BNL- 66583
Informal Report

MEASUREMENTS OF THE CONFINEMENT LEAKTIGHTNESS AT THE KOLA NUCLEAR POWER STATION (UNIT 2) IN RUSSIA

G.A. Greene and J.G. Guppy

August 1998

Department of Advanced Technology

Brookhaven National Laboratory
Upton, Long Island, New York 11973

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Department of Advanced Technology

Brookhaven National Laboratory
Brookhaven Science Associates
Upton, Long Island, New York 11973

Under Contract No. DE-AC02-98CH10886
UNITED STATES DEPARTMENT OF ENERGY

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*This work was performed under the auspices of the U.S. Department of Energy

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Final Report
Kola Confinement Leaktightness
WBS Number: 1.2.2.1
For the Kola Nuclear Power Plant, Polyarnie Zori, Russia

by

James G. Guppy
Principal Investigator
Brookhaven National Laboratory
Upton, NY 11973-5000
516-344-2698

This is the final report on the INSP project entitled, "Kola Confinement Leaktightness" conducted by BNL under the authorization of Project Work Plan WBS 1.2.2.1. This project was initiated in February 1993 to assist the Russians to reduce risks associated with the continued operation of older Soviet-designed nuclear power plants, specifically the Kola VVER-440/230 Units 1 and 2, through upgrades in the confinement performance to reduce the uncontrolled leakage rate.

The major technical objective of this project was to improve the leaktightness of the Kola NPP VVER confinement boundaries, through the application of a variety of sealants to penetrations, doors and hatches, seams and surfaces, to the extent that current technology permitted. A related objective was the transfer, through training of Russian staff, of the materials application procedures to the staff of the Kola NPP.

This project was part of an overall approach to minimizing uncontrolled releases from the Kola NPP VVER-440/230's in the event of a serious accident, and to thereby significantly mitigate the consequences of such an accident. The U.S. provided materials, application technology, and applications equipment for application of sealant materials, surface coatings, potting materials and gaskets, to improve the confinement leaktightness of the Kola VVER-440/230's. The U.S. provided for training of Russian personnel in the applications technology.

Under this project, with the help of US-supplied materials and equipment, the Russian workers were to seal Cable Penetrations, Doors and Hatch Covers, Liner Weld Seams, and Stem Penetrations in the confinement of Kola Units 1 and 2. The Russian workers were to also apply surface coatings to all internal compartment surfaces consisting of floors, walls and ceilings in these confinements.

The tasks and sub-tasks accomplished as part of this activity are described briefly below:

1. Project planning. This task consists of several sub-tasks:

   (i) Prepare Project/Task Information Sheet. The "Kola Confinement Leaktightness" Near Term Risk Reduction Project originated in February 1993 with the issuance of the Project/Task Information Sheet and subsequent approval by the Expert Working Group.

   (ii) Final Project Definition and Preparation of the Project Work Plan. The original draft Project/Task Information Sheet document was revised in October, 1993. This document defined the tasks which would be performed in order to improve the leaktightness of Kola Unit 2.

2. Negotiate and award contract for materials, equipment, test application and training. The specifications for the materials, applications technology and training were developed between February 1993 and June 1993. The BNL Specification for the work was issued in a Request for Proposals in June 1993. The contract for the work was issued to Promatec in July 1993. This contract provided for materials, applications technology and training for a test application of the sealant to the Instrument and Control compartments in Kola Unit 2.

3. Test application of sealant materials and delivery of materials and equipment to Kola NPP. The test application of sealant to improve the leaktightness of the I & C compartments at Kola Unit 2 was performed during August and September 1993. A leaktightness test of the two compartments was carried out, and was judged successful. The material was judged suitable for completion of application at Unit 2. Following this demonstration, the contract for delivery of sealant materials, equipment, training, and technical support to Kola NPP for the completion of the leaktightness task at Unit 2 was awarded to Promatec, and the materials and equipment needed to complete the leaktightness improvements were delivered to the Kola NPP. The Russian workers were trained in the materials application technology to continue the work at the plant.

4. Sealant/gasket installations in Kola Unit 2. Application of the sealants and gasket materials in Kola Unit 2 were begun during plant outages in the time period from August 1994 to December 1994. Additional gasket material requested by Kola NPP was ordered and delivered. The installation of gaskets and application of the sealant were completed by May 1996.

5. Confinement inspection and integrated pressure test of confinement. Inspection of sealed surfaces after exposure to confinement conditions subsequent to plant operations was conducted in the Spring of 1996. A plan for the confinement pressure test was developed by Kola NPP and reviewed and approved by BNL. An integrated pressure test of the effectiveness of the sealant and gasket applications was performed on the Unit 2 confinement in May 1996 and a test of the Unit 1 confinement was performed in November 1996. Copies of the integrated leaktightness tests for both units are included in the attachments to this report.

A listing of the deliverables accomplished under this task are listed below. All of the deliverables below and the project milestones in the Project Work Plan have been accomplished, in spite of customs difficulties and scheduling delays with the Kola NPP plant staff.

1. Deliver sealant materials and application equipment to Kola NPP.

2. Train the Russian personnel in materials applications technology.

3. Provide a test application of sealant materials to the I&C compartment of Kola Unit 2.

4. Complete the application of sealants to penetrations and surfaces and the installation of gaskets as identified in Project Information Sheet for the Kola Unit 2.

5. Inspect the seals at Kola NPP after exposure to plant operations.

6. Report on the pressure tests of the confinements of Kola Units 1 and 2.

There are eight attachments to this report, the Project Work Plan which documents the authorization basis for the project (Attachment 1), two reports in the form of Foreign Travel Trip Reports by G. A. Greene (BNL) for on-site evaluation of the progress of the leaktightness project at the Kola NPP (Attachments 2,3), the approved Kola NPP procedural guide for confinement leaktightness testing (Attachment 4, translated to English), the Kola NPP reports on the leaktightness results for both Kola Unit 1 and 2 (Attachments 5,6, in Russian and translated to English), a written request by the Kola NPP management for additional materials to further improve leaktightness in Units 1 and 2 (Attachment 7, in Russian and translated to English), and a written request to Burns and Roe for two manual isolation valves for Kola Unit 2 to supplement the automatic isolation valves already installed (Attachment 8, in Russian and translated to English). Attachments 7 and 8 represent unresolved action items which require resolution. Action is underway by BNL to resolve these requests to the mutual satisfaction of the DOE and Kola NPP.

ATTACHMENTS

1. Project Work Plan, WBS Number 1.2.2.1, Revision 1, January 25, 1996, Project Title: Kola Confinement Leaktightness.

2. Foreign Travel Trip Report of G.A. Greene, 5/24-30, 1996 to Kola Nuclear Power Plant, Polyarnie Zori, Russia.

3. Foreign Travel Trip Report of G.A. Greene, 10/11-19, 1996 to Kola Nuclear Power Plant, Polyarnie Zori, Russia.

4. Kola Nuclear Power Plant Procedural Guide for Confinement Leaktightness Testing.

5. Results of Leaktightness Testing for Kola Unit 2 (5/96) (English and Russian).

6. Results of Leaktightness Testing for Kola Unit 1 (10/96) (English and Russian).

7. Request for Additional Material for Leaktightness Improvements, Kola Units 1, 2 (English and Russian).

8. Request from Kola NPP to B&R for Manual Isolation Valves, Kola Unit 2 (English and Russian).

ATTACHMENT 1

Project Work Plan
WBS Number 1.2.2.1, Revision 1
January 25, 1996
Project Title: Kola Confinement Leaktightness

Project Work Plan

WBS Number: 2.2.1
Revision 1
January 25, 1996

1. Project Title:	**Kola Confinement Leaktightness**
2. Responsible Contractor:	Brookhaven National Laboratory (BNL)
3. Responsible Individual:	James G. Guppy/T. Ginsberg
4. Total Estimated Cost:	$ 876K (US Contribution)
5. Host Organization/ Primary Contacts:	Kola Nuclear Power Plant; Rosenergoatom

6. Technical Objective:

The major objective of this project is to improve the leaktightness of the Kola Unit 2 VVER confinement boundaries, through the application of a variety of sealants to penetrations, doors and hatches, seams and surfaces, to the extent that current technology permits. A related objective is the transfer, through training of Russian staff, of the materials application technology to Kola NPP.

7. Scope:

This project is part of an overall approach to minimizing uncontrolled releases from the Kola NPP Unit 2 VVER-440/230 in the event of a serious accident, and thereby significantly mitigate the consequences of such an accident. The U.S. will provide materials, application technology, and applications equipment for application of sealant materials, surface coatings, potting materials and gaskets, to improve the confinement leaktightness of the Kola Unit 2. The U.S. will also provide for training of Russian personnel in the applications technology. Under this project, with the help of US supplied materials and equipment, the Russian workers will seal Cable Penetrations, Doors and Hatch Covers, Liner Weld Seams, and Stem Penetrations in the confinement of Kola Unit 2. The Russian workers will also apply surface coatings to all internal compartment surfaces consisting of floors, walls and ceilings in this confinement.

8. Description of Activities:

(a) Project Planning. This task consists of several sub-tasks as outlined below:

(i) Prepare draft Project/Task Information Sheet. The "Kola Confinement Leaktightness" Near Term Risk Reduction Project originated in February 1993, with the issuance of the Project/Task Information Sheet on February 24, 1993. This project definition was subsequently approved by the Expert Working Group for this work.

(ii) Final Project Definition. The original draft "Project/Task Information Sheet" document was revised on October 18, 1993. This document defined the tasks which would be performed in order to improve the leaktightness of Kola Unit 2.

(iii) Prepare the Project Work Plan. Updating of the Project Work Plan will be done, if

necessary, because of cost, schedule or scope of work changes.

(b) Negotiate and award contract for materials, equipment, test application and training. The specifications for the materials, applications technology and training were developed between February 1993 and June 1993. The BNL Specification for the work was issued in a Request for Proposals in June 1993. The contract for the work was issued to Promatec in July 1993. This contract provided for materials, applications technology and training for a test application of the sealant to the Instrument and Control compartments in Kola Unit 2.

(c) Test Application of Sealant Materials and delivery of materials and equipment to Kola NPP. The test application of sealant to improve the leaktightness of the I & C compartments at Kola Unit 2 was performed during August and September 1993. A leak tightness test of the two compartments was carried out, and was judged successful. The material was judged suitable for completion of application at Unit 2. Russian workers were trained as applicators to continue the work at the plant.

(d) Award contract for delivery of sealant materials, equipment, training, and technical support to Kola NPP for the completion of the leaktightness task at Unit 2. This contract was awarded only after successful completion of Task (c) above.

(e) Delivery of materials and equipment to Kola NPP.

(f) Training of Russian workers in the materials application technology.

(g) Sealant/Gasket Installations in Kola Unit 2. Application of the sealants and gasket materials to Kola Unit 2 were performed during plant outages in the time period from August 1994 to December 1994. Substantial work still remains to be performed. Completion of sealant applications, except for the spare penetrations, is expected to be completed by the Kola NPP during the next plant outage.

(h) Order and deliver any additional materials and equipment that may be needed for completion of the leaktightness project. Additional gasket material requested by Kola NPP is scheduled to be ordered during February 1996. When the NPP is ready for the integral leak test of the confinement, it is likely that they may request additional test equipment.

(i) Confinement Inspection and Pressure Test. This task consists of several sub-tasks as outlined below:

(i) Inspection of Seals. Inspection of sealed surfaces after exposure to confinement conditions subsequent to plant operations will take place during the next planned outage, scheduled for late Summer 1996. A site visit by Promatec, BNL, the NPP staff, and perhaps others, featuring an inspection will be planned, and a report will be issued which documents the condition of the sealant materials in situ after exposure to plant conditions for one year.

(ii) Planning for the Confinement pressure test will be performed by Kola NPP, and this plan will be reviewed by BNL.

(iii) Pressure Test of Confinement. An integrated pressure test of the effectiveness of the sealant and gasket applications will be performed on the confinement, or on selected rooms of the confinement.

(j) Provide on-call assistance and problem resolution based on requests from DOE, Kola NPP, PNNL, and the Contractor. These include: (a) A draft report on "Kola Confinement Leaktightness Project: Response to Empressarios Agrupadaos Report" - issued on July 31, 1995, and (b) a "white-paper" on the "Confinement Leaktightness Programs for the Russian NPPs" - currently in progress.

9. Deliverables:

(a) Deliver sealant materials and application equipment to Kola NPP.

(b) Russian personnel trained in materials applications technology.

(c) Provide a test application of sealant materials to the I&C compartment of Kola Unit 2.

(d) Completed application of sealants to penetrations and surfaces, and installation of gaskets, as identified in Project Information Sheet for the Kola Unit 2.

(e) Report from Promatec summarizing sealant application work performed on Kola Unit 2.

(f) A report on the inspection of seals at Kola Unit 2 after exposure to plant operations.

(g) A report on the Pressure Tests of the confinement of Kola Unit 2.

10. Project Schedule Milestones:

(a)	Prepare draft Project/Task Information Sheet	24FEB1993
(b)	Award contract for test application in I&C compartments	30JUL1993
(c)	Complete test application of sealant materials to the I&C compartment of Kola Unit 2.	15SEP1993
(d)	Complete Project/Task Information Sheet (Project Definition)	18OCT1993
(e)	Award contract for materials, equipment, and training.	21JUL1994
(f)	Delivery of sealant materials and application equipment to Kola NPP.	15AUG1994
(g)	Complete training of Russian personnel in materials application technology.	30SEP1994
(h)	Complete application of sealants to penetrations and surfaces, and installation of gaskets, for the Kola Unit 2.	30AUG1996
(i)	Inspection of sealed surfaces after exposure to confinement conditions during plant operations.	23SEP1996
(j)	Pressure Test of Confinement.	30SEP1996
(k)	Project Complete	30SEP1996

Please see the attached Gantt chart.

11. Period of Performance:

February 24, 1993 through September 30, 1996.

12. Time Phased Budget:

Please see the attached time-phased budget sheet.

13. Materials, Supplies, and Subcontracts:

Contracts for the sealant materials, applications equipment, a test application of the sealant to the Instrument and Control compartments in Kola Unit 2, and training of the Russian workers in materials application technology were issued to Promatec. Additional materials will be purchased from other vendors.

14. Partner Country Contribution:

The Kola NPP will provide staff for implementation of this project. This includes staff for interaction with the US side and Contractor, personnel to be trained in the materials application technology that will perform the actual task of sealing the confinement, and the supervisory staff. The NPP is also responsible for actual installation of sealant materials, and for providing any materials or equipment that is not provided by the US side.

15. Notes and Contingencies:

Since this project is a cooperative effort between the US side and the Kola NPP, the milestones indicated in this project work plan are dependent upon NPP activities. If the application of sealant materials to all the penetrations, doors, hatches, seams, and surfaces of the confinement is not completed during the upcoming plant outage in May 1996 by the Kola NPP staff, then the project will be delayed until after the subsequent plant outage.

Kola Confinement Leaktightness

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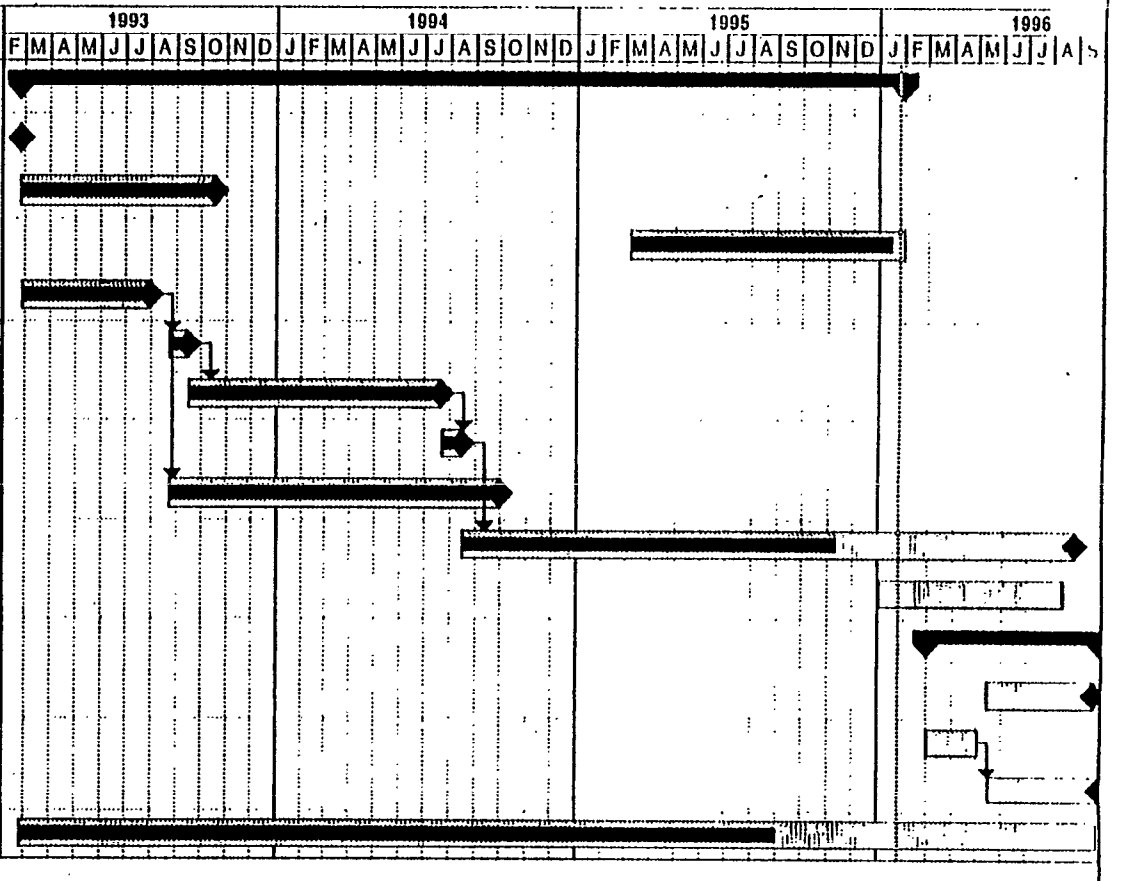
ID	Task Name	Duration	Start	Finish
1	**Project Planning**	766d	2/24/93	1/31/96
2	Prepare draft Project/Task Information Sheet	1d	2/24/93	2/24/93
3	Final Project Definition	169d	2/24/93	10/18/93
4	Prepare Project Work Plan	237d	3/7/95	1/31/96
5	Negotiate and award Test Application Contract	111d	2/26/93	7/30/93
6	Complete Test Application to I&C Compartments in Kola Unit 2	18d	8/23/93	9/15/93
7	Award Contract for material, equip, training, and tech supp.	221d	9/16/93	7/21/94
8	Delivery of Materials and equipment to Kola NPP	17d	7/22/94	8/15/94
9	Training of Russian workers in applications technology	200d	8/23/93	9/30/94
10	Sealant/Gasket Installation in Kola Unit 2	534d	8/16/94	8/30/96
11	Order and deliver additional material to Kola NPP as needed	163d	1/2/96	8/15/96
12	**Confinement Inspection and Pressure Test**	152d	3/1/96	9/30/96
13	Inspection of Seals	95d	5/14/96	9/23/96
14	Complete pressure test plan	45d	3/1/96	5/2/96
15	Confinement Pressure Test	98d	5/16/96	9/30/96
16	Provide on-call assistance and problem resolution	938d	2/24/93	9/27/96



Project: Kola Confinement Leaktightness
Date: 1/25/96

Task — Summary — Rolled Up Progress
Progress — Rolled Up Task — Progress
Milestone — Rolled Up Milestone

stimate Kola Confinement Leaktightness

2.1

Period of Performance: October 1995 to September 1996

Cost Element	Est. Staffmonths FY96	Est. Staffmonths FY97	Labor $ FY96	Labor $ FY97	Total
Labor					
Sub-total BNL Labor	3.5	0	$70,140	$0	$70,140
PNL Labor	0	0	$0	$0	$0
Subcontracted Labor	0.5	0	$9,360	$0	$9,360
Total Labor	4.00	0.00	$79,500	$0	$79,500

