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Vice President

Consolidated Edison Company of New York, Inc.
Indian Point Station
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Telephone (914) 737-8116

March 28, 1988

Re: Indian Point Unit No. 1
Docket No. 50-03

Mr. Lester Rubenstein, Project Director
Standardization & Non-Power Reactor
Project Directorate
Division of Reactor Projects - III, IV, V
and Special Projects
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Rubenstein:

Pursuant to NRC letters dated May 7 and December 15, 1986, and in accordance with discussions with Con Edison at a conference on April 3, 1987, we enclose supplemental environmental information with regard to Indian Point Unit No. 1. The information addresses the issues referenced in your May 7 and December 15, 1986 requests, and supplements our previous submittals to the NRC regarding Unit No. 1 as discussed in our July 31, 1986 letter to Mr. Herbert N. Berkow.

The information provided updates the current status of Unit No. 1 systems and buildings since our submission to the NRC of a Decommissioning Plan for Unit No. 1 on October 17, 1980. The information also incorporates the currently used terminology for decommissioning alternatives set forth in the February 11, 1985 proposed rule (50 Federal Register 5600) in reviewing the Commission's three proposed decommissioning alternatives against the information submitted in our 1980 Decommissioning Plan.

Safety issues and environmental considerations relating to Unit No. 1, including specific concerns relating to continued spent fuel storage, have been fully explored and evaluated in previously submitted documents and correspondence between the Commission and Con Edison. As discussed in the attached supplement, there have been no significant changes at the Unit No. 1 facility and no conditions exist, which raise previously unevaluated environmental considerations. The information provided in the supplement reviews the environmental considerations associated with Unit No. 1 and include conservative (and more accurate) estimates of the remaining radionuclide inventory in the Unit No. 1 systems.

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Re: Indian Point No. 1
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As you may be aware, the Unit No. 1 facility is an integral part of the daily operations of Indian Point Unit No. 2 and is therefore continually occupied and maintained in accordance with the site radiation protection program. As has been the case since the Unit was shutdown in 1974, Unit No. 1 areas continue to be routinely monitored as required for radioactivity and contamination, and maintained for safe and accurate radiological assessment of plant conditions. Accordingly, Con Edison submits that there continue to be no significant environmental impacts associated with either the current plant status or the SAFSTOR alternative proposed in the 1980 Decommissioning Plan.

We hope that this supplemental information will be useful in your review of the licensing status of Unit No. 1. Should you or your staff have any questions, please contact us.

Very truly yours,

Attachment

cc: Senior Resident Inspector
U.S. Nuclear Regulatory Commission
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SUPPLEMENTAL ENVIRONMENTAL INFORMATION IN SUPPORT OF INDIAN POINT UNIT NO. 1

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
Indian Point Unit No. 1
Docket No. 50-03
March, 1988

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1.0 SUMMARY

This document provides the additional environmental information regarding Indian Point Unit No. 1 (Unit 1) requested by the U.S. Nuclear Regulatory Commission (NRC) on May 7 and December 15, 1986. Unit 1 is a closed-cycle, four-loop pressurized water reactor designed by the Babcock and Wilcox Company. Consolidated Edison (Con Edison), which owns and maintains Unit 1, was the principal contractor and had responsibility for the construction, testing, and initial startup of the facility.

On November 10, 1969 Con Edison submitted an application to convert the Unit 1 Provisional Operating License No. DPR-5, issued by the Atomic Energy Commission (AEC) on March 26, 1962, to a full term operating license. That application is pending. On June 19, 1980 the NRC issued an order revoking Unit 1's authority to operate as a power reactor and requested that a plan for decommissioning (Plan) be submitted. The Plan, which was submitted on October 17, 1980 (Reference 1), describes the facility and its proposed decommissioning by mothballing with delayed dismantlement. The Plan also discusses the primary environmental safety considerations evaluated and the basis for the decommissioning option chosen. By letters dated May 7 and December 15, 1986, the NRC requested additional environmental information in connection with Unit 1's licensing status. Based on Con Edison's July 31, 1986 response (Reference 2) to the May 7 request and a conference with the NRC on April 3, 1987, changes to the status of the facility and the environmental effects since submission of the Plan to the NRC in 1980, are discussed herein.

The environmental information provided below is intended to assist the NRC in its evaluation of Unit 1 licensing. Information on facility and site environmental impacts related to operation have been previously provided to the NRC in Con Edison's June 1973 and August 6, 1970 Environmental Reports for Indian Point Units 1 and 2 (References 3 and 4, respectively), as well as additional correspondence related to the safe storage of spent fuel on-site. The supplemental environmental information provided herein supports the decommissioning considerations previously evaluated by Con Edison. Specifically, the information (a) updates the status of systems and structures of Unit 1 since submission of the Plan, (b) provides a summary of the operational alternatives presented in the Plan and includes the generic decommissioning alternatives considered for the proposed disposition of the Unit, and (c) discusses the safety and environmental effects of temporarily storing the spent fuel on-site.

In consideration of Unit 1's non-operational status, Con Edison removed all fuel from the reactor by January 1976 and stored it in the spent fuel pools in the Fuel Handling Building. All systems in the containment building were drained, except where wet layup provided shielding or corrosion resistance, and secured closed.

The containment building is suitable for research and development use as described in the Plan, and has been modified for potential use as an interim onsite storage facility for temporary storage of low-level waste generated at Units 1 and 2. In addition, numerous areas of the plant have been cleaned and decontaminated for general access. All areas continue to be controlled in accordance with the site Radiation Protection Program.

The Unit 1 facility has increasingly been utilized for the operational support of Unit 2. Currently, a major portion of the facility is now used to provide such support. As a result, although the Unit 1 reactor is no longer in operation, the facility constitutes an integral part of power generating operations at the Indian Point site and will remain so throughout the life of Unit 2. Personnel routinely enter Unit 1 to perform site related duties and provide continued monitoring and inspection of the facility. Present utilization of Unit 1 is in accordance with the site's radiological protection, effluent control and environmental monitoring programs. Personnel routinely enter Unit 1 to perform site related duties and provide continued monitoring and inspection of the facility.

Since the Plan predates the currently used terminology for decommissioning alternatives set forth in the NRC's February 11, 1985 proposed rule on decommissioning criteria (50 Federal Register 5600), the supplemental information set forth herein assesses environmental impact in terms of the three proposed decommissioning alternatives addressed in the NRC's proposed rule. These alternatives are:

1. DECON Prompt Removal/Dismantling
2. ENTOMB Onsite Entombment with Delayed Dismantling
3. SAFSTOR Mothballing with Delayed Dismantling

It is our conclusion that neither the DECON (prompt removal) nor ENTOMB (onsite entombment) alternatives, if presently implemented, would result in a significant reduction in the environmental impact compared to the implementation of the SAFSTOR alternative (mothballing with delayed dismantling) described in the Plan. The close proximity of Unit 1 to the operating Unit 2, coupled with the potential congestion of vehicular and equipment traffic associated with active decommissioning alternatives such as ENTOMB or DECON, make the proposed plan for Unit 1 the only practical decommissioning alternative. These reasons, as well as the substantial radiological advantages associated with delaying ultimate dismantlement of Unit 1, provide the basis for the choice submitted in the Plan as the preferred Unit 1 alternative. Based on an evaluation of safety, feasibility and operational considerations, Con Edison has concluded that there are no significant environmental effects associated with decommissioning Unit 1 as described in the Plan.

2.0 INTRODUCTION

2.1 PLANT HISTORY

The Indian Point generating station is located on the east bank of the Hudson river approximately 24 miles north of New York City. The 235 acre site houses three generating units including Unit 1. Unit 2 is owned by Con Edison and is located adjacent to and north of Unit 1. Unit 3 is owned by the Power Authority of the State of New York and is adjacent to and south of Unit 1.

Con Edison was the principal contractor and had responsibility for the construction, testing, and initial startup of Unit 1 in 1962. Unit 1 received a construction permit in 1956. A Provisional Operating License (DPR-5) was issued in 1962 and has continued in effect since pending resolution of Con Edison's November 10, 1969 application for a full-term operating license (Reference 5). Between 1962 and 1974, Unit 1 operated under a provisional license at a net electric generating capacity of 265 MWe.

Unit 1 was shut down on October 31, 1974, when a variance granted to Con Edison from the AEC's interim acceptance criteria for emergency core cooling systems expired. Unit 1 did not meet current operational requirements with respect to other safety systems, and no plans existed for bringing the facility into compliance with existing requirements. Accordingly, the reactor was defueled in January 1976, and the fuel was stored in the facility's Fuel Handling Building. Unit 1 Technical Specification 3.2.1, Appendix A, prohibits fuel loading or movement into the reactor containment building without prior review and authorization from the NRC.

In the 1978 rate case before the New York State Public Service Commission, Con Edison indicated it favored mothballing Unit 1 until Unit 2 was retired. Upon Unit 2 retirement, Unit 1 could be dismantled and radioactive materials removed as prescribed in the NRC Regulatory Guide 1.86 (Reference 6).

On February 11, 1980, the NRC ordered Con Edison to show cause why Provisional Operating License No. DPR-5 should not be revoked and why Con Edison should not submit a plan pursuant to 10 CFR 50.82 to decommission Unit 1. On March 12, 1980, Con Edison submitted an answer to the NRC's order to show cause stating that Con Edison had decided to retire Unit 1 from service as a generating facility. At that time Con Edison also consented to the entry of an NRC order revoking the Provisional Operating License for Unit 1, provided that no further licensing actions were required, in that the order would continue Con Edison's authority to possess the facility and its contents, and maintain the facility's retired status in the "status quo" (Reference 2).

On June 19, 1980, the NRC's Director of Nuclear Reactor Regulation issued an order revoking those portions of the Unit 1 license which permitted operation of Unit 1 as a nuclear reactor. That order continued Con Edison's authority to possess the facility and its contents, and permitted maintenance of Unit 1 in its present status. On October 17, 1980 Con Edison submitted a plan for the decommissioning of Unit 1, as requested by the NRC. Con Edison's November 10, 1969 application to convert the provisional operating license into a full-term license remains pending.

2.2 GENERAL PLANT DESCRIPTION

Unit 1 is a closed-cycle, four-loop pressurized water reactor designed by the Babcock and Wilcox Company. The initial core was loaded with uranium-thorium fuel. For economic reasons the fuel was later changed to a uranium dioxide, stainless steel clad core designed and fabricated by Westinghouse Electric Corporation, and loaded in three enrichment regions. The reactor was controlled by cruciform type control rods.

