



Department of Energy
Brookhaven Area Office
Upton, New York 11973

December 16, 1991

Dr. Satoshi Ozaki
Associated Universities, Inc.
Brookhaven National Laboratory
Upton, New York 11973

Dear Dr. Ozaki:

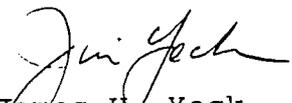
**SUBJECT: RHIC ENVIRONMENTAL ASSESSMENT (EA) AND FINDING OF NO
SIGNIFICANT IMPACT (FONSI)**

The RHIC FONSI was approved by Dr. Paul L. Ziemer, DOE Assistant Secretary for Environment, Safety, and Health, on December 6, 1991. A copy of the signed FONSI is attached. Accordingly, the EA was approved subject to the incorporation of changes noted on a marked-up copy which I have provided directly to Tom Sperry.

Please revise the EA and provide 20 copies of the revised Document to my office.

Dr. Zimmer has determined that FONSI does not need to be published in the Federal Register since this is not an action with effects of national concern. However, the local public should be notified of the availability of the EA and FONSI in accordance with 40 CFR 1506.6(b) and DOE Order 5440.1D. Please coordinate public outreach activities with the Carol Morrison (708-972-2014) or Brian Quirke (708-972-2423) of the DOE Field Office, Chicago.

Sincerely,


James H. Yeck
RHIC Project Manager

cc: J. Nelsen, ESHD, CH, w/att.
C. Morrison, OCM, CH, w/att.
S. Musolino, BNL w/att.
T. Sperry, BNL, w/att.
A. Baittinger, BNL, w/att.
G. Kinne, BNL, w/att.

FINDING OF NO SIGNIFICANT IMPACT

RELATIVISTIC HEAVY ION COLLIDER

at the

BROOKHAVEN NATIONAL LABORATORY, UPTON, NY

AGENCY: Department of Energy

ACTION: Finding of No Significant Impact

SUMMARY: The Department of Energy (DOE) has prepared an Environmental Assessment (EA), DOE/EA-0508, of the proposed action to construct and operate the Relativistic Heavy Ion Collider (RHIC) at the Brookhaven National Laboratory (BNL), Upton, New York. The RHIC facility would provide an ability to collide heavy ions of over ten times the beam energy generated by colliding heavy ions at any existing or proposed facility in the world. The project would utilize the existing facilities previously constructed for the ISABELLE/Colliding Beam Accelerator (CBA) at BNL plus other needed equipment, facilities, and components. Remaining construction, specific to permit the operation of the RHIC, would consist of completion of the tunnel, building three experimental halls with support facilities, such as substations, storage space, paving the road, fabricating and installing superconducting magnets and associated accelerator systems, rehabilitating existing berms, and instituting a planting program to control berm erosion and provide shading to the Peconic River. Based on the information and analyses in the EA, DOE believes that the proposed action is not a major Federal action significantly affecting the quality of the

human environment within the meaning of the National Environmental Policy Act (NEPA) of 1969. Therefore, the preparation of an Environmental Impact Statement is not required and DOE is issuing this Finding of No Significant Impact (FONSI).

ADDRESSES AND FURTHER INFORMATION: Persons requesting additional information regarding the RHIC project or wishing a copy of the EA should contact:

David Goodwin
U.S. Department of Energy
Brookhaven Area Office
Upton, NY 11973
(516) 282-3424

For general information on the NEPA process, please contact:

Carol Borgstrom, Director
Office of NEPA Oversight
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585
(202) 586-4600

SUPPLEMENTARY INFORMATION:

Background: In 1983, the concept of a heavy ion collider facility, reaching center-of-mass collision energies at least ten times higher than maximum collision energies obtainable at existing accelerator facilities, was identified as the highest priority need for a new facility in the Long Range Plan for basic nuclear research in the U.S. Immediately thereafter, a panel was formed, which included leading experimentalists and theorists from both high energy and nuclear physics throughout the U.S. and in Europe,

to consider the basic design requirements for such a facility. This group formulated the essential design parameters for a relativistic heavy ion collider which would incorporate the flexibility to study collisions of all nuclei from the lightest to the heaviest and allow experiments to be carried out over the full range of energies. The technical parameters were developed for an accelerator complex which would utilize the facilities already in place from the ISABELLE/CBA project at BNL.

