Department of Energy
Brookhaven Group
Building 464
P.O. Box 5000
Upton, New York 11973

OCT 26 1999

Mr. Michael Schlender
Brookhaven Science Associates, LLC
Brookhaven National Laboratory
Upton, New York 11973

Dear Mr. Schlender:

SUBJECT: APPROVAL OF UNREVIEWED SAFETY ISSUE DETERMINATION/ SAFETY EVALUATION (USID/SE) FOR PILE FAN #5 REMOVAL FOR BROOKHAVEN RESEARCH REACTOR DECOMMISSIONING PROJECT (BGRR-SE-99-01)

The Brookhaven Group (BHG) has reviewed your request to begin removal of the BGRR Pile Fan #5 Removal. BHG has determined that the actions referenced in USID/SE BGRR-SE-99-01 are appropriate with the requirements of DOE Order 5480.21, Unreviewed Safety Questions and DOE-EM-STD-5503-94, EM Health and Safety Plan Guidelines. Therefore, removal of the BGRR Pile Fan #5 is authorized contingent upon the resolution of questions attached concerning the work plan for the removal of Pile Fan #5.

If you have any questions regarding this matter, please contact Lloyd Nelson of my staff at extension 5225.

Sincerely,

George J. Malosh
Brookhaven Group Manager

Enclosure:
As stated

cc: J. Goodenough, EPG, CH
M. Holland, BHG
S. Mallette, BHG
M. Dikeakos, BHG

All comments resolved per Lloyd Nelson communication to S. Moss 10/26/99 SAM

DOE BHG comments on BGRR-SE-99-01

1) Table 1-1, "Activity Description" No. 1 states "obtain concurrence from HFBR for performing work in the motor room". Has this been done and where is the specific concurrence from Reactor Division (RD) for the work being performed in the motor room? Has RD reviewed this work package?

2) What precautions were made to isolate work being done in Building 704 from the electrical switch gear and equipment used for the HFBR?

3) Has the pile fan been drained of all oils? Are there any PCB's in the oil? If not where is the documentation this has been analyzed and/or removed? What part of the work plan addresses the removal and draining of oils from the Pile Fan?

4) The BGRR Task-Specific ES&H Plan Table 2.1.1 Chemical Hazards Listing does not have ingestion exposure checked, but Table 2-1, Chemical Hazard Information does specify ingestion as an exposure route for Sr, Cs, Pu, Am, and Uranium. These tables need to accurately reflect hazard conditions and must agree with each other.

Responses to DOE-BHG Questions on BGRR-SE-99-01, USID/SE for Pile Fan #5 Removal

1. Table 1-1, "Activity Description" No. 1 states "obtain concurrence from HFBR for performing work in the motor room." Has this been done, and where is the specific concurrence from Reactor Division (RD) for the work being performed in the motor room? Has RD reviewed this work package? [L.Nelson, DOE-BHG]

   Response: The quotation listed above comes from the Task-Specific Environment, Health and Safety Plan for Pile Fans Removal from Building 704, BGRR-010, Rev. 0, dated 10/05/99. The TEHASP, although it is attached to the USID/SE, is not, strictly speaking, part of the USID/SE. Rather, the TEHASP (and the Technical Work Document) are self-standing documents with their own separate review and approval cycle /sign-off. They are attached as critical references, necessary for the USID/SE reviewers, to adequately assess the USID/SE.

   The Technical Work Document, upon which the quote from the TEHASP was based, has on its cover sheet, a sign-off by the reviewer for the Reactor Division (Michael Baldwin) dated 9/20/99. Within the Technical Work Document, under Section 5.0 - Prerequisites, Step 5.5 reads, "Obtain permission from HFBR Operations to perform work in the Fanhouse motor room" with a line for initials and date when accomplished. This would only be secured after DOE-BHG authorized the work for performance.

