70-1151
LA-85-46

Westinghouse Electric Corporation
Water Reactor Divisions
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June 25, 1985

Office of Nuclear Materials Safety and Safeguards
Division of Fuel Cycle and Material Safety
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

ATTENTION: Mr. W. T. Crow, Acting Chief
Uranium Fuel Licensing Branch

REFERENCE: SNM-1107, Docket No. 70-1151

Gentlemen:

Westinghouse Electric Corporation hereby submits an amendment application to SNM-1107 for the addition of two uranyl nitrate (UNH) storage tanks. The following information is submitted for your review:

1. Attachment 1 which provides justification for use of the UNH tanks,

2. Attachment 2 which describes the current administrative and physical controls for the UNH tanks in conjunction with postulated events or failures,

3. Attachment 3 which lists the "contributing causes" described in your letter dated May 2, 1985 and lists those contingencies which address each item, and

4. Additional pages to SNM-1107 describing controls for the UNH tanks and a commitment to perform internal analyses for future installations of unfavorable geometry systems.

These attachments respond to your Question 1 in Enclosure 1 to your letter dated May 2, 1985.

The following information is provided in response to Questions 2, 3, and 4 of your May 2, 1985 letter:

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QUESTION 2: The combined dyke capacity for the UNH tanks is approximately 15,000 gallons which will contain the equivalent leakage from two tanks. This is considered sufficient volume under maximum credible upset conditions since the tanks are not interconnected and thus could not be inadvertently drained as a result of a common mode failure. If this volume were to be exceeded, the overflow would be contained using emergency methods such as soil dyking until appropriate cleanup could be implemented.

QUESTION 3: The tank will be located on a concrete pad equipped with a dyke to contain minor leaks. Liquid spills and leaks will be transferred to containers for further processing. The consequences of a major leak are not considered to be serious because of the low uranium concentrations of these liquids (typically less than MPC).

QUESTION 4: This confirms that the plant liquid effluents, resulting from full-scale operation of the existing and proposed discharge lines, will not exceed the total radioactivity release rate estimated for plant operations of 1600 MTU per year.

Installation of the new tanks is scheduled for completion at the end of July. Consequently, your timely review is appreciated.

A check for $150.00 is included to cover the costs of an administrative amendment.

If you have any questions please write or telephone me at (412) 374-4652.

Sincerely,

WESTINGHOUSE ELECTRIC CORPORATION

Edward Reich /for
A. J. Nardi, Manager
NES License Administration

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ATTACHMENT 1

Westinghouse currently operates four uranyl nitrate (UNH) tanks which are used for storage of in-process UNH. This material is generated in our Scrap Recovery and Solvent Extraction areas during scrap recovery operations. Uranyl nitrate represents one of the physical forms which must be recycled to the conversion lines for production of UO_2 powder. Because of plant expansion requirements and scrap recovery needs, additional UNH tank capacity is required.

Bulk storage of UNH is the only practical method of storage for the volumes required in our low enriched conversion operations. The two additional tanks will provide a total capacity of approximately 45,000 gallons. Without the flexibility of bulk UNH storage, over 500 safe diameter tanks (20 feet high) would be required to accomplish the same task. This would be an unmanageable number of tanks from the standpoint of floor area required, pumping requirements, maintenance, etc. Similar problems would be encountered with poisoned tanks.

Three UNH tanks were originally installed in 1977 and a fourth tank added during 1981. These tanks have been operated in accordance with approved written operating procedures and have been subject to rigorous administrative and physical controls to assure that nuclear criticality safety criteria are satisfied, including the double contingency principle.

In Attachment 2, the current administrative and physical controls for the UNH tanks are described in conjunction with postulated "events" or failures. The following conclusions can be drawn from such an analysis:

1. Plant supervision is intimately involved in the controls associated with operation of the UNH tanks, including direct verification of parameters such as dissolver charging (safe batch), concentration controls, free acid content and transfers of solutions to and from the UNH tanks. This minimizes the probability that a single operator error could cause a violation of nuclear criticality safety criteria. Operating procedures require that these verifications be in writing.

2. Adequate safety margins exist to minimize the probability of a criticality in the unlikely event that concentration controls are exceeded.