The proposed action consists of the construction and operation at BNL of the RHIC facility to provide a unique heavy ion research facility which would extend by at least an order of magnitude the center-of-mass collision energies available with man-made beams of nuclei. The RHIC would utilize existing (though unfinished) facilities already in place for the ISABELLE/CBA at BNL, plus other needed equipment, facilities, and components existing at BNL including a Tandem Van de Graaff Accelerator, Heavy Ion Transfer Line (HITL), Alternating Gradient Synchrotron (AGS), and AGS Booster. All of the facilities are currently operating except the AGS Booster. The Tandem Van de Graaff accelerator would serve for the initial ion acceleration. From this point, the ions would traverse the long (approximately 610 meters) Heavy Ion Transfer Line (HITL) to allow injection into the Booster accelerator. After extraction from the Booster, the ions would enter the Alternating Gradient Synchrotron (AGS) where they would be accelerated to the top AGS energy (28 GeV/amu for gold). The particles would be

transferred to the collider by a magnet system installed in the existing transfer line tunnels. Superconducting magnets would bend and focus the ion beams within the RHIC. The entire system is designed with incorporated safety measures which would automatically shut down machine operation in response to any event that would lead to uncontrolled beam loss.

Construction of the ISABELLE/CBA commenced in 1979, and continued until 1983, when support was withdrawn from the project. Remaining construction, specific to permit the operation of the RHIC, would consist of building two experimental halls with support facilities, such as substations, storage space, paving the ring road, fabricating and installing superconducting magnets and associated accelerator systems, rehabilitating existing berms, and instituting a planting program to control berm erosion and provide shading to the Peconic River. In conjunction with the two experimental halls to be constructed, the tunnel would be completed at these locations.

Environment Impacts: The potential environmental impacts from the proposed construction and operation of the RHIC facility at BNL, as well as the cumulative effects from these actions are evaluated in the EA. Areas of potential environmental impact evaluated in the EA are air quality, noise, water quality and usage, aquatic and

terrestrial ecology, threatened and endangered species, land use, historical and archaeological resources, socioeconomic environment, radiological impacts, and potential impacts of accidents.

Facility Construction Impacts: Needed construction of the RHIC at BNL is limited to two research areas, utilities, and site work that would result in very little disturbance of previously undeveloped land. These construction activities would not generate radioactive waste. Restrictions such as diversion of storm water runoff to retention basins, immediate mulching and reseedling of disturbed areas, and the use of standard erosion control practices would be incorporated into project construction to eliminate potential impacts to ecological areas. No part of the proposed action would occur in a wetland. No significant impacts are expected on ecological resources.

Some portions of the RHIC project associated with the existing ISABELLE/CBA facilities would be within an area (i.e., the Peconic River) designated as "scenic" under the New York State Wild, Scenic and Recreational River Act. The ISABELLE/CBA facilities were constructed prior to the 1987 designation of the portion of the Peconic River flowing through BNL as "scenic". Impacts to the scenic resources of the Peconic River will be minimal. Construction and operation of RHIC will not affect the quality or physical nature of the River, either on the site or downstream. Most of the facilities required for RHIC have been completed and

are visible from the Peconic River. Construction of the few remaining facilities will result in minimal additional visual detractation. There will be no impact on the scenic nature of the River itself as a result of RHIC activities. At the RHIC location, the Peconic River is an intermittant stream. The general public does not have open access to use and enjoyment of the River located within the BNL boundary.

Correspondence between DOE and the New York State Historic Preservation Office indicated that the RHIC project would have no effect on cultural resources. DOE has consulted with the State of New York on construction-related matters and will continue to do so. DOE will implement appropriate mitigation/protection measures that might be identified by the State during construction, as needed. These measures would be defined in conjunction with the State permit application process.

Impacts of Facility Operation: The RHIC complex would not have a significant effect on water consumption at BNL. Operation of the collider would result in a net increase in water usage of only four percent. This represents only three percent of BNL's margin of safe yield of 5,200,000 gallons per day. The RHIC is projected to require 27.7 MW of electrical power, with the injector system (AGS, Booster, etc.) using another 16.8 MW. Thus RHIC would add 70 percent to the total BNL peak load, an amount within the supply capability of present public utilities. Present estimates project

a three percent increase in steam production to meet the RHIC heating and air conditioning requirements. This increase is within the BNL's central steam plant reserve capacity.

RHIC operation would result in less than a five percent increase in the current amount (1500 tons) of solid waste generated by BNL; less than three percent increase in the current amount (45 tons) of hazardous non-radioactive waste generated by BNL; and less than five percent increase in the current amount (7300 cubic feet) of radioactive waste generated from all BNL projects. These increases would not be considered significant and, combined with waste minimization and recycling practices, should produce insignificant environmental impacts.

Four sources of potential radiological impact during RHIC operation were analyzed: 1) direct radiation; 2) skyshine; 3) releases of activated air from the tunnel; and 4) releases of radionuclides to the groundwater. The combination of existing (1.1 mrem/yr) and RHIC associated releases (0.77 mrem/yr) would be 50 times lower than DOE permitted limits (100 mrem/yr).