   Furthermore, by BNL Memorandum dated May 7, 1999, from L. Somma (HFBR Facility Manager) to C. Newson (BGRR Project Engineer) ownership of the five fan cells, the secondary air fan cell west side and the three west end auxiliary rooms (total of 9 rooms) was transferred to BGRR-DP. This memo followed an arrangement worked out via a previously established Memorandum Of Agreement (MOA) for the Ownership of the Fan House, Building 704, and Primary Exhaust Air Duct System and Associated Systems and Components, signed by both W. Reeside, Manager of the Reactor Division, and F. Petschauer the then Manager of the BGRR Project and dated 12/11/98.

2. What precautions were made to isolate work being done in Building 704 from the electrical switchgear and equipment used for the HFBR? [L. Nelson, DOE-BHG]

   Response: In addition to the controls put into place by the documents referenced above in response to Question #1, there is the physical control of space (on the order of 25 feet) between the cubicle for Fan #5 and the electrical switchgear associated with HFBR. This can be seen on BGRR Dwg. No. A-704-1A, "Bldg. 704 Plans and Details," Issue #9, dated 6/24/48.

   The specific controls of interest include, "During the stabilization of the Fan House, the BGRR Project will seal any north wall penetrations between the fan rooms and motor rooms to provide a physical barrier to the HFBR electrical distribution switchgear room and the building west side end rooms," which is given both within the MOA and the

cover memo. As the Fan itself currently represents part of that wall separation, when it is removed, the gap that it leaves in the wall will be filled to reestablish the separation.

3. Has the pile fan been drained of all oils? Are there any PCBs in the oil? If not, where is the documentation this has been analyzed and/or removed? What part of the work plan addresses the removal and draining of oils from the Pile Fan?

   Response: In the Technical Work Document for Pile Fan No.5 Removal, under Section 5.0 - Prerequisites, Step 5.4, it states, "Verify the oil has been drained from the fan bearing assemblies" with a line for initials and date.

   With regard to the presence or absence of PCBs in any oil present, a sampling and analysis of Chain-of-Custody Number 99062105 received 6/22/99, consisting of oils samples from Fan #5 Outload Bearing and Fan #3 Northside Bearing and a Trip Blank indicated < MDL for PCBs.

4. The BGRR Task-Specific ES&H Plan Table 2.1.1, Chemical Hazards Listing does not have ingestion exposure checked but Table 2-1, Chemical Hazard Information does specify ingestion as an exposure route for Sr, Cs, Pu, Am, and Uranium. These tables need to accurately reflect hazard conditions and must agree with each other. [L. Nelson, DOE-BHG]

   Response: You are correct. This was a typographical oversight not picked up during the regular review process. The master copy and electronic file copy have been corrected on Page 11 of 32, Section 2.0 - Hazard Analysis, Subheading 2.1.1 - Chemical Hazards Listing to reflect the addition of an 'X' in the box next to "Ingestion exposure."

Safety Evaluation Number: **BGRR – SE – 99 – 01** **Revision Number:** 0

Prepared by: S. H. Moss **Date:** 10/04/99

Description of proposed activity: WBS 1.2, Fan Removal and Decontaminate Fan House [Phase 1]

The Fan House, Building 704 is made up of two major sections. The main section is the motor house area located on the south side of the building which includes the normal and emergency electrical power feeds to the High Flux Beam Reactor (HFBR). This section includes one primary fan motor, with some associated valve operators and instrumentation. The north and west ends of the building are segmented into nine rooms. Five of the rooms house the primary air cooling fans. Another room houses instrumentation for fan operations. One houses the primary emergency fan. One room houses the secondary air cooling fan and associated valves. The southwest room housed the emergency engine for the primary air emergency cooling fan. The fans are internally contaminated, and most of the fan rooms are also contaminated.

This will be accomplished in two phases. Phase 1 will cover only the removal of Pile Fan #5, in accordance with the Technical Work Document - Pile Fan No. 5 Removal [Ref. 11], copy attached and the Task-specific Environment, Health and Safety Plan [Ref. 10], copy attached. Phase 2 will include the rest of the fans and all remaining decontamination work. It will be covered either as a revision of this USID/SE or under a separate one.

