Categorical Exclusion for the US Belle II Project

Proposed Action

The purpose of the US Belle II project is to use existing manufacturing capabilities in various U.S. locations to build detector subsystem elements for use in upgrading the Belle detector at the KEK Laboratory in Tsukuba, Japan to the improved Belle II detector. The SuperKEKB/Belle II research and development project in Japan will probe new physics through high-precision studies of heavy quark decays and charge parity (CP)-violation. The US Belle II project would deliver detector subsystems to the KEK Laboratory for integration with the Belle II detector and SuperKEKB accelerator.

Location of Action

- Pacific Northwest National Laboratory (PNNL), Richland, Washington, USA
- University of Hawaii, Manoa, Hawaii, USA
- Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA
- Indiana University, Bloomington, Indiana, USA
- Fermi National Accelerator Laboratory (Fermilab), Batavia, Illinois, USA
- University of Cincinnati, Cincinnati, Ohio, USA
- Luther College, Decorah, Iowa, USA
- University of South Alabama, Mobile, Alabama, USA
- Wayne State University, Detroit, Michigan, USA

Description of the Proposed Action

The High Energy Physics (HEP) program of the U.S. Department of Energy's (DOE's) Office of Science conducts basic research into the nature and interactions of the fundamental constituents of matter. The US Belle II project will study rare and CP-violating decays of particles containing bottom quarks and charm quarks in electron-positron collisions produced by the upgraded Super-KEKB accelerator in Tsukuba, Japan. The ultimate goal is to discover physics beyond the "standard model," or to help interpret new physics discovered elsewhere by observing the implications of rare heavy quark decays.

The US Belle II project includes design and assembly of some Belle II detector subsystems in existing laboratories and facilities. The detector subsystems include fused silica imaging time-of-propagation counters, segmented solid scintillator muon tracking detectors, and time projection chambers (TPCs) for evaluating beam backgrounds prior to installation of the inner detectors. The US Belle II project includes custom electronics readouts for these systems, as well as the other muon system elements.

The equipment would be delivered to the KEK Laboratory in Tsukuba, Japan, where it would be assembled and integrated with the Belle II detector. Work would take place in existing facilities using existing infrastructure. A laser calibration system would be used during these tests. The KEK Laboratory operates under its respective procedures and relevant Japanese regulations for environmental, health and safety.

The project would be funded by the DOE, primarily through the Pacific Northwest Site Office (PNSO), and managed by PNNL. It would be carried out in collaboration with universities and laboratories in the U.S. and Japan. The universities are currently funded through programmatic research grants, primarily

from DOE.[1] US Belle II funding details are found in the US Belle II Project Execution Plan. The project would deliver detector subsystems to the KEK Laboratory for integration with the Belle II detector and SuperKEKB accelerator in Tsukuba, Japan. Prototype detector modules would be evaluated at the Fermilab Test Beam Facility.[2]

All project activities, regardless of funding source, are considered connected actions. Therefore, National Environmental Policy Act (NEPA) checklists were sent to each participating university and to Fermilab in December 2011. Checklists were completed by each institution and compiled by DOE in January 2012. These checklists were used by DOE to determine the potential for environmental impacts from the proposed action at each location. Based on the information received from the participants, the project activities at PNNL, at the universities and at Fermilab would not result in significant environmental impacts individually or cumulatively. The following is a project description of the activities that would be completed at each location.

Pacific Northwest National Laboratory, Richland, Washington, USA

Work that would take place at PNNL includes software development, firmware development, Monte Carlo simulations, specifications and procurements for fused silica optics, and subcontracting to universities. It is anticipated that this work would not result in any environmental impacts.

University of Hawaii, Manoa, Hawaii, USA

The University of Hawaii would develop electronics, including application-specific integrated circuit (ASIC) and board design, board prototyping, board fabrication, board testing, software development, firmware development, and Monte Carlo simulations. Additionally, the university would design, prototype, fabricate, and test micro-TPCs. Electronics work would involve typical related hazards (e.g., lead solder, solvents). TPC work would include use of counting gases that may include isobutane, carbon dioxide, methane, or other gases. Quantities of these materials would be limited to laboratory scale. The estimated chemical quantities in use for the US Belle II project at the collaborator institutions do not involve chemical quantities that present a significant risk beyond the facility worker. Hazardous material storage and use at collaborator institutions will be controlled by their respective procedures. Compressed gases used for the U.S. Belle II project would be stored and piped according to the responsible institution's procedures.

Virginia Polytechnic Institute and State University, Blacksburg Virginia, USA

Virginia Polytechnic would design, assemble, and test plastic scintillator detectors. Assembly would use epoxy and optical coupling grease. Alcohol solvents (isopropyl alcohol and/or ethanol) are likely to be used. Quantities of these materials would be limited to laboratory scale. The estimated chemical quantities that will be in use for the US Belle II project at the collaborator institutions do not present a significant risk beyond the facility worker. Hazardous material storage and use at collaborator institutions will be controlled by their respective procedures.

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[1] Indiana University is funded by the National Science Foundation. Wayne State University and PNNL have submitted programmatic funding proposals to DOE that are currently pending review. The addition of a new faculty member to the Hawaii grant is also currently pending review.

[2] The Fermilab Test Beam Facility may not be available in late 2012 and 2013, in which case alternative locations will be considered. The leading candidate is the European Organization for Nuclear Research (CERN) facility in Geneva, Switzerland.

Indiana University, Bloomington, Indiana, USA

Indiana University would develop electronics, including ASIC and board design, board prototyping, board fabrication, and board testing. The university would also be involved with software development, firmware development, and Monte Carlo simulations. Electronics work would involve typical related hazards (e.g., lead solder, solvents). Quantities of these materials would be limited to laboratory scale. The estimated chemical quantities that will be in use for the US Belle II project at the collaborator institutions do not present a significant risk beyond the facility worker. Hazardous material storage and use at collaborator institutions will be controlled by their respective procedures. Compressed gases that will be used for the US Belle II project will be stored and piped according to the responsible institution's procedures.