3. Free acid content of the UNH tanks provides a wide safety margin in the event that caustic is inadvertently added to the system.

Attachment 3 lists the "contributing causes" described in your letter dated May 2, 1985 and lists those contingencies which address each item.

ATTACHMENT 2

EVENTS/CONTINGENCIES

EVENT	CONTINGENCIES
1. Exceed U-235 concentration limit in UNH tanks.	1.1 Batch control in dissolvers.
	1.2 Sampling at adjustment tanks and analysis for grams U-235 per liter.
	1.3 Dilution if necessary with nitric acid in adjustment tanks.
	1.4 Continuous recirculation of contents and continuous gamma monitoring of recirculating UNH.
	1.5 Manual tank dump when limit is exceeded (10 grams U-235 per liter).
2. Precipitation of uranium in UNH tanks.	2.1 Sampling and analysis at adjustment tanks to assure greater than 4% free acid.
	2.2 Continuous agitation or recirculation of UNH tank contents.
	2.3 Procedural controls to prohibit introduction of unauthorized materials to the UNH tanks.
	2.4 Recirculation lines are heat traced to prevent freezing of contents.
	2.5 UNH temperature checked once per shift.
	2.6 Steam lance to heat tanks on outside walls if UNH temperature drops below 30°F.
3. Over-batching dissolvers.	3.1 Procedural controls to limit dissolvers to safe mass batch.

EVENTS/CONTINGENCIES

EVENT	CONTINGENCIES
	3.2 Supervisor or Chief Operator verification of total dissolver charge.
4. Exceeding limits in adjustment tanks.	4.1 Procedural controls on batch charging of dissolvers.
	4.2 Procedural controls on water and nitric acid additions to dissolvers.
	4.3 Supervisor or Chief Operator verification of U-235 concentration and free acid content in adjustment tanks.
5. Unauthorized transfer to UNH tanks.	5.1 All transfers of uranium-bearing solutions to UNH tanks occur through "spool pieces."
	5.1.1 Valves at spool pieces are normally QC sealed. QC must verify correctness of transfer before seal is removed.
	5.1.2 Supervisor or Chief Operator must verify correctness of transfers prior to the transfers.
	5.1.3 "Spool piece" removed and QC seal reapplied following transfer.
	5.2 Procedural controls specifying authorized transfers to UNH tanks.

EVENTS/CONTINGENCIES

EVENT	CONTINGENCIES
	5.3 Supervision must verify the transfers of drummed materials to the UNH tanks.
	5.4 Clear identification and sealing of UNH stored in drums which are dispositioned to UNH tanks.
6. Failure of gamma monitoring system.	6.1 High/low alarms on gamma monitors.
	6.2 Gamma monitoring system calibrated quarterly and following any maintenance on the system.
	6.3 Operability of gamma monitor checked twice per shift.
	6.4 Two gamma monitors in operation per tank.
	6.5 On/Off indicator in Control Room on recirculation pump operability.
7. Caustic inadvertently introduced to UNH tank during cleaning.	7.1 Supervisor or Chief Operator verification that the tank has been properly washed, that the wash solutions have been drained, and that the tank has been inspected to assure no residuals.
	7.2 Supervisor or Chief Operator verification that the "spool piece" has been removed and a QC seal applied to the valve.
	7.3 Caustic piping is independent from the UNH system.
8. Failure to follow procedures.	8.1 Operators trained in operation of UNH tanks and associated equipment.

EVENTS/CONTINGENCIES

EVENT	CONTINGENCIES
	8.2 Supervision verification that key system parameters and operational steps are completed properly.
	8.3 Routine audits by Regulatory Affairs to assure that controls are in effect.
9. Inadvertent addition of caustic via the deionized water system.	9.1 Percent free acid of UNH checked at adjustment tank.
	9.2 Procedural controls to prohibit deionized water to UNH tanks directly for dilution.
	9.3 Gamma monitors will detect precipitation.
	9.4 On/Off indicator in Control Room on recirculation pump operability.
10. Transfer of materials into UNH tanks which exceed 5 grams U-235 per liter.	10.1 Sampling and analyses of each batch for grams U-235 per liter before release.
	10.2 Batch control on dissolvers.
	10.3 Supervisor or Chief Operator verification of U-235 concentration prior to release from adjustment tanks.
11. Inadvertent addition of solvent to the UNH tanks.	11.1 Supervision must verify the transfers of drummed materials to the UNH tanks.
	11.2 Clear identification and sealing of UNH stored in drums which are dispositioned to UNH tanks.
	11.3 Physical separation of solvent and UNH in Solvent Extraction process.