Impacts of Accidents: Three potential dose pathways (air, water, direct radiation) have been analyzed for accident scenarios. Accidental loss of the entire beam at a single point could produce a 34 mrem dose at the top of the berm. This could result in an off-site (at the site boundary) dose rate of approximately 0.009

mrem/event due to skyshine. In the Collider Center, the dose rate from direct beam radiation would be about 0.65 mrem/event, with another 0.09 mrem/event from the skyshine. The total dose rate in the Collider Center resulting from this accident scenario is 0.74 mrem/event. The RHIC facility, therefore, would be classified as a "Low Hazard" in accordance with DOE Order 5481.1B, Chapter 3(a)1. This designation applies to facilities which present minor on-site and negligible off-site impacts to people or the environment. There would be no identifiable incident for the water pathway. Assuming complete tunnel exhaust and minimum transit time off-site, the off-site dose due to an air emission incident would be 0.016 mrem. This value is well below the EPA annual dose limit from radionuclide emissions from DOE facilities of 10 mrem.

Impacts of Decommissioning: Potential environmental impacts of RHIC decommissioning would be fully assessed in a separate NEPA document. Decommissioning activities are not expected to result in any significant environmental impacts. Operation of the RHIC would result in potentially significant activation of only a few specific components and soil around the beam dump. If necessary during decommissioning, contaminated soil near the beam dump and activated components would be shipped off-site for disposal. Activated components would be categorized as low-level waste. Reuse or restoration of the RHIC site should be subject to no major complications, with negligible long term effects. Decommissioning of the RHIC, like RHIC construction and operation, would have no

significant adverse environmental impacts.

Cumulative Impacts: No significant long-term or cumulative environmental effects are expected to result from the proposed action. Since the RHIC would utilize facilities constructed for ISABELLE/CBA, there would be very little disturbance of previously undeveloped land and no cumulative impacts from construction activities. The RHIC complex would not have a significant cumulative effect on water consumption at BNL, since operation would result in a net increase in water usage of only four percent. This represents only three percent of BNL's margin of safe yield of 5,200,000 gallons per day. The RHIC is projected to require 27.7 MW of electrical power, with the injector system (AGS, Booster, etc.) using another 16.8 MW. Thus RHIC would add 70 percent to the total BNL peak load, an amount within the supply capability of present public utilities. Present estimates project a three percent increase in steam production to meet the RHIC heating and air conditioning requirements, which is within the BNL's central steam plant reserve capacity. RHIC operation would result in less than a five percent increase in the current amount (1500 tons) of solid waste generated by BNL; less than three percent increase in the current amount (45 tons) of hazardous non-radioactive waste generated by BNL; and less than five percent increase in the current amount (7300 cubic feet) of radioactive waste generated from all BNL projects. These increases would not be considered significant and, combined with waste minimization and recycling

practices, should not produce significant environmental impacts. RHIC releases and waste generation, in association with those currently produced by BNL, would not produce any potential cumulative impacts. The combination of existing BNL air releases (1.1 mrem/yr) and RHIC associated releases (0.77 mrem/yr) would be 50 times lower than DOE permitted limits (100 mrem/yr). Based on the analysis in the EA, there would be no potentially significant cumulative impact from construction or operation of RHIC at BNL.

Alternatives Considered: Alternatives to the proposed action that were discussed in the EA include the no action alternative, RHIC construction at another site or use of existing facilities elsewhere, and construction of a fixed target accelerator.

The no action alternative (i.e., not constructing and operating the RHIC, and maintaining the current status quo of ISABELLE/CBA) would result in not meeting the facility need requirements identified by the high energy and nuclear physics community and would forfeit the opportunity to venture into new physics regimes. Failure to pursue the RHIC program would render the existing ISABELLE/CBA facilities of little future use as an accelerator and would eventually result in the demolition of the facilities except for the Collider Center which provides useful office space. In the near term, the existing ISABELLE/CBA facilities would continue to be used as office space and storage areas.

Alternative siting of the proposed action evaluated in the EA was determined to be undesirable as no similar complex of existing facilities (AGS, Tandem Van de Graaff, and AGS Booster) exists. In addition, locating a RHIC elsewhere would necessitate the construction of a complete accelerator ring, with corresponding increases in expense and environmental impact.

Construction of a fixed target accelerator that can achieve collision energies of the magnitude intended for the RHIC would require an accelerator ring with a diameter approximately 400 times that of the proposed RHIC. Such a machine would be impractical in terms of cost, resource utilization, and environmental impact.

Determination: Based on the information and analyses in the EA, DOE believes that the proposed construction and operation of the RHIC at BNL does not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act of 1969. Therefore, an Environmental Impact Statement for the proposed action is not required.

Issued in Washington, D.C., this 6th day of December 1991.



Paul L. Ziemer, Ph.D.
Assistant Secretary
Environment, Safety and Health