Department of Energy
Argonne Site Office
9800 South Cass Avenue
Argonne, Illinois 60439

JAN 0 9 2012

Dr. Eric Isaacs
Director, Argonne National Laboratory
President, UChicago Argonne, LLC
9700 South Cass Avenue
Argonne, IL 60439

Dear Dr. Isaacs:

SUBJECT: NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) DETERMINATION FOR ARGONNE NATIONAL LABORATORY (ANL)

The Argonne Site Office (ASO) has approved the following as a categorical exclusion (CX) under the category of "B 3.6 Siting/construction/operation/decommissioning of facilities for bench-scale research, conventional laboratory operations, small-scale research and development and pilot projects".

- Dynamic Compression Sector (DCS) project at Advanced Photon Source" (ASO-CX-292)

Therefore, no further NEPA review is required. However, if any modification or an expansion of the scope is made to the above project, additional NEPA review will be necessary.

Enclosed please find a copy of the approved Environmental Review Form (ERF) for the project. If you have any questions please contact Kaushik Joshi of my staff at (630) 252-4226.

Sincerely,

Joanna M. Livengood

Dr. Joanna M. Livengood
Manager

Enclosure:
As Stated

cc: J. Stauber, ANL/FMS, 214, w/encl.
D. Mancini, ANL/PSC, w/encl.
K. Damico, ANL/PSC, w/encl.
T. Barkalow, ANL/PSC, w/encl.

Environmental Review Form for Argonne National Laboratory

Click on the blue question marks (?) for instructions, contacts, and additional information on specific line items.

(?)**Project/Activity Title**: Dynamic Compression Sector (DCS) Project

(?)**ASO NEPA Tracking No.** _____ (?)**Type of Funding**: NNSA Project
B&R Code _____

(?)**Identifying number**: PSC1201 WFO proposal # _____ CRADA proposal # _____
Work Project # _____ ANL accounting # (item 3a in Field Work Proposal) _____
Other (explain) Proposed NNSA Project

(?)**Project Director**: *D. C. Mancini* Signature: [signature] Date: 12/8/11

(?)**Project Manager**: *K. DAmico* Signature: [signature] Date: 12/8/11

(?)**NEPA Owner**: *T. W. Barkalow* Signature: [signature] Date: 12/8/2011

ANL NEPA Reviewer: *J. V. Stauber* Signature: [signature] Date: 12/12/11

I. (?)**Description of Proposed Action:**

The Advanced Photon Source (APS) is a major national user facility providing high-brilliance x-ray beams for users from Argonne National Laboratory (ANL), other national laboratories, academic institutions, governmental bodies, and industrial firms. Synchrotron radiation emitted by circulating electron beams is used as the source of x-rays for probing the structure of matter and for studying various physical and chemical processes. The APS presently uses a stored circulating electron beam current of 102 mA at an electron energy level of 7.0 GeV (representing a stored energy level of about 2628 J) during normal operations. The highest electron energy level achievable is 7.7 GeV. The facility is authorized to operate with a safety limit for stored energy level of 9280 J (representing a maximum stored electron beam current of about 327 mA at 7.7 GeV or about 360 mA at 7.0 GeV).

The DCS project scope includes the design, procurement, assembly, installation, testing, and operation of beamline hardware, associated instrumentation, and experimental apparatus required to study materials under dynamic compression. The DCS project also must account for the eventual installation and operation of experimental apparatus (pulsed laser, experimental guns, target vacuum chamber, and associated equipment) that is to be developed by Washington State University (WSU) as a separate project also supported by DOE.

Specifically, the main scope elements include:

- Design and installation of beamline vacuum lines, photon shutters, safety shutters, x-ray optics, beam position monitors, shielded experiment enclosures, and other typical equipment used for operation of an insertion device beamline at the APS.
- Installation of one or more laser assemblies for experiment purposes (either diagnostics or to create impact loads on a target). (To be designed and built by WSU.)
- Design and installation of single stage experimental guns using smokeless powder (nitrocellulose) charges to propel a projectile onto a target assembly to create impact loads. (To be designed and built by WSU.)
- Design and installation of a two-stage experimental gun using smokeless gunpowder (nitrocellulose) charges to drive a disk which in turn compresses hydrogen gas to a high pressure, the high pressure

hydrogen gas then being used to propel a projectile onto a target assembly to create impact loads. (To be designed and built by WSU.)
- Design and installation of target vacuum chambers and associated equipment, including backstops for the two experimental guns. (To be designed and built by WSU.)
- Installation of x-ray detectors.
- Installation of supporting laboratories and offices.