The primary system consisted of four separate coolant loops, each provided with two reactor coolant pumps, isolation valves, and a horizontal U-tube steam generator. The saturated secondary steam produced in the steam generators was superheated in two oil-fired superheaters and then used to drive a three cylinder, tandem-compound, double flow high pressure and double flow low pressure condensing turbine generator. The heat removed from the condensing steam was transferred to the circulating water system and then discharged to the Hudson River.

The reactor and primary systems are housed inside the containment building, a leak-tight, spherical steel pressure vessel. Auxiliary systems, comprised of the boron addition and dilution system, the liquid and solid waste disposal system, and the fresh water cooling system, are housed separately in the adjacent Chemical Systems Building. The Chemical Systems Building also houses components of the facility's engineered safety features. A separate Fuel Handling Building provides storage for spent fuel. A Turbine Building housed the Turbine Generator.

3.0 CURRENT UNIT 1 STATUS

The Unit 1 reactor was defueled in January 1976. All 160 spent and partially-spent fuel assemblies remaining onsite are currently stored in the Unit 1 fuel storage pools until permanent disposal alternatives are available. The control rods and rod followers were removed from the core and stored in the fuel storage pools. The in-core detectors were removed from the reactor and stored in the source vault in the Nuclear Service Building. The reactor internals (upper & lower) are sealed in the reactor vessel with the head on and tensioned. The neutron shield tank surrounding the reactor vessel remains filled with chromated water for shielding purposes. Systems have generally been drained of liquids and left in a dry layup condition. Radiation areas continue to be controlled as required under the existing technical specifications. These areas are routinely monitored in accordance with the Indian Point Radiation Protection Program which covers the monitoring and control of both Units 1 and 2. General access areas have been cleaned or decontaminated to facilitate routine personnel access.

3.1 SPENT FUEL POOLS AND UNIT 2 SUPPORT SYSTEMS

The Plan described in detail the status of systems and structures as of October 1980. This section will update the status of those systems and structures that have changed since submission of the Plan.

3.1.1 Spent Fuel Pools

The spent fuel pool cooling, filtration, and demineralization system housed in the Fuel Handling Building is no longer in use. Pool filtration and demineralization is provided by periodic utilization of the existing liquid waste demineralization systems.

3.1.2 Water Treatment Plant

The Water Treatment System provides the same basic service as described in the Plan but has been modified and upgraded to improve its functioning with the installation and rearrangement of additional anion and cation beds.

3.1.3 Integrated Liquid Waste System

The Integrated Liquid Waste System (ILWS) located in the Chemical Systems Building is still used as the main radioactive liquid waste processing system for the site. The present means of processing the liquid has been changed from the liquid waste evaporators to a fluidized transfer demineralizer system. The evaporators are capable of being reactivated but only after any operational, maintenance,

radiological, instrument & control issues have been satisfied. The laundry facility has been deactivated and removed with all site laundry processed offsite by a vendor. The installed waste solidification system is presently not in use. When waste solidification is required, a vendor-supplied portable system is used.

3.1.4 Decontamination/Volume Reduction

As an adjunct to the site waste processing activities which are performed in Unit 1, a number of decontamination and volume reduction facilities have been located in the Unit 1 Chemical Systems Building. Compaction of dry active waste is performed in Unit 1 as well as super compaction by outside vendors and the preparation for offsite shipment. Separate decontamination facilities have also been established in Unit 1 for grit blasting, freon degreasing, liquid bead blasting and steam cleaning techniques. Each of these facilities are enclosed for control of contamination and protection of personnel.

3.1.5 Waste Gas System

This system was utilized for the operation of Unit 1 and is no longer required in service.

3.1.6 Containment Building

The Unit 1 containment building has been used extensively in support of research and development and remains available for such purposes. In addition to these uses which were described in section 2.3 of the Plan, an extensive effort was undertaken to decontaminate much of the area inside the containment building and upgrade the support systems (e.g., fire protection) to allow its use as an Interim On-site Storage (IOS) facility in accordance with Commission guidance on such facilities. The facility can be used for the temporary storage of certain low level radioactive wastes should access to existing offsite disposal facilities be restricted.

3.1.7 Conventional Plant Systems

As part of the increased utilization of Unit 1 facilities in support of the overall site goal of efficient power production, portions of the conventional (non-nuclear) side of the facility such as the turbine generator, oil fired superheaters and associated components have been removed to allow establishment of administrative offices, emergency response facilities and equipment laydown areas. The principle Alternate Safe Shutdown System power supply and associated switch gear installed in support of Unit 2 in response to NUREG-0737 has also been located in Unit 1.

4.0 ALTERNATIVES CONSIDERED

Con Edison's Plan for Unit 1 was arrived at following an evaluation of several alternatives involving either continued operation or decommissioning. A summary of the alternatives evaluated (in Section 2 of the Plan) and conclusions reached are discussed herein as part of the environmental assessment.

4.1 CONTINUED OPERATION

Based on analyses presented in section 2.2 of the Plan , Con Edison decided against continued operation of Unit 1 as a nuclear facility, or its conversion to a coal or oil-fueled steam supply system. [Therefore, on March 12, 1980, Con Edison made the determination to retire Unit 1 from service.]

4.2 "ENTOMB" DECOMMISSIONING ALTERNATIVE

ENTOMB is defined in NRC's Draft Generic Environmental Impact Statement (NUREG-0586 Reference 7) as the complete isolation of radioactivity from the environment by means of massive concrete and metal barriers until the radioactivity has decayed to levels which permit unrestricted release of the facility. These barriers must prevent the escape of radioactivity and prevent deliberate or inadvertent intrusion. The period necessary to maintain entombing structure integrity depends on the inventory of radioactive nuclides present.

Implementation of the ENTOMB alternative in a PWR is limited to the containment building because its unique structure lends itself to entombment and because it contains most of the radioactivity in the facility. The other radioactive buildings associated with a reactor must be decommissioned by another method such as DECON. It is possible, however, to move some radioactive components from the Fuel Handling Building or Auxiliary Building to the containment building and entomb them there rather than ship them offsite. A possession-only license and long term surveillance would then be required because of the presence of long-lived isotopes. Therefore, since the facility could not be released for unrestricted access within any reasonable time period, the facility owner would eventually initiate the DECON alternative so the possession-only license could be terminated.

4.2.1 Physical Considerations

Entombment of Unit 1 at this time would increase vehicular and construction equipment traffic on site, whereby the close proximity to Unit 2 would likely create an overly congested and hazardous condition as described in section 2.2.2 of the Plan. The human resources required for entombment construction activities would be likely to adversely impact the normal site support functions,

particularly during heavy human resource periods such as refueling and maintenance outages for Unit 2. These effects would increase the overall cost of decommissioning. The integrity of the structure would need to be assured over the extended period in which significant quantities of radioactivity remained in the entombed materials. A continuing surveillance program would need to be established and implemented.

Subsequent dismantling and reuse of the site would be more difficult under an entombment alternative than under other decommissioning alternatives. The presence of entombment barriers would add to the complexity of dismantlement when total facility removal becomes necessary.

Entombment would also preclude use of Unit 1 for any research and development work on system decontamination or other testing. Such work has been carried out since the reactor was defueled in 1976. In addition, as noted above, Con Edison has taken physical and administrative actions to qualify portions of the containment building as an Interim On-site Storage (IOS) facility for low-level waste. The IOS is intended to be used in support of Unit 2 operations on an as-needed basis. Entombment of Unit 1 would preclude such use.

4.2.2 Radiological Considerations

The inventory of radioactive material remaining under this alternative would be approximately the same as that remaining under the SAFSTOR alternative. Although there may be some reduction in maintenance, similar inspection and surveillance would be required. Radiation exposure during ENTOMB decommissioning would be less than during the DECON alternative, but greater than during the SAFSTOR alternative. Entombment of a facility would be an effective mode of decommissioning if the radioactivity were to decay over a reasonable period of time (e.g. 100 years) to an unrestricted access level. However, this would also require the owner utility to maintain site surveillance for that 100 year period, and limit site availability for alternate uses during that period.

4.3 "DECON" DECOMMISSIONING ALTERNATIVE

Con Edison also considered the decommissioning alternatives of prompt removal/dismantling (now referred to as DECON). Under this alternative described in section 2.2.3 of the Plan, all materials with radioactivity above unrestricted access levels are removed from the site, thereby yielding unrestricted use of the site for any subsequent purpose. The facility license would be terminated, the remaining facilities and structures dismantled, and the site released for unrestricted use.

A major project under the DECON option is the complete removal of the reactor vessel and internals. Because of its size and induced radioactivity, the reactor vessel would be segmented and shipped in commercially available licensed shipping casks to a licensed burial site.

All remaining contaminated parts of the plant would be decontaminated or removed from the site to a burial ground. Contaminated and activated concrete surfaces such as the biological shield and the spent fuel pools would be removed and shipped to a burial site. Decontamination and/or removal of other plant structures and surfaces would be performed as necessary based on the results of detailed radiological surveys and sampling. All contaminated equipment and piping within the containment building would be removed or decontaminated to acceptable levels. The provisional operating license or possession-only license would be terminated. If desired by the owner utility, the buildings could be demolished. All structures would then be removed to a depth of three feet below grade and backfilled to restore the area.

4.3.1 Physical Considerations

Unit 1 is situated between Units 2 and 3. As noted above, in addition to its own value in supporting operation of Unit 2, the Unit 1 containment building is surrounded by facilities that are also required to support its continued operation. The Chemical Systems Building, Fuel Handling Building, and Nuclear Service Buildings are physically attached to the Unit 1 containment building as described in the Plan. Dismantling these buildings and their radioactive components cannot be done without disabling these support facilities. Even if such dismantling were to take place, similar facilities would have to be reconstructed to provide the required support to Unit 2. Increased vehicular traffic and the additional burdens on normal site support functions and facilities described in the ENTOMB option would be even more pronounced under this alternative.

Demolition activities such as blasting, wrecking ball demolition, pneumatic/hydraulic drilling, fracturing, and flame cutting would raise serious environmental and industrial safety concerns including creation of shock waves, vibrations, dust and noise.

