS/OSART/92/59 at 1-2.

MAJOR ANALYSES MUST BE PERFORMED AT TEMELIN TO DETERMINE THE EXTENT OF ADDITIONAL DESIGN CHANGES AND PLANT MODIFICATIONS REQUIRED TO MEET WESTERN SAFETY STANDARDS

On the basis of the documents made available to date, it is clear that major safety-related analyses of Temelin have not been completed and may not have even commenced. The basis for the conclusion that the plant is licensable in the mid-1990's is the unrealistic assumption that these analyses will not identify the need for major new design changes and for re-doing work that has already been performed.

Safety-related Testing. Both NUS and the IAEA Temelin Design Review Mission have found that there has been inadequate safety-related testing of plant components and systems. In 1990, the IAEA Design Review Mission found that the accident analyses that had been performed were difficult to evaluate because of a lack of documentation of "the assumptions, [safety] codes utilized and results." IAEA Report RER/9/004-17 at 7. The report expressed concern over a possible failure to consider "radiological consequences" of accidents, and an inability to determine whether testing had included the sensitivity of key safety parameter outputs to reasonable changes in the inputs (id.). The Design Review Mission also concluded that the partially-performed (by the Soviets) Level 1 Probabilistic Safety Assessment (PSA) for Temelin must be re-done, and that a Level 2 PSA (to determine radiological consequences) must be performed (id. at 7-8).

Two years later, NUS expressed very similar concerns:

> The assumptions made in the [existing accident] analyses [of engineered safety features] appear to be conservative, but the analytical tools used are generally outdated and in many instances would be considered in the West to be unsuitable

> for a thorough accident evaluation. The Audit Team recommends that the plant safety analyses be substantially improved or totally redone. . . .

NUS Progress Report at A-4. NUS also recommended that the "severe accident review" at Temelin "should be accompanied by expanded accident analyses using current methodology" (id. at A-5). NUS recommended as a "First Priority" action (id. at A-17):

> Conduct Level 1 and 2 probabilistic safety assessments . . . . This activity should begin as soon as possible to be of maximum use in the design.

The importance of detailed, thorough safety-related testing at Temelin is underscored by the fact that in a 1993 IAEA report concluded that the Soviet design code on which VVER-1000 power plants such as Temelin were based did not adequately account for prevention and mitigation of severe accidents. The report noted that to meet international standards, "backfitting/complementary measures are inevitable." IAEA Report WWER-SC-071 at 14 (Issue C1). However, according to the "Technical Considerations" paper which accompanied the NSC's September 29, 1993 memorandum to the Eximbank on Temelin (at 6):

> [T]he PSA will not be conducted until the I&C system and other safety equipment is installed and the reactor is technically completed. When completed, this assessment should provide further insight into the desirability of further improvements.

In other words, after the projects which the Eximbank proposes to underwrite are completed, substantial additional plant modifications may be necessary. Thus, the assertion in the Eximbank Environmental Evaluation of Temelin that "[NUS] found Temelin to be fundamentally sound and in conformity with U.S. safety principles save for

the Russian Instrumentation & Control system" (at 2, emphasis supplied) is without foundation.

It is likely that when the safety analyses which have not yet been conducted are finally performed, they will show a need for substantial additional plant modifications. In 1990, the IAEA Pre-OSART Mission urged "[i]nstallation of a filtered venting system for the containment in order to maintain containment integrity in the event of a severe accident . . . ." IAEA Report NENS/OSART/90/36 at 46. In 1992, the Pre-OSART Mission's follow-up report stated that "[d]ecisions about management of gaseous waste and installing the filters for containment venting will be based on the results of the Level 1 PSA study,"[10] which "is scheduled to be completed before reactor startup."[11] In addition, the 1993 IAEA report concluded that the safety of the containment design in VVER-1000 plants needs to be re-evaluated.[12] The 1992 NUS audit criticized Temelin's reliance on a single containment sump and the design of the sump and associated piping; it concluded that these matters "will require detailed evaluation and may require plant modifications."[13] NUS also recommended, as a "First Priority" "Design Related" action, "comprehensive containment and containment subcompartment analyses under POST-LOCA [Loss of Coolant Accident] conditions."[14]

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10. IAEA Report NENS/OSART/92/59 at 6.

11. Id. at 4.

12. Id. at 24 (Issue C10).

13. NUS Progress Report at A-4.

14. Id. at A-17.

The necessary analyses will be more difficult, if not problematic, because of the lack of design basis information about the plant. After recommending that "the plant safety analyses be substantially improved or totally redone," NUS noted: "Input from the original Soviet designers is expected to be necessary to accomplish the reanalyses effectively." NUS Progress Report at A-4.

Fire Protection. In 1992, NUS concluded:

> The fire protection program at Temelin . . . appears to not meet all Western standards and practices. For example, a Western nuclear power plant oriented Fire Hazards Analysis (FHA) has not been conducted. Without it, there is considerable uncertainty as to whether the existing plant arrangements and the fire detection and suppression hardware are adequate. A detailed FHA should be performed as soon as practicable, so that any weaknesses in fire protection provisions can be identified and corrected. . . .

NUS Progress Report at A-4-5 (emphasis in original). The failure to perform a FHA for Temelin is serious; an IAEA report issued in April 1993 found: "Fire protection has not been a priority consideration in the WWER-1000/320 design and operating requirements." IAEA Report WWER-SC-071 at 17 (Issue C4). The IAEA concluded that the Soviet design standards and codes applicable to the Temelin generation of VVER-1000 nuclear plants was deficient as compared to NRC and IAEA requirements for Fire Protection (id.).

The FHA is a substantial, time-consuming undertaking. The extent to which substantial backfitting and plant modifications will need to be accomplished in order to meet NRC and IAEA Fire Protection standards cannot be determined until the FHA is performed. The NUS Progress Report emphasized that the FHA "should be

completed as so[o]n as possible to enable results to be factored into the design." NUS Progress Report at A-17. We are aware of no documents which demonstrate that the requisite FHA has been done, that the results of that analysis have been implemented, or that the plant can now meet United States and IAEA Fire Protection standards.

Equipment Qualification. The NUS Progress Report also was very critical of the Temelin project's program to ensure that all safety-related equipment is qualified to function in the environments to which the equipment will be exposed:[15]

> [T]he Audit Team concluded that the equipment qualification program for Temelin does not meet Western standards. A number of potentially significant weaknesses were identified, but a detailed audit of the entire program would be needed to determine the extent of the deficiencies. Examples of the weakness found included a lack of definition of the environmental qualification program performed by the Soviets for the equipment they supplied, and the absence of any indication that age-related or potential accident-caused equipment degradation were adequately considered in the design and specification of equipment.

NUS Progress Report at A-5 -6 (emphasis in original). The import of this serious finding is compounded because there is a considerable amount of Soviet-supplied equipment in the facility. One of the "First Priority" "Design Related Actions" recommended by NUS was:

> Critically examine the equipment qualification program and take the actions necessary to ensure its adequacy.

Id. at A-17. Successful implementation of this recommendation will require not only development of a program, but also examination and testing of equipment that already

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15. This is a basis requirement of Western nuclear regulation. See, e.g., the NUS Progress Report at B-8 (Item 36).

has been installed. This potentially major undertaking will be complicated by the lack of information about the plant's design basis.

THE TEMELIN PROJECT ALSO HAS SUFFERED FROM MANAGEMENT FAILURES WITH REGARD TO COST AND SCHEDULE CONTROL

Finally, the U.S. loan guarantee evidently relies on the assumption that Temelin can be completed within presently projected costs. However, the NUS report found fundamental deficiencies in cost and schedule control:

> There is a respectful "hands-off" attitude on the part of CEZ-ETE that places excessive trust in the contractor's commitment to CEZ and to the project cost, schedule and quality objectives, thereby allowing contractors and subcontractors too much independence in the management of their work. . . .
>
> One indication of inadequate cost management is the tendency to apply the contingency in project estimates against approved project changes. Such misapplication of the contingency obscures the cost of plant modifications and prevents their effective management.
>
> * * *
>
> . . . As was the case in the cost review, the Audit Team found that personnel and system capabilities . . . are adequate . . . . However, those capabilities are not being used effectively. . . . Particularly disturbing is the fact that no corrective actions appear to have been instituted to recover the losses or to avoid further [schedule] slippages, or at least no positive results have been demonstrated. . . .
>
> The main reason for the inability to control the project schedule is the apparent lack of aggressiveness on the part of project personnel in enforcing schedule commitments. . . .

NUS Progress Report at A-8 -9. The NUS report observed that the project control problems would be exacerbated by the "major design changes" being undertaken (id. at 5).

NUS concluded: "Without firm management action to address these project management issues, there is little assurance that the project can be effectively controlled" (id. at A-8, emphasis supplied).

PROGRESS REPORT ON THE AUDIT OF THE TEMELIN NUCLEAR POWER PLANT

prepared for

ČEZ, a.s.

by

HALLIBURTON NUS
Environmental Corporation

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1.0 INTRODUCTION

This Report 1) summarizes the results of the Audit of the Temelin Nuclear Power Plant conducted by the HALLIBURTON NUS Environmental Corporation , 2) describes the subsequent major follow-up actions taken by HALLIBURTON NUS on behalf of CEZ, a.s. (Czech Power Corporation, plc), and 3) presents HALLIBURTON NUS major conclusions and recommendations based on the Audit results and the follow-up tasks.

2.0 CONDUCT AND RESULTS OF AUDIT

The Audit was commissioned by the CEZ and had as its primary objective the assessment of the potential licensability of Temelin in the mid-1990s (its anticipated commissioning date). It was conducted by a multi-disciplinary team led by Halliburton NUS and composed of senior experts in a variety of disciplines including nuclear safety and licensing, design engineering, operational readiness, quality assurance, fire protection, radioactive waste disposal, project management, scheduling and costing, and contracting practices. The Team members had over 700 years of collective relevant experience, much of it in work related to European nuclear power plants. The Audit began in early August, 1991 and the Audit Team devoted approximately 7,000 man-hours of effort to the project as of December, 1991.

HALLIBURTON NUS, which had no prior involvement in the Temelin project, conducted the Audit independent of CEZ, CEZ-ETE (the CEZ subsidiary responsible for Temelin's construction and operation) and its supporting contractors and suppliers. To further ensure the independence of the Audit, HALLIBURTON NUS agreed that during the Audit, neither it nor its subconsultants would engage in any professional activities in Czechoslovakia which would be in conflict with their work on the Audit.

While the principal focus of the Audit was on nuclear safety and licensability, it also included other technical, economic and management aspects of the Temelin project. As appropriate, the Audit Team made findings and recommendations intended to improve plant design and construction activities and result in enhanced safety and reliability of plant operations. Based on these findings and recommendations, the Audit Team developed preliminary terms of reference to assist CEZ/CEZ-ETE in planning and implementing the major recommendations contained in the Audit Report.

As noted above, the principal focus of the Audit was on the safety and technical issues that would govern the licensability of Temelin in the mid-1990s. As an aid to the licensability assessment, a conceptual "reference plant" was developed which included the main characteristics deemed as crucial to the licensability of a nuclear power plant in the mid-1990s. The features of the reference plant, which are described in Attachment A, were then used as a frame of reference for comparisons with Temelin.

Based on the scope and results of its reviews, the Audit Team concluded that Temelin can be licensable in the mid-1990s but that its licensability cannot be assured unless the Audit Team's technical and programmatic recommendations are implemented. Although favorable results of some of the Teams recommendations (such as the conduct of new or improved analyses to support various features of the plant design) cannot be ensured, the Audit Team has a high degree of confidence that any deficiencies that may be found can be overcome by additional, more detailed analyses or relatively simple plant modifications.

A summary of all of the major Audit Team findings and conclusions are presented in Attachment A.

3.0 SUBSEQUENT FOLLOW-UP TASKS

Subsequent to the conduct of the Audit and the preparation of the Audit report, HALLIBURTON NUS was authorized by CEZ to conduct several additional tasks to assist CEZ/CEZ-ETE in implementing the Audit Team recommendations. They are described below.

3.1 Promulgation of Audit Team Findings and Recommendations

In accordance with the Audit team recommendations, HALLIBURTON NUS prepared and conducted several briefings on the Audit findings and recommendations to:

- Senior CEZ and CEZ-ETE managers
- CEZ-ETE middle managers
- Senior EGP and Skoda managers and their selected staff members
- Representatives of the CSKAE

The senior CEZ and CEZ-ETE managers were briefed on all of the Audit team findings and recommendations. The other groups were briefed on the technical findings and

recommendations and were provided consolidated listings of the technical findings, recommendations, and open issues.

HALLIBURTON NUS also conducted two one-week meetings with representatives of the original soviet designers to inform them of the technical results of the Audit and to solicit their inputs as to the validity of the findings. These inputs were incorporated in the recommended corrective Action Plan, as determined appropriate.

3.2 Assistance in the Preparation of Terms of Reference for the Corrective Action Plan

HALLIBURTON NUS provided on-site assistance to the CEZ-ETE Task Group that was formed to develop a detailed action plan to respond to the Audit Team technical findings and recommendations. The CEZ-ETE Terms of Reference have been completed in draft form. An English translation of the listing of the Titles is contained in Attachment B to this Report.

3.3 Extension of Cost and Schedule Reviews

Following CEZ review of the Audit Report, HALLIBURTON NUS was authorized to conduct more detailed reviews in the cost and schedule areas. The results of these reviews and the associated conclusions are contained in a report to CEZ called "Review of CEZ-ETE Cost and Schedule Proctions for NPP Temelin", dated March 16, 1992. Our judgement based on these more extended reviews is that the cost of Temelin will approximate 68 billion Kcs and that Unit 1 can be in commercial operation by the end of 1995 but that a more probable date will be 1996.

3.4 Extension of Organization and Staffing Review

CEZ also authorized HALLIBURTON NUS to conduct a more detailed review of Temelin related organization and staffing, both within CEZ and CEZ-ETE, and to make more detailed recommendations in these areas. The major recommendations resulting from this review were to:

- establish a Temelin oversight group at CEZ headquarters reporting to the CEZ general manager

- provide increased focus and visability to the CEZ-ETE engineering, construction, and safety analysis activities
- introduce a substantial number of expatriate Executive Advisors to support the CEZ-ETE department managers.

3.5 Independent Review of Draft Fuel/Core Design Contract and Support in Contract Finalization

CEZ authorized HALLIBURTON NUS to conduct an independent review of a proposed draft contract for the procurement of new fuel and related core design services. Our report on the results of this review and our associated comments and recommendations was submitted to CEZ on April 24th, 1992 and discussed with the cognizant Temelin staff and with representatives of the potential supplier. Substantial direct support to CEZ-ETE was, and is continuing to be, provided to expedite the process of contract finalization. A Letter of Intent was issued to the selected supplier on October 5, 1992.

3.6 Independent Review of Replacement I&C Draft Contract and Support in Contract Finalization

CEZ also authorized HALLIBURTON NUS to conduct a screening review of a proposed draft contract for the procurement of a replacement I&C system for Temelin. Our report on this review and the associated comments and recommendations was submitted to CEZ on June 11, 1992. Since then we have been providing substantial direct support to CEZ-ETE in contract finalization and in expediting the evaluation process. A Letter of Intent was issued to the selected supplier on September 18, 1992.

4.0 MAJOR CONCLUSIONS AND RECOMMENDATIONS BASED ON AUDIT RESULTS AND THE PREVIOUSLY DESCRIBED FOLLOW-UP TASKS

1) As noted in the Audit Report, HALLIBURTON NUS believes that Temelin can be licensible in the mid-1990s if the Audit Team's technical and programatic recommendations are implemented. However implementation progress has been, and continues to be slow. It must be accelerated if the current plant schedule is to be maintained.

2) The current site organization and the general site staff is not matched to the

2) The current site organization and the general site staff is not matched to the present nature of the project. The organization should be changed to centralize responsibility and place more emphasis on the engineering, construction, project control, and the safety analysis and licensing activities. The Temelin staff should also be strengthed in these areas so that the major design changes now planned can be successfully and efficiently managed.

3) Implementation of the new fuel/core design and I&C replacement projects will require a major design integration effort, not only between these projects but with the remaining nuclear island and balance of plant designs. This effort would normally be assigned to the plant architect/engineer (A/E). For Temelin, the A/E function appears to be the combined responsibility of EGP and the original Soviet designers. Because of the recent political developments in the former Soviet Union and the limited capability of EGP for perfoming this function, it is recommended that CEZ seriously consider using Western design integration support from major nuclear steam Suppliers and Engineering/Construction Companies.

4) Because of the need for obtaining substantial technical information from the original Soviet designers in connection with the new fuel/core design and replacement I&C system as well as for the plant, the current discussions and negotiations for obtaining such information from the involved Russian organizations should not only be continued but accelerated.

5) Temelin construction activities have for some time not progressed in accordance with the desired project schedule. The need to maintain, if not improve, the current construction schedule in parallel with implementing several major design changes will place a substantial new burden on the Temelin construction and construction management staff. CEZ should therefore also seriously consider contracting for experienced Western assistance in this area to provide increased confidence in the ability to place Temelin in commercial operation by 1996.

6) The agreement to license Temelin in accordance with Western standards requires the immediate initiation of a CEZ effort to establish a set of licensing criteria that satisfies both Czech and Western standards, and to obtain CSKAE acceptance of these criteria in the shortest possible time.
CEZ itself need to be the lead organization for this effort.

7) The recent diversification of the ORGREZ from ČEZ has rendered uncertain

previously established agreements relative to the design and procurement of the plant simulator. The technical, commercial, and schedular aspects of the purchase of the plant simulator should be reviewed and any corrective actions found to be necessary should be implemented.

8) Existing CEZ technical and financial oversight of the Temelin project is not adequate. It should be strengthened in accordance with the recommendations contained in the HALLIBURTON NUS report on NPP Organization, Staffing and Basic Contractual Approach dated March 13, 1992.

9) If Temelin is to succeed, Czech government support/action must be obtained in the areas of:

- Assumption of the nuclear third party liability
- Long term disposal or storage of spent fuel
- Willingness to provide government guarantees for major CEZ Temelin related loans.

ATTACHMENT A
SUMMARY OF AUDIT RESULTS

1.0 AUDIT TEAM FINDINGS AND CONCLUSIONS

A Halliburton NUS Audit Team conducted a spectrum of reviews addressing a number of technical, quality assurance, and project management issues. The major Audit Team findings and conclusions relative to these reviews are presented in the sections that follow. As noted in the Audit Report, our original findings and conclusions were based principally on information given to the Team by ETE members and their Contractors. As such, the Conclusions are only as valid as the information provided. Since that initial period much additional work was done and the findings and conclusions has been further validated.

