UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

LBP-11-26

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

G. Paul Bollwerk, III, Chairman
Dr. Kaye D. Lathrop
Dr. Craig M. White

In the Matter of	Docket No. 70-7015-ML
AREVA ENRICHMENT SERVICES, LLC	ASLBP No. 10-899-02-ML-BD01
(Eagle Rock Enrichment Facility)	October 7, 2011

SECOND AND FINAL PARTIAL INITIAL DECISION
(Uncontested/Mandatory Hearing on Environmental Matters)

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ACRONYMS AND ABBREVIATIONS

ACP	American Centrifuge Plant
ACHP	Advisory Committee on Historic Preservation
AEA	Atomic Energy Act of 1954
AERMOD	American Meteorological Society and EPA Regulatory Model
AES	AREVA Enrichment Services, LLC
AMS	American Meteorological Society
ANL	Argonne National Laboratory
APE	area of potential effect
B.A.	Bachelor of Arts
B.S.	Bachelor of Science
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	CO_2-equivalent
COL	combined license
COLA	combined license application
CV	Curriculum Vitae
DC	design certification
DOE	Department of Energy
DU	depleted uranium
DUF_6	depleted uranium hexafluoride
EIA	United States Energy Information Administration
EIS	environmental impact statement
EMP	effluent monitoring program
EP	emergency plan
EPA	Environmental Protection Agency
ER	environmental report
EREF	Eagle Rock Enrichment Facility
ERI	Energy Resources International, Inc.
ESRP	Eastern Snake River Plain
FCSS	Division of Fuel Cycle Safety and Safeguards
FEIS	Final Environmental Impact Statement
FNMCP	fundamental nuclear material control plan
FSME	Office of Federal and State Materials and Environmental Management Programs
GEH	General Electric-Hitachi
GHG	Greenhouse Gas
GLEF	global laser enrichment facility
GNEP	Global Nuclear Energy Partnership

GWh	gigawatt hour
HEU	high-enriched uranium
HF	hydrogen fluoride
IGE	interested governmental entity
IM	inspection manual
IMC	inspection manual chapter
INL	Idaho National Laboratory
ISAS	integrated safety analysis summary
ISC3	Industrial Source Complex Model
kWh	kilowatt hour
LES	Louisiana Energy Services, LLC
LEU	low-enriched uranium
LOC	letter of credit
MDC	minimum detectable concentration
MFC	Materials and Fuels Complex
MOA	memorandum of agreement
m/s	meters per second
M.S.	Master of Science
MT	metric ton
MWh	megawatt hour
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NCS	nuclear criticality safety
NEF	National Enrichment Facility
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act of 1966
NMSS	Office of Nuclear Materials Safety and Safeguards
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NRC	Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NWPP	Northwest Power Pool
NWS	National Weather Service
ORR	operational readiness review
PBL	planetary boundary layer
PGDP	Paducah Gaseous Diffusion Plant
PID	partial initial decision
PM	particulate matter
PSP	physical security plan
REMP	radiological environmental monitoring program

RES	Office of Nuclear Regulatory Research
RG	Regulatory Guide
SAAQS	State Ambient Air Quality Standards
SAR	safety analysis report
SBM	separations building modules
SER	safety evaluation report
SHPO	State Historical Preservation Office
SO_2	sulfur dioxide
SNM	special nuclear material
SPPP	standard practice procedures plan
SPQ	Statement of Professional Qualifications
SWU	separative work units
TLD	thermoluminescent dosimeter
U	uranium
UF_4	uranium tetrafluoride
UF_6	uranium hexafluoride
USEC	United States Enrichment Corporation
USGS	United States Geological Survey
WSA	Wilderness Study Area
$\mu g/m^3$	micrograms per cubic meter
µm	micrometer

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I. INTRODUCTION

1.1 Pursuant to the Commission's July 23, 2009 hearing notice, see Notice of Receipt of Application for License; Notice of Consideration of Issuance of License; Notice of Hearing and Commission Order and Order Imposing Procedures for Access to Sensitive Unclassified Non-Safeguards Information and Safeguards Information for Contention Preparation; In the Matter of AREVA Enrichment Services, LLC (Eagle Rock Enrichment Facility), 74 Fed. Reg. 38,052 (July 30, 2009) (CLI-09-15, 70 NRC 1 (2009)), on July 12-13, 2011, this Licensing Board conducted an evidentiary hearing in Idaho Falls, Idaho. That hearing was held in accordance with the requirements of the Atomic Energy Act of 1954 (AEA), 42 U.S.C. §§ 2011-2297, and 10 C.F.R. Part 70, which mandate that a hearing is required regarding the pending application of AREVA Enrichment Services, LLC, (AES) for a license to possess and use source, byproduct, and special nuclear material to enrich natural uranium at a

proposed facility, designated as the Eagle Rock Enrichment Facility (EREF), to be constructed and operated in Bonneville County, Idaho.

1.2 This final partial initial decision (PID) provides the Board's findings and conclusions regarding the uncontested matters associated with this proceeding that arise under the provisions of the National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. §§ 4321-4370, i.e., those matters affecting the quality of the human environment. This includes the results of the Board's review of the relevant portions of the record of this proceeding, its written inquiries to AES and the Nuclear Regulatory Commission (NRC) staff regarding several issues, and the information provided during the subject matter presentations at the July 2011 mandatory hearing evidentiary session. In this decision we thus address the NEPA/environmental-related matters associated with the uncontested portion of this proceeding and determine that (1) the staff's review pursuant to 10 C.F.R. Part 51, as embodied in its final environmental impact statement (FEIS), has been adequate to support the findings to be made by the Director of the Office of Nuclear Materials Safety and Safeguards (NMSS), with respect to whether the requirements of NEPA and the agency's implementing Part 51 regulations have been met; (2) the requirements of NEPA section 102(2)(A), (C) and (E), 42 U.S.C. § 4332(2)(A), (C), (E), and Subpart A of 10 C.F.R. Part 51 have been complied with in the proceeding; (3) after independently considering the final balance among conflicting factors contained in the record of the proceeding, the appropriate action to be taken is issuance of the requested license; and (4) after weighing the environmental, economic, technical, and other benefits against the environmental and other costs, and considering reasonable alternatives, the requested license should be issued.

II. PROCEDURAL BACKGROUND

2 .1 On April 8, 2011, the Board issued LBP-11-11, 73 NRC __ (Apr. 8, 2011), the first of two PIDs in this proceeding.[1] In that PID the Board provided its findings and conclusions regarding uncontested matters arising under the provisions of the AEA, i.e., those matters relating to the public health and safety and the common defense and security (as opposed to environmental matters arising under the provisions of NEPA). 73 NRC at __ (slip op. at 2). Those findings and conclusions included the Board's review of the relevant portions of the record of this proceeding, its written inquiries of AES and the staff regarding a number of issues, and the information provided during the subject matter presentations at a January 2011 mandatory hearing evidentiary session. Id. at __, __, __, __ (slip op. at 13, 64, 66, 81-82). With the exception of the then-unresolved decommissioning funding financial assurance issue that was pending Commission consideration of a Board-certified question, see Licensing Board Memorandum (Certifying Question to the Commission Regarding Decommissioning Financial Assurance) (Feb. 18, 2011) (unpublished), the Board determined that (1) the AES application, including its safety analysis report (SAR) and the associated integrated safety analysis summary (ISAS), emergency plan (EP), physical security plan (PSP), fundamental nuclear material control plan (FNMCP), and standard practice procedures plan (SPPP), along with the record of the proceeding, contained sufficient information to support license issuance; (2) the staff's review of the application, as embodied in its safety evaluation report (SER), had been adequate to support the findings to be made by the NMSS Director, with respect to whether the AES application met the applicable standards of Parts 30, 40, and 70; and (3) based on

[1] To avoid repetition, this decision will not recite this proceeding's entire procedural history prior to the issuance of its first PID. For such an account, see LBP-11-11, 73 NRC at __ (slip op. at 3-9).

conclusions regarding (a) the sufficiency of the AES application and record of the proceeding, and (b) the adequacy of the staff's review of the AES application, the issuance of a permit for construction and operation of the EREF, as modified by the license condition regarding the educational and experience qualifications of the facility's nuclear criticality safety (NCS) manager would not be inimical to the common defense and security or the health and safety of the public. LBP-11-11, 73 NRC at __ (slip op. at 82-83).

2 .2 With the staff's release of its FEIS in mid-February 2011, see Notice of Availability of [FEIS] for the [AES] Proposed [EREF] in Bonneville County, ID, 76 Fed. Reg. 9054 (Feb. 16, 2011), immediately following the issuance of its AEA/safety-related PID, the Board turned to consideration of environmental matters arising under the provisions of NEPA.[2] As with its AEA/safety-related review, see LBP-11-11, 73 NRC at __ & n.7 (slip op. at 7 & n.7), beginning on April 15, 2011, the Board provided a series of issuances posing questions

[2] As it had done relative to AEA/safety-related portion of the proceeding, see LBP-11-11, 73 NRC at __ n.3 (slip op. at 5 n.3), the Board provided interested governmental entities (IGEs) with an opportunity to participate in the NEPA/environmental-related portion of this uncontested hearing. On February 24, 2011, the Board issued a notice declaring IGEs could take part in the NEPA/environmental-related portion of the mandatory hearing by filing a statement of any issues or questions about which they wished the Board to give particular attention, which could be accompanied by any supporting documentation that the governmental entity saw fit to provide. See Atomic Safety and Licensing Board; AREVA Enrichment Services, LLC (Eagle Rock Enrichment Facility); Notice of Opportunity to Participate in Uncontested/Mandatory Hearing; Procedures for Participation by Interested Governmental Entities Regarding Environmental Portion of Enrichment Facility Licensing Proceeding, 76 Fed. Reg. 11,523, 11,523 (Mar. 2, 2011). The notice also indicated that, after reviewing any submitted material, the Board might request that one or more particular governmental entities send representatives to the hearing to participate as the Board deemed appropriate, including answering Board questions and/or making a statement for the purpose of assisting the Board's exploration of one or more of the issues raised by the governmental entity in the prehearing filings. See id. As was the case in the AEA/safety-related portion of the proceeding, however, there were no filings by State, local, or Native American tribal governments in response to this Board notice.

to both AES and the staff regarding NEPA/environmental-related matters.[3] AES and/or the staff filed written responses to the Board's questions on May 2, 9, 27, and June 17, 2011.[4]

[3] See Licensing Board Memorandum and Order (Initial Board Questions Regarding Environmental-Related Matters and Associated Administrative Directives) (Apr. 15, 2011) app. A (unpublished) [hereinafter Initial Board Environmental Questions]; Licensing Board Memorandum and Order (Second Set of Board Questions Regarding Environmental-Related Matters) (Apr. 22, 2011) app. A (unpublished) [hereinafter Board's Second Environmental Questions]; Licensing Board Memorandum and Order (Third Set of Board Questions Regarding Environmental-Related Matters) (May 12, 2011) app. A (unpublished) [hereinafter Board's Third Environmental Questions]; Licensing Board Memorandum and Order (Providing Presentation Topics, Additional Questions, and Administrative Directives Associated with Mandatory Hearing on Environmental Matters) (June 2, 2011) at 6 (unpublished) [hereinafter Board Presentation Topics and Administrative Directives].

[4] See Exh. NRC000136 (NRC Staff Response to the Licensing Board's Initial Questions Regarding Environmental Matters) [hereinafter Staff Initial Environmental Questions Response]; Exh. AES000064 (AES Response to Initial Environmental Questions) [AES Initial Environmental Questions Response]; Exh. NRC000170 (NRC Staff Response to the Licensing Board's Second Set of Questions Regarding Environmental Matters) [hereinafter Staff Second Environmental Questions Response]; Exh. AES000079 (AES Response to Second Set of Environmental Questions) [hereinafter AES Second Environmental Questions Response]; Exh. NRC000176 (NRC Staff Response to the Licensing Board's Third Set of Questions Regarding Environmental Matters) [hereinafter Staff Third Environmental Questions Response]; Exh. AES000095 (AES Response to Third Set of Environmental Questions) [hereinafter AES Third Environmental Questions Response]; Exh. NRC000184 (NRC Staff Response to Supplemental Board Question Regarding Environmental Question 23) [hereinafter Staff Fourth Environmental Questions Response]; Exh. AES000099 (AES Response to Fourth Set of Environmental Questions) [hereinafter AES Fourth Environmental Questions Response].

In connection with the exhibit citations that are included in the paragraph above, as admitted into the record of this proceeding at the July 2011 evidentiary hearing and reflected in the agency's ADAMS-associated electronic hearing docket, the official exhibit number for each evidentiary item contains a three-alpha character party identifier (i.e., AES, NRC); followed by six alpha and/or numeric characters designed to reflect its number and whether it was revised subsequent to its original submission as a prefiled exhibit (e.g., evidentiary exhibit AESR20031 admitted at the January 2011 hearing on AEA/safety-related matters is the second revised version of prefiled exhibit AES000031); followed by a two-character alpha or numeric identifier that will be employed in this case to indicate that the exhibit was utilized in the mandatory/uncontested portion of this proceeding (i.e., MA); followed by the designation BD01, which indicates that this Licensing Board (i.e., BD01) was involved in its identification and/or admission. Accordingly, the official designation for the staff's response to the Board's initial set of environmental questions referenced above is NRC000136-MA-BD01. For the sake of simplicity, however, we will refer to all exhibits admitted in the uncontested portion of this proceeding by their initial nine-character designation only.

Additionally, based in large part on the parties' answers to the Board's May 2011 questions, in a June 2, 2011 memorandum and order, the Board outlined the presentation topics for the NEPA/environmental-related portion of the mandatory hearing. See Board Presentation Topics and Administrative Directives at 2-6.

2 .3 In accordance with the Board's June 2, 2011 updated general schedule order, its June 2 issuance providing administrative directives for the environmental portion of the mandatory hearing, and its June 2 hearing notice,[5] the Board held an evidentiary hearing on uncontested environmental topics on July 12-13, 2011, in Idaho Falls, Idaho. At the hearing, witnesses for AES and the staff provided presentations on the following topics:

1. Purpose and Need for the Proposed Action
2. "Preconstruction" Activities
3. Greenhouse Gas Impacts of Facility's Production Power Consumption
4. Preconstruction and Construction Air Quality Impacts
5. Effluent and Radiological Environmental Monitoring Programs[6]
6. Historic/Cultural Resources Memorandum of Agreement and Associated Mitigation Measures

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[5] See Licensing Board Memorandum and Order (Updated General Schedule) (June 2, 2011) (unpublished); Board Presentation Topics and Administrative Directive; In the Matter of Areva Enrichment Services, LLC (Eagle Rock Enrichment Facility); Notice of Hearing (Notice of Evidentiary Hearing and Opportunity to Provide Oral and Written Limited Appearance Statements), 76 Fed. Reg. 34,103 (June 10, 2011) [hereinafter Hearing Notice].

[6] Although the Board designated this topic as "Radiological Effluent Monitoring Program (REMP)," see Board Presentation Topics and Administrative Directives at 5, the staff indicated that (1) the acronym "REMP" stands for "Radiological Environmental Monitoring Program," see Exh. NRC000207, at 3 (NRC Staff Presentation Topic 5, Radiological Effluent Monitoring Program (REMP)) [hereinafter Staff Effluent/Environmental Monitoring Presentation]; and (2) two monitoring programs were actually pertinent to the Board's presentation request, the REMP and the effluent monitoring program (EMP), see id. at 3, 7; see also Tr. at 578 (Fischer Test.). As a consequence, in this decision the Board will employ the designation set forth above to more accurately mirror the scope of the staff's presentation.

2 .4 Presentation materials, in the form of slide presentations and supporting documents, were provided to the Board beforehand and admitted as exhibits during the proceeding. See Board Presentation Topics and Administrative Directives at 7, 9; Tr. at 366-81. The Board asked questions of the parties' witnesses during the presentations and afforded the witnesses of each party the opportunity to comment upon the responses of the other party's witnesses. See Board Presentation Topics Order at 7-9. In accordance with 10 C.F.R. § 2.315(a), see Hearing Notice at 1-2, 76 Fed. Reg. at 34,104, the Board also entertained oral and written limited appearance statements from members of the public in connection with this proceeding. See, e.g., Limited Appearance Session Tr. at 1-59 (July 11, 2011); E-Mail from Liz Woodruff, Snake River Alliance, to Administrative Judge Paul Bollwerk and Jon Eser, Law Clerk, Atomic Safety and Licensing Board Panel (July 27, 2011; 6:29 p.m. ET) (ADAMS Accession No. ML112093371).

2 .5 Following the July 12-13 evidentiary hearing, in an August 2, 2011 memorandum and order, the Board adopted certain corrections to the hearing transcript, admitted two additional staff exhibits that revised a portion of its presentation materials relating to the matter of greenhouse gas impacts, and closed the evidentiary record of this mandatory hearing proceeding. See Licensing Board Memorandum and Order (Adopting Transcript Corrections; Admitting Additional NRC Staff Exhibits; Closing the Evidentiary Record of Mandatory Hearing Proceeding) (Aug. 2, 2011) at 2-3, app. A (unpublished).

2 .6 Thereafter, pursuant to the Board's October 7, 2010 memorandum and order, see Initial General Schedule app. A, at 2, AES and the staff filed proposed findings of fact and conclusions of law regarding the NEPA/environmental-related portion of this mandatory hearing proceeding on August 12, 2011, see Applicant's Proposed Findings of Fact and Conclusions of Law Concerning Uncontested Environmental Issues (Aug. 12, 2011) [hereinafter AES Proposed

Environmental Findings]; NRC Staff's Proposed Findings of Fact and Conclusions of Law Concerning Mandatory Hearing on Environmental Matters (Aug. 12, 2011) [hereinafter Staff Proposed Environmental Findings].

2 .7 Finally, regarding the then-pending AEA/safety-related financial assurance matter that was referenced above, see supra p. 3, in CLI-11-04, 74 NRC __ (July 12, 2011), the Commission responded to the February 2011 Licensing Board certified question regarding the showing required of applicant AES to establish the sufficiency of the letter of credit (LOC) that AES has chosen as its surety method under 10 C.F.R. §§ 30.35(f)(2), 40.36(e)(2), and 70.25(f)(2), to establish AES's decommissioning financial assurance. In granting review of the certified question and addressing that matter, the Commission determined that the AES commitment to use an LOC issued by a financial institution whose operations are regulated and examined by a federal or state agency complies with the applicable regulatory requirements. See CLI-11-04, 74 NRC at __ (slip op. at 13). In doing so, however, the Commission also directed the attention of the Board and the parties to a related issue concerning the timing of the submission of any AES LOC. Specifically, the Commission suggested that while a staff authorization permitting AES to defer execution of any final LOCs until after a license is issued but before AES receipt of licensed material might be problematic because 10 C.F.R. § 70.25(b)(2) -- the provision referenced in the staff's SER discussion regarding AES post-license issuance surety submissions -- is not by its terms applicable to the AES application, such a post-licensing LOC submission by AES might have been within the scope of the staff's exemption, thereby warranting additional Board and party input on the matter. See id. at __ (slip op. at 11-12).

2 .8 After obtaining staff and AES comments on the matter at the close of the environmental portion of the mandatory hearing, see Tr. at 646-55, in a July 26, 2011 issuance

the Board concluded that the staff's granting of the decommissioning financial assurance exemption and an associated license condition requiring AES to submit (1) final copies of its proposed financial instruments for staff review after a license is issued but no later than six months prior to (a) the planned date for AES receipt of nuclear material for testing at the Centrifuge Assembly Building, and (b) the planned dates for obtaining feed material for initial production at each of the four planned Separations Buildings Modules (SBM); and (2) final executed copies of the staff-reviewed financial assurance instruments to NRC at least twenty-one days prior to receipt of test material or receipt of feed material for initial production in an SBM, were supported in logic and fact so as to allow, at the appropriate juncture, the issuance of a license permitting the construction and operation of the EREF. See Licensing Board Memorandum and Order (Scope of Decommissioning Financial Assurance Exemption) (July 26, 2011) at 4-5 (unpublished).

III. APPLICABLE LEGAL STANDARDS

A. General Legal Standards

3 .1 As was noted in the Board's AEA/safety-related PID, see LBP-11-11, 73 NRC at __ (slip op. at 9-10), AEA section 274c(1), 42 U.S.C. § 2021(c)(1), gives the agency clear statutory authority to regulate the construction and operation of a uranium enrichment facility like the EREF. Further, AEA sections 53 and 63, 42 U.S.C. §§ 2073, 2093, which concern special nuclear material and byproduct material, provide the general statutory basis under which the agency has adopted the variety of regulations that would govern the proposed EREF's construction and operation. Finally, AEA sections 189a and 193, id. §§ 2239a, 2243, provide the statutory footing for the procedural precepts that apply to the uranium enrichment facility licensing action now before the Board, including the need for (1) the agency to conduct only a

single licensing action and adjudicatory proceeding to authorize the construction and operation of the EREF; and (2) a mandatory hearing regarding the AES application and the staff's associated safety and environmental reviews, despite the absence of a petitioner seeking to interpose a challenge to the AES request for such a single license for the EREF.

3 .2 Part 70 of title 10 of the Code of Federal Regulations establishes the basic regulatory framework that governs the licensing of an entity such as AES to construct and operate an enrichment facility. Nonetheless, as the Board also observed in its AEA/safety-related PID, a number of other rules and regulations in 10 C.F.R. Chapter I, including Parts 19, 20, 21, 25, 30, 40, 71, 73, 74, 95, 140, 170, 171, and most importantly for our purpose here, the agency's NEPA regulations in Part 51, are applicable to licensing a facility to receive, possess, use, transfer, deliver and process byproduct, source, and special nuclear material in the quantities necessary to conduct the activities contemplated at the EREF. See LBP-11-11, 73 NRC at __ (slip op. at 10).

B. Scope of Licensing Board Review

3 .3 With regard to a licensing board's responsibilities in this context, a board is to "conduct a simple 'sufficiency' review" rather than a de novo review on both AEA and NEPA issues. Exelon Generation Co., LLC (Early Site Permit for Clinton ESP Site), CLI-05-17, 62 NRC 5, 39 (2005). Thus, boards "should decide simply whether the safety and environmental record is 'sufficient' to support license issuance. In other words, the boards should inquire whether the NRC Staff performed an adequate review and made findings with reasonable support in logic and fact." Id. There is, however, a caveat in that boards are instructed to make independent environmental judgments with respect to certain NEPA findings, though even then they "need not rethink or redo every aspect of the NRC Staff's environmental findings or undertake their own fact-finding activities." Id. at 44; see also Dominion Nuclear

North Anna, LLC (Early Site Permit for North Anna ESP Site), LBP-07-9, 65 NRC 539, 559-60 (2007). The board's role thus is to "carefully probe [staff] findings by asking appropriate questions and by requiring supplemental information when necessary," but "the NRC Staff's underlying technical and factual findings are not open to board reconsideration unless, after a review of the record, the board finds the NRC Staff review inadequate or its findings insufficient." Clinton ESP, CLI-05-17, 62 NRC at 39-40.

3 .4 Additionally, in a mandatory hearing, a licensing board "must narrow its inquiry to those topics or sections in Staff documents that it deems most important and should concentrate on portions of the documents that do not on their face adequately explain the logic, underlying facts, and applicable regulations and guidance." Exelon Generation Co., LLC (Early Site Permit for Clinton ESP Site), CLI-06-20, 64 NRC 15, 21-22 (2006).

C. Required Board Environmental Findings

3 .5 In the initial July 2009 hearing notice for this proceeding, the Commission outlined the legal and factual environmental matters the presiding officer would be responsible for considering in conducting the adjudicatory proceeding relating to the AES application to construct and operate the EREF. See 74 Fed. Reg. at 38,053-54 (CLI-09-15, 70 NRC at 7). In that regard, as was noted in the Board's initial scheduling order, these findings require the Board to (1) determine whether the requirements of section 102(2)(A), (C), and (E) of NEPA and Subpart A of 10 C.F.R. Part 51 have been complied with in the proceeding; (2) independently consider the final balance among conflicting factors contained in the record of the proceeding with a view to determining the appropriate action to be taken; and (3) determine, after weighing the environmental, economic, technical, and other benefits against the environmental and other costs, and considering reasonable alternatives, whether a license should be issued, denied, or appropriately conditioned to protect environmental values. See Licensing Board Initial

Scheduling Order (May 19, 2010) attach. A, at 9 (unpublished) [hereinafter Initial Scheduling Order]. Additionally, the Commission directed that if the proceeding is not a contested proceeding, i.e., the proceeding is an uncontested/mandatory hearing rather than one in which a petitioner seeks to challenge the AES application in accord with the procedures specified in 10 C.F.R. Part 2, Subpart C, then in connection with environmental matters the licensing board is to determine whether (1) the application and record of the proceeding contain sufficient information to support license issuance; (2) the staff's review of the application has been adequate to support findings to be made by the NMSS Director with respect to whether (a) the application satisfies the standards set forth in the Commission's hearing notice and the applicable standards in 10 C.F.R. Parts 30, 40, and 70, and (b) the requirements of NEPA and the agency's implementing regulations in Part 51 have been met; and (3) the review conducted by the staff pursuant to 10 C.F.R. Part 51 has been adequate. See 74 Fed. Reg. at 38,053-54 (CLI-09-15, 70 NRC at 7); see also Initial Scheduling Order attach. A, at 9.