Locating heavy moving equipment and the building of temporary service facilities required for dismantling would be extremely difficult due to the very limited access space on site. Limited access/egress for trucks and personnel, and site security measures would severely hamper dismantling activities and restrict the speed and ease of material removal.

Shipment of reactor low level radioactive waste to existing disposal sites is severely restricted such that it is very likely that Con Edison would not be able to dispose of the waste which would be generated under this option without an unusual volume allocation. Our currently allowed waste allocation for the site, which will be further reduced in 1990, does not permit adequate burial capacity for the excessive volumes which would be generated by this option. Since there is no commanding reason for creating this additional waste volume at this time, granting of such an allocation is unlikely.

The federal government has not yet established an operational repository for spent nuclear fuel and there is currently no other facility to store spent fuel or other high level waste. Even if a federally sponsored Monitored Retrievable Storage Facility is available within the next 10 years (as proposed by DOE), there is no assurance Unit 1 would be given preference over other utilities.

4.3.2 Radiological Considerations

Although the interior radionuclide inventory of the Unit 1 primary and auxiliary systems has decayed substantially since shutdown, there still remains a very significant opportunity for additional reduction, should a further period of decay be provided by the decommissioning alternative chosen. Quantification of the impact of such decay is provided in the Environmental Assessment section of this report.

The decommissioning activities associated with cutting and removing the primary coolant piping, steam generators, and pressurizer, and the segmentation and removal of the reactor vessel and internals, are labor intensive and therefore very sensitive to the radiation levels associated with that equipment. While maximum precautions would be taken to maintain radiation exposures "as low as reasonably achievable" (ALARA), these activities would result in significantly greater exposures to workers if performed immediately under DECON than if they were delayed under either SAFSTOR or ENTOMB.

4.4 "SAFSTOR" DECOMMISSIONING ALTERNATIVE

SAFSTOR, as defined in NUREG 0586, are those activities required to place (preparation for safe storage) and maintain (safe storage) a radioactive facility in such condition that the risk to public safety is within acceptable bounds, and that the facility can be safely stored and subsequently decontaminated to levels which permit release of the facility for unrestricted use. The license may be converted to a possession-only license

for the duration of the dormancy period. After the period of dormancy, the facility owner would initiate decontamination/ dismantlement activities so the possession-only license could be terminated.

4.4.1 Physical Considerations

The application of the "SAFSTOR" alternative to Unit 1 as described herein and in section 2.2.4 of the Plan, allows continuation of the essential support services now being provided to both Unit 2 and overall site operations. In addition, as discussed previously, only after cessation of Unit 2 operations can the Unit 1 containment building, and its related systems and facilities be dismantled safely and economically. In this option, experienced and competent personnel necessary for a major dismantling of a nuclear facility such as Unit 1 would be available from the Unit 2 operating and support staff after Unit 2 has been retired. Following the removal of all fuel from the site to a federal repository, security requirements would be relaxed greatly and delays caused by access and egress limitations would be reduced. Laydown areas could be systematically organized as Unit 2 facilities became available.

4.4.2 Radiological Considerations

Delaying the removal and dismantling of Unit 1 until Unit 2 ceases operation would provide time for significant additional decay of the radioactive inventory. By the year 2013, the current Unit 2 license expiration date, the primary coolant and reactor auxiliary system internal surface radionuclide inventory (primarily Co-60) will have decayed substantially as will have the radioactive inventory of the activated primary system components including the reactor vessel and internals (refer to Section 5 for complete results of the activation analysis). Delayed dismantling therefore further supports the ALARA principle since radioactivity levels will have decayed during the SAFSTOR period.

4.5 CONCLUSION

Con Edison has previously concluded that the ENTOMB or DECON alternatives for Unit 1 are not currently feasible because of the support the facility provides to Unit 2 during its operating life. Furthermore, the congestion that would occur if entombment, construction, decontamination, or demolition activities were implemented while Unit 2 was operating could adversely impact the safe operation of the facility. The alternative of SAFSTOR allows a substantial reduction in radiation levels and the further development of protective ALARA techniques, which will ultimately promote greater reduction of overall personnel exposure at the time of actual decontamination activities. In addition, the decommissioning experience gained during the period of SAFSTOR by the actual decommissioning of other reactors would substantially improve our ability to safely and effectively dismantle Unit 1. For these reasons, Con Edison continues to support a decommissioning plan for Unit 1 as presented in the Plan which incorporates the SAFSTOR alternative chosen.

5.0 ENVIRONMENTAL ASSESSMENT

Con Edison's Plan is based upon (a) Unit 1 operational support of Unit 2, (b) the physical constraints associated with decommissioning Unit 1 while Unit 2 remains in operation, and (c) the safest and most effective decommissioning approach from an ALARA standpoint. This section reviews the environmental considerations for the decomissioning alternative chosen in the Plan. The assessment clearly demonstrates that the actions described in the Plan will not cause a significant environmental impact.

5.1 RADIOLOGICAL RELEASES TO THE ENVIRONMENT

Upon shutdown of Unit 1, in 1976 the 160 spent fuel assemblies and associated control rods and followers were transferred to the spent fuel pool. The in-core detectors were placed in the source vault in the Nuclear Service Building which is actively monitored and inventoried periodically. As described in the following sections, Con Edison has determined that the spent fuel can be stored safely in the pool until a federal repository is available to dispose of the fuel offsite.

The overall active site radiation protection, effluent control and environmental monitoring programs which will continue for the operating life of Unit 2 will ensure that potential releases to the environment from the site are controlled and maintained ALARA. Such potential releases would essentially be the result of Unit 1 operational support of Unit 2. Internal surface contamination within piping and components, and neutron activation of the reactor vessel, internals and shield materials will be safely contained during SAFSTOR within the piping and buildings housing those systems.

5.1.1 Spent Fuel Pools

The Unit 1 spent fuel is stored under 23 feet of water in the Spent Fuel Pools. Pool covers were installed on the pools to prevent debris or other objects from falling into the pools. Routine monitoring is performed and maintenance is provided as needed. Radiological and physical inspections of the Unit 1 Fuel Handling Building are performed on a routine basis as part of the overall site Radiological Protection Program.

Purification and filtration of the pool water is now performed using contractor portable demineralization and filtration services. Water chemistry is periodically checked manually to maintain pH and chloride concentrations within specified limits. These water chemistry conditions will ensure the integrity of the fuel cladding.

The Spent Fuel Pool Cooling System is no longer required since the decay heat generated by the stored spent fuel is sufficiently reduced and cooling by the surrounding water is more than adequate. In addition , as quoted from the February 11,1980 NRC Order to Show Cause "Calculations have been made by the NRC Staff (the Staff) and the licensee that show that the spent fuel now in the spent fuel pool has decayed sufficiently such that, in the event of a loss of water in the pool, this fuel can be air-cooled. Thus, there is no significant safety problem associated with the plant in its present defueled condition." Analyses have also been performed by Con Edison to also show simple air cooling of the fuel (upon a complete loss of water cooling) is sufficient at this time (see Section 5.2).

Analyses have also been done in-house showing that the most reactive fuel assemblies (4) contained in the storage baskets would have a Keff of less than 0.69 which is below the Unit 1 Technical Specification value. Therefore criticality of the fuel would not occur in the event of a loss of water cooling as described above or the crushing of an assembly.

Based on the foregoing program of maintaining and monitoring the spent fuel pools, and the significant decay of the fuel which has been presented in previously submitted documents (Reference 8), radiological releases from the stored fuel are highly unlikely.

5.1.2 System Surface Radionuclide Inventory

By-product material remaining on internal surfaces of the primary system and reactor auxiliary systems is contained within the system boundaries (piping and components).

Measurements and estimates of auxiliary system internal surface inventory were performed by Battelle Pacific Northwest Laboratory in May 1982 (Reference 9). At that time the total estimated radiological inventory was 190 curies. A detailed breakdown by nuclide is shown in Table 6.1a, of this report. As of January 1988, this inventory is estimated to have decayed to approximately 80 curies.

Con Edison has recently performed an evaluation of primary system radionuclide surface inventory. Using radiation level measurements and analysis of surface contamination samples (wetted surface area data), an estimate of the gamma emitting isotopic inventory was made. The total

curie content of the primary isotopes of interest (Cobalt-60 and Cesium-137) existing at present was conservatively calculated to be 225 Curies. Applying the nuclide ratios shown in the Battelle report to determine the primary system beta contribution presently yields a total primary system surface nuclide inventory of approximately 540 Ci (see Table 6.1b).

Combining all system surface radionuclide inventories mentioned above yields an estimate for total radionuclide surface inventory for 1988 of approximately 620 Curies. Since most of this inventory is contained in the corrosion film within the piping and components, and is fixed contamination, there is a very low probability of by-product material migration and release to the environment. There is no evidence to date to indicate there has been any by-product material migration.

5.1.3 Vessel/Internals/Concrete Activation

The greatest source of radioactivity in the containment building is neutron activation products in the reactor vessel and internals. Preliminary analyses of these activated components were presented in section 2.2.3.2 of the Plan and were re-analyzed here on an updated basis to provide additional details and reflect the passage of time. The detailed estimates prepared by Con Edison in 1987 using the ORIGEN 2 computer code indicate the total activity in the vessel and internals was 1.14×10^6 curies at shutdown and will be 2.49×10^4 in 2013, for an approximate 77% decrease from the present 1988 value of 1.10×10^5. A detailed breakdown by nuclide within the vessel, internals, neutron shield tank, and biological shield concrete is shown in Table 6.2. These activation products are an integral part of the vessel and shield materials and will not result in releases to the environment.

5.2 ACCIDENTS AND NATURAL PHENOMEMA

The following sections discuss the effects of postulated accidents and natural phenomena on the Unit 1 facilities. The only postulated accidents of any consequence associated with Unit 1 in its retired condition would involve spent fuel storage. The remaining sources of substantial radioactivity are found as activation products tightly adhered to and contained in Unit 1 primary systems. Based on the past evaluations presented below, a release of any significance is highly unlikely. Nevertheless, an evaluation of the offsite consequences of a worst case release

scenario was performed to provide a bounding perspective. Assuming 100% fuel clad failure of the entire 160 assemblies in the spent fuel pool and a release of the gap activity in accordance with the assumptions outlined in Regulatory Guide 1.25, a total body dose (due to Kr-85, the only contributor to the offsite dose) of 0.027 Rads would result at the site boundary. This conservative dose estimate is a small fraction of the EPA Protective Action Guidelines lower limit as given in EPA-520/1-75-001.