1.1 Technical Concept Review

The Audit Team performed an examination of the overall technical concept of the Temelin nuclear power plant to determine whether the principal design features of the plant are comparable to those that can be expected to be present in a "reference" plant built in Western Europe or the U.S. in the mid-1990s. The Audit Team concluded that the overall technical concept of Temelin is in many respects consistent with modern reactor designs used in the West and that the design includes, or can be practicably modified to include, essentially all features necessary to reflect Western nuclear power plant standards projected for the mid-1990s.

A number of the initial Temelin design concepts, criteria, or analyses fell short of modern Western practices, but these shortcomings can be largely eliminated through design improvements that are expected to make the plant comparable with contemporary facilities in the West. These include the addition of a modern instrumentation and control system, an improved fuel and core design, improvements resulting from VVER and Western nuclear power plant operating experience (including TMI upgrades), and improvements resulting from the Audit Team recommendations.

The Temelin plant design includes a number of important features that equal or, in some cases, exceed Western practices. These areas of strength include, for example, good

physical separation between trains of safety-related components and a large degree of safety-related system redundancy (e.g., three independent spray ponds are provided, each alone capable of accepting the maximum plant heat loads.)

1.2 Safety and Licensing Review

The Audit Team investigated sixteen topical areas of importance to the safety and licensability of the Temelin nuclear power plant. The Team concluded that the overall plant design has many good safety features but that additional work is necessary to enhance plant safety. The Audit Team concluded that the Temelin plant, as presently designed, would not be licensable in Western countries without modification. However, the Audit Team further concluded that analyses and modifications are practical that would enable the facility to essentially meet Western standards. The principal recommended actions to help ensure licensability are described in Section 2.1 of this Report.

The results of the Team's reviews in each area are briefly summarized in the paragraphs which follow.

The defense-in-depth safety review determined that many of the hardware provisions necessary to implement the defense-in-depth concept are provided in Temelin's design; however, the Project still has to develop more fully the necessary "safety culture" that approaches plant safety with a healthy questioning attitude that avoids complacency. The Team frequently found, in this and other areas it examined, two factors adverse to safety that appear to remain from work practices under the previous Czechoslovakian economic system:

- the widespread absence of a questioning attitude, especially below the senior management level, which tends to result in the acceptance without challenge of safety decisions or representations by other parties; and

- the lack of aggressive management action to investigate and control conditions adverse to the company's objectives.

Another finding that was repeated throughout the Audit Team's investigations is that there is an inadequate amount of information from the original Soviet reactor supplier concerning the technical basis and underlying analyses of the plant design. Obtaining such information from the appropriate former Soviet organization is considered an important factor in the successful economic completion of the plant, and its future safe

operation. Access to such information is particularly important to support design changes now being planned or emerging in the future.

The Audit Team believes that Temelin's design against external events, both natural and man-made, is generally satisfactory although some areas of uncertainty exist that will necessitate further study; for example, the seismic conditions at the site require better characterization, and the ongoing verification of the adequacy of the seismic design of safety-related structures and components needs to be completed. However, the Audit Team does not anticipate these to be areas of major safety risk.

The Audit Team's investigation of major component integrity raised a number of concerns that may lead to additional analyses and potential plant changes. These include the need to complete seismic and accident analyses to demonstrate the acceptability of the primary system's equipment and components.

The core design review was complicated by the uncertainty surrounding the potential award of a contract for the supply of improved nuclear fuel to the Soviets or a Western supplier; the award of such a contract could result in significant core design modifications. Although the currently proposed fuel and core design is not "state of the art", it appears to be safe, providing the question of shutdown margin and/or potential fuel damage during cooldown accidents can be resolved satisfactorily. However the suppression system for xenon oscillations in the Soviet design is complex and may be difficult to understand by the plant operators and engineering staff.

The Audit Team was favorably impressed with the overall design of Temelin's ultimate heat sink (UHS) which appears to provide a very redundant, reliable and robust source of cooling water to dissipate reactor decay heat and other essential cooling system loads under normal and accident conditions. Some questions were raised in the review, such as the duration of the period during which the UHS would have to support the safe shutdown of Temelin during "stand alone" conditions, i.e., in the absence of access to offsite power and water supplies, and the UHS' ability to provide heat dissipation during the stand alone period. Those questions appear to be capable of resolution through additional analyses and/or minimal plant modifications.

The safety related electrical, instrumentation and control, and protection systems at Temelin are based on a conservative design approach that provides redundancy (typically, three 100% capacity safety trains) and good physical separation of trains of safety equipment. Two areas of concern that require further study and potential hardware modifications are the apparent inadequate sizing (compared to Western

standards) of the plant's safety-related DC battery system, and the lack of consideration in the design of the potentially adverse interactions between the Temelin plant electrical systems and the Bohemia power grid.

The Audit Team determined that Temelin is provided with the major engineered safety features normally provided in Western plants. In fact, some of the features provided at Temelin exceed Western standards. However, Temelin's reliance on a single containment sump located in an extension of containment is not consistent with Western practice. In addition, the design of the sump and associated piping exhibit several design weaknesses. Potentially inadequate debris protection and vortex suppression capabilities and single failure protection of the suction piping will require detailed evaluation and may require plant modifications.

Major relevant accident sequences appear to have been considered in the existing transient and accident analyses for the Tem.. plant. The assumptions made in the analyses appear to be conservative, but the ana.; ical tools used are generally outdated and in many instances would be considered in the West to be unsuitable for a thorough accident evaluation. The Audit Team recommends that the plant safety analyses be substantially improved or totally redone. This can be accomplished in connection with the planned complete rework of the PSAR/FSAR to bring those documents more in line with Western standards. Input from the original Soviet designers is expected to be necessary to accomplish the reanalyses effectively.

The organizational structure and overall management plan for the radiation protection program at Temelin are conceptually similar to those implemented in the West, and contain the basic elements required to support licensing and safe operation of the plant. The program has some weaknesses, however, such as the lack of a formalized and documented ALARA program for system and plant design, and the failure to use a sufficiently conservative post-LOCA source term to evaluate internal plant shielding requirements.

The measures planned for industrial security at Temelin, including physical security and the safeguarding of nuclear materials, are comparable to those that would be expected for nuclear facilities in the West. While some areas have a potential for improvement, a number of the security measures planned for Temelin exceed those normally implemented in U.S. and Western European plants.

The fire protection program at Temelin is based on appropriate Czechoslovak standards, but appears to not meet all Western standards and practices. For example, a Western

nuclear power plant oriented Fire Hazards Analysis (FHA) has not been conducted. Without it, there is considerable uncertainty as to whether the existing plant arrangements and the fire detection and suppression hardware are adequate. A detailed FHA should be performed as soon as practicable, so that any weaknesses in fire protection provisions can be identified and corrected on a schedule that supports the overall completion of the plant.

The Audit Team determined that adequate emergency planning measures have been defined for Temelin, within the context of a national "Reference Emergency Plan." While actions were identified as planned or being taken to prepare for and manage emergencies arising from Temelin's operations, a thorough review of their actual implementation will be required at a later date.

The adequacy of the Temelin plant siting was recently investigated and confirmed by an IAEA site safety review mission. The Audit Team examined the work of the IAEA mission and agrees with its conclusions and recommendations, which are in the process of being implemented by CEZ-ETE.

The severe accident review revealed that CEZ-ETE is taking appropriate initial steps to develop hardware and management capabilities to handle severe accident scenarios. Hydrogen control equipment (catalytic recombiners) are in the process of being procured, and it was indicated that a filtered containment venting system will be considered if a planned probabilistic safety analysis should indicate that it is needed. CEZ-ETE is also adding a power operated pressurizer relief valve, whose judicious use can help mitigate severe accident conditions. The Audit Team concluded that these developmental efforts should continue, and should be accompanied by expanded accident analyses using current methodology, so as to define possible management actions (e.g. corium control strategies) that would mitigate the consequences of severe accidents.

Planned plant improvements have been defined to a large extent through the initiative of senior Temelin plant personnel; fifty-five such improvements are currently under study. The Audit Team reviewed these potential improvements and found them generally worthy of further development and potential implementation. A concern exists that the viability and merit of some of these proposed modifications may not be capable of evaluation in the absence of relevant design information from the original Soviet designer. On the whole, however, the Audit Team found these efforts commendable, and believes that they should continue.

Finally, the Audit Team concluded that the equipment qualification program for Temelin

does not meet Western standards. A number of potentially significant weaknesses were identified, but a detailed audit of the entire program would be needed to determine the extent of the deficiencies. Examples of the weakness found included a lack of definition of the environmental qualification program performed by the Soviets for the equipment they supplied, and the absence of any indication that age-related or potential accident-caused equipment degradation were adequately considered in the design and specification of equipment.

1.3 Quality Assurance Review

The Audit Team examined the Quality Assurance/Quality Control (QA/QC) programs of CEZ-ETE and its major contractors and subcontractors involved in the Temelin project. The evaluation encompassed all aspects of the project, including design, fabrication, construction, and preparation for testing and operations.

The audit determined that excellent quality control measures are being applied by the personnel involved in all aspects of the project. There are, however, programmatic weaknesses in the QA programs of CEZ-ETE and its contractors. As compared to Western standards, the CEZ-ETE QA organization is not sufficiently involved in the establishment of quality requirements for suppliers or subcontractors, the evaluation of the QA programs of bidders, or the selection of suppliers or subcontractors. The QA management procedures of CEZ-ETE and its contractors and subcontractors are insufficient in number and detail to ensure that all personnel perform their duties. The CEZ-ETE QA organization appears to be insufficiently staffed for the current stage of the Temelin project. The present QA personnel, however, are properly trained, qualified and certified.

While an informal, but thorough and effective program is in place for the correction of defective work, the QA procedures for the performance and inspection of construction work are inadequate to provide instruction on how the tasks should be performed, and there is no provision for analysis of deficiencies to determine their root causes and identify potential adverse quality trends.

Finally, inadequate use is being made of audits, both internal and external, to manage and evaluate compliance with QA requiremer A comprehensive audit program needs to be implemented at all levels of the proje

1.4 Project Management Review

The Audit Team examined the project management aspects of the Temelin project, seeking to determine whether human, physical and financial resources are being properly deployed towards the completion of the plant within approved budget, schedule and technical requirements. The Team concluded that CEZ-ETE and the major suppliers have many of the resources and tools necessary for the management of the project. However, a number of problem areas were identified.

Organizationally, CEZ-ETE needs to augment its management team to establish more effective control over engineering activities, construction activities, and other related activities at the site. The Audit Team found that construction was continuing to be behind schedule, and that strong integration of engineering activities was not evident.

CEZ-ETE lacks a strong on-site engineering organization to manage and control the overall design effort and the interfaces among the various design groups as well as the technical demands of the major ongoing design changes. This is important on any technical project as complex as a nuclear power plant, but is especially important at Temelin because of the complicated arrangement of contractors and the ongoing major reevaluations and design changes. Clear lines of authority and responsibility for this important function need to be established.

Regarding construction, the situation is similar. Progress is slow and additional management focus is needed. Based on the Audit Team's review it was not evident that there was any one senior experienced ETE manager who was dedicated solely to construction management oversight. The Audit Team believes this is a major weakness that needs to be corrected.

Concerning the safety, licensing, and new requirements areas, the Team believes that dedicated managers for these functions are needed.

Based on the Audit results, it appears that management needs in a number of areas, including construction and engineering, are only partially satisfied in the present organizational arrangement and that improvements are required.

The control and coordination systems used by CEZ-ETE to manage the project contribute to the delays being experienced in the project schedule. For example, one of the main elements used to resolve problems and assess construction progress is the control meeting of the Directors which is held only on a monthly schedule.

CEZ headquarters is insufficiently involved in overseeing, monitoring and reviewing the

progress of the project. CEZ headquarters should establish vehicles similar to those used in Western utilities to enable it to participate directly in the oversight of the project. This is imperative in light of the many design changes currently underway. Only through such oversight, can CEZ gain an independent view of the progress of the project, and take appropriate action in a timely manner.

An organized program of independent safety oversight, similar to those found in Western utilities, has not been established at Temelin. This should be done to promote the development of an appropriate safety culture.

Without firm management action to address these project management issues, there is little assurance that the project can be effectively controlled. One option to increase such control involves realigning the organization to establish clear responsibilities, to formalize those responsibilities in writing, and to supplement a number of managers with "shadow" managers with experience from the West.

1.5 Project Cost Review

The management of project costs is a subset of the overall management of a nuclear power plant project. The Audit Team conducted an evaluation of the methods used at all levels of the Temelin project for estimating, recording, reporting and controlling project costs. The results of that investigation shed light not only on cost management measures, but also on the overall approach to project management of Temelin's design and construction activities.

The Audit Team found that the personnel involved in cost management activities are capable and the systems used for tracking and estimating costs are thorough and appropriate. However, the cost control capabilities that exist are not being adequately utilized. There is a respectful "hands-off" altitude on the part of CEZ-ETE that places excessive trust in the contractor's commitment to CEZ and to the project cost, schedule and quality objectives, thereby allowing contractors and subcontractors too much independence in the management of their work. This attitude needs to be replaced with one of aggressive cost monitoring and management through the clear definition of responsibilities and the addition of several experienced Western cost/schedule professionals who would either be placed in direct charge of the Project cost activities or support the existing Temelin staff as "shadow managers". In addition, to significantly strengthing project cost management, this would provide opportunities for training and technology transfer.

One indication of inadequate cost management is the tendency to apply the contingency in project estimates against approved project changes. Such misapplication of the contingency obscures the cost of plant modifications and prevents their effective management.

The cost estimate for Temelin Units 1 and 2 was judged to be low. The Audit Team recommended that it be revised upward to reflect more accurately the anticipated cost of the current scope of work, and to provide proper allowances for the plant modifications currently under development, the estimated cost of schedule delays, the cost of potential modifications resulting from this Audit, and the reinstatement of some contingency.

In view of the Audit Team Findings, the Team recommended that CEZ immediately embark on more detailed assessment of the cost (and schedule) aspects of the Project, and that CEZ-ETE personnel be an integral part of those assessments.

1.6 Project Schedule Review

The Audit Team also evaluated the methods used at all levels of the Temelin project to control project schedules. As was the case in the cost review, the Audit Team found that personnel and system capabilities in the area of scheduling are adequate, both within CEZ-ETE and at the contractors and subcontractors. However, those capabilities are not being used effectively. A new project schedule was established in September 1990, but is already running approximately five months late. Particularly disturbing is the fact that no corrective actions appear to have been instituted to recover the losses or to avoid further slippages, or at least no positive results have been demonstrated. The recent delays were stated to be due mainly to the performance of construction subcontractors, especially Hutni Montaze, the subcontractor for pre-erection and on-site erection of the containment and the prefabricated steel panels for the in-containment civil works.

The main reason for the inability to control the project schedule is the apparent lack of aggressiveness on the part of project personnel in enforcing schedule commitments. Excuses for schedule delays are tolerated, partly as a cultural residue from the previous economic system, and also because of CEZ-ETE's "hands-off" attitude towards the responsibilities of its contractors and subcontractors as mentioned earlier. There is a need for strong, aggressive schedule managers who will develop and enforce a site-wide program for expediting the installation of bulk commodities and managing the schedule of the major project changes now underway. As in the cost area, the most expeditious means of improving the effectiveness of project schedule management is through the

clear definition of responsibilities (through formal position descriptions) and the addition of experienced Western schedule professionals to lead the schedule management activity or act in a "shadow management" role.

Some additional scheduling performance indicators also need to be developed. For example, the project should start issuing monthly families of curves for the installation of bulk materials, showing cumulative quantities by time and comparing budget against actual installation rates and overall plant completion percentage. The project should also generate manpower curves (planned and actual) to permit effective manpower deployment and management.

The Audit Team believed that the earliest possible Unit 1 plant completion date was mid-1995. Achieving the mid-1995 date would require increased effort and attention to completing the remaining detailed design work, a marked improvement in craft productivity, the addition of a significant number of Western cost/schedule managers and specialists, and increased CEZ senior management attention and visibility. It would also require the expeditious award of the I&C upgrade contract and special emphasis on expediting the associated design and procurement efforts to minimize the impact of this major change on the overall project schedule. In recognition of these considerations, a 1996 plant completion estimate was believed to be more realistic. Even this date might not be achieved unless aggressive schedule management measures are undertaken in the near future.

It should be recognized that delays in project completion not only result in increased project cost but also subjects the project to greater licensing risk because of the possibility of the enactment of more stringent licensing requirements and the possibility of increased public opposition to nuclear power in Czechoslovakia or in neighboring countries.

1.7 Contracting and Insurance Review

The Audit Team reviewed English translations of all or portions of the principal contracts for the design and equipment supply at Temelin. The review was impeded by the imprecision of the translations and unavailability of some referenced legal materials. The Audit Team was able to determine that the existing contracts are not effective tools to enforce contractor performance. They do not contain (among other terms typically found in Western contracts) provisions for:

(a) establishing explicit penalties and incentives tied to contractor performance;

(b) imposing requirements on the contractors to meet established schedules, with associated performance-based penalties or rewards;

(c) allowing project management to be informed of contractor performance with respect to cost, schedule and quality; and

(d) providing explicit guarantees of the quality of the contractor's work.

The Audit Team recommended that such provisions be sought in future CEZ-ETE contracts.

Existing CEZ-ETE contracts do not contain any nuclear liability provisions. Proposed ABB and Westinghouse draft contracts seek indemnification and "hold harmless" clauses to cover nuclear incidents, along with waivers of all rights of recourse and subrogation that CEZ and its insurers may have. (Those are standard provisions in Western contracts.) Clarification of the absolution of foreign vendors and contractors from liability for nuclear incidents may be necessary as CEZ seeks to enter into further contracts with Western suppliers.

1.8 Radioactive Waste Management Review

The Audit Team performed a review of the existing and planned measures at Temelin for the control and processing of radioactive waste (gaseous, liquid and solid), the short and long term storage of radioactive waste, and the long term storage of spent nuclear fuel.

The Audit Team found that Temelin's gaseous radwaste processing system generally conforms to Western standards and contains favorable features not found in typical facilities in the West. One weakness of the system is the absence of continuous radiation monitoring capability at the system discharge prior to admittance to the plant vent stack.

