UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE SECRETARY

In the Matter of Docket No. 70-3103

Louisiana Energy Services
National Enrichment Facility

PETITION TO INTERVENE BY
NUCLEAR INFORMATION AND RESOURCE SERVICE
AND
PUBLIC CITIZEN

Pursuant to 10 CFR 2.309 and the notice published by the Nuclear Regulatory Commission ("NRC" or the "Commission"), at 69 Fed. Reg. 5873 (Feb. 6, 2004), Petitioners Nuclear Information and Resource Service ("NIRS") and Public Citizen hereby petition to intervene in the above-captioned proceeding. As demonstrated below, Petitioners have representational standing, through their members, to make this petition.

Description of Proceeding

This proceeding concerns an application by Louisiana Energy Services, L.P. ("LES") for licenses necessary to authorize construction and operation of a gas centrifuge enrichment facility at a site in Lea County, New Mexico, near the City of Eunice. LES filed its application with the NRC on December 15, 2003. The NRC published a notice of hearing and opportunity to intervene on February 6, 2004 at 69 Fed. Reg. 5873 (Feb. 6, 2004). If granted pursuant to 10 CFR 30.33, 40.32, and 70.23, the NRC licenses sought by LES would authorize LES to construct and operate the first full-scale gas centrifuge enrichment facility in the United States.

Description of Petitioners

NIRS is a non-profit corporation with more than 6000 members, 48 of whom reside in New Mexico and several of whom live in southeastern New Mexico. Attached are the declarations of ten members of NIRS, who support this petition. NIRS has a mission to promote a non-nuclear energy policy and a concern for the health and safety of the people and ecosphere that includes southeastern New Mexico and the surrounding region.

Public Citizen is a national non-profit consumer advocacy organization with 126,537 members nationwide, including 1628 members in New Mexico. Rose Gardner, whose declaration is attached, is a member of Public Citizen and supports this petition. Public Citizen's mission is to protect openness and democratic accountability in government and the health, safety, and financial interests of consumers. Public Citizen advocates policies that will lead to safe, affordable, and environmentally-sustainable energy.

Standing

As required by NRC's Federal Register notice and 10 CFR 2.309, a petition to intervene must state:

(i) The name, address, and telephone number of the requestor or petitioner;
(ii) The nature of the requestor's/petitioner's right under the Act to be made a party to the proceeding;
(iii) The nature and extent of the requestor's/petitioner's property, financial or other interest in the proceeding; and
(iv) The possible effect of any decision or order that may be issued in the proceeding on the requestor's/petitioner's interest.

Caselaw of the NRC further explains the standing requirement. The Atomic Safety and Licensing Board recently summarized these standing requirements:

> When determining whether a petitioner has established the necessary "interest" under section 2.714 [now 2.309], licensing boards are directed by Commission precedent to look for guidance to judicial concepts of standing. *See, e.g., Yankee Atomic Electric Company* (Yankee Nuclear Power Station), CLI-98-21, 48 NRC 185, 195 (1998); *Quivira*

> *Mining Co.* (Ambrosia Lake Facility, Grants, New Mexico), , CLI-98-11, 48 NRC 1, 5-6 (1998); *Georgia Institute of Technology* (Georgia Tech Research Reactor, Atlanta, Georgia), CLI-95-2, 42 NRC 111, 115 (1995). According to these concepts, to qualify for standing a petitioner must allege (1) a concrete and particularized injury that is (2) fairly traceable to the challenged action and (3) likely to be redressed by a favorable decision. *See, e.g., Steel Co. v. Citizens for a Better Environment*, 523 U.S. 83, 102-04 (1998); *Kelly v. Selin*, 42 F.3d 1501, 1508 (6th Cir. 1995). These three criteria are commonly referred to, respectively, as "injury in fact," causality, and redressability. The requisite injury may be either actual or threatened. *Yankee*, CLI-98-21, 48 NRC at 195 (citing, e.g., *Wilderness Society v. Griles*, 824 F.2d 4, 11 (D.C. Cir. 1987)), but must arguably lie within the "zone of interests" protected by the statutes governing the proceeding—here, either the AEA or the National Environmental Policy Act (NEPA). *See Yankee*, CLI-98-21, 48 NRC at 195-196; *Ambrosia Lake Facility*, CLI-98-11, 48 NRC at 6.

In re *Duke Energy Corp.* (Catawba Nuclear Station, Units 1 and 2), LBP-04-04, __ NRC __ (March 4, 2004) (at 11-12).

Petitioners' standing to participate in this proceeding is demonstrated by the declarations of the following members of Petitioner organizations, who have authorized Petitioners to represent their interests in this proceeding:

> Rose Gardner, Eunice, NM
> Maurice Gardner, Eunice, NM
> Jessica Gardner, Eunice, NM
> Evelina Berumen, Eunice, NM
> Wayne Henson, Eunice, NM
> Phillip C. Barr, Hobbs, NM
> Lee Cheney, Hobbs, NM
> Tommie Williams, Eunice, NM
> Fletcher Williams, Eunice, NM
> Anita Ireland, Eunice, NM
> Elizabeth J. Nymeyer, Eunice, NM

As demonstrated by the attached declarations, Petitioners' members live near the proposed site, i.e., within 2-1/2 to 22 miles. Thus, they have presumptive standing by virtue of their proximity to the enrichment facility that may be built at the site. *See Pacific Gas & Electric Co.* (Diablo Canyon Power Plant Independent Spent Fuel Storage Installation), LBP-02-23, 56 NRC 413,

426-27 (2002), citing *Florida Power & Light Co.* (Turkey Point Nuclear Generating Plant, Units 3 and 4), LBP-01-6, 53 NRC 138, 146, *aff'd,* CLI-01-17, 54 NRC 3 (2001).

Petitioners' members seek to protect their lives and health by opposing the licenses sought by LES. The issuance of such licenses to LES could have an adverse effect on these individuals' interests in protecting their health and safety by allowing the construction of an unsafe nuclear facility. Petitioners seek to ensure that no such licenses are issued by the Commission unless LES demonstrates full compliance with the AEA and NEPA.

Specific Aspects of the Subject Matter as to which Petitioners Seek to Intervene

As contemplated by the Federal Register notice, Petitioners set forth below the specific aspects of the subject matter of this proceeding as to which they wish to intervene:

1. Whether there is a reasonable basis for information provided by the applicant regarding projected emissions, site impacts, safety factors, and exact operational parameters.
2. Whether sufficient information is available regarding the potential impact of the proposed facility upon shallow and deep ground water beneath the site to permit sound judgments about such environmental impacts.
3. Whether sufficient information has been provided regarding the impact of operation of the proposed facility upon municipal sources of water to permit sound judgments about such impacts.
4. Whether sufficient information has been provided regarding the potential impact of storage of depleted uranium hexafluoride (UF_6) at the proposed facility to permit sound judgments about such impacts.

5. Whether sufficient information has been provided regarding the cost and potential impact of disposal of depleted UF_6 to permit sound judgments about such matters.
6. Whether sufficient information has been provided concerning the risks to national security based on probable proliferation of nuclear weapons technology that may result from the construction of the proposed facility.
7. Whether sufficient information has been provided about the need, or lack of need, for the proposed facility in the market for uranium enrichment services.
8. Whether the application contains a sufficient decommissioning plan, including provision for the financing of decommissioning and disposal of depleted UF_6.
9. Whether the applicant's Environmental Report contains a sufficient discussion of the proposed action's environmental impacts, particularly as regards potential effects of gas pipeline and gas well accidents, transportation impacts, and cumulative effects of related nearby facilities for deconversion and waste disposal that are likely to be built to serve the proposed facility.

Conclusion

For the foregoing reasons, Petitioners have demonstrated their standing to intervene in the pending proceeding and to participate in the forthcoming hearing on the issuance of licenses to LES to construct and operate the proposed facility. Petitioners should be admitted as intervenors.

Respectfully submitted,

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April 6, 2004

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE SECRETARY

In the Matter of Docket No. 70-3103

Louisiana Energy Services
National Enrichment Facility

CONTENTIONS ON THE CONSTRUCTION PERMIT/OPERATING LICENSE APPLICATION FOR THE NATIONAL ENRICHMENT FACILITY MADE BY NUCLEAR INFORMATION AND RESOURCE SERVICE AND PUBLIC CITIZEN

Pursuant to 10 CFR 2.309 and the notice published by the Nuclear Regulatory Commission ("NRC" or the "Commission") at 69 Fed. Reg. 5873 (Feb. 6, 2004), Petitioners Nuclear Information and Resource Service ("NIRS") and Public Citizen present the following contentions for hearing on the construction permit/operating license application by Louisiana Energy Services, L.P. ("LES"). Each of the contentions asserted herein is within the scope of this licensing proceeding and concerns matters that are material to the determinations to be made in such proceeding, as required by 10 CFR 2.309(f).

Contentions presented herein are organized into the following categories:

1. Impacts upon ground water and water supplies
2. Waste storage and disposal
3. Decommissioning costs
4. Costs of management and disposal of depleted UF_6
5. Need for the facility; impact on national security

6. Natural gas-related accident risks not adequately accounted for

1. Impacts upon ground water and water supplies

1.1 Contention: Petitioners contend that the Environmental Report ("ER") contained in the application does not contain a complete or adequate assessment of the potential environmental impacts of the proposed project on ground and surface water, contrary to the requirements of 10 CFR 51.45.

The factual bases for such contention are set forth below, based upon analyses prepared by George Rice, an experienced groundwater hydrologist, whose resume is attached. In many instances the bases refer to matters that appear not to have been investigated or considered in the ER.

As background, the proposed NEF site is underlain by 10 to 30 feet of alluvium (ER 3.3-6).[1] The alluvium is underlain by the Dockum Group, which is composed of two subunits: the Chinle Formation and the Santa Rosa Aquifer. The Chinle immediately underlies the alluvium (ER 3.3-2). Water exists in the Chinle at a depth of about 220 feet (ER 3.4-12). The top of the Santa Rosa is about 800 feet below land surface (ER 3.4-12).[2,3]

The NEF will generate waste waters (treated effluent from the plant operations and sewage) and stormwater runoff. LES intends to discharge plant effluents and runoff to evaporation basins on the plant. Sewage will be discharged to a septic leach field. Treated effluent from the plant will be discharged to a double lined evaporation basin (ER 8.8-3). Approximately 2535 m^3 of effluent will be discharged to the basin each year (ER 8.8-3).