5.2.1 Loss of Fuel Pool Cooling

As presented in a submittal to the NRC on November 12, 1975 (Reference 8), Con Edison calculated the decay heat load from the spent fuel and determined that in the unlikely event of complete loss of pool cooling, the spent fuel would be adequately protected. Analyses also performed by the NRC as stated in the February 11, 1980 "NRC Order to Show Cause" concluded that spent fuel has sufficiently decayed such that the fuel can be air cooled. As of 1983, the heat load per assembly with a maximum burnup was only 234 watts. Consequently, at this heat load air cooling would be sufficient to protect the fuel if all cooling water were lost. At present, with approximately 5 more years of cooling and an additional reduction of the fuel heat load, adequate cooling by air is further assured.

5.2.2 Drop of Heavy Object in Pool

In the March 1, 1974 submittal to the AEC (Reference 10), Con Edison evaluated the effects of dropping heavy objects in the spent fuel pool without pool covers. The evaluation first considered the handling of a fuel shipping cask near the pool. A cask is prohibited by the Unit 1 Technical Specifications from being carried to the edge of, or over the fuel storage pool. As quoted from reference 10, "The results of this study demonstrate that no damage of that nature could occur if a cask were to be dropped anywhere in the area at Indian Point where fuel shipping casks are handled or stored...." Therefore, no direct damage to spent fuel is possible due to dropping of a cask. The Technical Specifications prohibit the movement of any heavy object over, or near the pool.

Con Edison further evaluated whether the fuel could withstand the impact of a fractured pre-cast concrete panel from the Fuel Handling Building wall also presented in the March 1, 1974 submittal to the AEC (Reference 10). The analysis assumed one-half a panel dropped through 23 feet

of water and struck an area of 16 fuel assemblies. Tests made on dummy assemblies showed the fuel could safely absorb the energy of impact without failure of the cladding. In addition, previous analysis performed in-house had also shown that in the event of a catastrophic failure of an assembly (crushing of an assembly), criticality would not result since the Keff would remain below the Unit 1 Technical Specification value.

Based on these previously submitted analyses, Con Edison concluded that the drop of heavy objects on or near the fuel would not cause any radiological releases to the environment.

5.2.3 Seismic Protection

Con Edison evaluated the seismic capability of the Fuel Handling Building and the Spent Fuel Pools in the September 15, 1974 submittal to the NRC (Reference 11). The results of the analysis previously presented to the NRC indicated that for the postulated earthquake, there would be no damage to the fuel stored in the storage pool. The Fuel Handling Building itself could also withstand the effects of the earthquake, and there would be no structural damage resulting in steel falling into the storage pools. Similarly, the fuel storage racks could withstand the seismic effects without damage to the fuel contained in storage baskets. As stated in the analysis (Reference 11), "The results of these evaluations indicate that no nuclear fuel now present in Indian Point Unit No.1 would be damaged as a result of an earthquake as severe as the postulated Safe Shutdown Earthquake."

5.2.4 Site Flooding

The Indian Point Fuel Handling Building is located well above the high water level of the Hudson River, and is therefore, not in a flood region. The highest recorded water elevation in the vicinity of the site as reported in the Unit 1 Environmental Report (Reference 3) and the Unit 2 Final Safety Analysis Report (FSAR) was 7.4 feet above mean sea level, well below the ground floor level (15' 3") of Unit 1.

5.2.5 Fires

The Unit 1 Fire Protection System is integrated with the Unit 2 system and is actively maintained. Unit 1 facilities are therefore adequately protected in the event of a fire.

5.3 NOISE AND TRAFFIC

Effects associated with noise and traffic from the maintenance of Unit 1 in its present status will be minimal since the primary source of noise producing activity is from operation of Unit 2. Since the operating Unit 1 systems used in support of Unit 2 would be required regardless of the Unit 1 status, no change in noise level would be expected. There is very little traffic specifically associated with Unit 1. Accordingly, Unit No. 1's contribution to site noise and traffic is insignificant.

5.4 VISUAL AESTHETICS

There will be no change to the aesthetics of the site, and accordingly, no environmental effect since the Unit 1 structures can not be removed without a severe and undesirable impact on Unit 2 operation. In any event, the site would remain as a power generating facility site throughout the operating life of Unit 2, and therefore no significant effect on visual aesthetics would occur regardless of Unit 1 status.

5.5 RELATIONSHIP BETWEEN SHORT-TERM USE AND LONG-TERM PRODUCTIVITY

The location of Unit 1 between operating Units 2 and 3 precludes the practicality of releasing portions of Unit 1 for unrestricted access. Furthermore, because spent fuel is stored in the Unit 1 Fuel Handling Building, the facility structures cannot be released for unrestricted access in the near future. Con Edison intends to continue to use the site for power generation for at least the next 25 years in accordance with the current Unit 2 operating license. Consequently, there is no conflict in local short-term use versus long-term productivity.

Upon ultimate shutdown of Unit 2 (and 3), the land and site at Indian Point could be released for unrestricted use following decontamination or dismantling of all Unit 1, 2, and 3 structures of the common Indian Point site. Delay of the final decontamination or dismantling of Unit 1 will permit the further decay of radionuclides contained in the facility's systems and materials, thereby reducing the radiation exposure to workers. Delay in decontamination or dismantling will also allow more time for technological improvements over the next several decades in

the areas of robotics, radioactive waste volume reduction, transportation and disposal. These advanced techniques could further reduce radiation exposures, radwaste volume and cost.

5.6 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The proposed decommissioning alternative would not involve the commitment of any significant resources other than the Unit 1 land area. This land area, however, is committed to its present purpose of supporting power generation at the site regardless of Unit 1 status. As noted earlier, this land could ultimately be returned to unrestricted use following decommissioning and decontamination or dismantling of all structures. Delay in dismantling of Unit 1 may, in fact, reduce the volume of radioactive waste as compared to DECON or ENTOMB, and therefore, may reduce the commitment of resources.

5.7 RADIOLOGICAL AND ALARA BENEFITS

Numerous radiological and ALARA benefits result from implementation of the SAFSTOR alternative. Initiation of the final decommissioning (DECON) of Unit 1 at the current expiration date of the Unit 2 license will lower the gamma activity of the activated steel components contained in the reactor by a factor of approximately 25 (the primary gamma emitter being cobalt-60 with a half-life of 5.3 years). Similarly, the total activity will be reduced by a factor of 3.5 over the same period. Therefore, a corresponding reduction in total exposure to workers during decontamination and dismantling can be expected. Advances in robotics, handling techniques and general ALARA techniques are likely to provide a further significant reduction in the radiation exposure to personnel involved in the eventual removal of residual radioactivity and equipment disassembly. Advances in the handling, packaging, shipping, and compaction of radwaste should also reduce the volume of radioactive waste associated with the dismantling and decontamination of the facility.

5.8 UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Con Edison is not aware of any unavoidable adverse environmental impacts which would result specifically from implementation of the decommissioning alternative proposed for Unit 1. The environmental impacts, including those cited above, are site related and would be unaffected by this alternative (but may be adversely affected by the DECON or ENTOMB alternative).

6.0 INVENTORIES

Tables 6.1a and 6.1b contain the inventories of radionuclides present on the internal surfaces of the reactor primary and auxiliary systems. The inventories are provided for Unit 1 at present and in 2013, the current year for the expiration of the Unit 2 operating license.

Table 6.2 contains the radionuclide inventories of activated materials at the indicated locations for the vessel, internals, neutron shield tank and concrete. The inventories are provided for Unit 1 at shutdown (1974), at present (1988), and for the current expiration date of the Unit 2 license (2013).

7.0 CONCLUSION

In accordance with the NRC's request, this report provides certain supplemental environmental information in connection with Con Edison's 1980 submittal of a Decommissioning Plan. The information contained or referenced in this Plan provides a more than ample basis for Con Edison's proposed selection of the SAFSTOR decommissioning alternative.

As discussed herein, there have been no significant changes at the facility since submission of the Decommissioning Plan in 1980, and no conditions exist, which raise previously unevaluated environmental considerations. Accordingly, implementation of Con Edison's proposed SAFSTOR alternative continues as the best means for assuring the health and safety of the public and on-site personnel pending final dismantlement of the Indian Point facility.

8.0 REFERENCES

1. "Decommissioning Plan for Indian Point 1", October 1980.

2. Letter to Herbert N. Berkow of the NRC from John D. O'Toole, Vice President Consolidated Edison, July 31,1986.

3. Indian Point Unit 1 Environmental Report and Benefit Cost Analysis, June 1973.

4. Indian Point Unit No. 2 Environmental Report, Docket 50-247, dated August 6, 1970, including supplements of September 9, 1971, October 15, 1971, and February 15,1972.

5. Letter to Dr. Peter A. Morris of the AEC from Leboeuf, Lamb, Leiby & MacRae attorneys for Consolidated Edison, concerning a petition to convert Provisional Operating License to a Full Term Operating License, November 10, 1969.

6. "Termination of Operating Licenses for Nuclear Reactors", United States Nuclear Regulatory Commission (USNRC) Regulatory Guide 1.86, dated June 1974.

7. Draft Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, NUREG-0586, U.S. Nuclear Regulatory Commission, January 1981.

8. Letter from William J. Cahill, Jr., Vice President Consolidated Edison, to Mr. Robert W. Reid, Director NRR, November 12, 1975 and October 20, 1975 regarding air cooling of spent fuel.

9. "Residual Radionuclide Distribution and Inventory at Indian Point One," Battelle Report PNL-5020, November 1984.

10. Letter to John F. O'Leary of the AEC from Leboeuf, Lamb, Leiby & MacRae attorneys for Con Edison, in response to Regulatory Staff Questions at Meeting of November 14, 1973 concerning tornado analysis, March 1, 1974.

11. Letter from Carl L. Newman to Robert W. Reid, September 15, 1974, regarding evaluation effects of safe shutdown earthquake on nuclear fuel at Indian Point 1.