BNL Travel

Destination	# of trips	# of Days	# People	Per Diem	Transp	Handling	G&A	Total
NY to Vendor FY96	2	2	2	$1,208	$2,800	$601	$2,097	$6,706
NY to Vendor FY97	0	0	0	$0	$0	$0	$0	$0
NY to Vendor FY98	0	0	0	$0	$0	$0	$0	$0
Sub-total Domestic	2	2	2	$1,208	$2,800	$601	$2,097	$6,706
NY to Moscow FY96	1	3	7	$5,565	$14,686	$3,038	$10,596	$33,885
NY to Moscow FY97	0	0	0	$0	$0	$0	$0	$0
NY to Moscow FY98	0	0	0	$0	$0	$0	$0	$0
Sub-total Foreign	1	3	7	$5,565	$14,686	$3,038	$10,596	$33,885
Sub-total Travel	3	5	9	$6,773	$17,486	$3,639	$12,694	$40,592

ials & Supplies	$5,000	$750	$2,616	$8,366

Contracts/Equipment	Contract	BNL MH	BNL G&A	Total
Contracts	$25,000	$1,500	$2,558	$29,058
Commitments as of 12/95	$12,085	$725	$1,236	$14,046
Total Contracts/Equipment	$25,000		$3,794	$43,104
Contingency			-	$40,000
Actual Cost thru 12/95				$663,900
Total Estimated Costs				$875,462

Cost Estimate Kola Confinement Leaktightness
WBS 2.2.1
Period of Performance

Time-Phased Estimate

October 1995 to September 1996

	Oct-95	Nov-95	Dec-95	Jan-96	Feb-96	Mar-96	Apr-96	May-96	Jun-96	Jul-96	Aug-96	Sep-96	FY94/FY95	FY96	Total
Staffmonths				0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44		4	
Labor $				$8,833	$8,833	$8,833	$8,833	$8,833	$8,833	$8,833	$8,833	$8,833		$79,500	$79,500
Travel						$3,353		$33,865		$3,354				$40,592	$40,592
Materials & Supplies						$8,366								$8,366	$8,366
Contract $							$14,046			$29,058				$43,104	$43,104
Contingency												$40,000		$40,000	$40,000
Actual Cost to Date	$772	$0	$0										$663,128	$772	$663,900
Total Estimated Costs	$772	$0	$0	$8,833	$8,833	$20,552	$22,879	$42,718	$8,833	$41,245	$8,833	$48,833	$663,128	$212,334	$875,462

Funding FY92/93	$683,935
Funding needed FY94	$191,527
Total Funding	$875,462

ATTACHMENT 2

Foreign Travel Trip Report of G.A. Greene
5/24-30, 1996 to Kola Nuclear Power Plant
Polyarnie Zori, Russia

DOE Trip No. 9603507

SUMMARY

FOREIGN TRAVEL TRIP REPORT

G. Alanson Greene, Mechanical Engineer
516-344-2296
Department of Advanced Technology
Building 820M
BROOKHAVEN NATIONAL LABORATORY

June 7, 1996

Dates of Trip: May 24-30, 1996

Destination: Kola Nuclear Power Plant, Polyarnie Zori, Russia

Statement of Purpose of Trip:

The purpose of the trip is to lend technical support and consulting to the staff at the Kola NPP in their integrated reactor safety program. During the trip, a walkdown of the Kola Unit 2 confinement will be conducted in order to visually examine the condition of the confinement boundary and sealant. The confinement pressurization and leaktightness testing will be witnessed. The status of the installation of the high-level confinement radiation monitors will be reviewed and all action items decided. Future activities will be discussed.

Abstract:

The walkdown of Unit 2 of the Kola NPP was conducted in concert with the under pressurization leak tightness tests of the confinement. Leakage points were identified and the defects were corrected by the application of sealant material where possible. The hutch locks, isolation valves, new gaskets, and the sealant have been installed during the current outage. The over pressurization test was observed following the under pressurization test. Discussions were held with the Kola management concerning their need for additional aid in the form of similar hardware for the upgrade of Unit 1, which goes into an outage on July 1, 1996. A review of the installation of the confinement radiation detectors was held and the project status was discussed. A conference call was scheduled for June 6, 1996 between Kola, BNL, and Victoreen to begin planning for a return visit to Kola for the final installation of the high level confinement radiation monitoring system.

Detailed Trip Report

George Greene (BNL) visited the Kola NPP (Unit 2) in Polyarnie Zori, Russia, from May 24-May 30, 1996, to review the current status of the installation of the high-level confinement radiation monitor system, and to witness and participate in the Unit 2 confinement leaktightness tests that were planned for May 28-30.

The four radiation monitors have been installed in the Kola Unit 2 confinement on the steam generator level in the vicinity of two steam generators and two primary coolant loops. The four sets of in-confinement power and signal cables have been pulled through steel conduits and have been passed through the confinement penetrations into the reactor building (ex-confinement). At the request of the Kola management, an additional 1000 feet of RG59 coaxial cable has been added to the shipment of the two field calibrators; this cable is needed to complete the wiring to the readout devices and the remote displays. Matrix International is making progress on shipping this material by air to Moscow and then by truck to Kola.

The confinement leaktightness testing began on May 26 and continued until May 28. The details of the test procedures are contained in a Kola test protocol document, a copy of which was supplied. The results of the testing were faxed to BNL in a summary report. Both documents are on file at BNL. A short summary of the tests follows. The first part of the leaktightness testing involved an under pressurization test in which a vacuum was pulled on the confinement of 226 mm H_2O by operation of the confinement ventilation fans, resulting in an in-flow of air through defects in the confinement boundary. During the under pressure test, personnel entered the confinement and examined the boundaries for leaks. These were marked and later repaired with sealant material, after the ventilation system had been sealed off to measure the time for the confinement to return to ambient pressure. Next, the overpressurization test was performed. A positive pressure was established in the confinement by operation of a compressor, and the resulting pressure in the confinement was measured. Leakage sites were again located and, at the end of the pressurization test, the leakage rate was determined (after the compressor had been shut down) by measuring the time for the confinement to bleed down to the ambient pressure (ie., $P_{gauge} = 0$).

The Kola summary report indicates that during the 1994 outage the Unit 2 confinement had been able to be pressurized to 70 mm H_2O and exhibited a leak rate of 4950 vol%/day. However, during the 1996 tests, the confinement was able to be pressurized to 275 mm H_2O and the leakage was reduced to 768 vol%/day. The sharp reduction in the measured leak rate can be attributed to the confinement leakage upgrades supplied through the INSP program: new isolation valves, replacement hutch locks, new gaskets, and application of sealant material to local defect sites. Several dozen leak sites remain which the plant intends to repair prior to startup on June 7, 1996. The reported leak rate was measured with these known defects yet unrepaired, hence the leakage at startup should be less than reported above. The Kola staff indicated that they were prepared to continue to upgrade the Unit 2 confinement to further reduce the leakage, and that they were interested in applying the same upgrades to Unit 1, another VVER 440-230 of similar age.

Appendix

Itinerary:

May 24, 1996	Depart New York JFK
May 25	Official Stop Over in St. Petersburg
May 26	Arrive Polyarnie Zori, Russia
May 26-28	Observe Leaktightness Tests and Discuss Status of Radiation Monitor Project
May 29	Depart Polyarnie Zori, Russia; Official Stop Over in Helsinki
May 30	Arrive New York JFK

People Contacted:

Gennady Paradnikov	Head of Adjustment and Startup Department
Sergey Gorelikhin	Deputy Head of Adjustment and Startup Department
Leonid Popruzhko	Engineer-in-Charge of Radiation Monitor Installation
Anatoly Tutunnik	Deputy Chief Engineer

Literature Acquired:

Procedural Guide for Conducting Leaktightness Testing of the Kola Confinement, on file in Russian.

Summary Report of 1996 Leaktightness Tests of Kola NPP Unit 2, translated to English and attached (9 pages).

ATTACHMENT 3

Foreign Travel Trip Report of G.A. Greene
10/11-19, 1996 to Kola Nuclear Power Plant
Polyarnie Zori, Russia

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: October 24, 1996

TO: Vanessa E. Crump

FROM: G. A. Greene G. A. Greene

SUBJECT: Foreign Travel Trip Report and Travel Voucher for Trip #9606937

I have attached my foreign travel trip report with copies of three attachments. The attachments are designated by number with post-its. Please remove the post-its and type "ATTACHMENT NO. ___" at the top of each one.

I have also attached the necessary information for the travel voucher, including the airline receipt, two limousine receipts, copies of two checks to Travisa, cash advance, travel itinerary, my itemized expenses, and a sample "lodging and meals expense report" to assist you in preparing the travel voucher. I estimate a refund of approximately $311.00 due to me. Please try to have the voucher ready for my signature by October 29; if that will not be possible, let me know right away.

Cc: J. G. Guppy
A. W. Reisman

To V. Crump
1130
10/24/96

DOE Trip No. 9606937

SUMMARY

FOREIGN TRAVEL TRIP REPORT

George Alanson Greene, Mechanical Engineer
516-344-2296
Department of Advanced Technology
Building 820M
BROOKHAVEN NATIONAL LABORATORY

October 24, 1996

Dates of Trip: October 11-19, 1996

Destination: Kola Nuclear Power Plant, Polyarnie Zori, Russia

Statement of Purpose of Trip:

The purpose of the trip is to complete the installation of the confinement high-level radiation monitoring system and to bring the system on line. In addition, the status of other INSP projects at the Kola NPP are to be reviewed, including the confinement leaktightness upgrades, the confinement isolation valves, and the emergency backup batteries. Other discussion points include the translation diskettes of the manual for the radiation monitoring system, the compilation of US standards for confinement radiation monitoring, and the contract with Kola for installation of the radiation monitoring system.

Abstract:

Two of the four radiation monitors were installed in the confinement and all electrical connections to the readout devices in the Unit 2 control room and to the remote indicators were completed. Only one detector system is operational; there is a short in the wiring for the second detector which we believe is a result of damage to the detector connector during hookup by the Kola staff. The other two detectors were not mounted in the confinement during our visit as a result of a misunderstanding. Kola staff will mount them and complete the wiring as we demonstrated for the other two detectors. A return visit will be required during the next outage to complete the installation of the radiation monitoring system. An update was given on the leaktightness work for Units 1 and 2. The status of the installation of the emergency backup batteries and the schedule for completion of the installation were discussed. A request for manual controls for two of the isolation valves was received for consideration. The translation diskettes of the manual for the radiation monitoring system were delivered, the US standards for confinement radiation monitoring were sent, and the $14,000.00 contract for installation of the cables for the radiation monitoring system was discussed.

Detailed Trip Report

Confinement Radiation Monitoring System for Kola Unit 2. BNL and Victoreen representatives visited the Kola NPP (October 11-19, 1996) to begin the final installation of the high-level confinement radiation monitoring system in Kola Unit 2. Non-standard connections were constructed at the confinement penetrations for the power and signal cables for each of the four detectors. The power and signal cables were terminated in a temporary rack in the reactor control room along with the wires from the four remote alarming-indicators. Only two of the four detectors were installed in the confinement, therefore we were only able to work on two detectors. One train of two detectors was wired to the readouts, a recorder, and two remote indicators; Kola staff will wire the second train themselves in exactly the same configuration as the first train. When the system was calibrated, all four readouts, two recorders, and four remote indicators worked properly. However, one cable was accidentally shorted out at the detector by the Kola staff during installation, so only one of the four detector channels was able to be made operational. This channel was tested with the radioactive field calibrator and it operated exactly as it had been calibrated at the Victoreen Company. It will be necessary to return to Kola during the next scheduled outage to correct the cabling deficiencies and to bring the entire system operational. It may be desirable to bring one Kola staff to Victoreen for in-depth training on the system before then.

Status of Confinement Leaktightness, Isolation Valves, and Emergency Backup Batteries at Kola NPP. The status of the INSP projects indicated above were determined through briefings by the cognizant Kola personnel during the visit to install the confinement high-level radiation monitoring system. Discussions were held with T. Petkevich (Chief of Localizing Systems Laboratory) concerning the leaktightness upgrades and the confinement isolation valves. At the time of my visit in May 1996, 21 leak sites were identified for correction prior to restart of Unit 2 in June 1996. Kola personnel were able to correct 15 of the 21 defects prior to restart (see Attachment 1). A total of fifteen additional defects have been identified for correction during the next scheduled outage. As for Unit 1 which is presently on an outage, 80% of the planned work on leaktightness has been completed. Kola has requested additional gasket material, sealant material, and valves in a memo from the plant chief engineer, which will be translated and forwarded for consideration (Attachment 2 in Russian). Prior to restart of Unit 1, leaktightness tests will be performed as was done for Unit 2 in May 1996. T. Petkevich requested that I look into her request for manual controls for two of the isolation valves which had been sent to Burns and Roe in May 1996. This request was communicated to R. Denning by telephone and is included in this report as Attachment 3. Discussions were held with A. Simeonov (Deputy Chief of the Electrical Department) concerning the status of the installation of the emergency backup batteries for Units 1 and 2. Two batteries and their switching panels were installed for Unit 2 in June 1996. The two batteries and switching panels for Unit 1 are currently being installed and are expected to be completed by the end of October 1996. The fifth battery and switching panel system which is common to both units is being installed and is expected to be completed before restart of Unit 1.

Appendix

Itinerary:

October 11, 1996	Depart New York JFK
October 12	Arrive Polyarnie Zori, Russia
October 13-17	Install Radiation Monitor System and Discuss Status of INSP Projects at Kola
October 18	Depart Polyarnie Zori, Russia; Official Stop Over in Oslo
October 19	Arrive New York JFK

People Contacted:

Gennady Paradnikov	Head of Setup, Testing, and Startup Department
Sergey Gorelikhin	Deputy Head of Adjustment and Startup Department
Leonid Popruzhko	Engineer-in-Charge of Radiation Monitor Installation
Tatiana Petkevich	Chief of Localizing Systems Laboratory
Alexander Simeonov	Deputy Chief of the Electrical Department
Marina Kasakova	Kola Interpreter

Literature Acquired:

1. Update to the "Summary Report of 1996 Leaktightness Tests of Kola NPP Unit 2," translated to English (9 pages).

2. Memo from Omelchuk to Greene, "Request For Additional Gasket Material, Sealant Material, and Valves," dated October 16, 1996, in Russian (2 pages).

3. Memo from Omelchuk to Chuebon (Burns and Roe), "Request For Manual Controls For Two Isolation Valves," dated May 11, 1996, in Russian (2 pages).

ATTACHMENT 4

Kola Nuclear Power Plant Procedural Guide for
Confinement Leaktightness Testing

KOLA NUCLEAR POWER PLANT

LEAKAGE TESTS OF THE PRESSURIZED CONTAINMENT BUILDING SYSTEM

UNITS 1 AND 2 WORKING PROGRAM

APPROVED:

Deputy chief engineer for operations
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DEVELOPED BY:

Setup, testing and startup shop
Head of TsNIP
[signed] G. S. Paradnikov

1994

RUSSIAN FEDERATION MINISTRY OF ATOMIC ENERGY
KOLA NUCLEAR POWER PLANT

APPROVED:
Head of 2GU, GAN RF
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8 September 1994

CONFIRMED:
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LEAKAGE TESTS OF THE PRESSURIZED CONTAINMENT BUILDING SYSTEM. UNITS 1 AND 2. WORKING PROGRAM

Kola NPP

APPROVED:

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[footer - signatures of Petkevich, Gorelikhin, Paradnikov, Petroc and Omel'chuk]

12-11-20 PG-94

Pressurization leakage tests of containment building of accident containment system. Units 1 and 2. Working program.

Kola NPP Setup, Testing and Startup Department

1994

1. INTRODUCTION

1.1. This program defines the scope, sequence and procedures for conducting the leak testing of the pressurized containment building (GO) system of reactor units 1 and 2, the criteria for the successful completion of the tests, and the required safety measures.

1.2. The tests of the GO system are divided into the following:

1.2.1. Preliminary integrity testing by vacuum tests to detect defects of the GO system.

These tests are to be performed periodically, during the time for preventive maintenance (PPR).

1.2.2. Integrated leakage tests to confirm the functional acceptability of the GO system as a safety containment system and to determine the levels of leakage from the GO system.

These tests are to be performed periodically during preventive maintenance on the power generating unit in question, once a year.

Integrated tests are to be performed with a positive pressure of 0.14 kgf/cm^2 before the execution of operations for the prevention of rupture of the lining of the central room, the spent fuel pool, etc.

After the executions of the operations to ensure the integrity of the lining of the rooms indicated above, tests of the pressurized containment building system (SGO) are to be performed at a positive pressure of 0.3 kgf/cm^2.

1.3. The deadlines for the performance of the tests are defined by the "Working program for the startup of unit 1 (2) after preventive maintenance."

1.4. A representative of the setup, testing and startup department, to be designated at the first test according to the program by instruction from the chief engineer of the Kola Nuclear Power Plant, conducts technical supervision of the testing; thereafter the technical supervisor is to be designated by instruction of the head of the setup, startup and testing department (TsNIP).

1.5. Operating personnel of the reactor shop, the thermal automation and measurement department and the electrical shop, personnel of the centralized repair shop and personnel of the TsNIP are recruited for the tests at the discretion of the technical supervisor.

On-duty repair teams of the reactor shop (RTs), the centralized repair shop (TsTsR), the thermal automation and measurement department (TsTAI) and the electrical shop (ETs) are provided for the time required for the performance of the tests for the current elimination of defects.

The individuals responsible for the operations are the heads of the shops.

1.6. The technical supervisor of the tests is to execute all operations involved in the performance of work under this program after receiving the approval of the shift chief of the NPP or the phase shift chief (NSO). All switches are to be thrown by the shift personnel of the shops according to their areas of responsibility.

1.7. The NSO is to provide working supervision of the operations in strict adherence to

the specifications of this program.

1.8. This program has been developed on the basis of the following documentation:

- "The VVER nuclear power plant, the V-230 and V-270 reactor plant, and the pressurized containment building system. Standard program of operating leakage tests. 230.270.KhA.KAV.PM";
- "Regulations for the construction and operation of safety containment systems for nuclear power plants. PN AEG-10-021-90";
- "Instructions for safety inspections in the operation of nuclear power facilities. RD-7-5."

1.9. List of abbreviations used in the text.

BV - spent fuel pool;
BShchU - unit control room;
GO - pressurized containment building;
KZV - exhaust stopper valve;
KZP - inlet stopper valve;
KID - excess pressure valve;
NSO - phase shift chief;
NS AES - nuclear power plant shift chief;
OOTiTB - labor protection and safety equipment department;
OYaBiN - nuclear safety and reliability department;
PPR - preventive maintenance;
PG - steam generator;
RO - reactor section;
RTs - reactor shop;
TsD - radioactive decontamination department;
TsTAI - thermal automation and measurement department;
TsNIP - setup, testing and startup department;
TsTsR - centralized repair shop;
ShchAO - hardware section control board;
ETs - electrical shop;
SGO - pressurized containment building system.

1.11. The time required for the execution of this program is as follows:
the vacuum testing stage - 12 hours;
the integrated test stage - 24 hours.

1.12. The tests in question are to be conducted on the basis of item 8.3 of the "Regulations for the construction and operation of safety containment systems for nuclear power plants. PN AEG-10-021-90."

2. SAFETY SPECIFICATIONS IN THE EXECUTION OF OPERATIONS

2.1. In the performance of the tests, the following specifications apply: items 2.5 and 2.8 of the "Regulations for safety procedures in the operation of thermomechanical equipment of power stations and heating systems," chapters I and II of "Standard regulations for fire safety for industrial enterprises" and "Instructions on radiation safety of the NPP" (item 6, 7, 8 and 9) and chapters 4, 8 and 9 of the "Regulations for fire safety operation of power plants" (PPB-AS-93).

2.2 Personnel certified according to the official instructions are to be cleared to participate in the operations involved in the leakage testing of the pressurized enclosure system, provided they have successfully completed:

- a test on their knowledge of the regulations for safety procedures and fire safety regulations, and the working programs and testing methods;
- training on safety procedures, radiation safety and fire safety regulations.