Provision of a storage location for the smokeless gunpowder as well as a location to handload charges for the experimental guns. No more than 50 pounds of smokeless powder for DCS operations will be permitted on the Argonne Site or stored in the main storage location. A maximum of 5 pounds of smokeless powder will be permitted to be stored in the area where the charges are prepared for the experimental guns. Current plans are to locate the main storage in an existing structure on site and to transport small quantities of smokeless powder from the storage facility to the charge preparation area storage on an as needed basis following the on-site transportation safety requirements.
No changes will occur to the storage ring, or other accelerator systems, or operating parameters as a result of this project. The DCS project is not part of the APS Upgrade project, but will be designed so it can utilize the increased storage ring operating parameters which will result from the APS Upgrade project.

This ERF only addresses the scope of the current DCS project and does not address any possible future expansions of that project's scope. A separate ERF will need to be prepared should scope expansion occur.

II. (?)**Description of Affected Environment:**

The baseline description of the affected environment is provided in the *Environmental Assessment for Enhanced Operations of the Advanced Photon Source at Argonne National Laboratory-East, Argonne, Illinois*, DOE/EA-1455, June 2003 (Enhanced Operations EA).

The APS site areas affected will be inside Building 400 and an adjoining Laboratory/Office Module (LOM). The sector location to be used for the DCS beamline has yet to be chosen. The installation of the DCS beamline may result in a beamline penetrating the outer wall of Building 400. If this occurs, the intent is to modify the structure of an existing LOM to accommodate the beamline portion and instrument stations located outside of Building 400. There is no construction currently planned in the areas surrounding Building 400 and its LOMs.

Current plans are to locate the main storage in an existing structure on site. An alternate would be to build, or procure a prebuilt, small structure to contain the main smokeless powder storage location and to locate that structure in accordance with the requirements to DOE M 440.1-1A DOE Explosives Safety Manual, but this is not currently planned. If a scope change or addition is made later to include a new small structure, a separate ERF will be prepared to address that addition.

III. (?)**Potential Environmental Effects:** (Attach explanation for each "yes" response. **See Instructions for Completing Environmental Review Form**)

A. Complete Section A for all projects.

1. (?)Project evaluated for Pollution Prevention and Waste Minimization opportunities and details provided under items 2, 4, 6, 7, 8, 16, and 20 below, as applicable — Yes X No ____

Solvents will be used to clean the experimental gun assemblies between uses. The design of the gun assemblies will consider means of minimizing the amount of solvent to be used for each cleaning, especially for the larger two stage experimental gun. Note that while use of solvents to clean various items is common in beamlines and is addressed by the Enhanced Operations EA,

the quantity to be used for DCS operations is larger than is typical and therefore is being addressed in this ERF.

2. (?)Air Pollutant Emissions (If yes, see question #12 and contact FMS Division) Yes X No ____

Air pollutant emissions from APS operations, including those of beamlines and beamline experiments, are addressed in the Enhanced Operations EA. However, the use of smokeless powder is not explicitly addressed in that report and therefore is being addressed in this ERF.

The combustion of the smokeless gun charges to be used in the experimental gun assemblies results in carbon monoxide (CO) gas being released and exhausted to the atmosphere. CO is an airborne pollutant addressed in the existing US EPA Clean Air Act Permit Program (CAAPP) Permit ID: 043802AAA for the Argonne site. While the amount of CO generated by each use is relatively small, the accumulative amount generated and released over one year has been estimated using conservative assumptions made as to the number of shots and amount of gunpowder used in one year of DCS operations. The assumptions are based upon a scale up of operations currently being conducted by WSU in a WSU owned facility in Washington state.

The estimate assumes that there are 20 shots a day from one or more small single stage experimental guns and 3 shots a day from the large two stage experimental gun. Each small single stage gun shot is estimated to contain 20 grams of smokeless powder and each large two stage gun shot is estimated to contain 200 grams of smokeless powder. A total of 150 days of use is estimated to occur. This gives a total in one year of 60 kg of smokeless powder used in the small single stage guns and 90 kg of smokeless powder used in the large two stage gun for a combined total of 150 kg. For nitrocellulose the volume of explosion gases (mostly CO) given free expansion to atmospheric conditions is 841 l/kg. The result is an estimated total of 1.2615E+05 liters. Since CO has a density of 1.145 g/l at STP and assuming all CO released to the atmosphere is at STP, approximately 318 pounds of CO is produced on an annual basis given the assumptions made. Assuming 150 days of use where CO is being produced by DCS operations, the average daily rate of production is 843 l, or about 2.12 pounds, of CO. This is well within the bounds of bench scale R&D activities.