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TABLE 6.1a
TOTAL RESIDUAL RADIONUCLIDE INVENTORY IN AUXILIARY SYSTEMS
INDIAN POINT STATION, UNIT ONE
(CURIES)

NUCLIDE	HALF-LIFE (YR.)	SAMPLE* DATE 25 MAY 1982	CALCULATED JAN 1988	CALCULATED 2013
FE-55	2.70E+00	1.03E+02	2.45E+01	4.00E-02
CO-60	5.27E+00	6.00E+01	2.87E+01	1.07E+00
NI-63	1.00E+02	2.20E+01	2.12E+01	1.78E+01
CS-137	3.02E+01	4.40E+00	3.87E+00	2.18E+00
CS-134	2.06E+00	3.80E-01	5.78E-02	1.29E-05
NI-59	7.50E+04	1.80E-01	1.80E-01	1.80E-01
MN-54	8.54E-01	9.40E-02	9.99E-04	1.55E-12
TOTALS		1.90E+02	7.85E+01	2.13E+01

*NOTE: EXTRACTED FROM REFERENCE 5, TABLE S.1.

TABLE 6.1b
TOTAL RESIDUAL RADIONUCLIDE INVENTORY IN PRIMARY SYSTEM
INDIAN POINT STATION, UNIT ONE
(CURIES)

NUCLIDE	HALF-LIFE (YR.)	SAMPLE* DATE 2 NOV 1987	CALCULATED JAN 1988	CALCULATED 2013
* FE-55	2.70E+00	1.75E+02	1.68E+02	2.75E-01
CO-60	5.27E+00	2.02E+02	1.98E+02	7.38E+00
* NI-63	1.00E+02	1.46E+02	1.46E+02	1.22E+02
CS-137	3.02E+01	2.33E+01	2.32E+01	1.31E+01
* CS-134	2.06E+00	4.19E-01	3.97E-01	8.84E-05
* NI-59	7.50E+04	1.24E+00	1.24E+00	1.24E+00
* MN-54	8.54E-01	7.83E-03	6.87E-03	1.06E-11
TOTALS		5.48E+02	5.36E+02	1.44E+02

* NOTE: CURIE CONTENTS FOR THESE ISOTOPES HAVE BEEN ESTIMATED AT JANUARY 1, 1988 AND DECAY-CORRECTED AS APPROPRIATE. THE ESTIMATES HAVE BEEN OBTAINED BY USING THE DATA IN TABLE 6.1a FOR JANUARY 1, 1988, TO CALCULATE A RATIO BETWEEN THE ISOTOPE OF INTEREST AND THE CO-60 ACTIVITY DETERMINED BY ACTUAL SAMPLING.

Table 6.2a
Activation Analysis of Primary
Systems Components

ACTIVATION ANALYSIS OF
INDIAN POINT UNIT #1
TIME=REACTOR SHUTDOWN

COMPONENT	RADIAL FLUX REDUCTION	AXIAL FLUX REDUCTION	SPECTRAL FLUX FACTOR	TOTAL FLUX REDUCTION	VOLUME (CM**3)	MATERIAL	H-3 (CURIES)	C-14 (CURIES)	CL-36 (CURIES)
SHIM RODS CORE A ONLY	1.00E+00	1.00E+00	1.00E+00	1.00E+00	5.11E+04	STAINLESS STEEL	7.46E-08	1.02E+00	1.92E-02
CRB CORES A&B	1.00E+00	1.00E+00	1.00E+00	1.00E+00	2.09E+05	STAINLESS STEEL	3.01E-05	1.93E+01	3.43E-01
CRB FOLLOWERS CORES A&B	1.00E+00	1.00E+00	1.00E+00	1.00E+00	2.09E+05	ZIRCALOY-2	1.93E-03	2.82E+00	3.43E-06
FILLER RODS CORE A ONLY	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.57E+05	ZIRCALOY-2	4.36E-05	4.60E-01	1.05E-07
FILLER RODS CORES A&B	5.00E-01	1.00E+00	1.00E+00	5.00E-01	1.66E+05	ZIRCALOY-2	7.65E-04	1.12E+00	1.36E-06
HOLDOWN COLUMNS CORES A&B	2.40E-02	1.00E+00	1.00E+00	2.40E-02	2.50E+06	STAINLESS STEEL	8.64E-06	5.54E+00	9.84E-02
FILLER BARS CORES A&B	2.40E-02	1.00E+00	1.00E+00	2.40E-02	5.07E+04	STAINLESS STEEL	1.75E-07	1.12E-01	2.00E-03
CORE SHROUD	6.30E-03	1.00E+00	5.00E+00	3.15E-02	6.68E+05	STAINLESS STEEL	3.03E-06	1.94E+00	3.45E-02
UPPER INTERNALS	1.00E+00	1.00E-02	5.00E+00	5.00E-02	9.30E+05	STAINLESS STEEL	6.70E-06	4.30E+00	7.63E-02
LOWER INTERNALS	1.00E+00	1.00E-02	5.00E+00	5.00E-02	9.30E+05	STAINLESS STEEL	6.70E-06	4.30E+00	7.63E-02
THERM. SHLD. #1	1.38E-03	1.00E+00	5.00E+00	6.90E-03	1.12E+06	STAINLESS STEEL	1.11E-06	7.14E-01	1.27E-02
THERM. SHLD. #2	5.05E-04	1.00E+00	5.00E+00	2.53E-03	1.88E+06	STAINLESS STEEL	6.84E-07	4.39E-01	7.79E-03
RX VESSEL CLAD	2.15E-04	1.00E+00	5.00E+00	1.08E-03	7.54E+04	STAINLESS STEEL	1.17E-08	7.49E-03	1.33E-04
RX VESSEL CORE HEIGHT	4.50E-05	1.00E+00	1.00E+00	4.50E-05	4.51E+06	CARBON STEEL	2.19E-08	3.35E-03	1.91E-04
RX VESSEL 3' BELOW CORE	4.50E-05	2.00E-01	1.00E+00	9.00E-06	1.60E+06	CARBON STEEL	1.56E-09	2.38E-04	1.35E-05
RX VESSEL >3' BELOW CORE	4.50E-05	2.00E-01	1.00E+00	9.00E-06	6.94E+06	CARBON STEEL	6.75E-09	1.03E-03	5.87E-05
RX VESSEL 3' ABOVE CORE	4.50E-05	1.00E-01	1.00E+00	4.50E-06	1.60E+06	CARBON STEEL	7.78E-10	1.19E-04	6.77E-06
RX VESSEL >3' ABOVE CORE	4.50E-05	1.00E-01	1.00E+00	4.50E-06	4.36E+06	CARBON STEEL	2.12E-09	3.24E-04	1.84E-05
INSULATION	9.65E-06	1.00E+00	1.00E+00	9.65E-06	2.10E+06	ALUMINUM	5.29E-10	6.02E-21	0.00E+00
NST I.D. WALL	9.00E-06	1.00E+00	5.00E+00	4.50E-05	7.85E+05	CARBON STEEL	3.82E-09	5.83E-04	3.32E-05
NST O.D. WALL	2.68E-13	1.00E+00	1.00E+01	2.68E-12	1.34E+06	CARBON STEEL	3.88E-16	5.93E-11	3.38E-12
BIOSHIELD	2.68E-05	1.00E+00	1.00E+01	2.68E-04	1.00E+08	CONCRETE	7.75E-06	1.99E-09	1.26E-10
						TOTALS	2.80E-03	4.21E+01	6.70E-01

Table 6.2a
(con't)

ACTIVATION ANALYSIS OF
INDIAN POINT UNIT #1
TIME=REACTOR SHUTDOWN

COMPONENT	AR-39 (CURIES)	CA-41 (CURIES)	MN-54 (CURIES)	FE-55 (CURIES)	CO-60 (CURIES)	NI-59 (CURIES)	NI-63 (CURIES)	ZN-65 (CURIES)	NB-94 (CURIES)	MO-93 (CURIES)
SHIM RODS CORE A ONLY	0.00E+00	0.00E+00	5.47E+03	3.93E+04	1.75E+04	6:85E+00	8.64E+02	0.00E+00	1.95E-02	1.97E-02
CRB CORES A&B	0.00E+00	0.00E+00	3.26E+04	3.26E+05	1.89E+05	1.11E+02	1.52E+04	0.00E+00	3.47E-01	3.72E-01
CRB FOLLOWERS CORES A&B	0.00E+00	0.00E+00	5.68E+01	5.77E+02	1.10E+03	4.56E-01	6.23E+01	2.22E-01	3.78E-01	0.00E+00
FILLER RODS CORE A ONLY	0.00E+00	0.00E+00	2.92E+01	2.14E+02	3.12E+02	8.64E-02	1.09E+01	1.79E-02	6.53E-02	0.00E+00
FILLER RODS CORES A&B	0.00E+00	0.00E+00	2.26E+01	2.29E+02	4.35E+02	1.81E-01	2.47E+01	8.80E-02	1.50E-01	0.00E+00
HOLDOWN COLUMNS CORES A&B	0.00E+00	0.00E+00	9.36E+03	9.36E+04	5.42E+04	3.19E+01	4.35E+03	0.00E+00	9.96E-02	1.07E-01
FILLER BARS CORES A&B	0.00E+00	0.00E+00	1.90E+02	1.90E+03	1.10E+03	6.46E-01	8.82E+01	0.00E+00	2.02E-03	2.17E-03
CORE SHROUD	0.00E+00	0.00E+00	3.28E+03	3.28E+04	1.90E+04	1.12E+01	1.53E+03	0.00E+00	3.49E-02	3.75E-02
UPPER INTERNALS	0.00E+00	0.00E+00	7.25E+03	7.25E+04	4.20E+04	2.47E+01	3.37E+03	0.00E+00	7.72E-02	8.28E-02
LOWER INTERNALS	0.00E+00	0.00E+00	7.25E+03	7.25E+04	4.20E+04	2.47E+01	3.37E+03	0.00E+00	7.72E-02	8.28E-02
THERM. SHLD. #1	0.00E+00	0.00E+00	1.21E+03	1.21E+04	6.99E+03	4.10E+00	5.60E+02	0.00E+00	1.28E-02	1.38E-02
THERM. SHLD. #2	0.00E+00	0.00E+00	7.41E+02	7.41E+03	4.29E+03	2.52E+00	3.44E+02	0.00E+00	7.88E-03	8.45E-03
RX VESSEL CLAD	0.00E+00	0.00E+00	1.26E+01	1.26E+02	7.33E+01	4.30E-02	5.88E+00	0.00E+00	1.35E-04	1.44E-04
RX VESSEL CORE HEIGHT	0.00E+00	0.00E+00	4.40E+01	4.36E+02	1.66E+01	7.14E-03	9.80E-01	0.00E+00	7.49E-05	0.00E+00
RX VESSEL 3' BELOW CORE	0.00E+00	0.00E+00	3.12E+00	3.10E+01	1.18E+00	5.07E-04	6.96E-02	0.00E+00	5.31E-06	0.00E+00
RX VESSEL >3' BELOW CORE	0.00E+00	0.00E+00	1.36E+01	1.34E+02	5.10E+00	2.20E-03	3.02E-01	0.00E+00	2.30E-05	0.00E+00
RX VESSEL 3' ABOVE CORE	0.00E+00	0.00E+00	1.56E+00	1.55E+01	5.88E-01	2.53E-04	3.48E-02	0.00E+00	2.66E-06	0.00E+00
RX VESSEL >3' ABOVE CORE	0.00E+00	0.00E+00	4.26E+00	4.22E+01	1.60E+00	6.91E-04	9.48E-02	0.00E+00	7.24E-06	0.00E+00
INSULATION	0.00E+00	0.00E+00	1.38E-02	1.37E-01	5.94E-04	0.00E+00	3.83E-01	5.69E-02	0.00E+00	0.00E+00
NST I.D. WALL	0.00E+00	0.00E+00	7.67E+00	7.59E+01	2.89E+00	1.24E-03	1.71E-01	0.00E+00	1.30E-05	0.00E+00
NST O.D. WALL	0.00E+00	0.00E+00	7.79E-07	7.72E-06	2.93E-07	1.26E-10	1.73E-08	0.00E+00	1.33E-12	0.00E+00
BIOSHIELD	1.12E-07	1.48E-08	6.97E-07	6.89E-06	1.24E-10	2.08E-11	2.53E-09	0.00E+00	0.00E+00	0.00E+00
	1.12E-07	1.48E-08	6.76E+04	6.60E+05	3.78E+05	2.18E+02	2.97E+04	3.84E-01	1.27E+00	7.26E-01