2.3. During the performance of the tests, the operating personnel are to conduct continuous monitoring of the state of the reactor plant and the safety systems and are to report in advance to the technical supervisor of the tests concerning any changes in switches on the operating systems involved with the reactor plant.

2.4. For the period of the performance of leakage tests of the pressurized enclosure with positive pressure, all operations at the reactor unit not involved with the performance of the tests are to be suspended, and all personnel not participating in the performance of the tests (with the exception of operating personnel) are to be removed from the pressurized enclosure area. The beginning of testing is to be announced by loudspeaker. A safety zone is to be designated by warning posters: "Danger Zone, Access Prohibited." The beginning of the sealing of doors to the pressurized enclosure is to be considered the beginning of testing.

2.5. All types of operations in the pressurized enclosure and within the safety zone are to be suspended for the testing period. The presence of personnel not participating in the tests being conducted in the pressurized enclosure or within the established safety zone is not permitted. All areas directly adjoining the pressurized enclosure are considered to be associated with the safety zone.

2.6. The personnel participating in the tests are to be admitted to the pressurized enclosure according to a list approved by the test supervisor. The entry of personnel into the pressurized enclosure and their departure from it are to be monitored by the list.

2.7. The presence and proper working order of primary fire extinguishing equipment are to be verified before the beginning of testing.

2.8. Should a fire break out in the testing zone, the phase shift chief is to announce to following actions:

- the immediate suspension of testing;
- the disengagement of the equipment which has been active in the tests;
- the dumping of positive pressure (or the vacuum in vacuum testing of the pressurized enclosure system;
- the unsealing of the pressurized enclosure to provide access to personnel for extinguishing the fire.

2.9. In the event of a fire in the unit control room (BShchU), the actions of item 2.8 are to be executed.

2.10. Scaffolding and support structures are to be installed by instruction of the technical supervisor of the tests for the inspection of the pressurized enclosure in locations where there are no stationary service platforms; these structures are to be dismantled and removed from the pressurized enclosure upon the conclusion of the tests.

2.11. The personnel participating in the performance of the tests are to be provided with individual protective equipment (helmets, coveralls and respirators). The personnel of the groups assigned to detect flaws in the components of the pressurized enclosure system are to have individual flashlights with a voltage not higher than 12 V.

2.12. In the inspection of the inner surface of the pressurized enclosure in vacuum testing, deviation from the predefined routes and the use of equipment or devices not specified in advance for this purpose for access to the inspection points are prohibited. During the leakage tests of the pressurized enclosure using positive pressure, the inspection within the premises of the electrical shop and the thermal automation and measurement shop is to be performed in the presence of operating personnel of the shops in question. The inspection of the pressurized enclosure is to be performed not sooner than 10 minutes after the pressure steps specified in the working program have been achieved.

2.13. Any extraneous objects are to be cleared from the zone for the performance of the tests and the inner rooms of the pressurized enclosure.

2.14. The prevention of any possibility of the ignition of objects in the pressurized enclosure or the safety zone is to be ensured, and fuels and lubricants, oxygen cylinders and fuel gases are to be removed from the pressurized enclosure.

2.15. The command point of the technical supervisor of the tests is to be equipped with reliable operating communications (telephone or loudspeaker):
- with the compressor station control panel;
- with the control panel for the ventilation systems which provide the creation of a vacuum inside the pressurized enclosure;
- with the unit control room, the hardware section control board and rooms A103, A 105 and A301;
- with the personnel groups performing the search for defects;
- with the rooms of operating personnel of the reactor section.

2.16. The following activities are not permitted during the tests:

- searching for defects in components of the pressurized enclosure by groups consisting of less than two people;
- opening or closing of the pressure doors or pressure hatches which seal the pressurized enclosure without a command from the technical supervisor for the tests;
- mechanical actions on the pressure lining (knocking on welds);
- the elimination of cracks or flaws under pressure by any method.

2.17. Access to the vacuum tests is provided according to thermal and radiation monitoring duties, while access to the pressurization tests is granted by order, with a notation in the operating log and the "Journal of records of operations by duties and orders."

3. EQUIPMENT NEEDED FOR PERFORMING THE TESTS

3.1. Two pressure check gauges with a scale of 0-1 kgf/cm^2 with an accuracy class of at least 0.4 are needed for performing the pressurization tests.

3.2. A U-shaped pressure and vacuum gauge with measurement limits of 200-500 mmH_2O is needed for vacuum testing of the pressurized enclosure.

3.3. A computer of the MK type is needed for performing calculations to determine the amount of leakage.

3.4. The following are needed for detecting flaws:
- buckets - quantity 5;
- soap solution - 10 l;
- brushes - quantity 5;
- battery-powered flashlights - quantity 5.

3.5. Chalk (10 pieces) or oil paint (1 l) and 5-6 small brushes are needed for marking the locations of leaks.

4. OPERATING RESTRICTIONS AND INSTRUCTIONS

4.1. Operations in regard to the opening of cut-off valves which are to be closed according to the list of annex 2 of this program are prohibited for the time required for performing the tests.

4.2. The performance of repair operations on valves, equipment or pipelines connected to the pressurized enclosure system or on sealed passages during the performance of the tests is prohibited.

4.3. Increasing the rate of change of the following parameters inside the pressurized enclosure system in the course of the performance of the tests is prohibited:

- the rate of increase of the pressure in the pressurized enclosure above 0.053 kgf/cm2·h.
- the rate of decrease of the pressure in the pressurized enclosure above 1.03 kgf/cm2·h.
- the rate of emergency pressure dumping from the pressurized enclosure (with the use of ventilation system B-4) above 1.53 kgf/cm2·h.

4.4. Pressure dumping from the pressurized enclosure system is to be performed by the engagement of ventilation systems B-2 (by switching on fan 1(2)B-2/1(2) and opening pressure valves 1(2)A2/1, 2 (3, 4), 2A-2/5, 6, 7, 8.

ventilation system V-4 may be engaged (switching on of fan 1(2) V-4-1(2) and opening of pressure valves 1(2) A-4/1, 2 (3, 4)) for rapid pressure dumping in an emergency.

4.5. The compressor is to be switched on for the pressurization of the containment building system after determination of the radiation situation in the rooms of the pressurized containment building by order of the shift chief of the labor protection department or with his consent.

4.6. During the performance of the tests, the electrically actuated air flow isolating valves are closed by remote control; manual final sealing is not permitted.

4.7. During the performance of tests of the pressurized containment building (GO) under positive pressure of 0.14 kgf/cm^2, the following actions are to be performed:

- after the pressure has been increased in the GO system, the pressure in the containment building is held at 0.13 - 0.14 kgf/cm^2 for 2 hours (the stabilization time);
- an increase in the positive pressure in the GO above 0.14 kgf/cm^2 is not permitted;
- in the performance of the first tests under this program, the leakage value is to be determined at three pressure stages of 0.05, 0.1 and 0.14 kgf/cm^2; later it is determined only at the level of 0.14 kgf/cm^2.

4.8. The following actions are to be executed in the performance of tests at a pressure of 0.3 kgf/cm^2:

- an increase in the pressure in the containment building above 0.3 kgf/cm^2 is not

permitted;

- after the pressure in the GO has been raised, the pressure in the GO is held at 0.25 - 0.3 kgf/cm^2 for 2 hours (the stabilization time);

- in the performance of the first tests of the pressurized containment building with a pressure of 0.3 kgf/cm^2, the leakage value is determined at 2 pressure stages of 0.14 and 0.3 kgf/cm^2; later it is determined only at the level of 0.3 kgf/cm^2.

4.9. During the rise in the pressure in the GO, the integrity of the lining of the spent fuel pool is monitored (according to the appearance of air bubbles in the water or by sound). In the event of the appearance of signs of a rupture, the tests are suspended, and the pressure is released from the containment building.

5. READINESS AND INITIAL STATE OF THE SYSTEM, AND RELATED SYSTEMS

5.1. The reactor plant is in a subcritical state, and the equipment of the primary loop is cooled to a temperature below 50°C. The safety systems are on "hot" standby.

The temperature in the steam generator box is not above 33°C.

5.2. All the cut-off valves which provide containment of the pressurized space are closed (according to Annex 2). A membrane is installed on the bubbler tank. The membranes on the reactor shaft cantilever have been dismantled.

The pressure relief valves (KID) from rooms A-004/1, 2 into the steam generator box in reactor unit 1 are wedged in the open position.

The traps in rooms A-004/3, 4 are open in unit 2.

5.3. All the containment hatches and doors of the GO are closed and sealed (with the exception of the doors in A-102/1 (2), 103/1 (2), 002/1 (2) at +2.7, A-106/1 (2), between A-102/1, 2 and A-204/1, 2, A010/1 (2), A-004/1, 2 (3, 4)), and the protective cover of the reactor and the process flange are installed and sealed, while the top covers of hatches of the central hall and system R-1 are removed. The protective plate of the spent fuel pool is removed.

5.4. Tank B-8 is filled to the nominal level.

5.5. The special compressor (system IS10) is prepared for operation for effecting the pressurization of the containment building. Seals are installed on the pressure pipelines:

- of unit 3 in room A-104/1;
- of unit 4 in room A-104/2;
- of the ShLA air traps of units 3 and 4 in rooms A-213/1, 2;
- of the phase unit 2 (1) which is not being tested in rooms A-107/2 (V-214/1).

Valves 4US10S33 on the pressure pipeline of unit 4 and 1,2US10S07, 08 on the pressure pipelines of units 1 and 2 of phase 1 are closed.

The stopper on the pressure pipeline of the first phase in the platform of phase II and on

the pressure pipeline of the unit being tested in room V-214/1 (A-107/2) is dismantled.

5.6. The reliability of the readings of the monitoring and measurement instruments used in the tests is verified - the thermal automation and measurement department (TsTAI) is responsible.

5.7. The lighting inside the GO and around the entire outside perimeter of the GO is to be in full working order - the electrical shop is responsible.

5.8. The telephone and loudspeaker communications are to be operational.

5.9. The ventilation systems R-1, P-4, V-2, V-4, R-2 and V-1 are switched off.

5.10. The ventilation systems 1(2) V-2 and 1(2) V-4 are ready for operation for dumping the positive pressure from the containment building system. Circuit protection has been removed for switching off the fans and valves of the system 1(2) V-2 and 1V-4 with an increase in the pressure in the steam generator box to 30 mmH_2O (from relay 203RP (203RP) for 1V-2-1(2), from relay 3RP (3RP) for 2V-2-1(2), and from relay 217RP (217(RP) for 1V-4-1(2); all the relays are situated on panel P4 of the hardware section control board). In the tests of the GO with a pressure greater than 0.2 kgf/cm^2, the circuit protection is removed for switching off the fans 2V-4-1(2) (from relay 5R32a (5R32-2), panel 100 ShchPR-2, and relay 6R33a (6R34), panel 24 BShchU-2), and circuit protection is removed in regard to the closing of the pressure valves of system 2V-2: 2A-2/8, 6 (from relay 5RP32-1, panel 100 ShchPR-2) and 2A-2/5, 7 (from relay 6R33, panel 24 BShchU-2), and system 2V-4: 2A-4/6, 7 (from relay 5R32-1, panel 100 ShchPR-2) and 2A-4/5 (from relay 6R33, panel 24 BShchU-2), with an increase in the pressure in the steam generator box to 0.2 kgf/cm^2.

5.11. Butterfly-type valves 1(2)V-4/1 - 6 and 1(2)G-4 are opened.

5.12. Before the beginning of the tests, the heads of the sections and subunits (reactor shop RTs, electrical shop ETs, thermal automation and measurement department TsTAI, centralized repair shop TsTsR, OKMiD, the radioactive decontamination department TsD, the labor protection and safety equipment department OOTiTB, the nuclear safety and reliability department OYaBiN and the setup, testing and startup department TsNIP) are to make an entry in the log of the nuclear power plant shift chief concerning the completion of operations at the unit and the readiness for the performance of tests of the containment building (a report by telephone to the NPP shift chief concerning the readiness for the performance of the tests is permitted as an exception).

5.13. The electrical control circuits of the NBS are to be switched off by PB keys on panel A7.

5.14. Insulating separators are to be installed on the normally closed contacts 3-4 and 5-6 or relays 1RA3 and 1RA4 in PA3-1 and 2 of control board SUZ-1 (2) for avoiding the startup of the ASP.

5.15. The following systems are to be sealed off according to the regular procedure: the main circulating pump safety valves, the control rods system safety valves and the service water of system R-1.

5.16. Just before the performance of tests of the containment building system with a positive pressure of 0.3 kgf/cm^2, the following operations are to be executed:

- holes with a diameter of 5 mm are drilled in the stainless steel lining of the central hall at a spacing of 2000 x 2000 mm;
- operations are performed in accordance with the plan SPbAEP on the unfastening of the corners of the spent fuel pool lining, the BZT inspection shaft, the upper block inspection shaft (A005, A221) and the room for storage of the control rod drive units (A-007);
- the spent fuel pool is filled to the top overflow level (mark +11.1).

6. LIST OF VARIABLE PARAMETERS

6.1. The pressure of the air medium of the pressurized containment building is to be recorded with two standard pressure gauges situated in rooms A-015/1 (2) and A-102/1 (2) instead of the regular EKM, or with pressure gauges located at the instrument station for the tests of the containment building, room V-109/1.

6.2. The vacuum in the rooms of the pressurized containment building are recorded with a U-shaped pressure and vacuum gauge situated in room A-103/1 (2) instead of the regular EKM.

6.3. The atmospheric pressure is checked every hour with the weather station (telephone 6-12-68).

7. CRITERIA FOR COMPLETION OF THE TESTS

7.1. The criterion in the first tests of the pressurized containment building (GO) under this program is the determination of the value of the leakage from the GO at three positive pressure steps: 0.05 kgf/cm^2, 0.1 kgf/cm^2 and 0.14 kgf/cm^2.

7.2. The criterion for the subsequent tests is to achieve the equality $L_{ek} = L_k \cdot 1.15$, where

L_{ek} - is the leakage value at a positive pressure in the GO of 0.14 kgf/cm^2, obtained during the tests;

L_k - is the certificate leakage value at a positive pressure $P_{pos} = 0.14$ kgf/cm^2, which satisfies the requirements of the NTD with respect to the radiation situation at the boundary of the buffer zone (SZZ).

7.3. In the pressurization tests, it is necessary to adhere to the criterion of reliability of the tests, $\Delta L_{si}/L_{ek} \leq 0.5$, with a confidence $P_d \geq 0.95$.

7.4. .The criterion for the completion of vacuum testing of the GO is the composition of a comprehensive list of defects of the components of the containment building from the inside of the building.

7.5. The criterion for tests of the GO with a positive pressure of 0.3 kgf/cm^2 is defined as follows:

- to determine L_{ek} at a pressure in the GO of 0.14 kgf/cm^2;
- if the condition of item 7.2 has been fulfilled, to raise the pressure in the GO to 0.3 kgf/cm^2 and determine $L_{ek}^{0.3}$.

This value of $L_{ek}^{0.3}$ will be the criterion for all subsequent tests. In this context, the following equality is to be fulfilled in the subsequent tests:

$$L_{ek} = L_{ek}^{0.3} \cdot 1.15, \text{ where}$$

L_{ek} - is the leakage value at a positive pressure in the GO of 0.3 kgf/cm^2, obtained during the tests.

8. SEQUENCE OF ACTIONS IN THE PERFORMANCE OF THE TESTS

8.1. The vacuum tests of the pressurized containment building system.

8.1.1. The pressure relief valves in system P-4 situated between rooms A-202/1 and A-102/1 are to be wedged in the closed position.

8.1.2. All personnel not involved in conducting the tests are to be removed from the premises of the GO.

8.1.3. The personnel participating in the tests are to be admitted inside the pressurized containment building system through the sluice at + 2.7 and through the doors to rooms A-106/1 (2), A-010/1 (2) and A-004/1, 2 (3, 4), after which the doors of rooms A-103/1 (2), A-106/1 (2) and A-010/1 (2) and A-004/1, 2 (3, 4) are to be closed.

8.1.4. The two fans of system V-4 1 (2)V-4-4-1, 2 are to be switched on, and the opening of pressure valves 1 (2) A-4/1, 2, 3, 4 and the butterfly-type valve 1B-4 is to be monitored, and pressure valves 2A-4/5, 6, 7 are to be opened.

8.1.5. When an established vacuum has been achieved in the GO, the initiation of the inspection of the structural components of the GO is to be announced by loudspeaker.

When the vacuum level is insufficient (less than 100 mmH_2O), the ventilation system V-2 is to be switched on, for which the following air cut-off valves are opened:

unit 1 - K-11/1 - 4, 6 - 9, 11, 14 - 16, 18;

unit 2 - K-11/21 - 25, 27 - 29, 32 - 35;

the fans 1 (2)V-2-1, 2 are switched on, the opening of pressure valves 1 (2)A-2/1, 2, 3, 4 is monitored, and valves 2A-2/5, 6, 7, 8 are opened.

The components of the GO are to be inspected by patrol routes (Annex 5).

8.1.6. Defects are to be detected by visual inspection or by the application of soap solution to the components of the containment building.

8.1.7. The defects discovered are to be marked with chalk or paint, and their locations are to be entered in the log.

8.1.8. Upon the completion of the inspection patrols, the fans of ventilation systems V-2 and V-4 are to be switched off, and the following steam cut-off valves of system V-2 are to be opened:

for unit 1 - K-12/1, 3, 4, 8 - 11, 14;

for unit 2 - K-12/21, 24, 27, 28, 29.

After balancing of the pressure in the GO with atmospheric pressure, the personnel are to be removed from the premises of the containment building system.

8.1.9. Upon the completion of the tests:

- the fluid pressure and vacuum gauges used for monitoring the vacuum in the GO are to be dismantled;

- the fixers are to be removed from the pressure relief valves of ventilation system P-4.

8.2. The integrated pressurization leakage tests of the containment building system with a positive pressure of 0.14 kgf/cm^2.

8.2.1. The GO is to be sealed in accordance with section 5 of this program.

8.2.2. All personnel are to be removed from the premises of the GO, after which all the

outside doors of the GO are to be closed. A monitor is placed on a stand of the central hall.

8.2.3. The valves for feeding compressed air from the compressor plant 1(2)US10S07 (room V-214/1 for unit 1 and A-107/2 for unit 2) and 1(2)US10S08 are to be opened.

8.2.4. Authorization is obtained from the NPP shift chief before the initiation of the tests.

8.2.5. The compressor is switched on, and the raising of the pressure in the GO is initiated. The time of switching on of the compressor is to be recorded.

8.2.6. The pressure is to be increased in steps of 0.05, 0.1 and 0.14 kgf/cm^2. The changes in the air pressure and the air temperature are to be recorded in a testing log.

8.2.7. The components of the pressurized containment building system which affect the integrity of the system and the structural elements are to be inspected at each step, with special attention devoted to the deformations of the components affecting the safety of the nuclear power plant. Monitors on a stand are to check the integrity of the lining of the spent fuel pool.

8.2.8. During the inspection, special attention is to be devoted to the condition of the outer doors, hatches and passages, the seals of the protective cover of the reactor and the containment valves, the structural elements at the points under the greatest stresses (in the areas of joints and contact welds between component elements and solid concrete) and crack openings and deformations.

8.2.9. The defects in the components of the GO system detected in the process of increasing of the pressure are to be eliminated; the defects which are not eliminated are to be entered in the testing log.

8.2.10. If defects which threaten the integrity of the pressurized containment building system are discovered in the process of increasing of the pressure, the compressor is to be switched off immediately, and the pressure in the containment building is to be released in accordance with item 4.4 of this program.

8.2.11. When the positive pressure P_{pos} in the containment building reaches 0.14 kgf/cm^2, the valves on the compressed air feed line 1(2)US10S07 are to be closed, and the compressor is to be switched off.

8.2.12. The pressure in the GO system is to be held for 2 hours within limits of 0.13- 0.14 kgf/cm^2 by switching the compressor on and off. At the end of this period, the pressure is to be increased to 0.14 kgf/cm^2.