EVENT	CONTINGENCIES
	11.4 Routine draining and cleaning of UNH tanks.
12. Failure to properly filter UNH, resulting in particulates in UNH tank.	12.1 Double filtration of UNH from dissolvers (filter press and cartridge) to the UNH tanks.
	12.2 Visual observation that UNH is "clear."

ATTACHMENT 3

CONTRIBUTING CAUSES/CONTINGENCIES

	CONTRIBUTING CAUSE		CONTINGENCIES
a.	No detailed written procedures for new process.	a.1	Written procedures are required for all process operations.
		a.2	All procedures for operations involving uranium must be approved by Regulatory Affairs.
		a.3	Supervision is responsible for the safety aspects of all operations.
		a.4	Routine audits by Regulatory Affairs are performed to assure compliance.
b.	Process upsets.	b.1	All new or modified processes must be reviewed and approved by Regulatory Affairs.
		b.2	Written and approved procedures are required for all operations.
		b.3	Operations personnel are trained in the proper responses to process upsets (e.g. dumping of UNH tanks).
c.	Inadequate identification of materials.	c.1	Transfers of uranium-bearing materials are controlled by procedures.
		c.2	Supervisor or Chief Operators are required to verify the proper identification of materials prior to the transfers.

CONTRIBUTING CAUSES/CONTINGENCIES

CONTRIBUTING CAUSE	CONTINGENCIES
	c.3 Process vessels (UNH tanks) are physically isolated to prevent inadvertent transfers of improper materials.
	c.4 Drums are clearly identified and sealed when used for UNH.
	c.5 Supervisors or Chief Operators verify transfers of drummed materials to the UNH tanks.
d. Failure to audit program.	d.1 The audit program is a condition of the SNM-1107 license.
	d.2 Audits of programs and operations include assessments of personnel performance.
e. Failure to follow procedures.	e.1 Supervisor overchecks of operators.
	e.2 Regulatory Affairs audits.
f. Changes improperly authorized by shift supervisors.	f.1 Supervision is responsible for the safety aspects of all operations.
	f.2 Changes to existing procedures and new operations involving special nuclear materials must be reviewed and approved by Regulatory Affairs prior to implementation.
	f.3 Routine audits are performed by Regulatory Affairs to confirm compliance.

CONTRIBUTING CAUSES/CONTINGENCIES

CONTRIBUTING CAUSE	CONTINGENCIES
	f.4 Supervision is supported by process engineering for technical aspects of the processes.
g. Inadvertent mixtures of solvent, aqueous liquors, and raffinates.	g.1 In solvent extraction, a U-235 gamma monitor continuously measures the raffinate stream for high uranium content and diverts the stream to a safe geometry vessel.
	g.2 Supervisors or Chief Operators are required to verify transfers of drummed materials to the UNH tanks.
	g.3 Drums of UNH are clearly identified and sealed.
	g.4 Physical separation of solvent and UNH in Solvent Extraction process.
	g.5 Routine draining and cleaning of UNH tanks.
h. Failure to completely drain system.	h.1. Supervisor or Chief Operator verification that UNH tanks are emptied, that tanks are washed and wash solution processed, that lines are drained, that tank interior is inspected and cleaned of solid build-up and that spool piece removed by Operations and valve sealed by QC.
	h.2 Low-level indication in Control Room.

