AES RESPONSES TO INITIAL ENVIRONMENTAL QUESTIONS

The Licensing Board noted that all of the environmental questions could be answered by both the Nuclear Regulatory Commission ("NRC") Staff and AES, although the Licensing Board explained that at least one party must respond to each question. AES and the NRC Staff have conferred regarding which party is best positioned to respond to the Licensing Board's questions. Based on those discussions, AES is providing a response to the following questions: 4, 5(a), 6(b), and 12. Below, AES repeats each question, identifies the person(s) providing a response to the question, and responds to the question. Affidavits and statements of qualification for each expert are also provided, as necessary.

ASLB Question 4:

> **In discussing the decontamination and decommissioning of the EREF, the FEIS refers to both an "initial radiation survey" and a "final radiation survey." FEIS at 2-24. By comparing these surveys, AREVA Enrichment Services, LLC, (AES) would be able to determine if decontamination is complete under Commission regulations or further decontamination must be performed. What ensures that the surveys are (1) representative of the area being decontaminated/decommissioned; and (2) similar in scope and location so as to afford a proper comparative basis for making a decontamination decision?**

Response to Question 4 (Panzarino, Strum and Kay):[1]

As noted in the Final Environmental Impact Statement ("FEIS") (Exh. NRC000134), the initial site radiation survey determines the natural background radiation levels in the area of the proposed Eagle Rock Enrichment Facility ("EREF"), thereby providing a benchmark for identifying any increase in radioactivity levels in the area. The final site

[1] *See* Exhibits AES000068 (Panzarino Affidavit) and AES00069 (Panzarino Professional Qualifications); Exhibits AES000065 (Strum Affidavit) and AES000014 (Strum Professional Qualifications); Exhibits AES000066 (Kay Affidavit) and AES000012 (Kay Professional Qualifications).

radiological survey would measure radioactivity over the site for comparison to the original benchmark survey. The establishment of an adequate background for use as a reference area for the final decommissioning survey was addressed in the response to NRC RAI D-2. *See* Letter from AES to NRC, AES-O-NRC-11-00976, "Surface Soil Sampling for the Eagle Rock Enrichment Facility," dated April 7, 2011 (Exh. AES000071). The pre-construction background survey has been completed and is described below. The construction survey and decommissioning survey are also described below.

During the License Application data collection phase, ten (10) soil samples were taken within the site boundary to determine the expected average soil concentrations of naturally occurring radionuclides and cesium-137 (EREF Environmental Report ("ER") Section 3.11.1.5) (Exh. AES000070). Five (5) of the samples were taken within the footprint of the facility. The other five (5) samples were taken outside of the facility footprint but within the site boundary. Based on the detectable radionuclide concentrations observed for these original ten (10) site area soil samples (EREF ER Table 3.11-3), laboratory minimum detection requirements for subsequent samples were chosen to provide a high likelihood that the actual concentration levels of the radionuclides of interest would be determined.

A follow-up round of pre-construction soil sampling and analyses was performed in October 2010. The sampling plan was governed by the requirements of Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Inception Through Normal Operations to License Termination) — Effluent Streams and the Environment," Revision 2 (July 2007) (Exh. AES000072). The site property was divided into four (4) survey units, with fifteen (15) soil samples taken in each of the survey units, giving a total of sixty (60) samples to cover

the facility footprint and areas beyond the plant proper. The four (4) survey units were delineated as follows:

- Survey Unit 1: The Stormwater Detention and Retention Basins;
- Survey Unit 2: The main cylinder storage pad area north of the main facilities;
- Survey Unit 3: The main facility footprint for the Technical Support Building, the Blending, Sampling and Preparation Building, the Separation Building Modules, the UF_6 Handling Areas, and the Full Product Cylinder Storage Pad; and
- Survey Unit 4: Areas on-site, but outside those that are scheduled to be disturbed during plant construction.

At each of the sixty (60) sampling locations (GPS identified), a one-square foot area was cleared of vegetation and other non-soil materials (large rocks, roots, twigs, leaves, etc.). Within the one-square foot area, the top one inch of soil was collected, and any non-soil materials were removed. The remaining soil was mixed and placed in a labeled plastic container for shipment to the analytical laboratory.