CO is not considered a greenhouse gas so there's no concern to be addressed from that perspective, but CO is a criteria pollutant. According to G. Barrett, FMS-Sustainability & Environment Department, the project meets the definition of bench scale R&D and therefore the emissions are considered insignificant.

In addition to the production of CO gas, solvents will be used to clean the experimental guns after each shot. The solvents will be used in wipe cleaning and Argonne has obtained an exemption for wipe cleaning from the Illinois State Cold Cleaning Standard 35IAC218.182. The emissions from use of these solvents remain within the permitted Argonne air emissions.

3. (?)Noise Yes ____ No X

Note: Argonne requirements related to hearing protection would be followed should in-door construction activities result in noise levels above 85 decibels. Sustaining noise above this level for appreciable lengths of time is not anticipated during normal in-door construction activities. In addition the design of the experimental gun assemblies and their experimental enclosures will minimize the amount of noise generated by each shot.

4. (?)Chemical/Oil Storage/Use Yes X No ____

Note: Various cleaning and lubricating compounds may be present during in-door construction and chemicals will be present during beamline operation. Material Safety Data Sheets are required to be present and readily available during construction when chemicals are present.

Any large containers of liquid chemicals, such as cleaning solvents, will be managed on spill containment pallets. Smaller retail-sized liquid chemical containers will be managed in flame-proof storage cabinets.

The Enhanced Operations EA did not provide information on specific chemicals that may be present during beamline operations. Instead that document took credit for engineered ventilation means that would be used in beamline spaces to minimize chemical exposure and the use of an experiment safety review process to identify chemical hazards and to specify necessary safety measures in experiment designs and safe handling procedures to be followed during the experiments. These same means would be used following completion of the DCS beamline and its experimental enclosures.

Two types of solvent will be used to clean the experimental guns after each shot: a commercially available gun cleaning agent containing acetone, kerosene, and other items as denoted on its MSDS and isopropanol. Cleaning entails dunking wipes in the cleaning agent or isopropanol and then running the wet wipe through the gun barrel, interior of the associated vacuum chamber, gun breech assembly, and so on. Thus all liquid will be placed on wipes and the wet wipes will eonstitute the hazardous waste. The wipes wetted with isopropanol will be treated as special waste in accordance with Illinois state laws. The amount of solvents used to clean each experimental gun is to be less than 8 fluid ounces of each solvent for each shot of a single stage experimental gun and less than 16 fluid ounces of each solvent for each shot of the two stage experimental gun. In actuality the actual usage will most likely be much less for each day of operation. These estimates are based upon a scale up of operations currently being conducted by WSU in a WSU owned facility and the actual usage is expected to be much less than these estimates.ASO-CX-265 Indoor Bench-Scale Research Projects and Conventional Laboratory Operations addresses a maximum of 5 gallons of hazardous liquid chemicals used in a single experiment, measurement, or test. Each shot of an experimental gun will result in measurements being taken of an impacted target and therefore each shot constitutes a test or measurement as used in ASO-CX-265. The estimated quantity used in each shot is 8 fluid ounces of each solvent for each shot of a single stage experimental gun and 16 fluid ounces of each solvent for each shot of the two stage experimental gun. Thus the usage per measurement or test is well within the maximum limits of bench-scale research as described in ASO-CX-265.

5. (?)Pesticide Use Yes ____ No X

Note: No use of pesticides is presently foreseen during in-door construction activities for the DCS project.

6. (?) Polychlorinated Biphenyls (PCBs) Yes ____ No X

Note: No PCBs were used in APS construction, are currently present, or would be added as a result of the DCS project.

7. (?) Biohazards Yes ____ No X

Note: No new biohazard facilities are being provided as part of the DCS project nor are there any plans to use biological samples on the DCS beamline.

8. (?)Liquid Effluent/Wastewater (If yes, see question #12 and contact ESQ Division) Yes ____ No X

Note: No new floor drains to the Argonne sewer system will be installed as part of the DCS project.

9. (?)Waste Management

a) Construction or Demolition Waste Yes X No ____

Note: The DCS beamline experiment stations will be typical steel-lead-steel plate structures on the existing Building 400 concrete base. Typical beamline and experiment station construction related wastes may be generated, but not in any significant quantities. Metal waste will be recycled in accordance with Argonne policy.

b) Hazardous Waste Yes X No ____

Note: Removal of an existing beamline's structures as part of DCS beamline construction may result in disposal of lead contaminated waste. This will only occur if the DCS is sited at an existing beamline and that beamline's structure must be removed for the DCS project. Any such waste would be handled in accordance with Argonne hazardous waste requirements.