The Temelin liquid radwaste system is conceptually consistent with those used in the West. However, liquid release restrictions applicable to Temelin are far more severe (by factors of 100 to 1000) than those imposed in the West. Consequently, the Temelin liquid radwaste processing system needs to be carefully designed to ensure that it operates properly and meets licensing requirements. The existing design of the system is undergoing a comprehensive review to improve its efficiency. An important aspect of the system that needs to be reviewed is the performance of the waste evaporator, which is critical to the plant's ability to meet discharge limits. The existing Soviet design does

not appear sufficiently reliable, and may require, at a minimum, the addition of an entrainment separator vessel.

There are also weaknesses in the approach for radiation monitoring of liquid discharges, the absence of tank recirculation and sampling capability at each collection point, and documentation of the seismic qualification of the auxiliary building structure that contains the liquid radwaste processing facility. Finally, a formal ALARA program for system and plant design has not been instituted for any of Temelin's radwaste management systems; its absence is particularly noticeable in the liquid radwaste management system.

CEZ-ETE has established exemplary methods for the classification and segregation of solid radwaste at Temelin, and has developed suitable conditioning plants for the different types of solid radwaste. Temelin's solid radwaste processing system is generally consistent with Western standards. CEZ-ETE intends not to use large, Soviet-designed waste storage cells in the auxiliary building, but to use instead conditioning and incineration facilities now under development.

Interim and long term storage facilities have been developed for Temelin's waste. Those facilities are comparable or superior to those available in Western countries (e.g. the U.S.). One improvement that needs to be made is the provision of emergency storage for solidified bitumenized waste in the event the normal waste disposal facility at the Dukovany site becomes temporarily unavailable.

The storage capacity for spent fuel provided at Temelin is sufficient for about 9 years of plant operation. A solution for the long term storage of spent fuel from nuclear plants in Czechoslovakia needs to be developed and implemented by the time the spent fuel pool at Temelin is filled.

1.9 Preparation for Operations review

The Audit Team examined the current plans and programs for performing a preoperational test program at Temelin. The program is being developed by the start-up group at SKODA-Praha. The review led to the conclusion that the SKODA start-up group has provided the bases for a thorough test program for the plant as originally designed. The preliminary schedule for the program establishes a logical progression of the test activities and adequate time for each test. However, appropriate steps must now be taken to prevent the plant improvements and design changes, either currently being made or proposed herein, from having a negative impact on the overall integrated test

program. For example, the I&C system changes may significantly affect the schedule for the preparation of the test procedures, and could result in major overall delays in the test program.

The Audit Team assessed the operator training program being developed for Temelin and determined that the initial training program being planned generally conforms with Western standards, and in some respects surpasses the programs being implemented in the U.S. The applicants for plant operator assignments are required to have a strong educational background (engineering degrees), and most will have plant operation experience at Dukovany. A potential major difficulty may arise with regard to simulator training. A plant-specific simulator is committed to be installed at Temelin, but current schedules suggest that the simulator will not be available until near the time for fuel load. For Western plants to be licensable in the mid-1990s, it would likely be required that a simulator be installed at the site and be made ready for training at least six months prior to fuel load.

The Audit Team was further concerned that the integration of several ongoing or planned activities, (e.g., the I&C change, the fuel change, accident reanalysis, and the addition of a simulator) may have a negative impact on the ongoing training and pre-operational testing program.

1.10 Emergency Feedwater System Review

The Emergency Feedwater (EFW) System was one of three aspects of the Temelin Plant for which the Audit Team performed a detailed design review using the "vertical slice" methodology. The EFW review covered the system's capacity, redundancy, functional capability, reliability, and systems interaction. The review was conducted following the review criteria contained in the U.S. NRC's Standard Review Plan.

The Audit Team could not reach a final conclusion as to the adequacy of the EFW system, because all of the necessary design documentation was not available. However, the conceptual design of the system is consistent with Western standards and includes considerable strengths: a large degree of redundancy (3x100% capacity trains), appropriate physical separation between trains, good protection against missiles, pipe whip and jet impingement and against inside-building flooding. However, there is no documented evidence that the system can withstand a single active failure, and the system exhibits certain design weakness including lack of diversity in the power supply, availability of flow instrumentation and isolation capability for only two out four steam generators, and potentially inadequate tank capacity for plant cooldown.

1.11 Station Blackout Review

The Audit Team performed a detailed examination of the ability of the Temelin plant to cope with and survive a station blackout, defined as a coincident loss of all normal (Bohemia grid) and onsite AC power sources. The vital AC systems which are powered by the safety-related DC batteries are considered operable.

Based on the excess system redundancies and the automatic diesel start features inherent in the Temelin design, the Audit Team concluded that the Temelin diesel and decay heat removal systems will be successful in mitigating the effects of a full station blackout, with the exception of DC battery operation. The Temelin DC battery system was sized to support the loads assigned to it for a period of only 20 seconds. Comparable battery systems in Western plants are sized to operate for a minimum of one hour. The Audit Team believes this is a major deviation from Western practice and should be reconsidered.

The Audit Team also concluded that the interactions between the Temelin site and the Bohemia grid have not been adequately considered in the plant nuclear performance assessments. The principal concern is power-to-flow transients which can be induced by grid voltage and/or frequency perturbations. Frequency upsets only trip the plant. They do not initiate grid shed and diesel start; hence the potential exists to stall Engineered Safety Systems. The effects and limits of grid voltage and frequency perturbations on the plant should be therefore investigated and any necessary design modifications implemented.

1.12 Ultimate Heat Sink Review

The Ultimate Heat Sink (UHS) is part of the Technical Important Water System (TVD), which removes heat from the reactor via the Emergency Cooling System (TQ) and the TQ heat exchanger. The Audit Team performed a detailed review of the UHS capability provided at Temelin, concentrating on the UHS itself and the TVD. The review focused on system configuration, system redundancy and diversity, coping time, and systems interaction.

The Audit Team found that the TVD system (including the UHS) consists of 3x100% redundant, independent, physically separated subsystems, each capable of meeting the reactor heat removal requirements. This represents a greater level of redundancy than that available at many Western nuclear power plants. The TVD system appears to provide a reliable source of cooling water to dissipate heat loads from the reactor and

other essential plant systems. However, the ability of the UHS to cope with design basis events for extended periods of time without make-up water has not been demonstrated, and should be developed through the generation of a documented design basis founded, among other things, on a comprehensive 30-day transient analysis of UHS heat dissipation capability and safety-related water reserves.

1.13 New Instrumentation and Control System Review

At the time of the Audit, CEZ-ETE was in the process of defining a Western designed replacement of all instrumentation and control equipment (I&C) specified by the former Soviet Designer for the Temelin plant. The Audit Team conducted a limited review of the I&C replacement project to determine whether the transition from the Soviet Technical Project to the substitute Western technology was being defined in a manner that preserves Temelin's favorable design attributes. The Audit Team's review did not cover the technical merits of the offerings proposed by the two prospective vendors, Westinghouse and ABB as these are being addressed by another contractor to CEZ-ETE.

Nevertheless, based on its limited review, the Audit Team determined that the requirements document issued by CEZ ETE did not specify certain important technical requirements of the replacement I&C system. For example, the document did not present requirements for validated analytical tools or explicit operating sequences and performance objectives for the Reactor Protection System, Engineered Safety Systems, and the Limitation System. The lack of specification of these matters in the requirements document suggest that a supplement may be appropriate in order to properly appraise the bidders of the full range of technical requirements for Temelin's I&C system.

Important concerns raised by the I&C replacement are the need to assure adequate cooperation of the original Soviet design organization in providing design basis information, and the importance of centralizing in a single organization the task of integrating the new I&C design into all aspects of the plant. The Audit Team was informed that in the past, the performance of the Soviets in responding to Temelin requests for technical information has not been good, either with respect to the timeliness of the responses or their technical content.

1.14 New Fuel and Core Design Review

At the time or the Audit, CEZ was making efforts to procure, through competitive bidding, new fuel and related services for a redesigned three-year core of the Temelin reactor. Several Western vendors plus the original Soviet fuel supplier are bidding on the new fuel procurement. Although a detailed evaluation of the new fuel procurement was outside the Audit Team's scope of review, the Audit Team believes the fuel procurement initiative to be sensible from both the technical and economic standpoints. However, regardless of whether the new fuel is purchased from Western vendors or the Soviets, there are technical and schedule risks that must be taken into consideration.

If the decision is made to procure fuel from a Western supplier, CEZ should make arrangements for the original fuel designer to provide requisite technical information to the selected vendor. Such information is needed to fully integrate the fuel design with the design of the rest of the plant, including the prospective new I&C system. The selected Western supplier could also be contracted to prepare the appropriate sections of the Safety Analysis Report to be filed in support of plant licensing. A Western supplier would need to perform some amount of developmental work, including testing, to supply fuel that matches the Soviet design requirements. All these matters take effort, result in increased costs, and may introduce a delay in the Temelin schedule. However, the local, national, and international acceptance of Temelin would be enhanced by the "Westernization" of both the fuel and I&C systems, and safety may also be improved.

If the decision is made to procure fuel from the original fuel designer, the integration of the fuel design with the rest of the plant becomes more straight-forward. On the other hand, the original Soviet fuel and core design has been questioned by the CSKAE and the plant may not be licensable without physical modifications or additional analyses using more current analytical techniques. For these reasons, procurement of fuel from the original fuel supplier may also pose schedule as well as technical risks.

2.0 MAJOR RECOMMENDED ACTIONS

2.1 Licensing Related Actions

As identified in the Audit Report, the Audit Team believes that Temelin can generally meet Czech and Western licensing requirements projected for the mid-1990s, but that:

- Some plant modifications will be required
- A substantial number of additional analyses must be completed

- New detailed PSAR and FSAR (including transient and accident analyses) must be prepared and independently reviewed against Western standards

- An improved CEZ and CEZ-ETE safety culture must be demonstrated

- CEZ and CEZ-ETE efforts to promote acceptance of nuclear power both locally and nationally must be intensified

2.2 Design Related Actions

2.2.1 First Priority Actions

General Actions

- Complete the evaluation of the new fuel/core bids and ensure the continued availability of necessary design information from the original Soviet designers. This effort should be integrated into the overall assessment of Temelin.

- Complete the evaluation of the replacement I&C bids and ensure the continued availability of necessary design information from the original Soviet designers. This effort should be integrated into the overall assessment of Temelin.

- Conduct Level 1 and 2 probabilistic safety assessments using an entity independent of the design organizations. This activity should begin as soon as possible to be of maximum use in the design.

- Conduct a Western fire hazards analysis. This activity should be completed as son as possible to enable results to be factored into the design.

- Critically examine the equipment qualification program and take the actions necessary to ensure its adequacy.

- Complete the seismic reanalysis of safety related structures and systems.

- Conduct a comprehensive design review to determine the adequacy of safety train separation in the detailed plant and system designs.

- Conduct and document comprehensive containment and containment subcompartment analyses under POST-LOCA conditions.

- Collect/create Temelin design basis documentation and supporting design information.

Specific Actions

- Provide single failure protection for critical piping leading from the containment sump.
- Conduct a detailed review of all aspects of containment sump and connected systems design.
- Make provisions to facilitate adding a filtered vent to the containment.
- Reevaluate the need for a boric acid tank heating system.
- Establish a defensible coping time criteria for loss of all off and on-site AC power and demonstrate the design can meet it.
- Conduct a comprehensive review of the adequacy of the DC battery system and make any necessary design changes.
- Review the safety system designs relative to the potential effects on non-safety related component failures on the safety related systems.
- Complete the liquid radwaste evaporator design study and make any necessary design changes.
- Explore the advantages of not regenerating depleted resin beds in the liquid radwaste design.

2.2.2 Second Priority Actions

- Investigate the acceptability of the TVD water filtration building and contained systems with respect to the potential for common mode failure.
- Provide continuous radiation monitors on the intermediate loop of the district heating system.
- Estimate the seismic shear wave velocity of the site and determine if the value

indicates that soil-structural interaction analyses should be performed.

- Monitor the Hluboka fault activities as recommended by the IAEA Mission Final Report and update the Tectonic Map.

- Investigate the structural adequacy of the steam generator baffle plate under steam line break accident conditions.

- Review the radwaste system designs from an ALARA standpoint and make the design changes found to be of major benefit.

- Provide continuous liquid radiation monitors at the liquid sample tank discharges with automatic valve closure in the event of high radiation levels.

2.3 Management/Organization/Staffing/Actions

- Communicate pertinent audit findings to CEZ-ETE. This activity should begin immediately and involve appropriate Temelin managers. To a great extent, this activity should precede other major decisions regarding the design.

- Improve Temelin safety culture
  - Increase CEZ oversight of Temelin operations.
  - Establish an Off-Site Safety Review Committee.
  - Establish an Independent Safety Engineering Group (ISEG).
  - Establish a system to obtain regular feedback of operating experience from other nuclear power plants.
  - Foster a positive safety culture at all levels of the Temelin staff.
  - Obtain on-loan staff support from the West.
  - Accelerate the completion and implementation of the Temelin Q/A programs with emphasis on self audits.

The Off-Site Safety Review Committee would be composed of 6-12 senior personnel from CEZ, CEZ-ETE, and independent organizations (for example, Eastern and Western research institutes and consultants) who are familiar with broad nuclear safety issues. The committee would meet approximately quarterly to review major Temelin safety issues and make appropriate recommendations to the plant manager and CEZ headquarters.

The ISEG would have the principal function of examining plant design, construction, and

operating activities with a view toward the improvement of plant safety. It would consist of approximately five dedicated full time engineers located on-site and reporting to a corporate official who holds a high level technically oriented position but who is not in the direct management chain for plant construction or power production. The ISEG would perform independent reviews and audits of day-to-day safety related plant activities.

- Establish formal agreements to ensure the continued availability of technical information from the original Soviet design organizations.

- Establish full time project managers for major new Temelin projects, e.g.:

  - TMI Action Items
  - "55 Item" Plant Improvement Program
  - I&C Replacement
  - New Fuel/Core DProcurement

- Establish a strong CEZ-ETE on-site engineering organizataion.

- Add experienced and aggressive management support to the cost and schedule activities.

- Ensure that all new contracts with former Soviet, Czechoslovak or Western suppliers include the provisions necessary to allow CEZ-ETE project managers to effectively control and manage their work.

2.4 Comments on New Nuclear Fuel and I&C Procurements

- Local, national, and international acceptance of Temelin will be enhanced by "Westernization" of I&C and fuel. Safety may also be improved by such Westernization, especially if Soviet technical cooperation can be obtained.

- Procurement of fuel from a Western Supplier also appears to be prudent in view of the ongoing political and economic changes in the former Soviet Union.

- If fuel is procured from a Western supplier serious consideration should be given to using the same supplier for the I&C procurement as for the fuel.

Operational Training/Plant Simulator

- The nuclear fuel and I&C upgrade procurements will have strong technical and schedular impacts on:

  - Design and procurement of the plant simulator
  - Preparation of the plant technical specifications (limitations and conditions).
  - Preparation of test, operating, and emergency procedures.
  - Operator training and qualification.

- In recognition of the above, special emphasis should be placed on each of these areas to avoid their becoming critical path items relative to plant start up.

3.0 ACTION PLAN

The Audit Team prepared preliminary terms of reference to assist CEZ/CEZ-ETE in planning and implementing the major recommendations contained in the Audit Report. CEZ-ETE has further elaborated the Terms of Reference associated with the Audit Team technical recommendations. They are included as Attachment C to the accompanying Progress Report.

ATTACHMENT B
REFERENCE PLANT

B.1 Development of the Reference Plant

In order to assess the safety and licensability of the ETE facility, a composite "Reference Plant" was developed which exhibited characteristics deemed as crucial to the licensability of a nuclear facility in Western Europe in the middle of the last decade of the twentieth century. The criteria established for the Reference Plant started with current requirements for the design of an equivalent reactor in the United States; namely, Title 10, Code of Federal Regulations, Part 50 (10 CFR 50), including Appendices thereto, 10 CFR 100, and continued with a review of the important European criteria that differ from the U. S. Code of Federal Regulations. Furthermore, design improvements proposed for the next generation of nuclear power plants appearing in the EPRI Advanced Light Water Reactor (ALWR) Utility Requirements Document, Volume 1, were considered in the evaluation criteria, along with the relevant IAEA Standards.

The above framework established a set of essential characteristics for a safe, licensable plant in each of the functional areas which were assessed. The number of characteristics explicitly selected was limited in order to provide a practical scope for comparison with the ETE plant features but, in the professional judgement of the audit team, reflected items having the potential for a major impact on the licensing process. Obviously, the CSFR regulations would require full compliance for the acquisition of a license.

A frame of reference was established for each of the 43 characteristics, to provide a source of information that would identify the nature and scope of the potential licensing issue. The references chosen were selected at the level of general requirements, fully recognizing that a detailed examination of the design or process elements for ETE would require comparison against more detailed standards applicable to the licensing process in a benchmark country. The 43 Reference Plant essential characteristics are summarized in Table B-1.

B.2 Categorization of Essential Characteristics

In order to assess the relative importance of the essential characteristics of the Reference Plant and provide a more complete set of international references for the regulatory framework, each of the characteristics was placed in a category which reflected some commonality. The specific categories which resulted from this sorting were: Site; Overall Plant System Interface; Quality Assurance; System Design; and Severe Accidents. Following this categorization, different tiers of requirements were identified and tabulated, starting with the most general regulatory framework, the IAEA Standards and Guides, next identifying the major U.S. regulations which applied, and finally tabulating other documents felt to be pertinent. The results of this effort are provided in Table A-2.