3 .6 Against the backdrop of these governing statutory and regulatory standards, and with the Commission's directives regarding the Board's responsibility to make environmental-related findings in mind, we turn to our consideration to the issues identified by the Board and the information provided by the parties.

IV. FACTUAL FINDINGS AND LEGAL CONCLUSIONS

A. Evidentiary Hearing Issues

4 .1 In setting forth the Board's determinations relative to the mandatory hearing portion of this Part 70 licensing proceeding, we begin with the subject matter of the various presentations that were made by AES and the staff in response to the Board's requests for additional information on those six particular items.

1. Purpose and Need for the Proposed Action

a. Introduction

4 .2 As part of its NEPA analysis, the agency must provide information that addresses the purpose and need for the proposed action, in this case, the need for the EREF and the enriched uranium it would produce. See 10 C.F.R. Part 51, app. A, § 4. This presentation topic regarding the purpose and need for the EREF arose from the staff's response to the Board's environmental question 3 regarding the impact, if any, of the March 2011 earthquake and tsunami and the resulting events at the Fukushima Dai-ichi facility relative to the FEIS purpose and need analysis for the EREF. As submitted, the staff's purpose and need critique relies upon an anticipated increase in the number of newly-licensed nuclear power plants in the United States beginning in 2011. See Initial Board Environmental Questions app. A, at 1. In its May 2, 2011 response, the staff indicated:

> The aftermath of recent events at the Fukushima Daiichi facility has no impact on the staff's assumptions in its purpose and need analysis. These assumptions are based upon the number of new reactor combined license applications (COLAs) that the staff has received (NRC000134 at 1-5). To date, no combined license applicant has withdrawn its application or sought suspension of the staff's review thereof in response to the Fukushima events. Thus, the staff's analysis remains unchanged.

Staff Initial Environmental Questions Response at 2-3.

Admittedly, assessing in the near term the impacts of the Fukushima event on the long-term need for enrichment services is a potentially daunting endeavor. But to conclude that nothing has changed post-Fukushima does not appear realistic. Notwithstanding the likely continued growth of nuclear power in countries such as China, Russia, India, and South Korea, recent events, including the announced intention of the Japanese, Swiss, and German governments to lower or eliminate their reliance on nuclear power as a portion of their domestic energy production, the Italian referendum that prohibits the re-introduction of nuclear power

facilities into that country, and questions in this country regarding the pace of new reactor construction, as is apparent from the pre-Fukushima suspended status of combined license (COL) applications for facilities such as Callaway, River Bend, Grand Gulf, and Nine Mile Point, as well as questions that have been raised post-Fukushima regarding the development schedules for facilities such as South Texas and Bellefonte, suggest that there is a need to revisit the staff's pre-Fukushima purpose and need assessment for the EREF. As a consequence, intended in the context of this uncontested hearing as a "stress test" regarding the purpose and need for the facility, the Board requested from the parties a presentation

> addressing how the need for the EREF fits into the larger picture of the need for future domestic and non-domestic uranium enrichment capacity, which should include a discussion/analysis based on:
>
> a. The current status of the existing and potential future sources of uranium enrichment services discussed in the AES ER and/or the staff's FEIS; and
>
> b. Forecasts of installed nuclear generating capacity (units added net of retirements) that employ estimates of domestic and non-domestic new nuclear power plant generating capacity based on assumptions about such capacity that, relative to the capacity figures utilized in the AES ER for the reference and high growth forecasts of installed nuclear capacity by 2020 and 2030, are below the increases in installed capacity forecast in the AES ER by fifty percent for domestic capacity and twenty-five percent for non-domestic capacity.

Board Presentation Topics and Administrative Directives at 2-3.

b. Witnesses and Evidence Presented

4 .3 As the lead party for this presentation topic, AES provided two witnesses to discuss its analysis of the need for the facility under the Board's "stress test" scenarios. In conjunction with their prefiled slide presentations, which were admitted as exhibits, they provided oral testimony at the evidentiary hearing. See Tr. at 389-461; Exh. AES000102 (ASLB

Presentation Topic #1, Purpose & Need, AES Introduction) [hereinafter AES Purpose and Need Presentation A]; Exh. AES000103 (ASLB Presentation Topic #1, Purpose and Need for the Proposed Action) [hereinafter AES Purpose and Need Presentation B]. The staff also made two witnesses available to answer questions relating to this topic.

i. AES Witnesses

4 .4 Sam Shakir, who is AES president and chief executive officer, testified previously in the AEA safety-related portion of this mandatory hearing and his qualifications and experience were outlined in that decision. See LBP-11-11, 73 NRC at __ (slip op. at 28).

4 .5 Michael H. Schwartz received both bachelor of science (B.S.) and master of science (M.S.) degrees in nuclear engineering from the University of Michigan. See Exh. AES000104, at 1 (Curriculum Vitae (CV) of Michael H. Schwartz). A consultant on issues relating to the nuclear fuel cycle for over thirty-five years, Mr. Schwartz currently serves as chairman of the board of directors of Energy Resources International, Inc. (ERI). ERI, a consulting firm established in 1989, provides energy and resource consulting services to electric power companies, private industry, institutions and associations, and government agencies in the United States and overseas. Among ERI's products is an annual nuclear fuel market projection that addresses all nuclear fuel market elements, including a chapter dedicated to the international market for uranium enrichment services. See id.

ii. Staff Witnesses

4 .6 Stephen Lemont received a B.S. in chemistry from Brooklyn College of the City University of New York and a Ph.D. in physical chemistry from Columbia University. See Exh. NRC000155, at 1 (Stephen Lemont Statement of Professional Qualifications (SPQ)). Dr. Lemont, who has worked for over thirty years managing and participating in major, multi-disciplinary environmental projects for federal and state government agencies and private

industry, previously was employed by the Northern Virginia District of the Virginia Department of Transportation; PG&E National Energy Group, an independent electric power producer; and Dames & Moore, an environmental and engineering consulting firm. See id. at 1-2. He currently serves as a senior project manager in the Environmental Protection and Performance Assessment Directorate, Division of Waste Management and Environmental Protection, in the NRC Office of Federal and State Materials and Environmental Management Programs (FSME), and is the EIS project manager for the EREF licensing proceeding. See id. at 1.

4 .7 Bruce M. Biwer has a bachelor or arts (B.A.) degree in chemistry from St. Anselm College and M.S. and Ph.D. degrees in chemistry from Princeton University. See Exh. NRC000151, at 1 (Bruce M. Biwer SPQ). Dr. Biwer has worked at Argonne National Laboratory (ANL) since 1987 as a chemist and an environmental systems engineer, a position he currently holds with the ANL Environmental Science Division's Radiological Health Risk Section. He serves as project manager for the staff's EIS for the EREF and authored the EIS terrorism section.

4 .8 Based on the respective qualifications and experience of the proffered witnesses, the Board finds each of these AES and staff witnesses qualified to testify regarding the purpose and need for the EREF.

c. Regulations and Guidance Relating to Purpose and Need for the Proposed Action

4 .9 As was noted above, NRC regulations mandate that an EIS contain a description of the purpose of, and a discussion of the need for, a proposed action. See supra p. 13. Staff materials licensing-related guidance regarding the preparation of the purpose and need analysis in the applicant's environmental report (ER) and the staff's EIS state that the applicant and staff treatment of this subject should explain "why the proposed action is needed," going on to indicate that the discussions should describe

> the underlying need for the proposed action and should not be written merely as a justification of the proposed action, nor to alter the choice of alternatives. . . . Examples of need include a benefit provided if the proposed action is granted or descriptions of the detriment that will be experienced without approval of the proposed action. In short, the need describes what will be accomplished as a result of the proposed action.

Exh. NRC000189, at 5-2, 6-1 (NMSS, NRC, Environmental Review Guidance for Licensing Actions Associated with NMSS Programs, NUREG-1748 (Aug. 2003)).

d. Evidentiary Findings

4 .10 In its ER, AES sought to make its purpose and need showing based principally upon two factors. The first was "the importance from a national energy security perspective of establishing additional reliable and economical uranium enrichment capacity in the U.S." Exh. AES000070, at 1.1-1 ([AES, EREF, ER] (rev. 2 Apr. 2010)) [hereinafter ER] . In support of this security and policy objective, AES cited various Department of Energy (DOE), Department of State, and congressional committee statements. Some of these statements go as far back as 1989, with the most recent a July 2002 DOE letter to the NRC.[7] See id. at 1.1-1 to -2.

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[7] As an additional policy grounds supporting the need for the EREF, in its ER, AES also referenced the George W. Bush Administration-sponsored Global Nuclear Energy Partnership (GNEP). According to AES,

> [u]nder GNEP's reliable fuel services program, nations with advanced nuclear technologies would provide fuel to meet the needs of other countries in order to reduce the motivation for countries seeking nuclear power to develop uranium enrichment capabilities. By participating in GNEP, growing economies can enjoy the benefits of clean, safe nuclear power while minimizing proliferation concerns and eliminating the need to invest in the complete fuel cycle (e.g., enrichment). AES's new facility would further the objectives of GNEP by augmenting international enrichment capacity and thereby increasing the reliability of global enrichment supply.

ER at 1.1-2. With the demise of the GNEP under the current presidential administration, however, this non-proliferation basis for the EREF has not been further cited by AES or the

(continued...)

Additionally, AES provided (1) an ERI-prepared uranium enrichment requirements forecast utilizing both "reference" and "high-growth" estimates of installed nuclear power generating capacity based on a country-by-country and unit-by-unit review of current nuclear power programs and plans for the future;[8] and (2) an ERI-prepared estimate of worldwide current and potential future sources of uranium enrichment services that, in turn, were used to generate a detailed market analysis of the short and long term domestic and international need for enrichment services through 2030 under (a) a base scenario that assumed domestic enrichment production is provided by the existing Louisiana Energy Services, LLC (LES) National Enrichment Facility (NEF) as well as the planned AES EREF and the still-to-be completed United States Enrichment Corporation (USEC) American Centrifuge Plant (ACP),[9] (b) the base scenario

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[7](...continued)
staff.

[8] During the hearing, ERI Board Chair Schwartz described the difference between the reference and high-growth forecasts as follows:

> The reference forecast, as we generate it, is basically bottoms-up looking at individual projects, different countries, and it is our judgment as to whether there will be delay, whether projects will go forward at all, and just reflects our best judgment on each project.
>
> The high-growth case, which, as you suggest, are based on the sponsor, the project sponsor or in some cases it is the national electric power company's statement of what they intend to do, although in some cases we actually will ratchet that back to something that we think is more reasonable, maybe based on the history that has been demonstrated where a country or company has consistently said that they are going to do such-and-such, and it just never materializes or it is always delayed. So, we will make those adjustments.

Tr. at 420-21.

[9] Although the LES facility was licensed under the NEF designation, see Letter from Joseph G. Giitter, Chief, Special Projects Branch, NMSS, to Karl Gross, Licensing Manager,
(continued...)

plus operation of the proposed General Electric-Hitachi (GEH) global enrichment laser facility (GLEF), or (c) six other scenarios that assumed the EREF was not constructed but that other sources of enrichment services were available domestically (i.e., from the GEH GLEF, additional USEC ACP expansion, United States weapons surplus high-enriched uranium (HEU)-derived low-enriched uranium (LEU) becoming commercially-available) or internationally (i.e., from Russian Rosatom expansion or additional European production equal to that planned for the EREF). See id. at 1.1-3 to -26. AES summarized the results of that analysis as follows:

> [U]nder the Reference Nuclear Power Growth forecast, enrichment capacity provided by the proposed AES facility in the U.S. or one of the other alternatives presented will be necessary to help meet requirements for enrichment services that arise from presently operating and yet to be built nuclear power plants. However, by about 2021 it is also evident that neither the AES plant in the U.S. nor any of the alternatives will be adequate by itself to meet enrichment services requirements, which are forecast to continue to grow. Under the High Nuclear Power Growth forecast, by no later then 2014 it is apparent that no individual alternative would be adequate by itself to meet world enrichment requirements. Thus, not only will the AES enrichment facility be required in the U.S., but one or more of the other alternatives will also be required to meet forecast requirements.
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> . . . [T]here is a deficit of U.S. supply relative to U.S. requirements in each scenario that is an alternative to the proposed AES facility in the U.S. While this is not necessarily unexpected in a world market in which nuclear fuel supply moves both into and out of the U.S., it does highlight the potential advantage of having additional indigenous supply of uranium enrichment services from the perspective of national security.
>
> The need for a new enrichment plant, such as the one proposed by AES, which with a nominal enrichment capacity of 6 million [separative work unit (SWU)] per year [ ] will represent

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[9](...continued)
LES (June 23, 2006), encl. at 1 (NRC Materials License SNM-2010) (ADAMS Accession No. ML061780384), it currently is also being referred to as the URENCO USA facility. See URENCO USA, http://www.urenco.com/content/33/urenco-usa.aspx. In this decision, we will refer to the facility by its licensed designation.

> approximately 10% of world requirements when it is operating at full capacity, becomes even more apparent if even a small supply margin relative to requirements is viewed as desirable by owners and operators of nuclear power plants. This margin would help to assure competition and also help mitigate the impact of potential operational difficulties and/or disruptions at any enrichment plant in the future. If viewed from the perspective of the adequacy of U.S. supply to meet U.S. requirements, . . . the additional supply that would be made available by the presence of the AES enrichment facility in the U.S. would only serve to reduce the deficit, but would not eliminate it.
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> . . . .
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> . . . Therefore, the alternatives to building the nominal 6 million SWU per year AES enrichment facility in the U.S. . . . each have a greater degree of inherent uncertainty associated with them than [constructing and operating the EREF]. Furthermore, when the critical nuclear fuel procurement objectives, security of supply and a competitive procurement process for U.S. purchasers of these services are considered, it becomes apparent that for long term planning purposes those alternatives, or even combinations thereof, are not acceptable. Accordingly, there is a demonstrated need for AES's proposed nominal 6 million SWU per year enrichment plant in the U.S.

Id. at 1.1-27 to -28.

4 .11 In its FEIS, the staff's approach to the required needs analysis focused on the market for domestic enrichment services and relied initially upon information regarding electricity requirements generated by DOE's United States Energy Information Administration (EIA), as well as the pending NRC workload relative to new power reactors. According to the staff, a 2010 EIA forecast that nuclear generation in the United States will grow from 806 billion kilowatt hours (kWh) in 2008 to between 882 and 951 billion kWh in 2035, in conjunction with the number of pending 10 C.F.R. Part 52 applications the agency has under active review for reactor design certifications (DCs) (three new applications and two DC amendments) and COLs (twelve applications encompassing twenty new units), "suggest a continuing, if not increasing, demand

for LEU." Exh. NRC000134, at 1-5 (1 FSME, NRC, [EIS] for the Proposed [EREF] in Bonneville County, Idaho, NUREG-1945 (Feb. 2011)) [hereinafter FEIS].

4 .12 Further, noting an EIA calculation that the current five-year average domestic demand for enrichment services is 14 million SWUs per year and an EIA forecast that the annual domestic demand for enrichment services would be between approximately 13 and 16 million SWUs from 2006 through 2025, the staff sought to categorize and analyze the current and future sources of that supply. According to the staff, based on EIA data, there are three existing domestic market supply sources: domestic production, i.e., the Paducah Gaseous Diffusion Plant (PGDP) and the LES NEF, which account for 15 percent of United States demand; the Megatons to Megawatts Program, under which USEC at the PGDP converts Russian HEU from dismantled warheads into LEU, and which accounts for 38 percent of United States demand; and other foreign sources, such as China, France, Germany, the Netherlands, and the United Kingdom, which provide 47 percent of United States demand. Also, the staff declares that with the scheduled demise of the Megatons to Megawatts Program in 2013 and the PGDP potentially ceasing operation within two or three years thereafter, 53 percent of the source that fulfulls current United States LEU demand will disappear. To fill this deficit, the staff declares, are the LES NEF, which is operating but is still under construction, as well as the planned AES EREF, the USEC ACP, and the GEH GLEF. See id. at 1-5 to -7. Nonetheless, the staff acknowledges, if the PGDP ceases operation and if the NEF and all the other facilities still to be licensed or completed eventually reach their full rated capacity

> the total projected enrichment capacity in the United States would exceed the projected demand (approximately 16 million SWUs per year) by about 6 million SWUs per year . . . . However, given the uncertainties in future development and/or potential expansion of the proposed projects, this projected level of extra capacity would not provide the needed assurance that the enriched uranium would be reliably available when needed for domestic nuclear power production.

Id. at 1-7.

4 .13 Finally, observing that all the current domestic enriched uranium production comes from the PGDP or the just-opened-for-operation-but-still-under-construction LES NEF, the staff declares:

> This situation creates a severe reliability risk in U.S. domestic enrichment capacity. Any disruption in the supply of enriched uranium for domestic commercial nuclear reactors could have a detrimental impact on national energy security because nuclear reactors supply approximately 20 percent of the nation's electricity requirements. The proposed EREF could play an important role in assuring the nation's ability to maintain a reliable and economical domestic source of enriched uranium by providing such additional enrichment capacity. Further, this additional capacity would lessen U.S. dependence on foreign sources of enriched uranium.

Id. The staff then goes on to reference the July 2002 DOE letter cited by AES in its ER as establishing the United States policy that national energy security can be attained by providing additional domestic enriched uranium sources and declares that the EREF's "additional capacity would lessen U.S. dependence on foreign sources of enriched uranium." Id. Added to this, the staff maintains, is the relative attractiveness of the EREF's gas centrifuge technology from both an economic and environmental perspective, as compared to the PGDP's less efficient and more energy-intensive gaseous diffusion technology. Id.

4 .14 Both the AES and staff analyses addressing the need for the EREF were issued before the March 2011 earthquake and tsunami that resulted in severe damage to the Fukushima Dai-ichi facility along the eastern coast of Japan. In response to the Board's May 2011 request for an evidentiary presentation regarding the possible impacts of that event on the future need for enrichment services and, concomitantly, the need for the EREF, acting as the lead party AES took a three-pronged approach to answering the question "Why the EREF?".

4 .15 The first prong concerned the existing and future supply of domestic enrichment services. The AES business case for the EREF is based upon the need for enrichment services

for the existing United States reactor fleet, with any need for enrichment services for "new builds" providing the basis for future facility expansion. See Tr. at 390-91 (Shakir Test.); see also AES Purpose and Need Presentation A, at 3. Current United States demand for enrichment services is approximately 14.5 million SWUs, with the need for enrichment services growing over the past fifteen years because power uprates to the existing fleet have added the equivalent of twenty new nuclear reactors. See Tr. at 391 (Shakir Test.); see also AES Purpose and Need Presentation A, at 3. Further, approximately 40 percent of the current supply of domestic enrichment services is from the "Megatons to Megawatts" agreement with the Russians to downblend HEU into LEU, which expires in 2013 and will leave a significant supply gap. See AES Purpose and Need Presentation A, at 3. With only one of the two energy-intensive gaseous diffusion enrichment facilities still operating, and that one -- the PGDP -- scheduled to close between 2012 and 2016, the only domestic operating enrichment facility would be the LES NEF, which could meet only a quarter to a third of demand in the United States, depending on how much capacity is ultimately constructed at that New Mexico facility. See Tr. at 392 (Shakir Test.). This would mean that, in the absence of any new domestic enrichment services capacity, to meet domestic LEU demand the United States nuclear fleet would have to rely heavily on foreign supplies, primarily from Russia. See Tr. at 390-93 (Shakir Test.); see also AES Purpose and Need Presentation A, at 3. Consequently, to meet this imminent deficiency in LEU, expanding domestic enrichment capacity received support in the 2005 Energy Act by reason of the authority provided DOE to grant loan guarantees for the construction and operation of domestic enrichment facilities, a policy that was reaffirmed in Secretary of Energy Chu's statement in a May 2010 press release concerning the DOE grant of a $2 billion loan guarantee for the EREF. See Tr. at 392-93; see also AES Purpose and Need Presentation A, at 3; NRC000160, at 1

(Press Release, DOE, DOE Offers Conditional Loan Guarantee for Front End Nuclear Facility in Idaho (May 20, 2010)).

4 .16 Also presented by AES as supporting evidence of the need for EREF was information regarding the status of the contractual commitments AES actually has for the EREF's LEU output. Previously in the context of an AEA/safety-related issue concerning foreign ownership and control of the EREF, AES established that it had several billion dollars worth of SWU contracts in place with various American utilities and others, an amount sufficient to fund EREF operation for more than five years. See LBP-11-11, 73 NRC at __ (slip op. at 35). Currently, those commitments translate to having 90 percent of the EREF's output through 2028 from the facility's initial 3.3 million SWU buildout already under contract. Two-thirds of this committed output is with fourteen United States utilities, which represent 50 percent of the existing United States operating reactor fleet of 104 units, with the balance of the 90 percent held by an AES parent company to be used as part of integrated product offers that are made to American and foreign utilities world-wide. See Tr. at 399, 400, 402 (Shakir Test.); see also AES Purpose and Need Presentation A, at 4.

4 .17 Finally, to address directly the inquiry posed by the Board in requesting this presentation topic, see supra p.14, AES presented an updated uranium enrichment requirements forecast prepared by ERI, the author of the AES ER forecast. In this estimate, in addition to providing the Board-requested forecast of the need for enrichment services by reducing the ER-projected increases in installed capacity by 50 percent for domestic (i.e., United States) capacity and 25 percent for non-domestic (i.e., non-United States) capacity, ERI also provided an update of both the projected enrichment services supply and the future demand for enrichment services.

4 .18 Regarding the United States enrichment services supply, the USEC PGDP is projected to operate only through 2013, with its inventory used to support transition to the ACP, or, even if the ACP does not operate, to still cease operations within several years because of the competitive pressures associated with its high electrical usage costs. The LES NEF, which has been operational since 2010, will continue to increase its production to 5.7 million SWUs per year by 2016, although that figure represents a one-year slippage in the ER projection and still depends on the ability of LES to obtain a license amendment that would allow it to double the size of the 3 million SWU per year it is authorized to produce under its existing license. The USEC ACP is projected to obtain a DOE loan authorization this year, to begin SWU production in 2014, and to be producing 3.8 million SWUs per year by 2018, a three to four-year slippage from the ER estimate. Relative to the Megatons to Megawatts program, an estimated 0.3 million SWUs per year would be produced between 2013 and 2019, at which point that supply source would cease. Although the AES EREF likewise is projected to suffer a one-year slippage from the production forecast in the ER, it nonetheless is presumed to obtain a license in early 2012, begin operation in 2015, and be producing 6.4 million SWUs per year by 2022. Also, the transaction and tails assays used in these projections are expected to be slightly lower than those used in the ER, see ER at 1.1-7, for both domestic and non-domestic Western enrichment services suppliers, which results in a slightly lower level of supply at the tails assay stated in the ER over the long-term. See Tr. at 406-09 (Schwartz Test.); see also AES Purpose and Need Presentation B, at 3. And finally, with respect to the GEH GLEF, its potential production was not factored into the ERI estimates in the ER or the Board presentation because GEH has not yet decided whether to construct that facility. See Tr. at 410-11 (Schwartz Test.).