CONTRIBUTING CAUSES/CONTINGENCIES

	CONTRIBUTING CAUSE		CONTINGENCIES
i.	Failure of instruments.	i.1	High/low alarms on gamma monitors.
		i.2	Gamma monitoring systems calibrated quarterly and following any maintenance on the system.
		i.3	Routine inspections by Regulatory Affairs for instrument operability.
		i.4	Verification of operational status of rupture disks.
j.	Poor communications between personnel.	j.1	Operations performed in accordance with written, approved procedures.
		j.2	Process steps documented via checklists provided as part of procedures.
		j.3	Procedures and checklists subject to Regulatory Affairs inspections.
k.	Failure to investigate and correct "out of spec" signals.	k.1	Continuous occupancy of Control Room to assure timely response to signals.
		k.2	Training of operators in nuclear criticality safety aspects of operations and equipment.

CONTRIBUTING CAUSES/CONTINGENCIES

CONTRIBUTING CAUSE	CONTINGENCIES
1. Failure to record transfer.	1.1 Supervisor verification that transfers are completed.
	1.2 Periodic audits by Regulatory Affairs.
m. Irregularities in function and operation of valves.	m.1 Spool piece connections used to isolate UNH tanks rather than using valves alone.
	m.2 Spool piece removed after use.
n. Temporary transfer lines.	n.1 Changes to existing equipment require written approvals by Regulatory Affairs.
	n.2 Changes to existing equipment require written, approved procedures.
o. Other potential causes for specific installation.	o.1 Dumping of the contents of a single tank releases the material to a safe slab geometry.

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REVISION RECORD

Revision Number	Date of Revision	Pages Revised	Revision Reason
1	12/12/83	1.9-52 through 1.9-76 inclusive, 2.2-10, 2.2-11, 2.3-1, 4.8-1	Respond to NRC questions in NRC letter dated April 6, 1983.
2	3/26/84	All pages resubmitted as Revision 2. See submittal letter attachment for description of changes.	Respond to NRC questions in NRC letters dated January 26, 1984 and February 23, 1984.
3	1/4/85	All pages resubmitted as Revision 3. See revision lines in right hand columns of each page for specific changes.	Respond to NRC questions.
4	6/21/85	New pages 2.2-12 and 2.2-13 and revised pages 2.3.1 and 2.3.2. See revision lines in right hand columns of each page for specific changes.	Licensing of uranyl nitrate storage tanks.

SECTION 2

TABLE OF CONTENTS

2.2.15 Dissolver Systems

The following controls shall be provided as part of the dissolver systems:

2.2.15.1 Procedural controls on batch charging of dissolvers to ensure safe limits on Uranium-235 concentration and percent free acid in adjustment tanks.

2.2.15.2 Supervisor or Chief Operator verification of correct dissolver batch charging.

2.2.15.3 Supervisor or Chief Operator verification of Uranium-235 concentration and free acid content in adjustment tanks prior to transfer.

2.2.16 Uranyl Nitrate Storage Tanks

The following controls shall be provided as part of the uranyl nitrate storage system:

2.2.16.1 Gamma monitoring system on continuous recirculating UNH stream with high level alarm readout in Control Room.

2.2.16.2 Two gamma monitors in operation per tank; calibrated quarterly and following any maintenance on the system.

2.2.16.3 Operability of gamma monitoring system checked twice per shift.

2.2.16.4 Recirculation lines are heat traced to prevent freezing of tank contents; temperature of tank contents checked once per shift.

2.2.16.5 A manual dump capability is provided for emergency discharge of each UNH tank.

2.2.16.6 Procedural controls specifying authorized transfers to and from UNH tanks.

2.2.16.7 All transfers of uranium-bearing solutions to UNH tanks occur through "spool pieces", with procedural controls on connection and removal of "spool pieces".

2.2.16.8 Supervisor or Chief Operator verification that each UNH tank has been properly washed and inspected to assure no retention of residuals. Tanks shall be drained and inspected at least every six months.

2.2.16.9 Procedural controls to prohibit deionized water addition to UNH tanks directly for dilution.

2.2.16.10 Supervisory verification of transfers of drummed materials to UNH Tanks.

2.2.16.11 Procedural controls to clearly identify and seal UNH stored in drums which are dispositioned to UNH tanks.

2.2.16.12 Electrical power to the UNH tanks connected to the emergency diesel system.

2.3 Nuclear Criticality Safety Limits

2.3.1 General Nuclear Criticality Control Procedures and Criteria

2.3.1.1 Written procedures describing general nuclear criticality control requirements shall be maintained in the Regulatory Affairs Procedures Manual by the Radiation Protection Component. Copies of this manual shall be maintained by the line supervision in each functional area and the procedures contained therein shall be communicated to affected personnel. Operations shall be conducted in accordance with these procedures to ensure compliance with NRC regulations and license conditions.