TABLE B-1

REFERENCE PLANT

FEATURE/CHARACTERISTIC	FRAME OF REFERENCE
1) THE TEMELIN PLANT INCORPORATES THE DESIGN CHANGES AND OTHER IMPROVEMENTS FOUND NECESSARY AS A RESULT OF THE TMI ACCIDENT	1)USNRC 10 CFR 50.34(f) IAEA 50-C-D (REV1) 1988
2) AN ADEQUATE PHYSICAL SECURITY PLAN HAS BEEN PREPARED FOR THE PLANT	2) RSK-LL, 19.4 USNRC 10CFR 50.34 (c) AND 10CFR 73
3) AN ADEQUATE SAFEGUARDS CONTINGENCY PLAN HAS BEEN PREPARED FOR THE PLANT	3)NATIONAL IMPLEMENTATIONS OF THE NONPROLIFERATION TREATY USNRC 10CFR 50.34 (d) AND 10CFR 73
4) A PLANT/SITE SPECIFIC PSA INCLUDING EXTERNAL EVENTS HAS BEEN PERFORMED TO IDENTIFY AREAS OF RELATIVE VULNERABILITY AND POTENTIAL FOR PRACTICAL SAFETY IMPROVEMENTS	4)NEW REQUIREMENT IN GERMANY AND SWITZERLAND USNRC 10CFR 50.34 (f)(1)(i, GL 88-20 SUPPL. 4
5) ADEQUATE PROTECTION AGAINST PRESSURIZED THERMAL SHOCK HAS BEEN PROVIDED FOR THE PRIMARY SYSTEM BOUNDARY	5)RSK-LL, 4 RCC-M USNRC 10CFR 50.34 (b)(9) APPENDIX A CRITERION 50, APPENDIX G, AND APPENDIX H
6 THE AFWS DESIGN HAS FUNCTIONAL CAPABILITY,CAPACITY AND RELIABILITY ACCORDING TO ITS IMPORTANCE TO SAFETY.	6)USNRC 10CFR 50.34 (f)(1)(ii)

7) A RELIABLE AND EFFECTIVE SYSTEM OF HYDROGEN CONTROL INSIDE CONTAINMENT HAS BEEN PROVIDED	7) RSK-GL. 24 USNRC 10CFR 50.34 (f)(2)(ix)
8) THE CONTROL ROOM DESIGN REFLECTS HUMAN FACTOR PRINCIPLES AND INCLUDES A SAFETY PARAMETER DISPLAY	8) RSK-GL. 8 USNRC 10CFR 50.34 (f)(2)(iii)&(iv) IAEA 50-C-D(REV 1) EPRI URD VOL II
9) A PLANT SIMULATOR THAT CORRECTLY MODELS THE CONTROL ROOM AND INCLUDES THE CAPABILITY FOR FULL FIDELITY SIMULATION OF NORMAL, ABNORMAL AND ACCIDENT CONDITIONS IS AVAILABLE FOR OPERATOR QUALIFICATION AND TRAINING	9)USNRC 10CFR 50.34 (f)(2)(i)
10)A SATISFACTORY EMERGENCY RESPONSE PLAN HAS BEEN PREPARED AND TESTED PRIOR TO REACTOR OPERATION	10)USNRC 10CFR 50.34 (a)(9), 50.47 AND APPENDIX E IAEA 50-SG-G6 IAEA 50-SG-O6
11)A SATISFACTORY PLAN HAS BEEN PREPARED FOR THE OWNERS ORGANIZATION, TRAINING OF PERSONNEL, AND CONDUCT OF OPERATION	11)INSAG - 3&4 USNRC 10CFR 50.34 (a)(6), (b)(6)(i), AND (f)(3)(vii)
12)A SATISFACTORY QUALITY ASSURANCE PROGRAM HAS BEEN ESTABLISHED AND IMPLEMENTED FOR PLANT DESIGN, FABRICATION, CONSTRUCTION, TESTING AND OPERATION	12) CS AEC DECREE 436/90 OF 10/10/90 KTA 1401 IAEA 50-SG-QA SER. 10CFR 50.34 (a).7, APPENDIX A CRIT 1, AND APPENDIX B
13)SATISFACTORY TECHNICAL SPECIFICATIONS GOVERNING PLANT OPERATION HAVE BEEN PREPARED PRIOR TO PLANT OPERATION	13)10 CFR 50.34 (b)(6)(vi), 50.36 AND 50.36a
14)SATISFACTORY AND DETAILED PLANT OPERATING AND EMERGENCY PROCEDURES HAVE BEEN PREPARED PRIOR TO PLANT OPERATION	14)IAEA 50-C-O R1 10CFR 50.34(f)(2) (ii)

15)THE PLANT DESIGN CONTAINS ADEQUATE PROVISION FOR THE CONTROL OF RADIATION FOR OCCUPATIONAL DOSE AND RADIOACTIVE EFFLUENTS AND WASTE PRODUCTS DURING NORMAL OPERATIONS TO ACHIEVE ALARA OBJECTIVES	15)IAEA 50-SG-D9 IAEA 50-SG-O5 IAEA 50-SG-O11 GERMAN IWRS GUIDE SWISS HSK-R GUIDE USNRC 10CFR 50.34a APPENDIX I
16)THE PLANT DESIGN INCLUDES ADEQUATE MEASURES TO MINIMIZE THE PROBABILITY AND EFFECT OF FIRES AND EXPLOSIONS	16)INT'L FIRE PROT. GUIDE 1983 IAEA 50-SG-D2 10 CFR 50 APPENDIX A CRITERION 3 AND APPENDIX R
17)THE CONTAINMENT STRUCTURE CAN ACCOMMODATE WITH SUFFICIENT MARGIN THE CALCULATED PRESSURE AND TEMPERATURE RESULTING FROM THE MOST LIMITING LOSS OF COOLANT OR STEAMLINE BREAK ACCIDENT.	17)RSK-LL, 5 RCC-G IAEA 50-SG-D12 10 CFR 50 APPENDIX A, CRITERION 34,35,38 AND APPENDIX K
18)THE PLANT DESIGN INCLUDES ADEQUATE PROVISIONS FOR RESIDUAL HEAT REMOVAL, EMERGENCY CORE COOLING, AND CONTAINMENT HEAT REMOVAL	18)RSK-LL, 22 RCC-P, RCC-M 10 CFR 50 APPENDIX A CRITERION 34, 35,38 AND APPENDIX K
19)THE PLANT HAS BEEN SATISFACTORILY SITED TO MINIMIZE RISK TO THE GENERAL PUBLIC	19) RCP-M, RCP-P RSK-LL, 2 IAEA 50-C-S R1 10CFR 100
20)THE POTENTIAL FOR AN AIRCRAFT CRASH AT THE PLANT SITE HAS BEEN ADEQUATELY EVALUATED AND THE RISK IS ACCEPTABLE	20) RSK-LL 19.1 IAEA 50-C-S R1 IAEA 50-SG-S5 10CFR 100.10
21)THE PLANT SEISMIC DESIGN CRITERION IS APPROPRIATE FOR THE SITE CONDITIONS AND THE PLANT CAN ADEQUATELY SUSTAIN THE SEISMIC INDUCED LOADS	21) IAEA 50-C-S R1 IAEA 50-SG-S1 10CFR 50 APPENDIX A CRIT. 2

22)THE DESIGN CRITERIA RELATIVE TO HIGH WINDS, EXTERNAL FLOODS, AND TRANSPORTATION AND NEARBY FACILITY ACCIDENTS ARE APPROPRIATE AND THE PLANT CAN SAFELY SUSTAIN THE POSTULATED EVENTS	22) KTA 2207 REG GUIDE 4.7 10CFR 50 APP A CRITERION 2
23)THE DESIGN RELATIVE TO CONTROL ROOM HABITABILITY IS APPROPRIATE AND THE PLANT DESIGN ALLOWS THE OPERABILITY OF THE CONTROL ROOM TO SUSTAIN THE POSTULATED EVENTS.	23) RSK-LL 19.3 IAEA 50-C-D R1 10CFR 50 APP A CRITERION 2,4,5, 19 AND 60
24)THE TRANSIENT AND ACCIDENT ANALYSES HAVE BEEN DEVELOPED IN SUFFICIENT SCOPE AND DETAIL TO SUPPORT THE PREPARATION OF ADEQUATE PLANT TECHNICAL SPECIFICATIONS, AND NORMAL AND EMERGENCY PROCEDURES	24) IAEA 50-C-D R1 IAEA 50-SG-D11
25)PROVISIONS HAVE BEEN MADE AND PROCEDURES FOR OPERATOR ACTION ARE AVAILABLE FOR DEALING WITH APPROPRIATE SEVERE ACCIDENT PHENOMENA IN A REASONABLE MANNER, INCLUDING: a) CONTAINMENT VENTING b) HYDROGEN CONTROL c) CORIUM CONTROL NOTE: CONTAINMENT VENTING INSTALLED IN GERMANY AND FRANCE, SWEDEN, BELGIUM AND FINLAND, AND BEING INSTALLED IN SWITZERLAND. CATALYTIC IGNITERS BEING INSTALLED IN GERMANY; ELECTRIC IN SWITZERLAND. CORIUM FLOODING PROVISIONS BACKFIT IN SWEDEN AND FINLAND, AND BEING CONSIDERED IN US FOR BWR MARK 1 CONTAINMENTS.	25) IAEA 50-C-D R1 EPRI URD VOL II INSAG-3 (SEE NOTE)
26)THE PLANT DESIGN CONTAINS ADEQUATE MARGIN FOR THE CONTROL OF REACTIVITY AND FOR AVOIDANCE OF RISK OF FUEL DAMAGE IN ANTICIPATED TRANSIENTS WITH OR WITHOUT TRIP.	26) IAEA 50-C-D R1 EPRI URD VOL II ATWS RSK-LL, 20 NUREG 460

27) THE PLANT MEETS SINGLE FAILURE REQUIREMENTS AND PROVIDES ENHANCED REDUNDANCY FOR APPROPRIATE SIGNIFICANT SAFETY SYSTEMS	27) RCC-M, RCC-P GER. BMI SAFETY CRITERIA 10/21/77 INTERP TO SAFETY CRITERIA 5/10/84 IAEA 50-C-D R1 IAEA 50-SG-D11 EPRI URD VOL II
28) ADEQUATE PROVISIONS FOR REACTOR SAFE SHUTDOWN FROM A LOCATION OTHER THAN THE CONTROL ROOM HAVE BEEN MADE.	28) RSK-LL,8422.2 IAEA 50-C-D R1 10CFR 50 APP R
29)ADEQUATE PROVISIONS ARE MADE TO LIMIT THE RELEASE OF RADIOACTIVITY FROM THE PRIMARY SYSTEM TO OUTSIDE CONTAINMENT	29) GERMAN KTA IAEA 50-SG-D13 REG GUIDE 1.4 10CFR 100 (11) NUREG 0800 SECT. 15.6.3
30)THE PLANT CAN TOLERATE DESIGN BASIS ASSUMPTIONS (INITIATING EVENT PLUS SINGLE FAILURE) FOR AT LEAST THIRTY MINUTES WITHOUT OPERATOR ACTION.	30)GERM. KTA RULE EPRI URD VOL II. NUREG (SANDIA)
31)THE ULTIMATE HEAT SINK IS ADEQUATELY SIZED AND SUFFICIENTLY RELIABLE TO PERFORM ITS FUNCTION.	NUREG 0800 SECT. 9.2.5 10CFR 50
32)THE HVAC DESIGN IS ADEQUATE TO CONTROL THE ENVIRONMENT SUCH THAT SAFETY RELATED EQUIPMENT OPERATES DURING NORMAL AND ABNORMAL/ACCIDENT PLANT STATES WITHIN TEMPERATURE AND HUMIDITY CONDITIONS FOR WHICH IT IS DESIGNED.	32)NUMARC 8700 NUREG 0800 SECT 9.4.5 REG GUIDE 1.26
33)THE COMBINATION OF THE ON-SITE AND OFF-SITE POWER SUPPLIES AND THE DISTRIBUTION SYSTEM IS CAPABLE TO RELIABLY SUPPLY POWER TO AT LEAST ALL SAFETY RELATED LOADS DURING OPERATIONAL STATES AND DURING ACCIDENTS.	33)IAEA 50-C-D REV1, IAEA 50-SG-D7, 10CFR 50 APP A CRITERION 17, 18

34)PROVISION HAS BEEN MADE FOR PROTECTING THE SIGNAL INTEGRITY OF SAFETY RELATED AND SUPPORTING CONTROL AND PROTECTION DEVICES	34) KTA 2206 IEEE472 IEC 801
35)MEANS ARE AVAILABLE TO CONTROL DEPRESSURIZATION OF THE PRIMARY SYSTEM AS REQUIRED FOR ACCIDENT MANAGEMENT.	35)NEW GERMAN RQMNT BEING BACKFIT
36)ELECTRICAL AND PROCESS EQUIPMENT PERFORMING SAFETY RELATED OR SUPPORTING FUNCTIONS HAS BEEN SHOWN TO BE QUALIFIED TO PERFORM ITS FUNCTION IN THE ENVIRONMENT TO WHICH IT IS EXPOSED	36)10CFR 50.49
37)DESIGN DOCUMENTATION IS AVAILABLE TO THE PLANT OPERATING ORGANIZATIONS TO PROVIDE AN ADEQUATE BASIS FOR DESIGN ASSURANCE AND CONFIGURATION MANAGEMENT.	37) NUMARC EPRI URG VOL II
38)PROVISIONS HAVE BEEN MADE TO MANAGE THE RISKS ASSOCIATED WITH OPERATIONS DURING SHUTDOWN	38)FRENCH SHUTDOWN PRA NRC GUIDANCE WHICH IS LIKELY TO DEVELOP INTO A LICENSING REQUIREMENT
39)ADEQUATE DESIGN FEATURES HAVE BEEN INCLUDED TO PREVENT RADIOACTIVE CONTAMINATION OF THE DISTRICT HEATING SYSTEM	39)BEZNAU AND GOSGEN AS EXAMPLES
40)THE PLANT DESIGN ADEQUATELY PROVIDES PROTECTION AGAINST THE EFFECTS OF A POSTULATED STATION BLACKOUT.	40)NUMARC 8700 REGGUIDE 1.155
41)THE STARTUP TEST PROGRAM INCLUDES INTEGRATED TESTING TO ENSURE THE PLANT PERFORMS IN ACCORDANCE WITH THE DESIGN INTENT	41)INSAG - 3 SECT.4.4

42)THE POTENTIAL RADIATION DOSE TO THE PUBLIC FOR DESIGN BASIS AND SEVERE ACCIDENTS HAS BEEN ADEQUATELY EVALUATED, AND THE RISK IS ACCEPTABLE.	42)GERMAN RADIATION PROTECT. ORDINANCE
43)ADEQUATE CONSIDERATION IS GIVEN TO CRITERIA AND DESIGN TO ASSURE STRUCTURAL RELIABILITY OF THE PRIMARY SYSTEM BOUNDARY	43)10CFR 50 APP A CRITERIA 30, 31, 32 10CFR 50.55a

ACHIEVEMENT OF THE ABOVE REFERENCE PLANT CHARACTERISTICS WILL HAVE A STRONG POSITIVE INFLUENCE ON PLANT SAFETY AND LICENSABILITY. NEVERTHELESS, IT SHOULD BE RECOGNIZED THAT PLANT LICENSABILITY IS ALSO A FUNCTION OF THE LICENSING PROCESS ITSELF. THE INTERACTION BETWEEN THE LICENSING AUTHORITY AND THE OWNER CAN HELP TO ASSURE EFFECTIVE DECISION MAKING IN THE REVIEW OF DESIGN SOLUTIONS AND METHODS OF IMPLEMENTATION. A FORMALLY ESTABLISHED PROCESS WITH WELL DEFINED LICENSING CRITERIA, THE AVAILABILITY OF AN EXPERIENCED LICENSING STAFF, AND THE INCORPORATION OF METHODS FOR THE EARLY IDENTIFICATION AND RESOLUTION OF RATIONAL SAFETY ISSUES CAN BE VERY VALUABLE IN PROMOTING AND ACHIEVING PLANT LICENSABILITY.

TABLE B-2

REFERENCE PLANT LISTING

(FEATURES AND REFERENCE DOCUMENTS CATEGORIZED)

FEATURE OR CHARACTERISTIC	INTERNATIONAL DOCUMENTS	U.S. REGULATIONS	OTHER PERTINENT DOCUMENTS
SITE			
19) THE PLANT HAS BEEN SATISFACTORILY SITED TO MINIMIZE RISK TO THE GENERAL PUBLIC	IAEA-50-C-S Rev. 1 IAEA-50-SG-S9	10 CFR 100	RCC-M, RCC-P, RSK-LL 2
20) THE POTENTIAL FOR AN AIRCRAFT CRASH AT THE PLANT SITE HAS BEEN ADEQUATELY EVALUATED AND THE RISK IS ACCEPTABLE	IAEA-50-SG-S5[3,6] 50-SG-D6 [3.1]	10 CFR 100.10	RSK-LL 19.1 SCSIN RULE I.2.A
21) THE PLANT SEISMIC DESIGN CRITERION IS APPROPRIATE FOR THE SITE CONDITIONS AND THE PLANT CAN ADEQUATELY SUSTAIN THE SEISMIC INDUCED LOADS	IAEA-50-SG-S1 Rev. 1 50-SG-D15 50-SG-S8	10 CFR 100 App. A 10 CFR 50 App. A	RSK-LL 18.1 KTA 2201 SCSIN RULES I.2.c,I.3.b I.3.c,V.2.g
22) THE DESIGN CRITERIA RELATIVE TO HIGH WINDS, EXTERNAL FLOODS, AND TRANSPORTATION AND NEARBY FACILITY ACCIDENTS ARE APPROPRIATE AND THE PLANT CAN SAFETY SUSTAIN THE POSTULATED EVENTS	IAEA 50-C-S5[3,1,8] 50-C-D5) [3.3, 3.4] IAEA-50-SG-S10A IAEA-50-SG-S11A[3]	10 CFR 100.10 10 CFR 50 App. A	BMI Guideline for chemical explotions SCSIN RULES I.2.e,I.2.d
OVERALL PLANT SYSTEM INTERFACE			
4) A PLANT/SITE SPECIFIC PSA INCLUDING EXTERNAL EVENTS HAS BEEN PERFORMED TO IDENTIFY AREAS OF RELATIVE VULNERABILITY AND POTENTIAL FOR PRACTICAL SAFETY IMPROVEMENTS	IAEA 50-SG-D11) [6.3]	10CFR 50.34 f(1) (i) GL-88-20	New German and Swiss practices