[1] Alluvium is stream deposited clay, silt, sand, and gravel.
[2] The Santa Rosa Aquifer is used as a source of domestic and livestock water (Leedshill-Herkenhoff et al., 2000, page 6-12). LES does not believe the Santa Rosa can be affected by the proposed NEF. Thus, it does not intend to investigate this unit (ER 3.4-12 and 3.4-13).
[3] The 800 foot figure is inconsistent with the depth reported for the top of the Permian units (760 feet, ER page 3.3-3). The Santa Rosa is above the Permian (Nicholson and Clebsch, 1961, table 3). See discussion below.

Stormwater runoff from the uranium byproduct cylinder ("UBC") storage pad and cooling tower blowdown will be directed to a single lined evaporation basin (ER 8.8-3). This basin will be able to hold approximately 53,600 m^3 of runoff (ER 8.8-3). Stormwater runoff from the plant (except the UBC storage pad) will be directed to an unlined evaporation basin (ER 8.8-3). This basin will be able to hold approximately 23,350 m^3 of runoff (ER 3.4-6). Overflow from the basin will be discharged to ground surface (ER 4.4-7). Sewage will be discharged either to an above ground leach field (drain pipes buried beneath a mound of sand and soil) or a below ground leach field (ER 4.1-3). Approximately 7250 m^3 of sewage will be discharged annually (ER 3.12-4).

Some water from the evaporation basins and septic leach field will infiltrate into the alluvium. A number of things may happen to the water after it enters the subsurface. It may be removed by evapotranspiration, pond on the surface of the Chinle Formation and flow along the alluvial/Chinle contact, flow into the groundwater system that exists in the Chinle Formation, or flow into the Santa Rosa Aquifer.

A. Basis: In this situation, the ER has several serious shortcomings: The ER fails to demonstrate that there has been any evaluation of the fate of waste waters and runoff that enter the subsurface at the NEF. To determine where this water will go, LES should answer the following questions:

a. How much water would infiltrate into the alluvium from:

- The treated effluent basin?
- The UBC storage pad and cooling tower blowdown basin?
- The stormwater basin?
- The septic leach field?

b. Where would water flowing along the alluvial/Chinle contact be discharged?

c. How long would it take for water from the NEF to reach the discharge area?

d. Are there subsurface fractures or other fast pathways that would allow water to flow rapidly from the alluvium to the Chinle, or from the Chinle to the Santa Rosa?

It should be noted that a pesticide has been detected in a groundwater sample collected from Chinle monitor well (MW-2) (ER 3.4-7). This finding may indicate a connection to the surface such as a fast flow path from the alluvium to the Chinle. LES says only that the detection is probably a false positive (ER 3.4-7).

e. LES also should have determined the ages of water in the Chinle and Santa Rosa. Relatively young water would indicate that water reaches these units along fast flow paths.

f. LES has also failed to adequately address whether groundwater exists in the alluvium at the proposed NEF site. LES has installed three Chinle monitor wells (ER 3.2-17) and drilled 14 borings at the site (ER 3.2-20). LES has provided logs for five borings (ER figures 3.2-10 – 3.2-14), but not for the other nine borings or the monitor wells. LES should provide all logs and descriptions of subsurface materials so that its claim that there is no groundwater in the alluvium (ER 3.4-5) can be thoroughly evaluated. The five logs that were provided indicate that the borings were backfilled on the same day they were drilled (ER figures 3.2-10 – 3.2-14). Thus, LES may not have allowed sufficient time for water to enter the borings. Water levels in the alluvial groundwater system at the WCS site are known to recover slowly (ER 3.2-15). Further, the clay at the bottom of boring B-2 was described as “moist” (ER figure 3.2-11). This could be due to the presence of water in the alluvium. In addition, groundwater is known to exist in the alluvium at three places near the NEF site: 1) about ½ mile north at the Wallach sand and gravel quarry (ER 3.4-2), 2) about ½ mile northeast at Baker Spring (ER 3.4-2 and 3.4-3), and 3) about 2/3 mile east at the WCS site (ER 3.4-3 and 3.4-4). In this situation, the ER should also have

addressed questions such as: What are the sources (recharge points) of groundwater in the Chinle and Santa Rosa? How will LES distinguish between groundwater contamination caused by the NEF and contamination caused by other potential sources (e.g., Wallach quarry, WCS site, Lea County Landfill[4])?

g. There are other questions not adequately addressed in the ER which demand answers before the ER can be considered a complete and adequate assessment of potential impacts on groundwater. For example, there is a mystery as to the depth of the Santa Rosa Aquifer at the NEF site. LES states that the depth is 800 feet (SAR 1.3-9). This is contradicted by the statement that the top of the Permian is at a depth of 760 feet (ER 3.3-3). The Santa Rosa is above the Permian.[5] According to ER table 3.3-1, the top of the Santa Rosa is approximately 450 feet below land surface. There is a Dockum Group well approximately 3 miles from proposed NEF site (T22S, R38E Sec. 18, 234).[6] The water-bearing unit is at a depth of 325 feet. This may be the Santa Rosa Aquifer.

h. In addition, LES does not intend to investigate the Santa Rosa Aquifer at the proposed NEF site (ER 3.4-13). LES plans to install only two monitor wells (ER 6.1-7 and figure 6.1-2). Presumably, these wells will be completed in the alluvium. This does not appear to be adequate. There will be at least four potential sources of groundwater contamination at the site (three evaporation basins and the septic leach field). At least one well should be up gradient of the site (background).

i. Further, the detection limit for most metals in groundwater will be 5 ppm (ER table 6.2-1). This is much higher than the health-based standards established for many metals (e.g.,

[4] The Lea County Landfill is less than 500 feet from the southeast corner of the proposed NEF site.
[5] Nicholson and Clebsch, 1961, table 3.
[6] Nicholson and Clebsch, 1961, plate 2.

arsenic = 0.05 ppm, chromium = 0.1 ppm).[7] The detection limits for each metal should be no higher than the health-based standard.

j. Also, the full composition of the UF_6 feedstock has not been specified (ER at 1.2-2). LES should identify the other hazardous materials that may be contained in the feedstock (e.g., metals).

k. The permeabilities presented in ER table 3.3-2 of the Environmental Report may be derived from laboratory measurements. Laboratory measurements often underestimate the bulk permeability of a rock body because they do not account for fractures and other features that may act as fast flow paths.[8]

l. LES states that water in the Santa Rosa Aquifer is "considered not potable." (ER 4.12-9) The basis for this statement is not given. The Santa Rosa Aquifer is used as a source of domestic and livestock water in Lea County.[9]

References:

Davis, S.N., and R.J.M. DeWiest, 1966, *Hydrogeology*.
EPA 1998, *Safe Drinking Water is in Our Hands, Existing Standards and Future Priorities*, EPA 815-F-98-007, June 1998.
Leedshill-Herkenhoff, Inc., John Shomaker & Associates, Inc., Montgomery & Andrews, P.A., 2000, *Lea County Regional Water Plan*, prepared for Lea County Water Users Association, December 7, 2000.
Linsley, R. K., Kohler, M. A., and Paulhus, J. L. H., 1958; *Hydrology for Engineers*, McGraw-Hill Book Company.
Louisiana Energy Services, 2003c, National Enrichment Facility Wall Map; December 2003, downloaded from: http://www.nrc.gov/materials/fuel-cycle-fac/licapp-envir-rpts.html.
Nicholson, A., and A. Clebsch Jr., 1961, *Geology and Ground-Water Conditions in Southern Lea County, New Mexico*; Ground-Water Report 6, New Mexico Bureau of Mines and Mineral Resources, 1961.

[7] EPA 1998.
[8] Linsley, Kohler, and Paulhus, 1958, page 131; Davis and DeWiest, 1966, page 165.
[9] Leedshill-Herkenhoff et al., 2000, page 6-12.

1.2 Contention: Petitioners contend that the ER contained in the application does not contain a complete or adequate assessment of the potential environmental impacts of the proposed project upon water supplies in the area of the project, contrary to 10 CFR 51.45.

To introduce a new industrial facility with significant water needs in an area with a projected water shortage runs counter to the federal responsibility to act "as a trustee of the environment for succeeding generations," according to the National Environmental Policy Act (NEPA) § 101(b)(1) and 55 U.S.C. § 4331(b)(1). To present a full statement of the costs and benefits of the proposed facility the ER should set forth the impacts of the NEF on groundwater supplies.

A. Basis: The NEF would require two new potable water supply lines—one from Eunice and the other from Hobbs (ER 4.1.2). LES claims that the water requirements of the NEF, which would average 240 m^3/day, are well within the capacity of the Eunice and Hobbs water systems, which have a combined capacity of 92,050 m^3/day (ER 4.4.5). Such reliance on daily capacity totally neglects the severe long-term water shortage problem of Lea County. The *Lea County Regional Water Plan*, a comprehensive survey of water resources, shows that most potable water in Lea County is drawn from the Lea County Underground Water Basin (UWB), which is part of the Ogallala Aquifer—an essential water source for agricultural irrigation. The water plan states that groundwater in the UWB is being withdrawn faster than it is being recharged, causing the water level to drop of as much as 70 feet since the 1920s. The report projects a doubling of water usage by 2040 and warns that "there is physically not enough water in the Basin to maintain an annual diversion of this magnitude."[10] An adequate ER would set forth the impact of the NEF in contributing to such foreseeable shortage of a vital resource.

[10] *Lea County Regional Water Plan*, Prepared for the Lea County Water Users Association by Leedshill-Herkenhoff, Inc., John Shomaker & Associates, Inc., and Montgomery & Andrews, P.A. 7 Dec. 2000.

2. Waste storage and disposal

2.1 Contention: Petitioners contend that LES does not have sound, reliable, or plausible strategy for disposal of the large amounts of radioactive and hazardous Depleted Uranium Hexaflouride ("DUF_6") waste that the operation of the plant would produce. See NRC Order, 69 Fed. Reg. 5873, 5877 (Feb. 6, 2004).

The factual bases for such contention are set forth below, based upon analyses by Dr. Arjun Makhijani, whose resume is attached.

As background, LES states in its application (ER 4.13.3.1.3 Depleted UF6 Disposition Alternatives) that its "preferred option and a 'plausible strategy' for disposition of the UBCs [uranium byproduct cylinders] is private sector conversion and disposal…." LES goes on to argue (ER 4.13-8) that "ConverDyn, a company that is engaged in converting U_3O_8 material to UF_6 for enrichment, has the technical capability to construct and operate a depleted UF_6 to depleted U_3O_8 facility at its facility in Metropolis, Illinois in the future if there is an assured market. One of the two ConverDyn partners, General Atomics, may have access to an exhausted uranium mine (the Cotter Mines in Colorado) where depleted U_3O_8 could be disposed. Furthermore, discussions have recently been held with Cogema concerning a private conversion facility. Cogema has experience with such a facility currently processing depleted UF_6 in France. These factors support LES's position that this option is the preferred 'plausible strategy' option."