8.2.13. The technical examination of the pressurized containment building system is to be performed by a committee appointed by order of the director of the Kola Nuclear Power Plant.

8.2.14. The recording of the variations in pressure is to be initiated at the same time at all the measurement points. The recording is to be performed at least once every 2 minutes up to a pressure in the GO P_{pos} = 0.02 kgf/cm^2.

8.2.15. A preliminary calculation of the amount of leakage is to be performed. In the event that the calculated leakage level does not satisfy the criterion of item 7.2 of this program, the pressure must be released from the GO system in accordance with item 4.4 of this program, the defects discovered must be eliminated, and the tests must be repeated.

8.2.16. With a positive pressure in the GO system of 0.02 kgf/cm^2, the tests are to be suspended, and the pressure is to be released from the containment building by switching on ventilation system V-2.

8.2.17. Actions upon the completion of the tests:

- the standard pressure gauges are to be dismantled;
- a stopper is to be installed in the compressed air feed pipeline to the GO system in room

V-214/1 (A-107 (2));

- valve 1(2)US10S08 is to be closed;
- all the operating systems, ventilation systems and radiation monitoring systems are to be put into a condition which conforms to the "Operating regulations . . . ."

8.3. The integrated pressurization leakage tests of the containment building system with a positive pressure of 0.3 kgf/cm^2.

8.3.1. Items 8.2.1 - 8.2.5 are to be fulfilled. Note: In the first tests of the containment building with a pressure of 0.3 kgf/cm^2, items 8.2.6 - 8.2.12 of this program are to be fulfilled.

The value of the leakage from the pressurized containment building is to be determined at pressure in the GO of 0.14 kgf/cm^2.

If the leakage value obtained satisfies the criterion of item 7.2, the tests are to continue.

8.3.2. The pressure is to be increased in steps of 0.1 kgf/cm^2. The changes in the air pressure and the air temperature are to be recorded in the testing log.

8.3.3. The components of the pressurized containment building system which affect the integrity of the system and the structural elements are to be inspected at each step, with special attention devoted to the deformations of the components affecting the safety of the nuclear power plant. The monitors on a stand of the central hall is to check the integrity of the lining of the spent fuel pool.

8.3.4. During the inspection, special attention is to be devoted to the condition of the outer doors, hatches and passages, the seals of the protective cover of the reactor and the containment valves, the structural elements at the points under the greatest stresses (in the areas of joints and contact welds between component elements and solid concrete) and crack openings and deformations.

8.3.5. The defects in the components of the GO system detected in the process of increasing of the pressure are to be eliminated; the defects which are not eliminated are to be entered in the testing log.

8.3.6. If defects which threaten the integrity of the pressurized containment building system are discovered in the process of increasing of the pressure, the compressor is to be switched off immediately, and the pressure in the containment building is to be released in accordance with item 4.4 of this program.

8.3.7. When the positive pressure P_{pos} in the containment building system reaches 0.3 kgf/cm^2, the valves on the compressed air feed line 1(2)US10S07 are to be closed, and the compressor is to be switched off.

8.3.8. The pressure in the GO system is to be held for 2 hours within limits of 0.25- 0.3 kgf/cm^2 by switching the compressor on and off. At the end of this period, the pressure is to be increased to 0.3 kgf/cm^2.

8.3.9. The technical examination of the pressurized containment building system is to be performed by a committee appointed by order of the director of the Kola Nuclear Power Plant.

8.3.10. The recording of the variations in pressure is to be initiated at the same time at all the measurement points. The recording is to be performed at least once every 2 minutes up to a pressure in the GO P_{pos} = 0.05 kgf/cm^2.

8.3.11. A preliminary calculation of the amount of leakage is to be performed. In the event that the calculated leakage level does not satisfy the criterion of item 7.5 of this program, the pressure must be released from the GO system in accordance with item 4.4 of this program,

the defects discovered must be eliminated, and the tests must be repeated.

8.3.12. With a positive pressure in the GO system of 0.05 kgf/cm^2, the tests are to be suspended, and the pressure is to be released from the containment building by switching on ventilation system V-2.

8.3.13. Actions upon the completion of the tests:

- the standard pressure gauges are to be dismantled;
- a stopper is to be installed in the compressed air feed pipeline to the GO system in room V-214/1 (A-107 (2));
- valve 1(2)US10S08 is to be closed;
- all the operating systems, ventilation systems and radiation monitoring systems are to be put into a condition which conforms to the "Operating regulations . . . ."

9. PROCEDURE FOR PROCESSING THE TEST RESULTS

The level of leakage is to be calculated with the use of the results obtained and with the guidance of the requirements of Annex 3 in the form of integral leakage values at the stages of the testing positive pressure P_{pos} of 0.05, 0.1 and 0.14 kgf/cm^2.

The calculation of the leakage values at the pressure stages indicated above and the extrapolation of the test results to the design pressure may be performed by the calculation program Scont3.

The test result is to be extrapolated to a pressure P_{pos} of 0.98 MPa (4 kgf/cm^2). The calculation of the radiation situation at the boundary of the buffer zone (SZZ) is to be performed at the extrapolated leakage value. If the radiation situation at the boundary of the buffer zone at the extrapolated leakage value satisfies the requirements of the NTD, the leakage value obtained is to be recognized as satisfactory, and a conclusion to the effect that the pressurized containment building system is fit for operation is to be issued. The leakage value L_k is to be entered in the certificate of the GO system.

Note:

1. Subsequent operating tests are to be performed with the station compressor plant for a pressure stage P_{pos} = 0.0294 MPa ((0.14 kgf/cm^2), and the calculation of the leakage level is to be performed accordingly for this pressure only.

2. After the performance of operations for the reinforcement of the lining of the spent fuel pool room, the central hall, etc., tests are to be performed only with a pressure of 0.3 kgf/cm^2, and the leakage value is to be calculated for this pressure only.

10. THE FORM FOR THE PRESENTATION OF DATA AND TEST RESULTS

10.1. A "Protocol of the results of leakage tests of the pressurized containment building system of unit 1 (2) in accordance with annex 5 of the 'Regulations for the construction and operation of containment safety systems of nuclear power plants'" PNAE G-10-21-90 is to be prepared from the test data.

10.2. In the light of the results of the technical examination, the committee is to prepare a report presenting a conclusion concerning the possibility of operation, indicating deadlines for the performance of subsequent technical examinations.

Annex 1

Key:

1 - from special compressor;
2 - pipeline for pressurization of containment buildings of units 3 and 4;
3 - to traps of unit 4;
4 - to GO of unit 4;
5 - containment building, unit 2;
6 - to traps of unit 3;
7 - to GO of unit 3;
8 - containment building, unit 1;
9 - Legend:
- flange joint;
- stopper;
- transition section;
- containment building pipeline passage.

Annex 2

List of valves closed in tests
of the containment building system

1	2	3
valve	designation	note
1. BP overflow	1(2)B-37, 29, 30	
2. drain from concrete cantilever	1(2)SK-25/1 1(2)B-30 1B-34	
3. KB	1(2)SK-23, 24, 2K-7, 2B-86, 1K-7, 1B-8	
4. relief from KB to V-3	1(2)A29/1, 3, [illegible] air line	
5. NBS delivery	1(2)B-12/1,, 2, 3	
6. delivery 2NDr-1 (in room A-102/1)		
7. drain from 2ShA	2SK-27	
8. drain of R-1 and B-004 boxes		
9. pipeline from 20V0-1 to B-8	2U1-40	
10. TOP pipeline	1(2)R-35	
11. SVO-1 drains	1U1-13/1 2U1-20/1	
12. All samplers		
Ventilation		
13. pressure valve of R-2 system	1(2)D-2	
14. pressure valve of fan V-1-1	1(2)G-1	
15. pressure valves of V-2 system	1(2)A-2/1, 2, 3, 4, 2A-2/5, 6, 7, 8	
16. all steam and water cut-off valves of system V-2		
17. gate valves on ventilators P-4-1 (2)		

18. pressure valves of V-4 system	1(2)A-4/1, 2, 3, 4, 2A-5/5, 6, 7	
19. rotary valve on V-4 system		
20. valves for constant and periodic aerosol monitoring of GO		
20a. pressure valves of system 2P-4	2P-4/1,2	
20b. pressure valves of system P-6	A-6/3,4	
Special waste water disposal system		
21. trap from main circulating pump deck (rooms A-102/1, 2) and from sluice (A-103/1, 2)	1SK-10	
22. traps in monitoring instrumentation room (room A-004/1, 2)		
23. trap in ventilation chamber area of primary loop (room A-013/1 (2))		
24. trap in corridor A-306/1 (2)		
25. trap in feed maintenance deaerator room (room A-303/1 (2))		
26. trap from R-1 boxes	1SK-30, 31 2SK-29	
27. trap in A-010/1 A-011/2		
28. trap in sampling room of plant 1 A-311/1 (2)		
29. relief, overflow and sampler valves, air lines 1 (2) KB.		
30. valves on head 1NDR-1 in room A-102/1		

PROCEDURE FOR PROCESSING TEST RESULTS

The calculation of the leakage value is performed from the measurement results according to the formula (1):

$$L_m = (2400/\Delta z)(1 - P_{i+1}/P_i), \quad (1)$$

where L_m is the leakage value, in % per day;

P_i and P_{i+1} are the absolute air pressure in the pressurized space at the measurement times z and z_{i+1}, in kg/m^2;

$Lz = z_{i+1} - z_i$ represents the time between measurements, in hours;

i = 1 to n, where n is the number of measurements in the time interval $z_n - z_i$).

The value of the absolute air pressure in the GO P_{absi} is computed as the sum of the measured values of the positive pressure P_{posi} and the barometric pressure B_i (according to data of the weather station):

$$P_{absi} = P_{posi} + B_i \quad (2)$$

$$P_{posi} = (j \text{ to } n\ P_{posj})/K, \quad (3)$$

where K is the number of pressure gauges;

P_{posj} represents the readings of each of them at the time of measurement.

Annex 4

LIST
of standard openings which isolate the containment building system

Item	quantity	Adjacent rooms
1. hatches of central hall:		
- over main circulating pumps	6	A-102/1, 2-A-301
- over steam generators	6	A-002/1, 2-A-301
- over SVO-1 filters	1	A-207/1, 2-A-301
- over SVO-1 solid waste	1	A-206/1, 2-A-301
- transportation opening	1	A-002/1, 2-A-301
2. hatches of R-1 system:		
- above air coolers	10	V-007/1, 2
- above pressure valves	5	-"-
- diameter 600 above air lines	5	-"-
- diameter 500 into inlet box	1	V-007/1-V=004/1
3. reactor cover with process flange	1	
4. room doors:		
- A-004/1, 2	1	V-004/2-A-004/1, 3
- A-004/2, 4	1	V-004/2, 4-A-014/1, 2
- V-007/2	1	V-007/2-V-004/2
- A-011/1, 2	1	A-011/1, 2-A-015/1, 2
- A-013/1, 2	1	A-013/1, 2-A-015/1, 2
- A-103/1, 2	1	A-103/1, 2-V-105/1, 2
- A-102/1, 2	1	A-102/1, 2-A-103/1, 2
- A-002/1, 2	1	A-002/1, 2-A-103/1, 2
- A-101/1, 2	1	A-101/1, 2-A-008/1, 2
- A-106/1, 2	1	A-105/1, 2-V-105/1, 2
- A-201/1, 2	1	A-201/1, 2-A-102/1, 2
- A-204/1, 2	1	A-204/1, 2-A-102/1, 2
- A-205/1, 2	1	A-205/1, 2-A-204/1, 2
- A-308/1, 2	1	A-308/1, 2-A-206/1, 2
- A-502/1, 2	1	A-502/1, 2-A-503/1, 2

Annex 6

Patrol routes for containment building in integrated tests

1	2
Room	Inspection objects
Mark -1.80	
V-004	cable, pulse and process passages, pressure door to room A-004/3; stopper valves - quantity 2; pressure door to inlet box
V-007	cable and pulse passages, 10 hatches under air coolers, pressure door to delivery box
V-005	seals of R-1 fan shafts (quantity 5), 5 round hatches in walls in row G
V-010	cable and pulse passages, valve trap
V-009	process and pulse passages
A-011	pulse passages
A-015	pressure door to A-013/2, process and pulse passages, cable passages above door to A-013/2
A-014	pressure door to room A-004/4, cable, pulse and process passages
Mark 0.00 and +2.70	
V-105	pressure doors to rooms A-103/2 and A-105/2, cable, pulse and process passages
A-107	process and pulse passages, backup stoppers, stem passages
A-108	process, pulse and cable passages, pressure door to room A-101/2
V-104	pressure door to room A-104/2
E-102 E-107	passage of any type
Mark +5.40 and +6.30	
V-209	cable passages in wall in row "G" E-3
V-203	cable passages of main circulating pump cables (quantity 2), passages E382, 383, 381, 384, 388, 380, 379, 378 and 377
A-210	cable passages E77

V-214	process passages
A-008	cable passages E-304, E-305 (entrance from A-203)
E-202	passages of all types
A-214	process passages in pipeline corridor from room A-206/2
Mark +9.60 and 10.50	
A-301	hatches above steam generators and main circulating pumps, backup passages, reactor cover
A-302	overflow valves, quantity 9
A-306	cable passages E-205
Mark +14.7	
A-503	cable (E-219), pulse and process passages; pressure door to room A-502/2
E-401	process passages of main steam pipelines and feeder pipelines

ATTACHMENT 5

Results of Leaktightness Testing for Kola Unit 2 (5/96)
(English and Russian)

KOLATOM Kola Nuclear Power Plant

FAX

1. To:	Yu. V. Kon'yev
Company:	REA Concern
Telephone:	(095)220-64-30
Fax:	(095)220-63-64
2. To:	Dr. George A. Greene
Company:	Director BNL (USA)
Telephone:	516-344-2296
Fax:	516-344-3526

From:	
	V. V. Omel'chuk
	Chief Engineer
Telephone:	(815-32)-68-351
Fax:	(815-32)-68-140
Date:	31 May 1996
Reference Number:	11/8-249
No. pp. incl. cover:	7

concerning the forwarding of the test certificate
for the system of pressurized rooms of unit 2.

Gentlemen:

Per your request, I am sending certificate 55-96/TsNIP for the testing of the system of pressurized rooms of unit 2 of the Kola Nuclear Power Plant conducted after preventive maintenance PPR-96.

Attachment: 1. Certificate 55-96/TsNIP, 6 pages, to each address.

Respectfully,

Chief Engineer [signed] V. V. Omel'chuk

APPROVED
Chief Engineer, Kola NPP
[signature] V. V. Omel'chuk
30 May 1996

Kola Nuclear Power Plant
Certificate 55-96/TsNIP

Kola NPP, unit 2 — 25 - 27 May 1996
Reactor Department
Design component: system of pressurized rooms (SGP)
Reference document: working program 1.2-11-20PG-94

A committee made up of the following
deputy director, TsNIP — S. V. Gorelikhin
[setup, testing and startup department]
supervisor of GLSB, TsNIP — T. I. Petkevich
engineer, reactor department — V. V. Sborovskiy
tested the integrity of the system of pressurized rooms and obtained the following results.

Test	Program item	Test criteria (results of previous tests after preventive maintenance PPR-94)	Result	Conclusion
1. Vacuum test of SGP	item 8.1	Vacuum in SGP, 199 mmH_2O	Vacuum in SGP, 226 mmH_2O	Satisfactory
2. Pressurization of SGP	item 8.2	Pressure achieved in SGP, *70 mmH_2O*; Leakage *L=4950%* of volume per day (for P=0.5 atm gauge); Leak equivalent diameter *De=366 mm*	Pressure achieved in SGP, *275 mmH_2O*; Leakage *L=768%* of volume per day (for P=0.5 atm gauge); Leak equivalent diameter *De=192 mm*	Satisfactory

1. Course of tests

The testing was conducted in two stages: vacuum testing and pressurization testing.

1.1. Vacuum testing: the SGP [system of pressurized rooms] was prepared for the tests in accordance with the specifications of the testing program. Personnel of the TsNIP [setup, testing and startup department] and repair personnel of the TsTsR [centralized repair shop], TsTAI [thermal automation and measurement department], ETs [electrical shop] and KRU, Kola NPP, were admitted to the pressurized area to look for defects. A vacuum was created in the pressurized enclosure by the operation of two fans of the 2B-4 system (overall flow rate Q = 80,000 m^3/h). The vacuum level was monitored with a U-shaped pressure gauge situated on a pulse pressure measurement tube in the steam generator box.

Several dozen flaws were discovered in the pressure lining, passages and hatch and door seals in the course of the vacuum testing; the flaws basically were eliminated within a day by the repair personnel. Supplementary vacuum testing to confirm the elimination of the defects and possibly to detect new ones was performed before the pressurization testing. At the conclusion of vacuum testing, the pressure valves of ventilation system 2B-4 in steam generator box 2A-4/6,7 were closed, and the vacuum drop time was monitored.

1.2. Pressurization testing: the SGP was prepared for tests in accordance with the specifications of the testing program. A positive pressure was created in the pressurized enclosure by the operation of a compressor to test the pressurized enclosure of the reactor units of phase 2. The pressure was monitored with two pressure gauges with a scale of 0 - 1 kg/cm^2 and an accuracy class of 0.4 situated on pressure measurement tubes in the steam generator box.

Because of the inadequate capacity of the compressor and the relatively great extent of the pressurization system, the pressure in the sealed enclosure reached P = 275 mmH_2O. An outside inspection of the SGP was performed at this pressure, and the amount of leakage from the GO [pressurized enclosure] was determined after the compressor had been turned off.

2. Conclusions

2.1. The test results are in conformity with the criteria.

2.2. The defects cited in Annex 1 were detected in the course of the tests.

[signed] S. V. Gorelikhin
[signed] T. I. Petkevich
[signed] V. V. Sborovskiy

3. Conclusion

3.1. The integrity of the system of pressurized rooms (SGP) has been enhanced substantially due to the execution of a set of actions during preventive maintenance PPR-96.

3.2. The system of pressurized rooms is hereby cleared for further operation.

3.3. The defects discovered are to be eliminated in accordance with Annex 1.

The parties responsible are: the centralized repair shop (TsTsR), the thermal automation and measurement department (TsTAI), the electrical shop (ETs) and the TsEOO (according to affiliation).

3.4. Measures are to be developed for the further enhancement of the integrity of the SGP.

Party responsible: setup, testing and startup department (TsNIP);
Deadline: June 1996.