4 .19 Regarding non-domestic enrichment services supply, the information proffered to the Board by AES emphasized that small schedule slippage for new capacity since the ER was

issued would be the watchword. For URENCO Europe, its operation and expansion are anticipated to continue at a steady state with an annual capacity of 14.5 million SWUs per year expected by 2015, which is 2 million SWUs per year more than the ER estimate. For the AREVA Georges Besse I gaseous diffusion plant, it is expected to face the same scenario as the USEC PGDP, with minimum level production through 2012 and the use of its inventory to support the transition to the George Besse II gaseous centrifuge plant, which was operational in April 2011 and is expected to increase production up to 7.5 million SWUs per year by 2017. For Rosatom, the state-owned corporation that oversees both commercial and military nuclear activities in Russia, its continued expansion is still expected, although the Megatons to Megawatts program is expected to end in 2012 and there are barriers to its sale of enrichment services in the United States and Europe owing to trade laws and contractual constraints. Also, the ER projections regarding reprocessing of discharged fuel to offset the need for enrichment services are considered largely unchanged. All this results in an overall small change in expectations regarding non-domestic supply from the ER, with one major exception. Relative to the ER projections, Chinese enrichment services capacity is expected to increase significantly, i.e., by 8.7 million SWUs annually by 2030, to meet a larger share of Chinese internal requirements. See Tr. at 413-15 (Schwartz Test.); see also AES Purpose and Need Presentation B, at 4.

4 .20 Further, in response to the Board's requested "stress test" to adjust the ER reference and high growth forecasts of installed nuclear capacity by 2020 and 2030 by reducing the ER-projected increases in installed capacity by 50 percent for domestic capacity and 25 percent for non-domestic capacity, ERI calculated that, relative to the ER estimates, these reductions would result in installed capacity reductions of between (1) 4.2 percent for the 2020 reference growth forecast and 11.3 percent for the 2030 high growth estimate for domestic nuclear generation; and (2) 5.5 percent for the 2020 reference growth calculation and

13.1 percent for the 2030 high growth estimate for world (i.e., domestic and non-domestic) nuclear generation. And in terms of enrichment requirements, ERI calculated these adjustments by approximating them as a reduction in the net increase in the ER-identified requirements for enrichment services. On this basis, the "stress test" reductions of 50 percent for domestic requirements and 25 percent for non-domestic requirements resulted in a world reference 2016-2030 period annual average reduction of 5.3 million SWUs per year (8.2 percent) and a world high-growth 2016-2030 period annual average reduction of 9.4 million SWUs per year (11.6 percent).[10] See Tr. at 418-19, 423 (Schwartz Test.); see also AES Purpose and Need Presentation B, at 5-6.

4 .21 Taking into account these "stress test" adjustments as applied to domestic enrichment services requirements, ERI calculations showed that over the period from 2016 through 2030, for both the reference and high growth scenarios, the average annual requirements for domestic enrichment services would continue to exceed the domestic base supply, including the planned production from the EREF, by 0.8 million and 1.1 million SWUs, respectively. In contrast, utilizing the Board's requested "stress test" adjustments for domestic and non-domestic requirements, while the high growth scenario average annual world enrichment services requirements during the 2016 to 2030 period would still exceed the world

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[10] Although the ERI presentation provided figures only for the world (i.e., domestic and non-domestic) enrichment services reductions, using the methodology employed by ERI to calculate the world figures shows that, taking into account the Board's 50 percent reduction factor, for the reference case, average annual domestic SWU demand between 2016 to 2030 will drop 0.9 million SWUs (5.7 percent), while for the high growth case, the average annual domestic SWU demand from 2016 to 2030 will be reduced by 1.35 million SWUs (7.9 percent).

Intuitively, it may seem odd that the domestic reduction percentage is smaller than that for the world reduction estimate, given the Board's larger reduction factor -- 50 percent for domestic v. 25 percent for non-domestic -- but this does not account for the fact that non-domestic demand is larger by about a factor of three, making the 25 percent non-domestic reduction the stronger driver of overall world demand.

base supply, including the planned EREF production, by 0.4 million SWUs, for the reference forecast the average annual world base supply would exceed world enrichment services requirements by 5.7 million SWUs, a condition that also would apply, by 0.6 million SWUs, if the EREF was not in operation. See Tr. at 423-26 (Schwartz Test.); see also AES Purpose and Need Presentation B, at 7-8.

4 .22 Having thus addressed the Board's "stress test" scenario, ERI also proffered a new forecast intended to reflect events occurring subsequent to the ER's submittal, which was based on the following assessments:

- Impact of the Fukushima accident – significant reductions in Japan and Germany, but minimal impact on the rest of the world when compared to the ER
- U.S. license renewals and power uprates continue following the Fukushima accident
- Continued expansion of nuclear power in China, which is very significant
- Downturn in world economy
- Renewed interest in low-cost natural gas
- Difficulty in obtaining long-term financing for new nuclear power plants
- Statements of ongoing support for nuclear power from government and industry leaders in most countries with existing nuclear power programs

AES Purpose and Need Presentation B, at 9; see also Tr. at 426-27 (Schwartz Test.). Further, according to ERI, its forecast is "conservative (low) relative to other post-Fukushima forecasts with regard to expectations for installed nuclear generation capacity in the long-term," AES Purpose and Need Presentation B, at 9, which is consistent with its forecast in the ER as compared to other entities, see Tr. at 427-28. ERI found that for both the reference and high growth forecasts, domestic requirements will exceed domestic supply, specifically, the reference growth forecast will increase slightly from 0.8 to 1.1 million SWUs, while under the high growth forecast the domestic supply deficit increases from 1.6 to 2.1 million SWUs. On the other hand, the average annual world base supply, which includes the EREF output, is projected to exceed

world enrichment services requirements for the reference growth case from 2016 to 2030 by 3.2 million SWUs, but world enrichment requirements would exceed the base supply for the high growth forecast by 6.0 million SWUs during this same period. See Tr. at 428-31 (Schwartz Test.); see also AES Purpose and Need Presentation B, at 10. Also in this regard, over the past fifteen years, there has been an average yearly surplus of supply over requirements of about 3.2 million SWUs per year, which has served to offset any particular potential supply problems and assure there is a reasonable level of competition in the market. See Tr. at 454 (Schwartz Test.).

4 .23 In its updated forecast, ERI thus concluded that with the EREF and all other domestic-based base supply, domestic requirements for uranium enrichment services are expected to exceed United States-based supply over the long-term for both the reference and high growth forecasts. Relative to world supply, taking into account EREF production and all other base supply, world supply is expected to exceed world requirements for the reference growth forecast, but requirements for enrichment services are expected to exceed supply for the high growth forecast. See Tr. at 432 (Schwartz Test.); see also AES Purpose and Need Presentation B, at 11.

e. Board Conclusions Regarding Purpose and Need for the Proposed Action

4 .24 With the likely closure of the PGDP in the next several years, potentially leaving the United States with the LES NEF as its sole operating enrichment facility, the question of the need for the EREF would seem, at first blush, to be the proverbial “slam dunk.” As it turns out, this is not necessarily the case, particularly in the wake of the Fukushima I incident in March 2011. To be sure, the wave of requests in this country to extend the operating life of the existing 104 operating reactors, and thus the potential ongoing demand for enrichment services for those facilities, has up to this juncture continued largely unabated. This can be contrasted, however,

with the status of the seventeen docketed applications for new COL facilities. Even before the Fukushima I incident, agency licensing review had been essentially suspended on five of those applications, and post-Fukushima questions have been raised that bring into question the continuing viability of at least two others. This suggests that, as was the case following the Three Mile Island Unit 2 accident, at a minimum the time line associated with the licensing of new reactor facilities in the United States generally will be more protracted than was originally presumed. See Union Elec. Co. d/b/a AMEREN Missouri (Callaway Plant, Unit 2), CLI-11-05, 74 NRC __, __ & n.82 (slip op. at 23 & n.82) (Sept. 9, 2011). Moreover, post-Fukushima outside the United States, several countries, including Germany, Japan, and Switzerland, have indicated they will shutdown some or all of their current operating power reactors over the next fifteen to twenty years. See Tr. at 426, 446, 449 (Schwartz Test.). Certainly, it would not be wholly unexpected to see the projected schedules for constructing and operating new facilities in other countries delayed or postponed as well.

4 .25 All of this has the potential to impact the need for enrichment services over the operating life of the proposed EREF. Nonetheless, from the Board's perspective, in the context of the agency's NEPA-related review of the need for this facility, several factors ultimately sustain a finding of a "need" for the EREF.

4 .26 The first supporting element is the need to ensure the continued availability of diverse, reliable sources of domestic enrichment services to provide LEU for domestic power reactors. The importance of this general principal previously has been recognized in both the LES NEF and USEC ACP licensing proceedings. See USEC, Inc. (American Centrifuge Plant), LBP-07-6, 65 NRC 429, 473 (2007); Louisiana Energy Servs., L.P. (National Enrichment Facility), LBP-05-13, 61 NRC 385, 443, petition for review denied, CLI-05-28, 62 NRC 721, 726 (2005). Although the congressional, DOE, and State Department policy pronouncements cited

by the parties as confirming this policy are not necessarily of the most recent vintage, we are aware of nothing that leads us to question that policy's continuing viability.[11] As such, the previously-recognized domestic enrichment services availability policy supports a NEPA finding of a "need" for the construction and operation of the EREF.

4 .27 The degree to which this "need for domestic sources" component is significant here, however, depends in large part upon the current and future domestic market for the enrichment services that the EREF will supply. The Board's "stress test" inquiry was intended to probe one potentially important aspect of this market existence question, i.e., what impact would a Fukushima I-related decline/delay in installed domestic and non-domestic nuclear facility capacity have on the previous ER analysis of the requirements for enrichment services over the next twenty years. So too, the updated May 2011 ERI forecast sought to account for this factor, as well as the other relevant enrichment requirements and supply changes that have occurred since the AES ER was provided to the staff in 2009.

4 .28 The "stress test" analysis outlined above indicates that, with the EREF operating, for either the reference or high growth scenarios average annual domestic enrichment services requirements between 2016 and 2030 would still exceed the domestic supply by approximately 1.0 million SWUs per year. So too, the "stress test"-modified annual world requirements would, with the EREF operating, exceed supply by somewhat less than 0.5 million SWUs per year under

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[11] In response to the Board's environmental question 1 requesting recent support for the proposition that a domestic supply of LEU is a matter of public policy, the staff pointed to two recent statements by DOE, one by DOE Secretary Steven Chu in a May 2010 press release describing DOE's issuance of a two-billion dollar loan guarantee for the EREF as helping to meet the need for increased uranium enrichment in the United States, and another in June 2010 congressional testimony by DOE Chief Operating Officer R. Shane Johnson indicating that although DOE did not believe its decision to sell downblended HEU from DOE's stockpile resulted in greater dependence on foreign uranium sources, to increase domestic enrichment capacity DOE had made available four billion dollars in loan guarantees for the deployment of advanced enrichment technology in the United States. See Staff Initial Environmental Questions Response at 1. Certainly, neither of these statements is inconsistent with this policy.

the high growth scenario, but world supply would exceed world requirements by more than 5.5 million SWUs per year for the reference scenario. This can be contrasted with the ERI May 2011 forecast. That projection suggests that, with the EREF operating, from 2016 to 2030 the average annual domestic supply deficit increases for both the reference and high growth scenarios to 0.3 million SWUs and 0.5 million SWUs respectively, while for the world, supply would exceed requirements for the reference case, but not for the high growth forecast.

4 .29 One can, of course, question whether the ERI revised forecast or the Board's more exacting "stress test" more accurately reflects the likely impacts of the Fukushima I accident on the enrichment services/supply market. Indeed, the ERI forecast suggesting that, notwithstanding the Fukushima I incident, for the 2016 to 2030 domestic reference and high growth scenarios and the world high growth scenario there will be an increasing supply deficit, seems somewhat counter-intuitive. Nonetheless, looking particularly at the market for domestic enrichment services that is the focus of the policy concern outlined above, and which reflects for the reference and high growth domestic estimates an annual enrichment services deficit of between 0.8 and 2.1 million SWUs, it is apparent both the "stress test" and ERI forecast results fully support a finding that there is a need for the EREF.

4 .30 Moreover, two other factors reflected on the record of this proceeding further bolster the basis for this finding. One is the recognized "margin level" that exists in the enrichment market. As ERI chief executive officer Schwartz explained, on an average yearly basis, 3.0 million SWUs in excess of requirements generally exist in the enrichment market to provide a level of margin that offsets potential supply problems as well as maintains a level of

reasonable market competition.[12] This already-existing level of margin signifies that there is some "give" in the enrichment services market that could absorb EREF production if need be.

4 .31 Additionally, support for this needs finding comes from the testimony of AES President Shakir regarding the current status of industry commitments for the EREF's enrichment services. Noting that the AES business case was based on fulfilling the needs of the existing American nuclear fleet regardless of any new-built reactors, Mr. Shakir stated that 90 percent of the EREF's output through 2028 from the initial buildout of 3.3 million SWUs annually is already committed under contracts. Of this, two-thirds is with United States utilities and the other one-third is under commitment by AES's parent company to be available under the terms of integrated product and service agreements offered to domestic and foreign utilities by the parent. As was the case in the LES proceeding, see LES, LBP-05-13, 61 NRC at 444-45, this evidence of significant actual utility commitments provides a compelling showing in support of the need for the EREF.

[12] Staff witness Dr. Biwer further supported this "margin" concept by noting that, depending on where the reactors are in their cycles and the fuel rod facilities are with the manufacturing process and what excess product capacity or storage they have, domestic demand does fluctuate from year to year by two to four million SWUs. See Tr. at 456-57 (Biwer Test.).

4 .32 Finally, in making this finding of a need for the EREF,[13] we note that the domestic enrichment service forecasts relied upon above are dependent on an accurate assessment of the actual enrichment facilities that will available over the next five years or so, in particular the availability of the already-licensed, but not yet fully constructed, USEC ACP. If the ACP does not begin operations, and at this juncture a federal loan guarantee apparently essential to moving that project forward has yet to be finalized, the need for the EREF's enrichment production would be further enhanced. On the other hand, if the ACP is to be built, the supply/demand figures that have been generated in this instance suggest that, notwithstanding its unique enrichment technology, the NEPA needs analysis relative to the still-to-be licensed GEH GLEF, whose output was not considered in the AES ER needs analysis because there has not been a GEH commitment to build, see Tr. at 410-11 (Schwartz Test.), may become a much closer case.

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[13] At the July 11, 2011 10 C.F.R. § 2.315(a) oral limited appearance session and in a plethora of written limited appearance statements submitted subsequently, the question was raised as to whether, relative to the Fukushima I accident, under section 51.92(a)(2) there is "new and significant circumstances or information" such that a supplement to the FEIS needs to be prepared by the staff regarding the need for the EREF, a matter the Board had AES and the staff address during one of the mandatory hearing sessions, see Tr. at 457-61. Although, as we have observed previously, see LBP-11-11, 73 NRC at __ n.31 (slip op. at 75 n.31), the Board is under no duty in the context of this mandatory hearing proceeding to respond to these limited appearance statements as litigable concerns, we note that as the substance of our discussion above makes clear, relative to the matter of the need for the EREF, we do not see the Fukushima I matter as having providing "a '"seriously different picture of the environmental impact of the proposed project from what was previously envisioned."'" Hydro Res., Inc. (P.O. Box. 777, Crownpoint, NM 87313), CLI-06-09, 64 NRC 417, 419 (2006) (quoting Hydro Res., Inc. (P.O. Box 15910, Rio Rancho, NM 87174), CLI-04-39, 60 NRC 657, 659 (2004) (quoting Sierra Club v. Froehlke, 816 F.2d 205, 210 (5th Cir. 1987))); see also Marsh v. Oregon Natural Res. Council, 490 U.S. 360, 373-74 (1989) (agency decisions regarding the need to supplement on EIS based on new and significant information are subject to the "rule of reason"). Moreover, to the degree any supplementation of the FEIS might be needed, this decision provides that subjunction. See Dominion Nuclear North Anna, LLC (Early Site Permit for North Anna ESP Site), CLI-07-27, 66 NRC 215, 230 & n.79 (2007) (in mandatory hearing, Commission discussion regarding alternative site review supplements EIS).

2. "Preconstruction" Activities

a. Introduction

4 .33 As part of its safety PID, the Board outlined the circumstances surrounding an exemption from the requirements of 10 C.F.R. §§ 30.4, 30.33(a)(5), 40.4, 40.32(e), 70.4, and 70.23(a)(7) that the staff had granted AES in March 2010 permitting AES to begin certain "preconstruction" activities at the EREF site. See LBP-11-11, 73 NRC at __-__, __-__ (slip op. at 51-52, 54-57). As the Board noted there, the current provisions of Parts 30, 40, and 70 mandate that for a proposed nuclear materials-related activity, including uranium enrichment, "commencement of construction" relative to that activity prior to a favorable staff conclusion regarding the NEPA cost-benefit balance associated with the proposed activity is "grounds for denial" of the authorization to conduct that activity. Under this exemption, however, a variety of activities considered "construction" under the definitions that currently govern nuclear materials facilities, including the type of site clearing/grading and building that AES indicated it wished to undertake prior to the completion of the staff's environmental review of the EREF application, would now be considered "preconstruction" activities that are allowed to be begin at reactor sites without any prior NRC authorization. See id. at __ (slip op. at 55). While concluding that, particularly in light of a pending agency rulemaking that would change the rules governing nuclear materials facilities like EREF to permit the preconstruction activities authorized by the exemption, the exemption appeared to be adequately supported, the Board also noted that the environmental impacts of preconstruction activities had been assessed as part of the FEIS for this proceeding and, as such, were subject to Board scrutiny in the context of the NEPA/environmental-related portion of this mandatory hearing. See id. at __ (slip op. at 56-57).

4 .34 Consequently, as a follow-on to its AEA/safety-related determination, the Board requested that as one of their NEPA/environmental-related evidentiary presentations, the parties provide a presentation describing:

> a. Any activities that have been undertaken by AES pursuant to the staff's March 2010 exemption approval; and
>
> b. Relative to each of the construction activities authorized by the March 2010 staff exemption, if those construction activities have been/were undertaken by AES, but AES subsequently was denied authorization to operate, or decided not to begin operation of, the EREF (i) what type of redress/restoration action would be mandated by any applicable federal, state, or local statutory and/or regulatory requirements; and (ii) what redress/restoration action AES would anticipate actually taking.

Board Presentation Topics and Administrative Directives at 3.

b. Witnesses and Evidence Presented

4 .35 AES was also the lead party on this topic and provided testimony from two witnesses who elaborated on the information provided in its prefiled slide presentation, which was admitted as an exhibit at the evidentiary hearing. See Tr. at 461-78; Exh. AES000105 (ASLB Presentation Topic #2, Preconstruction Activities) [hereinafter AES Preconstruction Activities Presentation]. Two staff witnesses likewise were made available to answer any Board questions regarding this topic.

i. AES Witnesses

4 .36 George A. Harper, AES Vice President, Engineering and Licensing, testified previously in the AEA/safety-related portion of this mandatory hearing and his qualifications and experience are outlined in that decision. See LBP-11-11, 73 NRC at __ (slip op. at 16).

4 .37 The other AES witness, Jim Kay, AES EREF Licensing Manager, also testified previously in the AEA safety-related portion of this mandatory hearing and his qualifications and experience are set forth in that decision. See LBP-11-11, 73 NRC at __ (slip op. at 41).

ii. Staff Witnesses

4 .38 The background and qualifications for the two staff witnesses, Stephen Lemont and Dr. Bruce Biwer, were set forth previously in section IV.A.1.b.ii supra.

4 .39 Based on the respective qualifications and experience of the proffered witnesses, the Board finds each of these AES and staff witnesses qualified to testify regarding preconstruction activities.

c. Regulations and Guidance Relating to "Preconstruction" Activities

4 .40 Current Parts 30, 40, and 70 requirements state that for a proposed nuclear materials-related activity, including uranium enrichment, "commencement of construction" relative to that activity prior to a favorable staff conclusion regarding the NEPA cost-benefit balance associated with the proposed activity is "grounds for denial" of the authorization to conduct that activity. 10 C.F.R. §§ 30.33(a)(5) (byproduct material), 40.32(e) (source material), 70.23(a)(7) (special nuclear material). Further, existing Parts 30, 40, and 70 regulations define "commencement of construction" to include "clearing of land, excavation, or other substantial action that would adversely affect the natural environment of a site." Id. §§ 30.4, 40.4, 70.4. As is noted in the SER accompanying the staff's March 17, 2010 letter granting the AES exemption request, see Exh. NRC000082 encl. 1, at 1-2 (Letter from Daniel H. Dorman, Director, Division of Fuel Cycle Safety and Safeguards (FCSS), NMSS, to George Harper, Licensing Manager, AES (Mar. 17, 2010)) [hereinafter Staff Construction Exemption Approval], notwithstanding the existing regulatory language in Parts 30, 40, and 70, a recent change to the definition of "construction" in the context of power reactor licensing under 10 C.F.R. Parts 50 and 52 has established that a variety of activities considered "construction" under the definitions that still govern nuclear materials facilities, including the type of site clearing/grading and building that AES wishes to undertake prior to the completion of the staff's environmental review of its EREF

application,[14] would now be considered "preconstruction" activities that are allowed to be undertaken at reactor sites without any prior NRC authorization. See Limited Work Authorizations for Nuclear Power Plants, 72 Fed. Reg. 57,416, 57,416 (Oct. 9, 2007), corrected in 73 Fed. Reg. 22,786, 22,786-87 (Apr. 28, 2008). What the staff thus is permitting with this exemption is the extension of this reactor regime to materials facilities, including the EREF and the GEH GLEF.[15]

4 .41 Two things are of note relative to this exemption. First, the Commission has approved and published a final rule that, when effective on November 14, 2011, revises sections 30.33(a)(5), 40.32(e), and 70.23(a)(7), and the definition sections associated with those provisions, to permit the type of preconstruction activities that are allowed under Part 50 and the exemption granted to AES. See Licenses, Certifications, and Approvals for Material Licensees, 76 Fed. Reg. 56,951, 56,962-66 (Sept. 15, 2011). Relying on the agency's legal interpretation that it lacks the authority under the AEA and NEPA to regulate "preconstruction" activities, see id. at 56,952, 56,954, 56,958-59, this rule revises the existing definition of "commencement of construction" in Parts 30, 40, and 70 to conform these provisions to the Part 50 standard.

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[14] Under the revised 10 C.F.R. § 50.10(a)(2) activities that are no longer considered "construction" include clearing of the site, grading, installation of drainage, erosion and other environmental mitigation measures, and construction of temporary roads and borrow areas; erection of fences and other access control measures; excavation; erection of support buildings (such as, construction equipment storage sheds, warehouses and shop facilities, utilities, concrete mixing plants, docking and unloading facilities, and office buildings) for use in the construction of the facility; building of service facilities such as paved roads, parking lots, railroad spurs, exterior utility and lighting systems, potable water systems, sanitary sewerage treatment facilities; and transmission lines. See Staff Construction Exemption Approval encl. 1, at 2.

[15] A similar request to the staff for the GEH GLEF facility was approved by the staff in May 2009. See Letter from Daniel H. Dorman, Director, FCSS, NMSS, to Albert E. Kennedy, Licensing Manager, GEH (May 8, 2009) (ADAMS Accession No. ML083510647).

4 .42 In addition, as was noted in the Vogtle ESP proceeding, see Vogtle ESP, LBP-09-19, 70 NRC at 503-04, in contrast to the regulatory scheme that permits certain "construction" activities to be undertaken at a reactor site pursuant to a limited work authorization so long as a site redress plan is submitted, see 10 C.F.R. § 50.10(d), (g), there is no agency requirement that an applicant submit a redress plan relative to preconstruction activities nor, absent state or local requirements, take any remediation action regarding preconstruction activities if it decides not to complete the project or is denied agency authorization to construct and operate the facility.

d. Evidentiary Findings

4 .43 Pursuant to the staff's March 2010 exemption from the requirements of sections 30.4, 30.33(a)(5), 40.4, 40.32(e), 70.4, and 70.23(a)(7) of the Commission's rules, AES initiated various preconstruction activities in the fall of 2010. Prior to doing so, AES had begun mitigation of historical and cultural resource MW004, the John Leopold Homestead, which would be completely destroyed because it would be under the footprint of the security fence and a proposed electrical substation. See AES Preconstruction Activities Presentation at 5, 8-9; Tr. at 466, 469 (Kay Test.); FEIS at 4-6. AES then proceeded to improve the existing farmer's road on the site as well as to clear land for the site, the main access road, and the construction of power lines. See AES Preconstruction Activities Presentation at 5; Tr. at 466-67 (Kay Test.). Since completing those activities in November 2010, AES has not performed any other preconstruction activities. See AES Preconstruction Activities Presentation at 5; Tr. at 466-67 (Kay Test.). AES nonetheless may choose to perform other activities in the late summer/early fall of 2011, including topsoil removal at the location of the main plant area, clearing land, rock excavation, and access road construction. See AES Preconstruction Activities Presentation at 6; Tr. at 467 (Kay Test.).