8) THE CONTROL ROOM DESIGN REFLECTS HUMAN FACTOR PRINCIPLES AND INCLUDES A SAFETY PARAMETER DISPLAY	IAEA 50-C-D Rev. 1 [347-353, 604-606] 50-SG-D3 [8] 50-SG-D8 [4,9] 50-SG-D11 [5,3,5,4]	10 CFR 50.34 (f)(2) iii and iv	RSK-LL [8]
23) THE DESIGN RELATIVE TO CONTROL ROOM HABITABILITY IS APPROPRIATE AND THE PLANT DESIGN ALLOWS THE OPERABILITY OF THE CONTROL ROOM TO SUSTAIN THE POSTULATED EVENTS	IAEA 50-C-D Rev. 1 [604] 50-SG-D3 [6] 50-SG-D8 [4]	10 CFR 50 App. A Criteria 2, 4, 5, 19, 60	RSK-LL [8,19.3]
34) PROVISION HAS BEEN MADE FOR PROTECTING THE SIGNAL INTEGRITY OF SAFETY RELATED AND SUPPORTING CONTROL AND PROTECTION DEVICES	IAEA 50-SG-D3 [7] 50-SG-D8 [4] IEC 801	IEEE 472	KTA 2206
28) ADEQUATE PROVISIONS FOR REACTOR SAFE SHUTDOWN FORM A LOCATION OTHER THAN THE CONTROL ROOM HAVE BEEN MADE	IAEA 50-C-D Rev. 1 [607] 50-SG-D8 [4.10]	10 CFR 50 App. R	RSK LL [22.2]
32) THE HVAC DESIGN IS ADEQUATE TO CONTROL THE ENVIRONMENT SUCH THAT SAFETY RELATED EQUIPMENT OPERATES DURING NORMAL AND ABNORMAL/ACCIDENT PLANT STATES WITHIN TEMPERATURE AND HUMIDITY CONDITIONS FOR WHICH IT IS DESIGNED		10 CFR 50.49 NUREG 800 [Sect. 9.4.5]	KTA rules
38)PROVISIONS HAVE BEEN MADE TO MANAGE THE RISKS ASSOCIATED WITH OPERATIONS DURING SHUTDOWN	IAEA 50-SG-D11) [5.3, 5.4]		
24) THE TRANSIENT AND ACCIDENT ANALYSES HAVE BEEN DEVELOPED IN SUFFICIENT SCOPE AND DETAIL TO SUPPORT THE PREPARATION OF ADEQUATE PLANT TECHNICAL SPECIFICATIONS AND NORMAL AND EMERGENCY PROCEDURES	IAEA 50-C-D Rev. 1 [1201-1205]		
16) THE PLANT DESIGN INCLUDES ADEQUATE MEASURES TO MINIMIZE THE PROBABILITY AND EFFECT OF FIRES AND EXPLOSIONS	IAEA 50-SG-D2 Rev. 1	10 CRF 50 App. R	RCC-I RSK-LL [11] KTA rule

2) AN ADEQUATE PHYSICAL SECURITY PLAN HAS BEEN PREPARED FOR THE PLANT	IAEA 50-C-D Rev. 1 [367]	10 CFR 50.34(c) 10 CFR 73	RSK LL 19.4
3) AN ADEQUATE SAFEGUARDS CONTINGENCY PLAN HAS BEEN PREPARED FOR THE PLANT	IAEA Safeguards Agreement for Temelin	10 CFR 50.34 (d) 10 CFR 73	
QUALITY ASSURANCE			
12) A SATISFACTORY QUALITY ASSURANCE PROGRAM HAS BEEN ESTABLISHED AND IMPLEMENTED FOR PLANT DESIGN, FABRICATION, CONSTRUCTION, TESTING AND OPERATION	IAEA 50-C-QA Rev. 1	10 CFR 50.34(a), (7) 10 CFR 50 App. B	KTA 1401
SYSTEM DESIGN			
43) ADEQUATE CONSIDERATION IS GIVEN TO CRITERIA AND DESIGN TO ASSURE STRUCTURAL RELIABILITY OF THE PRIMARY SYSTEM BOUNDARY	IAEA 50-C-D Rev. 1 [501-505] 50-SG-D13 [3.6, 4.2]	10 CFR 50 App. A 10 CFR 50. 55a	RSK-LL [4.1] RCC-M KTA 3201
5) ADEQUATE PROTECTION AGAINST PRESSURIZED THERMAL SHOCK HAS BEEN PROVIDED FOR THE PRIMARY SYSTEM BOUNDARY	IAEA 50-SG-D13 [3.6, 4.2]	10 CFR 50.34 (b) (9) 10 CFR 50 App.G&H	RSK-LL [4.1.2-4.1.4) RCC-M KTA 3203
26) THE PLANT DESIGN CONTAINS ADEQUATE MARGIN FOR THE CONTROL OF REACTIVITY AND FOR AVOIDANCE OF RISK OF FUEL DAMAGE IN ANTICIPATED TRANSIENTS WITH OR WITHOUT TRIP	IAEA 50-C-D Rev. 1 [4] 50-SG-D11 [6.3.2.2(b)] 50-SG-D14 [2.1,2.2,3.1,3.4]	10 CFR 50 App. A 10 CFR 50.62 EPRI URD Vol. II NUREG 460	RSK-LL [3.1.2, 3.1.3, 20]
18)THE PLANT DESIGN INCLUDES ADEQUATE PROVISIONS FOR RESIDUAL HEAT REMOVAL, EMERGENCY CORE COOLING, AND CONTAINMENT HEAT REMOVAL	IAEA 50-C-D Rev. 1 [512-515, 915] 50-SG-D12 [4.4] 50-SG-D13 [3,4.3, 4.4]	10 CFR 50 App. A 10 CFR 50 App. K	RSK-LL [22] RCC-P, RCC-M
6) THE AFWS DESIGN HAS FUNCTIONAL CAPABILITY, CAPACITY AND RELIABILITY ACCORDING TO ITS IMPORTANCE SAFETY	IAEA 50-SG-D13 [4,6.3]	10 CFR 50.34 (f) (1) (ii)	RSK-LL [22.2]

31) THE ULTIMATE HEAT SINK IS ADEQUATELY SIZED AND SUFFICIENTLY RELIABLE TO PERFORM ITS FUNCTION	IAEA 50-SG-D6 [2.4, 2.5, 4] IAEA-50-SG-S11A[4]	10 CFR 50 App. A NUREG 800 Sect. 9.2.5	
27) THE PLANT MEETS SINGLE FAILURE REQUIREMENTS AND PROVIDES ENHANCED REDUNDANCY FOR APPROPRIATE SIGNIFICANT SAFETY SYSTEMS	IAEA 50-C-D Rev. 1 [329-336] 50-P-1	EPRI URD Vol. II	CSIN-RULE I.3.a RCC-M, RCC-P BMI Interpretation of Si Failure Criterion, 1984
30) THE PLANT CAN TOLERATE DESIGN BASIS ASSUMPTIONS (INITIATING EVENT PLUS SINGLE FAILURE) FOR AT LEAST THIRTY MINUTES WITHOUT OPERATOR ACTION)	IAEA 50-SG-D3 [7.3.2]	EPRI URD Vol. II	KTA 3501
17) THE CONTAINMENT STRUCTURE CAN ACCOMMODATE WITH SUFFICIENT MARGIN THE CALCULATED PRESSURE AND TEMPERATURE RESULTING FROM THE MOST LIMITING LOSS OF COOLANT OR STEAMLINE BREAK ACCIDENT	IAEA 50-SG-D12 [4.2]	10CFR 50 App. A&K	RSK-LL [5] RCC-G
29) ADEQUATE PROVISIONS ARE MADE TO LIMIT THE RELEASE OF RADIOACTIVITY FROM THE PRIMARY SYSTEM TO OUTSIDE CONTAINMENT	IAEA-50-SG-D9 50-SG-D12 [4.2,4.2,4.5] 50-SG-D13 [4.5,4.6]	10CFR 50.34a 10CFR 100.11 NUREG 800 [SEC.15.6.3]	RSK-LL[9,10.1.2,10.1.3]
7) A RELIABLE AND EFFECTIVE SYSTEM OF HYDROGEN CONTROL INSIDE CONTAINMENT HAS BEEN PROVIDED	IAEA-50-SG-D12 [4.6]	10CFR 50.34 (f)(2)(ix)	RSK-LL[24]
33) THE COMBINATION OF THE ON-SITE AND OFF-SITE POWER SUPPLIES AND THE DISTRIBUTION SYSTEM IS CAPABLE TO RELIABLY SUPPLY POWER TO AT LEAST ALL SAFETY RELATED LOADS DURING OPERATIONAL STATES AND DURING ACCIDENTS	IAEA-50-SG-D7	10CFR 50 App A	RSK-LL[7.4,7.5] SCSIN RULE IV.2.b
36) ELECTRICAL AND PROCESS EQUIPMENT PERFORMING SAFETY RELATED OR SUPPORTING FUNCTIONS HAS BEEN QUALIFIED TO PERFORM ITS FUNCTION IN THE ENVIRONMENT TO WHICH IT IS EXPOSED	IAEA-50-C-D Rev.1 [1206/1207]	10CFR 50.49	

1) THE TEMELIN PLANT INCORPORATES THE DESIGN CHANGES AND OTHER IMPROVEMENTS FOUND NECESSARY AS A RESULT OF THE TMI ACCIDENT	IAEA 50-C-D Rev. 1	10CFR 50.34(f)	RSK-LL[23]
39) ADEQUATE DESIGN FEATURES HAVE BEEN INCLUDED TO PREVENT RADIOACTIVE CONTAMINATION OF THE DISTRICT HEATING SYSTEM			
15) THE PLANT DESIGN CONTAINS ADEQUATE PROVISION FOR THE CONTROL OF RADIATION FOR OCCUPATIONAL DOSE AND RADIOACTIVE EFFLUENTS AND WASTE PRODUCTS DURING NORMAL OPERATIONS TO ACHIEVE ALARM OBJECTIVES	IAEA-50-SG-D9 IAEA-50-SG-O5 50-SG-O11 ICRP PUBLICATIONS	10CFR 50.34a 10CFR 50 App.I	Beznau and Gosgen exa Soviet requirements (Novovoronesh) German Rad.Prot Ordinance German IWRS Guide
44) IN-SERVICE INSPECTION AND MAINTENANCE PLANS HAVE BEEN PREPARED AND THE DESIGN PROVIDES FOR THE POSSIBILITY TO PERFORM THESE ACTIVITIES UNDER ALARA CONDITIONS, IN PARTICULAR FOR THE PRIMARY PRESSURE BOUNDARY			Swiss HSK-R Guide RSK-LL[10]
45) SAFETY RELATED PLANT SYSTEMS ARE NOT SHARED BETWEEN SEVERAL REACTORS, EXCEPT FOR MOVABLE EQUIPMENT DESIGNED FOR RARE EMERGENCIES			
41) THE STARTUP TEST PROGRAM INCLUDES INTEGRATED TESTING TO ENSURE THE PLANT PERFORMS IN ACCORDANCE WITH THE DESIGN INTENT	IAEA-50-SG-O4	NUREG 800 [Sect.4.4,5.7.8]	
SEVERE ACCIDENTS			
25) PROVISIONS HAVE BEEN MADE AND PROCEDURES FOR OPERATOR ACTIONS ARE AVAILABLE FOR DEALING WITH APPROPRIATE SEVERE ACCIDENT PHENOMENA IN A REASONABLE MANNER. INCLUDING: A) CONTAINMENT VENTING B) HYDROGEN CONTROL C) CORIUM CONTROL	IAEA-50-C-D Rev. 1 [315-317] INSAG 3 [2.3]	EPRI URD VOL II	

35) MEANS ARE AVAILABLE TO CONTROL DEPRESSURIZATION OF THE PRIMARY SYSTEM AS REQUIRED FOR ACCIDENT MANAGEMENT.			RSK recommendation installation of venting hydrogen control systems
40) THE PLANT DESIGN ADEQUATELY PROVIDES PROTECTION AGAINST THE EFFECTS OF A POSTULATED STATION BLACKOUT	IAEA-50-SG-D7 Rev.1	Reg.Guide 1.155 NUREG 8700	
42) THE POTENTIAL RADIATION DOSE TO THE PUBLIC FOR DESIGN BASIS AND SEVERE ACCIDENTS HAS BEEN ADEQUATELY EVALUATED, AND THE RISK IS ACCEPTABLE	IAEA-50-C-D Rev.1 [203,315-317] INSAG 3 [2.3]		
37) DESIGN DOCUMENTATION IS AVAILABLE TO THE PLANT OPERATING TO PROVIDE AN ADEQUATE BASIS FOR DESIGN ASSURANCE AND CONFIGURATION MANAGEMENT	IAEA-50-C-O Rev.1	NUMARC GUIDANCE EPRI URG VOL II	German Rad. Prot. Ordinance [par. 28.3]
13) SATISFACTORY TECHNICAL SPECIFICATIONS GOVERNING PLANT OPERATION HAVE BEEN PREPARED PRIOR TO PLANT OPERATION	IAEA-50-SG-O3	10CFR 50.34 (b)(6)(vi) 50.36, 50.36a	BMI compilation of informa to be submitted for license
14) SATISFACTORY AND DETAILED PLANT OPERATING AND EMERGENCY PROCEDURES HAVE BEEN PREPARED PRIOR TO PLANT OPERATION	IAEA-50-C-O Rev. 1	10CFR 50.34 (f)(2)(ii)	as above
11) SATISFACTORY PLAN HAS BEEN PREPARED FOR THE OWNERS ORGANIZATION, TRAINING OF PERSONNEL, AND CONDUCT OF OPERATION	IAEA-50-C-O Rev. 1 INSAG-3 [3.1.1,3.1.2,4.5] INSAG-4	10CFR 50.34 (a)(6),(b)(6)(i), (f)(3)(vii)	as above
9) A PLANT SIMULATOR THAT CORRECTLY MODELS THE CONTROL ROOM AND INCLUDES THE CAPABILITY FOR FULL FIDELITY SIMULATION OF NORMAL, ABNORMAL AND ACCIDENT CONDITIONS IS AVAILABLE FOR OPERATOR QUALIFICATION AND TRAINING	IAEA-50-SG-O1	10CFR 50.34 (f)(2)(i)	BMI compilation of informa to be submitted for license
10) A SATISFACTORY EMERGENCY RESPONSE PLAN HAS BEEN PREPARED AND TESTED PRIOR TO REACTOR OPERATION	IAEA-50-SG-G6 IAEA-50-SG-O6	10CFR 50.34 (a)(9) 10CFR 50.47 10CFR 50 App.E	

ATTACHMENT C
CEZ-ETE ACTION PLAN

Draft Terms of Reference to define each of the actions believed necessary to respond to the Audit Team technical recommendations have recently been completed by CEZ-ETE with HALLIBURTON NUS assistance. Some actions are already in progress. Implementation of the remaining Terms of Reference will begin following HALLIBURTON NUS final review and comment.

A listing of each of the Titles of the Terms of Reference is appended together with an indication of the priority in which they will be accomplished. An integrated schedule for the conduct of these actions is now under preparation by CEZ-ETE and is a part of a detailed Action Plan that explains and discusses the detailed steps necesssary for each of the items listed.

TERMS OF REFERENCE LISTING

	ACTION PLAN ITEMS	PRIORITY *
1	Create an independent safety engineering group	B
2	Implement the audit team recommendations on safety culture	A
3	Establish full time project managers for major new Temelin projects[4]	A
4	Accelerate the completion and implementation of Temelin QA programs with emphasis on self-audits	A
5	Establish a formal system to obtain regular feedback on nuclear power plant operating experience	B
6	Ensure that new contracts with suppliers include provisions that will permit effective project management	A
7	Document and organize the Temelin design basis documentation	A
8	Conduct an independent review of the Temelin PSAR against Western standards	B
9	Conduct an independent review of the Temelin FSAR against Western standards	B
10	Perform a Temelin plant safety analysis using U.S. licensing models and assumptions	B

11	Conduct Level 1 and 2 probabilistic safety analyses	A
12	Ensure the integration of all current major design modifications	A
13	Conduct a fire hazards analysis using Western nuclear power plant methodology	A
14	Establish a program for the environmental qualification of safety related equipment	A
15	Complete the seismic re-analysis of safety related structures and systems	A
16	Determine the necessity of conducting a soil-structure interaction analysis	B
17	Evaluate the Hluboka fault activity and update the area tectonic map	B
18	Confirm the structural integrity of major Temelin safety-related structures and components	A
19	Assess the structural adequacy of the steam generator baffle components under main steam line break accident conditions	A
20	Conduct detailed safety train separation design reviews,including potential adverse non-safety system component interactions with safety systems	B
21	Make design provisions to facilitate adding a filtered vent to containment	A
22	Establish an approach for coping with Station Blackout and confirm the ability of the plant to meet it	A
23	Conduct a comprehensive review of the battery system and identify and implement any necessary design changes	A
24	Evaluate the TVD water filtration building relative to potential common mode failure of the TVD systems	A
25	Design, procure and install continuous radiation monitors on the intermediate loop of the district heating system	C
26	Evaluate the control room habitability under accident conditions	A

27	Evaluate the adequacy of the ultimate heat sink relative to Western standards	A
28	Provide emergency feedwater flow indication and isolation capability for all steam generators	A
29	Impiement the audit team recommendations concerning the power supplies for the atmospheric Pump valves	B
30	Verify that the Temelin post-accident hyrogen monitoring and control systems satisfy the requirements of the TMI Action Plan	B
31	Evaluate the ability of safety systems to function under postulated internal flooding conditions	A
32	Verify the ability of the reactor coolant pump seals to withstand Station Blackout conditions	A
33	Develop single failure protection for critical piping leading from the containment sump	A
34	Reevaluate the need for a boric acid tank Heating system	A
35	Conduct a detailed review of all aspects of the containment sump and connected systems design	A
36	Complete the liquid radwaste evaporator design evaluation and make any necessary design changes	A
37	Evaluate the option of not regenerating depleted resin beds in the liquid radwaste system design	B
38	Reevaluate the plant design from an ALARA standpoint and incorporate any desirable modifications	A
39	Design procure and install continuous radiation monitors at sample tank discharges with automatic valve closure features on high radiation level signal	A
40	Provide the ability to detect the pressence of liquids and their removal from the dry waste storage rooms	C

	Further evaluate the solid radwaste system to reduce the volume of waste for disposal	C
2	Make provision for interim storage of bituminized waste drums	B
43	Incorporate the remaining Audit Team radwaste recommendations into the plant design	C
44	Implement the Audit Team recommendations on radiation protection	C
45	Implement the Audit Team recommendations on preoperational testing	C
46	Implement the Audit Team recommendations on conduct of operations	C
47	Implement the Audit Team recommendations on operating procedure development	C
48	Implement the Audit Team recommendations on emergency planning	C

* LEGEND

A Initiate Immediatelly

B Initiate as Soon as Practical and When Necessary presequisite Activities Have Been Completed

C Initiate as Soon as Project Resources Can Be Made Available

nER/9/004-17
20 August, 1990

TEMELIN DESIGN REVIEW MISSION

MISSION REPORT

INTERNATIONAL ATOMIC ENERGY AGENCY

25th June - 6th July, 1990

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1. INTRODUCTION

At the request of the Government of the Czech and Slovak Federative Republic, the International Atomic Energy Agency has organized a two week safety mission to review selected topics of the design of the Temelin Nuclear Power Plant.