A. Basis: In reality, the ability to construct a UF_6 to U_3O_8 deconversion plant and the possible access to a uranium mine are more wishful thinking than "plausible strategy." As LES itself states, (ER 4.13-15), DOE possesses approximately 700,000 metric tons of depleted UF_6 from operations at its Oak Ridge, Paducah and Portsmouth uranium enrichment plants, which

started piling up as far back as far as 1947. DOE is building its own conversion facilities. That taxpayers must fund the capital costs of these facilities is a strong indication that the private sector does not believe that construction of a conversion facility would make economic sense.

Further, there is the issue of the hazards of transporting DUF_6. If DOE or any other entity were to convert DUF_6 into U_3O_8, it would be far less risky to convert it at the place where it is generated than to transport it for conversion. In case of an accident and puncture of cylinders, even a modest fire would cause rapid volatilization of DUF_6. DUF_6 readily hydrolyzes, i.e., reacts with moisture to form uranyl fluoride and hydrofluoric acid. Hence an accident of this type would release both hazardous and radioactive materials that would be dispersed over considerable areas and that would severely affect motorists present on the road. LES's conversion strategy would be far more plausible if it were proposing to actually build the facility as an integral part of the enrichment plant.

B. Basis: The statement that a ConverDyn partner, General Atomics, "may have access to an exhausted uranium mine…where depleted U_3O_8 could be disposed" represents a grossly inadequate certitude for a "plausible strategy" determination, particularly for a radioactive and hazardous substance which has been accumulating in massive quantities in the U.S. for 57 years without a plausible disposal program. Moreover, officials at Cotter Mines have publicly denied that they would or could accept the LES waste. (See interview by John Fleck, published in Albuquerque Journal, Jan. 7, 2004). Neither has LES made a serious argument, much less demonstrated, that the Cotter Mines site meets technical and environmental criteria for DU disposal.

C. Basis: Similarly, the statement that "discussions have recently been held with Cogema concerning a private conversion facility" (ER 4.13-8) is without substance. LES does

not indicate the outcome of these discussions, whether Cogema actually is interested in this idea, whether Cogema believes construction of a conversion facility would be profitable, and so forth. Holding discussions is hardly the same as a substantive commitment to build and operate such a facility.

D. Basis: The LES application (ER 4.13.3.1.3 Depleted UF6 Disposition Alternatives) states, "The disposition of UBCs by DOE conversion and disposal is described…since it is also a 'plausible strategy,' but is not considered the preferred option." In support of this assertion, LES points to § 3113 of the 1996 USEC Privatization Act (which requires the DOE to take possession and dispose of DU from private uranium enrichment plants *if* the waste is considered by the NRC to be low-level radioactive waste) and to two letters, one from DOE, dated July 25, 2002, and one from NRC, dated March 24, 2003. The DOE letter states, "….the Department acknowledges that Section 3113 *may* constitute a "plausible strategy for the disposal of depleted uranium from the private sector domestic uranium enrichment plant license applicants and operators," but DOE also states that "there has been no formal determination by NRC that depleted uranium is low-level radioactive waste for purposes of Section 3113 of the 1996 USEC Privatization Act. Consequently, DOE is not obligated to accept it for disposal unless and until NRC makes such a determination." (*emphasis added*). DOE's letter adds: "The procedures and costs for this potential service are yet to be determined." Similarly, the NRC letter states, "NRC staff considers that Section 3113 would be a 'plausible strategy' for dispositioning depleted uranium tails *if* NRC determines that depleted uranium is a low-level radioactive waste. In that regard, the staff expects that LES will indicate in its application whether it will treat the tails as a waste or a resource. LES should also demonstrate in its application, given the expected constituents of

its depleted tails, that the tails meet the definition of low-level radioactive waste in 10 CFR Part 61." (*emphasis added*).

Thus, even LES's supporting documents, and the official positions of both DOE and NRC, establish that DOE acceptance of DU waste is "plausible" only if NRC makes a formal determination that UF_6 tails are low-level radioactive waste. UF_6 waste has been stored onsite at DOE facilities for 57 years now, and the volume of this waste has grown to more than 700,000 metric tons, yet NRC never has been able to make a determination that this radioactive/hazardous material is "low-level" waste—even given the tremendous economic boost such a determination would have given the DOE for its own waste disposal needs. Moreover, DOE itself has not decided that the UF_6 is low-level waste or any kind of waste. Because the major radioactive component of UF_6, Uranium-238, has a half-life of 4.46 billion years, there clearly have been no major new technical findings that would allow NRC to declare that UF_6 can be classified as "low-level" waste (which requires an institutional control period of only 500 years).

LES attempts to avoid this dilemma by describing the list of radioactive waste categories and determining that DU waste does not fit neatly into any of them. (See ER 4.13-6, -7). LES erroneously concludes from this exercise that DU waste thus falls, by default, into the low-level waste category. LES's reliance on a default definition of low-level waste is inappropriate and incorrect. LES omits to note that it is the NRC, not LES, that determines waste classification. The classification of low-level waste can apply only to waste that would clearly be appropriate for shallow land disposal and 100 year institutional control. DU meets neither requirement. Greater than Class C ("GTCC") waste requires special disposal methods (discussed below), and

thus the second option proposed by LES is also inappropriate and cannot be considered a "plausible strategy" for disposition of its DU waste.

It can be shown that DU fits into the waste category of GTCC waste. It consists of long-lived alpha-radiation-emitting uranium isotopes, mainly uranium-238. The specific activity of DU is about 400 nanocuries per gram. It varies and can be slightly more or slightly less depending on the U-234 content of the DU, but is always greater than about 340 nanocuries per gram, even at the theoretical limit when all U-235 has been extracted from the uranium. The limit for long-lived alpha emitting isotopes above which waste is normally classified as GTCC waste is 100 nanocuries per gram. It is true that the specific alpha-emitting radionuclides mentioned in the regulation are transuranic radionuclides (with atomic number greater than 92, the atomic number of uranium). This is probably because DU has never been formally viewed as a waste. Throughout the nuclear era, uranium-238, the main component of DU, has been considered as a resource because it can be converted into plutonium-239 in breeder reactor blankets. For such reasons, many, including DOE personnel, still regard DU as a resource. However, now that plutonium dreams have become far too costly to be realized on a large scale, DU is on the verge of formally being considered a waste, and its classification must be based upon criteria that were used to classify other wastes.

The long half-life of all three uranium isotopes (the shortest half-life, that of U-234, is more than 200,000 years), the fact that they are all alpha emitters, and the specific activity of DU being well over 100 nanocuries per gram (U_3O_8, the suggested disposal waste form, has a specific activity of over 300 nanocuries per gram) all point to the classification of DU as GTCC waste. Thus, LES's "plausible strategy for waste disposition," which relies on a non-existent

conversion facility *and* a determination that DU waste is low-level radioactive waste, is based on two unrealistic assumptions and is therefore doubly implausible.

The conclusion that DU is GTCC waste fits squarely within the NRC definition for that category, if we ignore the nomenclatural difference between uranium and transuranium radionuclides and focus on the substance. In 10 CFR 61.55 (3)(iii) and (iv), NRC defines wastes containing more than 100 nanocuries per gram of alpha-emitting transuranic radionuclides with half-lives of more than 5 years as "not generally acceptable for near-surface disposal." Indeed, such wastes are clearly comparable to the wastes defined as transuranic ("TRU") waste by DOE and EPA (with small differences – the NRC definition is more stringent) (See 40 CFR § 191.02(i)). Such wastes must be disposed of in a deep geologic repository. DOE is currently spending $20 billion to dispose of TRU waste in a deep repository; DU cannot logically be classified in any other way than in a category that would mark it for deep geologic disposal.

Table 1 shows the logic of this conclusion by comparing the properties of U-234 and U-238, which account for almost all the radioactivity in DU, with the main constituents of TRU waste:

Table 1: Properties of U-234, U-238 and Selected Transuranic Radionuclides

Isotope	**Main decay mode**	**Alpha particle energy, MeV**	**Half-life, years**	**Comments**
uranium-238	Alpha	4.1	4.46 billion	
uranium-234	Alpha	4.8	245,000	
neptunium-237	Alpha	4.8	2.14 million	

plutonium-238	Alpha	5.5	87.7	
plutonium-239	Alpha	5.1	24,110	
plutonium-240	Alpha	5.1	6,537	
americium-241	Alpha	5.5	432	strong gamma emitter

Notes:

1. All energies rounded to two significant figures. The alpha emitting radionuclides emit alpha particles with more than one characteristic energy, with each energy level being produced with a known probability. The alpha particle energy shown is an approximate average of these particles energies, weighted by the emission probability.
2. Plutonium-241 is not included in the definition of TRU waste since it has a half-life of less than 20 years. Its beta particle energy is 0.021 MeV.

The disposition of depleted uranium tails must be addressed based on the radiological hazards of this material that require that it be disposed of in a deep geological repository.

2.2 Contention: Petitioners contend also that the LES ER lacks adequate information to make an informed licensing judgment, contrary to the requirements of 10 CFR Part 51. As set forth below, the ER fails to discuss the impacts of construction and operation of deconversion and disposal facilities that are required in conjunction with the proposed enrichment plant.

The factual bases for such contentions are set forth below and also above, in connection with 2.1, based upon analyses by Dr. Arjun Makhijani, whose resume is attached.

A. Basis: The ER does not, for example, include environmental impacts of construction and lifetime operation of a conversion plant for the UF_6 waste (suggesting that construction and operation of such a plant is not seriously considered). The suggestion that Cogema and/or ConverDyn may build and operate such a facility for the conversion of LES's UF_6 waste shows that the ER is deficient in not addressing the cumulative environmental impacts of construction and operation of such a facility, which would in fact be an integral part of LES's operations.

Specifically, the disposition of contaminated hydrofluoric acid ("HF") would be a significant issue. Radioactively contaminated materials should not be released into open commerce. Treating HF as a waste or transporting it for re-use in the manufacture of UF_6 would be expensive and would create risks. Both the costs and risks must be analyzed.

B. Basis: The ER does not discuss the environmental ramifications of construction and operation of a geological repository for the UF_6 waste. Nor does it even include a discussion of the environmental effects of generation and storage of additional UF_6 waste (on top of the 700,000 metric tons existing now in the U.S., and thousands of tons to be generated by the existing enrichment facility at Paducah, Tennessee and U.S. Enrichment Corporation's approved test centrifuge plant at Portsmouth, Ohio). A full discussion of this issue should be part of the assessment of the impacts of the proposed action in both the ER and the NRC's Environmental Impact Statement ("EIS").