Head of Reactor Department [signed] P. I. Novozhilov

Head of Setup, Testing
and Startup Department [signed] G. S. Paradnikov

LIST OF DEFECTS OF THE PRESSURIZED ENCLOSURE OF UNIT 2 DISCOVERED DURING TESTS OF THE ENCLOSURE AFTER PREVENTIVE MAINTENANCE PPR-96

1	2	3	4
Item	Room	Party responsible for execution	Execution deadline
DISCOVERED DURING VACUUM TESTING			
1. Lining defect (at the top under the entry door)	A-105/2		eliminated after vacuum testing
2. Lack of fusion penetration in lining in floor behind RTO	A-206/2		eliminated after vacuum testing
3. Leakage under pulse tubes behind RTO	A-206/2		eliminated after vacuum testing
4. Lining flaw behind platform in wall	A-207/2	Centralized repair shop (TsTsR)	before startup of the unit
5. Lining flaw at point of weld of suspension (left remote) to ceiling	A-002/2		eliminated after vacuum testing
6. Lining defect on cable shaft by steam generator PG-1	A-002/2		eliminated after vacuum testing
7. Lining defect on cable shaft by steam generator PG-6	A-002/2		eliminated after vacuum testing
8. Lining defect on wall behind steam generator PG-6 (at inlet of pipeline)	A-002/2		eliminated after vacuum testing
9. Two lining defects on wall behind steam generator PG-5	A-002/2		eliminated after vacuum testing

10. Lining defect on wall between steam generator PG-4 and steam generator PG-5	A-002/2	TsTsR	before startup of the unit
11. Lining defect of vertical pipeline passage behind steam generator PG-1 (to the right of ladder)	A-002/2	TsTsR	before startup of the unit
12. Leak on pulse line Dy100 (metering) and along lining separation between KZV [exhaust stopper valve] K-11/23 inlet and lining behind steam generator PG-3 (under GK service platform)	A-002/2	TsTsR	before startup of the unit
13. Leak on inlet passage Dy15	A-101/2		eliminated after vacuum testing
14. Lining defect on wall at mark 4.5	A-101/2		eliminated after vacuum testing
15. Lining defect in corner behind channel	A-101/2 (top)		eliminated after vacuum testing
16. Leak in door seal from A-101/2 to A-107/2	A-101/2	TsTsR	before startup of the unit
17. Leak on inlet passage Dy20	A-502/2		eliminated after vacuum testing
18. Leak on inlet steam lines	A-002/2	TsTsR	preventive maintenance PPR-97
19. Defect on main circulating pump (GTsK) support (cold fine) of loop 1	A-002/2		eliminated after vacuum testing
20. Leak along pipeline Dy200 (at floor) by 2P-2/6	A-102/2 (inner wall)		eliminated after vacuum testing
21. Leak on cable passage	A-103/2		eliminated after vacuum testing
22. Leaks in seal of operation hatch and hatch above 2GTsN-4			preventive maintenance PPR-97
23. Leak in floor (bordering on room A-004/3)	A-002/2		eliminated after vacuum testing

24. Gas pocket under connecting platform in room A-013/2	A-002/2		eliminated after vacuum testing
25. Gas pocket in weld at joining of floor and wall of room A-013/2 (to right of entrance)	A-002/2		eliminated after vacuum testing
26. Defect by passage in wall in room A-012/2 at floor level	A-002/2		eliminated after vacuum testing
27. Weld defect on support of pipeline Dy500 of cold line, loop 1	A-002/2		eliminated after vacuum testing
28. Weld defect on face of support prop under 2PG-6	A-002/2		eliminated after vacuum testing
29. Gas pocket on wall of cable shaft	A-002/2		eliminated after vacuum testing
30. Ceiling lining defect next to KZV K-11/24 and K-11/25	A-002/2	TsTsR	before startup of the unit
31. Lining defect by gangway (1.5 m from floor)	A-013/2		eliminated after vacuum testing
32. Weld defect on frame of opening between room A-013/2 and SVO-1	A-013/2		eliminated after vacuum testing
33. Weld defect in lining of gangway	A-013/2		before startup of the unit
34. Leak on pulse tube inlet	A-001/2		eliminated after vacuum testing
35. Leaks on hatches Dy800 of system R-1-2,3,4,5	B-009/2	TsEOO	before startup of the unit
36. Weld defect around pulse tube above KIP box (SIR-324) opposite 2P-2/6	A-102/2		eliminated after vacuum testing
37. Weld defect around 2P-1/4, 2/2, 1/2	A-102/2	TsTsR	before startup of the unit
38. Lining burn-through at point of weld of hoist beam between loops 2 and 3	A-102/2		eliminated after vacuum testing

39. Defect on abutment of KID [pressure relief valve] inlet with pressure lining (2.5 right of door, last on left)	circular corridor 211-4		eliminated after vacuum testing
40. Leak on section under reactor cover of transportation passage from BV [spent fuel pool] to BP		TsTsR	preventive maintenance PPR-97
41. In room A-015/5, cut and seal pipe Dy32 (in room A-002/2, the pipe passes around the ring of the reactor shaft at a height of 1.5 m from the floor)		TsTsR	preventive maintenance PPR-97
42. Numerous lining defects in reactor shaft under cantilever		TsTsR	preventive maintenance PPR-97

1	2	3	4
DISCOVERED IN PRESSURIZATION TESTING			
1. Leak on gangway lining	A-303/2	TsTsR	before startup of the unit
2. Leak on pulse passage (left of door to room A-308/2)	A-306/2	thermal automation and measurement department (TsTAI)	before startup of the unit
3. Leak on 2PG-3 constant ventilation passage	A-014/2	TsTsR	before startup of the unit
4. Leak on KIP passage by 2PG-4,5 constant ventilation passage	A-014/2	TsTsR	before startup of the unit
5. Leak in gangway weld	B-007/2	TsTsR	preventive maintenance PPR-97
6. Leak around circumference of air inlet passage (in right wall)	B-210/2 (second room)	TsTsR	preventive maintenance PPR-97
7. Leak in Dy800 hatch seal (4 from entrance)	B-008/2	TsEOO	before startup of the unit
8. Leak in rectangular hatch seal (2 and 4 from entrance)	B-008/2	TsEOO	before startup of the unit
9. Leaks in gland seal of ventilator shafts 2R-1-3,4,5	B-005/2	TsEOO	preventive maintenance PPR-97 (assemble face seals)
10. Leaks around circumference of protective plates of ventilator system 2P-1		TsEOO	preventive maintenance PPR-97

11. KIP control valve (backup line P) out of order at gate valve 21-17/4	B-005/2	TsTAI	preventive maintenance PPR-97
12. Leaks in two cable passages (45-46, for example)	A-203/2	TsTAI	before startup of the unit
12. Leak in cable passage (47, for example)	A-008/2	TsTAI	before startup of the unit
13. Leak in cable passage (48, for example)	A-008/2	TsTAI	before startup of the unit
14. Leak in KIP inlet passage	A-012/2	TsTsR	before startup of the unit
15. Leak in gangway lining	A-303/2	TsTsR	before startup of the unit

KOLATOM Kola Nuclear Power Plant

FAX

1. To:	Yu. V. Kon'yev
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Telephone:	(095)220-64-30
Fax:	(095)220-63-64
2. To:	Dr. George A. Greene
Company:	Director BNL (USA)
Telephone:	516-344-2296
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From:	
	V. V. Omel'chuk
	Chief Engineer
Telephone:	(815-32)-68-351
Fax:	(815-32)-68-140
Date:	31 May 1996
Reference Number:	11/8-249
No. pp. incl. cover:	7

concerning the forwarding of the test certificate for the system of pressurized rooms of unit 2.

Gentlemen:

Per your request, I am sending certificate 55-96/TsNIP for the testing of the system of pressurized rooms of unit 2 of the Kola Nuclear Power Plant conducted after preventive maintenance PPR-96.

Attachment: 1. Certificate 55-96/TsNIP, 6 pages, to each address.

Respectfully,

Chief Engineer [signed] V. V. Omel'chuk

√ = corrections made before June 1996 restart of Unit 2

APPROVED
Chief Engineer, Kola NPP
[signature] V. V. Omel'chuk
30 May 1996

Kola Nuclear Power Plant
Certificate 55-96/TsNIP

Kola NPP, unit 2 — 25 - 27 May 1996
Reactor Department
Design component: system of pressurized rooms (SGP)
Reference document: working program 1.2-11-20PG-94

A committee made up of the following

deputy director, TsNIP	S. V. Gorelikhin
[setup, testing and startup department]	
supervisor of GLSB, TsNIP	T. I. Petkevich
engineer, reactor department	V. V. Sborovskiy

tested the integrity of the system of pressurized rooms and obtained the following results.

Test	Program item	Test criteria (results of previous tests after preventive maintenance PPR-94)	Result	Conclusion
1. Vacuum test of SGP	item 8.1	Vacuum in SGP, 199 mmH_2O	Vacuum in SGP, 226 mmH_2O	Satisfactory
2. Pressurization of SGP	item 8.2	Pressure achieved in SGP, *70 mmH_2O*; Leakage *L=4950%* of volume per day (for P=0.5 atm gauge); Leak equivalent diameter *De=366 mm*	Pressure achieved in SGP, *275 mmH_2O*; Leakage *L=768%* of volume per day (for P=0.5 atm gauge); Leak equivalent diameter *De=192 mm*	Satisfactory

1. Course of tests

The testing was conducted in two stages: vacuum testing and pressurization testing.

1.1. Vacuum testing: the SGP [system of pressurized rooms] was prepared for the tests in accordance with the specifications of the testing program. Personnel of the TsNIP [setup, testing and startup department] and repair personnel of the TsTsR [centralized repair shop], TsTAI [thermal automation and measurement department], ETs [electrical shop] and KRU, Kola NPP, were admitted to the pressurized area to look for defects. A vacuum was created in the pressurized enclosure by the operation of two fans of the 2B-4 system (overall flow rate $Q = 80{,}000\ m^3/h$). The vacuum level was monitored with a U-shaped pressure gauge situated on a pulse pressure measurement tube in the steam generator box.

Several dozen flaws were discovered in the pressure lining, passages and hatch and door seals in the course of the vacuum testing; the flaws basically were eliminated within a day by the repair personnel. Supplementary vacuum testing to confirm the elimination of the defects and possibly to detect new ones was performed before the pressurization testing. At the conclusion of vacuum testing, the pressure valves of ventilation system 2B-4 in steam generator box 2A-4/6,7 were closed, and the vacuum drop time was monitored.

1.2. Pressurization testing: the SGP was prepared for tests in accordance with the specifications of the testing program. A positive pressure was created in the pressurized enclosure by the operation of a compressor to test the pressurized enclosure of the reactor units of phase 2. The pressure was monitored with two pressure gauges with a scale of 0 - 1 kg/cm^2 and an accuracy class of 0.4 situated on pressure measurement tubes in the steam generator box.

Because of the inadequate capacity of the compressor and the relatively great extent of the pressurization system, the pressure in the sealed enclosure reached P = 275 mmH_2O. An outside inspection of the SGP was performed at this pressure, and the amount of leakage from the GO [pressurized enclosure] was determined after the compressor had been turned off.

2. Conclusions

2.1. The test results are in conformity with the criteria.

2.2. The defects cited in Annex 1 were detected in the course of the tests.

[signed] S. V. Gorelikhin
[signed] T. I. Petkevich
[signed] V. V. Sborovskiy

3. Conclusion

3.1. The integrity of the system of pressurized rooms (SGP) has been enhanced substantially due to the execution of a set of actions during preventive maintenance PPR-96.

3.2. The system of pressurized rooms is hereby cleared for further operation.

3.3. The defects discovered are to be eliminated in accordance with Annex 1.

The parties responsible are: the centralized repair shop (TsTsR), the thermal automation and measurement department (TsTAI), the electrical shop (ETs) and the TsEOO (according to affiliation).

3.4. Measures are to be developed for the further enhancement of the integrity of the SGP.

Party responsible: setup, testing and startup department (TsNIP);
Deadline: June 1996.

Head of Reactor Department [signed] P. I. Novozhilov

Head of Setup, Testing and Startup Department [signed] G. S. Paradnikov

LIST OF DEFECTS OF THE PRESSURIZED ENCLOSURE OF UNIT 2 DISCOVERED DURING TESTS OF THE ENCLOSURE AFTER PREVENTIVE MAINTENANCE PPR-96

1	2	3	4
Item	Room	Party responsible for execution	Execution deadline
DISCOVERED DURING VACUUM TESTING			
1. Lining defect (at the top under the entry door)	A-105/2		eliminated after vacuum testing
2. Lack of fusion penetration in lining in floor behind RTO	A-206/2		eliminated after vacuum testing
3. Leakage under pulse tubes behind RTO	A-206/2		eliminated after vacuum testing
4. Lining flaw behind platform in wall	A-207/2	Centralized repair shop (TsTsR)	before startup of the unit
5. Lining flaw at point of weld of suspension (left remote) to ceiling	A-002/2		eliminated after vacuum testing
6. Lining defect on cable shaft by steam generator PG-1	A-002/2		eliminated after vacuum testing
7. Lining defect on cable shaft by steam generator PG-6	A-002/2		eliminated after vacuum testing
8. Lining defect on wall behind steam generator PG-6 (at inlet of pipeline)	A-002/2		eliminated after vacuum testing
9. Two lining defects on wall behind steam generator PG-5	A-002/2		eliminated after vacuum testing

10. Lining defect on wall between steam generator PG-4 and steam generator PG-5	A-002/2	TsTsR	before startup of the unit
11. Lining defect of vertical pipeline passage behind steam generator PG-1 (to the right of ladder)	A-002/2	TsTsR	before startup of the unit
12. Leak on pulse line Dy100 (metering) and along lining separation between KZV [exhaust stopper valve] K-11/23 inlet and lining behind steam generator PG-3 (under GK service platform)	A-002/2	TsTsR	before startup of the unit
13. Leak on inlet passage Dy15	A-101/2		eliminated after vacuum testing
14. Lining defect on wall at mark 4.5	A-101/2		eliminated after vacuum testing
15. Lining defect in corner behind channel	A-101/2 (top)		eliminated after vacuum testing
16. Leak in door seal from A-101/2 to A-107/2	A-101/2	TsTsR	before startup of the unit
17. Leak on inlet passage Dy20	A-502/2		eliminated after vacuum testing
18. Leak on inlet steam lines	A-002/2	TsTsR	preventive maintenance PPR-97
19. Defect on main circulating pump (GTsK) support (cold line) of loop 1	A-002/2		eliminated after vacuum testing
20. Leak along pipeline Dy200 (at floor) by 2P-2/6	A-102/2 (inner wall)		eliminated after vacuum testing
21. Leak on cable passage	A-103/2		eliminated after vacuum testing
22. Leaks in seal of operation hatch and hatch above 2GTsN-4			preventive maintenance PPR-97
23. Leak in floor (bordering on room A-004/3)	A-002/2		eliminated after vacuum testing

24. Gas pocket under connecting platform in room A-013/2	A-002/2		eliminated after vacuum testing
25. Gas pocket in weld at joining of floor and wall of room A-013/2 (to right of entrance)	A-002/2		eliminated after vacuum testing
26. Defect by passage in wall in room A-012/2 at floor level	A-002/2		eliminated after vacuum testing
27. Weld defect on support of pipeline Dy500 of cold line, loop 1	A-002/2		eliminated after vacuum testing
28. Weld defect on face of support prop under 2PG-6	A-002/2		eliminated after vacuum testing
29. Gas pocket on wall of cable shaft	A-002/2		eliminated after vacuum testing
30. Ceiling lining defect next to KZV K-11/24 and K-11/25	A-002/2	TsTsR	before startup of the unit
31. Lining defect by gangway (1.5 m from floor)	A-013/2		eliminated after vacuum testing
32. Weld defect on frame of opening between room A-013/2 and SVO-1	A-013/2		eliminated after vacuum testing
33. Weld defect in lining of gangway	A-013/2		before startup of the unit
34. Leak on pulse tube inlet	A-001/2		eliminated after vacuum testing
35. Leaks on hatches Dy800 of system R-1-2,3,4,5	B-009/2	TsEOO	before startup of the unit
36. Weld defect around pulse tube above KIP box (SIR-324) opposite 2P-2/6	A-102/2		eliminated after vacuum testing
37. Weld defect around 2P-1/4, 2/2, 1/2	A-102/2	TsTsR	before startup of the unit
38. Lining burn-through at point of weld of hoist beam between loops 2 and 3	A-102/2		eliminated after vacuum testing

39. Defect on abutment of KID [pressure relief valve] inlet with pressure lining (2.5 right of door, last on left)	circular corridor 211-4		eliminated after vacuum testing
40. Leak on section under reactor cover of transportation passage from BV [spent fuel pool] to BP		TsTsR	preventive maintenance PPR-97
41. In room A-015/5, cut and seal pipe Dy32 (in room A-002/2, the pipe passes around the ring of the reactor shaft at a height of 1.5 m from the floor)		TsTsR	preventive maintenance PPR-97
42. Numerous lining defects in reactor shaft under cantilever		TsTsR	preventive maintenance PPR-97

1	2	3	4
DISCOVERED IN PRESSURIZATION TESTING			
1. Leak on gangway lining	A-303/2	TsTsR	before startup of the unit
2. Leak on pulse passage (left of door to room A-308/2)	A-306/2	thermal automation and measurement department (TsTAI)	before startup of the unit
3. Leak on 2PG-3 constant ventilation passage	A-014/2	TsTsR	before startup of the unit
4. Leak on KIP passage by 2PG-4,5 constant ventilation passage	A-014/2	TsTsR	before startup of the unit
5. Leak in gangway weld	B-007/2	TsTsR	preventive maintenance PPR-97
6. Leak around circumference of air inlet passage (in right wall)	B-210/2 (second room)	TsTsR	preventive maintenance PPR-97
7. Leak in Dy800 hatch seal (4 from entrance)	B-008/2	TsEOO	before startup of the unit
8. Leak in rectangular hatch seal (2 and 4 from entrance)	B-008/2	TsEOO	before startup of the unit
9. Leaks in gland seal of ventilator shafts 2R-1-3,4,5	B-005/2	TsEOO	preventive maintenance PPR-97 (assemble face seals)
10. Leaks around circumference of protective plates of ventilator system 2P-1		TsEOO	preventive maintenance PPR-97

11. KIP control valve (backup line P) out of order at gate valve 21-17/4	B-005/2	TsTAI	preventive maintenance PPR-97
12. Leaks in two cable passages (45-46, for example)	A-203/2	TsTAI	before startup of the unit
12. Leak in cable passage (47, for example)	A-008/2	TsTAI	before startup of the unit
13. Leak in cable passage (48, for example)	A-008/2	TsTAI	before startup of the unit
14. Leak in KIP inlet passage	A-012/2	TsTsR	before startup of the unit
15. Leak in gangway lining	A-303/2	TsTsR	before startup of the unit

КОЛААТОМ Кольская Атомная Электростанция

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Число страниц, включая титульную:	7

о направлении акта
испытаний СГП блока 2

Уважаемые господа!

По Вашей просьбе направляю акт №55-96/ЦНИП об испытаниях системы герметичных помещений блока 2 Кольской АЭС, проведенных после ППР- 96.

Приложение: 1.Акт №55-96/ЦНИП на 6 листах в каждый адрес.

С уважением

Главный инженер В.В.Омельчук

«Утверждаю»
Главный инженер Кольской АЭС
В.В.Омельчук
«30» 05 1996г.

Кольская АЭС
ИНВ. №55-96/ЦНИП

АКТ

Кольская АЭС, блок 2 25÷27.05.96г.
Реакторный цех
Конструктивный элемент: система герметичных помещений (СГП)
Руководящий документ: рабочая программа №1,2-11-20ПГ-94

Комиссия в составе:

зам.начальника ЦНИП Горелихина С.В.
руководителя ГЛСБ ЦНИП Петкевич Т.И.
инженера РЦ Сборовского В.В.

провела испытания системы герметичных помещений на герметичность и получила следующие результаты:

Наименование испытаний	Пункт программы	Критерий испытаний (результаты, полученные при предыдущем испытании после ППР-94)	Полученный результат	Заключение
1.Вакуумирование СГП	п.8.1	Разрежение в СГП 190 мм в.ст.	Разрежение в СГП 226 мм в.ст.	Удовлетворительно
2.Наддув СГП	п.8.2	Достигнутое давление в СГП *70 мм в.ст* Утечка *L=4950%* объёма в сутки (пересчёт на Р=0,5ати) Эквивалентный диаметр неплотностей *Дэ=366 мм*	Достигнутое давление в СГП *275 мм в.ст* Утечка *L=768%* объёма в сутки (пересчёт на Р=0,5ати) Эквивалентный диаметр неплотностей *Дэ=192 мм*	Удовлетворительно

1.Ход испытаний.

Испытание проводилось в два этапа: вакуумирование и наддув.

1.1.Вакуумирование: СГП подготовлена к испытаниям в соответствии с требованиями программы испытаний. В гермообъём допущен персонал ЦНИП и ремонтный персонал ЦЦР, ЦТАИ, ЭЦ, КРУ КАЭР для поиска дефектов. Разрежение в ГО создавалось работой двух вентиляторов системы 2В-4 (общий расход Q=80 000м^3/час). Контроль разрежения осуществлялся по U-образному манометру, установленному на импульсной трубке замера давления в боксе ПГ.

В ходе вакуумирования было выявлено несколько десятков дефектов по гермооблицовке, проходкам, уплотнениям люков и дверей, которые, в основном, в течение суток были устранены ремонтным персоналом. Перед наддувом было проведено дополнительное вакуумирование для подтверждения устранения дефектов и возможного выявления новых. В конце вакуумирования были закрыты гермоклапана вент.системы 2В-4 в боксе ПГ 2А-4/6,7, и проконтролировано время падения разрежения.