The mission, which took place in Temelin (CSFR) during the period of 25 June to 6 July, 1990, was carried out by 6 external experts and an IAEA coordinator (see list of mission members in attachment I).

The mission was the last of three missions carried out under a comprehensive IAEA programme for the review of the Temelin project. The first mission was concerned with aspects of the site of the Temelin plant. The second mission was a pre-OSART (pre-operational safety review team) and consisted of a review of construction practices and preparations for operation.

This last mission was concerned with design aspects, falling into the category of a new type of safety mission offered by the Division of Nuclear Safety of the IAEA under the generic name of Engineering Safety Services. Funds for the missions were provided by the Technical Cooperation project RER/9/004-Safety Analysis of VVER-Type Reactors.

During preliminary discussions between the IAEA and Czechoslovak authorities, it was recognized that a mission such as that could not perform a complete design review of the Temelin plant. It was, therefore, decided to concentrate the review in few specific topics of interest to Temelin Power Company (ETE).

These topics were:

- Reactor Core Design, including mechanical, neutronic and thermo-hydraulic aspects, and specially with respect to core stability safety

- Systems Design, including reactor protection safety system actuation and accident analysis.

Therefore, the objective of the mission could be stated as :

- To review the design of the Temelin plant in the identified topics, in light of international practices and to advise the staff of Nuclear Power Plant Temelin and Czechoslovak authorities on the suitability of the design.

This report, after a summary description of the development of the mission in section 2, presents the final conclusions and the recommendations of the mission.

In addition, Appendix A through G present summaries of individual experts reviews, together with more specific recommendations related to the individual sub-topics in which the mission was divided.

2. DEVELOPMENT OF THE MISSION

The mission was prepared well in advance. Preliminary discussions between IAEA and ETE in February 1990 defined the scope of the mission and the necessary documentation to be made available for review. Job descriptions were prepared for each specific area and experts were recruited in individual fields.

The necessary documentation was prepared by the Czechoslovak counterparts with the assistance of the design organizations, including the main designers from Soviet Union. A preliminary programme was prepared. The experts met together as a team with Czechoslovak counterparts on Monday 25 June 1990. They discussed their tasks and their roles in the mission and they agreed on a final programme.

The actual programme followed by the mission is presented in Attachment II. In the first session the role of several Czechoslovak organizations with respect to the Temelin project was explained. Later, the staff of ETE and N.E. Energoprojekt presented an overview of Temelin design, with details on the core and safety system design.

Since core stability, and specially the control of xenon oscillation was one of the topics of interest to ETE, a series of three presentations was made by the experts, explaining the control philosophy used in the USA, FRG and France respectively.

A corresponding presentation was given by Czechoslovak and Soviet specialists describing their methodology for Power Distribution Control.

This was followed by four days of group discussions on specific subjects, which are reported in the appendices to this report.

The last days of the missions were primarily dedicated to internal mission discussions where general recommendations were developed and for the preparation of the mission report.

A final meeting with ETE management and other authorities of Czechoslovakia was conducted to present the mission conclusions and recommendations.

3. CONCLUSIONS

3.1 The mission evaluation reveals that, with respect to the aspects reviewed, the design of the VVER-1000 reactor to be used in the Temelin Nuclear Power Plant is more similar to modern pressurized-light-water reactors now being put in operation in other countries.

3.2 The mission has not identified any major safety issue or problem in the Temelin design. Therefore, the recommendations made are more related to possible improvements in the plant or in the plant analysis, which aim to improve plant performance and understanding of plant behaviour. These recommendations, if taken into consideration, will also have a positive impact on nuclear safety.

3.3 In the opinion of the mission, the design of the Temelin plant has not been finalized yet. This is reflected in a Safety Analysis Report which is not entirely complete and which can sometimes present inconsistent information. This is not completely unusual, given the status of the project, although one expects that issues which may lead to irreversible decisions be solved in the appropriate time.

3.4 Specifically on the issue of core stability with respect to xenon oscillations, it is the missions opinion that, although the issue deserves attention, similar conditions also existed in other light-water-reactors. The mission believes that xenon oscillation is an easily solvable problem with existing available techniques.

4. RECOMMENDATIONS

4.1 Documentation and exchange of information

The different documents presented during the review work was judged to be not well referenced, poorly documented and sometimes incomplete. Moreover the amount of documents generally available for the Czechoslovak experts seems to be insufficient.

It is recommended the quality and the quantity of documentation be improved. The Czechoslovak counterparts should precisely define a list of documentation necessary for their review work. For each document, they should specify its format and the objective of such a documentation.

As an example, the presented safety analysis report (RP-SAR) which was one of the bases for the discussion of accident analyses is based on a 3-year cycle. This report could not be reviewed by the Czechoslovak experts prior to the mission which made the discussion of selected transients even more difficult considering already expected language problems. It is therefore strongly recommended that the flow of information between the different parties (designers, customers, VVER-users, etc.) be improved and especially to try to ensure that the material exchanged is complete and consistent. It is further recommended that in the next version of RP-SAR, plant specific analyses be provided for an adequate review.

4.2 Accident analysis

4.2.1 Classification of events - Description of analyses

The list of the accidents analyzed in the Temelin Safety Analyses Report (SAR) was provided.

It is recommended that precise rules for the classification of these events, in term of frequency of occurrence and consequences be defined. Consequences must be considered not only for fuel damage but also in term of radiological consequences.

For each category of accident, acceptance criteria must be defined.

For each accident, it is recommended that systematic, more detailed information be given on the assumptions, codes utilized and results.

4.2.2 Sensitivity Analysis

The analysis of transients and accidents is generally not only performed for fixed input data and boundary conditions but for a reasonable set of possible values for the parameters which essentially influence the relevant output key safety parameters. In this way, the sensitivity of these parameters with respect to the data can be determined and bounding values for input and output parameters be estimated. Analyses with various assumed initial conditions are required to verify that the condition leading to the severest consequences has been properly identified.

Although the mission is convinced that the Soviet experts do their analyses along these lines, this aspect is not presented in some of the presented results (e.g. steam line break, rod ejection)

The mission recommends that sensitivity analysis be made part of the routine safety analysis.

4.3 Probabilistic Safety Assessment (PSA)

The limited level 1 PSA for the Temelin plant was performed by Soviet experts.

Considering the importance of the PSA in safety analysis as a complementary tool, it is recommended that this study be completed on the following aspects:

- more complete list of internal initiating events
- considerations on initial conditions
- external initiating events
- level 2 PSA (radiological consequences)

Czechoslovak organizations should participate in the elaboration of this study.

It is recommended that a more detailed effort on the validation of the assumptions be performed.

It is also recommended that the completed study be utilized to improve safety level (changes of the proposed design, utilisation for the training of the operators, use for determination of some technical specifications).

4.4 Severe Accident

The proposed design takes only into consideration Design Basis Accident (DBA). The review performed was limited to this aspect. Severe accident considerations and accident management strategies are an important part of modern safety analysis.

The mission discussed some of the proposal by Temelin staff to improve the design in this aspect, by installing for instance containment venting and a safety parameter display. The mission support these efforts. Furthermore in order to guarantee a higher level of safety, it is recommended to take into consideration:

- the "state oriented approach"
- the new developments in the severe accident.

4.5 Core Design Optimization

The current Temelin core design seems not to be optimized from the point of view of thermal margins and fuel cycle economics.

It is recommended that the core be optimized so as to improve fuel cycle economics and power distribution thermal margins. This optimization should include:

a) developing fuel assembly with zirconium spacer grids and guide thimbles, removable top nozzle

b) use of low leakage loading patterns for reloads

c) optimum enrichment and number of assemblies consistent with cycle energy needs

d) using in-fuel burnable absorbers

4.6 Load Following

In the near future, the percentage of nuclear power related to the total amount of electric power in Czechoslovakia could go beyond the limit where base load mode of operation alone may not be sufficient. Therefore it is recommended that load following be considered in the plant design.

As a result, actions should be taken to define grid requirements of Czechoslovak network, including the impact of Temelin plant operation.

In case of a decision to include load following in the plant design, both core design and control system should be re-evaluated and modified, if necessary.

It would also be useful to perform a realistic analysis of present design in order to assess the capability of Temelin plant for load follow operation.

4.7 Core Control and Xenon Control

Current core control strategy is confusing, poorly defined, difficult for the operators and possibly unrealistic. This strategy probably is also the source of occasional xenon oscillations in VVER-1000 cores. Also, the power distribution guidelines are complex and have insufficient operating margins. It is recommended that manual semi-automatic and fully automated core control and xenon control strategies available in the industry be thoroughly investigated, properly balancing the cost and complexity and the human factor with the plant needs, and be adopted for Temelin.

4.8 Part-Length Control Rods

Although part-length control rods have been used in other light-water-reactors in the past, this has been discontinued due to the adverse impact on axial power distribution and positive reactivity insertion.

The mission believes that it is not absolutely necessary to use part-length rods for axial distribution control.

Therefore, it is recommended that the removal of part-length rods be considered as a part of core control redesign.

There is also some advantage to replace part-length rods by full-length rods, since it would be beneficial to enhance shutdown margin in the design.

4.9. Core Protection Setpoints

It is common international practice in other pressurized-light-water-reactors to establish core protection setpoints against overpower and overtemperature. Overpower setpoint is a protection against exceeding the allowable heat power. Overtemperature setpoint is a protection against adverse boiling (low DNBR). These are calculated on line with appropriate penalties functions for power distribution. The present design of Temelin does not include this concept.

It is recommended that overpower and overtemperature setpoints be developed taking into account core temperature, flux difference and core pressure.

4.10 Incore Instrumentation System

The present incore instrumentation is calibrated referring to the first flux map. This operation is not an absolute calibration.

A lot of plants are operated in Soviet Union as well as in other countries with incore instrumentation not being independently calibrated.

No real safety problem results from this lack of calibration, nevertheless, if some anomaly should exist in the core design, the use of such instrumentation will not permit a full investigation. It is recommended that installation of an alternate system be considered, properly balancing cost/benefits and plant needs.

4.11 Technical Support Staff

The mission would like to point out to Temelin management that the plant performance is strongly influenced by the selection of strategy for the fuel cycle. The appropriate evaluation of core conditions, safety system performance and the related safety margins, are the assurance to management and the public that the plant will be operated in a safe manner.

Therefore, it is recommended that appropriate emphasis be given to maintaining a qualified group of technical support personnel in areas such as reactor physics and systems analyses which can monitor plant operation, utilize worldwide operational experience and keep up-to-date with international developments in the area of nuclear safety.

5. ACKNOWLEDGEMENTS

The mission members would like to express their sincere thanks and appreciation to the entire ETE staff for their support and assistance during the period of the mission. The cooperation of staff of other organizations of CSFR and the Soviet specialists in providing additional information to the experts is also appreciated. The difficult work of Czechoslovak and Russian translators and their efforts are deeply appreciated. Finally, the experts were thankful for the opportunity of being exposed to an interesting cultural experience of living in a country during a period of tremendous political and social transformation.

SPECIAL DELEGATION OF THE
GOVERNMENT OF AUSTRIA TO THE
UNITED STATES OF AMERICA
REGARDING THE
TEMELIN NUCLEAR POWER PLANT

c/o EMBASSY OF AUSTRIA
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March 9, 1994

Via Hand Delivery

Hon. Kenneth D. Brody
President and Chairman
Export-Import Bank
of the United States
811 Vermont Avenue, N.W.
Washington, D.C. 20571

Re: Temelin Nuclear Power Plant Loan Guarantee; Response to the Czech Republic's March 3 Position Paper and to Westinghouse's February 25 Letter to Congressman Orton

Dear Mr. Brody:

Subsequent to my February 28, 1994 letter to you, the Special Delegation of the Government of Austria to the United States Regarding the Temelin Nuclear Power Plant has received a March 3 "Position Paper on the Temelin Nuclear Power Plant" issued by the Embassy of the Czech Republic, and a letter dated February 25 from Westinghouse Electric Corporation to Congressman Orton. In accord with your invitation to submit new information for the Export-Import Bank's ("Eximbank") consideration prior to rendering a final decision on Temelin, the Delegation submits this response to these two documents.

Austria has every interest in assuring that the Czech Republic, and its people, succeed in their historic effort to rejoin Western society. In many areas, including energy projects, Austria has offered cooperation and assistance.[1] It is in this spirit that Austria responds to the Czech Position Paper, as well as to the Westinghouse letter.

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1. On an annual basis, Austria has been a net exporter of electricity to Czechoslovakia and the Czech Republic for many years. Austria and the Czech Republic have a power exchange contract through 1996, for mutual assistance in case of power shortages.

SUMMARY

Austria agrees that Temelin should be licensable under Western nuclear regulatory standards before it could be allowed to operate.[2] Unfortunately, neither the Czech Position Paper nor the Westinghouse letter provides any evidence that that goal is being reached. To the contrary, these documents confirm that Temelin is not being designed and constructed with the benefit of public and expert scrutiny, which is a hallmark of the U.S. nuclear licensing process and which is essential to ensure that Western safety standards will be met. In brief:

- ◊ Substantial technical documentation would be required to demonstrate that the safety-related issues raised by previous audits and reviews of Temelin are being adequately addressed. Neither the Czech Position Paper nor the Westinghouse letter provides any of that documentation.

- ◊ The Czech Position Paper's claim that Temelin is 90% complete in civil work and 60% complete in technological and engineering work is meaningless. What is being proposed for Temelin is a new type of nuclear plant, with a hybrid Soviet/Western design. The Czech paper and Westinghouse letter fail to acknowledge the seriousness of the Soviet design flaws and the extensive nature of the design changes that will be required.

- ◊ NRC Chairman Selin has stated to the Austrian Delegation that the NRC has not studied Temelin in depth and does not intend to be responsible for ensuring whether Western safety standards are satisfied. CEZ's and Westinghouse's continued refusal to disclose necessary information demonstrates the need for public, expert scrutiny of safety and environmental issues before the loan guarantee could be approved.

- ◊ The Czech Position Paper confirms that there has not yet been an adequate environmental study of Temelin.

- ◊ The claim that an adequate least-cost study has been performed is incorrect.

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2. See the Czech Position Paper, pages 2, 6, 7.

Moreover, CEZ has recently stated that spent nuclear fuel from Temelin will *not* be sent to a disposal facility at Dukovany. The Eximbank's Environmental Evaluation, however, assumed that Temelin spent fuel *would* be stored at Dukovany.

RESPONSE TO THE CZECH REPUBLIC'S MARCH 3 POSITION PAPER AND THE FEBRUARY 25 WESTINGHOUSE LETTER

NEITHER CEZ NOR WESTINGHOUSE HAS YET PROVIDED ANY TECHNICAL DOCUMENTS WHICH DEMONSTRATE THAT PROGRESS IS BEING MADE TO ADDRESS THE FUNDAMENTAL DESIGN PROBLEMS AND OTHER SAFETY ISSUES AT TEMELIN RAISED BY NUS HALLIBURTON AND BY THE INTERNATIONAL ATOMIC ENERGY AGENCY ("IAEA"). In the Austrian Delegation's previous analyses, we documented at length the design and other safety issues raised by NUS's October 1992 Report and by IAEA missions in 1992 and in 1990.[3] The Czech Position Paper (page 6) admits that NUS and the IAEA issued "negative findings about the Temelin project," and acknowledges that NUS and CEZ developed an "Action Plan" for Temelin. The Position Paper asserts that CEZ's "implementation of the Action Plan invalidates [the] negative findings" (*id.*). However, at this late date **not a single document has been provided** to demonstrate what progress has been made. The Czech Position Paper includes an "Appendix" which lists studies and reports on several environmental issues, mostly prepared during the Communist regime. The reports themselves have not been made available by the Czech Republic, but their titles indicate that **none** of them addresses **any** of the critical nuclear design and other safety issues which NUS and IAEA raised. The Westinghouse letter to Congressman Orton includes an "Attachment" which lists only the titles of documents which allegedly "demonstrate the credibility and technological basis of the Westinghouse products to be used at Temelin."[4] **None** of these documents appears to be specific to Temelin; the documents referenced by Westinghouse pertain to other nuclear units, or they are general discussions of modernization or upgrading programs that Westinghouse has undertaken or studied. The NUS/CEZ Action Plan of which we are aware, which is reproduced as Attachment 1 to this letter, is extremely broad and demanding in scope. Assertions that this Action Plan is being successfully implemented, without substantiating documentation, are insufficient.

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3. See the Delegation's "Technical Memorandum Regarding the Temelin Nuclear Power Plant" (February 1994), and "The Safety Analysis Underlying the Temelin Nuclear Plant Loan Guarantee" (February 28, 1994), reproduced as Attachments 1 and 2, respectively, to my February 28 letter on behalf of the Delegation.

4. First page of the Attachment to the February 25, 1994 letter to Congressman Orton.

TEMELIN IS AN EXPERIMENT WHICH HAS BARELY BEGUN; THE CZECH POSITION PAPER AND WESTINGHOUSE LETTER FAIL TO DEMONSTRATE THAT TEMELIN CAN BE BROUGHT UP TO WESTERN SAFETY STANDARDS IN THE NEAR FUTURE. The Czech Position Paper asserts, without any documentation, that "[a]t present almost 90% of civil work and 60% of technological and engineering work at Temelin NPP construction site have been completed." The NUS and IAEA findings, which Temelin's advocates have not contested, cast serious doubt on this claim. As of late 1992,[5] efforts to comply with Western Fire Protection standards had not even begun; there was no adequate program in place to determine whether safety-related equipment was qualified to function in the environments to which that equipment will be subjected; there were unresolved design questions about the containment; and there had been no adequate safety-related testing of the plant, as designed or as constructed. Moreover, NUS, and an IAEA mission to Temelin, found that Quality Assurance programs had been inadequate, that the necessary safety culture was lacking, and that the Temelin Project was not adequately staffed and was receiving inadequate engineering support.[6]

Even more fundamental, **the design basis for the already-constructed portions of the plant is not fully known**. Unless and until this information gap is filled, the required safety analyses cannot be performed and the plant cannot meet Western licensing standards. Although Westinghouse asserts that it has performed several design reviews (February 25 letter to Congressman Orton, page 1), it has not referenced any such reviews in the "Attachment" to its letter. In late 1992, NUS reported that "adequate cooperation of the original Soviet design organization" was necessary even for the I&C project, and that "in the past, the performance of the Soviets in responding to Temelin requests for technical information has not been good, either with respect to the timeliness of the responses or their technical content."[7] Therefore, the mere assertion of the Czech

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5. The assertion that the NUS findings "are now two years old" (Czech Position Paper, page 6) is not correct; the NUS Progress Report which was very critical of Temelin was issued less than a year and one-half ago in (October 1992).