3. Decommissioning costs

3.1 Contention: LES has presented estimates of the costs of decommissioning and funding plan as required by 42 U.S.C. 2243 and 10 CFR 30.35, 40.36, and 70.25 to be included in a license application. See SAR 10.0 through 10.3; ER 4.13.3. Petitioners contest the sufficiency of such presentations, as set forth more specifically herein.

The bases for such contention are set forth below, based upon analyses by Dr. William J. Weida, whose resume is attached. Petitioners refer below to the portions of the application that are put in issue:

A. Basis: LES adopts as its model for the cleanup of the NEF two short-term projects carried out in Europe (see SAR Table 10.1-1, note 8, Table 10.1-2, note 4, 10.1.7.3, 10.1.7.4). However, the effort required in decommissioning a plant largely depends upon the length of time

it was in operation; thus, the cleanup of short-term pilot operations is not an appropriate proxy. The decommissioning of a facility after 30 years of operation is a process which can only be approximately predicted. The difficulties encountered in decommissioning depend upon the nature and extent of contamination occurring during operations, factors that can easily be underestimated at the inception of a project. It is appropriate in attempting to project the nature of the work required to refer to proxy projects that can be viewed in hindsight. The costs of decommissioning both of the DOE weapons complex and commercial sector nuclear facilities normally have been greater than originally estimated.

B. Basis: The cost estimate contained in the application is not reasonable and contains several inaccuracies. The stated contingency fee amounts for the LES proposal are only 10% (SAR Table 10.1-1, note 8). This lowers the cost estimates considerably. The report produced by the Lawrence Livermore National Laboratory (Hatem Elyat et al., "Cost Analysis Report for the Long-Term Management of Depleted Uranium Hexafluoride," UCRL-AR-127650, May 1997) ("LLNL Report") and described by LES as "the most comprehensive assessment of DUF_6 disposition costs for alternative disposition strategies available in the public domain" (SAR 10.3-1) has contingency fees of 30% for similar facilities and 30-50% for the type of equipment required by the process specified by LES. (LLNL Report § 3.2.2.4, at 30-31). Moreover, funding for major projects such as this is always cheaper when they are done by the government, because the cost of capital for the government is lower than for private companies. The cost of capital is huge on this project (see ER Tables 4.13-2, -3)—about 30%--and reflects the high level of risk associated with the project. Note that the ER (ER 4.13-18) talks at length about a government cost of capital of 6%--an unrealistic figure to project for the capital requirements of a private entity thirty years hence. In addition, the use of classification and proprietary data to

avoid revealing costs of decommissioning (e.g., SAR Table 10.1-2, note 5) is likely to lead to higher costs downstream. Moreover, costs to dispose of material in Envirocare are listed as $150 per cubic foot and then, later in the report, cited as $100 per cubic foot. (SAR Table 10.1-1, note 7, Table 10.1-5, note 1). Both of these costs are for low-level waste only. If the waste is contaminated at a level that requires higher level disposal options, the costs will increase significantly above LES's estimates.

4. Costs of management and disposal of depleted UF_6.

4.1 Contention: Petitioners contend that LES's application seriously underestimates the costs and the feasibility of managing and disposing of the depleted UF_6 ("DUF_6") produced in the planned enrichment facility.

The factual bases for such contention are set forth below, based upon analyses prepared by Dr. William J. Weida, whose resume is attached. Petitioners set forth below the bases for Petitioners' determination that the application is inadequate in this regard:

A. Basis: LES's reliance on the LLNL Report as a basis for LES's cost estimates for deconversion and disposal is not justified. The LLNL Report states that its cost estimates are medians. (§ 4, at 36) This middle value has little significance as a cost estimate and, given the numerous uncertainties, the upper value—worst case scenario—is likely to be much higher. Moreover, there is another unstated assumption—that the waste is low level. (See also SAR 10.1.6.7). It is not clear that this would be the case under even the most favorable assumptions about the LES project.[11]

[11] The NRC has yet to make a definitive determination as to the waste classification of depleted uranium hexafluoride. In a letter from the NRC to LES regarding a set of licensing issues raised by LES, the agency writes, "NRC staff considers that Section 3113 would be a "plausible strategy" for dispositioning depleted uranium tails if NRC determines that depleted uranium is a low-level radioactive waste. In that regard, the staff expects that LES will indicate in its application whether it will treat the tails as a waste or a resource." [Robert C. Pierson, Director, Division of Fuel Cycle Safety and Safeguards, Office of Nuclear Materials Safety and Safeguards, letter to Rod M.

B. Basis: Further, the LLNL cost estimates are based on travel distances of 1000 kilometers or 620 miles (§ 4.1.3, at 37; id. 92), but the data presented in the LES application show that travel of over 1000 miles would be required to convert the DUF_6 at Paducah, Kentucky, or Portsmouth, Ohio, and travel of an additional 1000 miles (ER Table 4.13-1) would be required to get the material to a disposal site.

C. Basis: In LLNL's projections of the cost of decommissioning, it is assumed that materials such as steel used in the construction could be recycled. (See ER 4.13-17). Thus, it is assumed that such material would not constitute waste. However, such an assumption cannot be made. Steel used in the buildings will probably be contaminated to the extent that it must be considered radioactive waste. Petitioners will demonstrate that steel recyclers in the United States will not accept steel with detectable radioactive contamination. (See statements by Steel Manufacturers Association: 2000-2001 Public Policy Statement, Steel Manufacturers Association (Washington, D.C.) 26-27; Stuart, E., Statement of the Steel Manufacturers Association, testimony before the U.S. Department of Energy regarding the Notice of Intent to Prepare a Programmatic Environmental Impact Statement on the Disposition of Scrap Metals, 16 Aug. 2001). In consequence, a significant amount of the steel used in construction of the deconversion plant will have to be disposed of as low-level radioactive waste.

D. Basis: Significant revenues are assumed from the sale of CaF_2--$11.02 million per year (ER 4.13-17, Table 4.13-2; LLNL Report at 50). These assumptions are unfounded and cannot be incorporated in the calculation of the cost of decommissioning. In the application, no market is demonstrated for CaF_2, and no range of probable prices is provided. Further, material from other facilities is also being sold into this market, and no evidence is provided that the

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Krich, Director, Licensing, Louisiana Energy Services, 24 March 2003.] LES does not indicate in its application whether it will treat the DUF6 tails as a waste or a resource.

market could absorb an additional 30% of this material or that this would not lower the price offered for the material.

E. Basis: A problem arises with respect to disposal of CaF_2. It is not known whether the CaF_2 will be contaminated with uranium. Such contamination would prevent the resale of the CaF_2 and would require that such material be disposed as low-level waste. The 1997 LLNL Report states that a "potential vulnerability" of cost projections is the likelihood of such uranium contamination of CaF_2 (§ 6.3.1, Table 6.16, at 118). LLNL estimates that such contamination would raise disposal costs by $735 million, since it would mean that the CaF_2 must be disposed of in a low-level waste disposal facility. (Table 6.16)

F. Basis: There is an even more significant risk that the MgF_2 would also be contaminated. The LLNL report states that MgF_2 generated in decommissioning may be contaminated. (§ 6.3.2, at 119). Such contamination would require that such material be disposed of as radioactive waste. Such disposal would raise the cost of decommissioning by more than $400 million. (See Table 6.17, at 120).

G. Basis: LES's "preferred plausible strategy" for the disposition of depleted UF_6 is the possible sale to a "private sector conversion facility" followed by disposal of deconverted U_3O_8 in a "western U.S. exhausted underground uranium mine." (ER 4.13-8). Such a strategy cannot be accepted as plausible for several reasons. LES's strategy assumes that private investors will establish a facility to convert depleted UF_6 to U_3O_8. However, no such conversion facility now exists. Neither is it likely to be built in present circumstances. LES requires, for its plans, a conversion facility that will continue in operation for approximately the 30-year life of the enrichment plant. LES cannot purport to rely upon the proposed deconversion facility to be used to treat existing DOE depleted UF_6, because the existing DUF_6 stockpile is so great that the

queue for conversion would preclude acceptance of LES's waste. DOE possesses 704,000 metric tons of DUF_6 and predicts that converting its own waste will take 25 years. (Audit Report: Depleted Uranium Hexafluoride Conversion, DOE/IG-0642, U.S. DOE, Office of Inspector General, March 2004). DOE inventories will absorb the capacity of new facilities. (ER 4.13-18). Furthermore, there is no showing in LES's application that a private company would be interested in investing in a deconversion facility that would suit LES's timing and throughput requirements. LES's smaller conversion throughput significantly raises the unit cost. (See LLNL Report, Table 6.11, at 109-10). Moreover, LES at present does not have enrichment orders on its books to demonstrate to investors that there will be an ongoing need for deconversion in the amounts required by LES. There is no showing that the volumes and timing required by LES can be deconverted economically at the costs assumed by LES.

H. Basis: The mine disposal option advanced by LES (ER 4.13-11) cannot be considered plausible. The single mine identified in the application, the Cotter Corp. mine in Colorado (ER 4.13-8), in fact opposes the use of its property for such purposes. (See interview by John Fleck, published in Albuquerque Journal, Jan. 7, 2004). The mine disposal strategy must assume that an abandoned uranium mine can be found which will be acceptable for disposal of Greater than Class C ("GTCC") waste and can lawfully accept such waste. LES's plan to dispose of deconverted U_3O_8 in such a mine assumes that the waste will be packed in 55-gallon steel drums without further engineered barriers (ER 4.13-10). Such a plan is not realistically approvable, since most mine environments have sufficient ground water to corrode such containers and to transport the radionuclides in ground water, defeating the disposal system. LES does not have a plausible strategy.

I. Basis: The "engineered trench" method of waste disposal proposed by LES is not likely to be acceptable (ER 4.13-11, -19). Viewing the depleted U_3O_8 as GTCC waste, disposal in such a manner would not meet approval under 10 CFR Part 61. The method proposed, shallow burial in 55-gallon drums, cannot meet the requirements of 10 CFR 61.7(a)(2), which calls for use of containers that are "designed to be stable, i.e., maintain gross physical properties and identity, over 300 years," since such containers have at best a projected life of 20 years. Moreover, the engineered trench method would not emplace the waste at a depth where "subsequent surface activities by an intruder will not disturb the waste." (10 CFR 61.7(b)(5). In addition, waste exceeding Class C concentrations "is generally unacceptable for near-surface disposal." 10 CFR 61.7(b)(5). In 1970 DOE forbade sites to bury transuranic waste, of a radioactivity of 100 nCi per gram or more, in shallow earthen burial sites. (K.S. Hollingsworth, Policy Statement Regarding Solid Waste Burial, AEC Directive IAD No. 0511-21 (March 20, 1970)). The use of disposal pits at INEEL has had particularly unfortunate results, since at that site intermittent rainfall resulted in flooding of the pits and gross disturbance of the disposed waste. (A. Makhijani and M. Boyd, Poison in the Vadose Zone: An Examination of the Threats to the Snake River Plain Aquifer from the Idaho National Engineering and Environmental Laboratory, at 95 (Oct. 2001); M. Fioravanti and A. Makhijani, Containing the Cold War Mess: Restructuring the Environmental Management of the U.S. Nuclear Weapons Complex, at 76-100 (Oct. 1997)).