The activities covered here include:

1) Sample and evaluate in-situ, the component pieces of the fan house scheduled for removal.
2) Fans will be removed as part of the primary air cooling system for the BGRR.
3) Each fan will be removed with its associated piping and louvers up to the downstream isolation valve.
4) A blank flange will be installed at the discharge valve to provide a second means of isolation as confinement for the HFBR.
5) All services, air, water, and steam to any of the rooms will be isolated in the motor room, and piping will be removed in the fan room.
6) The above-ground duct to each fan will be isolated from the fan by positioning the suction valve in the closed position, sealed from inside each fan room during the isolation of the fan.
7) The fans and piping will be placed in sealand containers and characterized for shipment to a metal melt facility for disposal.
8) Once the equipment is removed, any contamination remaining will be evaluated, fixed in place, or removed and isolated from the motor rooms.
9) The fire detection system will be deactivated, as required during the removal process.
10) As-left surveys and samples will be collected, analyzed and documented.
11) An activity closure report will be prepared.
12) Custody of the fan rooms and auxiliary rooms will be returned to the HFBR.

Of all the above, only as applicable to Phase 1, removal of Pile Fan #5.

Purpose:

The purpose of WBS 1.2 for the BGRR Decommissioning Project is Fan Removals and Decontamination of Fan House (Building 704). It specifically consists of: 1) removal and disposal of contaminated equipment in the fan rooms; 2) decontamination or fixing-in-place, as appropriate, contamination present in the fan rooms; 3) returning custody of the fan and auxiliary rooms to the Reactor Division / High Flux Beam Reactor.

The purpose of breaking the work up into two phases is to verify the adequacy of the planned removal process for one fan before embarking on the removal of all fans. The expedited completion of Phase 1 also facilitates the installation of a temporary stack drain system that allows for the removal of the Pile Fan Sump (covered under BGRR-SE-99-02 [Ref.13]).

References:

(1) Procedure No. BGRR-SOP-0902, "Safety Evaluations for Unreviewed Safety Issue Determinations", Rev.0 dated 7/12/99.
(2) BGRR-002, "Hazard Classification and Auditable Safety Analysis for Brookhaven Graphite Research Reactor (BGRR) Decommissioning Project", Rev. 2 dated September 8, 1999.
(3) BGRR-001, "Brookhaven Graphite Research Reactor (BGRR) Project Management Plan", Rev.0 dated May 26, 1999, as concurred with by DOE.

(4) BNL ES&H Manual Standard 1.3.3, "Safety Analysis Reports / Safety Assessment Documents", Rev.1 dated 7/28/92. [URL= https:sbms.bnl.gov/ld/ld08/ld08d081.htm]
(5) DOE-STD-1027-92, "Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports" Change Notice No. 1 dated September 1997.
(6) LA-12846-MS, "Specific Activities and DOE-STD-1027-92 Hazard Category 2 Thresholds", LANL Fact Sheet issued November 1994.
(7) LA-12981-MS, "Table of DOE-STD-1027-92 Hazard Category 3 Threshold Quantities for the ICRP-30 List of 757 Radionuclides", LANL Fact Sheet issued August 1995.
(8) BNL Memorandum of Agreement (MOA) between BGRR Project Office and HFBR regarding ownership and control of Fan House Building 704 and Associated Equipment, Systems and Structures, dated 12/11/98.
(9) BNL NEPA CX covering fan removals and related activities, as approved by DOE-BHG Group Manager on 5/25/99.
(10) BGRR Decommissioning Project Task-specific Environment, Health and Safety Plan (TEHASP) for Pile Fan #5 Removal Activities. (Copy included as Attachment No. 1).
(11) BGRR Decommissioning Project Technical Work Document "Pile Fan No. 5 Removal" (Copy included as Attachment No. 2).
(12) BGRR Decommissioning Project – Environment, Health and Safety Plan, Rev. 0 dated September 16, 1999.
(13) BGRR-SE-99-02, Rev. 0 dated 09/14/99 covering WBS 1.3, Pile Fan Sump, Piping and Soils Removal.
(14) BNL Memorandum dated August 18, 1999, from M. Fallier to Distribution, "Minutes of Meeting – HFBR Stack Drain and Pile Fan Sump Projects".
(15) NUREG/CR-0672, "Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station", June 1980.
(16) Long Island Power Authority – Shoreham Nuclear Power Station – NRC Docket No. 50-322, "Updated Decommissioning Plan", February 1993.