The following radionuclide analyses were performed on each soil sample:

- Gamma isotopic analysis, including K-40, Cs-137, and Ac-228;
- Uranium isotopic analysis for U-233/234, U-235/236, U-238, and by a separate method for U-236; and
- Thorium isotopic analysis for Th-228, Th-230, and Th-232.

These sixty (60) samples, plus the original ten (10) samples taken during the initial data collection, establish the natural range of background concentrations of radionuclides in on-site, surface soil, prior to the beginning of facility construction activities.

In addition to the pre-construction sampling described above, soil samples will be collected during construction of the main plant facilities (actual number and location to be

determined by AES) from disturbed areas next to facility foundations to characterize foundation soils (back-fills) prior to UF_6 cylinders arriving on-site.

The data from the radiological analyses of these samples (both pre-construction and construction periods) provide radionuclide background levels that will be used for future assessments of potential impact on the local environment from facility operations or decommissioning. Collectively, these soil samples constitute the background reference area for the EREF and have been taken (pre-construction samples) or will be taken (construction samples) in the same areas that will be designated survey units during decommissioning. The sampling plan design satisfies the licensing commitment to the NRC to provide a sufficient number of sampling points in and around the facility footprint to characterize the site area for pre-construction and pre-operation background radionuclide levels, i.e., initial radiation surveys.

Before the start of decommissioning operations, an extensive radiological survey of the facility will be performed in conjunction with a historical site assessment. The historical site assessment will consider any operational issues that occurred during the facility lifetime that need to be factored into decommissioning planning and radiological surveys. The findings of the radiological survey and historical site assessment will be compared to the background reference area or "initial radiation" surveys and will be presented in a decommissioning plan which will be submitted to the NRC. The decommissioning plan will be prepared in accordance with 10 C.F.R. § 70.38, "Expiration and termination of licenses and decommissioning of sites and separate buildings or outdoor areas," and the applicable guidance provided in NUREG-1757, "Consolidated Decommissioning Guidance," Volume 2, Rev. 1, Appendix A, "Implementing the MARSSIM Approach for Conducting Final Radiological Surveys" (Exh. NRC000117).

To ensure that decommissioning surveys are representative of the areas being decontaminated/decommissioned, the NUREG-1575, "Multi-Agency Radiation Surveys and Site Investigation Manual (MARSSIM)," Revision 1 (Exh. AES000073) guidance will be followed. The MARSSIM represents a process that the NRC and EPA have endorsed for this purpose. Therefore, the guidance used to establish the survey units (both present and future), and the conduct of those surveys (both prior to construction, during construction and during decommissioning), ensures the surveys are representative and similar in scope to afford a proper comparative basis for making a decontamination decision.

To ensure that the final radiological surveys are similar in scope and location to the initial surveys so as to afford a proper comparative basis for making a decontamination decision, the MARSSIM process will also be followed. The MARSSIM provides detailed guidance for planning, implementing, and evaluating environmental and facility radiological surveys conducted to demonstrate compliance with regulations. MARSSIM focuses on the demonstration of compliance during the final status survey following scoping, characterization, and any necessary remedial actions.

ASLB Questions 5(a):

> **Which, if any, of the potential mitigation measures identified by NRC in several parts of section 4.2 and summarized in Tables 5-3 and 5-4 will be implemented by AES?**

Response to Question 5(a) (Kay and Harper):[2]

The mitigation measures, identified in EREF FEIS (NUREG-1945), Tables 5-3 and 5-4 (Exh. NRC000134), summarize the potential mitigation measures recommended by the

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[2] *See* Exhibits AES000078 (Harper Affidavit) and AES000011 (Harper Professional Qualifications).

NRC for consideration during construction and operation of the EREF. *See also* EREF ER, Revision 2, Chapter 5 (Exh. AES000070). The attached Table 1 indicates which mitigation measures described in the FEIS that AES will implement.

ASLB Question 6(b):

> **(b) Did AES/NRC consider other mitigation measures to preserve the resource, such as shifting the security fence and substation, rather than simply cataloging the site and if not, why not?**

Response to Question 6(b) (Kay and Harper):

AES did consider other mitigation measures to preserve the resources associated with cultural site MW004; however, it was determined that the west side location for the substation was the preferred engineered solution providing for shorter and more direct runs from the substation to the points of high usage, and as noted below, following discussions with the State Historic Preservation Officer ("SHPO") mitigation of MW004 was recommended.