4 .44 With the preconstruction activities performed to date and those activities AES may still choose to perform, if AES is subsequently denied authorization to operate, or decides on its own accord not to begin operation of the EREF, redress or restoration of the site is not mandated by federal, state, or local requirements, statutory or otherwise. See AES Preconstruction Activities Presentation at 12; Tr. at 471-72 (Kay Test.). In particular, the NRC does not mandate site redress or restoration for preconstruction activities. See Tr. at 477 (Lemont Test.).

4 .45 Even though not legally required to do so, AES nonetheless would anticipate redressing and restoring the site in several ways to minimize hazards to humans, wildlife, and the environment. See Tr. at 472 (Kay Test.). AES would re-grade land to preclude erosion due to channeled runoff, stabilize areas by replacing soil and planting vegetation, take away all equipment and temporary structures, and remove any added fencing. See AES Preconstruction Activities Presentation at 13; Tr. at 473-74 (Harper Test.). After redress and restoration, the site should be suitable for animal grazing, but perhaps not for the agricultural purposes for which it currently is being used. See Tr. at 474-75 (Harper Test.).

e. Board Conclusions Regarding “Preconstruction” Activities

4 .46 In responding to the Board’s request for information on AES preconstruction activities, AES provided a complete and thorough presentation addressing each of the Board’s areas of interest concerning this subject. AES initially outlined the limited preconstruction activities it had taken to date, primarily clearing land for later construction. Then, albeit confirming its understanding that if the EREF is not constructed or operated, no federal, state, or local requirements would mandate that AES redress or restore the site, AES explained the degree to which it would redress and restore the site to minimize hazards to humans, wildlife, and the environment.

4 .47 Given the agency's current regulatory posture regarding the need for materials license applicants like AES to redress any preconstruction activities they undertake, the Board concludes that AES's plan to redress and restore the site even if an NRC license to construct and operate the EREF ultimately is not obtained or the facility is not constructed is warranted and prudent. The AES description of its preconstruction activities and the reasonableness of AES's preconstruction activity plan also supports the various impact findings made by the staff in its FEIS as well as issuance of the proposed license.

3. Greenhouse Gas Impacts of Facility's Production Power Consumption

a. Introduction

4 .48 At all levels of government, policymakers are attempting to account for and address greenhouse gas (GHG) emissions. At the NRC, the Commission has directed the staff to consider GHGs in its environmental reviews for major licensing actions. The Commission also directed that in the interest of consistency, for power reactors the staff review should encompass emissions from the uranium fuel cycle as well as from construction and operation of the facility to be licensed. See Duke Energy Carolinas, LLC (William States Lee III Nuclear Station, Units 1 and 2), CLI-09-21, 70 NRC 927, 931 (2009). Since receiving this Commission direction, the staff has issued several EISs considering GHGs. See, e.g., Exh. NRC000169, at 6-8 to -9 (1 Office of New Reactors, NRC & Planning, Environmental and Regulatory Division, U.S. Army Corps of Engineers, [EIS] for [COLs] for South Texas Project Electric Generating Station Units 3 and 4, NUREG-1937 (Feb. 2011)) [hereinafter South Texas COL EIS].

4 .49 Per the Commission's NEPA GHG impacts guidance, the FEIS for the EREF includes a discussion concerning the GHG emissions associated with the construction, operation, and decommissioning of that facility. See FEIS at 4-127 to -142. In environmental question 11, the Board inquired why, given the discussion in the EISs for COL applications (such

as that for the proposed South Texas facility) indicating that uranium enrichment facilities are primarily responsible for the carbon footprint of the uranium fuel cycle due to their high energy demands, there was no FEIS discussion of the GHG emissions that would be generated providing electricity to power the EREF centrifuges. See Initial Board Environmental Questions app. A, at 4. In its response, the staff declared:

> The NRC staff analyzed GHG impacts in both regional and national contexts while attempting to focus on the most meaningful aspects of EREF operation. In determining which aspects of the EREF operation would be included in the impact analysis, the staff reviewed available historical data on Idaho and national GHG emissions. Projections provided by Rocky Mountain Power regarding how required power would be provided to the EREF indicated that modifications to existing substations, the addition of one new substation, and construction of a 161-[kilovolt] transmission line would be needed, but no new generating capacity was proposed (NRC000134 at 2-12). Although it was impossible to specify the relative contributions from Idaho generating sources, it was possible to calculate a hypothetical bounding condition for GHG emissions from electricity production by assuming all required power would be generated by coal-fired power plants (the largest source of carbon dioxide emissions per unit of power produced among any of the existing utility-scale thermoelectric technologies).
>
> However, the staff determined that such an assumption would be contrary to the historical record since no coal-fired power plants are currently operational in Idaho and, although an earlier State of Idaho moratorium on new coal plants has since expired, none are proposed for the foreseeable future. Natural gas-fired power plants, the only fossil fuel plants currently operating in Idaho, release roughly one third of the GHGs than coal-fired plants for equivalent amounts of power. Furthermore, the staff's review of available state and national data (NRC000168) revealed that natural gas accounts for only14 percent of Idaho electricity, while over 80 percent is generated by hydroelectric facilities, resulting in the electricity sector representing a relatively minor contribution to statewide total GHG emissions and Idaho accounting for only 0.1 percent of the national GHG emissions from electricity production. Data from state and national inventories of GHG emissions presented in Table 4-33 (NRC000134 at 4-133) further reveal that while transportation-related GHG emissions in Idaho and the United States (in calendar year 2000) accounted for virtually the same percentage of the state and national total GHG emissions (27 percent and 26 percent, respectively), percentages

> of GHG emissions related to electricity consumption were dramatically different (13 percent of the statewide total versus 32 percent of the national total).
>
> Given the relatively small projected energy requirements for the EREF, which Rocky Mountain Power has indicated it can provide without additional generation capacity, and the reasonable expectation that the majority of required power would be generated by relatively GHG-free Idaho hydroelectric technologies, the staff determined that generating the electricity needed to support EREF operations would represent a relatively minor indirect contribution to the EREF GHG operational footprint and that the licensing decision, which this EIS supports, would be better informed by concentrating the GHG impact analysis on other aspects of EREF operation. Statewide GHG emission projections (NRC000134 at 4-132) revealed that by 2020, the transportation sector would make the largest contribution to statewide GHG, followed by agriculture-related activities and fuel consumption. Consequently, since both transportation and on-site fuel consumption were integral to EREF operation, the staff focused its GHG impact analysis on EREF's potential contribution to the transportation and fuel consumption sectors.
>
> Regarding the manner in which the environmental impacts of the uranium fuel cycle were introduced into the EIS for the South Texas Project Electric Generating Station Units 3 and 4 COL, NRC regulations at 10 C.F.R. § 51.51(a) require that the contributions of the uranium fuel cycle be evaluated and added to the environmental costs of a proposed new nuclear power plant. It was also appropriate for the South Texas Project's EIS to include a GHG assessment of the nuclear fuel cycle since the results of such an analysis would provide an important reference point for the proposed action against which to evaluate the GHG footprints of alternative power generating technologies. However, as acknowledged in Section 6.1 of the South Texas Project's EIS (NRC000169), the electric power demand for the gas centrifuge enrichment technology proposed for the EREF is significantly less than that for gaseous diffusion enrichment technology. Thus, coupled with the information discussed above regarding the low impact to GHG emissions from generation of electricity to power the proposed EREF, the staff focused its analysis in the EREF EIS on other sources of GHG emissions associated with EREF operations.

Staff Initial Answers at 10-12.

4 .50 Relative to this staff answer, noting that (1) coal-fired electrical generation associated with the annual production at a gaseous diffusion plant of the number of SWUs intended to be produced annually by the EREF gas centrifuges would generate approximately 25.5 million metric tons (MT) of GHGs; and (2) the staff in the EREF FEIS had discussed GHG emissions in the neighborhood of 10,000 MT, in environmental question 22 the Board requested a quantitative showing of what the GHG emissions would be for the EREF's electrical consumption. See Board's Third Environmental Questions app. A, at 3. In its response to environmental question 22, the staff indicated that if the EREF was dependent on coal-fired electrical generation, the GHG production for the electricity required to operate the facility annually would amount to approximately 276,000 MT. The staff also observed, however, that (1) GHG-free hydropower is readily available in Idaho; (2) AES cannot dictate the source of power being delivered to the EREF; (3) there is no evidence to suggest that the EREF will cause any dramatic shift in how electricity is produced, or imported into, Idaho; and (4) the power demands of the EREF are small relative to a gaseous diffusion facility. As a consequence, according to the staff, nothing suggests that electricity generation will be a primary factor responsible for EREF-related GHG emissions. See Staff Third Environmental Questions Response at 3-4.

4 .51 With this response in hand, the Board requested the following presentation from the parties:

> In its responses to Board environmental questions 11 and [22] (Prefiled Exhs. NRC000136 and NRC000176), the staff indicated that although the EREF's annual full production power consumption could be responsible for the release of 276,036 tons of [GHG] emissions if all the required power were produced by coal-fired power plants, the current Idaho electricity technology profile (i.e., dominant use of hydropower and greater reliance on natural gas), when combined with the comparatively small power demands of the EREF relative to a gaseous diffusion plant of equivalent capacity, suggests that electricity will not be a primary factor responsible for GHG emission relating to EREF operations. Relative to these responses, please provide a presentation that:

a. Explains whether and why the significance level of SMALL assigned to the EREF GHG emission impacts (FEIS at 4-142) would or would not be affected if all the required power for the facility were produced by coal-fired power plants; and

b. (i) Provides a best estimate of the annual GHG emissions that would be associated with EREF's annual full production power consumption if all the required power for the facility were produced consistent with the electricity technology profile for likely EREF power suppliers (i.e., those supplying power to the eastern Idaho region); and (ii) explains whether and why the significance level of SMALL assigned to the EREF GHG emission impacts (FEIS at 4-142) would or would not be affected if all the required power for the facility were produced consistent with the electricity technology profile for likely EREF power suppliers.

Board Presentation Topics and Administrative Directives at 3-4.

b. Witnesses and Evidence Presented

4 .52 The staff was the lead party for this presentation topic. At the evidentiary hearing, after the staff's slides were admitted into evidence, see Exh. NRC000190 (NRC Staff Presentation Topic 3, Greenhouse Gas Impacts of Facility's Production Power Consumption) [hereinafter Staff GHG Presentation], two staff witnesses provided testimony on this subject, see Tr. at 478-519. AES did not make a presentation regarding this topic or proffer any witnesses for Board questions.

4 .53 Also, as was noted in section II above, see supra p. 7, after the evidentiary hearing but before the record was closed, in response to an unopposed staff request, the Board permitted the staff to supplement its evidentiary presentation with two new exhibits. One was the affidavit of Dr. Bruce M. Biwer, which incorporates revised versions of slides 10 and 11 from the staff's GHG presentation, while the other was the DOE EIA's June 2011 Monthly Energy Review. See Exh. NRC000216 (Affidavit of Bruce M. Biwer Concerning the NRC Staff Unopposed Motion

to Amend and Supplement the Record (July 29, 2011)) [hereinafter Biwer GHG Affidavit]; Exh. NRC000217 (EIA, DOE, June 2011 Monthly Energy Review, DOE/EIA-0035(2011/06) (June 28, 2011)).

4 .54 Relative to the evidentiary hearing presentation on this subject, the staff's first witness, Ron Kolpa, received a B.S. degree in chemistry from Illinois Benedictine University and an M.S. degree in chemistry from Iowa State University. Mr. Kolpa has over thirty years of experience in the areas of environmental science and environmental protection at both federal and state government agencies. Currently, Mr. Kolpa works as an environmental systems engineer and supervisor in the Physical Sciences Section of the ANL Environmental Science Division. See Exh. NRC000154 (Ron Kolpa SPQ).

4 .55 The background and qualifications for the staff's second evidentiary session witness, Stephen Lemont, and Dr. Biwer, the witness supporting its post-hearing evidentiary submission, are outlined in section IV.A.1.b.ii supra.

4 .56 Based on the respective qualifications and experience of the proffered witnesses, the Board finds each of these staff witnesses qualified to testify regarding GHG impacts of the EREF's production power consumption.

c. Regulations and Guidance Relating to Greenhouse Gas Impacts of Facility's Production Power Consumption

4 .57 Under NEPA, the NRC must assess the environmental impacts of a proposed facility, including those impacts associated with GHG emissions by the proposed facility. See Lee, CLI-09-21, 70 NRC at 931. In assessing GHG impacts, the NRC must devote its resources to taking a "hard look" at the issue. Pa'ina Hawaii, LLC (Materials License Application), CLI-10-18, 72 NRC __, __ (slip op. at 21) (July 8, 2010); Louisiana Energy Servs., LP (Claiborne Enrichment Ctr.), CLI-98-3, 47 NRC 77, 87-88 (1998). This standard requires the agency to rigorously explore and objectively analyze impacts, so that merely offering "'general statements

about "possible" effects and "some risk" do[es] not constitute a "hard look" absent a justification regarding why more definitive information could not be provided.'" Pa'ina, 72 NRC at __ (slip op. at 21) (quoting Blue Mountains Biodiversity Project v. Blackwood, 161 F.3d 1208, 1213 (9th Cir. 1998)). Taking a hard look "'foster[s] both informed decision-making and informed public participation,'" and thus ensures that the agency does not act upon "incomplete information, only to regret its decision after it is too late to correct." LES, 47 NRC at 88 (quoting Marsh, 490 U.S. at 371).

4 .58 At the same time, the agency need not undertake an unceasing impacts analysis. Rather, because NEPA is premised on a "rule of reason," the agency need only consider the reasonable alternatives to a proposed action. See Pa'ina, 72 NRC at 22. As a result, the NRC may decline to examine "remote and speculative risks" or events with "inconsequentially small" probabilities. See Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station), ALAB-919, 30 NRC 29, 44 (1989). In that regard, according to the Council on Environmental Quality (CEQ), the "rule of reason" is "a judicial device to ensure that common sense and reason are not lost in the rubric of regulation." Final Rule: National Environmental Policy Act Regulations; Incomplete or Unavailable Information, 51 Fed. Reg. 15,618, 15,621 (Apr. 25, 1986).

4 .59 Irrespective of the cause of the impact or the appropriate level of administrative scrutiny, for the purpose of NEPA evaluation NRC regulations categorize impacts into three types: direct, indirect, and cumulative. See 10 C.F.R. § 51.14(b) (adopting various CEQ regulations, including definitions of direct, indirect, and cumulative effects/impacts in 40 C.F.R. §§ 1508.7, 1508.8, 1508.25). Direct impacts are those caused by the action that is the subject of the EIS, and occurring at the same time and place as that action, while indirect impacts are caused by the action at a later time or more distant place, yet are still reasonably foreseeable.

See 40 id. § 1508.8. In contrast, cumulative impacts are those that "result[] from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." Id. § 1508.7. But regardless of their classification as direct, indirect, or cumulative, impacts that are reasonably foreseeable are to be assessed. See 10 id. Part 51, app. A, § 7.

4 .60 Finally, as a tool for assessing the significance of potential impacts, NRC regulations establish a standard scheme. See, e.g., id. Part 51, app. B, table B-1 n.3. This protocol was created based on the approach outlined in section 1508.27 of the CEQ regulations, which indicates that agencies should consider both the context and intensity of impacts. See 40 id. § 1508.27. The NRC has established three levels of impacts -- SMALL, MODERATE, and LARGE -- that are defined as follows:

> SMALL. The environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource.
>
> MODERATE. The environmental effects are sufficient to noticeably alter but not to destabilize important attributes of the resource.
>
> LARGE. The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

FEIS at xxxi.

d. Evidentiary Findings

4 .61 In the atmosphere, GHGs are transparent to incident solar radiation, but they act to trap radiation reflected from the surface of the earth, thus preventing heat from dissipating through the atmosphere and into space. Over time this process warms the earth's atmosphere. See Tr. at 483-84 (Kolpa Test.). GHGs principally result from the burning of fossil fuels, such as

coal or natural gas. See Staff GHG Presentation at 3, 5; Tr. at 483 (Kolpa Test.). The burning process emits three primary GHGs: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). See Tr. at 483 (Kolpa Test.). Since CO_2 predominates, convention dictates that the GHG amounts are combined and represented as a CO_2-equivalent (CO_2e). See Tr. at 483 (Kolpa Test.); see also Exh. NRC000193, at 3-1 n.52 (U.S. Environmental Protection Agency [(EPA)], Inventory of U.S. [GHG] Emissions and Sinks: 1990-2009, EPA 430-R-11-005 (Apr. 15, 2011)).

4 .62 On a national level, coal is used to produce 45 percent of the electric power in the United States, whereas hydroelectric generation accounts for just 7 percent. See Staff GHG Presentation at 3; Exh. NRC000191, at 230 (Table 8.2a) (EIA, DOE, Annual Energy Review 2009, DOE/EIA-0384 (2009) (Aug. 19, 2010)). In Idaho, however, hydroelectric dominates as the energy production source, being responsible for 79.6 percent of electricity produced in that state. See Exh. NRC000192, at 75 (EIA, DOE, State Electricity Profiles 2009, DOE/EIA-348(01)/2 (Apr. 15, 2011)); see also Staff GHG Presentation at 4; Tr. at 487-88 (Kolpa Test.). Further, because hydroelectric produces no GHGs, electricity production in Idaho contributes only a small share of the nation's GHG emissions, i.e., approximately 0.05 percent of the national electricity-related GHG emissions. In other words, for each unit of electricity produced, far fewer GHGs are likely to be emitted if that electricity is produced in Idaho than almost anywhere else in the United States. See Staff GHG Presentation at 6; Tr. at 490 (Kolpa Test.).

4 .63 But the electricity to power the EREF would not necessarily come from sources exclusively within Idaho. See Tr. at 502-03 (Kolpa Test.); Exh. NRC000194, at 73 (showing total power sales within Idaho nearly twice as large as net generation within Idaho) ((EIA, DOE, State Electricity Profiles 2009, DOE/EIA-348(01)/2 (Apr. 15, 2011)) [hereinafter 2009 Idaho Summary

Statistics].[16] As a rule of thumb, transmission operators attempt to supply power to satisfy a load from the closest possible baseload source, a practice that reduces transmission losses. See Tr. at 488, 497-98, 500 (Kolpa Test.). Although this practice means that the EREF would likely receive most of its power from local in-state sources, ultimately the sources of EREF's power could vary regularly and, in any event, would be outside of AES's control. See Tr. at 500-03 (Kolpa Test.). Electricity to power the EREF thus may come from sources outside of Idaho.

4 .64 At the Board's request, as a bounding condition for the GHG emissions associated with EREF's annual full production power consumption of 683,280 megawatt hours (MWh), see Staff Third Environmental Questions Response at 3, the staff calculated the resulting GHG emissions as if all the required power for the facility were produced by coal-fired power plants. According to the staff, utilizing such a power source would produce GHG emissions of 674,900 MT CO_2e annually.[17] See Biwer GHG Affidavit at unnumbered p. 2 (revising slide 10 to Staff GHG Presentation). Such a coal production-only figure would be approximately 0.031 percent of the 2009 annual United States electricity generation GHG emissions of 2,154 million MT CO_2e, which according to the staff would have a SMALL impact on the environment. See id. at unnumbered p. 3.

4 .65 In addition to this bounding estimate, in response to a Board request for a GHG estimate based on sources utilized in the area near the EREF, using the most recent emissions

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[16] Although submitted separately, exhibits NRC000192 and NRC000194 are excerpts from the same EIA/DOE document.

[17] This emission factor was derived by dividing the estimated annual amount of CO_2e generated by coal-fired power plants in the United States in 2010 (approximately 1,828 million MT) by the estimated amount of power generated by these plants in 2010 (approximately 1,850.8 million MWh), yielding an estimated emission factor of 0.9877 MT CO_2e/MWh. This figure, when multiplied by the EREF annual power demand figure of 683,280 MWh/year, yields 674,900 MT/year of CO_2e as the GHG emissions if all of the electrical power to the EREF were to be supplied by coal-fired electric generating plants. See Biwer GHG Affidavit at unnumbered p. 2.

figures available from the EPA, the staff calculated the annual GHG emissions if the power for the EREF were obtained from the Northwest Power Pool (NWPP), which includes the State of Idaho.[18] See id. at unnumbered pp. 3-4. The annual EREF power demand of 683,280 MWh and a staff-identified emission factor for the NWPP of 858.8 pounds (lb)/MWh CO_2e yields an annual GHG emission rate of 266,749 MT CO_2e. See id. The staff considers such an emission, at 0.012 percent of the 2009 United States electricity generation GHG emissions, to have a SMALL impact on the environment as well. See id. at unnumbered p. 4.

4 .66 Finally, of its own volition, based on the assumption that all EREF power is provided by Idaho generators with their extensive hydroelectric power generation capacity, the staff provided an estimate of GHG impacts using a 2009 annual emission factor of 172.0 lb/MWh CO_2 for Idaho generators derived from a 2009 electrical generation CO_2 emissions total of 1,024,000 MT, which yielded an annual EREF GHG emissions figure of 54,145 MT CO_2.[19] See Staff GHG Presentation at 10; Tr. at 506 (Kolpa Test.). This, in turn, would be 0.0025 percent of the 2009 United States electricity generation GHG emissions, which the staff likewise characterized as SMALL. See Staff GHG Presentation at 12-13; Tr. at 506 (Kolpa Test.).

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[18] The NWPP, one of several non-overlapping geographic regions in the United States that are defined by EPA for the purpose of collecting GHG emissions data, encompasses the upper northwestern portion of the continental United States, including Idaho and the surrounding areas. See Tr. at 492 (Kolpa Test.); see also Exh. NRC000195 (EPA, eGRID2010 Version 1.1 Year 2007 GHG Annual Output Emission Rates (May 10, 2011) [hereinafter 2007 GHG Annual Output Emission Rates]. For each of these geographic regions, EPA calculates an annual GHG emission rate. See Tr. at 491-92 (Kolpa Test.). According to EPA, "[a]nnual total output emission rates for [GHGs] can be used as default factors for estimating GHG emissions from electricity use when developing a carbon footprint or emission inventory." 2007 GHG Annual Output Emissions Rates.

[19] Although the staff subsequently refers to this as a CO_2e figure, see Staff GHG Presentation at 12, it appears this number reflects only CO_2 emissions, see 2009 Idaho Summary Statistics at 73.

e. Board Conclusions Regarding Greenhouse Gas Impacts of Facility's Production Power Consumption

4 .67 In considering the impacts associated with the GHG estimates provided by the staff, as the staff noted, see Tr. at 515-16 (Lemont Test.), the agency has only recently begun considering the NEPA impacts of GHGs for licensing actions and is still striving to develop a consistent approach, with the Commission directing the staff to consider GHG impacts in a comprehensive and uniform manner. With that in mind, in reaching our decision regarding the adequacy and accuracy of the staff's analysis of the GHG emission impacts of EREF power production, we discuss several issues that deserve further explication.

4 .68 Initially, we note that in response to the Board's written questions and later at the evidentiary hearing, the staff appeared to rely upon a distinction between what it perceived as the more direct environmental impacts associated with EREF GHG emissions and the "relatively minor indirect contribution" to GHG emissions of the EREF's production power consumption as a basis for not providing any EIS consideration of the GHG impacts of such power consumption. See Staff GHG Presentation at 11-12; Tr. at 509-11 (Kolpa Test.), 512-14 (Lemont Test.). According to the staff, its focus was on direct GHG impacts from the EREF, as opposed to those over which applicant AES has no control, as would be the case with regard to how the EREF's production power requirements are fulfilled. Moreover, according to the staff, there was no evidence that operation of the EREF would require the addition of any power production capacity by any local power producer. See Staff Initial Environmental Questions Response at 11. As a consequence, in the case of the EREF, the EIS analysis was limited to "direct" GHG impacts from preconstruction, construction, operation, and decommissioning. See Tr. at 507-08, 511 (Kolpa Test.).