6. The Czech Position Paper's unsubstantiated assertions that "[m]ajor components have been manufactured . . . in compliance with quality assurance principles and standards" (page 7) and that CEZ has "reorganized project management" (page 5) are not sufficient to demonstrate that the problems identified by NUS and the IAEA missions have been resolved. The Westinghouse letter states that, under the old Communist government of Czechoslovakia, "government acts and regulations for construction, design, Quality Assurance . . . and nuclear safety were revised in 1984" (page 2). If those reforms had been adequate, presumably the IAEA and NUS would not have identified major concerns in 1990-1992.

7. NUS Report, page A-15 (Attachment 3 to my February 28 letter on behalf of the Delegation).

Position Paper, without evidence, that design basis information is now being obtained from the Russians (pages 6-7) is insufficient to demonstrate that this aspect of the NUS Action Plan has been adequately implemented.

The Czech Position Paper (page 6) states that "Russian reactors . . . were upgraded in Finland (West European I&C), Slovakia (West European I&C), and Hungary (the bid invitation specifications are being prepared for many improvements)." The Finnish experience (at Loviisa) is not comparable to Temelin because Loviisa was not upgraded; it was designed with Western input from the beginning. Temelin, by contrast, would be re-designed **after** it has been partially constructed, and the design basis of that construction is not fully known. As the Czech paper acknowledges, the Hungarian experiment has not yet actually begun. The safety upgrades at the Slovakian plant (Bohunice-V1) that have occurred to date are not comparable to what is proposed for Temelin. At Bohunice-V1 there was only a "small reconstruction"; it was never claimed that those minor upgrades would result in a plant that fully meets Western safety standards. It is unclear whether Bohunice-V1 can or will ever be modified to meet Western safety standards. Therefore, it is incorrect to imply that the Temelin project is similar to upgrades that have already occurred elsewhere.

WHAT WILL BE REQUIRED IF TEMELIN IS TO BE LICENSABLE UNDER WESTERN SAFETY STANDARDS IS A FUNDAMENTALLY NEW PLANT DESIGN: A HYBRID OF THE SOVIET VVER-1000 AND WESTERN DESIGNS. FOR THIS REASON, THE CZECH POSITION PAPER'S PERCENTAGE COMPLETION FIGURES ARE MEANINGLESS. UNTIL THE NECESSARY DESIGN BASIS INFORMATION IS OBTAINED FROM THE ORIGINAL PLANT DESIGNERS AND ALL NECESSARY SAFETY ANALYSES ARE ADDRESSED IN A PRELIMINARY SAFETY ANALYSIS REPORT COMPARABLE TO WHAT IS REQUIRED BY THE U.S. NRC FOR NUCLEAR PLANTS IN THE UNITED STATES, THERE IS NO WAY TO KNOW HOW MUCH OF THE PLANT REALLY HAS BEEN "COMPLETED." The Czech Position Paper claims (page 6) that "it is not unusual that upgrading is accomplished by an organization that is different from the original supplier. This practice can in no way be considered as an artificial grafting of one technology to another." What this argument disregards is the IAEA's findings, in April 1993 (less than a year ago), that the OBP-82 Soviet design codes for VVER-1000 plants such as Temelin are deficient when compared to more recent Soviet design codes, and United States and IAEA standards.[8] As the Austrian Special Delegation previously noted, many of the generic concerns about the VVER-1000 design identified by the IAEA in 1993 were specifically cited by the NUS as concerns about Temelin in late 1992: *e.g.*, inadequate Fire Protection design, the lack of a Safety Analysis Report, failure to base the design on adequate testing for severe accidents, and

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8. See the Austrian Delegation's February 1994 Technical Memorandum, page 7 (Attachment 1 to my February 28 letter on behalf of the Delegation). The April 1993 IAEA report is included in Attachment 9 to my February 28 letter.

questions about the containment design basis.[9] In fact, the Czech Position Paper acknowledges (page 6) that "[t]he findings and recommendations made by the IAEA program in 1993 are consistent with those of the Halliburton NUS audit."

The Westinghouse letter, without even citing the IAEA's 1993 report, implies that the IAEA has concluded that VVER-1000 plants can be made licensable under Western standards (pages 2-3). **However, the IAEA has never determined that a specific VVER-1000 plant, such as Temelin, would actually meet Western standards after the recommended modifications are made; this remains an open question.** Therefore, without substantial additional information, there is no way to determine whether Temelin could be operational by "1996 to 1998" (Czech Position Paper, page 3).

THE CZECH REPUBLIC'S RESPONSE TO CONCERNS ABOUT TEMELIN HIGHLIGHTS THE NEED FOR A PUBLIC, EXPERT INQUIRY. The Westinghouse letter and the Czech Position Paper indicate that Westinghouse will only be responsible for the specific plant systems it is providing: the fuel core and the I&C system.[10] Although the Czech Republic's nuclear regulators are receiving training from the U.S. NRC, **the Austrian Special Delegation has been informed by NRC Chairman Selin that the NRC has not studied Temelin in any detail and will not be responsible for determining whether Temelin meets NRC standards.** The Czech Position Paper, which asserts that Western safety standards will be met in the Czech licensing process, apparently is not authored by the Czech nuclear regulatory agency or by nuclear regulatory officials. Its authors are employees of CEZ, and the Chairman of the Supervisory Board of CEZ (who is also an advisor to the Czech Ministry of Industry and Trade). The Petition Paper does not document or even refer to any analysis or inspection of Temelin by Czech nuclear regulators, to determine whether the IAEA and NUS concerns are being adequately addressed. Conclusory declarations by the utility that is building and would operate Temelin are no substitute for technical safety documentation and environmental impact information, and a meaningful opportunity for public and expert commentary on that information after it is provided. The need for disclosure and public input is especially great now that CEZ

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9. See the February 28, 1994 "Safety Analysis" paper, pages 5, 6 (footnote 7), 14, 16 (Attachment 2 to my February 28 letter on behalf of the Delegation).

10. The Czech Position Paper states (page 7) that "the supplies by Westinghouse have to comply with the U.S. NRC requirements and standards (contractual commitment." Westinghouse states in its letter (page 2) that "[i]n October 1994, as part of the Westinghouse contracts, we will submit a Safety Analysis Report (PSAR) for the Fuel and Instrumentation and Control Systems, including how this scope integrates with the plant itself." Westinghouse further states that others will be responsible for "the total safety Analysis Report" and for "Safety Analysis Services to support [CEZ]" (*id.*).

has admitted the NUS and IAEA "negative findings,"[11] without providing any documentation of how those findings are being addressed.[12]

THE CZECH POSITION PAPER CONFIRMS THAT THE CZECH GOVERNMENT WILL NOT PERMIT THE ENVIRONMENTAL IMPACT ANALYSIS THAT SHOULD BE REQUIRED FOR A NUCLEAR PROJECT LIKE TEMELIN AND THAT APPEARS TO BE REQUIRED BY CZECH LAW ITSELF. The Position Paper states that the 1992, post-Communist Czech environmental law, which we understand provides for public notice and comment, will not be applied to Temelin (pages 7-8). The Czech Position Paper states (page 7) that "requirements of the new Czech Environmental Impact Assessment Law No. 244/1992 are not retroactively applicable to Temelin NPP since its construction started in 1987."

The Government of Austria has no desire or intent to intrude into matters such as the Czech administration of its environmental law. However, the copy of the Czech Republic's Environmental Impact Assessment Law No. 224/1992 we have examined indicates that there does not appear to be the problem of retroactivity claimed by the Czech Position Paper. Environmental Impact requirements apply not only to original construction, but to significant modifications of a project. It is now proposed to modify the Temelin Project very substantially from the original design. An Environmental Impact Statement to address this proposed modification would seem to be required – even though original project approval was given before the present law was enacted.

Apart from the correct interpretation of the Czech statute, the Austrian Special Delegation believes that it would be a dangerous precedent if the plant that may be the flagship for nuclear power in the nations of the former Soviet bloc were immunized from the basic requirements that should govern the development of nuclear power in Western democracies. The environmental reports which are listed in the Appendix to the Czech Position Paper were mostly written during the Communist regime in the former Czechoslovakia. It is not clear whether any of these reports has ever been made public, or even provided to the Eximbank or to the National Security Council. The

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11. Czech Position Paper, page 6.

12. The Position Paper states that the Czech Republic "has conducted bilateral dialogue with the Republic of Austria on [the Temelin] issue" and that "Vienna and Prague . . . are the most suitable places for such a bilateral dialogue" (page 4). Vienna and Prague have, indeed, engaged in fruitful dialogue on nuclear power projects. For example, a team of Austrian experts worked with Czechoslovakian experts to examine the Bohunice reactors, and Austrian experts provided recommendations on steps needed to assure safe operation. In the case of Temelin, there has been no such cooperation (at least since the decision to proceed with the Westinghouse upgrade). The Czech Republic has declined to provide the basic technical and safety analyses on which such a dialogue could be based.

Temelin loan guarantee should not be approved until those reports are made available for expert and public review and comment.

THE CZECH POSITION PAPER AGAIN DEMONSTRATES THE NEED FOR PUBLIC AVAILABILITY AND OPPORTUNITY FOR SCRUTINY OF THE LEAST COST ANALYSIS WHICH UNDERLIES THE LOAN GUARANTEE. Eximbank did not itself undertake a least-cost analysis. The Czech Position Paper continues to rely on the study by Tractebel that is not available to the public. In its prior memoranda the Austrian Government has pointed out that, to the extent that portions of the Tractabel study have been made available for inspection, they confirm that it is not possible to conclude that Temelin is the least cost assumption – even if Temelin could be completed safely at the cost assumed by the Tractabel study, which is impossible.[13]

The Czech Position Paper (page 6) claims that all alternatives to the completion of Temelin, including a gas combined cycle plant, have been evaluated. However, the options of converting Temelin to a gas-fired or clean coal-fired power plant were not, in fact, investigated by Tractabel. Such a conversion would be significantly cheaper than greenfielding the portion of Temelin that has been constructed to date (which is assumed by CEZ to cost almost as much as completing Temelin), followed by a new construction of a fossil fuel-fired plant. Moreover, energy saving options (demand side management) were evaluated by Tractebel, but were not included in the least-cost comparison that was performed. Also, cost estimates for the various options were supplied to Tractebel by CEZ and were judged, in a World Bank appraisal, as being heavily biased in favor of nuclear power. Thus, the Czech statement that a nuclear power plant or Temelin is the least-cost option excludes the two most favorable, lower-cost alternatives: demand side management options, and conversion of the existing plant from nuclear to fossil.

The conversion of Temelin to a gas-fired power plant would not necessarily increase the dependence on Russian gas, as claimed by the Czech Position Paper (page 9). The Czech gas grid will be connected to the West European supply system (*e.g.*, the Transgas/West Austria-Gas pipeline). The diversification of gas supplies is one of the main goals of Czech energy policy,[14] as is also the case for Austria. Until recently, Austria was fully dependent on Russia for its gas supply (via the Ukraine and the Slovak Republic), but it has recently contracted for gas from Norway. In the last 27 years, there has been not a single day when gas deliveries to Austria were endangered, or gas was used as a political weapon. Moreover, the risk can be minimized through underground storage.

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13. See the Delegation's February 1994 Technical Memorandum, pages 16-20 (Attachment 1 to my February 28 letter).

14. International Energy Agency, *Czech and Slovak Federal Republic, 1992 Survey*.

The claim that it is technologically impossible to use the installed equipment at Temelin for a gas-fired plant (Czech Position Paper, page 9) is contradicted by the conversion projects performed in the United States, Zimmer and Midland, and also by the studies performed for Zwentendorf, Bohunice, and other European plants. Upon the initiative of the Austrian Chancellor and in agreement with the Czech Premier, a well-experienced international company and a group of experts in three countries studied this question, and they concluded that conversion of Temelin to gas was feasible. Their findings were presented to the Czech Government's delegation which cooperated with the Austrian delegation on the subject of conversion from nuclear to gas. The Czech delegation was given all relevant information in two meetings, February 1993 in Prague and March 1993 in Vienna. The next meeting was scheduled for June 1993, to be held at Temelin, but to date the Czech delegation has declined to meet.

The Czech Position Paper claims that a gas conversion would require "enormous operational expenses and unpredictable investment costs" (page 9). To the contrary, natural gas is competitive with other fuels and gas prices are generally coupled to the prices of a "fuel-basket" (mainly oil products), on the basis of long-term contracts. As for the investment required for conversion, according to international experience there is little uncertainty about the cost of a gas conversion option (state of the art technology is available, and Temelin is not yet radioactive). By contrast, there are many uncertainties associated with finishing Temelin as a nuclear plant. These include the costs of complying with Western safety standards, the actual cost of decommissioning a nuclear plant, and the disposal of spent nuclear fuel from Temelin. Compared to the large cost overruns in the construction of nuclear power plants (at least 300%, according to *The Economist*, November 21, 1992), investments in natural gas facilities are much more predictable. The Czech unwillingness to consider a gas-fired power plant contrasts with the international trend, towards an increasing demand for combined-cycle technology.

The Czech Position Paper also claims that gas conversion of Temelin is inconsistent with the Austrian experience with the Zwentendorf plant (page 9). However, Zwentendorf is not comparable to Temelin. In the late 1970's, construction of the Zwentendorf nuclear plant was halted. At that time, two coal-fired plants were constructed close to the Zwentendorf site, using the already-installed electric infrastructure. At the time, conversion to gas was not feasible, because the relevant technology was not as advanced, and gas turbines were not as efficient, reliable and inexpensive as they are today. In the early 1990's, the question was raised about whether to use the remaining Zwentendorf equipment to construct a large gas-fired facility. That option was rejected, because (among other reasons) the additional generating capacity was not required, and Austrian energy policy aims at stabilizing electricity demand. It was decided to construct much smaller, gas-fired plants in heavily populated areas (Zwentendorf is located far from major cities), so that the waste heat could be used for district heating purposes.

NEW INFORMATION REGARDING STORAGE OF TEMELIN SPENT NUCLEAR FUEL

New information from CEZ confirms that the Eximbank's Environmental Evaluation was mistaken when it claimed that spent nuclear fuel from Temelin will be stored in a new facility to be constructed at Dukovany. As I noted in my February 28 letter (pages 5-6), the statement in the Eximbank's Environmental Evaluation that an intermediate storage facility to be constructed at Dukovany will be available for spent nuclear fuel from Temelin[15] is contradicted by recent statements of the Major of Dukovany. The Czech Position Paper does not claim that the Dukovany intermediate storage facility will be available for spent nuclear fuel from Temelin (page 8). According to a recent (March 9) release from the Austrian Press Agency, CEZ has confirmed that the Dukovany storage facility will **not** be available for Temelin-spent fuel. The Austrian Press Agency's release is enclosed as Attachment 2 to this letter. An English translation of the last paragraph is:

> The investor [CEZ], denied . . . the accusations of the Major of Dukovany, Vitezslav Jonas, that spent nuclear fuel from the southern Bohemian nuclear power plant at Temelin will also be stored in this waste depository [at Dukovany]. The nuclear waste from Temelin will be disposed of in another depository, the location of which has not yet been established, according to CEZ spokesperson, Miroslav Novak.

Therefore, with regard to the storage of spent nuclear fuel, the Eximbank has relied on incorrect information.

CONCLUSION

The Special Delegation of the Government of Austria is confident that the admissions in the Czech Republic's Position Paper and Westinghouse's letter, together with the new information we have submitted, call for reconsideration of the Eximbank's

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15. "Environmental Evaluation, Export-Import Bank of the United States Engineering Division, Temelin Nuclear Power Station," dated January 26, 1994, page 8 (included in Attachment 9 to my February 28 letter on behalf of the Austrian Special Delegation).

Hon. Kenneth D. Brody
March 9, 1994
Page 11

position on the Temelin loan guarantee. We shall continue to provide you with further relevant materials as they become available.

Very truly yours,

Manfred Heindler
on behalf of
THE SPECIAL DELEGATION OF THE GOVERNMENT OF AUSTRIA TO THE UNITED STATES REGARDING THE TEMELIN NUCLEAR POWER PLANT

Attachments

cc: Hon. Martin A. Kamarck
First Vice President and Vice Chairman, Export-Import Bank of the United States
Hon. Maria Luisa M. Haley
Director-Designate, Export-Import Bank of the United States
Hon. Rita M. Rodriguez
Director, Export-Import Bank of the United States
Hon. Cecil B. Thompson
Director, Export-Import Bank of the United States
Carol F. Lee
General Counsel, Export-Import Bank of the United States
Hon. Kathleen McGinty
Deputy Assistant to the President and
Director, Office of Environmental Policy
Hon. Leon S. Fuerth
National Security Advisor to the Vice President
Hon. Eileen B. Claussen
Special Assistant to the President for Global Environmental Affairs
Hon. Dana M. Marshall
Senior Advisor to the Vice President for International Economic Affairs
Hon. Jim Bacchus, U.S. House of Representatives
Hon. Barbara Boxer, U.S. Senate
Hon. Peter Deutsch, U.S. House of Representatives
Hon. John D. Dingell, U.S. House of Representatives
Hon. Lauch Faircloth, U.S. Senate
Hon. Eric D. Fingerhut, U.S. House of Representatives
Hon. Barney Frank, U.S. House of Representatives
Hon. Henry B. Gonzalez, U.S. House of Representatives
Hon. Lee H. Hamilton, U.S. House of Representatives
Hon. Michael Huffington, U.S. House of Representatives
Hon. Joseph P. Kennedy II, U.S. House of Representatives
Hon. John F. Kerry, U.S. Senate
Hon. Patrick J. Leahy, U.S. Senate
Hon. Alfred A. McCandless, U.S. House of Representatives
Hon. Bill Orton, U.S. House of Representatives
Hon. Claiborne Pell, U.S. Senate
Hon. Bill Richardson, U.S. House of Representatives
Hon. Donald W. Riegle, Jr., U.S. Senate

ATTACHMENT 1

NUS/CEZ Action Plan
October 1992

ATTACHMENT C
CEZ-ETE ACTION PLAN

Draft Terms of Reference to define each of the actions believed necessary to respond to the Audit Team technical recommendations have recently been completed by CEZ-ETE with HALLIBURTON NUS assistance. Some actions are already in progress. Implementation of the remaining Terms of Reference will begin following HALLIBURTON NUS final review and comment.