The layouts for the security fence and substation began in 2008, concurrent with the development and issuance of the ER in December 2008. Simultaneously, cultural resource surveys of the site property were conducted. Reports were subsequently submitted to the NRC and the SHPO that described the results of the AES cultural resource contractor's evaluation and proposed recommendations for the 13 cultural sites within the project area. In early-fall of 2009, site MW004 was determined to be the only site (of the 13) eligible for nomination to the Historical Register. *See* Letter to George A. Harper, Vice President, Engineering, Eagle Rock Enrichment Facility, AREVA Enrichment Services LLC, from Kenneth C. Reid, State Archaeologist and Deputy State Historic Preservation Officer, Idaho State Historical Society. Subject: Class III Cultural Resource Inventory of the Proposed Eagle Rock Enrichment Facility, Bonneville County, dated September 29, 2009 (ADAMS Accession No. ML092810293) (Exh.

AES000074). By that time, the status of the design for the EREF, including the security fence, substation and transmission line routes, precluded facility design modifications to preserve site MW004. Based on discussions with the SHPO and their findings, mitigation of site MW004 through data recovery was recommended.

ASLB Question 12:

> **(a)(1) Aside from quarterly analyses of water and/or sediment in the two Cylinder Storage Pads Stormwater Retention Basins, how would leakage of uranium hexafluoride (UF6) or its reaction products from stored cylinders be detected? (2) What is the likelihood that small but continuous leaks would be detected by either the effluent monitoring or radiological environmental monitoring systems?**
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> **(b) Given that the EREF site is located at a latitude and elevation where the ground and other outside surfaces are likely to be covered by snow during the winter months, will snow be allowed to accumulate on full cylinders residing on cylinder storage pads? If so, please explain how snow cover would impact the ability of monitoring systems to detect continuous small releases from damaged or improperly sealed cylinders, and discuss whether natural chemical or physical mechanisms could trap hazardous chemical or radiological materials in snow or ice on cylinder storage pads and then release it into the air or water when temperatures rise.**

Response to Question 12(a)(1) (Tilden, Panzarino):[3]

The EREF does not solely rely on the physiochemical effluent monitoring and radiological environmental monitoring systems to detect potential leakage from the storage cylinders. Before the DUF_6 cylinders are placed on the storage pads, they are surveyed for external contamination (wipe tested). Once moved to the storage pad, leakage of uranium hexafluoride (UF_6) or its reaction products from the cylinders would also be detected by the inspection program, as discussed below.

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[3] *See* Exhibits AES000067 (Tilden Affidavit) and AES000015 (Professional Qualifications).

Section 4.13.3.3 (Mitigation for Depleted UF_6 Temporary Storage) of the ER states that AES will maintain an active cylinder management program to maintain optimum storage conditions in the cylinder yard and will monitor the integrity of the cylinders stored in the storage pad. Cylinders are stored on concrete saddles (or saddles comprised of other suitable material) that do not cause cylinder corrosion and the saddles will be placed on a stable concrete surface. The cylinders are re-inspected annually for damage or surface coating defects, corrosion, valve integrity, damage, leaks, etc. Further details are contained in the ER and are also discussed in section 2.1.5 (Depleted Uranium Management) of the FEIS. Any signs of leakage discovered on the cylinder during these inspections would result in an investigation of the cause and a corrective action plan to correct the situation.

The history of UF_6 cylinders in storage has shown that past small leaks of UF_6 cylinders caused by improper handling and storage were self sealing because a UF_4 hydrate plug forms at the point of leakage. DOE/EIS-0269, *Final Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride*, Appendices B (Exh. AES000075) and D (Exh. AES000076). This makes it very unlikely for a "small but continuous" leak of UF_6 to occur from a cylinder.

Response to Question 12(a)(2) (Tilden, Panzarino):

Even though small but continuous leaks from a UF_6 cylinder are very unlikely as discussed in the response to Question 12(a)(2) above, it is likely that any such leaks would be detected by both the effluent monitoring and the radiological environmental monitoring systems.