4 .69 We, however, do not regard such characterizations as supported by agency regulations or the record of this hearing. While GHG impacts from EREF's production power

consumption may be indirect in the sense that they potentially are caused at distant places where the electricity utilized by the facility is generated,[20] they nonetheless are reasonably foreseeable so as to deserve consideration if of sufficient moment.[21] See 40 C.F.R. § 1508.8. Moreover, the record before us demonstrates that these indirect impacts are not necessarily smaller in magnitude than the direct impacts that were considered in the EREF EIS: for example, indirect annual emissions of 266,749 MT CO_2e in the NWPP scenario or 54,145 MT CO_2 for the Idaho-only estimate as compared to direct emissions of 26,136 MT CO_2 annually from facility operation.[22] Compare Biwer GHG Affidavit at unnumbered pp. 2, 3-4 with FEIS at 4-141; see also Tr. at 506 ("54,145 metric tons of greenhouse gas is certainly not an insignificant number") (Kolpa Test.). Further, given previous agency EIS statements that "[t]he

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[20] Additionally, the staff's description of direct impacts may in some instances be under-inclusive of the regulatory definition. NRC regulations adopt the CEQ definition of "direct impacts," which are those that are "caused by the action and occur at the same time and place," 40 C.F.R. § 1508.8, whereas the staff appears to designate direct impacts as those over which the facility owner or operator has control, see Tr. at 511-12 (Kolpa Test.). In certain instances, however, impacts can arise at a facility over which no one has control or someone else has control, yet the impact still occurs at the facility. In those instances the staff's definition seemingly would not capture direct impacts as defined by the regulations.

[21] Also in this regard, we note that recently-issued CEQ draft guidance regarding the consideration of climate change and GHG emissions in EIS analyses suggests that since "Federal agencies typically describe their consideration of the energy requirements of a proposed action," in the context of that analysis "agencies should evaluate GHG emissions." See Memorandum from Nancy H. Sutley, Chair, CEQ, to Heads of Federal Departments and Agencies, Draft NEPA Guidance on Consideration of the Effects of Climate Change and [GHG] Emissions (Feb. 18, 2010) at 5 (citing 40 C.F.R. § 1502.16(e)) [hereinafter CEQ Draft GHG Emissions Memorandum].

[22] The pending CEQ draft guidance on climate change consideration suggests that, along the lines of the discussion in this section, a quantitative measure of estimated GHG emissions "can serve as a reasonable proxy for assessing potential climate change impacts, and provide decision makers and the public with useful information for a reasoned choice among alternatives," and that a useful indicator of the need for an EIS GHG analysis may be a proposed action's generation of more than 25,000 MT of direct CO_2e GHG emissions. Id. at 3. While the GHG emissions involved here are admittedly indirect rather than direct, even at the lowest Idaho-only levels proffered by the staff, they exceed this reference point by a factor of two.

largest source of [CO_2] emissions associated with nuclear power is from the fuel cycle" and "[t]he largest use of electricity in the fuel cycle comes from the enrichment process," South Texas COL EIS at 6-9, attempting to dismiss the need for an EIS discussion of such impacts based solely on the unspecified difference in electrical consumption between a gaseous diffusion facility, such as the PGDF, and a gas centrifuge facility, such as the EREF, see Staff Initial Environmental Questions Response at 12, fails as a matter of consistency. As a result, we see no basis in logic or fact for the staff's failure to discuss such impacts in its FEIS.

4 .70 That being said, in responding to the Board's written questions and request for a presentation on GHG impacts associated with the proposed EREF production power consumption, the staff ultimately provided the basis for an adequate analysis under NEPA. As requested by the Board, the staff assessed the GHG emission rates for two scenarios. The staff first offered data and analysis detailing a GHG emission rate if all the required power for the EREF was produced by coal-fired power plants. That emission rate -- 674,900 MT CO_2e annually -- represents an upper bounding value. This can be contrasted with the second staff figure of 266,749 MT CO_2e annually that reflects a discounting of the annual EREF GHG emission rate to recognize the substantial reliance on non-coal sources, such as hydroelectric power, by Idaho-region NWPP electricity sources likely to supply the EREF.[23] The staff also

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[23] This NWPP CO_2e figure, apparently computed by using the annual total output emission rates for the NWPP of 858.79 lb CO_2/MWh, does not appear to account for the 16.34 lb CH_4/gigawatt hours (GWh), and 13.64 lb N_2O/GWh that would be components of any CO_2e estimate. See 2007 GHG Annual Output Emission Rates. At one point, the staff suggested that this figure was 888.77 lb CO_2e/MWh, but this appears to reflect a misreading of the CH_4 and N_2O figures in exhibit NRC000195 as based on megawatt hours rather than gigawatt hours. Compare id. with Staff Third Environmental Questions Response at 3-4. Instead, as is reflected in another (albeit nonrecord) portion of the EPA document the staff cited in support of the 858.79 lb figure, the correct CO_2e number for the NWPP appears to be 863.36 lb/MWh, which would result in a GHG emission figure for the EREF of 268,165 MT/year of CO_2e. See EPA, eGRID2010 Version 1.1 Year 2007 eGrid Subregion Emissions - Greenhouse Gases at 1 (May 10, 2011),

(continued...)

provided another possible GHG footprint estimate of 54,145 MT, based on the assumption that all the power for the EREF was being provided by hydroelectric-dominant Idaho producers. Further, a comparison of these three emission rate figures to the 2009 United States electricity generation GHG emission figures shows them to be 0.031, 0.012, and 0.0025 percent, respectively, of the United States GHG emissions. See Biwer GHG Affidavit at unnumbered pp. 3-4; Staff GHG Presentation at 12. And, as was noted above, relative to all three of these estimates the staff concluded that GHG emission rates would result in no more than a SMALL impact on the environment relative to the 2009 United States electricity generation GHG emission rate.

4 .71 With regard to the size of the GHG impact at issue here, initially we find that, as among the three scenarios addressed by the staff, the estimates based upon the NWPP figures are the most reasonable under the circumstances for assessing the environmental impacts of the proposed EREF. Although the Board sought a GHG analysis based on what is typical for electrical generation supply in the area in which the EFEF is located, the staff indicated it was unable to provide such an analysis, suggesting instead that the impacts critique should best focus on what would typically come from electric power generators located in the state of Idaho. See Tr. at 497-99 (Kolpa Test.). This staff alternative, however, fails to account adequately for the fact that power is typically wheeled widely in a given region depending on needs and availability. See Tr. at 500-02 (Kolpa Test.). As a consequence, we consider the NWPP estimate more depictive of EREF power usage and the associated GHG production than the Idaho-only estimate that the staff appears to prefer.

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[23](...continued)
http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2010V1_1_year07_SummaryTables.pdf (last visited Oct. 2, 2011) [hereinafter 2007 Subregion Greenhouse Gas Emissions].

4 .72 And relative to the level of the particular GHG impacts associated with the facility's production power consumption, i.e., SMALL, MODERATE, or LARGE, from our perspective, for an individual facility, in most instances looking at anything beyond a comparison with the annual United States GHG impacts associated with the particular emission-generation activity at issue (here, electrical generation) comes close to predetermining that any GHG contribution will be considered SMALL. In this instance, a comparison of the figures associated with the three annual EREF GHG production scenarios and the 2008 global fossil fuel GHG figures posited by the staff shows that the GHGs arising from the EREF-related estimates are, respectively, 0.0023, 0.00091, and 0.00018 percent of the global GHG figures, see Biwer GHG Affidavit at unnumbered pp. 3-4; Staff GHG Presentation at 12, which are numbers that tend to mask any real significance the impacts might actually have.[24]

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[24] Given source diversity and the low GHG emission levels of most entities, the problem of how best to assess the significance of GHG emissions for a particular source was also addressed in the draft CEQ guidance document:

> Because climate change is a global problem that results from global GHG emissions, there are more sources and actions emitting GHGs (in terms of both absolute numbers and types) than are typically encountered when evaluating the emissions of other pollutants. From a quantitative perspective, there are no dominating sources and fewer sources that would even be close to dominating total GHG emissions.
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> . . . .
>
> Under this proposed guidance, agencies should use the scoping process to set reasonable spatial and temporal boundaries for this assessment and focus on aspects of climate change that may lead to changes in the impacts, sustainability, vulnerability and design of the proposed action and alternative courses of action.

CEQ Draft GHG Emissions Memorandum at 2. In this instance, the spatial and temporal boundaries for an assessment seem best drawn at a local or regional level (rather than on a national or global basis), although, for the same reason we find reliance on Idaho-only electrical production GHG emissions to be an unrealistic basis for computing the annual GHG emissions

(continued...)

4 .73 That being said, we have no difficulty in concluding that the staff's determination that the annual GHG emissions associated with the EREF's power production are SMALL was correct.[25] With EREF GHG emissions based on NWPP power production being 0.012 percent of annual United States GHG electrical generation emissions, that designation has the requisite reasonable support in logic and fact.[26] Moreover, the record, including the staff's FEIS as supplemented by all adjudicatory materials in this proceeding, indicates that the staff's review of GHG emissions has been adequate pursuant to 10 C.F.R. Part 51 and supports issuance of the proposed license.

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[24](...continued)
associated with electrical power production for the EREF, the staff's suggestion that using Idaho-only annual GHG emissions as a basis for comparison seems less than satisfactory.

It should be added that another issue with the annual global GHG figures referenced by the staff in its analysis is that using those estimates for comparative purposes poses a proverbial "apples and oranges" problem. Assonance between the compared GHG-producing activities being of some importance, measuring a figure for global "fossil fuel" GHG generation against a figure for "electricity generation" GHG production makes the comparative usefuless of the global figure problematic.

[25] Although not directly addressed in this context are the possible cumulative effects of the GHG emissions arising from electrical generation associated with the EREF, given the potential size of the emissions as identified above and the limited number of enrichment facilities either licensed or under (or likely to be under) consideration for licensing in this country, as a practical matter we do not see that in this particular instance such an analysis would provide any additional information relevant to the agency's NEPA inquiry. See CEQ Draft GHG Emissions Memorandum at 10.

[26] Not presented by the staff was an estimate of EREF GHG emissions as a percentage of the NWPP electrical generation, a figure that, given our preference for the NWPP emission calculations as a reasonable measure of EREF GHG emissions, see supra p. 55, we might consider to be the most accurate measuring stick for GHG impacts in this instance, see Tr. at 509-10 (staff would attempt to make the greenhouse gas calculation consistent with way impacts were calculated for other resources, so if impacts were identified at state level, then greenhouse gas impacts would be identified at that level) (Kolpa Test.). Nonetheless, another (although again nonrecord) portion of the same EPA document that the staff relied upon to generate the NWPP numbers, see supra note 23, suggests that the EREF would contribute about 0.23 percent of the annual NWPP CO_2e emissions, see 2007 Subregion Greenhouse Gas Emissions, likewise a SMALL impact.

4. Preconstruction and Construction Air Quality Impacts

a. Introduction

4 .74 In its FEIS, the staff stated that while the air quality impacts arising from AES preconstruction and construction activities associated with the EREF generally would be SMALL for all hazardous air pollutants, such as organic compounds, and for all criteria air pollutants, such as carbon monoxide, nitrogen oxide, and sulfur dioxide, that was not the case for particulates. See FEIS at 4-113. Rather, the staff declared, air quality impacts "would be MODERATE to LARGE for particulates during certain periods of preconstruction, despite application of appropriate mitigations," with construction impacts being SMALL because "construction activities are expected to constitute 10 percent of the overall impacts from preconstruction and construction." Id. According to the staff, these MODERATE to LARGE preconstruction impacts were likely to arise as a result of fugitive dust generation and to last only as long as the dust-generating activities were underway. See id. at 4-12. In contrast, the NRC staff asserted in the FEIS that during operation of the proposed EREF, the impacts on air quality would remain SMALL. See id.

4 .75 To better understand how the staff reached these conclusions regarding the potentially MODERATE to LARGE air quality impacts during preconstruction and construction, the Board requested that the parties provide the following presentation:

> Please provide a presentation regarding the staff's FEIS-related analysis of EREF [preconstruction and] construction air quality impacts, which should include a discussion of the following:
>
> a. The adequacy and capabilities of the selected air dispersion model;
>
> b. The determination of the surface data, meteorological data, terrain data, and modeling assumptions used; and

c. The results obtained.

Board Presentation Topics and Administrative Directives at 3-4; see Licensing Board Memorandum and Order (Corrections Regarding June 2, 2011 Issuance and Prefiled Exhibit NRCR00077) (June 21, 2011) at 1 (unpublished).

b. Witnesses and Evidence Presented

4 .76 Once again, the staff served as the lead party for this presentation, providing the testimony of one witness to elucidate its presentation materials that were admitted into evidence. See Tr. at 519-57; Exh. NRC000197 (NRC Staff Presentation for Topic 4, Preconstruction and Construction Air Quality Impacts) [hereinafter Staff Air Quality Impacts Presentation]. AES did not provide a witness for this topic.

4 .77 The background and qualifications for staff witness Ron Kolpa, who was the technical reviewer for and author of the FEIS section on air quality impacts, see Tr. at 524 (Kolpa Test.), are discussed at section IV.A.3.b. supra.

4 .78 Based on his qualifications and experience, the Board finds this staff witness qualified to testify regarding preconstruction and construction air quality impacts.

c. Regulations and Guidance Regarding Preconstruction and Construction Air Quality Impacts

4 .79 Under NEPA, the agency must assess the environmental impacts of a proposed facility like the EREF. See 42 U.S.C. § 4332(2)(C)(i). Following this general NEPA directive to evaluate impacts, the staff assesses air quality impacts as a matter of course. See, e.g., USEC, Inc. (Am. Centrifuge Plant), LBP-07-06, 65 NRC 429, 487-88 (2007). In keeping with its standard impact evaluation protocol, the staff categorizes these impacts as SMALL, MODERATE, or LARGE. See section IV.A.3.c supra.

4 .80 In parallel with the staff's role under NEPA to assess environmental impacts, the EPA possesses authority under the Clean Air Act to set numerical standards for air pollutants

from emission sources, which would include the proposed EREF. See 42 U.S.C. § 7411. EPA's National Ambient Air Quality Standards (NAAQS) set maximum levels for air pollutants in the ambient air deemed to provide protection for human health and welfare. See 42 U.S.C. § 7409(b); 40 C.F.R. Part 50. NAAQS exist for sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), lead, ozone, particulate matter (PM) with an aerodynamic diameter greater than or equal to 10 micrometers (μm) (PM_{10}), and PM with an aerodynamic diameter greater than or equal to 2.5 μm ($PM_{2.5}$). See 40 C.F.R. Part 50. In Idaho, EPA has granted authority to the State to implement, maintain, and enforce its own EPA-compliant air quality programs through State Ambient Air Quality Standards (SAAQS). See 42 U.S.C. § 7410(a)(1). That, however, does not relieve the NRC of its duty under NEPA to assess the environmental impacts of air pollutants associated with the proposed EREF, including giving appropriate consideration both to whether any pollutant surpasses the NAAQS and the consequences of that pollutant exceeding the NAAQS.

d. Evidentiary Findings

4 .81 To assess the air quality impacts posed by the preconstruction and construction of the proposed EREF, the staff used an air dispersion model referred to as AERMOD, which is an acronym that reflects this regulatory model's development by the American Meteorological Society (AMS) and EPA. See Staff Air Quality Impacts Presentation at 3. Currently, AERMOD is the primary model for demonstrating compliance with EPA regulations and for State air quality protection planning. See id.; Tr. at 525 (Kolpa Test.); Exh. NRC000198, at 10-11 (Office of Air Quality and Standards, EPA, AERMOD: Description of Model Formulation, EPA-454/R-03-004, (Sept. 2008)) [hereinafter AERMOD Model Description]; Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions, 70 Fed. Reg. 68,218, 68,218 (Nov. 9, 2005). Although AERMOD has

replaced the Industrial Source Complex Model (ISC3) as the preferred model for this purpose, see AERMOD Model Description at 11, AERMOD itself is subject to a process of continuous verification and refinement, see Tr. at 553-56 (Kolpa Test.).

4 .82 AERMOD operates by modeling a steady-state Gaussian plume that predicts air dispersion based on defined parameters in the planetary boundary layer (PBL). See Staff Air Quality Impacts Presentation at 3; Tr. at 525-26, 537 (Kolpa Test.). The PBL is that layer of the atmosphere immediately adjacent to the ground surface. See id. at 525 (Kolpa Test.). Relevant modeling parameters in the PBL include atmospheric turbulence conditions and surface characteristics. See id. (Kolpa Test.). The ability of AERMOD to allow modeling across these parameters permits relative flexibility in obtaining air dispersion simulations based on a variety of site-specific characteristics, including rural/urban area, flat/complex terrain, surface-level/elevated releases, single/multiple sources, and point/area/line/volume sources, as well as one-hour to annual (or period) averaging times. See Staff Air Quality Impacts Presentation at 4; Tr at 525-27 (Kolpa Test.).

4 .83 As inputs to the model, AERMOD uses hourly, sequential, pre-processed meteorological data.[27] See Tr. at 526 (Kolpa Test.); see also Staff Air Quality Impacts Presentation at 5-6. Being able to employ such refined inputs permits estimates of not only airborne concentrations, but also dry and wet deposition rates for both particulate and gaseous non-reactive emissions. See Tr. at 526 (Kolpa Test.). Also, results can be averaged over timeframes ranging from one hour to multiple year periods. See Tr. at 526 (Kolpa Test.); see also Staff Air Quality Impacts Presentation at 4.

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[27] Surface hourly meteorological data inputs include ambient temperature, wind speed and direction at one- or multi-levels, station pressure, sky condition, standard deviation of wind direction fluctuations, and upper sounding data. See Staff Air Quality Impacts Presentation at 6; see also Tr. at 528 (Kolpa Test.).

4 .84 Three surface characteristic data comprise essential inputs to AERMOD: surface roughness, albedo, and the Bowen ratio. See Staff Air Quality Impacts Presentation at 7; Tr. at 528-30 (Kolpa Test.). Surface roughness, which represents the height of obstacles relative to wind flow, is a measure of surface irregularities that are associated with surface vegetation, topography, or structures and can alter the direction of the near-surface winds. See Tr. at 528-29 (Kolpa Test.). Albedo, which represents a reflection coefficient of solar radiation, is the ratio of the amount of radiation incident to a surface to the amount of radiation that is reflected from that surface. See Tr. at 529 (Kolpa Test.). Albedo is used to determine the amount of convection that can be expected at the PBL as a result of heat energy being radiated from the earth's surface, with fresh snow, which is highly reflective, and heavily vegetated cover, which allows very little incidental heat energy radiation, being the extremes in this regard. See Tr. at 529-30 (Kolpa Test.). The Bowen ratio, which is a surface moisture indicator that is the ratio of sensible heat flux to latent heat flux, is used to determine PBL parameters for the differing convective conditions that would occur over different planetary surfaces, with bodies of water at one end of the spectrum and the midday desert at the other.[28] See Tr. at 530 (Kolpa Test.); see also Staff Air Quality Impacts Presentation at 7.

4 .85 Surface characteristic data for AERMOD modeling used for the EREF were obtained on the EREF property as well as on comparable nearby properties, including the Materials and Fuels Complex (MFC) within the Idaho National Laboratory (INL) site, which is located about eleven miles west of the proposed EREF, and the Pocatello, Idaho municipal airport. See Exh. NRC000135, at C-4 to -5 (2 FSME, NRC, [EIS] for the Proposed [EREF] in

[28] Over water, the Bowen ratio describes heat transfer, either sensible heat, which is manifested as a change in temperature, or latent heat, which is manifested as an increase in water vapor in the PBL due to evaporation. Away from water, the Bowen ratio describes the manner in which heat incident to the ground surface promotes warming of the atmosphere and increases in near-surface relative humidity. See Tr. at 530 (Kolpa Test.).

Bonneville County, Idaho, NUREG-1945 (Feb. 2011)) [hereinafter FEIS Appendices]. The elevation, terrain features, and land uses surrounding the INL MFC are particularly comparable with those of the proposed EREF site. See FEIS Appendices at C-4; Tr. at 535 (Kolpa Test.). Further in this regard, terrain and land cover information required by AERMOD to model the surface characteristics over which the dispersing plume will pass was obtained from the United States Geological Survey's (USGS) digital elevation model and land cover data for the area around the MFC, which were utilized because they were considered representative of the EREF site. See Tr. at 534-35 (Kolpa Test.).

4 .86 Ideally, AERMOD meteorological data also should be obtained at the site to be modeled or as close by as practicable. For the EREF, the most reliable meteorological measuring station in the vicinity is a National Weather Service (NWS) station near the INL MFC. See Tr. at 531-32 (Kolpa Test.); FEIS Appendices at C-4. Moreover, to ensure that AERMOD meteorological data are representative over the long-term and are not influenced by unusual short-term conditions, five years of continuous data are used. See Tr. at 532 (Kolpa Test.). When individual datum was unavailable, substitute datum from the Idaho Falls Regional Airport, Fanning Field -- another NWS station -- was used. See Tr. at 532 (Kolpa Test.). Additionally, upper sounding data were gathered from the NWS station at Boise, which is the only place in the State where such data are collected. See Staff Air Quality Impacts Presentation at 8; Tr. at 534 (Kolpa Test.).

4 .87 In utilizing the AERMOD model to help arrive at an understanding of the air quality impacts associated with a proposed activity, in addition to inputs derived from direct meteorological measurements and surface/terrain characteristics, the staff imposed several assumptions on the AERMOD model intended to reflect the scale and duration of anticipated activities on the EREF site. In defining these assumptions, which the staff attempted to do using

conservative values tempered with professional judgment, see Tr. at 541, 552 (Kolpa Test.), the staff took into account a number of activities that could act as emission sources for criteria pollutants or particulates: types of construction vehicles, onsite comfort heating systems, ground disturbance and wind erosion, travel on unpaved roads, the onsite concrete batch plant, onsite petroleum fuel storage, corrosion control coatings handling and application, welding and brazing, and the use of explosives for grade alteration. See Staff Air Quality Impacts Presentation at 10. But the assumptions associated with those activities were, in turn, further dependent on other assumptions regarding construction schedules, size of active construction zones, number/type/condition of equipment used, workforce size, fuel consumption, soil type and moisture content, and intended mitigation measures. See Staff Air Quality Impacts Presentation at 11; Tr. at 540 (Kolpa Test.). As a consequence, the staff identified still other assumptions about circumstances on the EREF site that it considered relevant to informing the model, including AES employing well-maintained vehicles that, as appropriate, use low-sulfur diesel fuel; having the majority of the materials and equipment used on the site delivered from Idaho Falls; utilizing a workforce that commutes (without carpools or buses) from Idaho Falls with an average workday of ten hours for twenty-one days each month; managing air pollutants using best practices; and a particulate size consistent with high-silt unconsolidated soil on a average disturbed area of 221 acres. See Staff Air Quality Impacts Presentation at 12; Tr. at 541-43 (Kolpa Test.).

4 .88 Utilizing the input meteorological/surface data and the source assumptions, AERMOD facilitates a comparison of air quality results for the site with both the NAAQS and SAAQS. Criteria pollutants are modeled for CO, NO_2, SO_2, and PM for both PM_{10} and $PM_{2.5}$ particles. See Staff Air Quality Impacts Presentation at 14; Tr. at 545 (Kolpa Test.). AERMOD predicts that for the EREF, all of the NAAQS and SAAQS would be met at the property boundary,

except for particulates, which exceeded the standard at the property boundary primarily because of fugitive dust. See Staff Air Quality Impacts Presentation at 14-15; Tr. at 547 (Kolpa Test.).

4 .89 In that regard, total concentrations of PM_{10} and $PM_{2.5}$ particulates (including background) from preconstruction and construction are estimated to constitute as much as 271.5 percent and 105.3 percent of the NAAQS/SAAQS twenty-four hour limits, respectively. See Staff Air Quality Impacts Presentation at 14. Yet, PM_{10} and $PM_{2.5}$ particulates in the area of the EREF already have background concentrations roughly a third of the standard for PM_{10}, i.e., 52.0 micrograms per cubic meter ($\mu g/m^3$), compared to the twenty-four hour standard of 150 $\mu g/m^3$, and more for $PM_{2.5}$, i.e., 21.0 $\mu g/m^3$ compared to the twenty-four hour standard of 35 $\mu g/m^3$. See Staff Air Quality Impacts Presentation at 14; Tr. at 545 (Kolpa Test.). Thus, apart from EREF preconstruction or construction activities, substantial quantities of particulates from fugitive dust already impact air quality in the vicinity of the facility.

4 .90 Finally, relative to the AERMOD model, EPA has noted that AERMOD suffers from a modeling artifact that may exaggerate low wind speed ambient air concentrations.[29] See 70 Fed. Reg. at 68,245-46; see also FEIS Appendices at C-10 to -11. AERMOD is based on a steady-state Gaussian plume model, although that model does not accurately describe dispersion under calm conditions, see 70 Fed. Reg. at 62,245, and the resulting bias affects AERMOD's results for EREF air quality impacts. See Tr. at 547-50 (Kolpa Test.); FEIS Appendices at C-10 to -11. In reality, particulate concentrations are very sensitive to wind speed because low wind speeds can result in minimal dust dispersion once that particulate is airborne, resulting in the highest fugitive dust concentrations in downwind directions. See Tr. at 547

[29] Although EPA apparently intends to make modifications to AERMOD to address the recognized low wind speed bias in that model, the agency has not yet done so. See Tr. at 547, 549-50 (Kolpa Test.).