1.2.Наддув: СГП подготовлена к испытаниям в соответствии с требованиями программы испытаний. Избыточное давление в ГО создавалось работой компрессора для испытаний ГО блоков 2ой очереди. Контроль давления осуществлялся по двум манометрам со шкалой 0÷1 кг/см^2 классом точности 0,4, установленным на импульсных трубках замера давления в боксе ПГ.

В связи с недостаточной производительностью компрессора, а также из-за относительно протяжённой трассы системы наддува давление в ГО достигнуто Р=275 мм в.ст. При этом давлении произведён наружный осмотр СГП, и после отключения компрессора определена величина утечки из ГО.

2.Выводы.

2.1.Результаты испытаний соответствуют критериям.

2.2.В ходе испытаний выявлены дефекты, приведённые в приложении 1.

С.В.Горелихин

Т.И.Петкевич

В.В.Сборовский

3.Заключение.

3.1.За счёт проведения в ППР-96 комплекса мероприятий герметичность СГП существенно увеличилась.

3.2. Система герметичных помещений допускается к дальнейшей эксплуатации.

3.3. Устранить выявленные дефекты в соответствии с приложением 1.

Отв. ЦПР, ЦТАИ, ЭП, ЦЭОО (по принадлежности)

3.4.Разработать мероприятия по дальнейшему увеличению герметичности СГП.

Отв. ЦНИП Срок-июнь 1996г.

Начальник РЦ П.И.Новожилов

Начальник ЦНИП Г.С.Парадников

Горелихин,23-44

ПЕРЕЧЕНЬ ДЕФЕКТОВ ГЕРМООГРАЖДЕНИЯ БЛОКА 2, ВЫЯВЛЕННЫХ ПРИ ИСПЫТАНИЯХ ГО ПОСЛЕ ППР-96.

Наименование	Помещение	Ответственный за исполнение	Срок исполнения
1	2	3	4
ВЫЯВЛЕНО ПРИ ВАКУУМИРОВАНИИ			
1. Дефект облицовки (вверху под входной дверью)	А-105/2		устранено после вакуумирования
2. Непровар облицовки в полу за РТО	А-206/2		устранено после вакуумирования
3. Течь за РТО под импульсными трубками	А-206/2		устранено после вакуумирования
4. Дефект облицовки за площадкой в стене	А-207/2	ЦЦР	до пуска блока
5. Дефект облицовки в месте приварки подвески (левая дальняя) к потолку.	А-002/2		устранено после вакуумирования
6. Дефект облицовки на кабельной шахте возле ПГ-1	А-002/2		устранено после вакуумирования
7. Дефект облицовки на кабельной шахте возле ПГ-6	А-002/2		устранено после вакуумирования
8. Дефект облицовки на стене за ПГ-6 (у входа трубопровода)	А-002/2		устранено после вакуумирования
9. Два дефекта облицовки на стене за ПГ-5	А-002/2		устранено после вакуумирования
10. Дефект облицовки на стене между ПГ-4 и ПГ-5	А-002/2	ЦЦР	до пуска блока
11. Дефект облицовки вертикального трубопроводного коридора за ПГ-1 (справа от лестницы)	А-002/2	ЦЦР	до пуска блока
12. Течь по импульсной проходке Ду100 (доз. контроля) и по разрыву облицовки м/у закладной КЗВ К-11/23 и облицовкой за ПГ-3 (под площадкой обслуживания ГК)	А-002/2	ЦЦР	до пуска блока
13. Течь по закладной проходки Ду15	А-101/2		устранено после вакуумирования
14. Дефект облицовки на стене на отм. 4.5	А-101/2		устранено после вакуумирования

1	2	3	4
15. Дефект облицовки в углу за швеллером	А-101/2 (верх)		устранено после вакуумирования
16. Течь по уплотнению двери из А-101/2 в А-107/2.	А-101/2	ЦПР	до пуска блока
17. Течь по закладной проходки Ду20	А-502/2		устранено после вакуумирования
18. Течи по закладным паропроводов	А-002/2	ЦПР	ППР-97
19. Дефект на опоре ГЦК (холодная нитка) петли I	А-002/2		устранено после вакуумирования
20. Течь вдоль трубопровода Ду200 (у пола) возле 2Р-2/6	А-102/2 (внутр. стена)		устранено после вакуумирования
21. Течь по кабельной проходке	А-103/2		устранено после вакуумирования
22. Течи по уплотнению технологического люка, люка над 2ГЦН-4			ППР-97
23. Течь в полу (примыкание к пом. А-004/3).	А-002/2		устранено после вакуумирования
24. Свищ под переходной площадкой в пом. А-013/2.	А-002/2		устранено после вакуумирования
25. Свищ в сварном шве примыкания пола к стене пом. А-013/2 (справа от входа)	А-002/2		устранено после вакуумирования
26. Дефект возле проходки в стене в пом. А-012/2 на уровне пола.	А-002/2		устранено после вакуумирования
27. Дефект сварного шва на опоре трубопровода Ду500 хол. нитки петли № 1.	А-002/2		устранено после вакуумирования
28. Дефект сварного шва на торце подкоса опоры под 2ПГ-6.	А-002/2		устранено после вакуумирования
28. Свищ на стене кабельной шахты.	А-002/2		устранено после вакуумирования
30. Дефект облицовки потолка рядом с КЗВ К-11/24, К-11/25.	А-002/2	ЦПР	до пуска блока
31. Дефект облицовки возле трапа (1,5 м от пола).	А-013/2		устранено после вакуумирования
32. Дефект сварного шва по обрамлению проема между пом. А-013/2 и СВО-1	А-013/2		устранено после вакуумирования
33. Дефект сварного шва в облицовке трапа	А-013/2		до пуска блока

1	2	3	4
34. Течь по закладной импульсных трубок.	А-001/2		устранено после вакуумирования
35. Течи по люкам Ду800 системы Р-1-2,3,4,5	В-009/2	ЦЭОО	до пуска блока
36. Дефект сварного шва вокруг импульсной трубки над коробкой КИП (СИР-324) напротив 2Р-2/6	А-102/2		устранено после вакуумирования
37. Дефект сварного шва вокруг 2Р-1/4, 2/2, 1/2	А-102/2	ЦЦР	до пуска блока
38. Прожог облицовки в месте приварки балки тельфера м/у 2 и 3 петлями	А-102/2		устранено после вакуумирования
39. Дефект по примыканию закладной КИДа к гермооблицовке (2,5 от двери справа, последний слева)	кольцевой коридор 2П-4		устранено после вакуумирования
40. Течь по сектору подколпачному транспортного коридора БВ-БП		ЦЦР	ППР-97
41. В пом. А-015/5 обрезать и заглушить трубу Ду32 (в пом. А-002/2 труба проходит по кольцу шахты реактора на высоте 1,5 м от пола)		ЦЦР	ППР-97
42. Многочисленные дефекты облицовки в шахте реактора под консолью		ЦЦР	ППР-97

1	2	3	4
ВЫЯВЛЕНО ПРИ НАДДУВЕ			
1. Течь по облицовке трапа	А-303/2	ЦЦР	до пуска блока
2. Течь по импульсной проходке (слева от двери в А-308/2)	А-306/2	ЦТАИ	до пуска блока
3. течь по проходке постоянной продувки 2ПГ-3	А-014/2	ЦЦР	до пуска блока
4. Течь по проходке КИП возле трубопровода пост. продувки 2ПГ-4,5	А-014/2	ЦЦР	до пуска блока
5. Течь по сварному шву трапа	В-007/2	ЦЦР	ППР-97
6. Течь по окружности проходки воздуховода (в правую стену)	В-210/2 (второе пом.)	ЦЦР	ППР-97
7. Течь по уплотнению люка Ду800 (4 от входа)	В-008/2	ЦЭОО	до пуска блока
8. Течь по уплотнению прямоугольного люка (2 и 4 от входа)	В-008/2	ЦЭОО	до пуска блока
9. Течи по сальниковому уплотнению валов вентиляторов 2Р-1-3,4,5	В-005/2	ЦЭОО	ППР-97 (смонтировать торцевые уплотнения)
10. Течи по окружности броневых плит вент. системы 2Р-1		ЦЭОО	ППР-97
11. Неисправен золотник вентиля КИП (Р резервная нитка) у задвижки 21-17/4	В-005/2	ЦТАИ	ППР-97
12. Течи по 2 кабельным проходкам (напр. 45-46)	А-203/2	ЦТАИ	до пуска блока
12. Течь по кабельной проходке (напр. 47)	А-008/2	ЦТАИ	до пуска блока
13. Течь по кабельной проходке (напр.48)	А-008/2	ЦТАИ	до пуска блока
14. Течь по закладной проходки КИП	А-012/2	ЦЦР	до пуска блока
15. Течь по облицовке трапа	А-303/2	ЦЦР	до пуска блока

Руководитель ГЛСБ ЦНИП Петкевич Т.И.

ATTACHMENT 6

Results of Leaktightness Testing for Kola Unit 1 (10/96)
(English and Russian)

KOLA-ATOM Kola Nuclear Power Plant

TELEFAX

To: Dr. George Greene	From: Omel'chuk, V.V.
Company: BNL (USA)	Chief Engineer
	Telephone: 815-32-68-351
	Fax: 815-32-68-140
Telephone: 516-344-2296	Date: Dec. 15, 1996
Fax: 516-344-3526	Issuing No. 11/8-519 Number of pages, including cover page: 8

Dear Mr. Green!

I am directing to your attention documentation regarding integral leak-tight testing of the containment (hermetic sheild) for Unit 1 following the planned outage of the unit. The completed maintenance work and the repair/reconstruction of the elements of the hermetic barrier system have contributed to a considerable decrease in the amount of leakage from the containment. However, as always, large leakage of air during the testing was observed through the ventilation system of the hermetic barrier system.

During the sealing of the hatches following their construction/repair, it was determined, that in order to substantially seal them it was imperative to use a softer rubber, than the one that was provided by you earlier at the Kola NPP of the size 15 x 20 mm (instead of 15 x 30). I am asking that you look nto the possibility of supplying this type of rubber for the Kola NPP. The required amount of rubber is indicated in the Kola NPP fax "Issue number 11/8-448" dated October 16, 1996.

In the weekly progress report from October 25, 1996, according to the International program for Nuclear Safety, prepared by PNL (USA, Richland, Washington Stated), it is indicated that Argonne National Laboratory (ANL) personnel have prepared for the Hungarian NPP a report "Containment Loading and Structural Response during Accidents Involving Rupture of Wide-diameter Steam Pipes at VVER-440/213 NPP"(Jeff Binder, ANL, 630--252-7265). I am asking for your help in providing/directing a copy of this document to the Kola NPP in order to study this document and it's possible application/utilization.

Attachment: Document No.182-96/CNIP from December 04, 1996 regarding integral leak-tight testing of hermetic seal/containment of Unit 1 following planned outage on 7 pages in one submittal.

With Respect,
Chief Engineer Omel'chuk V.V.

Authorization

Chief Engineer Kola NPP
_____V.V. Omel'chuk
Dec. 12 1996

NPP
182-96/CNIP
Document

Kola NPP, Unit 1
Reactor (Unit)?
Structural Element: System of Hermetic Units/Compartments
Guidance Document:Working Program No.1,2-11-20PG-94

Committe Members:
Acting Director CNIP Gorelichina, S.V.
Manager GLSB CNIP Petkovich, T.I.
Engineer RC Sborovskoi V.V.

Conducted testing of leak-tightness of the hermetic enclosures/spaces and obtained the following results:

Name/type of experiment	Program item	Criteria for experiments (results,obtained from previous experiments during Planned Outage- 1995)	Results Obtained	Conclusions
1. "Vacuuming / evacuation of Central Hermetic system	p.8.1	Exhaust into the Central Hermetic System 100 mm/24 hrs	Exhaust into CHS 220 mm/24hrs	Satisfactory
2.Pressurization of CHS	p.8.2	Attained pressure level in CHS 90mm/24hrs , leakage L=4560% volume in 24 hrs (recalculation to P=0,5 atm. Equivalent diameter of openings D=354mm	Attained pressure in CHS 320 mm,/24hrs Leakage L=720% volume in 24 hrs. (recalculation for P=0,5atm. Equivalent diameter of openings D=134 (184?) mm	Satisfactory

1. Experimental Steps.

The experiments were conducted in two stages: vacuuming and pressurization

1.1 Vacuuming: CHS (Central Hermetic System) was prepared for the experiments in accordance with the testing requirements. CNIP personnel were permitted into primary containment along with ---,----,--,-- KNPP personnel in order to locate defects. Exhaust into the primary containment/hermetic seal was accomplished with two fans in the 2V-4 system (general rate Q=80 000m 3/hr.). The control of the exhaust was accomplished by U-like pressure gage, located on the impulse pipe pressure indicator in box PG(power generator).

During the vacuuming process more than twenty defects were determined along the outerskin of the containment/hermetic covering, along penetrations, along hatch and door seals, the most significant of which were eliminated by maintenance crews during two shifts.

1.2 Pressurization: CHS was prepared for exeriments in accordance with testing prgram requirements. Surplus (excess) pressure in the containment/hermetic cover was created by a compressor for testing the leak-tightness of the units as the following measure. The pressure control was maintained by two gauges with a scale 0+1 --/cm2____ degree of accuracy 0.4 , located on the impulse pipe pressure indicator in box/unit PG.

In connection with the inadequate functioning of the compressor, and like-wize because of the considerable line of route of the exhaust system, pressure in the primary containment/hermetic seal reached p=320 mm in 24 hrs.

P.3.

At this pressure level an external inspection was conducted of the CHS (containment/hermetic system), after turning off the compressor the rate of leakage from the containment was determined.

2.Conclusions.

2.1. Results of the tests were in accordance with the criteria.

2.2. The defects discovered during the testing, were eliminated. 1.

S.V. Gorelikhin
T.I. Petkevich
V.V. Sborovskii

3.In Summary.

3.1.By taking advantage of the Planned Outage-96 at the complex, considerable improvements to the CHS were achieved.

3.2 The system of hermetic spaces/units can now permit future power operations.

3.3. Eliminate the revealed defects in accordance with the attachment.

"Responsible parties" ----,----,--,----, (according to affiliations)

3.4. Develop improvements for improving the leak-tightness of the CHS during the Planned Outage -97.

"Responsibility of CNIP During December 1996

Director of RC P.I.Novojilov

Director of CNIP G.S.Paradnikov

p.4

LIST OF DEFECTS IN THE HERMETIC CONTAINMENT, REVEALED DURING TESTING IN 1996.

No.	Name/Item	No. No.	Responsibil. for elimination	Period/time of elimination	Comments
	REVEALED DURING VACUUMING				
1.	Leakage of air along gasket K-11/1	A-105/1	CEOO	before pressurization	eliminated
2.	Leakage of air along gasket K-12/14	A-109/1	CEOO	before pressurization	eliminated
3.	Improperly positioned terminator K-11/18	A-108/1	CTAI	before pressurization	eliminated
4.	Re-seal door-hatch of air passage 1V-1 in front of hermetic valve 1G-1	V-304	CEOO	Planned outage-97	
5.	Leakage of air along welded seam between foundation and piping conduits for service water	1b-005	KAER	December 1996	seal with air-tight packing
6.	Defect of the outer shell of the maintenance area PK KO, "otm"10.5 (behind 1R-17/4)	A-101/1	KAER	before power start-up of the Unit	eliminated
7.	Leakage along sealed door between A-101/1 and A-108/1	A-101/1	CCR	before pressurization	eliminated
8.	Defect in the outer shell of the maintenance area MK KO "otm" 10.5 (behind exhaust chamber)	A-101/1	KAER	before power start-up of unit	eliminated
9.	Leakage of air along the feedwater piping and steam piping	A-101/1 A-002/1	KAER	before pressurization	eliminated
10.	Defect of outer shell at the BB support (closest to the door to the left of the entrance)		KAER	before power start-up of unit	eliminated

11.	Defect of outer shell at the BB support (second to the door closer to "KO")	A-502/1	KAER	before pressurization	eliminated
12.	Defect of outer shell of the maintenance area PK KO under beam (on the wall opposite door #6)	A-101/1	KAER	before pressurization	eliminated
13.	Passage of air from piping "DU"150 (Air Pipe 150?) In the floor under "KO"	A-101	CCR	before pressurization	eliminated
14.	Defect of outer shell of the floor under KO (10*50mm)	A-101/1	KAER	before power start-up of unit	eliminated
15.	Defect of outerfacing of the wall behind KO at the level of the heaters	A-101/1	KAER	before power start-up of unit	eliminated
16	Leakage along the outer housing of the door lock between A-102/1 - A-103/1	A-102/1	KAER	before power start-up of unit	eliminated
17.	In the floor under the KIP stand (support) 1R-2/5 leakage along perimeter of the square "packing" (150*150)	A-102	KAER	before power start-up of unit	eliminated
18.	Leakage along flanges of four "DU" 250 Pipes on the inside wall along 1r-2/6	A-102/1	KAER	before power start-up of unit	eliminated
19.	Leakage of air along traps of enclosure A-103/1 and deck of GCN	A-102/1 A-103/1	CCR	before pressurization	inspected valve SK-40
20.	Weak leak along flange of "undercap"		TTO	before pressurization	sealed with sealant
21.	Leakage along two cable penetrations to the left of door (2 and 3 below)	A-103/1	CTAI	December 1996	eliminated
22.	Leakage along welded seam between seal and outerfacing in corner (7th pipe from the bottom)	A-103/1	CTAI	December 1996	eliminated

23.	Defect of outerfacing of the wall behind 1R-1/3	A-102/1	KAER	before power start-up of unit	eliminated
24.	Defects of welded seams at the base/support of **NDr**	A-102/1	KAER	before power start-up of unit	eliminated
25.	Defects of outerfacing of hatch opening above **NDr**	A-102/1	KAER	Planned Outage-97	eliminated
26.	Leakage along the lower left corner of door between A-102/1 and A-204/1	A-102/1	CCR	Planned Outage-97	
27.	Two defects of welded seams along the perimeter 1R-2/4	A-102/1	KAER	before power start-up of unit	eliminated
28.	Leakage along opening (near panel 43)	A-002 "mark"? "otm"-1.8	KAER	before power start-up of unit	eliminated
29.	Two defects of outerfacing in the flooring near the area of loop 6	A-002 "mark"? "otm"-1.8	KAER	before power start-up of unit	eliminated
30.	Leakage along two seams in the flooring near the area of loop 6	A-002 "mark"? "otm"-1.8	KAER	before power start-up of unit	eliminated
31.	Defect in the outerfacing behind Power Generator 4 on the wall near the stairs under the platform	A-002 "mark"? 'otm"-1.8	KAER	before power start-upof unit	eliminated
32.	Defect of the outerfacing of the floor behind the cold filament of steam generator-3 at the steam generator platform column (axis 32)	A-002 mark "otm"-1.8	KAER	before power start-up of unit	eliminated

33.	Defect in opening No.5 (second from bottom in the row of openings)to the left of the entrance to A-213/1	A-002 mark "otm"-1.8	KAER	before power start-up of unit	eliminated
34.	Defect in the outerfacing along floor - wall joint between SG-2 and SG-3 (axis 34)	A-002 mark "otm'1.8	KAER	before power start-up of unit	eliminated
35.	Defect in the outerfacing along floor - wall joint behind SG-1 (to the left of the cable tray)	A-002 mark "otm"-1.8	KAER	before power start-up of unit	eliminated
36.	Defect of the outerfacing of the wall behind pipes behind the SG-1 (above the "KIP" pipe penetrations)	A-002 mark "otm"-1.8	KAER	before power start-up of unit	eliminated
37.	Leakage along the support frame under GCH-2,3	A-002 mark "otm" -1.8	KAER	befor power start-up of unit	eliminated
38.	Defects in the frame of the hot GZZ 3 loops (between the box and deck)	A-002 marking - 1.8	KAER	before power start-up of unit	eliminated
39.	Defect in the outerseal behind the door in the corner	A-105/1	KAER	Power Outage-97	
40.	Leakage from beneath the flange bolts K-12/5 and K-11/4	A-106/1	CEOO	before pressurization	eliminated
41.	Leakage under two cable penetrations above the door	A-013/1	CTAI	Power Outage-97	eliminated
42.	Leakage along cable penetration flange in A-012/1 (to the left of entrance door)	A-013/1	KAER	Power Outage-97	
43.	Defect in the outerseal of the wall between A-013/1 and A-002/1	A-013/1	KAER	Power Outage-97	
44.	Leakage along welded seam and the packing of the trap	A-013/1	CCR	before pressurization	trap has been inspected