5. Need for the facility; impact on national security

5.1 Contention: Petitioners contend that the Environmental Report ("ER") does not adequately describe or weigh the environmental, social, and economic impacts and costs of operating the National Enrichment Facility ("NEF") (See ER 1.1.1 et seq.).

The ER contains LES's statement of the asserted purpose and need pursuant to 10 CFR 51.45, but the supposed benefit-cost analysis fails to demonstrate that there is a need for the facility. "To assist the NEPA cost-benefit analysis, the NRC ordinarily examines the need a facility will meet and the benefits it will create." In re Louisiana Energy Services, CLI-98-3, 47 NRC 77, 89 (1998). This contention is also related to the national security determinations that must be made in this licensing proceeding. (See 10 CFR 40.32(e), 70.31(d)). Important facts bearing upon the asserted need, or benefit, are omitted or misstated, as shown in the bases cited below. These contentions are based upon analyses by David Osterberg and Dr. Arjun Makhijani, whose resumes are attached.

A. Basis: LES's presentation erroneously assumes that there is a shortage of enrichment capacity. Thus, LES takes a backward approach, projecting the consequence of not building the three million SWU per year capacity of the proposed LES plant, and asking how the supposed "shortfall" could be made up, without first determining that *not* building the LES plant would create an enrichment services shortfall. (ER 1.1). And when LES argues that the existing U.S.-Russia agreement to downblend HEU from Russian nuclear weapons must somehow "compensate for the 3 million SWU per year of enrichment services that would have been provided by LES…" (ER Section 1.1.2.4.6), it simply assumes that those three million SWU would be needed from a U.S. source.

B. Basis: LES's statements of "need" for the LES plant (ER 1.1) depend primarily upon global projections of need rather than projections of need for enrichment services in the U.S. There is no indication that needs of U.S. nuclear utilities cannot be met without construction and operation of the LES facility.

C. Basis: Demand for SWUs in LES's analysis does not account for the fact that some licensed facilities may not have their licenses extended to the full time period requested. In fact, licensed plants have historically experienced problems with aging that have required them to reduce or curtail operation, particularly in the 1990's.

D. Basis: The LES projections seem to assume that current and future market participants will willingly surrender market share to a new participant. Thus, LES assumes that USEC and Eurodif will cede their market positions to the NEF and that China will not effectively participate in the face of competition. It is not reasonable to make such assumptions without data indicating that NEF will have an advantage in cost or other factors that will enable it to prevail.

E. Basis: Moreover, LES has not demonstrated that employing foreign enrichment suppliers is detrimental to US nuclear interests. LES has not proven that either price or availability of enrichment services would be different if the LES plant is not built and enrichment services are, to some degree, supplied by imports. Despite its pages of detailed scenarios, LES has not shown that building a new enrichment facility in the U.S. would reduce the cost of uranium enrichment services, nor that U.S. nuclear utilities would suffer in other ways if the LES plant were not built, nor that national security and public safety would diminish. LES has not made the case that there would be any shortfall of uranium enrichment services, nor that such services would be appreciably less expensive or more reliable if placed on U.S. soil.

F. Basis: LES has referred to supply and demand in the uranium enrichment market (ER 1.1), but it has not provided a business plan that shows how LES would effectively enter this market in the face of existing and anticipated competitors and contribute some public benefit. LES has not provided the Commission with any information regarding the current costs of SWUs

to present and expected market participants; the cost of the proposed NEF SWU production—including all costs related to construction, operation, decommissioning and UF_6 waste disposal—nor market projections; and thus has not demonstrated how construction of the proposed facility would satisfy any alleged need. In this connection, it is disingenuous for, on one hand, LES to tout its own centrifuge technology (throughout ER 1.1) and then to argue that United States Enrichment Corporation ("USEC") has not successfully demonstrated its own centrifuge technology (based on DOE designs that actually predate Urenco designs) (ER 1.1.2.5.3) and so cannot be expected to contribute to supply. Either centrifuge technology works and is economically competitive with other sources of uranium enrichment services, or it does not work and is not economically competitive.

G. Basis: It is a fundamental omission that LES fails to discuss the impact of the NEF project upon the nonproliferation objectives of the 1993 U.S.-Russia agreement on the purchase of enriched uranium produced by downblending highly enriched uranium ("HEU") from the weapons program of the former Soviet Union. USEC, which administers the "Megatons to Megawatts" program for the United States, has reported to Congress that "both the U.S. and Russian partners have been successful in making this 1993 agreement work. In so doing, the partners have reduced the threat to world stability posed by the proliferation of nuclear weapons and materials." (Implementation of the U.S.-Russian HEU Purchase Program, Submitted by USEC to the United States Senate Committee on Foreign Relations, March 28, 2001, at 1).

The President is required to report to Congress on the effects of the U.S.-Russia agreement on domestic nuclear fuel industries (42 U.S.C. § 2297h-10(b)(10)). The Administration has described the U.S.-Russia agreement as "a key element of U.S. nonproliferation policy [that] provides a structured basis for Russia to participate in U.S. nuclear

fuel markets." (Report to Congress on the Effects of the U.S./Russia HEU Agreement on the Domestic Nuclear Fuel Industries, December 31, 2001, at 1). The 2001 report confirms that "the Department [of Energy] has placed a high priority on sustaining and, if possible, increasing the benefits derived from the HEU Agreement that converts nuclear weapons related HEU into low-enriched uranium for use in commercial power reactors" (id. 2).

In mid-2002, after completing pricing revisions in the U.S.-Russia agreement, DOE announced that, "Our strong cooperation with Russia will help ensure that the important goal of protecting the world from the proliferation of nuclear weapons continues" (DOE press release, June 18, 2002). The Department of State said: "The United States and Russia will continue to cooperate to fully realize the non-proliferation, national security, and economic benefits of the HEU Agreement" (Department of State press release, June 19, 2002).

Operation of the LES plant clearly would interfere with US national security objectives that seek to ensure a steady market for downblended Russian HEU. LES's remarks that this program is "not unsusceptible to disruptions caused by both political and economic factors" (ER, p 1.1.3) or may be subject to problems with "USEC and its labor unions" (ER 1.1.2.5.7) is mere conjecture and disparages stated U.S. national security policy to continue to reduce HEU inventories. Thus, LES has not shown that such downblending is not exactly what the U.S. and Russia *should* be doing to reduce proliferation threats caused by the presence of large quantities of nuclear weapons-usable HEU that exists in both countries.

LES states that for Russia to increase its sales of downblended HEU "would not alleviate the desire on the part of U.S. purchasers for either additional indigenous uranium enrichment capability in the U.S. or provide for a second source of supply competition in the U.S." (ER 1.1.2.5.6). The prospect of using downblended uranium does not show a need for an additional

uranium enrichment plant; to the contrary, it shows that supply is ample. There is no indication that such unfulfilled "desire" is the same as actual market demand, which it is not, nor that the national interest is not served by reducing world inventories of HEU. The reality is that Urenco and LES would not profit from sales of downblended uranium, but their desire for profits demonstrates neither the national interest nor a shortage of capacity.

5.2 Contention: Petitioners also contend that the operation of the proposed LES facility would pose an unnecessary and unwarranted challenge to national security and to global nuclear non-proliferation efforts.

The LES license application does not even address these critical issues to the security, health, and safety of the United States and the entire world. These issues should be addressed under Need for the facility, in both the ER and the EIS, and in all sections relating to the handling of classified information. The bases for this contention are set forth below, based upon analyses by Dr. Arjun Makhijani, whose resume is attached.

A. Basis: The ER and EIS should discuss the non-proliferation benefits of using downblended low-enriched uranium ("LEU") fuel derived from U.S. and Russian surplus highly enriched uranium ("HEU"). They should also consider the effect of the enrichment plant proposed by USEC on total enrichment capacity in the U.S. and the world in regard to evaluating the no action alternative, with due consideration for the fact that USEC is already building an additional enrichment pilot plant. The no action alternative should also include the environmental benefits in terms of reducing mining, milling, and uranium processing and enrichment and reduced DU generation from using downblended HEU compared to LEU made from mined uranium.

B. **Basis:** In this connection, the ER should add an alternative of increasing the amount and pace of downblending. Specifically, it should evaluate the benefits for the environment and for non-proliferation of additional purchases of HEU from Russia and of increasing the pace of purchase of downblended reactor fuel. The ER should similarly evaluate the effect of increasing the pace and amount of US downblending. This effect should consider the benefits of the U.S. adopting a policy of non-proliferation leadership by example instead of by fiat as is the tendency at present (see F below). Such analysis would show that the existing enrichment capacity and the existing agreements and projects to downblend surplus military HEU in Russia and the U.S. into LEU reactor fuel indicate that there is no need for the LES project in the short- and medium-term. The facts are that (a) there is enough LEU in the downblending pipeline for about six years to fuel all the U.S. reactors at the current rates of consumption from the down-blending of the remaining 350 metric tons of Russian surplus HEU, and (b) the down blending of 120 metric tons of surplus HEU will provide fuel for the reactors for about 1.5 years at the current rate of consumption, assuming natural uranium blendstock. Thus, a total of about 7.5 years of U.S. demand for enrichment services is already in the pipeline due to the downloading of military HEU that has been declared surplus. In addition, USEC has agreed to keep the Paducah enrichment plant operating until USEC brings a centrifuge plant on line. The downblending program and the Paducah plant together create surplus enrichment capacity of about 40 percent over current U.S. requirements. Thus, there is already a significant surplus of reactor fuel in the commercial pipeline for the next decade.

C. Basis: A total of 600 metric tons of U.S. HEU could be declared surplus (including amounts already so declared) if the U.S. pursued sound non-proliferation policies, including the goal of persuading others not to pursue uranium enrichment. There is also the considerable

potential for additional surplus Russian HEU, the amount of which would depend on suitable pricing and political agreements with the United States, as well as on a U.S. decision to increase the amount of U.S. HEU declared surplus.