(Kolpa Test.). Consequently, accurate modeling of calm conditions becomes essential to an understanding of what may be the largest contributor to particulate concentrations.

4 .91 To better comprehend the magnitude of AERMOD's bias in assessing EREF air quality impacts, the staff performed a sensitivity analysis. The staff altered the input low wind speeds from 0.134 meters per second (m/s), which is the low threshold of wind-speed-measuring equipment at MFC, to 1.0 m/s. See Tr. at 548-49 (Kolpa Test.); FEIS Appendices at C-10 to -11. As a result of this change, the total PM_{10} concentration dropped from 271.5 percent of the NAAQS/SAAQS standards to 161.3 percent of the standard and the total $PM_{2.5}$ concentration dropped from 105.3 percent of the standards to 94.1 percent of the standards. See Exh. Staff Air Quality Impacts Presentation at 16; Tr. at 549 (Kolpa Test.).

e. Board Conclusions Regarding Preconstruction and Construction Air Quality Impacts

4 .92 In responding to the Board's request for a presentation on preconstruction and construction air quality impacts by the proposed EREF, the staff provided a complete and thorough analysis and presentation. The staff addressed each of the Board's concerns, including (1) the adequacy and the capabilities of the selected dispersion model; (2) the analysis underlying the staff's determinations about the surface data, meteorological data, terrain data, and other modeling assumptions that were to used in that model; and (3) the results that were obtained from the model. See Tr. at 523-24 (Kolpa Test.).

4 .93 Regarding the adequacy of the dispersion model, the staff reasonably relied upon a highly refined model -- AERMOD -- for modeling the impact of air pollutants associated with the proposed EREF. Regarded as the principal model for demonstrating compliance with EPA regulations, AERMOD takes into account years of pre-processed meteorological data along with surface/atmospheric conditions that would correspond to conditions at the proposed EREF to provide a reasonably accurate assessment of possible pollutant dispersion during facility

pre-construction and construction. Moreover, the fact that AERMOD is subject to a continuing process of verification and refinement provides assurance that the staff relied upon a capable dispersion modeling program.

4 .94 On the matter of modeling inputs, the staff reasonably determined the appropriate meteorological, surface/terrain, and other data inputs to AERMOD, which were obtained for the EREF property or for representative lands nearby. Moreover, the staff procured a comprehensive set of data parameters to inform AERMOD fully and obtained a substantial volume of pertinent data to represent conditions on the EREF site appropriately. Additionally, the staff reasonably relied upon various additional assumptions regarding the scope and duration of EREF preconstruction and construction activities and the existing circumstances at the EREF site to ensure that the model produced a reasonably accurate depiction of air quality impacts arising from pre-operational activities at the EREF site.

4 .95 Lastly, on the matter of modeling results, the staff obtained comprehensive results from AERMOD for CO, NO_2, SO_2, and both PM_{10} and $PM_{2.5}$. AERMOD predicts that, with the exception of particulates, all of the relevant NAAQS and SAAQS would be met at the EREF property boundary. Although total concentrations of PM_{10} and $PM_{2.5}$ particulates (including existing background levels) constitute at most 271.5 percent and 105.3 percent of the respective NAAQS/SAAQS twenty-four-hour limits, two factors affect these values. PM_{10} and $PM_{2.5}$ in the area of the EREF already have background concentration levels that are roughly a third of the applicable standards, i.e., for PM_{10}, 52.0 $\mu g/m^3$ compared to the twenty-four-hour standard of 150 $\mu g/m^3$, and for $PM_{2.5}$, 21.0 $\mu g/m^3$ compared to the twenty-four-hour standard of 35 $\mu g/m^3$. Therefore, wholly apart from EREF preconstruction or construction activities, substantial quantities of particulates from fugitive dust already impact air quality in the vicinity of the site. At the same time, EPA has acknowledged that AERMOD suffers from a modeling artifact that may

exaggerate low wind speed ambient air concentrations. A staff sensitivity analysis attempting to correct for this modeling artifact in assessing EREF preconstruction and construction impacts indicates that while all predicted particulate concentrations may not be reduced to below NAAQS/SAAQS standards, the model nonetheless may significantly overstate particulate concentrations.[30]

4 .96 Based on the foregoing, the Board finds that the staff reasonably relied upon a suite of robust analysis tools to assess the preconstruction and construction air quality impacts associated with the proposed EREF. As a result, the staff has sufficiently supported its conclusion regarding those preconstruction and construction air quality impacts in both logic and fact. Moreover, the record, including the staff's FEIS as supplemented by all adjudicatory materials in this proceeding, establishes that the staff's review of pre-operational air quality impacts has been adequate pursuant to 10 C.F.R. Part 51 and, in conjunction with the AES commitment to implement the staff-identified mitigation measures for fugitive-dust generation control, see AES Fourth Environmental Questions Response at 2, supports issuance of the proposed license.

5. Effluent and Radiological Environmental Monitoring Programs

a. Introduction

4 .97 As was noted by the staff in its FEIS, while the AES Effluent Monitoring Program (EMP) addresses “monitoring, recording, and reporting of data from radiological contaminants emitted from specific points,” the AES Radiological Environmental Monitoring Program (REMP), which concerns “the monitoring of general environmental media . . . within and outside the

[30] The staff noted as well that instances in which fugitive dust-producing construction activities will coincide with low prevailing wind speeds in the direction of the closest property boundary from the proposed EREF so as to have a MODERATE impact on near-field air quality are in a wind direction that is only likely to occur less than 4 percent of the time. See FEIS at 4-22.

proposed EREF property boundary," will "be used to confirm the effectiveness of the effluent controls and the EMP and to verify that facility operations do not result in detrimental radiological impacts on the environment." FEIS at 6-1. And one of the important monitoring concerns for the EREF would be to measure any leakage of uranium hexafluoride (UF_6) or its reaction products from storage cylinders onsite. In environmental question 12(a), the Board first asked how, aside from quarterly analyses of water and/or sediment in the two cylinder storage pad stormwater retention basins, leakage of UF_6 or its reaction products from storage cylinders would be detected. See Initial Board Initial Environmental Questions attach. A, at 5. In its response, AES declared:

> 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 [depleted UF_6 (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 [UF_6] or its reaction products from the cylinders would also be detected by the inspection program, as discussed below.
>
> Section 4.13.3.3 (Mitigation for [DUF_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 [(DU)] 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 [DUF_6], 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.

AES Initial Environmental Questions Response at 7-8.

4 .98 Additionally, in environmental question 12(a), the Board inquired about the likelihood that small but continuous leaks would be detected by either the AES effluent monitoring or radiological environmental monitoring systems. See Initial Board Initial Environmental Questions attach. A, at 5. In its response, AES maintained:

> Even though small but continuous leaks from a UF_6 cylinder are very unlikely as discussed in the response to Question 12[(a)] 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 [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 [UF_6] 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 [EPA'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.

AES Initial Questions Response at 8-9.

4 .99 With these answers in mind, and given the importance of the facility's monitoring programs in ensuring that any radiological impacts from the facility are promptly identified, assessed, and mitigated, the Board asked for the following presentation from the parties:

> Please provide a presentation regarding the staff's FEIS-related analysis of the AES [effluent and environmental monitoring programs] that includes a detailed discussion of the following:
>
> a. A summary of the features of the [AES effluent and environmental monitoring programs], including monitoring of any storage cylinders in the cylinder storage pad area;
>
> b. How the staff has determined that the types of effluents monitored and the number, type, detection limits, and locations of monitoring equipment are sufficient;
>
> c. How the staff ascertained that the [AES effluent and environmental monitoring programs'] features are adequate for the EREF construction, operation, and decommissioning phases and for normal and off normal (accident, extreme weather, etc.) operation, including whether uranium tetrafluoride (UF_4) hydrate plugs are likely to form to seal small leaks of [UF6] or its reaction products in storage cylinders; and
>
> d. How the staff will ensure that the [AES effluent and environmental monitoring programs] will be properly implemented, adequately tested, and fully capable during the period from two years before the start of operations to the end of decommissioning.

Board Presentation Topics and Administrative Directives at 5.

b. Witnesses and Evidence Presented

4 .100 The lead party for this presentation was also the staff, whose presentation materials were admitted into evidence. See Staff Effluent/Environmental Monitoring Presentation. Testimony on behalf of the staff was provided by three witnesses, while AES made two witnesses available to answer Board questions. See Tr. at 571-622.

i. Staff Witnesses

4 .101 Staff witness Karl Fischer, who received a bachelor of science degree in nuclear engineering and a master of engineering degree in radiological health engineering from the University of Michigan, is a health physicist with over fourteen years of experience in environmental, defense, and medical/research applications. Mr. Fischer currently is an environmental system engineer with ANL where he provides support to clients in the areas of health physics and radiological health risk, including radiological transportation risk. Prior to joining ANL in 2008, he worked for three years as a deputy program manager with Northrop Grumman Information Technology in the Nuclear Test Personnel Review Program operated by the Defense Threat Reduction Agency of the U.S. Department of Defense, and for eight years prior to that as a health physicist and senior health physicist for the National Institutes of Health, Division of Radiation Safety. See Exh. NRC000152, at 1 (Karl Fischer SPQ).

4 .102 Staff witness Deborah Seymour testified previously in the AEA safety-related portion of this mandatory hearing and her qualifications and experience were outlined in that decision. See LBP-11-11, 73 NRC at __ (slip op. at 40).

ii. AES Witnesses

4 .103 AES witness Mark S. Strum received a B.S. degree in nuclear engineering from Lowell Technology Institute, an M.S. degree in radiological sciences and protection from the University of Lowell, and a master of business administration degree from Nichols College. For

the past nine years he has been employed as an advisory engineer with AREVA NP, after serving for five years as a project manager with Duke Engineering Services and for twenty-three years as a senior engineer with Yankee Atomic Electric Company. During his thirty-nine years of performing radiological assessments supporting the design, licensing, and operation of power reactors, his responsibilities have included plant effluent environmental dose assessments; environmental radiological monitoring program evaluations; radwaste processing; storage and disposal assessments; and technical support in the areas of effluent monitoring, radiological effluent technical specifications, and off-site dose calculation manual implementation. See Exh. AES000014, at 1-2 (SPQ for Mark S. Strum).

4 .104 AES witness Barry M. Tilden received a B.S. degree in mathematics from the U.S. Naval Academy and a M.S. degree in Computer Science from the Naval Postgraduate School. Mr. Tilden has thirty-two years experience in the nuclear industry, including serving as EREF plant operations manager for the past two years, three years as plant manager during the startup phase at the Paducah DUF_6 conversion facility, nine years in management positions at the USEC PUEF, eight years as plant lead engineer for license renewal technical evaluations at the Calvert Cliffs Nuclear Power Plant, and eleven years experience in the Navy's nuclear propulsion program. See Exh. AES000015, at 1-2 (SPQ for Barry Martin Tilden).

4 .105 Based on the respective qualifications and experience of the proffered witnesses, the Board finds each of these staff and AES witnesses qualified to testify regarding the EREF radiological effluent monitoring program.

c. Regulations and Guidance Regarding Effluent and Radiological Environmental Monitoring Programs

4 .106 Under 10 C.F.R. Part 20, app. B, and section 70.59, Part 70 applicants are required to establish a radiological monitoring program to monitor and report the release of radiological gaseous and liquid effluents to the environment. Although the question of the

sufficiency and adequacy of the AES program for radiological effluent monitoring and radiological environmental monitoring was part of the staff's AEA/safety-related review of the AES application and was addressed in the staff's SER, see Exh. NRC000032, at 9-8 to -13 (NMSS, NRC, [SER] for the [EREF] in Bonneville County, Idaho, NUREG-1951 (Sept. 2010)) [hereinafter SER], in the context of the agency's NEPA responsibility to consider the radiological effects of a proposed action and the alternatives available for reducing or avoiding such impacts, see 10 C.F.R. § 51.71(d), an applicant's radiological measurements and monitoring program also is subject to scrutiny.

4 .107 And in that regard, two staff guidance documents set forth the information that should be provided in the ER and the EIS regarding a radiological monitoring program and monitoring program acceptance criteria, see Exh. NRC000189, at 5-26, 6-29 to -30 (NMSS, NRC, Environmental Review Guidance for Licensing Actions Associated with NMSS Programs, NUREG-1748 (Aug. 2003)) [hereinafter Staff Environmental Review Guidance]; Exh. NRC000031, at 9-12 to -15 (NMSS, NRC, [SRP] for the Review of a License Application for a Fuel Cycle Facility, NUREG-1520 (Mar. 2002)) [hereinafter Staff Fuel Cycle SRP]; see also Tr. at 581-82 (Fischer Test.), while two other staff guidance documents outline what the staff believes are acceptable methods for designing a radiological monitoring program and submitting required semiannual reports specifying principal radionuclide releases to unrestricted areas for the purpose of estimating maximum potential annual public doses from such releases, see Exh. NRC000208, at 6-16 (Office of Nuclear Regulatory Research (RES), NRC, Quality Assurance for Radiological Monitoring Program, Regulatory Guide [(RG)] 4.15 (rev. 2 July 2007)); Exh. NRC000209, at 3-7, A-1 (RES, NRC, Monitoring and Reporting Radioactive Materials in Liquid and Gaseous Effluents from Nuclear Fuel Cycle Facilities, RG 4.16 (rev. 2 Dec. 2010)); see also Tr. at 582-83 (Fischer Test.).

d. Evidentiary Findings

4 .108 Radiological monitoring on the EREF site involves two separate but complementary programs. One is the effluent monitoring program or EMP, which concerns the monitoring, recording, and reporting of data for radiological contaminants emitted from specific effluent release points in the facility utilizing media such as exhaust vent air sampler filters, mobile air monitor filters, and evaporator exhaust vent liquid condensate. The other is the radiological environmental monitoring program, which provides a supplemental check of containment and effluent controls by monitoring general environmental media, including soil, sediment, groundwater, biota, and ambient air, both within and outside of the boundaries of the proposed EREF. See Tr. at 578, 583, 597 (Fischer Test.); Staff Effluent/Environmental Monitoring Presentation at 7; FEIS at 6-1.

4 .109 Neither the EMP nor the REMP are active during the preconstruction or construction phases at the facility because there are no radioactive materials onsite. Nonetheless, to provide a baseline against which to measure in monitoring for any later releases, REMP-related monitoring would begin at least two years prior to the receipt of radioactive materials and the beginning of startup operations. See Tr. at 584-85 (Fischer Test.); see also Staff Effluent/Environmental Monitoring Presentation at 8, 14. In the case of the EREF, baseline monitoring has already begun by obtaining more than seventy soil samples and will continue during facility construction, including the characterization of backfill and other non-native materials that are brought onto the site. See Tr. at 585 (Strum Test.). Thereafter, both the EMP and the REMP would become active during pre-operational testing and would continue during the EREF's operations phase. Finally, for the facility's decommissioning phase, AES would be responsible for submitting an appropriate radiological monitoring program as part if its

decommissioning plan. See Tr. at 584, 585 (Fischer Test.); see also Staff Effluent/Environmental Monitoring Presentation at 8.

4 .110 With respect to the EMP, based on the model monitoring program set forth in supplement 1 to the staff's Generic Letter 89-01, see Exh. NRC000210 (Office of Nuclear Reactor Regulation, NRC, Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Boiling Water Reactors, NUREG-1302 (Apr. 1991)), the EMP is intended to confirm the effectiveness of effluent controls and verify that facility operations have no detrimental radiological impact. To accomplish this end, all potential radioactive effluents can be discharged from the facility only through monitored pathways and AES would be required to undertake continuous sampling for airborne and liquid effluents at those points where it is authorized to make such discharges. See Tr. at 586, 591-92 (Fischer Test.); FEIS at 6-6, 6-7; see also Staff Effluent/Environmental Monitoring Presentation at 9.

4 .111 For the nine EMP airborne discharge points -- six gaseous effluent ventilation systems in the separations building, the technical services building, and the centrifuge test and postmortem facilities; the heating/ventilation/air conditioning systems in the blending, sampling, and preparation building ventilated room and the technical support building contaminated area; and the centrifuge test and port mortem facility exhaust filtration system -- continuous alpha and hydrogen fluoride (HF) monitoring would occur. Regarding industrial liquid effluents, in addition to the fact that the EREF will not be connected to any publicly-owned water treatment works, no discharges would be permitted to natural surface waters or to the ground. Instead, all liquid process effluents would be collected by the facility's liquid effluent collection and treatment system. Effluent releases would only occur by means of an evaporator after multiple stages of precipitation and filtration, with sampling at the evaporator exhaust vent to ensure no uranic

releases have occurred. See Tr. at 586, 592-93 (Fischer Test.); FEIS at 6-2, 6-4 to -4, 6-7; Staff Effluent/Environmental Monitoring Presentation at 9-11.

4 .112 AES would submit EMP monitoring reports to the NRC semi-annually. The airborne and effluent monitoring samples would be subjected to weekly gross alpha/beta analysis and quarterly isotopic composite analysis. Isotopic analysis for uranium would only be performed if gross alpha/beta activity indicated that an individual radionuclide would be present in a concentration greater than 10 percent of the concentrations specified in table 2 to appendix B to 10 C.F.R. Part 20. See Tr. at 593 (Fischer Test.); Staff Effluent/Environmental Monitoring Presentation at 12.

4 .113 Relative to the REMP, which also is based on the model monitoring program outlined in the staff's Generic Letter 89-01, supplement 1, the focus of those monitoring efforts generally would be within three miles of the facility, but may include more distant locations as appropriate. Sampling locations are chosen based on identified exposure pathways, such as direct exposure to a ground plume, inhalation from a plume, or ingestion of food products. Although there is no regulatory requirement governing environmental monitoring program reporting, AES has committed to semi-annual reporting, consistent with that applicable to the EMP. See Tr. at 597 (Fischer Test.); see also Staff Effluent/Environmental Monitoring Presentation at 14.

4 .114 Given airborne particulates are anticipated to be the primary effluents from the EREF, the main component of the REMP is continuous particulate air monitoring. In accord with Generic Letter 89-01, supplement 1, AES will conduct monitoring at five or more stations. Three stations will be on the site boundary in the wind sectors with the highest calculated or predicted annual average ground level concentration (which is a function of the wind rose, wind speed, wind direction, distance to the boundary fence line, and release point height); one station will be

in the vicinity of a community having the highest calculated or predicted annual average ground level concentration; and one station will be at a control location at a distance of more then five miles from the facility in the upwind or non-prevailing wind sector not in the vicinity of any other radiological facility. Monitoring samples will be retrieved at least biweekly, although more frequent retrieval may be required during periods of heavy dust concentration. Gross alpha/beta analysis will be performed weekly, with quarterly isotopic analysis on a composite sample. Because there are no communities or residences within five miles of the facility footprint, the community location will be at the site boundary in the same sector as the nearest residence, which is approximately five miles east of the facility. See Tr. at 598-99 (Fischer Test.); see also Staff Effluent/Environmental Monitoring Presentation at 15, 21.

4 .115 Groundwater monitoring is a second major REMP component. Again following the guidance from staff Generic Letter 89-01, supplement 1, AES will install monitoring wells at eight locations based on the predominant northeast to southwest direction of groundwater flow under the EREF site. Two of the eight groundwater monitoring locations will be up-gradient of the facility to service as control sites, while two wells would be located so as to monitor unexpected leakage from the stormwater detention and retention basins. In addition, after operations begin two deep aquifer wells would be installed to the west and south of the facility footprint. Isotopic analysis for uranium would be performed semiannually. See Tr. at 599-600 (Fischer Test.); see also Staff Effluent/Environmental Monitoring Presentation at 16, 21.

4 .116 Additional REMP components are the stormwater and basin sediment sampling stations, which provide monitoring for the site stormwater detention basin and the two cylinder storage pad retention basins. Under normal operations, stormwater would be collected in the site stormwater detention basin, which is unlined and would release water by both evaporation and infiltration into the ground. Because the site stormwater detention basin would only receive

runoff from paved surfaces, roofs, and landscape areas, not including the cylinder storage pads, it is not expected that this approach will result in a significant release of uranic material. In contrast, the cylinder storage pad retention basins, which would be lined to prevent infiltration and would have no outlets, will be designed to have the capacity to hold all in-flows for the life of the facility. A major component of the "evaporation outlet only" planning for these basins is the expectation that they will be dry for up to five months of the year, i.e., June through October, notwithstanding the fact they also are to receive treated domestic sanitary effluent.[31] Further, consistent with staff Generic Letter 89-01, supplement 1, stormwater and basin sediment would undergo quarterly uranium isotopic analysis. See Tr. at 600-01 (Fischer Test.); FEIS at 4-42 to -43, 6-8 to -9; see also Staff Effluent/Environmental Monitoring Presentation at 17, 21.

4 .117 Also as part of the REMP, AES will conduct soil and vegetation sampling. Initially, prior to startup there will be baseline samples, including crops and grass as available, that will be collected in the same vicinity in each of the sixteen compass rose sectors around the facility near the fenceline. After start up, operation samples will be collected from each of eight sector locations, including three of the sectors with the highest predicted atmospheric deposition, see supra p. 77, and one offsite control location. Samples will undergo semiannual uranium isotopic

[31] The EREF Domestic Sanitary Sewage Treatment Plant is to receive only domestic sanitary wastes and no plant process-related effluents. This treated domestic sanitary sewage thus is not expected to contain any uranic content. Nonetheless it will be directly monitored under the EMP when it is released to the lined cylinder storage retention basins, with samples collected for semiannual uranium isotopic analysis. Moreover, this treated domestic sanitary sewage would again be monitored through the REMP basin and sediment sampling process. See Tr. at 601, 603 (Fischer Test.); FEIS at 6-7 to -9; see also Staff Effluent/Environmental Monitoring Presentation at 18. Also, in response to a Board question about whether the combination of domestic sanitary sewage runoff into the cylinder storage retention basin and the likelihood of steady evaporation from that basin would so dilute cylinder pad runoff as to mask a cylinder radiation leak from detection, the staff cited basin sediment sampling as a monitoring technique that would detect such contamination. See Tr. at 602-03 (Biwer Test.).

analysis. See Tr. at 603-04 (Fischer Test.); FEIS at 6-10; see also Staff Effluent/Environmental Monitoring Presentation at 19, 21.

4 .118 In addition to the environmental media sampling described above, the REMP will include direct exposure gamma radiation monitoring to assess any offsite dose that might result from the stored UF_6 cylinders or other facility operations. Thermoluminescent dosimeters (TLDs), which will be deployed at the fenceline in all sixteen compass sectors, would be utilized for quarterly testing to estimate the offsite dose equivalent associated with gamma radiation through extrapolation of the dosimeter data using a Monte Carlo N-Particle or similar computer program. Moreover, two offsite control TLDs would provide information on changes in regional background radiation levels. See Tr. at 604-05 (Fischer Test.); FEIS at 6-10; see also Staff Effluent/Environmental Monitoring Presentation at 20, 21.

4 .119 Also in connection with the various AES REMP monitoring efforts, the location modeling for which was checked by the staff, see Tr. at 607, AES will submit a semi-annual summary report to the NRC that would include the types, numbers, and frequencies of environmental measurements and the identities and concentrations of EREF-related radionuclides found in the various environmental samples. Among other things, this report would provide the minimum detectable concentrations (MDCs) for the monitoring analyses and the error associated with each measurement. Following staff Generic Letter 89-01, supplement 1 guidance, sampling instrumentation and methodologies must be capable of attaining specified MDCs to ensure that sampling and analytic methods are sensitive enough to support the appropriate action levels specifying when, if those levels are exceeded, an investigation is started into the source of the elevated radioactivity and/or process operations would be shut

down.[32] See Tr. at 580, 605, 608 (Fischer Test.); FEIS at 6-5, 6-6, 6-7, 6-9, 6-10, 6-11; see also Staff Effluent/Environmental Monitoring Presentation at 23.

4 .120 Finally, although not an explicit part of either its EMP or REMP programs, AES will implement a monitoring and management program for the UF_6 storage cylinders stored on the EREF site. As was noted previously, stormwater runoff from the storage pads on which these casks would be placed would be captured, retained, and monitored periodically for uranic releases from the two cylinder storage pads stormwater retention basins (along with the domestic sewerage effluents). Further, external/direct radiation exposures will be measured using the TLDs along the facility fence line. These monitoring efforts also will be supplemented by a cylinder management program. Prior to placing a storage cylinder on the storage pad or transporting a cylinder offsite, AES would inspect the cylinder for damage and survey it for external contamination. There would also be an annual AES inspection of each cylinder's anticorrosion layer to ensure that exterior corrosion or mechanical damage is spotted and addressed. If such an inspection revealed significant cask deterioration, in addition to a root cause determination effort that might involve additional cask inspections, the contents of the defective cask could be transferred to another cask, after which the defective cask would be discarded. See Tr. at 594-95 (Fischer Test.); see also Staff Effluent/Environmental Monitoring Presentation at 13.