45.	Defect in the outerseal of the ceiling between 1 PG-6 and cable shaft	A-002/1	KAER	before power start-up of unit	eliminated
46.	Leakage along flange of piping/ conduit penetration behind 1 PG-2 (3m from bottom of the annular platform)	A-002/1 Top	KAER	before power start-up of unit	eliminated
47.	Behind 1 PG-2 leakage along two flanges of conduit penetrations	A-002/1 top	KAER	before power start-up of unit	eliminated
48.	Two defects in the outerfacing on the wall behind 1SG-3(near the top maintainance platform	A-002/1 top	KAER	before power start-up of unit	eliminated
49.	Two defects of openings in the wall next to "KO"	A-101/1	KAER	before power start-up of unit	eliminated
50.	Defect in the outerfacing of the wall near the top maintenance platform !SG-1 (near the feedwater piping conduits from the SG-1 facing)	A-002/1 top	KAER	before power start-up of unit	eliminated
51.	Defect in the outerfacing on the wall along 1SG-1 (near the feedwater piping conduits)	A-002/1 top	KAER	before power start-up of unit	eliminated
52.	Defect in the outerfacing on the wall betwee SG-5 and the exploding-valve platform (under the ceiling)	A-002/1 top	KAER	before power start-up of unit	eliminated
53.	Defect in the outerfacing near the feedwater piping conduit support between SG-5 and SG-6	A-002/1 top	KAER	before power start-up of unit	eliminated
54.	Defect in the outerfacing above the openings for the steam piping mark "otm" 14.0	A-002/1 top	KAER	before power start-up of unit	elliminted
55.	Defect in the outerfacing near the supports for piping conduits for the sprinkling system	A-002/1 top	KAER	before power start-up of unit	eliminated

56.	Leakage through the breathing hatches/vents of the biological shield along the ceiling.	A-001/1		Power Outage-97	separate measures
57.	Small leak in the opening of DU200 (air duct?)	A-001/1	KAER	Power outage-97	
58.	Replace screw in top rack of door	A-004/1	CCR	before pressurization	eliminated
59.	Leakage along flanges of openings 1Y1-9,12,19	A-106/1	KAER	December 1996	
60.	Leakage along hatch seal above NDr-1	A-301	TTO	Power Outage-97	
61.	Undampen trap a-311/1 from trap A 303/1	A-303/1	CCR	before pressurization	completed
62.	Leakage along cable openings/penetrations (3 items) near door no. A-502/1	A-501/1	CTAI	Power Outage-97	eliminted
63.	Crack along welded seam on the maintainance platform for exploding valves near stairs leading to shutoff valve	A-002/1 top	KAER	before power start-up of unit	eliminated
64.	Leakage from the opening/penetration (10mm) on the top platform, left wall	A-207/1	KAER	Power Outage-97	
65.	Leakage along cable penetration (4 pipes) behind 1SG-4	A-104/1	CTAI	Power Outage-97	eliminated
66.	Leakage along cable penetration (1 pipe) (left wall)	A-104/1	CTAI	Power Outage-97	eliminated
67.	Leakage along cable penetration (1 pipe) (opening above door)E-205	A-308/1	CTAI	Power Outage-97	eliminated
68.	Leakage along cable penetration (1 pipe) (opening above door) E-219	A-502/1	CTAI	Power Outage-97	eliminated

69.	Leakage along cable penetration (5 pipes) E-8	A-002	CTI	Power Outage-97	eliminated
70.	Leakage along cable penetration (2 pipes) E-54	A-103/1	CTAI	Power Outage-97	eliminated
71.	Leakage along cable penetration (5 pipes) E-7	A-004/1	CTAI	Power Outage-97	eliminated
72.	Leakage along cable penetration E-6a	A-004/2	CTAI	Power Outage-97	eliminted

DISCOVERED DURING PRESSURIZATION

1.	Weak leak along reserve/backup cable penetrations (first penetration/opening from the entrance on the.the left side of the floor)	A-201/1	CTAI	January-97	eliminated
2.	Leakage along cable penetrations 2 pipes (to the left on the wall across from SK-9 IVM)	A-203/1	CTAI	January-97	eliminated
3.	Leakage along cable penetration - 5 pipes (on the vertical wall across SK-4 IVM), caps not tightened on all reserve openings	A-203/1	CTAI	January-97	eliminated
4.	Leakage along cable penetration 13 pipes (on the vertical wall across from "Hzck-6)	A-203/1	CTAI	January-97	eliminated
5.	Leakage along the reserve cable penetration	A-008/1	CTAI	January-97	eliminated
6.	Leakage along cable penetration (on the right, bottom outside)	A-008/2	CTAI	January-97	eliminated

7.	Leakage along flange of piping conduit from A-306/1 into A-502/1	A-502/1	KAER	December 1996	
8.	Leakage along piping conduit flanges PK SUZ	A-108/1	KAER	December 1996	
9.	Unsealed hatch above Hdr-1	A-301	EC	Power Outage-97	
10.	Leakage along cable penetration (second along the walkway)	E-002/4	EC	Power Outage-97	eliminated
11.	Leakage along cable penetration (last one)	E-002/4	EC	Power Outage-97	eliminated
12.	1-P-1-5: -leakage along armored plate separations/seams -leakage from under pressure flange of gasket in the top portion	B-005/1	CEOO	Power Outage-97	eliminated
13.	1-P-1-4: -leakage from under pressure cap; -leakage along outside edge of ring; -leakage along syphon seal	b-005/1	CEOO	Power Outage-97 Power Outage-97	eliminated during testing
14.	Leakage along flanges of service water piping conduits. -1P1-3 entrance.; -next to armour for 1T-16/2 -1P-1-1 next to armour for 1T-17/1	B-005/1	CEOO	Power Outage-97	eliminated
15.	Leakage along seal of man-hole hatch to the air duct P-1	B-004/1	CEOO	Power Outage-97	
16.	Leakage along cable penetrations (along top) between A-103/1 and B-114/1	B-114/1	CTAI	Janauary-97	eliminated
17.	Leakage along piping flange (to the left)	B--114/1	KAER	Power Outage-97	

18.	Leakage along cable penetrations between A-004/2 and A-014/1	A-004/2	CTAI	Power Outage-97	eliminated
19.	K-11/5 leakage along flange seam	A-301	CEOO	Power Outage-97	
20.	Re-seal man-hole hatch infront of "G/K" 1G-1	A-304	CEOO	Power Outage-97	
21.	Leakage through seal of man-hole hatch in front of "g/k" 1B-4	B-213/1	CEOO	Power Outage-97	
22.	Leakage from "burn-through' of air duct along the support in front of the first gate-valve	b-213/1	CEOO	Power Outage-97	
23.	Connector/terminal improperly possitioned 1B-4	B-213/1	CTAI	before power start-up of unit	eliminated
24.	Re-seal flange in front of "g/k 1A-4/3	A-304	CEOO	Power Outage-97	
25.	Leakage along cable penetration near door A-103/1	B-105/1	CTAI	January-97	eliminated
26.	Re-seal flange K-12/5	A-106/1	CEOO	Power Outage-97	
27.	Leakages along perimeter of piston/rod penetrations	A-107/1	KAER	Power Outage-97	
28.	Leakages along two cut penetrations in the left corner behind armour 1PK-1	A-108/1	KAER	Power Outage-97	
29.	Leakage along two cable penetrations (to the left-over the door)	A-503/1	CTAI	January-97	eliminated
30.	Leakage along flange of piping conduit DU57 (under the support next to hatch GCH-2)	A-301	KAER	December-96	eliminated
31.	Leakage along flange of feedwater conduit 1 PG-3	mark 14 machine hall	KAER	before power start-up of unit	eliminated

32.	Leakage along flange of reserve opening (emergency opening) DU400 on the wall behind piping conduits for feedwater 1PG-1-3	mark 14 machine hall	KAER	December-96	
33.	Escape of air through KID of the ventillation system P-4	E-501			fabricate hermetic valves

Director GLSB CNIP Petkevich T.I.

(2)

КОЛАТОМ Кольская Атомная Электростанция

ТЕЛЕФАКС

Кому: Dr. George Greene	
Фирма:	BNL (USA)
Телефон:	516-344-2296
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От кого:	Омельчука В. В.
	Главного инженера
Телефон:	(815-32)-68-351
Факс:	(815-32)-68_140
Дата:	15.12.96
Исходящий №:	11/8- 519
Число страниц, включая титульную:	8

Уважаемый г. Грин!

Направляю Вам акт об интегральных испытаниях гермообъема (ГО) блока 1 после планового ремонта блока. Выполненные работы по ремонту и реконструкции элементов системы герметичного ограждения привели к существенному снижению величины утечки из ГО. Однако по-прежнему большие протечки воздуха во время испытаний наблюдались через системы вентиляции ГО.

Во время уплотнения люков после реконструкции выяснилось, что для качественного их уплотнения необходима резина меньшей твердости, чем та, что уже была ранее Вами поставлена на Кольскую АЭС и размером 15×20 мм (вместо 15×30). Прошу Вас рассмотреть вопрос о возможности поставки такой резины на КАЭС. Необходимое количество резины указано в факсе Кольской АЭС №11/8-448 от 16.10.96г.

В еженедельном отчете о проделанной работе от 25.10.96г. по Международной программе по ядерной безопасности, подготовленном PNNL (США, Ричланд, штат Вашингтон) указано, что персоналом Аргонской Национальной Лаборатории (ANL) подготовлен для АЭС Венгрии отчет «Нагрузки на контайнмент и структурная реакция для аварии с разрывом трубопровода большого диаметра на АЭС с реактором ВВЭР-440/213» (Jeff Binder, ANL, 630-252-7265). Прошу Вас оказать содействие в направлении на Кольскую АЭС экземпляра этого отчета для его изучения и возможного использования.

Приложение: Акт №182-96/ЦНИП от 04.12.96г. об интегральных испытаниях гермообъема (ГО) блока 1 после планового ремонта блока на 7 листах в 1 экз.

С уважением
Главный инженер Омельчук В.В.

Пепкевич, 29-71

«Утверждаю»
Главный инженер Кольской АЭС
В.В.Омельчук
«24» 12 1996г.

АЭС
182-96/цикл

АКТ

Кольская АЭС, блок 1 2+3.12.96г.
Реакторный цех
Конструктивный элемент: система герметичных помещений (СГП)
Руководящий документ: рабочая программа №1,2-11-20ПГ-94

Комиссия в составе:

зам.начальника ЦНИП	Городинина С.В.
руководителя ГЛСБ ЦНИП	Петкевич Т.И.
инженера РЦ	Сборовского В.В.

провела испытания системы герметичных помещений на герметичность и получила следующие результаты:

Наименование испытаний	Пункт программы	Критерий испытаний (результаты, полученные при предыдущем испытании после ППР-95)	Полученный результат	Заключение
1.Вакуумирование СГП	п.8.1	Разрежение в СГП 100 мм в.ст.	Разрежение в СГП 220 мм в.ст.	Удовлетворительно
2.Наддув СГП	п.8.2	Достигнутое давление в СГП *90 мм в.ст* Утечка *L=4560%* объёма в сутки (пересчёт на P=0,5атм) Эквивалентный диаметр неплотностей *Дэ=354 мм*	Достигнутое давление в СГП *320 мм в.ст* Утечка *L=720%* объёма в сутки (пересчёт на P=0,5атм) Эквивалентный диаметр неплотностей *Дэ=184 мм*	Удовлетворительно

1.Ход испытаний.

Испытание проводилось в два этапа: вакуумирование и наддув.

1.1.Вакуумирование: СГП подготовлена к испытаниям в соответствии с требованиями программы испытаний. В гермообъём допущен персонал ЦНИП и ремонтный персонал ЦЦР, ЦТАИ, ЭЦ, КРУ КАЭР для поиска дефектов. Разрежение в ГО создавалось работой двух вентиляторов системы 2В-4 (общий расход Q=80 000м^3/час). Контроль разрежения осуществлялся по U-образному манометру, установленному на импульсной трубке замера давления в боксе ПГ.

В ходе вакуумирования было выявлено несколько десятков дефектов по гермооблицовке, проходкам, уплотнениям люков и дверей, наиболее существенные из которых в течение двух смен были устранены ремонтным персоналом.

1.2.Наддув: СГП подготовлена к испытаниям в соответствии с требованиями программы испытаний. Избыточное давление в ГО создавалось работой компрессора для испытаний ГО блоков 2ой очереди. Контроль давления осуществлялся по двум манометрам со шкалой 0÷1 кг/см^2 классом точности 0,4, установленным на импульсных трубках замера давления в боксе ПГ.

В связи с недостаточной производительностью компрессора, а также из-за относительно протяжённой трассы системы наддува давление в ГО достигнуто P=320 мм в.ст.

При этом давлении произведён наружный осмотр СГП, после отключения компрессора определена величина утечки из ГО.

2.Выводы.

2.1.Результаты испытаний соответствуют критериям.

2.2.В ходе испытаний выявлены дефекты, приведённые в приложении 1.

С.В.Горелкин

Т.И.Петкевич

В.В.Сборовский

3.Заключение. during the planned outage 96 improvements to the

3.1.За счёт проведения в ППР-96 комплекса мероприятий герметичность СГП существенно увеличилась. system is hermetic spaces can now be regarded as sealed for future power operation

3.2. Система герметичных помещений допускается к дальнейшей эксплуатации.

3.3. Устранить выявленные дефекты в соответствии с приложением. eliminate examined / revealed defects in accordance with the attachment

Отв. ЦПР, ЦТАИ, ЭЦ, ЦЭОО (по принадлежности) according to functions

3.4.Разработать мероприятия по увеличению герметичности СГП в ППР-97.

Отв. ЦНИП Срок-декабрь 1996г.

Начальник РЦ П.И.Новожилов

Начальник ЦНИП Г.С.Парадников

Горелкин,23-44

ПЕРЕЧЕНЬ ДЕФЕКТОВ ГЕРМООГРАЖДЕНИЯ, ВЫЯВЛЕННЫХ ПРИ ИСПЫТАНИЯХ ГО В 1996г.

№ п/п	Наименование	№№ пом.	Отв. за устранение	Срок устранения	Примечание
	ВЫЯВЛЕНО ПРИ ВАКУУМИРОВАНИИ				
1.	Пропуск воздуха по сальнику К-11/1	А-105/1	ЦЭОО	до наддува	устранено
2.	Пропуск воздуха по сальнику К-12/14	А-109/1	ЦЭОО	до наддува	устранено
3.	Не настроен концевик К-11/18	А-108/1	ЦТАИ	до наддува	устранено
4.	Переуплотнить люк-лаз воздуховода 1В-1 перед г/к 1Г-1	В-304	ЦЭОО	ППР-97	
5.	Течи воздуха по св. шву м/у закладными и трубопроводами тех. воды	1В-005	КАЭР	декабрь 1996г.	уплотнить герметиком
6.	Дефект облицовки на площадке обслуживания ПК КО, отм. 10.5 (за 1Р-17/4)	А-101/1	КАЭР	до пуска блока	устранено
7.	Течь по уплотнению двери м/у А-101/1 и А-108/1	А-101/1	ЦЦР	до наддува	устранено
8.	Дефект облицовки на площадке обслуживания ПК КО, отм. 10.5 (за вент. коробом)	А-101/1	КАЭР	до пуска блока	устранено
9.	Течи воздуха вдоль трубопроводов питательной воды и паропроводов	А-101/1 А-002/1	КАЭР	до наддува	устранено
10.	Дефект облицовки на опоре ББ (ближняя от двери слева от входа)		КАЭР	до пуска блока	устранено
11.	Дефект облицовки на опоре ББ (следующая от двери ближе к КО)	А-502/1	КАЭР	до пуска блока	устранено
12.	Дефект облицовки на площадке обслуживания ПК КО под балкой (на стене, противоположной деф. 6)	А-101/1	КАЭР	до пуска блока	устранено
13.	Поток воздуха из трубопровода Ду150 в полу под КО	А-101/1	ЦЦР	до наддува	приварена заглушка
14.	Дефект облицовки пола за КО (10*50мм)	А-101/1	КАЭР	до пуска блока	устранено
15.	Дефект облицовки стены за КО на уровне нагревателей	А-101/1	КАЭР	до пуска блока	устранено
16.	Течь по верхнему карману замка двери м/у А-102/1-А-103/1	А-102/1	КАЭР	до пуска блока	устранено
17.	В полу под стендом КИП справа от 1Р-2/5 течь по периметру квадратной закладной (150*150)	А-102/1	КАЭР	до пуска блока	устранено
18.	Течи по заглушкам четырех труб Ду250 на внутр. стене возле 1Р-2/6	А-102/1	КАЭР	до пуска блока	устранено
19.	Течи воздуха по трапам пом. А-103/1 и палубы ГЦН	А-102/1 А-103/1	ЦЦР	до наддува	отревизован вентиль СК-40
20.	Слабая течь по фланцу подколпачному		ТТО	до наддува	загерметизировано герметиком
21.	Течи по двум кабельным проходкам слева от двери (2 и 3 снизу)	А-103/1	ЦТАИ	декабрь 1996г.	устранено
22.	Течь по сварному шву м/у закладной и облицовкой в углу (7-я труба снизу)	А-103/1	КАЭР	до пуска блока	устранено
23.	Дефект облицовки на стене за 1Р-1/3	А-102/1	КАЭР	до пуска блока	устранено

№ п/п	Наименование	№№ пом.	Отв. за устранение	Срок устранения	Примечание
24.	Дефекты сварных швов на постаменте НДр	А-102/1	КАЭР	до пуска блока	устранено
25.	Дефекты облицовки проема люка над НДр	А-102/1	КАЭР	ППР-97	устранено
26.	Течь по левому нижнему углу двери м/у А-102/1 и А-204/1	А-102/1	ЦЦР	ППР-97	
27.	Два дефекта сварных швов по периметру 1Р-2/4	А-102/1	КАЭР	до пуска блока	устранено
28.	Течь по проходке (возле панели 43)	А-002 отм. -1.8	КАЭР	до пуска блока	устранено
29.	Два дефекта облицовки в полу в районе петли 6	А-002 отм. -1.8	КАЭР	до пуска блока	устранено
30.	Течь по двум швам в полу в районе петли 6	А-002 отм. -1.8	КАЭР	до пуска блока	устранено
31.	Дефект облицовки за ПГ-4 на стене у лестницы под площадкой	А-002 отм. -1.8	КАЭР	до пуска блока	устранено
32.	Дефект облицовки пола за холодной ниткой ПГ-3 у колонны площадки ПГ (ось 32)	А-002 отм. -1.8	КАЭР	до пуска блока	устранено
33.	Дефект проходки №5 (второй снизу ряд проходок) слева от входа в А-213/1	А-002 отм. -1.8	КАЭР	до пуска блока	устранено
34.	Дефект облицовки по примыканию пол-стена между ПГ-2 и ПГ-3 (ось 34)	А-002 отм. -1.8	КАЭР	до пуска блока	устранено
35.	Дефект облицовки по примыканию пол-стена за ПГ-1 (слева от кабельной трассы)	А-002 отм. -1.8	КАЭР	до пуска блока	устранено
36.	Дефект облицовки стены за трубами за ПГ-1 (над выходом трубок КИП)	А-002 отм. -1.8	КАЭР	до пуска блока	устранено
37.	Течи по обрамлению опоры под ГЦН-2,3	А-002 отм. -1.8	КАЭР	до пуска блока	устранено
38.	Дефекты в обрамлении проема горячей ГЗЗ 3петли (между боксом и палубой)	А-002 отм. -1.8	КАЭР	до пуска блока	устранено
39.	Дефект облицовки за дверью под уголком	А-105/1	КАЭР	ППР-97	
40.	Течи из-под болтов фланцев К-12/5 и К-11/4	А-106/1	ЦЭОО	до наддува	устранено
41.	Течи по двум кабельным проходкам над дверью	А-013/1	ЦТАИ	ППР-97	устранено
42.	Течь по фланцу трубной проходки в А-012/1 (слева от входной двери)	А-013/1	КАЭР	ППР-97	
43.	Дефект облицовки стены м/у А-013/1 и А-002/1	А-013/1	КАЭР	ППР-97	
44.	Течь по сварному шву и уплотняющей поверхности трапа	А-013/1	ЦЦР	до наддува	трап отревизован
45.	Дефект облицовки на потолке между 1ПГ-6 и кабельной шахтой	А-002/1 верх	КАЭР	до пуска блока	устранено
46.	Течь по фланцу трубопроводной проходки за 1ПГ-2 (3м от низа кольцевой площадки)	А-002/1 верх	КАЭР	до пуска блока	устранено
47.	За 1ПГ-2 течи по двум фланцам трубопроводных проходок	А-002/1 верх	КАЭР	до пуска блока	устранено