Table 6.2a
(con't)

ACTIVATION ANALYSIS OF
INDIAN POINT UNIT #1
TIME=REACTOR SHUTDOWN

COMPONENT	TC-99 (CURIES)	SB-125 (CURIES)	I-129 (CURIES)	BA-133 (CURIES)	SM-151 (CURIES)	EU-152 (CURIES)	EU-153 (CURIES)	EU-154 (CURIES)	TOTAL CURIES
SHIM RODS CORE A ONLY	8.84E-04	2.27E-02	2.10E-17	2.58E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.31E+04
CRB CORES A&B	1.50E-02	2.36E-01	6.98E-15	3.72E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.63E+05
CRB FOLLOWERS CORES A&B	1.31E-05	0.00E+00	3.39E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E+03
FILLER RODS CORE A ONLY	1.07E-07	0.00E+00	1.16E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.67E+02
FILLER RODS CORES A&B	5.21E-06	0.00E+00	1.34E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.13E+02
HOLDOWN COLUMNS CORES A&B	4.30E-03	6.78E-02	2.00E-15	1.07E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.62E+05
FILLER BARS CORES A&B	8.71E-05	1.37E-03	4.06E-17	2.17E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.28E+03
CORE SHROUD	1.51E-03	2.38E-02	7.03E-16	3.75E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.67E+04
UPPER INTERNALS	3.33E-03	5.25E-02	1.55E-15	8.28E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.25E+05
LOWER INTERNALS	3.33E-03	5.25E-02	1.55E-15	8.28E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.25E+05
THERM. SHLD. #1	5.53E-04	8.73E-03	2.58E-16	1.38E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.08E+04
THERM. SHLD. #2	3.40E-04	5.36E-03	1.59E-16	8.45E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E+04
RX VESSEL CLAD	5.80E-06	9.16E-05	2.71E-18	1.44E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.18E+02
RX VESSEL CORE HEIGHT	8.58E-17	2.29E-04	3.71E-18	1.96E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.98E+02
RX VESSEL 3' BELOW CORE	6.09E-18	1.63E-05	2.64E-19	1.39E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.53E+01
RX VESSEL >3' BELOW CORE	2.64E-17	7.06E-05	1.14E-18	6.03E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E+02
RX VESSEL 3' ABOVE CORE	3.05E-18	8.14E-06	1.32E-19	6.96E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E+01
RX VESSEL >3' ABOVE CORE	8.30E-18	2.22E-05	3.59E-19	1.90E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.81E+01
INSULATION	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.92E-01
NST I.D. WALL	1.49E-17	3.99E-05	6.46E-19	3.41E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.67E+01
NST O.D. WALL	1.52E-24	4.06E-12	6.57E-26	3.47E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.81E-06
BIOSHIELD	0.00E+00	0.00E+00	0.00E+00	2.76E-09	1.17E-09	5.17E-07	7.34E-08	3.19E-09	1.61E-05
	2.93E-02	4.71E-01	4.86E-13	7.32E+00	1.17E-09	5.17E-07	7.34E-08	3.19E-09	1.14E+06

Table 6.2b

ACTIVATION ANALYSIS OF
INDIAN POINT UNIT #1
TIME= 1988

COMPONENT	RADIAL FLUX REDUCTION	AXIAL FLUX REDUCTION	SPECTRAL FLUX FACTOR	TOTAL FLUX REDUCTION	VOLUME (CM**3)	MATERIAL	H-3 (CURIES)	C-14 (CURIES)	CL-36 (CURIES)
SHIM RODS CORE A ONLY	1.00E+00	1.00E+00	1.00E+00	1.00E+00	5.11E+04	STAINLESS STEEL	1.05E-08	1.02E+00	1.92E-02
CRB CORES A&B	1.00E+00	1.00E+00	1.00E+00	1.00E+00	2.09E+05	STAINLESS STEEL	1.44E-05	1.93E+01	3.43E-01
CRB FOLLOWERS CORES A&B	1.00E+00	1.00E+00	1.00E+00	1.00E+00	2.09E+05	ZIRCALOY-2	9.22E-04	2.82E+00	3.43E-06
FILLER RODS CORE A ONLY	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.57E+05	ZIRCALOY-2	3.88E-06	4.57E-01	1.05E-07
FILLER RODS CORES A&B	5.00E-01	1.00E+00	1.00E+00	5.00E-01	1.66E+05	ZIRCALOY-2	3.66E-04	1.12E+00	1.36E-06
HOLDOWN COLUMNS CORES A&B	2.40E-02	1.00E+00	1.00E+00	2.40E-02	2.50E+06	STAINLESS STEEL	4.13E-06	5.53E+00	9.84E-02
FILLER BARS CORES A&B	2.40E-02	1.00E+00	1.00E+00	2.40E-02	5.01E+04	STAINLESS STEEL	8.27E-08	1.11E-01	1.97E-03
CORE SHROUD	6.30E-03	1.00E+00	5.00E+00	3.15E-02	6.68E+05	STAINLESS STEEL	1.45E-06	1.94E+00	3.45E-02
UPPER INTERNALS	1.00E+00	1.00E-02	5.00E+00	5.00E-02	9.30E+05	STAINLESS STEEL	3.20E-06	4.29E+00	7.63E-02
LOWER INTERNALS	1.00E+00	1.00E-02	5.00E+00	5.00E-02	9.30E+05	STAINLESS STEEL	3.20E-06	4.29E+00	7.63E-02
THERM. SHLD. #1	1.38E-03	1.00E+00	5.00E+00	6.90E-03	1.12E+06	STAINLESS STEEL	5.32E-07	7.13E-01	1.27E-02
THERM. SHLD. #2	5.05E-04	1.00E+00	5.00E+00	2.53E-03	1.88E+06	STAINLESS STEEL	3.27E-07	4.38E-01	7.79E-03
RX VESSEL CLAD	2.15E-04	1.00E+00	5.00E+00	1.08E-03	7.54E+04	STAINLESS STEEL	5.58E-09	7.47E-03	1.33E-04
RX VESSEL CORE HEIGHT	4.50E-05	1.00E+00	1.00E+00	4.50E-05	4.51E+06	CARBON STEEL	1.05E-08	3.35E-03	1.91E-04
RX VESSEL 3' BELOW CORE	4.50E-05	2.00E-01	1.00E+00	9.00E-06	1.60E+06	CARBON STEEL	7.42E-10	2.38E-04	1.35E-05
RX VESSEL >3' BELOW CORE	4.50E-05	2.00E-01	1.00E+00	9.00E-06	6.94E+06	CARBON STEEL	3.22E-09	1.03E-03	5.87E-05
RX VESSEL 3' ABOVE CORE	4.50E-05	1.00E-01	1.00E+00	4.50E-06	1.60E+06	CARBON STEEL	3.71E-10	1.19E-04	6.77E-06
RX VESSEL >3' ABOVE CORE	4.50E-05	1.00E-01	1.00E+00	4.50E-06	4.36E+06	CARBON STEEL	1.01E-09	3.24E-04	1.84E-05
INSULATION	9.65E-06	1.00E+00	1.00E+00	9.65E-06	2.10E+06	ALUMINUM	2.51E-10	6.02E-21	0.00E+00
NST I.D. WALL	9.00E-06	1.00E+00	5.00E+00	4.50E-05	7.85E+05	CARBON STEEL	1.82E-09	5.83E-04	3.32E-05
NST O.D. WALL	2.68E-13	1.00E+00	1.00E+01	2.68E-12	1.34E+06	CARBON STEEL	1.85E-16	5.93E-11	3.38E-12
BIOSHIELD	2.68E-05	1.00E+00	1.00E+01	2.68E-04	1.00E+08	CONCRETE	3.70E-06	1.98E-09	1.26E-10
						TOTALS	1.32E-03	4.20E+01	6.70E-01

Table 6.2b
(con't)