Monitoring is conducted for uranium from uranium hexafluoride (UF_6) or its uranium reaction products. The radiological environmental monitoring program is designed to detect uranium in the environment using isotopic analysis. The detection levels are 2% or less of

the limits in 10 C.F.R. Part 20 Appendix B, Table 2 (Effluent Concentrations). Vegetation, groundwater, soil, and water contained in the basins are included in this monitoring program.

Hydrogen fluoride is a non-uranium reaction product of uranium hexafluoride produced when UF_6 reacts with moisture in the air. Hydrogen fluoride gas is absorbed in the moisture to form aqueous hydrofluoric acid which will eventually fall to the ground or on water. U.S. Department of Health and Human Services, Toxicological Profile Fluorides, Hydrogen Fluoride, and Fluorine (September 2003) (Exh. AES000077).

In water, fluorides associate with various elements present in the water and settle into the sediment where they are strongly attached to sediment particles. When deposited on land, fluorides are strongly retained by soil, forming strong associations with soil components. Leaching removes only a small amount of fluorides from soils. Fluorides may be taken up from soil and accumulate in plants, or they may be deposited on the upper parts of the plants in dust.

The effluent monitoring program (physiochemical sampling) monitors soil, sediment, and vegetation for fluoride uptake using analyses methods that meet the Environmental Protection Agency's Lower Limits of Detection.

Small but continuous leaks from cylinders are likely to produce increasing concentrations of uranium and fluorides in environmental samples. As stated in the ER, AES will submit annual summary reports of the environmental sampling programs and associated data to the proper regulatory authorities. The report will note any increasing trends in the data and identify the actions taken in response to those trends.

Response to Question 12(b) (Tilden, Panzarino):

Snow will be allowed to accumulate on full UF_6 cylinders stored on the storage pads at EREF.

Since the annual cylinder inspection program would not be scheduled during periods when cylinders are covered with snow, identification of small leaks through this monitoring system would be delayed until the next inspection period. Any leakage of UF6 or its reaction products when cylinders are covered by snow could be trapped within the snow/ice cover and may not be immediately accessible to the physiochemical effluent monitoring or radiological environmental monitoring systems until runoff eventually occurred as temperatures rose during warm spells or the spring. As during other times of the year, and as discussed in the response to question 12 (a)(1), the self plugging feature of UF6 cylinder leaks would tend to limit any leakage from the cylinders during these winter periods.

In summary, proper cylinder handling and storage of UF_6 cylinders makes any leakage from these cylinders highly unlikely. The routine sampling and monitoring programs supplemented with the periodic cylinder inspections will provide effective and adequate indication of any leakage from cylinders stored on the storage pads.

Table 1 – AES Implementation of NRC Proposed Mitigation Measures

Impact Area	Activity	NRC Proposed Mitigation Measure	AES Implementation
CONSTRUCTION RELATED (from FEIS Table 5-3)			
Air Quality	Point source releases of criteria pollutants	Ensure vehicles and equipment with internal combustion engines are properly tuned and pollution control devices are functional.	Idaho does not have a vehicle emission inspection program in Bonneville County. However, AES and its construction manager will implement the spirit of this mitigation measure as best it can through proper maintenance of construction vehicles, visual observations of equipment and general employee training.
		Install hard-surface pavements, curbs, scupper drains, and drainage ways at fuel dispensing island that will channel spilled fuels to fire-safe containment sumps; require delivery drivers to remain in attendance throughout all fuel deliveries; place spill containment/response equipment at fuel dispensing stations.	Yes
		Provide first responder training to selected workers; ensure storage tanks are equipped with fully functional overflow and vapor control features.	Yes
		Install emergency shut-offs for fuel dispensing pumps; post spill response directives at the fuel dispensing islands; provide spill cleanup materials at the fuel dispensing islands for cleanup of small spills; ensure the fuel dispensing islands have adequate lighting.	Yes
		Adopt a policy that requires prompt cleanup of all spilled materials.	Yes