№ п/п	Наименование	№№ пом.	Отв. за устранение	Срок устранения	Примечание
48.	За 1ПГ-3 два дефекта облицовки на стене (около верхней площадки обслуживания)	А-002/1 верх	КАЭР	до пуска блока	устранено
49.	Два дефекта проходок на стене возле КО	А-101/1	КАЭР	до пуска блока	устранено
50.	Дефект облицовки на стене около верхней площадки обслуживания 1ПГ-1 (около трубопровода питательной воды, с торца ПГ-1)	А-002/1 верх	КАЭР	до пуска блока	устранено
51.	Дефект облицовки на стене вдоль 1ПГ-1 (около трубопровода питательной воды)	А-002/1 верх	КАЭР	до пуска блока	устранено
52.	Дефект облицовки на стене м/у ПГ-5 и площадкой взрывных клапанов (под потолком)	А-002/1 верх	КАЭР	до пуска блока	устранено
53.	Дефект облицовки рядом с опорой трубопровода питательной воды м/у ПГ-5 и ПГ-6	А-002/1 верх	КАЭР	до пуска блока	устранено
54.	Дефект облицовки над проходками паропроводов на отм. 14.0	А-002/1 верх	КАЭР	до пуска блока	устранено
55.	Дефект облицовки рядом с опорой трубопровода спринклерной системы за ПГ-6	А-002/1 верх	КАЭР	до пуска блока	устранено
56.	Течь через дыхательные лючки биологической защиты на потолке	А-001/1		ППР-97	по отдельным мероприятиям
57.	Небольшая течь в проходке Ду200	А-001/1	КАЭР	ППР-97	
58.	Заменить винт верхней кремальеры двери	А-004/1	ЦЦР	до наддува	устранено
59.	Течи по фланцам проходок 1У1-9,12,19	А-106/1	КАЭР	декабрь 1996г.	
60.	Течь по уплотнению люка над НДр-1	А-301	ТТО	ППР-97	
61.	Отглушить трап А-311/1 от трапа А-303/1	А-303/1	ЦЦР	до наддува	выполнено
62.	Течи по кабельным проходкам (3шт.) возле двери пом. А-502/1	А-501/1	ЦТАИ	ППР-97	устранено
63.	Трещина сварного шва на площадке обслуживания взрывных клапанов возле лестницы к клапан-заглушкам	А-002/1 верх	КАЭР	до пуска блока	устранено
64.	Течь из отверстия (10мм) на верхней площадке, левая стена	А-207/1	КАЭР	ППР-97	
65.	Течь по кабельной проходке (4трубы) за 1ПГ-4	А-002/1	ЦТАИ	ППР-97	устранено
66.	Течь по кабельной проходке (1труба) (левая стена)	А-104/1	ЦТАИ	ППР-97	устранено
67.	Течь по кабельной проходке (1труба) (проходка над дверью) Э-205	А-308/1	ЦТАИ	ППР-97	устранено
68.	Течь по кабельной проходке (1труба) (проходка над дверью) Э-219	А-502/1	ЦТАИ	ППР-97	устранено
69.	Течь по кабельной проходке (5 труб) Э-8	А-002/1	ЦТАИ	ППР-97	устранено
70.	Течь по кабельной проходке (2 трубы) Э-54	А-013/1	ЦТАИ	ППР-97	устранено

№ п/п	Наименование	№№ пом.	Отв. за устранение	Срок устранения	Примечание
71.	Течь по кабельной проходке (5 труб) Э-7	А-004/1	ЦТАИ	ППР-97	устранено
72.	Течь по кабельной проходке Э-6а	А-004/2	ЦТАИ	ППР-97	устранено
	ВЫЯВЛЕНО ПРИ НАДДУВЕ				
1.	Слабая течь по резервным кабельным проходкам (первая проходка от входа с левой стороны в полу)	А-203/1	ЦТАИ	январь 1997г.	устранено
2.	Течь по кабельной проходке - 2 трубы (слева на стене напротив СК-9 ИВМ)	А-203/1	ЦТАИ	январь 1997г.	устранено
3.	Течь по кабельной проходке -5 труб (на вертикальной стене напротив СК-4 ИВМ), не обтянуты заглушки всех резервных проходок.	А-203/1	ЦТАИ	январь 1997г.	устранено
4.	Течь по кабельной проходке - 13 труб (на вертикальной стене напротив HZCK-6).	А-203/1	ЦТАИ	январь 1997г.	устранено
5.	Течь по резервной кабельной проходке	А-008/1	ЦТАИ	январь 1997г.	устранено
6.	Течь по кабельной проходке (справа нижняя крайняя)	А-008/2	ЦТАИ	январь 1997г.	устранено
7.	Течь по фланцу трубопроводной проходки из А-306/1 в А-502/1	А-502/1	КАЭР	декабрь 1996г.	
8.	Течи по фланцам трубопроводов ПК СУЗ	А-108/1	КАЭР	декабрь 1996г.	
9.	Неплотность люка над НДр-1	А-301	ТТО	ППР-97	
10.	Течь по кабельной проходке (вторая по ходу)	Э-002/4	ЭЦ	ППР-97	устранено
11.	Течь по кабельной проходке (последняя)	Э-002/4	ЭЦ	ППР-97	устранено
12.	1-Р-1-5: -течь по разъему бронеплиты; -течь из-под прижимного фланца сальника в верхней части	В-005/1	ЦЭОО	ППР-97	устранено
13.	1-Р-1-4: -течь из-под прижимного кольца; -течь по наружному краю кольца; -течь по уплотнению сильфона.	В-005/1	ЦЭОО	 ППР-97 ППР-97	 устранено в ходе испытаний
14.	Течи по фланцам трубопроводов тех. воды -1Р1-3 вх.; -рядом с арматурой 1Т-16/2; -1Р-1-1 рядом с арматурой 1Т-17/1	В-005/1	ЦЭОО	ППР-97	устранено
15.	Течь по уплотнению люка-лаза в воздуховод Р-1	В-004/1	ЦЭОО	ППР-97	
16.	Течи по кабельным проходкам (наверху) м/у А-103/1 и В-114/1	В-114/1	ЦТАИ	январь 1997г.	устранено
17.	Течь по фланцу трубы (слева)	В-114/1	КАЭР	ППР-97	
18.	Течи по кабельным проходкам м/у А-004/2 и А-014/1	А-004/2	ЦТАИ	ППР-97	устранено

№. п/п	Наименование	№№ пом.	Отв. за устранение	Срок устранения	Примечание
19.	К-11/5-течь по фланцевому разъему	А-301	ЦЭОО	ППР-97	
20.	Переуплотнить люк-лаз перед г/к 1Г-1	А-304	ЦЭОО	ППР-97	
21.	Течь через уплотнение люка-лаза перед г/к 1Б-4	В-213/1	ЦЭОО	ППР-97	
22.	Течь из прожога воздуховода на опоре перед первой шиберной задвижкой	В-213/1	ЦЭОО	ППР-97	
23.	Не настроен концевик 1Б-4	В-213/1	ЦТАИ	до пуска блока	устранено
24.	Уплотнить фланец перед г/к 1А-4/3	А-304	ЦЭОО	ППР-97	
25.	Течь по кабельной проходке возле двери А-103/1	В-105/1	ЦТАИ	январь 1997г.	устранено
26.	Уплотнить фланец К-12/5	А-106/1	ЦЭОО	ППР-97	
27.	Течи по периметру штоковых проходок	А-107/1	КАЭР	ППР-97	
28.	Течи по двум разрезанным проходкам в левом углу за арматурой 1ПК-1	А-108/1	КАЭР	ППР-97	
29.	Течь по двум кабельным проходкам (слева вверху от двери)	А-503/1	ЦТАИ	январь 1997г.	устранено
30.	Течь по фланцу трубопровода Ду57 (под постаментом рядом с люком ГЦН-2)	А-301	КАЭР	декабрь 1996г.	
31.	Течь по фланцу питательного трубопровода 1ПГ-3	отм. 14 машзал	КАЭР	до пуска блока	устранено
32.	Течь по фланцу резервной проходки Ду400 на стене за трубопроводом питательной воды 1ПГ-1-3	отм. 14 машзал	КАЭР	декабрь 1996г.	
33.	Пропуск воздуха через КИДы вент. системы П-4	Э-501			смонтировать термоклапаны

3

Руководитель ГЛСБ ЦНИП Петкевич Т.И.

ATTACHMENT 7

Request for Additional Material for Leaktightness Improvements
Kola Units 1, 2
(English and Russian)

To: Dr. George Greene	From: Omel'shuk V.V. Chief Engineer
Company:	Telephone:
Telephone::	Fax:
Fax:	Date: 10/16/96 Ident. No. 11/8-448 No. Of Pages, including cover sheet: 2

Dear Mr. Greene!

During the past few years at the Kola Nuclear Power Plant a lot of work has been completed with regard to containment leak tightness. We are succesfully using materials and equipment made by USA companies, and supplied to the Kola NPP within the framework of the International Nuclear Safety Program. However, at this time ,these materials have either finished (regarding gaskets, as in the case of since the result of reconstructing the trap doors is requiring twice (2) the number of gaskets), or because their functional use has come to an end (which concerns sealants).

In order to successfully continue with our work on increasing containment leak-tightness of units 1, 2 I would like to request that you consider supplying the Kola NPP within the framework of the International Nuclear Safety Program, with materials and equipment that is listed in the attachment to this Fax.

Attachment: materials and equipment that are required (necessary) for the continuation of work for containment leak-tightness at the Kola NPP.

With Respect
Chief Engineer V.V. Omel'chuk

Translated by Helen Todosow
For G. Greene
Dec. 2, 1996

Attachment 1.

Materials and equipment required by the Kola NPP for continuing work in containment leak-tighness for Units 1,2

Unit 1.

Item/name	Required amount	size/dimensions
1.Rubber seals: - for doors - for hatches - for hatches of the "central air system(?)" - for the reactor header/cap	 100m 500m 100m 25m	 15x50 mm 15 x 30 mm 12 x 12 mm 030 mm
2.Sealants; - "carboline-163" - 45 V	 50 units/sets 5 units/sets	
3. Hermetic valves for the ventilation system.	2 items 2 items 2 items 16 items	Du 1000 (?) Du 250 (?) Du 350 (?) Du 500 (?)

Unit 2

Item /name	Required amount	Dimensions/size
1. Rubber seals: - for doors - for hatches - for hatches of the "central air system(?)"	 50m 250m 50m 25m	15 x 50 mm 15 x 30 mm 12 x 12 mm 030 mm
2. Sealants; - Carboline-163 (?) - 45 V	 50 units/sets 5 units/sets	

3.Manual drive for hermetic valves with pneumatic drives for the ventilation system "P-4" assembled at Unit 2 during planned outage -96.	2 items	Du 1000

Director of CNEP Paradnikov, G.S.

КОЛАТОМ Кольская Ато

Attachment 2

ТЕЛЕФА

Кому:	
	Dr.George Greene
Фирма:	BNL (USA)
Телефон:	516-344-2296
Факс:	516-344-3526

От ко	
Телеф	
Факс:	
Дата:	
Исходящий №:	11/8- 448
Число страниц, включая титульную:	2

Уважаемый г. Грин!

В последние годы на Кольской АЭС выполнен большой объем работ по герметизации помещений гермообъема. С успехом применяются материалы и оборудование производства компаний США, поставленные на Кольскую АЭС в рамках Международной Программы Ядерной Безопасности. Однако к настоящему моменту эти материалы либо закончились (касается резиновых уплотнений, т.к. в результате реконструкции люков расход резиновых уплотнений увеличивается в 2 раза), либо закончился их срок годности (касается герметиков).

Для успешного продолжения работ по повышению герметичности конфайнментов блоков 1,2 прошу Вас рассмотреть вопрос о поставке на Кольскую АЭС в рамках Международной Программы Ядерной Безопасности материалов и оборудования, представленных в приложении к настоящему факсу.

Приложение: материалы и оборудование, необходимые Кольской АЭС для продолжения работ по герметизации конфайнмента.

С уважением
Главный инженер Омельчук В.В.

Петкевич, 29-71

Приложение 1.

Материалы и оборудование, необходимые Кольской АЭС для продолжения работ по герметизации конфайнмента блоков 1,2

Блок 1.

Наименование	Необходимое количество	Размер
1. Резиновые уплотнения:		
- для дверей	100м	15×50 мм
- для люков	500м	15×30 мм
- для люков СВО-1	100м	12×12 мм
- для колпака реактора	25м	∅30 мм
2. Герметики:		
- карболайн-163	50 комплектов	
- 45В	5 комплектов	
3. Гермоклапаны систем вентиляции.	2шт.	Ду1000
	2шт.	Ду250
	2шт.	Ду350
	16шт.	Ду500

Блок 2

Наименование	Необходимое количество	Размер
1. Резиновые уплотнения:		
- для дверей	50м	15×50 мм
- для люков	250м	15×30 мм
- для люков СВО-1	50м	12×12 мм
- для колпака реактора	25м	∅30 мм
2. Герметики:		
- карболайн-163	50 комплектов	
- 45В	5 комплектов	
3. Ручной привод для гермоклапанов с пневмоприводом вентиляционной системы П-4, смонтированных на блоке 2 в ППР-96.	2 шт.	Ду1000

Начальник ЦНИП Парадников Г.С.

ATTACHMENT 8

Request from Kola NPP to B&R for Manual Isolation Valves
Kola Unit 2
(English and Russian)

KOLA -ATOMIC KOLA NUCLEAR POWER PLANT

TELE-FAX

TO: Mr. R. Chuebon COMPANY: U.S.A Burns & Roe TELEPHONE: 201-986-4226 FAX: 201-986-4210	FROM: OMEL'CHUK, V.V. Chief Engineer TELEPHONE: 815-32-68-351 FAX: 815-32-68-140 DATE: (Nov ??) 05/96 ISSUE no. 11/8-204 NUMBER OF PAGES INCL. COVERPAGE: 2

Concerning additional manual drives for pneumatically controlled hermetic valves for the Kola NPP, unit 2.

Dear Mr. Chuebon;

During the final phase of the contract between the company "Burns & Roe" and "Enertech" and in addition between "Burns & Roe" and the Kola NPP, and during the development of the technical specifications for hermetic valves, a detailed description of the operation of the valves was not available, in order to be able to unambiguously determine the functioning of the valves under various conditions. In addition, specialist at the Kola NPP, were not previously familiar with the principles of operation of the pneumatic drives of the hermetic valves (pneumatically controlled hermetic valves) made in the USA.

After receiving and carefully analyzing the complete collection of documents, concerning the functioning of the hermetic valves with pneumatic drives (pneumatically driven hermetic valves), it was determined that in the case of a unanticipated (unauthorized) cut-off of pressurized air-flow or electrical current to the pneumatic drive, the valves close-shut, and it is impossible to open them.

According to the plans for Unit 2 of the Kola NPP the air-flow into the pressurized system during

plant operations and during planned outages of the unit is accomplished only by the ventilation of the P-4 system, where the given hermetic valves are being installed. The shut-off of air flow to the steam generator "box" (room) during various operating conditions of the unit is unacceptable for the following reasons:

1. During power operations of the unit, the closing of valves (even only one out of two) during non-accident situations, and the inability of opening them, results in the full shut-off of air supply to the pressure system (?), and as a result, leads to the increase in temperature in the steam generator "box" (hall/room) and on the deck of the main circulating pumps, which in turn, leads to the necessary shutdown of the unit.

2. The shut-off of air supply to the steam generator in the case of the closing of hermetic valves during a planned outage of the unit, leads to a worsening of working conditions for plant personnel (increased temperatures, humidity, a worsening of the radiation conditions) in the steam generator hall.

As a consequence of the above, it becomes imperative to have a mechanism for manually opening the valves in the event of their unanticipated closure during non-accident situations.

Based on the information from Burns & Roe representatives and from brochures from "Enertech," it turns out that there are manual drives for hermetic valves, which can be retrofitted to the already installed hermetic valves.

I ask that you consider the installation of two manual drives for hermetic valves with pneumatic drives for system P-4 of unit 2 of the Kola NPP, as a form of technical assistance within the framework of the Lisbon Initiative.

With Respect,

Chief Engineer V.V. Omel'chuk

КОЛЬСКАЯ АТОМНАЯ ЭЛЕКТРОСТАНЦИЯ

ТЕЛЕФАКС

Attachment 3

Кому: Mr. R. Chuebon	От:
Фирма: США BURNS & ROE	Тел:
Телефон: 201-986-4226	Факс:
Факс: 201-986-4210	Дата:

Касается дополнительных ручных приводов для гермоклапанов с пневмоприводом блока 2 Кольской АЭС.

Уважаемый г. Шубен!

На этапе заключения контракта между компанией «Burns and Roe» и «Enertech» и затем между «Burns and Roe» и Кольской АЭС и во время разработки технической спецификации по гермоклапанам не хватало подробного описания работы клапанов, чтобы однозначно оценить работу клапана в различных режимах. Кроме того, специалисты КАЭС не были ранее знакомы с принципами работы пневмоприводов гермоклапанов производства США.

После получения и детального анализа полного комплекта документов, касающихся работы гермоклапанов с пневмоприводом, было выявлено, что в случае несанкционированного прекращения подачи сжатого воздуха или электропитания на пневмоприводы клапаны закрываются и их невозможно открыть.

По проекту на блоке 2 КАЭС приток воздуха в гермообъем при работе блока на мощности и во время планового ремонта (ППР) блока осуществляется только вент. системой П-4, на которой устанавливаются данные гермоклапаны. Прекращение подачи воздуха в бокс парогенераторов (ПГ) при различных режимах работы блока недопустимо по следующим причинам:

1. при работе блока на мощности закрытие клапана (даже одного из двух) в неаварийной ситуации и невозможность его открытия приводит к полному прекращению подачи приточного воздуха в гермообъем и, как следствие, к росту температуры в боксе ПГ и на палубе главных циркуляционных насосов (ГЦН), что в свою очередь приведет к необходимости останова блока;

2. прекращение подачи приточного воздуха в бокс ПГ в случае закрытия гермоклапана во время ППР блока приводит к ухудшению условий работы персонала (повышению температуры, влажности, ухудшению радиационной обстановки) в боксе ПГ.

Из вышеприведенного следует, что необходимо иметь приспособление для открытия клапанов вручную в случае их непредвиденного закрытия в неаварийной ситуации.

По информации представителей фирмы «Burns and Roe» и из проспектов фирмы «Enertech» следует, что существует ручной привод гермоклапанов, который можно смонтировать дополнительно на уже установленных гермоклапанах.

Прошу Вас рассмотреть возможность поставки на Кольскую АЭС в качестве технической помощи в рамках программы « Лиссабонская инициатива» двух ручных приводов для гермоклапанов с пневмоприводом вент. системы П-4 блока 2.

С уважением,

Главный инженер В. В. Омельчук