ACTIVATION ANALYSIS OF
INDIAN POINT UNIT #1
TIME= 1988

COMPONENT	AR-39 (CURIES)	CA-41 (CURIES)	MN-54 (CURIES)	FE-55 (CURIES)	CO-60 (CURIES)	NI-59 (CURIES)	NI-63 (CURIES)	ZN-65 (CURIES)	NB-94 (CURIES)	MO-93 (CURIES)
SHIM RODS CORE A ONLY	0.00E+00	0.00E+00	2.80E-09	3.55E+00	1.77E+02	6.85E+00	6.64E+02	0.00E+00	1.94E-02	1.95E-02
CRB CORES A&B	0.00E+00	0.00E+00	7.59E-01	9.74E+03	3.34E+04	1.11E+02	1.37E+04	0.00E+00	3.47E-01	3.70E-02
CRB FOLLOWERS CORES A&B	0.00E+00	0.00E+00	1.32E-03	1.72E+01	1.94E+02	4.56E-01	5.64E+01	2.55E-07	3.78E-01	0.00E+00
FILLER RODS CORE A ONLY	0.00E+00	0.00E+00	1.93E-14	2.15E-03	1.08E+00	8.64E-02	7.87E+00	6.31E-22	6.53E-02	0.00E+00
FILLER RODS CORES A&B	0.00E+00	0.00E+00	5.25E-04	6.84E+00	7.69E+01	1.81E-01	2.24E+01	1.01E-07	1.50E-01	0.00E+00
HOLDOWN COLUMNS CORES A&B	0.00E+00	0.00E+00	2.18E-01	2.80E+03	9.60E+03	3.19E+01	3.94E+03	0.00E+00	9.96E-02	1.06E-02
FILLER BARS CORES A&B	0.00E+00	0.00E+00	4.36E-03	5.60E+01	1.92E+02	6.38E-01	7.90E+01	0.00E+00	2.00E-03	2.13E-04
CORE SHROUD	0.00E+00	0.00E+00	7.64E-02	9.81E+02	3.37E+03	1.12E+01	1.38E+03	0.00E+00	3.49E-02	3.72E-03
UPPER INTERNALS	0.00E+00	0.00E+00	1.69E-01	2.17E+03	7.44E+03	2.47E+01	3.06E+03	0.00E+00	7.72E-02	8.23E-03
LOWER INTERNALS	0.00E+00	0.00E+00	1.69E-01	2.17E+03	7.44E+03	2.47E+01	3.06E+03	0.00E+00	7.72E-02	8.23E-03
THERM. SHLD. #1	0.00E+00	0.00E+00	2.81E-02	3.60E+02	1.24E+03	4.10E+00	5.08E+02	0.00E+00	1.28E-02	1.37E-03
THERM. SHLD. #2	0.00E+00	0.00E+00	1.72E-02	2.21E+02	7.60E+02	2.52E+00	3.12E+02	0.00E+00	7.88E-03	8.40E-04
RX VESSEL CLAD	0.00E+00	0.00E+00	2.94E-04	3.78E+00	1.30E+01	4.30E-02	5.33E+00	0.00E+00	1.35E-04	1.43E-05
RX VESSEL CORE HEIGHT	0.00E+00	0.00E+00	1.02E-03	1.30E+01	2.94E+00	7.14E-03	8.89E-01	0.00E+00	7.49E-05	0.00E+00
RX VESSEL 3' BELOW CORE	0.00E+00	0.00E+00	7.27E-05	9.26E-01	2.09E-01	5.07E-04	6.31E-02	0.00E+00	5.31E-06	0.00E+00
RX VESSEL >3' BELOW CORE	0.00E+00	0.00E+00	3.15E-04	4.02E+00	9.06E-01	2.20E-03	2.74E-01	0.00E+00	2.30E-05	0.00E+00
RX VESSEL 3' ABOVE CORE	0.00E+00	0.00E+00	3.64E-05	4.63E-01	1.04E-01	2.53E-04	3.15E-02	0.00E+00	2.66E-06	0.00E+00
RX VESSEL >3' ABOVE CORE	0.00E+00	0.00E+00	9.91E-05	1.26E+00	2.84E-01	6.91E-04	8.59E-02	0.00E+00	7.24E-06	0.00E+00
INSULATION	0.00E+00	0.00E+00	3.22E-07	4.11E-03	1.05E-04	0.00E+00	3.47E-04	6.59E-08	0.00E+00	0.00E+00
NST I.D. WALL	0.00E+00	0.00E+00	1.78E-04	2.27E+00	5.12E-01	1.24E-03	1.55E-01	0.00E+00	1.30E-05	0.00E+00
NST O.D. WALL	0.00E+00	0.00E+00	1.81E-11	2.31E-07	5.21E-08	1.26E-10	1.57E-08	0.00E+00	1.33E-12	0.00E+00
BIOSHIELD	1.08E-07	1.48E-08	1.62E-11	2.06E-07	2.20E-11	2.08E-11	2.29E-09	0.00E+00	0.00E+00	0.00E+00
	1.08E-07	1.48E-08	1.44E+00	1.85E+04	6.39E+04	2.18E+02	2.68E+04	4.22E-07	1.27E+00	8.98E-02

Table 6.2b
(con't)

ACTIVATION ANALYSIS OF
INDIAN POINT UNIT #1
TIME= 1988

COMPONENT	TC-99 (CURIES)	SB-125 (CURIES)	I-129 (CURIES)	BA-133 (CURIES)	SM-151 (CURIES)	EU-152 (CURIES)	EU-153 (CURIES)	EU-154 (CURIES)	TOTAL CURIES
SHIM RODS CORE A ONLY	8.84E-04	3.63E-06	2.10E-17	2.70E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.53E+02
CRB CORES A&B	1.50E-02	8.74E-03	6.98E-15	1.59E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.70E+04
CRB FOLLOWERS CORES A&B	1.32E-05	0.00E+00	3.39E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.71E+02
FILLER RODS CORE A ONLY	1.07E-07	0.00E+00	1.16E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.55E+00
FILLER RODS CORES A&B	5.23E-06	0.00E+00	1.34E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E+02
HOLDOWN COLUMNS CORES A&B	4.30E-03	2.51E-03	2.00E-15	4.57E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.64E+04
FILLER BARS CORES A&B	8.62E-05	5.03E-05	4.02E-17	9.15E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.28E+02
CORE SHROUD	1.51E-03	8.80E-04	7.03E-16	1.60E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.74E+03
UPPER INTERNALS	3.33E-03	1.94E-03	1.55E-15	3.54E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E+04
LOWER INTERNALS	3.33E-03	1.94E-03	1.55E-15	3.54E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E+04
THERM. SHLD. #1	5.54E-04	3.23E-04	2.58E-16	5.88E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.11E+03
THERM. SHLD. #2	3.40E-04	1.98E-04	1.59E-16	3.61E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E+03
RX VESSEL CLAD	5.81E-06	3.39E-06	2.71E-18	6.17E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.21E+01
RX VESSEL CORE HEIGHT	8.65E-17	8.50E-06	3.71E-18	8.38E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.69E+01
RX VESSEL 3' BELOW CORE	6.13E-18	6.03E-07	2.64E-19	5.95E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E+00
RX VESSEL >3' BELOW CORE	2.66E-17	2.62E-06	1.14E-18	2.58E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.20E+00
RX VESSEL 3' ABOVE CORE	3.07E-18	3.02E-07	1.32E-19	2.97E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.99E-01
RX VESSEL >3' ABOVE CORE	8.36E-18	8.22E-07	3.59E-19	8.10E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+00
INSULATION	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.57E-03
NST I.D. WALL	1.50E-17	1.48E-06	6.46E-19	1.46E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.94E+00
NST O.D. WALL	1.53E-24	1.50E-13	6.57E-26	1.48E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.99E-07
BIOSHIELD	0.00E+00	0.00E+00	0.00E+00	1.18E-09	1.06E-09	2.64E-07	2.54E-08	5.09E-10	4.32E-06
	2.94E-02	1.66E-02	4.86E-13	3.05E+00	1.06E-09	2.64E-07	2.54E-08	5.09E-10	1.10E+05

Table 6.2c

ACTIVATION ANALYSIS OF
INDIAN POINT UNIT #1
TIME= 2013

COMPONENT	RADIAL FLUX REDUCTION	AXIAL FLUX REDUCTION	SPECTRAL FLUX FACTOR	TOTAL FLUX REDUCTION	VOLUME (CM**3)	MATERIAL	H-3 (CURIES)	C-14 (CURIES)	CL-36 (CURIES)
SHIM RODS CORE A ONLY	1.00E+00	1.00E+00	1.00E+00	1.00E+00	5.11E+04	STAINLESS STEEL	2.59E-09	1.02E+00	1.92E-02
CRB CORES A&B	1.00E+00	1.00E+00	1.00E+00	1.00E+00	2.09E+05	STAINLESS STEEL	3.53E-06	1.92E+01	3.43E-01
CRB FOLLOWERS CORES A&B	1.00E+00	1.00E+00	1.00E+00	1.00E+00	2.09E+05	ZIRCALOY-2	2.26E-04	2.80E+00	3.43E-06
FILLER RODS CORE A ONLY	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.57E+05	ZIRCALOY-2	1.51E-06	4.55E-01	1.05E-07
FILLER RODS CORES A&B	5.00E-01	1.00E+00	1.00E+00	5.00E-01	1.66E+05	ZIRCALOY-2	8.96E-05	1.11E+00	1.36E-06
HOLDOWN COLUMNS CORES A&B	2.40E-02	1.00E+00	1.00E+00	2.40E-02	2.50E+06	STAINLESS STEEL	1.01E-06	5.52E+00	9.84E-02
FILLER BARS CORES A&B	2.40E-02	1.00E+00	1.00E+00	2.40E-02	5.07E+04	STAINLESS STEEL	2.06E-08	1.12E-01	2.00E-03
CORE SHROUD	6.30E-03	1.00E+00	5.00E+00	3.15E-02	6.68E+05	STAINLESS STEEL	3.56E-07	1.94E+00	3.45E-02
UPPER INTERNALS	1.00E+00	1.00E-02	5.00E+00	5.00E-02	9.30E+05	STAINLESS STEEL	7.86E-07	4.28E+00	7.63E-02
LOWER INTERNALS	1.00E+00	1.00E-02	5.00E+00	5.00E-02	9.30E+05	STAINLESS STEEL	7.86E-07	4.28E+00	7.63E-02
THERM. SHLD. #1	1.38E-03	1.00E+00	5.00E+00	6.90E-03	1.12E+06	STAINLESS STEEL	1.31E-07	7.11E-01	1.27E-02
THERM. SHLD. #2	5.05E-04	1.00E+00	5.00E+00	2.53E-03	1.88E+06	STAINLESS STEEL	8.02E-08	4.37E-01	7.79E-03
RX VESSEL CLAD	2.15E-04	1.00E+00	5.00E+00	1.08E-03	7.54E+04	STAINLESS STEEL	1.37E-09	7.46E-03	1.33E-04
RX VESSEL CORE HEIGHT	4.50E-05	1.00E+00	1.00E+00	4.50E-05	4.51E+06	CARBON STEEL	2.58E-09	3.33E-03	1.91E-04
RX VESSEL 3' BELOW CORE	4.50E-05	2.00E-01	1.00E+00	9.00E-06	1.60E+06	CARBON STEEL	1.83E-10	2.36E-04	1.35E-05
RX VESSEL >3' BELOW CORE	4.50E-05	2.00E-01	1.00E+00	9.00E-06	6.94E+06	CARBON STEEL	7.93E-10	1.02E-03	5.87E-05
RX VESSEL 3' ABOVE CORE	4.50E-05	1.00E-01	1.00E+00	4.50E-06	1.60E+06	CARBON STEEL	9.14E-11	1.18E-04	6.77E-06
RX VESSEL >3' ABOVE CORE	4.50E-05	1.00E-01	1.00E+00	4.50E-06	4.36E+06	CARBON STEEL	2.49E-10	3.22E-04	1.84E-05
INSULATION	9.65E-06	1.00E+00	1.00E+00	9.65E-06	2.10E+06	ALUMINUM	6.20E-11	6.02E-21	0.00E+00
NST I.D. WALL	9.00E-06	1.00E+00	5.00E+00	4.50E-05	7.85E+05	CARBON STEEL	4.49E-10	5.79E-04	3.32E-05
NST O.D. WALL	2.68E-13	1.00E+00	1.00E+01	2.68E-12	1.34E+06	CARBON STEEL	4.56E-17	5.89E-11	3.38E-12
BIOSHIELD	2.68E-05	1.00E+00	1.00E+01	2.68E-04	1.00E+08	CONCRETE	9.09E-07	1.98E-09	1.26E-10
						TOTALS	3.24E-04	4.19E+01	6.70E-01