Impact Area	Activity	NRC Proposed Mitigation Measure	AES Implementation
		Identify and select construction-related products and chemicals that are free of volatile solvents.	Yes, where possible. Alternatives for some solvents used may not be possible.
		Suspend high fugitive dust-generating activities during early morning hours with calm winds and during windy periods.	AES and construction manager will consult with Idaho authorities and utilize their expertise to appropriately address fugitive dust generation.
Geology and Soil	Soil disturbance	Minimize the construction footprint to the extent possible.	Yes
		Cover stockpiles to reduce exposure to wind and rain.	Yes, where practicable and where required.
		Limit routine vehicle traffic to paved or gravel roads.	Yes
Water Resources	Stormwater management	Reduce the size of impervious surfaces (parking lots, roads, and roofs) to the extent possible; implement a "fix-it-first" infrastructure policy to set spending priorities on the repair of existing infrastructure over the installation of new infrastructure; and employ low-impact development strategies and practices during construction activities.	Yes, without causing safety issues. Roofs are not included.
Ecological Resources	Habitat disturbance	Plant disturbed areas and irrigated crop areas with native sagebrush steppe species to establish native communities and prevent the establishment of noxious weeds. Plant immediately following the completion of disturbance activities and the abandonment of crop areas.	Yes, using certified noxious-weed-free seed, and native, low-water-consumptive plant species selected in consultation with the Idaho authorities.

Impact Area	Activity	NRC Proposed Mitigation Measure	AES Implementation
		Develop and implement a noxious weed control program to prevent the establishment and spread of invasive plant species. Hose down tires and undercarriage of off-road vehicles prior to site access to dislodge seeds or other propagules of noxious weeds. Monitor for noxious weeds throughout the construction and operations phases and immediately eradicate new infestations. Minimize indirect impacts of weed control activities, such as herbicide effects on non-target species, and soil disturbance and fire hazards from vehicle operation in undisturbed areas during weed control activities.	Yes.
Noise	Exposure of workers and the public to noise	Suspend the use of explosives during periods when meteorological conditions (*e.g.*, low cloud cover) can be expected to reduce sound attenuation.	Suspension of blasting activities will be based on unacceptable noise levels determined by AES, and its construction manager's site Health & Safety professionals.
OPERATIONS RELATED (from FEIS Table 5-4)			
Water Resources	Stormwater management	Reduce the size of impervious surfaces (parking lots, roads, and roofs) to the extent possible.	Yes, though roofs are not included.
		Implement a "fix-it-first" infrastructure policy to set spending priorities on the repair of existing infrastructure over the installation of new infrastructure.	Yes
		Employ low-impact development strategies and practices during operations.	Yes

Impact Area	Activity	NRC Proposed Mitigation Measure	AES Implementation
Ecological Resources	Wildlife protection	Develop areas that will retain water of suitable quality for wildlife and provide wildlife access to such areas with suitable water quality.	Since there are no wetlands on the site, wildlife will continue to have access to the on-site, intermittent stream drainages that retain water after a rain or snow storm.
		For basins with water quality unsuitable for wildlife, use animal friendly fencing and netting or other suitable material over basins to prevent use by migratory birds.	Since the EREF will not discharge any treated UF_6 process waters to the basins, the need for netting (or other suitable mitigation methods) is not anticipated. However, AES will consult with the appropriate Idaho authorities when basin designs are complete to discuss this issue further. Animal friendly fencing will be utilized around the basins.
		Place metal reflectors on the top wire of the fence along the AES property boundary, to reduce sage-grouse mortality resulting from collisions with the fence.	Suitable reflectors will be utilized on fencing along the AES property, as appropriate, to reduce sage-grouse mortality resulting from collisions with the fence.
		Coordinate with Idaho National Laboratory in monitoring risks to sage-grouse and other sensitive species and identifying measures to reduce risks and protect these species and their habitat, particularly sagebrush steppe.	Yes
		Coordinate with Idaho Department of Fish and Game to determine corrective action or mitigation for the offsite public lands lost to wildlife due to project effects.	Not necessary. None anticipated.

Impact Area	Activity	NRC Proposed Mitigation Measure	AES Implementation
Transportation	Traffic volume	Consider working with INL to operate a joint bus system.	Yes
		Establish shift changes outside of INL peak commuting periods.	AES expects its shift staffing to be small in comparison to INL. However, AES will implement this measure if practicable.
Public and Occupational Health	Radiological effects	Store "empty" cylinders with heels in the middle of a storage pad between full tail cylinders to reduce external exposure to workers.	"Empty" cylinders will be stored in accordance with ALARA practices. AES will also consider, as practicable, storing cylinders so as to maximize shielding from nearby cylinders.