The proposed use of the DCS beamline may involve generation of hazardous waste. The waste will be accumulated, managed, and documented in accordance with the requirements outlined in applicable LMS procedures for the proper labeling, storage, inspection, and handling of waste. Acutely Hazardous Waste storage is limited to 1 quart in a Satellite Accumulation Area (note that no acutely hazardous waste is anticipated to be generated within the currently planned scope of the DCS project). Generators will consult with Waste Management personnel for storage of acutely hazardous waste and before the generation of unusual or difficult waste streams. Personnel who generate waste and those who prepare waste requisitions are required to complete the chemical waste generator training in accordance with the requirements outlined in applicable LMS procedures.

As noted in III.A.4 above, two types of solvent will be used to clean the experimental guns after each shot: a commercially available gun cleaning agent containing acetone, kerosene, and other items as denoted on its MSDS and isopropanol. Cleaning entails dunking wipes in the cleaning agent or isopropanol and then running the wet wipe through the gun barrel, interior of the associated vacuum chamber, gun breech assembly, and so on. Thus all liquid will be placed on wipes and the wet wipes will constitute the hazardous waste. The wipes wetted with isopropanol will be treated as special waste in accordance with Illinois state laws.

c) Radioactive Mixed Waste Yes ____ No X

Note: Current APS operations do not produce radioactive mixed waste and the current planned scope of the DCS project will not create conditions where such waste would be generated.

d) Radioactive Waste Yes X No ____

Note: Removal of items from inside the storage ring tunnel (support girders, vacuum chamber components) which might occur as part of the DCS project may include slightly activated material. Regardless of radiological survey readings, all metallic items removed from the storage ring tunnel enclosures will be handled as low level radioactive waste unless the material can be included as part of Argonne's "Authorized Limit" process.

The current scope of the DCS project does not include use of any targets containing radioactive material.

e) PCB or Asbestos Waste Yes ____ No X

Note: No PCBs or asbestos were used in APS construction, are currently present, or would be added as a result of the DCS project.

f) Biological Waste Yes ____ No X

Note: No new biohazard facilities are being provided as part of the DCS project nor are there any plans to use biological samples on the DCS beamline.

g) No Path to Disposal Waste Yes ____ No X

Note: The APS presently does not generated waste with no identified path to disposal and none is expected to be generated from the DCS project.

h) Nano-material Waste Yes ____ No X

Note: No nano-material waste will be generated as no experiments will be conducted on nano-material samples as part of the current DCS project scope.

10. (?)Radiation Yes X No ____

Note: Ionizing radiation could result in external exposure of personnel, users, and members of the general public. Prompt radiation hazards arising from the loss of beam in targets, beam stops, septum magnets, and accelerator components lead to the production of radiation fields during injector operations. These radiation fields consist mainly of bremsstrahlung (x-rays), gamma rays, and neutrons. Interaction of these radiations leads to activation of accelerator components, which could also represent potential external exposure hazards. As the stored beam circulates in the storage ring, a small fraction of the beam is lost due to collisions with gas molecules, interactions among beam particles, and orbital excursions, which also produce radiation. In addition, the primary purpose of the APS is to produce high-quality synchrotron radiation (x-rays).

The accelerator tunnel shielding for the radiation produced by normal operations of the accelerator system was designed based on operations that produce, accelerate, and store an electron beam of energy 7.7 GeV using an injected beam-power level of 308 W (2.5×10^{11} e- /s in the beam; about 327 mA) with a stored electron beam energy of 9280 J. The beamline and experiment station shielding was designed for the synchrotron radiation produced by either a bending magnet or an insertion device. For synchrotron-radiation (x-rays) calculations, storage ring energy of 7.5 GeV and storage ring current of 200 mA have been assumed in all cases. These parameters were chosen for the simulation of the synchrotron radiation because they proved to be a worse case than the 7.0-GeV, 300-mA case. In addition, to accommodate operation at the Accelerator Safety Envelope (ASE) limit for the maximum stored electron beam erengy of 9280 J, the recommended shielding thicknesses include an additional tenth-value layer of shielding material.

The beamline MCI is not changed by the DCS project and will continue to bound DCS beamline operations.

11. (?)Threatened Violation of ES&H Regulations or Permit Requirements Yes ____ No X

Note: APS operation presently does not violate any ES&H Regulations or Permit Requirements and no violations are expected to result from the DCS project.