4 .121 NRC inspections of the EFEF facility, which will be conducted out of the agency's Region II office in Atlanta, Georgia, will include verification that AES has implemented its EMP

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[32] Per the staff's fuel cycle facility SRP, MDCs for gaseous effluent and evaporator condensate must be 5 percent or less of the concentrations listed in 10 C.F.R. Part 20, app. B, tbl. 2, while those for environmental monitoring of sediment, soil, and vegetation should be at least as low as those selected for effluent monitoring of air and water. See Tr. at 608 (Fischer Test.); FEIS at 6-5, 6-7; see also Staff Effluent/Environmental Monitoring Presentation at 23; Exh. NRC000070, at 9-12 (NMSS, NRC, [SRP] for the Review of a License Application for a Fuel Cycle Facility, NUREG-1520 (rev. 1 May 2010)).

and REMP monitoring efforts in compliance with agency regulations and license requirements regarding processing, control, and release of radioactive liquids and airborne effluents as well as directives governing environmental sampling, including soil, vegetation, and air sampling, and information reporting. This inspection program is intended to ensure that any radiation release has a minimal impact on the public and the environment and that AES adequately implements its radiological monitoring programs. See Tr. at 615-16 (Seymour Test.); Staff Effluent/Environmental Monitoring Presentation at 28.

4 .122 In accord with agency inspection manual (IM) inspection procedure 88045, staff inspections of AES radiological monitoring will have a number of areas of emphasis, including management controls, which covers how program implementation responsibilities are assigned and internal audits/inspections are conducted; analytical measurement quality control; monitoring/sampling station location and instrumentation; monitoring program recordkeeping and reporting; compliance with liquid and airborne effluent procedures and license requirements; problem identification and resolution; and program changes. Further, at any one time, the focus of the agency's radiological monitoring inspection regime, both as to the AES radiological monitoring program's design/planning and implementation, will depend on what is needed given the functional status of the EREF. See Tr. at 616-17 (Seymour Test.); see also Staff Effluent/Environmental Monitoring Presentation at 29, 31; Exh. NRC000212, at 1-3 (NMSS, NRC, NRC [IM], Inspection Procedure 88045 (Sept. 5, 2006)).

4 .123 The agency's initial radiation monitoring program-associated inspections will precede facility receipt of special nuclear material (SNM) and the start of hot acceptance testing (i.e., startup testing of the facility's operational status performed with a small amount of natural UF_6), which means inspections generally start one year prior to the applicant's construction and testing-related scheduling estimate of the start of facility operation. These inspection findings

could impact AES's ability both to receive SNM onsite at the EREF and perform hot functional testing prior to implementing any identified corrective measures for significant issues. See Tr. at 618-19 (Seymour Test.); see also Staff Effluent/Environmental Monitoring Presentation at 29, 31.

4 .124 The onset of EREF operations would provide the next major implementation milepost for the agency's radiation monitoring program inspection process. Per a license condition, see LBP-11-11, 73 NRC at __ (slip op. at 50), prior to permitting EREF operation, the agency will conduct an operational readiness review (ORR) inspection that, in addition to confirming the readiness of operational safety programs such as nuclear criticality and radiation safety, will include inspections to ensure the AES radiological monitoring program has been implemented adequately. Once again, inspection findings identifying significant issues would affect NRC authorization for EREF operations pending AES implementation of acceptable corrective measures. See Tr. at 619-20 (Seymour Test.); see also Staff Effluent/Environmental Monitoring Presentation at 32.

4 .125 Assuming operational authorization is given, under NRC Inspection Manual Chapter (IMC) 2600, the NRC inspection program associated with radiological monitoring would continue on an annual basis as part of the baseline inspection program for the EREF through facility decommissioning, as needed. If these inspections, which are intended to ensure continued effective program implementation, identified significant issues, additional inspection resources may be allocated to verify appropriate issue resolution. See Tr. at 620 (Seymour Test.); see also Staff Effluent/Environmental Monitoring Presentation at 33; Exh. NRC000213, at 5 (NMSS, NRC, NRC [IM], Manual Chapter 2600 (Jan. 27, 2010)).[33]

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[33] The Board observes that, although not included as part of exhibit NRC000213, page B-6 of appendix B to IMC 2600 specifies that a core inspection requirement for a gas

(continued...)

e. Board Conclusions Regarding Effluent and Radiological Environmental Monitoring Programs

4 .126 The Board finds, as outlined below, that in responding to the Board's request for information on the status of the radiological monitoring program for the EREF, the staff and AES provided both a comprehensive overview of the AES monitoring program and the corresponding staff inspection regime as well as specific information that addressed adequately several particular topics of Board interest.

4 .127 Relative to the staff's general environmental review efforts, the staff points out that the AES provided in its ER information on the various items that the staff's guidance for applicant preparation of nuclear materials-related environmental assessments should contain, including maps/aerial photographs of the site with effluent release points along with proposed monitoring and sampling locations clearly identified; a description of the principal radiological exposure pathways; the location and characteristics of radiation sources and radioactive effluents, both liquid and gaseous; a detailed description of the monitoring program including number and location of sample collection points, measuring devices used and pathways sampled or measured, sample size, sample collection frequency and sampling duration, method and frequency of analysis including lower limits of detection; a discussion justifying the choice of sample locations, analyses, frequencies, durations, sizes and lower limits of detection; and quality assurance procedures. We find these subject matter areas, which are pertinent to the staff's environmental review of the applicant's radiation monitoring program, to be adequately

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[33](...continued)
centrifuge facility is an annual effluent control/environmental inspection that would be conducted under IP 88045. Additionally, the Board notes that although IMC 2635, the particular IMC applicable to the EREF, still has not been finalized, the staff contemplates that IMC will be issued in advance of any safety-related construction at the facility or, alternatively, that the staff would use IMC 2696, the IMC for the LES NEF, as a substitute. See Tr. at 621-22 (Seymour Test.); see also LBP-11-11, 73 NRC at __ (slip op. at 59-60).

outlined and analyzed in the staff's FEIS as well. See Tr. at 609-10 (Fischer Test.); FEIS at 6-1 to -11; see also Staff Effluent/Environmental Monitoring Presentation at 24-25; Staff Environmental Review Guidance at 6-30.

4 .128 Also covered by AES and the staff during their presentations were several specific Board concerns regarding radiation monitoring under off-normal conditions and monitoring of stored DUF_6 cylinders. Relative to off-normal conditions, such as accidents or extreme weather, in response to a Board question about the ability of the monitoring system to give a warning of incipient off-normal conditions, staff witness Fischer declared that this is the purpose of establishing the action levels that are associated with environmental monitoring. See Tr. at 580 (Fischer Test.). And with regard to a Board question about whether, during the winter months, snow would be sampled in addition to soil, AES witness Strum testified that AES has no plans to conduct such tests as part of its routine monitoring program. He nonetheless indicated (without staff contradiction) that if any radioactive effluent deposition occurred during the winter months as a result of snow falling and scavenging any radioactive materials out of the air, the deposition would tend to stay with the snow as it melted, thereby permitting AES to pick up the disposition in routine soil sampling so that it would not go undetected. See Tr. at 605-06 (Strum Test.).

4 .129 In response to a Board concern about whether the concrete pads on which the cylinders are stored need to be lined and subject to a special inspection to ensure there is not cracking that would permit effluents from leaking casks to reach the ground, AES testified that the potential for cylinder storage yard contamination does not warrant sealing the pads or the piping leading to the cylinder storage pad stormwater retention basins, or leak checking the lined basins themselves. Instead, citing DOE's enrichment program under which DUF_6 cylinders are only inspected every four years (unless they are "known bad actors," in which case they receive an annual inspection), AES indicated (without staff contradiction) that annual cylinder inspections

would be sufficient to ensure any issues are addressed before contamination could get to the pad or beyond. See Tr. at 596 (Tilden Test.).

4 .130 Also of interest to the Board in connection with storage cylinder leakage and monitoring was further information on the possible formation of UF_4 hydrate plugs to seal small cylinder leaks of UF_6 or its reaction products. In his testimony, staff witness Fischer supported the formation of such plugs, citing the DOE experience associated with eight breached cylinders -- five by mechanical damage during stacking, two by external corrosion from ground contact, and one during maintenance operations -- at three storage sites -- Oak Ridge, Tennessee, Paducah, Kentucky, and Portsmouth, Ohio -- through 1998. According to staff witness Fischer, it could be expected that a UF_6 storage cylinder breach eventually would permit enough moist air to react with exposed UF_6 and iron to form a dense plug consisting of iron fluoride hydrates to prevent a rapid loss of cylinder material. See Tr. at 610-11 (Fischer Test.); see also Staff Effluent/Environmental Monitoring Presentation at 26; Exh. NRC000211, at B-1 to -4 (2 Office of Nuclear Energy, Science and Technology, DOE, Final Programmatic [EIS] for Alternative Strategies for the Long·term Management and Use of Depleted [UF_6], DOE/EIS-0269 (Apr. 1999)). Further, staff witness Biwer declared, while the relatively low humidity that might be expected at the southeastern Idaho EREF high desert site during the summer likely would slow this process, it nonetheless will occur. Nor would the relative size of what are generally extremely small leaks make much difference, according to staff witness Biwer, because (1) the corrosion process that would form the type of non-breach leak (i.e., one not involving an accidental drop or piercing) that could be stoppered using this method is itself a slow process that would allow for UF_4 oxidation plugging on an ongoing basis; and (2) in such a low-humidity circumstance, the same lack of moisture that would slow plug formation would also retard the

formation of the hydrogen fluoride that would be a danger to workers, thus providing time for the hydrate plug to form or for AES to plug the cylinder. See Tr. at 611-13 (Biwer Test.).

4 .131 Based on the foregoing, the Board finds that the staff sufficiently supports its conclusions regarding the adequacy of the AES effluent and environmental radiation monitoring programs in both logic and fact. Moreover, the record, including the staff's FEIS as supplemented by all adjudicatory materials in this proceeding, indicates that the staff's review of effluent and environmental radiation monitoring has been adequate pursuant to 10 C.F.R. Part 51 and supports issuance of the proposed license.

6. Historic/Cultural Resources Memorandum of Agreement and Associated Mitigation Measures

a. Introduction

4 .132 Because AES preconstruction activities were likely to result in destruction of the National Register of Historic Places (NRHP)-eligible John Leopard Homestead site located within the boundaries of the proposed facility, AES prepared a treatment plan outlining how it would mitigate the impact of the homestead site's destruction by utilizing professional excavation and data recovery prior to disturbing the site. The Idaho State Historical Preservation Office (SHPO) later approved the excavation and data recovery aspects of the AES treatment plan and the Leopard Homestead site excavation work was completed. Nonetheless, SHPO authorization for AES to conduct preconstruction activities at the homestead site has been withheld pending completion of a consultation process among the staff, SHPO, the Shoshone-Bannock Native American tribes, and AES intended to result in a memorandum of agreement (MOA) addressing how historic and cultural resource matters will be handled at the EREF site as construction goes forward. See FEIS at 4-6.

4 .133 In response to environmental question 20, in which the Board requested an update on the status of the MOA, see Board Third Environmental Questions app. A, at 1, the staff stated:

> Regarding the status of the MOA, the MOA has not yet been finalized. Comments on the Draft MOA have been received from the Idaho [SHPO] and AES. However, on May 11, 2011, the Cultural Resources Coordinator of the Shoshone-Bannock Tribes requested an additional 2 to 3 weeks to review the Draft MOA and present it to the Tribal Business Council, after which the Tribes could provide comments on the Draft MOA. Since this was a reasonable request, the staff agreed to allow the Tribes the additional time for the review. After the Tribes' comments are received, the staff will determine whether a teleconference is needed to discuss and resolve the comments among the parties to the agreement. After all comments have been resolved and agreed upon, the staff will incorporate the comments and will circulate the Final MOA for signature by the parties.
>
> The staff's current goal is for the MOA to be completed and executed prior to the July 12-14, 2011, mandatory environmental evidentiary hearing, but if not, then by the time the Atomic Safety and Licensing Board (ASLB) issues the Partial Initial Decision (PID) on environmental issues on September 23, 2011.

Staff Third Environmental Questions Response at 1.

As a consequence, the Board requested that the parties provide the following presentation:

> Please provide a presentation that discusses the current status of the historic/cultural resources [MOA] that is being developed by means of consultation among the staff, the Idaho [SHPO], the Shoshone-Bannock Tribes, and AES, including an overview of the draft MOA-referenced September 2009 monitoring and discovery plan that AES has proposed implementing to provide mitigation measures to address any additional historic or cultural resources that might be found during preconstruction/construction, operation, and decommissioning of the EREF. In the event the MOA has been finalized by the time of the presentation, please include an overview of the MOA's terms and conditions.

Board Presentation Topics and Administrative Directives at 5-6.

b. Witnesses and Evidence Presented

4 .134 The lead party for this presentation was also the staff, whose presentation materials were admitted into evidence. See Exh. NRC000214 (Staff Presentation for Topic 6, Historic/Cultural Resources Memorandum of Agreement and Associated Mitigation Measures) [hereinafter Staff MOA Presentation]. Staff testimony was provided by two witnesses. See Tr. at 622-41. AES did not make a presentation regarding this topic or make available any witnesses for Board questions.

4 .135 The background and qualifications for staff witness Stephen Lemont were set forth previously in section IV.A.1.b.ii supra.

4 .136 Staff witness Daniel O'Rouke received a B.A. in history and anthropology from Michigan State University and an M.S. in industrial archaeology from Michigan Technological University. Mr. O'Rourke, an archaeologist with over twenty years of professional experience, has worked since 2001 at ANL, where he currently serves as an assistant environmental scientist (Archaeologist) in the Ecological and Geographical Sciences Section of the Environmental Science Division at ANL. His duties include developing/synthesizing historic contexts and assessing project impacts in EISs; preparing historical building evaluations and documentation reports; conducting archaeological surveys; conducting visual impact assessments; and evaluating land use impacts. Prior to joining ANL, he provided technical project support for various cultural resource firms on projects for clients such as the University of Chicago, the National Forest Service, and private developers. See Exh. NRC000156, at 1 (Daniel J. O'Rouke SPQ).

4 .137 Based on the respective qualifications and experience of the proffered witnesses, the Board finds each of these staff witnesses qualified to testify regarding the historic/cultural resources MOA and associated mitigation measures.

c. Regulations and Guidance Regarding Historic/Cultural Resources Memorandum of Agreement and Associated Mitigation Measures

4 .138 The National Historic Preservation Act of 1966 (NHPA), 16 U.S.C. § 470, requires that all adverse effects to any NRHP-eligible historic or cultural resource be considered during any federal undertaking, such as an NRC licensing action for a proposed uranium enrichment facility. NRC fulfills its responsibilities under the NHPA in the context the historical and cultural resources impact assessment that is part of its NEPA environmental review. See Staff Environmental Review Guidance at 1-7 to -8. An historical/cultural resource is considered eligible for listing on the NRHP if it meets one or more of the following criteria: (1) association with an historic person; (2) association with an historic event; (3) representation of the work of a master; or (4) potential to provide information on the history or prehistory of the United States. See 36 C.F.R. § 60.4. Further, under NHPA section 106, the area of potential effect (APE) of the federal undertaking must be designated, e.g., the area directly affected by preconstruction/construction of a proposed facility, and the lead federal agency associated with the undertaking must conduct a consultation with the SHPO regarding the presence and protection of historic and cultural resources in the designated APE, as well as any federally-recognized Native American groups with an ancestral interest in the property, to determine if resources important to the tribe are present. See FEIS at 4-5.

d. Evidentiary Findings

4 .139 Review of the EREF site under NHPA section 106 resulted in a significant portion of the proposed EREF being subject to examination by an AES archaeological contractor. In addition to examining the 592-acre APE that would be directly impacted by preconstruction and construction activities, the archaeological contractor studied an additional 413 acres of the site for historical and cultural resources. These surveys identified thirteen archeological sites and twenty-four isolated finds within the APE. One of the sites, the John Leopard Homestead, was

recommended as eligible for listing in the NRHP because of its potential to provide information on regional historic era homestead farming practices, a designation concurred in by the Idaho SHPO. See FEIS at 4-5 to -6.

4 .140 With AES preconstruction activities associated with a security fence and a proposed transmission line to bring power into the EREF likely to result in destruction of the Leopard Homestead site, AES prepared a treatment plan outlining how it would mitigate the impacts of the homestead site's destruction by utilizing professional excavation and data recovery prior to disturbing the site. The Idaho SHPO later approved the excavation and data recovery aspects of the AES treatment plan and AES provided the site data report to the SHPO following completion of excavation work on the Leopard Homestead site. AES also submitted to the SHPO a monitoring and discovery plan that specifies the procedures for addressing and handling the unexpected discovery of human remains or archaeological material at the proposed EREF. Idaho SHPO approval of the AES request to be permitted to conduct preconstruction activities at the homestead site nonetheless has been withheld pending completion of an NHPA section 106 consultation process among the staff, the Idaho SHPO, the Shoshone-Bannock Native American tribes, and AES intended to result in an MOA that, among other things, addresses the completed mitigation of the Leopard Homestead site and references the AES monitoring and discovery plan. See id. at 4-7.

4 .141 The staff initially determined the historical/cultural resource impacts associated with the Leopard Homestead site would be LARGE because the homestead site would no longer exist given its destruction by the anticipated preconstruction activities. Yet, because the site was professionally excavated prior to ground disturbance and a report was prepared on the data recovered and because other examples of this particular homestead site type are found in the region, the staff reduced its impacts finding to MODERATE, with the impacts to other

historical/cultural resources associated with the EREF site considered to be SMALL. See id. at 4-7.

4 .142 Moreover, to further palliate any historical/cultural resource impacts at the EREF site, a monitoring and discovery plan was developed for AES by the same professional archaeology firm that conduced the Leopard Homestead site excavation. That plan outlines additional mitigation measures that would be implemented, if needed, as preconstruction and construction go forward. The monitoring and discovery plan provides direction on how known archaeological and historic resources are to be protected and how unexpected discoveries that might be encountered, such as human remains or archaeological materials, should be handled. To this end, the monitoring and discovery plan provides for an AES chosen-and-paid cultural resources monitor (or monitors) whose qualifications must meet or exceed the Secretary of the Interior's professional qualification standards for archaeology. Under the monitoring and discovery plan, the monitor will work closely with construction personnel to ensure that any already documented significant historical/cultural sites on the EREF property are not adversely impacted by preconstruction/construction activities. Further, for any previously undocumented cultural resources exposed by ground-disturbing activities, the monitor is responsible for properly identifying and documenting those resources, evaluating their potential for NRHP listing status, and recommending treatment for any that qualify as historic properties. The monitoring and discovery plan also provides that a member of an interested Native American tribe, which in the case of the EREF site would be a member of the Shoshone-Bannock tribes, can be present with the monitor as necessary. Further, under the monitoring and plan, in the event of an unanticipated discovery, the monitor would inform the Idaho SHPO, AES, the NRC, and the Shoshone-Bannock tribes so that any decisionmaking regarding the discovery can be coordinated. See Tr. at 630-34 (Lemont Test.); see also Staff MOA Presentation at 5-6; Exh.

NRC000215, at 2-3 (Western Cultural Resource Management, Inc., Archaeological Monitoring and Discovery Plan for the [EREF, AES], in Bonnville County, Idaho (Sept. 17, 2009)) [hereinafter Monitoring and Discovery Plan].

4 .143 In terms of the specific procedures under the monitoring and discovery plan that are to be used by the monitor to carry out his or her responsibilities, the monitor will conduct instructional briefings for all construction workers on monitoring procedures and requirements. This includes training the workers on the types of material that could be found that would be indicative of human remains or an archaeological site so that the workers can assist the monitor in identifying any unexpected human remains or cultural material. The monitor will also ensure that all known significant archaeological sites and all archaeological sites that have not been evaluated for significance are marked and avoided during ground-disturbing activities. Additionally, whenever ground-disturbing activities are going on, the monitor will observe whether those activities are being carried out pursuant to the monitoring and discovery plan and will maintain a log of ground-disturbing activities in the vicinity of documented sites and of previously unknown but discovered sites. The monitor would notify the supervisor or project lead supervisor at the site of any ground-disturbing activities that are contrary to the plan and has the authority to order that work cease, if necessary. See Tr. at 634-35 (Lemont Test.); see also Staff MOA Presentation at 7; Monitoring and Discovery Plan at 3-4.

4 .144 If a discovery of human remains is made, under the monitoring and discovery plan all ground-disturbing activity within 100 feet is to cease immediately and the monitor will document the discovery and contact the Idaho SHPO, NRC, AES, and, if a discovery is of tribal significance, a representative of the Shoshone-Bannock tribes. Additional ground-disturbing activities in the vicinity of the site will not be allowed until appropriate consultations and reviews have been completed, including fulfilling any Idaho legal requirements associated with reporting

and preserving human remains. See Tr. at 635-36 (Lemont Test.); see also Staff MOA Presentation at 8; Monitoring and Discovery Plan at 5-6.

4 .145 For the discovery of new archaeological material, utilizing his or her professional judgment and the information gained via consultations with the Idaho SHPO and the Shoshone-Bannock tribes, as necessary, the monitor will decide on the appropriate treatment for a new discovery, including determining whether construction within 100 feet can resume or must be suspended pending further study. When new archaeological material is discovered, the monitor will inspect, characterize, and document the discovery; determine potential NHRP eligibility; and coordinate with the Idaho SHPO, AES, NRC, and the Shoshone-Bannock tribes. If the site is determined to be NHRP listing-eligible, data recovery and other measures designed to mitigate any impacts would be implemented. See Tr. at 636-37 (Lemont Test.); see also Staff MOA Presentation at 9; Monitoring and Discovery Plan at 6-8.

4 .146 The AES monitoring and discovery plan was presented to the Idaho SHPO and is referenced in the pending, staff-prepared March 2011 draft MOA regarding the treatment of historic/cultural resources on the EREF site. See FEIS at 4-6. Relative to that MOA, to ensure the agreement complies with NHPA section 106, the staff does not intend to issue any 10 C.F.R. Part 70 license authorizing the construction and operation of the EREF before the MOA is executed by signatories AES, the Idaho SHPO, and the NRC. In addition, the assent of the Shoshone-Bannock tribes has been sought as a concurring party to the MOA. The draft MOA was provided to AES, the Idaho SHPO, and the Shoshone-Bannock tribes for review and comments on the draft MOA have been received from the Idaho SHPO and AES. Further, in early June 2011, the Shoshone-Bannock tribes cultural resources coordinator advised the staff that she completed her review of the draft MOA and had no comments, but that the draft must

still undergo legal review and be presented to the tribal business council. See Tr. at 626-27 (Lemont Test.); see also Staff MOA Presentation at 3.

4 .147 The fully executed copy of the final MOA and related documentation will be filed with the federal Advisory Committee on Historic Preservation (ACHP), which would fulfill the requirements of NHPA section 106 and permit a Part 70 license to be issued for the proposed EREF. See Tr. at 627 (Lemont Test.); see also Staff MOA Presentation at 4.

e. Board Conclusions Regarding Historic/Cultural Resources Memorandum of Agreement and Associated Mitigation Measures

4 .148 The information provided by the staff in response to the Board's request for a presentation regarding the status of the historical/cultural MOA for the EREF site afforded the Board a clear understanding of the current status of the MOA and the AES monitoring and discovery plan that is proposed to address handling any additional historical/cultural finds during facility preconstruction/construction. Also, as outlined by its presentation, the staff's commitment to have the MOA executed by the signatory parties, with concurrence by the Shoshone-Bannock tribes if possible, prior to issuance of any Part 70 license to construct and operate the EREF is a reasonable approach to ensure compliance with the requirements of NHPA section 106.[34]

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[34] In response to a September 7, 2011 request for a status report on the MOA, see Licensing Board Memorandum and Order (Requesting Status Report Regarding Memorandum of Agreement) (Sept. 7, 2011) at 2, on September 14, 2011, the staff provided the Board with a letter stating that required signatories -- the NRC, AES, and the Idaho SHPO -- have signed the final MOA and that, consistent with 36 C.F.R. § 800.6(b)(1)(iv), the staff will submit a copy of the executed MOA to the ACHP. The letter also indicated that after trying by telephone and e-mail to reach the Shoshone-Bannock tribes, as an invited concurring party to the MOA, because the tribes have not replied to the staff with comments on the draft MOA or with a notification that they have no comments, by letter dated September 1, 2011, the staff sent a copy of the final MOA to the tribes and requested the tribes to sign the final MOA as an invited concurring party should they desire to do so. The staff stated that as of its status report, it had has not received any communication from the tribes in response to this letter. See Letter from Marcia J. Simon, Staff Counsel, to Licensing Board (Sept, 14, 2011) at 1. Accompanying the letter was a copy of the final executed MOA, which indicates that as part of any license issued to AES for the EREF there will be a condition requiring that AES comply with the terms of the

(continued...)