Table 6.2c
(con't)

ACTIVATION ANALYSIS OF
INDIAN POINT UNIT #1
TIME= 2013

COMPONENT	AR-39 (CURIES)	CA-41 (CURIES)	MN-54 (CURIES)	FE-55 (CURIES)	CO-60 (CURIES)	NI-59 (CURIES)	NI-63 (CURIES)	ZN-65 (CURIES)	NB-94 (CURIES)	MO-93 (CURIES)
SHIM RODS CORE A ONLY	0.00E+00	0.00E+00	1.30E-15	4.52E-03	6.59E+00	6.85E+00	5.47E+02	0.00E+00	1.94E-02	1.94E-02
CRB CORES A&B	0.00E+00	0.00E+00	1.21E-09	1.24E+01	1.25E+03	1.11E+02	1.14E+04	0.00E+00	3.47E-01	3.70E-01
CRB FOLLOWERS CORES A&B	0.00E+00	0.00E+00	2.11E-12	2.19E-02	7.23E+00	4.56E-01	4.68E+01	1.37E-18	3.78E-01	0.00E+00
FILLER RODS CORE A ONLY	0.00E+00	0.00E+00	6.97E-18	2.45E-05	1.18E-01	8.64E-02	6.94E+00	1.70E-29	6.53E-02	0.00E+00
FILLER RODS CORES A&B	0.00E+00	0.00E+00	8.38E-13	8.72E-03	2.87E+00	1.81E-01	1.86E+01	5.43E-19	1.50E-01	0.00E+00
HOLDOWN COLUMNS CORES A&B	0.00E+00	0.00E+00	3.47E-10	3.56E+00	3.58E+02	3.19E+01	3.26E+03	0.00E+00	9.96E-02	1.06E-01
FILLER BARS CORES A&B	0.00E+00	0.00E+00	7.03E-12	7.23E-02	7.26E+00	6.46E-01	6.62E+01	0.00E+00	2.02E-03	2.15E-03
CORE SHROUD	0.00E+00	0.00E+00	1.22E-10	1.25E+00	1.26E+02	1.12E+01	1.14E+03	0.00E+00	3.49E-02	3.72E-02
UPPER INTERNALS	0.00E+00	0.00E+00	2.69E-10	2.76E+00	2.78E+02	2.47E+01	2.53E+03	0.00E+00	7.72E-02	8.23E-02
LOWER INTERNALS	0.00E+00	0.00E+00	2.69E-10	2.76E+00	2.78E+02	2.47E+01	2.53E+03	0.00E+00	7.72E-02	8.23E-02
THERM. SHLD. #1	0.00E+00	0.00E+00	4.47E-11	4.59E-01	4.61E+01	4.10E+00	4.20E+02	0.00E+00	1.28E-02	1.37E-02
THERM. SHLD. #2	0.00E+00	0.00E+00	2.74E-11	2.82E-01	2.83E+01	2.52E+00	2.58E+02	0.00E+00	7.88E-03	8.40E-03
RX VESSEL CLAD	0.00E+00	0.00E+00	4.68E-13	4.81E-03	4.84E-01	4.30E-02	4.41E+00	0.00E+00	1.35E-04	1.43E-04
RX VESSEL CORE HEIGHT	0.00E+00	0.00E+00	1.64E-12	1.66E-02	1.09E-01	7.14E-03	7.37E-01	0.00E+00	7.49E-05	0.00E+00
RX VESSEL 3' BELOW CORE	0.00E+00	0.00E+00	1.16E-13	1.18E-03	7.76E-03	5.07E-04	5.23E-02	0.00E+00	5.31E-06	0.00E+00
RX VESSEL >3' BELOW CORE	0.00E+00	0.00E+00	5.03E-13	5.12E-03	3.37E-02	2.20E-03	2.27E-01	0.00E+00	2.30E-05	0.00E+00
RX VESSEL 3' ABOVE CORE	0.00E+00	0.00E+00	5.80E-14	5.90E-04	3.88E-03	2.53E-04	2.61E-02	0.00E+00	2.66E-06	0.00E+00
RX VESSEL >3' ABOVE CORE	0.00E+00	0.00E+00	1.58E-13	1.61E-03	1.06E-02	6.91E-04	7.12E-02	0.00E+00	7.24E-06	0.00E+00
INSULATION	0.00E+00	0.00E+00	5.17E-16	5.23E-06	3.93E-06	0.00E+00	2.86E-04	3.53E-19	0.00E+00	0.00E+00
NST I.D. WALL	0.00E+00	0.00E+00	2.85E-13	2.89E-03	1.90E-02	1.24E-03	1.28E-01	0.00E+00	1.30E-05	0.00E+00
NST O.D. WALL	0.00E+00	0.00E+00	2.89E-20	2.94E-10	1.94E-09	1.26E-10	1.30E-08	0.00E+00	1.33E-12	0.00E+00
BIOSHIELD	1.02E-07	1.48E-08	7.53E-18	2.62E-10	8.20E-13	2.08E-11	1.89E-09	0.00E+00	0.00E+00	0.00E+00
	1.02E-07	1.48E-08	2.30E-09	2.36E+01	2.39E+03	2.18E+02	2.22E+04	2.26E-18	1.27E+00	7.22E-01

Table 6.2c
(con't)

ACTIVATION ANALYSIS OF
INDIAN POINT UNIT #1
TIME= 2013

COMPONENT	TC-99 (CURIES)	SB-125 (CURIES)	I-129 (CURIES)	BA-133 (CURIES)	SM-151 (CURIES)	EU-152 (CURIES)	EU-153 (CURIES)	EU-154 (CURIES)	TOTAL CURIES
SHIM RODS CORE A ONLY	8.84E-04	6.95E-09	2.10E-17	5.37E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.61E+02
CRB CORES A&B	1.50E-02	1.67E-05	6.98E-15	3.18E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E+04
CRB FOLLOWERS CORES A&B	1.32E-05	0.00E+00	3.39E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.77E+01
FILLER RODS CORE A ONLY	1.07E-07	0.00E+00	1.16E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.66E+00
FILLER RODS CORES A&B	5.23E-06	0.00E+00	1.34E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.29E+01
HOLDOWN COLUMNS CORES A&B	4.30E-03	4.81E-06	2.00E-15	9.12E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.66E+03
FILLER BARS CORES A&B	8.72E-05	9.75E-08	4.06E-17	1.85E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.43E+01
CORE SHROUD	1.51E-03	1.69E-06	7.03E-16	3.20E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E+03
UPPER INTERNALS	3.33E-03	3.72E-06	1.55E-15	7.07E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.84E+03
LOWER INTERNALS	3.33E-03	3.72E-06	1.55E-15	7.07E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.84E+03
THERM. SHLD. #1	5.54E-04	6.19E-07	2.58E-16	1.17E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.72E+02
THERM. SHLD. #2	3.40E-04	3.80E-07	1.59E-16	7.22E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.90E+02
RX VESSEL CLAD	5.81E-06	6.49E-09	2.71E-18	1.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.95E+00
RX VESSEL CORE HEIGHT	8.65E-17	1.63E-08	3.71E-18	1.67E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.74E-01
RX VESSEL 3' BELOW CORE	6.13E-18	1.16E-09	2.64E-19	1.18E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.20E-02
RX VESSEL >3' BELOW CORE	2.66E-17	5.02E-09	1.14E-18	5.13E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.69E-01
RX VESSEL 3' ABOVE CORE	3.07E-18	5.79E-10	1.32E-19	5.92E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.10E-02
RX VESSEL >3' ABOVE CORE	8.36E-18	1.58E-09	3.59E-19	1.61E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.45E-02
INSULATION	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.95E-04
NST I.D. WALL	1.50E-17	2.84E-09	6.46E-19	2.90E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.52E-01
NST O.D. WALL	1.53E-24	2.89E-16	6.57E-26	2.95E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55E-08
BIOSHIELD	0.00E+00	0.00E+00	0.00E+00	2.35E-10	8.76E-10	7.37E-08	3.38E-09	1.54E-11	1.11E-06
	2.94E-02	3.18E-05	4.86E-13	6.09E-01	8.76E-10	7.37E-08	3.38E-09	1.54E-11	2.49E+04