D. Basis: Declaring more HEU surplus in the U.S. and Russia is very desirable for security reasons, since further downblending will remove large amounts of weapons-usable HEU from potential diversion—a contribution to nonproliferation at a time when the reality of a nuclear materials and technology black market has proven to be far worse than had been generally realized before the A.Q. Khan network was exposed.

E. Basis: The ER should discuss the adverse impacts of creating additional enrichment capacity at a time when HEU downblending is being carried out more slowly than it should be. NRC should also consider the combined effect of the LES plant and the proposed USEC plant on prices and the potential that depressed prices may slow downblending of surplus HEU, with consequent heightened risks of proliferation.

F. Basis: The ER should evaluate the effect of building a new commercial enrichment plant at a time when the United States is trying to stop other countries, specifically Iran, from building one. NRC should evaluate the corrosive effect of such a policy on proliferation in the context of the deleterious impact that this U.S. approach has already had on proliferation. It was the opinion of Mahatma Gandhi (among others) that policies advocated by example are far more powerful than those rendered from on high by fiat. NRC should evaluate the effects on alternatives using this Gandhian framework specifically in regard to nuclear proliferation issues, for example, in regard to the U.S. purpose to prevent Iran from building a uranium enrichment plant. The ER should compare the costs and benefits of U.S. pursuit of such a policy, which would imply adoption of either the “no action alternative” or an increase in downblending, with

the costs and benefits of international confrontation and potential military conflict, e.g., in the Middle East over uranium enrichment if a "do-as-I-say-and-not-as-I-do" policy is pursued in the matter of uranium enrichment. The Administration is also currently facing a dilemma over the prospective construction of Brazilian enrichment capacity that may not be subject to international inspection and has expressed concern that the construction of such new capacity inhibits the achievement of nonproliferation objectives. (See article, "Brazil Shielding Uranium Facility," P. Slevin, Washington Post, April 5, 2004.).

G. Basis: The ER includes a minimal discussion of the consequences of near-complete foreign ownership of the proposed NEF (ER 1.0 at 1.0-1 through -3). Not only is this discussion inadequate, but also it fails to address the demonstrated shortcomings, as regards nuclear non-proliferation, of the particular ownership of LES. LES is dominated by Urenco, which, directly or through subsidiaries, owns 90% of LES. Urenco has been lax in regard to security in the past. As has been thoroughly documented in numerous publications (*Bulletin of Atomic Scientists*, January/February 1993; *Baton Rouge Sunday Advocate*, January 31, 1993, www.atoomspionage.com), highly classified Urenco centrifuge technology has been obtained by Urenco employees and subcontractors, such as A. Q. Khan, Bruno Stemmler, and Karl-Heinz Schaab, and made available to non-nuclear states. Urenco technology formed the centerpiece of Pakistan's successful nuclear weapons program, and Urenco technology and/or blueprints reportedly have been found in Iraq, Iran, Libya and North Korea. Urenco's security failures were further demonstrated by its training of nearly two dozen Iraqi centrifuge engineers for 43 weeks—at a time when Iraq was supposedly a non-nuclear state (1989-90)—at its Gronau plant in Germany (*The Nonproliferation Review*, Fall 1996, page 128) – after the entire scandal and horror of Iraq's use of chemical weapons in the 1980s. Since Urenco has had major security

lapses, the ER should examine in detail the security consequences of having LES as the owner and operator of an enrichment plant in the United States. The ER should report the results of an investigation of past security lapses in Europe, whether and how they derived from management culture, what has been done to remedy the problem, and how the remedies have been assessed, and an estimate of the consequences of major security lapses for proliferation. The LES Fundamental Nuclear Materials and Control Plan ("FNMCP") does not address such matters, nor does it cite what has been done to correct the problems and management culture. We have not reviewed any classified documents submitted in association with the LES license application. However. in view of the fact that no other company in the world has failed the basic test for nuclear technology security as dramatically, a complete investigation is warranted to examine whether Urenco is fit to obtain a license from the United States. The burden of proof in this case is on the NRC and LES that the problem has been fixed.

H. Basis: Evaluation of the potential impacts of proliferation should include consideration of the recommendation of the Stockholm International Peace Research Institute, which, in a prescient book warning of nuclear proliferation as a result of centrifuge uranium enrichment technology, states,

> "Unfortunately, the centrifuge cat is already partially out of the bag, and a number of operating facilities already exist. Preferably, these facilities should be shut down and dismantled….If it should prove impractical or impossible to shut down the centrifuge plants, then the internationalized centrifuge facilities should be managed in such a way as to prevent the further dissemination of this process….Eventually, the objective should be to phase out the gas centrifuge technique for uranium enrichment." (*Uranium Enrichment and Nuclear Weapon Proliferation,* Alan Krass, Peter Boskma, Boelie Elzen, Wim A. Smit, Stockholm International Peace Research Institute, International Publications Service, Taylor & Francis, Inc. New York, 1983).

While we acknowledge that gaseous diffusion technology is far more energy intensive, it is also far more difficult to build and run a large gaseous diffusion plant in secrecy. The proliferation

disadvantage of centrifuges should be carefully considered in the EIS in evaluating the no action alternative.

6. Natural gas-related accident risks not adequately accounted for

6.1 Contention: Petitioners contend that the Environmental Report ("ER") does not contain a complete or adequate assessment of the potential environmental impacts of accidents involving natural gas transmission facilities. Further, there has been no Integrated Safety Analysis ("ISA") based on module-specific data. 10 CFR 51.45 has not been satisfied.

The factual basis for such contention is set forth below, based upon analyses prepared by Paul Fenn, whose resume is attached. The bases include several instances of matters that have not been investigated or considered in the ER.

As background, the proposed NEF would be built less than 500 feet from two natural gas pipelines. The NEF would employ gaseous uranium, natural gas, and high voltage electricity—elements that combine to increase the consequences of any accident in the event of a natural gas explosion.

A. Basis: A substantial gas leak or pipeline explosion, whether by accident or terrorism, could compromise the containment of any of the three UF_6 Handling Areas of Cascade Halls 1 through 6. In particular, an explosion in a pipeline owned by El Paso Natural Gas Co. or Sid Richardson Energy Services Co. (ER 2.1.2.1) or an explosion of the NEF's 10.045 million BTUH gas tap (SAR 3.5.4.4.2 (D)) into the El Paso pipeline could cause a UF_6 release, which could seriously endanger plant workers and the public. LES concedes that the release of UF_6 gas could be harmful to surrounding communities (SAR 3.1.4). There are 68,515 residents in the surrounding New Mexico and Texas counties (SAR 1.3.2.1)—including four schools, a church, and the town of Eunice (with 2,500 residents) five miles west of the site (SAR 1.3.2.3).

However, LES assigns a "1E-05" probability to such an event, calling it "highly unlikely," giving it an initiating event index of "(-5)" and declaring that no Items Relied On For Safety ("IROFS") are needed (SAR table 3.7-4). But the methodology that LES used to calculate probability is highly suspect. LES claims that only a "substantial" gas explosion would compromise containment of UF_6 (SAR 3.2.2.4). LES concedes that a *high* "consequence category" applies to a release of UF_6 in event of a "substantial" explosion but asserts that the probability of such an event is very low (SAR table 3.7-4). However, LES's determination of probability is speculative and should be recalculated with appropriate data.

To determine the probability of a "substantial" gas explosion, one must conduct a module-specific analysis, using data on the volumes, pipeline sizes, pressure levels and types of gas that will pass within 1000 feet of the NEF and would be piped into it. (SAR figure 1.1-4). An ISA team performed the External Events and Fire Hazard Assessment for the entire facility (SAR 3.1.1). However, the needed data were not available:

> In order to assess the potential severity of a given fire and the resulting failures to critical systems, the facility Fire Hazard Analysis was consulted. However, since the *design supporting the license submittal for this facility is not yet at the detailed design stage, detailed in-situ combustible loading and in-situ combustible configuration information is not yet available*. [Emphasis added.] (SAR page 3.1-3).

Thus, LES's 1E-05 "highly unlikely" probability and initiating event index of (-5) for a "substantial" natural gas explosion are merely speculative and *inappropriate*. Again, the ISA team observed that the fires could spread from outside each fire area and suggested fire barriers (SAR page 3.1-2), but no specific analysis was made of their need or effectiveness.

B. Basis: LES's criterion of probability does not reflect changes in security calculations since September 11, 2001. Important U.S. energy facilities are among the nation's most likely terrorist targets. Federal warnings about Al Qaeda threats since September 11, 2001 have

repeatedly mentioned energy infrastructure. In June of 2003, for example, U.S. intelligence agencies warned about possible Al Qaeda attacks on energy facilities in Texas.[12] On September 11, 2001, White House officials warned that Boston Harbor might be an Al Qaeda target through the Liquefied Natural Gas port in Everett (account of Richard A. Clarke, who coordinated the government's response to the attacks[13]). The NEF is particularly vulnerable to attack because of the nearby gas pipelines.

C. Basis: Transportation Department ("DOT") regulations show the risks of pipeline explosions. At the NEF site the 16-inch Richardson pipeline delivers wellhead gas to a processing facility[14] and contains unrefined wellhead gas at a pressure of 30 psi.[15] A 14-inch commercial grade gas pipeline shares the same trench (SAR 2.1.2.5). The NEF design appears unsafe under DOT pipeline safety standards for "high consequence areas," a term that describes the NEF. The NEF proposal would enrich uranium just 500 feet away from two pipelines and connect to one pipeline with a 12,000 cubic feet per hour pipe.

Under DOT standards, the "threshold radius"—based upon pipeline diameter and pressure—represents the distance from a natural gas leak that may suffer damage. For the low-pressure Sid Richardson 16-inch pipeline the threshold radius would be about 100 feet, but the El Paso 14-inch pipeline will probably carry a significantly higher pressure to deliver 12,000 cubic feet per hour and may have a threshold radius exceeding 300 feet. If the 14-inch pipeline's operating pressure is 500 PSI with a threshold of 1000 PSI, the range of effect from an explosion

[12] Paul W. Paformak, Specialist in Science and Technology Resources, Science, and Industry Division, "Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress," Congressional Research Service, Library of Congress, September 9, 2003.

[13] Bryan Bender, "US feared 9/11 hit in Boston, book says: LNG site in Everett was considered at risk," *Boston Globe*, March 23, 2004.

[14] Telephone conversation with Sid Richardson Energy Service Company pipeline engineer Rick Pittam, April 1, 2004.