4 .149 Based on the foregoing, the Board finds that the sufficiency of the staff's FEIS historical/cultural impacts analysis has been adequately supported in both logic and fact and that the record, including the staff's FEIS as supplemented by all evidentiary materials in this proceeding, establishes that the staff's review of historical/cultural impacts has been adequate pursuant to 10 C.F.R. Part 51 and supports issuance of the proposed license.

B. Additional Items

1. Environmental Topics Raised by the Board But Not Addressed at the Evidentiary Hearing

4 .150 As was noted previously, following issuance of the staff's FEIS, the Board posed questions to AES and the staff in a number of areas.[35] See supra note 3 and accompanying text. A number of these questions related to other portions of the staff's FEIS that were not encompassed by the presentation topics although, unlike the safety portion of this proceeding, all involved material that was publicly available. Below, we outline our findings relative to those matters.

a. Board Environmental Question Topics Not Warranting Further Discussion

4 .151 Among the environmental areas that were the subject of Board questions but were not covered by or during evidentiary hearing presentation topics were (1) whether the need for the facility depends on a reduced supply of LEU from foreign sources; see Initial Board Environmental Questions attach. A, at 1 (Environmental Question 2); (2) what ensures that the initial and final radiation surveys will be representative of the areas that are being decomtaminated/decommissioned so as to provide a proper comparative basis for a

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[34](...continued)
MOA. See id. encl. at 4.

[35] In its proposed findings of fact and conclusions of law, applicant AES provides a discussion outlining the content of the AES/staff responses to the various Board questions. See AES Proposed Environmental Findings at 9-23.

decommissioning decision, see id. at 2 (Environmental Question 4); (3) which staff-identified potential environmental impact mitigation measures will be implemented by AES and how will effective implementation be ensured; see id. (Environmental Question 5); Third Board Environmental Questions app. A, at 4 (Environmental Question 24); (4) lack of discussion of mitigation measures relating to impacts of radiological material transportation accidents and use of transportation modeling routing restrictions for actual shipments, see Initial Board Environmental Questions app. A, at 3 (Environmental Question 8); (5) choice of FEIS evaluated accident scenarios and scale used for classifying accident scenerio impacts, see id. (Environmental Question 9); (6) use of construction/operation impacts as bounding for impacts of decontamination/decommissioning, see id. at 4 (Environmental Question 10); Third Board Environmental Questions app. A, at 1 (Environmental Question 21); (7) EREF use of possible Texas low-level radioactive waste disposal facility, see Second Board Environmental Questions app. A, at 1 (Environmental Question 13); (8) environmental impact of facility-generated sounds outside human hearing ranges, see id. at 2 (Environmental Question 16); (9) validity of construction worker dose calculations, see id. (Environmental Question 17); (10) use of 2010 census data to calculate radioactive material truck transportation route population densities, see id. (Environmental Question 18); and (11) selection of parameters for, and calibration of, atmospheric transport model used to determine radiological impacts of uranium compounds during normal facility operations, see id. at 3 (Environmental Question 19).

4 .152 The Board concludes that the staff's and the applicant's written responses to these questions, see supra note 4 and accompanying text, adequately addressed the Board's

concerns in those areas.[36] Accordingly, we consider these NEPA-related environmental issues resolved for this proceeding. See Clinton ESP, CLI-06-20, 64 NRC at 21-22.

b. Board Public Environmental Question Topics Warranting Additional Discussion

4 .153 In addition to the subjects outlined in section IV.B.1.a above that were the subject of Board questions, there were several other areas that were the subjects of Board questions and party answers that were not covered by the evidentiary hearing presentation topics, but which merit some additional discussion. These include the accuracy of the seismic and weather avoidance areas specified by AES in the course of its siting alternatives analysis for the EREF and the AES determination not to exclude the EREF site from consideration notwithstanding the nearby presence of the Hell's Half Acre recreational site.

i. Site Selection Seismic and Weather Avoidance Areas

4 .154 In its review of the FEIS, the Board took note of the map in Figure 2.8 showing regions in the continental United States that meet the original site selection criteria with regard to potential hazards from earthquakes, tornados, winter weather, and hurricanes. On this map, the region in which the EREF site is located, which is shown as a suitable siting area, is bordered on three sides by seismic avoidance areas. Additionally, the EREF site is shown to be relatively close to the boundary of the seismic avoidance area and to be about 75 miles from the large winter weather avoidance area. See FEIS at 2-30. In its second set of environmental questions, the Board asked AES and/or the staff why, given the configuration of unsuitable siting areas so close to the EREF site, they were confident that these avoidance areas have been accurately

[36] The Board also finds, based on the resumes, CVs, and SPQs admitted as part in the evidentiary record, that the various individuals proffered by AES and the staff to answer these questions have established their qualifications to respond to the questions.

mapped such that the proposed EREF falls outside their boundaries. See Second Board Environmental Questions app. A, at 1 (Environmental Question 14).

4 .155 In addressing the issue of the winter weather avoidance area, AES responded that in defining this area snowfall data from the National Oceanic and Atmospheric Administration were used to estimate the risk of long-term road closures owing to severe winter conditions. AES also emphasized that the avoidance area shown on the map was "a very simplified illustration of the general winter weather region of concern for the regional screening process." AES Second Environmental Questions Response at 2. Nonetheless, AES went on to state that the southern boundary of the avoidance region in Idaho was specifically drawn to separate areas of high snowfall to the north from the region of reduced snowfall that characterizes the cold desert climate of the eastern Snake River Plain. AES further noted that no attempt was made to analyze snowfall data for the mountainous areas of the western United States because these areas were never considered to be suitable sites for the EREF. See id. at 2-3.

4 .156 In discussing the seismic avoidance areas, AES asserted that the boundaries are sufficiently accurate because they are based on seismic hazard values calculated by the USGS for a closely-spaced geographic grid of 0.05 degree latitude by 0.05 degree longitude (equivalent to a regular spacing of approximately 3.5 by 2.5 miles). Seismic avoidance areas were designated where peak horizontal ground accelerations (pga) greater than 0.09g (where g is the acceleration of gravity) have a 10 percent probability of being exceeded over a fifty-year period. See id. at 3-4. The Board notes, however, that a more detailed map of the USGS seismic hazard probabilities in eastern Idaho is provided in Figure 3-17 of the FEIS. On this map the probable peak acceleration in the area of the proposed EREF is 0.05g to 0.07g, and the nearest

seismic avoidance area is located approximately twenty miles from the EREF site. See FEIS at 3-41.

4 .157 The Board concludes that the applicant's written responses demonstrated that the avoidance areas for both winter weather hazards and seismic hazards were mapped using the best available data and that these avoidance areas were located with sufficient accuracy to ensure that the proposed EREF falls outside their boundaries. That being said, we consider it worth commenting on the seemingly unlikely shape of the region of low seismic risk in which the proposed EREF is located and which prompted our original question to the parties. As noted in FEIS section 3.6.1.1, the eastern Snake River Plain (ESRP) where the proposed EREF site is located is a region of low historic seismicity compared to areas of the Basin and Range tectonic province to the north and south and the Yellowstone Plateau to the east. The low historic seismicity and lack of geologic evidence for large prehistoric earthquakes are the primary factors that influence the results of the USGS calculations that indicate low seismic hazard probabilities for the ESRP relative to the surrounding areas. Moreover, a reasonable explanation for the anomalously low seismicity in the ESRP is provided in several references cited in the license application ER. See ER at 3.3-26 (citing T. Parsons & G.A. Thompson, The Role of Magma Overpressure in Suppressing Earthquakes and Topography: Worldwide Examples, Science, 253-5023: 1399-1402 (1991); T. Parsons, G.A. Thompson, & R.P. Smith, More than One Way to Stretch: A Tectonic Model for Extension along the Plume Track of the Yellowstone Hotspot and Adjacent Basin and Range Province, Tectonics, 17-2: 221-234 (1998)). These technical analyses argue that tectonic strain beneath the ESRP is released by the injection of magmas associated with the Yellowstone hotspot, producing only very small magmatic earthquakes, whereas strain in the surrounding areas is released by sudden movements along normal faults, which can generate much larger earthquakes. This coupling of data on the distribution of historic

earthquakes with a geologically consistent model that explains that distribution addresses the Board's concerns about the shape of the low seismic risk area that includes the EREF site.

ii. Visual Impacts at Hell's Half Acre Wilderness Study Area

4 .158 In its FEIS, the staff notes that operation of the proposed EREF is expected to have a MODERATE visual impact on the quality of the recreational experience for visitors to Hell's Half Acre Wilderness Study Area (WSA), the northern boundary of which is located approximately two miles south of the EREF. See FEIS at 4-11. According to the FEIS, visual impacts result when contrasts are introduced into a visual landscape. The current visual landscape of the proposed EREF site is cultivated farmland and undeveloped rangeland. See id. at 4-8. But during the latter stages of construction and throughout operation, the proposed EREF would introduce several buildings into the landscape along with ambient facility lighting. Both the buildings and the lighting would be visible to campers at the Hell's Half Acre WSA trailhead for the duration of the proposed license. See id. at 4-10 to -11.

4 .159 Based on the staff's finding of a MODERATE visual impact, the Board asked the parties to describe the available data on the annual number of recreational visitors to the Hell's Half Acre WSA during the last decade, and the potential for increased recreational use of the Hell's Half Acre WSA over the next three decades. See Initial Board Environmental Questions at 3 (Environmental Question 7). To provide an answer, the staff contacted the Bureau of Land Management (BLM), Upper Snake Field Office, landowner of the Hell's Half Acre WSA. See Staff Initial Environmental Questions Response at 5. The staff witness supporting the staff's response to this question, Daniel O'Rourke,[37] stated that the staff confirmed from the BLM that

[37] The background and qualifications for staff witness O'Rouke, were set forth previously in section IV.A.6.b supra. With his qualifications as an ANL environmental scientist and his experience in conducting environmental reviews for cultural resources, he is an appropriate supporting witness for this staff response on the visual impacts of the proposed EREF relative

(continued...)

the visitor use data provided in the AES ER were reflective of the past visitor use at the Hell's Half Acre WSA: "Each year, about 9,000 to 10,000 people visit BLM Hell's Half Acre WSA and about 6,600 people use the loop hiking trail." Id. (citing ER at 3.9-1). The BLM also indicated that visitor use of the Hell's Half Acre WSA in fiscal year 2008 was between 6000 and 7000 people, and visitor use in fiscal year 2009 was between 5000 and 6000 people. See id.

4 .160 Staff witness O'Rourke further noted that the staff's analysis of visual impact rests on a qualitative determination and, therefore, does not depend on the precise number of visitors from year to year. As a result, although the data in the ER were not included in the EIS, these data do not change the staff's analysis. See id.

4 .161 The Board concludes that its question regarding the visual impacts relative to the Hell's Half Acre WSA has been adequately addressed by the staff's response. The Board also agrees that operation of the EREF will result in as much as a MODERATE visual impact relative to the Hell's Half Acre WSA trailhead, notwithstanding AES's proposed mitigation measures, which include painting the proposed facility in colors that would blend with the surrounding vegetation; creating earthen berms or other types of visual screens made of natural materials; and utilizing downward facing perimeter lighting.[38] See FEIS at 4-11.

2. Environmental Matters Not Raised by the Board

4 .162 Finally, there are portions of the staff's FEIS, such as that dealing with environmental justice and traffic impacts, about which the Board did not make a specific inquiry

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[37](...continued)
to the Hell's Half Acre WSA.

[38] The Board also notes that the better developed and more heavily used area of the Hell's Half Acre National Natural Landmark, of which the Hell's Half Acre WSA located just south of the EREF is only a small part, is located 20 miles to the southeast of the EREF site and would not be visually impacted. See FEIS at 4-9; Tr. at 551 (Kolpa Test.).

in this proceeding.[39] We found those portions to be sufficient on their face and therefore did not pursue them further.[40] See Clinton ESP, CLI-06-20, 64 NRC at 21-22. Finding nothing illogical about any aspect of the staff's approach to these environmental matters that were not the subject of specific Board inquiry, nor anything to indicate that the facts in the record do not support the staff's conclusions with respect to such environmental matters, we consider the issues addressed in those portions of the FEIS to be resolved in favor of issuance of the requested Part 70 license.

3. Findings Regarding Required NEPA Determinations

4 .163 As was noted previously, see supra section III.C, in accordance with

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[39] In this regard, we note that in its proposed findings of fact relative to the environmental portion of this uncontested hearing, the staff provided an outline of the significant technical findings and conclusions reached in each of its FEIS chapters, which constitute the staff's environmental findings regarding the impacts, alternatives, costs, and benefits associated with the construction, operation, and decomissioning of the proposed EREF. See Staff Proposed Environmental Findings at 9-36.

[40] Although the matter of the need for the EREF in light of the Fukushima I accident was the overwhelming focus of the limited appearance statements received by the Board in connection with the environmental portion of this mandatory hearing, see supra note 13, one of the limited appearance statements sent to the Board after the evidentiary hearing also appears to raise concerns about myrid additional issues that are not subjects specifically addressed by the Board in either the AEA/safety-related or NEPA/environmental-related portions of this proceeding, including the risks of uranium mining and milling; uncertainty about the method and timing of DU waste disposal; impacts of the facility on the local ecology and various local flora and fauna; accident risks associated with transportation of radioactive materials; compliance with the Federal Farmland Protection Act; the need for a nonproliferation assessment of the EREF; the provision of state and federal financial assistance to AES; preconstruction activities associated with transmission lines; and aquifer contamination. See E-mail from Liz Woodruff, Executive Director, Snake River Alliance (SRA) to Administrative Judge Paul Bollwerk (July 15, 2011 05:17 p.m. ET), attached file at unnumbered pages 1-5 (Final Talking Points Areva EIS.doc) (ADAMS Accession No. ML112010259). It appears, however, that the concerns raised in this limited appearance statement are similar, if not identical, to comments previously provided to the staff regarding the EREF draft EIS. See E-mail from Liz Woodruff, Energy Policy Analyst, SRA to EagleRockEIS Resource at 1-5 (Sept. 10, 2010 01:01 p.m. ET) (ADAMS Accession No. ML102580035). Nothing in the staff's FEIS responses to these concerns, see FEIS Appendices at I-23 (Commenter No. 191), provides us with an impetus for undertaking any additional inquiry regarding these matters.

paragraph II.E of the notice of hearing issued in this case, this Licensing Board is required to make the following determinations regarding NEPA issues:

> 1. Determine whether the requirements of section 102(2)(A), (C), and (E) of [NEPA] and Subpart A of 10 C.F.R. Part 51 have been complied with in the proceeding;
>
> 2. Independently consider the final balance among conflicting factors contained in the record of the proceeding with a view to determining the appropriate action to be taken; and
>
> 3. Determine whether the construction permit should be issued, denied, or appropriately conditioned to protect environmental values.

Additionally, the Board must determine whether (1) the application and record of the proceeding contain sufficient information to support license issuance; (2) the staff's review of the application has been adequate to support findings to be made by the NMSS Director with respect to whether (a) the application satisfies the standards set forth in the Commission's hearing notice and the applicable standards in 10 C.F.R. Parts 30, 40, and 70, and (b) the requirements of NEPA and the agency's implementing regulations in Part 51 have been met; and (3) the review conducted by the staff pursuant to 10 C.F.R. Part 51 has been adequate. See 74 Fed. Reg. at 38,053-54 (CLI-09-15, 70 NRC at 7-8). The Board's findings with respect to these NEPA issues are set forth below.

> a. Staff Compliance With NEPA Section 102(2)(A), (C), and (E) and 10 C.F.R. Part 51, Subpart A

4 .164 As detailed in the FEIS, in accord with NEPA section 102(2)(A), 42 U.S.C. § 4332(2)(A), the staff's independent technical analysis of the information provided in the AES ER, as supplemented by the staff, utilizes a "systematic, interdisciplinary approach which will ensure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment," and therefore comports with the NRC's requirements in Appendix A of 10 C.F.R. Part 51. Furthermore, the

staff environmental findings in the FEIS constitute the "hard look" required by NEPA and have reasonable support in logic and fact.

4 .165 In accordance with NEPA section 102(2)(C)(i)-(v), 42 U.S.C. § 4332(2)(C)(i)-(v), the FEIS in chapters 2 and 4, see FEIS at 2-1 to -69, 4-1 to -178, as supplemented by the findings in this decision, adequately addresses (1) the environmental impact of the proposed action; (2) any unavoidable adverse environmental effects; (3) alternatives to the proposed action; (4) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and (5) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented. The Board further concludes that the staff has satisfied the requirements of NEPA section 102(2)(C) to "consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved," 42 U.S.C. § 4332(2)(C). See FEIS at 1-19, 1-24 to -27, 9-1 to -2.

4 .166 In chapter 2 of the staff's FEIS, see FEIS at 2-27 to 2-42, as it involved unresolved conflicts concerning alternative uses of available resources, the staff adequately considered alternatives to the proposed action, including the no-action alternative, alternative sites, alternative sources of low-enriched uranium, and alternative enrichment technologies. Accordingly, the staff consideration of alternatives to the proposed action in the FEIS satisfies NEPA section 102(2)(E), 42 U.S.C. § 4332(2)(E).

4 .167 Having reviewed the basis for the staff's central environmental-related conclusions, the Board finds that the staff's review is adequate under 10 C.F.R. Part 51, Subpart A. See 10 C.F.R. 51.105(a)(4). Thus, all findings and analyses required by NEPA section 102(2)(A), (C), and (E), 42 U.S.C. § 4332(2)(A), (C), and (E), have been satisfied with respect to approval of the AES request for authorization under 10 C.F.R. Part 70 to construct and

operate the EREF. See North Anna ESP, LBP-07-9, 65 NRC at 614.

b. Independent Consideration of the Final Balance Among Conflicting Factors

4 .168 In section 2.5 of the FEIS, the staff concludes that the overall benefits of the proposed EREF outweigh the environmental disadvantages and costs associated with the construction, operation, and decommissioning of the EREF. See FEIS at 2-65. In support of this conclusion, the staff cites two considerations: (1) the need for an additional economical domestic source of enrichment services; and (2) the generally SMALL environmental impacts of the proposed action, although recognizing those impacts could be MODERATE as to certain aspects associated with the areas of historical/cultural resources, visual/scenic resources, ecological resources, and transportation, and LARGE as to certain aspects of air quality, at least on a temporary basis. See id. In accordance with the notice of hearing, the Board has independently considered the final balance among the conflicting factors contained in the record of this proceeding and concludes that, overall, the balance supports issuance of a Part 70 license to AES authorizing the construction and operation of the EREF.

c. Ultimate NEPA Determination Regarding License Issuance

4 .169 In accordance with the notice of hearing, after weighing the environmental, economic, technical, and other benefits against the enviromental and other costs, and considering the reasonable alternatives, the Board concludes that a Part 70 license authorizing AES to construct and operate the EREF should be issued, and no conditions on such license (beyond those already imposed by the staff or the Board) are necessary or appropriate to protect environmental values.

d. Sufficiency of Application/Record, Compliance with 10 C.F.R. Part 51, and Adequacy of Staff Review

Based upon its review of the AES ER, the staff's draft and final EIS, and the record of this

proceeding, the Board concludes that (1) the AES application and record of the proceeding, including the FEIS as supplemented by this decision, contain sufficient information to support issuance of a 10 C.F.R. Part 70 license to AES for the construction and operation of the EREF; (2) the staff's review of the application has been adequate to support any findings to be made by the NMSS Director with respect to whether (a) the application satisfies the standards set forth in the Commission's hearing notice and the applicable standards in 10 C.F.R. Parts 30, 40, and 70, and (b) the requirements of NEPA and the agency's implementing regulations in Part 51 have been met; and (3) the review conducted by the staff pursuant to 10 C.F.R. Part 51 has been adequate.

V. CONCLUSION

5 .1 In accordance with the Commission's directives, see Clinton ESP, CLI-05-17, 62 NRC at 34, 39; Clinton ESP, CLI-06-20, 64 NRC at 21-22, the Board conducted an independent sufficiency review of the staff findings, and probed those staff findings by focusing in detail on the NEPA/environmental-related issues addressed by the staff in its FEIS. In this regard, as was noted in section IV supra, relative to those matters that were the subject of a series of Board questions prior to the hearing, but for which the Board did not request a presentation from either the staff or AES, see section IV.B.1.a supra, the Board was satisfied with the answers provided. See Clinton ESP, CLI-06-20, 64 NRC at 21-22. Similarly, with respect to each of the topics that were the subject of party presentations at the July 2011 evidentiary hearing (and which were described in detail in section IV.A. above), the Board concludes that the staff review was sufficient and reasonably supported in logic and fact. Finally, the Board was satisfied with the adequacy of the staff review of topics in its FEIS that were not the subject of either Board questions or presentations.

5 .2 In accordance with the Commission's notice of hearing for this proceeding, see 74 Fed. Reg. at 38,054 (CLI-09-15, 70 NRC at 7), having reviewed the basis for the staff's NEPA/environmental-related conclusions, the Board determines that (1) the application and record of the proceeding contain sufficient information to support license issuance; (2) the staff's review of the application has been adequate to support findings to be made by the NMSS Director with respect to whether (a) the application satisfies the standards set forth in the Commission's hearing notice and the applicable standards in 10 C.F.R. Parts 30, 40, and 70, and (b) the requirements of NEPA and the agency's implementing regulations in Part 51 have been met; and (3) the review conducted by the staff pursuant to 10 C.F.R. Part 51 has been adequate. Further, after considering the final balance among conflicting factors in the record of this proceeding, the Board concludes that (1) the requirements of NEPA section 102(2)(A), (C), and (E) and 10 C.F.R. Part 51, Subpart A, have been complied with in the proceeding; and (2) after independently weighing the environmental, economic, technical, and other benefits against the environmental and other costs, and considering reasonable alternatives, the license requested under the AES application at issue in this proceeding should be issued.

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6 .1 For the foregoing reasons, it is this seventh day of October 2011, ORDERED, that:

1. Pursuant to 10 C.F.R. § 2.340(k), if the Director, NMSS, has made all findings necessary for license issuance that are not within the scope of this PID, within ten days of the issuance of this PID the Director, NMSS, shall issue the appropriate license authorizing the construction and operation of the proposed EREF.

2. Pursuant to 10 C.F.R. § 2.341(a), this PID will constitute a final decision of the

Commission forty (40) days from the date of issuance, i.e., on Wednesday, November 16, 2011, unless a petition for review is filed in accordance with 10 C.F.R. § 2.341(b), or the Commission directs otherwise. Any party wishing to file a petition for review on the grounds specified in section 2.341(b)(4) must do so within fifteen (15) days after service of this PID. A party must file a petition for review to have exhausted its administrative remedies before seeking judicial review. Within ten (10) days after service of a petition for review, any other party to the proceeding may file an answer supporting or opposing Commission review. Any petition for review and any answer shall conform to the requirements of 10 C.F.R. § 2.341(b)(2)-(3).

THE ATOMIC SAFETY
AND LICENSING BOARD

/RA/
G. Paul Bollwerk, III
CHAIRMAN

/RA/
Kaye D. Lathrop
ADMINISTRATIVE JUDGE

/RA/
Craig M. White
ADMINISTRATIVE JUDGE

Rockville, Maryland

October 7, 2011

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
AREVA ENRICHMENT SERVICES, LLC	)	DOCKET NO. 70-7015-ML
(Eagle Rock Enrichment Facility)	)	
	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing Licensing Board **SECOND AND FINAL PARTIAL INITIAL DECISION (LBP-11-26)**, dated October 7, 2011, have been served upon the following persons by Electronic Information Exchange.

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[Original signed by Linda D. Lewis]
Office of the Secretary of the Commission

Dated at Rockville, Maryland
this 7th day of October, 2011