2.3.1.2 A process or operation may be considered nuclearly safe if it requires at least two unlikely and unrelated accidents or errors to occur concurrently to cause a criticality accident.

2.3.1.3 Materials of unknown enrichment shall be handled as if it were at the maximum enrichment credible under the circumstances.

2.3.1.4 Where the mechanical design of equipment is important to radiation protection and nuclear criticality safety, the mechanical integrity under normal and credible accident conditions shall be assured.

2.3.1.5 All transfers of enriched uranium oxides from geometry-controlled equipment or containers to moderation-controlled equipment or containers shall require moisture analyses prior to the transfers.

2.3.1.6 Prior to addition of moderating materials (such as porosity control additive) to enriched uranium under moderation control, an analysis shall be performed to confirm the correct additive.

2.3.1.7 Prior to addition of lubricating materials to gearboxes, etc., internal to enriched uranium processing equipment (such as MAP Line blenders) under moderation-control, an analysis shall be performed to confirm the correct lubricant.

2.3.1.8 The records of nuclear criticality safety analyses shall include a floor plan of the SNM process and fixed storage areas showing the spacing requirements imposed to control neutron interaction except for portable storage devices and shipping containers which have been analyzed for such storage, and have established spacing requirements to control interaction.

2.3.1.9 Storage of SNM shall be subject to one or more of the following controls: (1) nuclear criticality safety postings with applicable rules, (2) designated floor markings or devices to assist personnel in the proper placement of containers, (3) physical constraints for individual containers or stacks of containers, such as storage vaults, bird cages and shipping containers.

2.3.1.10 Where practicable, reliance will be placed on equipment design in which dimensions are limited rather than on administrative controls for nuclear criticality safety. When nonfavorable geometry is used, Westinghouse shall justify the proposed use of nonfavorable geometry and establish appropriate administrative controls. After justifying the need for nonfavorable geometry equipment, the analysis must take into consideration identified contributing causes of criticality accidents, demonstrate that such causes will be subject to administrative controls, and demonstrate compliance with the double contingency principle (Ref. ANSI/ANS-8.1-1983). Contributing causes to be addressed will include (a) no detailed written procedures for the new process, (b) process upsets, (c) inadequate identification of material, (d) failure of audit program, (e) failure to follow procedures, (f) changes improperly authorized by shift supervisors, (g) inadvertent mixtures of solvent, aqueous liquors and raffinates, (h) failure to completely drain system, (i) failure of instruments, (j) poor communications between personnel, (k) failure to investigate and correct "out of spec" signals, (l) failure to records transfers, (m) irregularities in function and operation of valves, (h) temporary transfer lines, and (o) other potential causes as applicable.

2.3.2 Nuclear Criticality Safety Values

2.3.2.1 Maximum Permissible Values

(1) Maximum Permissible Values for subcrits with a maximum U-235 enrichment up to 5.0 w/o are established in tabular form as follows:

Figure 2.3.2.1	Batch or Mass Controlled Subcrits
Figure 2.3.2.2	Volume Controlled Subcrits
Figure 2.3.2.3	Cylinder Diameter or Equal Cross Sectional Area Controlled Subcrits
Figure 2.3.2.4	Slab Thickness Controlled Subcrits
Figure 2.3.2.5	Batch or Mass Controlled Subcrits (Engineering Controls)

DOCKET NO. 70-1151

CONTROL NO. 25528

DATE OF DOC. 06/25/85

DATE RCVD. 07/02/85

FCUF ✓ PDR ✓

FCAF ____ LPDR ____

WM ____ I&E REF. ✓

WMUR ____ SAFEGUARDS ✓

FCTC ____ OTHER ____

DESCRIPTION:

requests for amendment

07/18/85 INITIAL CEC