[15] Telephone conversation with Rick Pittam, April 1, 2004.

of the two pipelines would exceed 300 feet. Under the DOT standards, this would require a 660 foot buffer zone[16]. Our calculations indicate the following:

Max Allowable Pressure	Pipeline Diameter	Diameter Squared	P X D Squared	Square Root	Natural Gas Factor	Threshold Blast Radius
200 psi	16 in	256	51,200	226.0	.69	156ft
1000	14	196	196,000	442.7	.69	305.5
600	16	256	153,600	391.9	.69	270.42
500	14	196	98,000	313.0	.69	216.0

Since the explosion of either pipeline could ignite the other, the effect of an explosion of both pipelines should establish the buffer zone. Under any combination the table above, the effect would exceed 300 feet, requiring a 660 foot buffer zone.

D. Basis: Depending on wind conditions, natural gas leaks may not disperse and often form a column over the source and can be ignited by a spark. The NEF depends on outside air for its operations. Thus, leaking natural gas could penetrate every module of the NEF, including uranium processing areas and high voltage areas that could cause a substantial explosion. This situation is compounded by the hazardous operational processes, a risk not adequately accounted for in the application for the NEF.

Respectfully submitted,

Lindsay A. Lovejoy, Jr.
618 Paseo de Peralta, Unit B
Santa Fe, NM 87501
(505) 983-1800

[16] United States Department of Transportation, Research and Special Programs Administration, 49 CFR Part 192; [Docket No. RSPA-00-7666; Notice 4], RIN 2137-AD54; Pipeline Safety: Pipeline Integrity Management in High Consequence Areas (Gas Transmission Pipelines), AGENCY: Office of Pipeline Safety (OPS), Research and Special Programs Administration (RSPA), DOT; ACTION: Notice of proposed rulemaking.[Federal Register: January 28, 2003 (Volume 68, Number 18)] [Proposed Rules]

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April 6, 2004

Resume of Paul Fenn

Education

- Master of Arts (AM), Social Sciences Division, University of Chicago, 1992, Fellowship;
- Dean's Fellow, New School for Social Research PhD Philosophy Candidate, New York, 1989;
- BA History Bates College, Maine, Highest Honors, 1988.

Experience

- 1996-2004 Executive Director, Local Power.
- 1993-5 legislative director to the Senate Chairman of the Massachusetts Joint Committee on Energy.

Activities:

- Intervenor Representative, 2003-4 preparing all filings for Ratepayers for Affordable Clean Energy (R.A.C.E.), in California Public Utilities Commission proceedings on California gas utility procurement and Liquefied Natural Gas (R.04-01-025);
- Intervenor Representative, 2003-4, preparing all filings for R.A.C.E., in California Public Utilities Commission proceedings on electric procurement (R.01-10-024) and natural gas-fired generation;
- Intervenor representing ratepayers, 2003-4 in California Public Utilities Commission proceedings on Community Choice Aggregation, R.03-10-003;
- Intervenor and expert witness to Womens' Energy Matters 2003-4 in California Public Utilities Commission proceedings on Energy Efficiency programs (R.01-08-028);
- Author, 2002 California Community Choice law (AB117, Migden) and coauthor of the nation's original such law in Massachusetts (filed 1995, passed in 1997); advisor in drafting of similar laws in Ohio (1999) and New Jersey (2003);
- Author, 2001 San Francisco Solar "H Bond" Authority (City Charter revenue bond authority, Section 9.108.7, Ammiano), voter-approved Proposition H;
- Author, 2004 San Francisco "Energy Independence" Ordinance (Ammiano) enabling San Francisco to switch to a new electric service provider and take 1/4 of the community's energy use off grid using Community Choice and the Solar H Bond Authority.

Guest Lecturer/Speaker

- 2003 British Foreign and Commonwealth Office, Washington DC;
- 2003 California Planning & Conservation League Annual Event, Sacramento;
- 2002 Energy Resources Group, University of California at Berkeley;
- 2002 Sonoma State University;
- 2002 San Francisco Public Utilities Commission;
- 2001 Pomona College/Harvey Mudd College;
- 2001 California Office of Ratepayer Advocate.

Testified

- California Public Utilities Commission;
- California State Senate;
- California State Assembly;
- Massachusetts Department of Public Utilities;
- Massachusetts Division of Energy Resources;
- San Francisco Board of Supervisors;
- Other local, county and state governing boards, agencies, committees and commissions.

Other Facilities Safety Contracting Experience:

- Radio Frequency Plan Auditor for a national GSM 1800 Network, Lucent Technologies, 2000;
- Regulatory Affairs and Permitting Site Acquisition Engineer, Voicestream, 1999;
- Mapping Specialist, Motorola ECID Europe, 1997;
- Site Acquisition and Regulatory Specialist, Western Wireless, 1993-6.

Curriculum Vita of
Arjun Makhijani

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Takoma Park, MD 20912
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e-mail: arjun@ieer.org
Website www.ieer.org

Education:

Ph.D. University of California, Berkeley, 1972, from the Department of Electrical Engineering. Area of specialization: plasma physics as applied to controlled nuclear fusion. Dissertation topic: multiple mirror confinement of plasmas.

M.S. (Electrical Engineering) Washington State University, Pullman, Washington, 1967. Thesis topic: electromagnetic wave propagation in the ionosphere.

Bachelor of Engineering (Electrical), University of Bombay, Bombay, India, 1965.

Current Employment:

1987-present: President and Senior Engineer, Institute for Energy and Environmental Research, Takoma Park, Maryland. (part-time in 1987).

February 3, 2004-present, Associate, SC&A, Inc., one of the principal investigators in the audit of the reconstruction of worker radiation doses under the Energy Employees Occupational Illness Compensation Program Act under contract to the Centers for Disease Control and Prevention, U.S. Department of Health and Human Services.

Other Long-term Employment

1984-88: Associate Professor, Capitol College, Laurel, Maryland (part-time in 1988).

1983-84: Assistant Professor, Capitol College, Laurel, Maryland.

1977-79: Visiting Professor, National Institute of Bank Management, Bombay, India. Principal responsibility: evaluation of the Institute's extensive pilot rural development program.

1975-87: independent consultant (see page 2 for details)

1972-74: Project Specialist, Ford Foundation Energy Policy Project. Responsibilities included research and writing on the technical and economic aspects of energy conservation and supply in the U.S.; analysis of Third World rural energy problems; preparation of requests for proposals; evaluation of proposals; and the management of grants made by the Project to other institutions.

1969-70: Assistant Electrical Engineer, Kaiser Engineers, Oakland California. Responsibilities included the design and checking of the electrical aspects of mineral industries such as cement plants, and plants for processing mineral ores such as lead and uranium ores. Pioneered the use of the desk-top computer at Kaiser Engineers for performing electrical design calculations.

Professional Societies:

Institute of Electrical and Electronics Engineers and its Power Engineering Society
American Physical Society
Health Physics Society
American Association for the Advancement of Science

Awards:

The John Bartlow Martin Award for Public Interest Magazine Journalism of the Medill School of Journalism, Northwestern University, 1989, with Robert Alvarez.

Consulting Experience, 1975-1987

Consultant on a wide variety of issues relating to technical and economic analyses of alternative energy sources; electric utility rates and investment planning; energy conservation; analysis of energy use in agriculture; US energy policy; energy policy for the Third World; evaluations of portions of the nuclear fuel cycle.

Partial list of institutions to which I was a consultant in the 1975-87 period:

Tennessee Valley Authority
Lower Colorado River Authority
Federation of Rocky Mountain States
Environmental Policy Institute
Lawrence Berkeley Laboratory
Food and Agriculture Organization of the United Nations
International Labour Office of the United Nations
United Nations Environment Programme
United Nations Center on Transnational Corporations
The Ford Foundation
Economic and Social Commission for Asia and the Pacific
United Nations Development Programme

Languages: English, French, Hindi, Sindhi, and Marathi.

Reports, Books, and Articles (Partial list)

(Newsletter, newspaper articles, extracts from publications and books reprinted or adapted elsewhere, and other similar publications are not listed below).

Hower, G.L. and A. Makhijani, "Further Comparison of Spread-F and Backscatter Sounder Measurements," *Journal of Geophysical Research*, ***74***, p. 3723, 1969.

Makhijani, A., and A.J. Lichtenberg, *An Assessment of Energy and Materials Utilization in the U.S.A.*, University of California Electronics Research Laboratory, Berkeley, 1971.

Logan, B. G., A.J. Lichtenberg, M. Lieberman, and A. Makhijani, "Multiple-Mirror Confinement of Plasmas," *Physical Review Letters*, ***28***, 144, 1972.

Makhijani, A., and A.J. Lichtenberg, "Energy and Well-Being," *Environment*, ***14***, 10, June 1972.

Makhijani, A., A.J. Lichtenberg, M. Lieberman, and B. Logan, "Plasma Confinement in Multiple Mirror Systems. I. Theory," *Physics of Fluids*, ***17***, 1291, 1974.

A Time to Choose: America's Energy Future, final report of the Ford Foundation Energy Policy Project, Ballinger, Cambridge, 1974. One of many co-authors.

Makhijani, A., and A. Poole, *Energy and Agriculture in the Third World*, Ballinger, Cambridge, 1975.

Makhijani, A. *Energy Policy for the Rural Third World*, International Institute for Environment and Development, London, 1976.

Kahn, E., M. Davidson, A. Makhijani, P. Caeser, and S. Berman, *Investment Planning in the Energy Sector*, Lawrence Berkeley Laboratory, Berkeley, 1976.

Makhijani, A. "Solar Energy for the Rural Third World," *Bulletin of the Atomic Scientists*, May 1977.

Makhijani, A. "Energy Policy for Rural India," *Economic and Political Weekly*, 12, Bombay, 1977.

Makhijani, A., *Some Questions of Method in the Tennessee Valley Authority Rate Study*, Report to the Tennessee Valley Authority, Chattanooga, 1978.

Makhijani, A., *The Economics and Sociology of Alternative Energy Sources*, Economic and Social Commission for Asia and the Pacific, 1979.

Makhijani, A., *Energy Use in the Post-Harvest Component of the Food Systems in Ivory Coast and Nicaragua*, Food and Agriculture Organization of the United Nations, Rome, 1982.

Makhijani, A., *Oil Prices and the Crises of Debt and Unemployment: Methodological and Structural Aspects*, International Labour Office of the United Nations, Final Draft Report, Geneva, April 1983.

Makhijani, A., and D. Albright, *The Irradiation of Personnel at Operation Crossroads*, International Radiation Research and Training Institute, Washington, D.C., 1983.

Makhijani, A., K.M. Tucker, with Appendix by D. White, *Heat, High Water, and Rock Instability at Hanford*, Health and Energy Institute, Washington, D.C., 1985.

Makhijani, A., and J. Kelly, *Target: Japan - The Decision to Bomb Hiroshima and Nagasaki*, July 1985, a report published as a book in Japanese under the title, *Why Japan*? Kyoikusha, Tokyo, 1985.