Fermi National Accelerator Laboratory, Batavia, Illinois, USA

Fermilab would produce plastic scintillator in existing facilities. Test beam data would be taken at the Fermilab Test Beam Facility. NEPA documentation for the Test Beam Facility was completed in 2005. A laser calibration system would be used during these tests. Existing Fermilab procedures would be followed during these tests to protect workers.

University of Cincinnati, Cincinnati, Ohio, USA

The University of Cincinnati would develop software, firmware, and complete Monte Carlo simulations. No laboratory work is anticipated. All work would be conducted in existing facilities.

Luther College, Decorah, Iowa, USA

Luther College would develop software and complete Monte Carlo simulations. No laboratory work is anticipated. All work would be conducted in existing facilities.

University of South Alabama, Mobile, Alabama USA

The University of South Alabama would develop software and complete Monte Carlo simulations. No laboratory work is anticipated. All work would be conducted in existing facilities.

Wayne State University, Detroit, Michigan, USA

Wayne State University would design, fabricate, and assemble optics, photosensors and electronics for the beam monitor system. Alcohol solvents (isopropyl alcohol and/or ethanol) are likely to be used. Quantities of these materials would be limited to laboratory scale. The estimated chemical quantities that will be in use for the US Belle II project at the collaborator institutions do not involve chemical quantities that present a significant risk beyond the facility worker. Hazardous material storage and use at collaborator institutions will be controlled by their respective procedures.

All activities would be completed within existing facilities and would comply with applicable facility safety and environmental administrative controls and permit requirements as required by contract specifications and established memorandums of understanding (MOUs). Project-specific procedures and environmental safety and health programs developed in support of this work will be subject to review by PNNL for conformance with contract specifications and MOU requirements.

Biological and Cultural Resources

Activities related to this project would be conducted inside existing facilities and would not require modification of facilities. Therefore, no impacts to sensitive biological or cultural resources are anticipated.

Categorical Exclusion to Be Applied

Because the proposed action is to conduct a research and development project within existing facilities, the following categorical exclusion (CX), as listed in the DOE NEPA implementing procedures, 10 CFR 1021, would apply:

B3.6 Siting, construction, modification, operation, and decommissioning of facilities for small-scale research and development projects; conventional laboratory operations (such as, preparation of chemical standards and sample analysis); and small-scale pilot projects (generally less than 2 years) frequently conducted to verify a concept before demonstration actions, provided that construction or modification would be within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible). Not included in this category are demonstration actions, meaning actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment.

Eligibility Criteria

The proposed activity meets the eligibility criteria of 10 CFR 1021.410(b) because the proposed action does not have any extraordinary circumstances that might affect the significance of the environmental effects, is not connected to other actions with potentially significant impacts [40 CFR 1508.25(a)(1)], is not related to other actions with individually insignificant but cumulatively significant impacts [40 CFR 1508.27(b)(7)], and is not precluded by 40 CFR 1506.1 or 10 CFR 1021.211 concerning limitations on actions during environmental impact statement preparation.

The "Integral Elements" of 10 CFR 1021 are satisfied as discussed below:

INTEGRAL ELEMENTS, 10 CFR 1021, SUBPART D, APPENDIX B (1)-(5)	
WOULD THE PROPOSED ACTION:	EVALUATION:
Threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health?	The proposed actions use of chemicals and hazardous material storage would not violate any permit condition, or present a significant risk above and beyond those managed by existing environment, safety, and health procedures at the respective collaborating institutions.
Require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities?	No waste management facilities would be constructed under this CX. Any generated waste would be managed in accordance with applicable regulations in existing facilities. Waste disposal pathways are identified prior to generating waste and waste generation is minimized.
Disturb hazardous substances, pollutants, or contaminants that preexist in the environment such that there would be uncontrolled or unpermitted releases?	No preexisting hazardous substances, pollutants, or contaminants would be disturbed in a manner that would result in uncontrolled or unpermitted releases.
Have the potential to cause significant impacts on environmentally sensitive resources., including, but not limited, to: • protected historic/archaeological resources • protected biological resources and habitat • jurisdictional wetlands, 100-year floodplains • Federal- or state-designated parks and wildlife refuges, wilderness areas, wild and scenic rivers, national monuments, marine sanctuaries, national natural landmarks, and scenic areas.	No environmentally sensitive resources would be adversely affected. Resource reviews would be conducted for special circumstances. Refer to the Biological and Cultural Resources section for details regarding the application of cultural and biological resource reviews. The proposed action would not adversely affect floodplains, wetlands regulated under the Clean Water Act, national monuments, or other specially designated areas, prime agricultural lands, or special sources of water.
Involve genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species, unless the proposed activity would be contained or confined in a manner designed and operated to prevent unauthorized release into the environment and conducted in accordance with applicable requirements?	The proposed action would not involve the use of genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species, unless the proposed activity was contained or confined in a manner designed and operated to prevent unauthorized release into the environment and conducted in accordance with applicable requirements.

Compliance Action

I have determined that the proposed action satisfies the DOE NEPA eligibility criteria and integral elements, does not pose extraordinary circumstances, and meets the requirements for the CX referenced above. Therefore, using the authority delegated to me by DOE Order 451.1B, Change 2, I have determined that the proposed action may be categorically excluded from further NEPA review and documentation.

Signature: _____ **Date:** 2/17/12

Theresa Aldridge
PNSO NEPA Compliance Officer

cc: JA Stegen, PNNL