12. (?)New or Modified Federal or State Permits Required Yes ____ No X

Note: Argonne presently has Illinois EPA NPDES Permit No. IL0034592 covering permitted liquid effluents and US EPA Clean Air Act Permit Program (CAAPP) Permit ID: 95090195. Neither of these existing permits is expected to be revised as a result of the DCS project.

13. (?)Siting, Construction, or Major Modification of Facility to Recover, Treat, Store, or Dispose of Waste Yes ____ No X

Note: The APS presently does not include any waste disposal or storage facility and none would be added as part of the DCS project.

14. (?)Public Controversy Yes ____ No X

Note: No public controversy has resulted from APS operations and none is anticipated from the DCS project.

15. (?)Historic Structures and Objects Yes ____ No X

Note: No historic structures or objects are located in the APS and none will be involved in the upgrade.

16. (?)Disturbance of Pre-existing Contamination Yes ____ No X

Note: There is no known pre-existing contamination present around the APS structures or immediate environs.

17. (?)Energy Efficiency, Resource Conserving, and Sustainable Design Features Yes X No ____

Note: all construction and new structures will be in-doors. The Argonne Site Sustainability Plan dated December 2011 has been submitted to DOE-ASO. The new structures to be built in-doors will include infrastructure improvement features for improved energy efficiency measures described in the Site Sustainability Plan, especially lighting.

B. For projects that will occur outdoors, complete Section B as well as Section A. N/A

18. (?)Threatened or Endangered Species, Critical Habitats, and/or other Protected Species Yes ____ No ____

19. (?)Wetlands Yes ____ No ____

20. (?)Floodplain Yes ____ No ____

21. (?)Landscaping Yes ____ No ____

22. (?)Navigable Air Space Yes ____ No ____

23. (?)Clearing or Excavation Yes ____ No ____

24. (?)Archaeological Resources Yes ____ No ____

25. (?)Underground Injection Yes ____ No ____

26. (?)Underground Storage Tanks Yes ____ No ____

27. (?)Public Utilities or Services Yes ____ No ____

28. (?)Depletion of a Non-Renewable Resource Yes ____ No ____

C. For projects occurring outside of ANL complete Section C as well as Sections A and B. N/A

29. (?)Prime, Unique, or Locally Important Farmland Yes ____ No ____

30. (?)Special Sources of Groundwater (such as sole source aquifer) Yes ____ No ____

31. (?)Coastal Zones Yes ____ No ____

32. (?)Areas with Special National Designations (such as National Forests, Parks, or Trails) Yes ____ No ____

33. (?)Action of a State Agency in a State with NEPA-type Law Yes ____ No ____

34. (?)Class I Air Quality Control Region Yes ____ No ____

IV. Subpart D Determination: (to be completed by DOE/ASO)

Are there any extraordinary circumstances related to the proposal that may affect the significance of the environmental effects of the proposal? Yes ____ No X

Is the project connected to other actions with potentially significant impacts or related to other proposed action with cumulatively significant impacts? Yes ____ No X

If yes, is a categorical exclusion determination precluded by 40 CFR 1506.1 or 10 CFR 1021.211? Yes ____ No ____

Can the project or activity be categorically excluded from preparation of an Environment Assessment or Environmental Impact Statement under Subpart D of the DOE NEPA Regulations? Yes X No ____

If yes, indicate the class or classes of action from Appendix A or B of Subpart D under which the project may be excluded. Appendix B 3.6 "Siting/construction/operation/decommissioning of facilities for bench-scale research, conventional laboratory operations, small-scale research and development and pilot projects".

If no, indicate the NEPA recommendation and class(es) of action from Appendix C or D to Subpart D to Part 1021 of 10 CFR.

ASO NEPA Coordinator Review: Kaushik N. Joshi

Signature: KNJoshi Date: 01/05/12

ASO NCO Approval of CX Determination:

The preceding pages are a record of documentation that an action may be categorically excluded from further NEPA review under DOE NEPA Regulation 10 CFR Part 1021.400. I have determined that the proposed action meets the requirements for the Categorical Exclusion identified above.

Signature: _____ Date: 1/5/2012

Peter R. Siebach
Acting Argonne Site Office NCO

ASO NCO EA or EIS Recommendation:

Class of Action: _____

Signature: _____ Date: _____

Peter R. Siebach
Acting Argonne Site Office NCO

Concurrence with EA or EIS Recommendation:

CH GLD: _____

Signature: _____ Date: _____

ASO Manager Approval of EA or EIS Recommendation:

An ____ EA ____ EIS shall be prepared for the proposed _____ and

_____ shall serve as the document manager.

Signature: _____ Date: _____

Dr. Joanna M. Livengood
Manager