SCREENING CRITERIA

Safety Function(s) of Systems Affected

1. Will the proposed activity affect the safety function(s) or failure mode(s) of the equipment/facility? Y **(N)** N/A

Because of its defunct status and defueled state, the BGRR has no current requirements for redundant systems and/or safety class or safety significant SSCs (Systems, Structures and Components). Therefore, no safety functions exist that are directly associated with current components or equipment considered part of the scope of the BGRR Decommissioning Project. Where no safety functions exist, there can be NO effect on the safety function by the proposed activity.

Pile Fan No.5 was shutdown as part of the general BGRR shutdown in 1969. It may already be considered as failed.

The proposed activity will not affect the safety function(s) of the facility [as there are none]. It will not affect the failure mode(s) of the equipment/facility, as the equipment was previously and permanently shutdown. The answer to Question 1 of Safety Function(s) of System Affected is '**NO**'.

2. Will any new failure modes be introduced by the proposed activity? **(Y)** N N/A

While BGRR-002, "Hazard Classification and Auditable Safety Analysis for the BGRR Decommissioning Project", Rev. 2 dated September 8, 1999 [Ref. 2], has not yet been approved by DOE; it is anticipated that approval will come before the Pile Fan No.5 Removal is completed.

Without the BGRR-ASA for comparison, any failure mode associated with the proposed activity constitutes a new failure mode. Guidance for the selection of appropriate failure modes to consider was taken from other decommissioning projects [Refs. 15 & 16]. The failure modes selected and associated accident analyses presented in Appendix A are; Crane Load Drop, Waste Container Drop, Contaminated Waste Bag Rupture/Fire, Oxyacetylene Explosion and Explosion of LPG Leaked from a Forklift. The Task-specific Environment, Safety and Health Safety Plan for the Pile Fan No.5 Removal [Ref. 10] and the BGRR Technical Work Document for Pile Fan No.5 Removal [Ref. 11], call for the use of flame cutting equipment. Therefore, an accident scenario based on an oxyacetylene explosion was considered. Based on the physical characteristics of the materials to be removed (metal components), Combustible Waste Fire was deemed not a credible accident scenario. Based on a review of the Task-specific Environment , Safety and Health Plan for the Pile Fan No.5 Removal [Ref. 10] and the BGRR Technical Work Document for Pile Fan No.5 Removal [Ref. 11], the work to be performed in support of the

proposed activity does not require or include the use of Contamination Control Envelope Structures or HEPA Filter Units (which could rupture as an accident scenario, if present).

In the absence of the BGRR-ASA, the proposed activity represents a new activity, with its own unique spectrum of potential failure modes. Even with the inclusion of the BGRR-ASA, the proposed activity (NEPA-CX [Ref.9] covered action) represents an activity not covered by the BGRR-ASA (per Table 1.1 – ASA Applicability Table of Section 1.4 – Scope of Work), assuming the BGRR-ASA is approved by DOE as currently drafted).

As the proposed activity is specifically defined as being outside the scope of the BGRR-ASA and consists of deconstruction and remediation activities to be performed under NEPA-CX [Ref.9], it may well introduce new failure modes not previously considered under the BGRR-ASA. The answer to Question 2 of the Safety Function(s) of System Affected is '**YES**'.