A listing of each of the Titles of the Terms of Reference is appended together with an indication of the priority in which they will be accomplished. An integrated schedule for the conduct of these actions is now under preparation by CEZ-ETE and is a part of a detailed Action Plan that explains and discusses the detailed steps necessary for each of the items listed.

TERMS OF REFERENCE LISTING

	ACTION PLAN ITEMS	PRIORITY *
1	Create an independent safety engineering group	B
2	Implement the audit team recommendations on safety culture	A
3	Establish full time project managers for major new Temelin projects**	A
4	Accelerate the completion and implementation of Temelin QA programs with emphasis on self-audits	A
5	Establish a formal system to obtain regular feedback on nuclear power plant operating experience	B
6	Ensure that new contracts with suppliers include provisions that will permit effective project management	A
7	Document and organize the Temelin design basis documentation	A
8	Conduct an independent review of the Temelin PSAR against Western standards	B
9	Conduct an independent review of the Temelin FSAR against Western standards	B
10	Perform a Temelin plant safety analysis using U.S. licensing models and assumptions	B

11	Conduct Level 1 and 2 probabilistic safety analyses	A
12	Ensure the integration of all current major design modifications	A
13	Conduct a fire hazards analysis using Western nuclear power plant methodology	A
14	Establish a program for the environmental qualification of safety related equipment	A
15	Complete the seismic re-analysis of safety related structures and systems	A
16	Determine the necessity of conducting a soil-structure interaction analysis	B
17	Evaluate the Hluboka fault activity and update the area tectonic map	B
18	Confirm the structural integrity of major Temelin safety-related structures and components	A
19	Assess the structural adequacy of the steam generator baffle components under main steam line break accident conditions	A
20	Conduct detailed safety train separation design reviews,including potential adverse non-safety system component interactions with safety systems	B
21	Make design provisions to facilitate adding a filtered vent to containment	A
22	Establish an approach for coping with Station Blackout and confirm the ability of the plant to meet it	A
23	Conduct a comprehensive review of the battery system and identify and implement any necessary design changes	A
24	Evaluate the TVD water filtration building relative to potential common mode failure of the TVD systems	A
25	Design, procure and install continuous radiation monitors on the intermediate loop of the district heating system	C
26	Evaluate the control room habitability under accident conditions	A

27	Evaluate the adequacy of the ultimate heat sink relative to Western standards	A
28	Provide emergency feedwater flow indication and isolation capability for all steam generators	A
29	Implement the audit team recommendations concerning the power supplies for the atmospheric Pump valves	B
30	Verify that the Temelin post-accident hyrogen monitoring and control systems satisfy the requirements of the TMI Action Plan	B
31	Evaluate the ability of safety systems to function under postulated internal flooding conditions	A
32	Verify the ability of the reactor coolant pump seals to withstand Station Blackout conditions	A
33	Develop single failure protection for critical piping leading from the containment sump	A
34	Reevaluate the need for a boric acid tank Heating system	A
35	Conduct a detailed review of all aspects of the containment sump and connected systems design	A
36	Complete the liquid radwaste evaporator design evaluation and make any necessary design changes	A
37	Evaluate the option of not regenerating depleted resin beds in the liquid radwaste system design	B
38	Reevaluate the plant design from an ALARA standpoint and incorporate any desirable modifications	A
39	Design procure and install continuous radiation monitors at sample tank discharges with automatic valve closure features on high radiation level signal	A
40	Provide the ability to detect the pressence of liquids and their removal from the dry waste storage rooms	C

	Further evaluate the solid radwaste system to reduce the volume of waste for disposal	C
42	Make provision for interim storage of bituminized waste drums	B
43	Incorporate the remaining Audit Team radwaste recommendations into the plant design	C
44	Implement the Audit Team recommendations on radiation protection	C
45	Implement the Audit Team recommendations on preoperational testing	C
46	Implement the Audit Team recommendations on conduct of operations	C
47	Implement the Audit Team recommendations on operating procedure development	C
48	Implement the Audit Team recommendations on emergency planning	C

* LEGEND

A Initiate Immediately

B Initiate as Soon as Practical and When Necessary prerequisite Activities Have Been Completed

C Initiate as Soon as Project Resources Can Be Made Available

Attachment 2

Austrian Press Agency Release

Austria Presse Agentur

Bitte an Hrn. Meister weiterleiten!

"Strahlende" Grüße

Werner Mullner

APA147 5 WA 0180 09.Mar 94

Atomenergie/Energie/Mullager/Tschechien

Bau des Atommullagers in Dukovany offiziell genehmigt
Utl.: Kapazitat von 600 t vorgesehen - Ab 1996 in Betrieb -

Prag (APA) - Der Kreisamt im sudmahrischen Trebic hat am 1. d.M. die Genehmigung für den Bau eines Zwischen-Atommullagers im Areal des Atomkraftwerkes Dukovany erteilt. Wie die tschechische Presse erst heute, Mittwoch, berichtet, seien alle am Genehmigungsverfahren Betreffenen, einschließlich der tschechischen Umweltschutzorganisation "Duha" ("Regenbogen"), davon in Kenntnis gesetzt worem. Im diesem Mullager mit einer vorgesehenen Kapazitat von 600 t sollen ab 1996 atomare Brennstoffreste gelagert werden. ssss

Der "Duha"-Aktivist Jan Pinos erklarte gegenuber der Presse, seine Organisation wolle alle Moglichkeiten ausnutzen, um die Entscheidung des Kreisamtes rackgangig zu machen. Der Beschluß wird in 14 Tagen rechtskraftig werden.

Der Investor, die Tschechische Energiegesellschaft (Ceske energeticke zavody - CEZ), wies im diesem Zusammanhang die Vorwurfe des Burgermeisters von Dukovany, Vitezslav Jonas, zurueck, wonach im Mullager auch der ausgebrannte atomare Brennstoff aus dem sudbohmischen AKW Temelin gelagert werdan sollte. Der Atommull aus Temelin werde in einem anderem Lager untergebracht, dessen Ort noch nicht festgelegt worden sei, so der CEZ-Sprecher Miroslav Novak.
(Schluß) ps/h/os

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NUCLEONICS WEEK

Vol. 35 No. 10 March 10, 1994

IAEA, DOE QUIETLY DENY SAYING VVER-1000 CAN MEET WESTERN NORMS

Both IAEA and U.S. DOE officials say their agencies have made no flat findings that the VVER-1000 design can be upgraded to western safety standards. Two U.S. agencies, NRC and the National Security Council (NSC), based their recent endorsements of funding guarantees to let Westinghouse complete the Temelin station in the Czech Republic in part on such putative findings from IAEA and DOE (NW, 27 Jan., 1 and 3 March, 10).

The NRC stated last month that the U.S. Export-Import Bank had "requested NRC's views" on a Westinghouse project to upgrade and finish two VVER-1000s at Temelin. "In response, NRC indicated that it fully supports the conclusions of other agencies—DOE and the IAEA—that the upgraded Temelin design can meet a level of safety acceptable to western countries."

A similar statement was made last September by William Itoh, executive secretary of the NSC. Itoh told Ex-Im that DOE and the IAEA "have both concluded that the VVER-1000 design can be improved to meet a level of safety acceptable to Western countries."

Neither IAEA nor DOE have issued public statements on the issue. But queried by Nucleonics Week, IAEA spokesman Hans Meyer said March 3 that the IAEA has made no blanket VVER-1000 safety statement to date. In fact, the U.N. agency has an ongoing project on the safety of the latest Soviet-design PWR which is expected, by the end of this year, to produce a reference work on VVER-1000 generic safety codes. The IAEA has been studying the design since mid-1992.

An IAEA safety expert elaborated on March 8 that the 1992 G-7 summit had concluded, in part based on analysis by Gesellschaft fuer Anlagen- und Reaktorsicherheit mbH (GRS) of the uncompleted Stendal VVER-1000s in the former East Germany, that VVER-1000 safety could be substantially improved by the addition of western inputs.

Since then, the IAEA has been examining the matter more closely. Last December, the IAEA held a meeting on safety enhancement of national programs including VVER-1000s, and is "now working in-depth on topical issues," the expert said. One topical report nearing completion—on steam generator collectors—has been reviewed by VVER-1000 design engineers at Gidropress.

Because the cumulative operating history of the VVER-1000 program is short—the first units went on line only in the mid-1980s—it is "difficult to make a confident generic statement about how safe the reactors are, and difficult to evaluate particular safety problems," he explained.

During a meeting set for April on core control and protection strategies, western and Russian experts will explore current problems in control rod insertion. At one VVER-1000 unit last year, scramming times in excess of four seconds, plus control rods jamming in the mid-core region, prompted a decision to cut operation to 50% power.

By the end of this year, the IAEA aims to have compiled a reference work on generic VVER-1000 safety codes. The study will rank issues by safety significance, and serve as a "technical aid for regulators in deciding how to proceed with each specific plant," the official said.

In the IAEA's view, the generic assessment is necessary, he said, "because thus far it has been very difficult to proceed on a plant-by-plant basis, and there are a lot of black (empty) points in the database."

This year, the IAEA will conduct an extensive mission to only one VVER-1000: Zaporozhe-5 in Ukraine. Since 1992, fact-finding has gotten more difficult for the IAEA. "The Russians are now very reluctant to permit missions to their reactors," the official said. "In order to get important information, we now have to hire their experts and pay for the data."

The official said there is a big difference between the statement that a VVER-1000 unit may be backfit to standards which "might be tolerable" in the West, and the statement that a reactor would be "licensable" under Western regulatory requirements. The German Federal Ministry of Environment & Nuclear Safety, for example, concluded that, while upgrades would have substantially improved safety, the Stendal PWRs could not have been licensed under its detailed regulations. German studies showed that the VVER-1000 containment "caused a lot of problems" with air pressure loads. "The containment was not upgradable," the official said.

Well-placed DOE officials also denied this week that the agency has made any blanket statements on VVER-1000 safety.

Last month, NRC Chairman Ivan Selin called on Secretary of Energy Hazel O'Leary to support the Temelin upgrade project. "Selin has been the real driving force behind Temelin," one U.S. official said. Sources said O'Leary has agreed to support the project, but officials added that her senior aides will not yet make a general statement on the safety of VVER-1000s.

According to the U.S. official, "there are some technical people (in the U.S. Administration) who say we can improve the VVER-1000 up to western levels and those who say that we cannot generalize." Because coal and natural gas "will not suffice" to assure energy supply in the ex-USSR and eastern Europe, he said, "there is going to have to be a nuclear alternative to fossil fuels."

"But there is a lot of variability from unit to unit, depending in part on the extent of how each conforms to Soviet design specifications," he said. "Some units have defects. Before we can say that Temelin or any other plant can be brought up to western levels, we must take a hard look at all the documentation on its configuration management."

The Czech government's decision to complete Temelin-1 and -2 was based in part on studies by Halliburton NUS and Westinghouse indicating the feasibility and economy of safety upgrades.—*Mark Hibbs, Bonn*

UNITED STATES
NUCLEAR REGULATORY COMMISSION
Office of Public Affairs
Washington, D.C. 20555

FACT SHEET ON NRC LICENSING ASSISTANCE FOR CZECH NUCLEAR PLANT

The Nuclear Regulatory Commission has agreed to provide licensing assistance for upgrading a nuclear power plant under construction in the Czech Republic.

Czech regulatory authorities requested the assistance of the NRC in applying U.S. licensing methodology in a safety evaluation of the Temelin nuclear power plant, a Russian-designed VVER-1000 pressurized water reactor. The Temelin design is similar to modern pressurized light water reactors now in operation in other countries.

Westinghouse Electric Corporation, under contract with the Czech Republic, will supply nuclear fuel and an instrumentation and control (I&C) system for the Czech reactor. The U.S. company also will prepare a safety assessment report with an analysis and evaluation pertinent to the fuel design, I&C design and accident analysis consistent with U.S. licensing requirements.

To support Czech regulators in licensing the Temelin plant, the NRC will contract with the Idaho National Engineering Laboratory (INEL) to train the Czech nuclear regulators in the process by which the NRC licenses reactors. Some senior managers of the Czech regulatory authority have already trained at the NRC. The NRC staff will monitor the training to ensure that INEL complies with the NRC's approach to licensing. The NRC anticipates the training program will take about two years to complete.

In connection with Export-Import funding to underwrite the upgrading of the plant, ExIm Bank requested NRC's views. In response, the NRC indicated that it fully supports the conclusions of other agencies--the Department of Energy and the International Atomic Energy Agency--that the upgraded Temelin design can meet a level of safety acceptable to western countries.

The NRC has been given assurances by the Czech regulatory authority that competent Czech officials have performed a site suitability review of Temelin, from an environmental view, in accordance with applicable laws and regulations in force in that country.

In accordance with precedent and policy, neither the NRC or INEL will be responsible for safety decisions made by the Czech regulatory authority.

#

UNITED STATES OF AMERICA
BEFORE THE
NUCLEAR REGULATORY COMMISSION

In the Matter of Westinghouse Electric Corporation (Exports to the Czech Republic For The Temelin Nuclear Power Plant	)	Docket No. 110-04699 Application No. XSNM-02785

AFFIDAVIT

CITY OF WASHINGTON)
: ss.
DISTRICT OF COLUMBIA)

THOMAS B. COCHRAN, Ph.D. being duly sworn, attests as follows:

1. I am a senior staff scientist with, and director of, the nuclear program at the Natural Resources Defense Council ("NRDC"). I have worked with NRDC for over 20 years. I was appointed to the Nuclear Regulatory Commission's Advisory Committee on the Clean Up of Three Mile Island, and am currently a member of the Three Mile Island Public Health Advisory Board. From 1978 to 1982, I was a member of the Department of Energy's Energy Research Advisory Board, which advised the Secretary of Energy on a number of issues, including nuclear material production.

2. I am the author of The Liquid Metal Fast Breeder Reactor: An Environmental and Economic Critique (Washington, DC: Resources for the Future, 1974); and co-editor/author of the Nuclear Weapons Databook, Volume I: U.S. Nuclear Forces and Capabilities

(Cambridge, MA: Ballinger Press, 1984); Volume II: U.S. Nuclear Warhead Production (1987); Volume III: U.S. Nuclear Warhead Facility Profiles (1987); Volume IV: Soviet Nuclear Weapons (1989). In addition, I have published numerous articles and working papers, including those in SIPRI Yearbook chapters, Science, Arms Control Today, and the Bulletin of the Atomic Scientists.

3. My areas of special focus include nuclear weapons research and production, Soviet nuclear weapons and power, nuclear weapons proliferation, safeguards, and radiation exposure standards. I received my Ph.D. in Physics from Vanderbilt University in 1967, and served as assistant Professor of Physics at the Naval Postgraduate School, Monterey, California, from 1969 to 1971.

4. I have followed the scientific and technical literature assessing the health and environmental impacts associated with accidental releases of radioactive substances. I have examined in particular the radiological impacts of the Chernobyl reactor accident in April 1986. Shortly after the accident, I co-authored an article on the long-term health effects of Chernobyl. von Hippel and Cochran, "Estimating long-term health effects", Bulletin of Atomic Scientists, August/September 1986) (Special issue on "Chernobyl: The Emerging Story"). I have since participated in numerous conferences and meetings concerning Chernobyl and have twice visited the plant.

5. The widespread effects of Chernobyl are well summarized in a 1988 article prepared by Lynn Anspaugh, Robert Catalin and Marvin Goldman. "The Global Impact of the Chernobyl Reactor Accident", 242 Science 1513-1519 (December 16, 1988). Anspaugh, et al. found that radioactive materials from Chernobyl were widely distributed well beyond the borders of the Soviet Union and throughout the Northern Hemisphere, including Europe and the United States.

6. The collective effective dose equivalent (i.e., the cumulative radiation to all persons over their lifetimes) from the Chernobyl accident has been estimated by Anspaugh, et al., to be:

USSR	326,000 person-Gy	(35%)
Europe (non-USSR)	580,000	(62%)
Asia (non-USSR)	27,000	(3%)
U.S. and Canada	1,200	(0.1%)
Total (Northern hemisphere)	930,000	(100.0%)

7. Even using a low cancer risk coefficient (2 cancer fatalities per 100 person-Gy), the authors estimate that the total fatal cancers due to Chernobyl will be:

USSR	6,500	(35%)
Europe (non-USSR)	10,400	(62%)
Asia (non-USSR)	500	(3%)

U.S. and Canada	20	(0.1%)
Total (Northern hemisphere)	17,400	(100.0%)

8. Based on the 1990 BEIR V Report of the National Academy of Sciences, I believe 10 cancer fatalities per 100 person-Gy is a more appropriate cancer risk coefficient applicable here. This would increase the above cancer fatality estimates. For each cancer fatality, there would be an additional 0.5 to 0.75 non-fatal cancers, so the total number of cancers would be in the range of 130,000 to 150,000, with two-thirds occurring outside the USSR, and 150-175 occurring in the U.S. and Canada. Based on their respective populations, there would be roughly 140 - 160 additional cancers amongst the public of the United States resulting from Chernobyl fallout.

The above is, to the best of my knowledge, true and accurately stated.

Thomas B Cochran

THOMAS B. COCHRAN, PH.D.

Sworn to before me this 16th day
of March, 1994.

Donna Marie Wilcox

NOTARY PUBLIC

CERTIFICATE OF SERVICE

I hereby certify that this day a copy of the foregoing "Petition For Intervention And Request For Hearing Of The Natural Resources Defense Council, Friends Of The Earth, Hnuti Duha and Global 2000" was hand-delivered to:

Mr. Ronald D. Hauber, Assistant Director
International Security, Exports
and Material Safety
Office of International Programs
11555 Rockville Pike
Mail Station WF1 3-H-5
U.S. Nuclear Regulatory Commission
Rockville, Maryland 20852

and sent by first class mail, postage prepaid, to

Mr. William S. Hudec
Senior License Administrator
Westinghouse Electric Corporation
Energy Systems
Nuclear International Business Area
P.O. Box 355
Pittsburgh, Pennsylvania 15230-0355

Dated at Washington, D.C. this 17th day of March, 1994.

S. Jacob Scherr
Natural Resources Defense Council
1350 New York Avenue, N.W.
Washington, D.C. 20005