Effects on Safety

1. Could the proposed activity increase the probability of occurrence of an accident previously evaluated in the ABD? Y **(N)** N/A

For the Brookhaven Graphite Research Reactor Decommissioning Project, the authorization basis document is the BGRR-ASA (which is not approved by DOE). However, a DOE approved NEPA-CX exists that specifically approves the removal of the Pile Fans (including Pile Fan No.5), which, when combined with this USID/SE, as approved by DOE; fulfil the role of authorization basis documentation.

In the absence of an approved BGRR-ASA, there are no accident occurrence probabilities to be reviewed for impact by the proposed activity (as neither the BGRR-DP Health And Safety Plan [Ref. 12] nor the Task-specific Environment, Safety and Health Plan [Ref. 10] contain any accident analyses/probability of occurrences). This makes the trivial answer (prior to the approval of the BGRR-ASA) 'NO'.

However, the BGRR-ASA must still be reviewed for the potential impact of the proposed activity on the probability of occurrences for the accident scenarios contained within the BGRR-ASA. Because of the "Routine Risk" nature of the defueled BGRR (classified as a "Radiological Facility"), a rigorous probabilistic risk assessment was not required as part of the Auditable Safety Analysis. Instead, using a graded approach and the guidance offered in BNL ES&H Standard 1.3.3, {https:sbms.bnl.gov/ld/ld08/ld08d081.htm}[Ref. 4], the Risk Assessment Tables of Section 3.2 of the BGRR-ASA were developed.

Among the events analyzed in BGRR-ASA Section 3.2 – Risk Assessment are; Seismic Event, High Winds, Graphite Dust Detonation, Loss of Pile Negative Pressure System Ventilation, Loss of Pile Negative Pressure System Filtration, Crane Load Drop, Fire, Facility Worker Exposure to Toxic Material.

The proposed activity has no capability to impact the probability of occurrence of Seismic Events or High Winds (which are natural phenomena). Additionally, as the proposed activity is limited to the removal of Pile Fan No.5; it has no potential to impact the probability of events occurring at other local buildings e.g., Buildings 701 & 702. This eliminates from further consideration; Graphite Dust Detonation, Loss of Pile Negative Pressure System Ventilation, Loss of Pile Negative Pressure System Filtration, and Building 701 Crane Load Drop. The only remaining accident scenarios from the BGRR-ASA to be considered are: Risk Assessment No. 007, covering Fire; and Risk Assessment No. 008, covering Facility Workers Exposure to Toxic / Hazardous Materials.

The proposed activity involves removal of contaminated metal components. There are discrete amounts of combustible materials involved and primarily mechanical means used for separation (flame cutting is limited to minimum cut(s) necessary of clean (non-rad) metal to allow for size reduction of fan components to fit packaging for offsite transport). The accident analysis of the proposed activity in Appendix A includes three accident scenarios which already and independently address the potential for initiation of fire. These events are; Explosion of LPG Leaked from a Forklift, Oxyacetylene Explosion and Contaminated Waste Bag Rupture/Fire. The proposed activity, having its own fire probability assessment, represents no increase in the probability of fire as defined in BGRR-ASA Risk Assessment No.7. It merely reflects one of the potential initiators of the event. Theproposed activity represents no increase in the probability of occurrence of the event as defined in BGRR-ASA Risk Assessment No. 007.

Finally, as 'Potential Initiators' under Risk Assessment No. 008 covering Facility Worker Exposure to Toxic/Hazardous Materials are; natural phenomenon, operator error, or equipment failure causing breach of deactivated piping or equipment containing residual hazardous/toxic material. The only BGRR-DP facility workers are those directly involved in the

decommissioning process, including the performance of the proposed activity. Therefore, the proposed activity does not increase the probability of occurrence of this event. It merely reflects one of the potential initiators of this event. The proposed activity represents no increase in the probability of occurrence of the event as defined in BGRR-ASA Risk Assessment No. 008.

So the non-trivial answer to Question 1 of 'Effects on Safety' is also 'NO'.

The proposed activity does not increase the probability of any accident evaluated in the authorization basis document(ation).

2. Could the proposed activity increase the probability of occurrence of a malfunction of equipment, systems, or components that are Important-to-Safety? Y **N** N/A

As was already discussed in response to Screening Criterion No. 1 under 'Safety Function(s) of Systems Affected'; the BGRR has no current requirements for redundant systems and/or safety class or safety significant SSCs (Systems, Structures and Components) due to its defunct status and defueled state. Therefore, no safety functions exist that are directly associated with the proposed activity covered by this USID/SE. Without equipment, systems or components that are Important-to-Safety, there can be no probability of occurrence of a malfunction of equipment, systems or components that are Important-to-Safety; nor any increase in same.

The proposed activity COULD NOT increase the probability of occurrence of a malfunction of equipment, systems or components that are Important-to-Safety.

3. Could the proposed activity create the possibility of an accident of a different type than those previously evaluated in the ABD? **Y** N N/A

As already discussed in the response to Screening Criterion No. 2 under 'Safety Function(s) of Systems Affected', the answer to this question is 'YES'. However, the consequences of any such accident , as discussed in Appendix A are bounded under the consequences of accidents presented in the BGRR-ASA.

4. Could the proposed activity create the possibility of an equipment, system, or component malfunction of a different type than those previously evaluated in the ABD? **Y** N N/A

As already discussed in the response to Screening Criterion No. 2 under 'Safety Function(s) of Systems Affected', the answer to this question is 'YES'. However, the consequences of any such malfunction , as discussed in Appendix A are bounded under the consequences of accidents presented in the BGRR-ASA.

5. Does the proposed activity reduce the Margin-of-Safety as defined in the basis for any ABD? Y **N** N/A

In BGRR-SOP-0902 [Ref. 1], the procedure states "In the context of this procedure a Margin-of-Safety is reduced if the Safety Limit or Limiting Condition of Operation or Administrative Control as defined in the Authorization Basis Document(s) is violated". As this safety evaluation is based upon the guidance provided in the above referenced procedure, that definition of Margin-of-Safety compels the answer 'NO'.

The proposed activity DOES NOT reduce the Margin-of-Safety as defined in the BGRR-ASA because the work is being reviewed under the USI process prior to authorization and will not violate any of the Administrative Controls already contained in the BGRR-ASA as long as the work is performed as described in the task specific technical work documents [Refs. 9, 10, 11 and 12]

Authorization Basis Document(s) Changes

1. Is a change to the facility ABD(s) being made? (Y) N N/A

The BGRR-ASA refers to the performance of work outside the scope of the ASA as requiring the use of the USI process as defined in BGRR-SOP-0902 [Ref. 1]. The proposed activity covered here specifically falls under that classification (see ASA Table 1.1 – ASA Applicability Table, for NEPA-CX activity – Pile Fan Removal). The completed and approved USID/SE for the proposed activity should be considered as an addendum and amendment to the BGRR-ASA.

Therefore, it does constitute a change to the BGRR-ASA and requires the approval of the DOE Project Manager for the BGRR Decommissioning Project, prior to implementation. The answer to Question 1 under 'Authorization Basis Document(s) Changes' is 'YES'.

SAFETY EVALUATION CONCLUSION

Based on the evaluation of the evidence cited above, the issue --

_____ Does NOT constitute an Unreviewed Safety Issue.

✓ Does constitute an Unreviewed Safety Issue.

**** IF ANY OF THE ABOVE ARE <u>YES</u>, THEN A USI EXISTS. ****

Clyde T. Newsom 10/5/99
BGRR Project Engineer Signature/ Date

RP Mittelberger for S Musolino 10/5/99
BGRR Project ES&H Manager Signature/ Date

Stephen K. Fulbright 10/5/99
BGRR Project Manager Signature/ Date

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ERD Quality Representative Signature/ Date