Makhijani, A., *Experimental Irradiation of Air Force Personnel During Operation Redwing - 1956*, Environmental Policy Institute, Washington, D.C., 1985.

Makhijani, A., and R.S. Browne, "Restructuring the International Monetary System," *World Policy Journal*, New York, Winter, 1985-86.

Makhijani, A., R. Alvarez, and B. Blackwelder, *Deadly Crop in the Tank Farm: An Assessment of Management of High-Level Radioactive Wastes in the Savannah River Plant Tank Farm*, Environmental Policy Institute, Washington, D.C., 1986.

Makhijani, A., "Relative Wages and Productivity in International Competition," *College Industry Conference Proceedings*, American Society for Engineering Education, Washington, D.C., 1987.

Makhijani, A., *An Assessment of the Energy Recovery Aspect of the Proposed Mass Burn Facility at Preston, Connecticut*, Institute for Energy and Environmental Research, Takoma Park, 1987.

Makhijani, A., R. Alvarez, and B. Blackwelder, *Evading the Deadly Issues: Corporate Mismanagement of America's Nuclear Weapons Production*, Environmental Policy Institute, Washington, D.C., 1987.

Makhijani, A., *Release Estimates of Radioactive and Non-Radioactive Materials to the Environment by the Feed Materials Production Center, 1951-85*, Institute for Energy and Environmental Research, Takoma Park, 1988.

Alvarez, R. and A. Makhijani, "The Hidden Nuclear Legacy," *Technology Review*, 91, 42, 1988.

Makhijani, A., Annie Makhijani, and A. Bickel, *Saving Our Skins: Technical Potential and Policies for the Elimination of Ozone-Depleting Chlorine Compounds*, Environmental Policy Institute and Institute for Energy and Environmental Research, Takoma Park, 1988.

Makhijani, A., Annie Makhijani, and A. Bickel, *Reducing Ozone-Depleting Chlorine and Bromine Accumulations in the Stratosphere: A Critique of the U.S. Environmental Protection Agency's Analysis and Recommendations*, Institute for Energy and Environmental Research and Environmental Policy Institute/Friends of the Earth, Takoma Park, 1989.

Makhijani, A., and B. Franke, *Addendum to Release Estimates of Radioactive and Non-Radioactive Materials to the Environment by the Feed Materials Production Center, 1951-85*, Institute for Energy and Environmental Research, Takoma Park, 1989.

Makhijani, A., *Global Warming and Ozone Depletion: An Action Program for States*, Institute for Energy and Environmental Research, Takoma Park, 1989.

Makhijani, A., *Managing Municipal Solid Wastes in Montgomery County*, Prepared for the Sugarloaf Citizens Association, Institute for Energy and Environmental Research, Takoma Park, 1990.

Saleska, S., and A. Makhijani, *To Reprocess or Not to Reprocess: The Purex Question - A Preliminary Assessment of Alternatives for the Management of N-Reactor Irradiated Fuel at the U.S. Department of Energy's Hanford Nuclear Weapons Production Facility*, Institute for Energy and Environmental Research, Takoma Park, 1990.

Makhijani, A., "Common Security is Far Off," *Bulletin of the Atomic Scientists*, May 1990.

Makhijani, A., *Draft Power in South Asian Agriculture: Analysis of the Problem and Suggestions for Policy*, prepared for the Office of Technology Assessment, Institute for Energy and Environmental Research, Takoma Park, 1990.

Mehta, P.S., S.J. Mehta, A.S. Mehta, and A. Makhijani, "Bhopal Tragedy's Health Effects: A Review of Methyl Isocyanate Toxicity," *JAMA 264*, 2781, December 1990.

Special Commission of International Physicians for the Prevention of Nuclear War and the Institute for Energy and Environmental Research, *Radioactive Heaven and Earth: The Health and Environmental Effects of Nuclear Weapons Testing In, On, and Above the Earth*, Apex Press, New York, 1991. One of many co-authors.

Makhijani, A. and S. Saleska, *High Level Dollars Low-Level Sense: A Critique of Present Policy for the Management of Long-Lived Radioactive Waste and Discussion of an Alternative Approach*, Apex Press, New York, 1992.

Makhijani, A., *From Global Capitalism to Economic Justice: An Inquiry into the Elimination of Systemic Poverty, Violence and Environmental Destruction in the World Economy*, Apex Press, New York, 1992.

Special Commission of International Physicians for the Prevention of Nuclear War and the Institute for Energy and Environmental Research, *Plutonium: Deadly Gold of the Nuclear Age*, International Physicians Press, Cambridge, MA, 1992. One of several co-authors.

Makhijani, A., "Energy Enters Guilty Plea," *Bulletin of the Atomic Scientists*, March/April 1994.

Makhijani, A., "Open the Files," *Bulletin of the Atomic Scientists*, Jan./Feb. 1995.

Makhijani, A., " 'Always' the Target?" *Bulletin of the Atomic Scientists*, May/June 1995.

Makhijani, A. and Annie Makhijani, *Fissile Materials in a Glass, Darkly: Technical and Policy Aspects of the Disposition of Plutonium and Highly Enriched Uranium*, IEER Press, Takoma Park, 1995.

Makhijani, A. and K. Gurney, *Mending the Ozone Hole: Science, Technology, and Policy*, MIT Press, Cambridge, MA, 1995.

Makhijani, A., H. Hu, K. Yih, eds., *Nuclear Wastelands: A Global Guide to Nuclear Weapons Production and the Health and Environmental Effects*, MIT Press, Cambridge, MA, 1995.

Zerriffi, H. and A. Makhijani, *The Nuclear Safety Smokescreen- Warhead Safety and Reliability and the Science Based Stockpile Stewardship Program*, Institute for Energy and Environmental Research, Takoma Park, May 1996.

Zerriffi, H. and A. Makhijani, "The Stewardship Smokescreen," *Bulletin of the Atomic Scientists*, September/October 1996.

Makhijani, A. *Energy Efficiency Investments as a Source of Foreign Exchange*, prepared for the International Energy Agency Conference in Chelyabinsk, Russia, 24-26 September 1996.

Makhijani, A. "India's Options," *Bulletin of the Atomic Scientists*, March/April 1997.

Ortmeyer, P. and A. Makhijani, "Worse than We Knew," *Bulletin of the Atomic Scientists*, November/December 1997.

Fioravanti, M. and A. Makhijani, *Containing the Cold War Mess: Restructuring the Environmental Management of the U.S. Nuclear Weapons Complex*, Institute for Energy and Environmental Research, Takoma Park, October 1997.

Principal author of three chapters in Schwartz, S., ed., *Atomic Audit: The Costs and Consequences of U.S. Nuclear Weapons Since 1940*, Brookings Institution, Washington, D.C., 1998.

Fioravanti, M. and A. Makhijani, *Supplement to Containing the Cold War Mess- IEER's Response to the Department of Energy's Review*, Institute for Energy and Environmental Research, Takoma Park, March 1998.

Makhijani, A., "A Legacy Lost," *Bulletin of the Atomic Scientists*, July/August 1998.

Makhijani, A. and Hisham Zerriffi, *Dangerous Thermonuclear Quest: The Potential of Explosive Fusion Research for the Development of Pure Fusion Weapons*, Institute for Energy and Environmental Research, Takoma Park, July 1998.

Makhijani, A. and Scott Saleska, *The Nuclear Power Deception - U.S. Nuclear Mythology from Electricity "Too Cheap to Meter" to "Inherently Safe" Reactors*, Apex Press, New York, 1999

Makhijani, A., "Stepping Back from the Nuclear Cliff," *The Progressive*, vol. 63, no. 8, August 1999.

Makhijani, A., Bernd Franke, and Hisham Zerriffi, *Preliminary Partial Dose Estimates from the Processing of Nuclear Materials at Three Plants during the 1940s and 1950s*, Institute for Energy and Environmental Research, Takoma Park, September 2000. (Prepared under contract to the newspaper *USA Today*.)

Makhijani, A. and Bernd Franke, *Final Report of the Institute for Energy and Environmental Research on the Second Clean Air Act Audit of Los Alamos National Laboratory by the Independent Technical Audit Team*, Institute for Energy and Environmental Research, Takoma Park, December 13, 2000.

Makhijani, A., *Plutonium End-Game: Managing Global Stocks of Separated Weapons-Usable Commercial and Surplus Nuclear Weapons Plutonium*, Institute for Energy and Environmental Research, Takoma Park, January 2001.

Makhijani, Arjun, Hisham Zerriffi, and Annie Makhijani, "Magical Thinking: Another Go at Transmutation,"*Bulletin of the Atomic Scientists,* March/April 2001.

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Makhijani, A. "Burden of Proof," *Bulletin of the Atomic Scientists*, July/August 2001.

Makhijani, A. "Reflections on September 11, 2001," in Kamla Bhasin, Smitu Kothari, and Bindia Thapar, eds., *Voices of Sanity: Reaching Out for Peace*, Lokayan, New Delhi, 2001, pp. 59-64.

Makhijani, A. and Michele Boyd, *Poison in the Vadose Zone: An examination of the threats to the Snake River Plain aquifer from the Idaho National Engineering and Environmental Laboratory* Institute for Energy and Environmental Research, Takoma Park, October 2001.

Makhijani, A. *Securing the Energy Future of the United States: Securing the Energy Future of the United States: Oil, Nuclear, and Electricity Vulnerabilities and a post-September 11, 2001 Roadmap for Action*, Institute for Energy and Environmental Research, Takoma Park, November 2001.

Makhijani, A. and Sriram Gopal, *Setting Cleanup Standards to Protect Future Generations: The Scientific Basis of Subsistence Farmer Scenario and Its Application to the Estimation of Radionuclide Soil Action Levels (RSALs) for Rocky Flats*, Institute for Energy and Environmental Research, Takoma Park, December 2001.

Makhijani, A., "Some Factors in Assessing the Response to September 11, 2001," *Medicine and Global Survival*, International Physicians for the Prevention of Nuclear War, Cambridge, Mass., February 2002.

Deller, N., A. Makhijani, and J. Burroughs, eds., *Rule of Power or Rule of Law? An Assessment of U.S. Policies and Actions Regarding Security-Related Treaties*, Apex Press, New York, 2003.

Makhijani, A., "Nuclear Targeting Turns 60," forthcoming, *Bulletin of the Atomic Scientists*, May/June 2003.

Makhijani, A., "Strontium," *Chemical & Engineering News*, September 8, 2003.

Makhijani, A. and Nicole Deller, *NATO and Nuclear Disarmament: An Analysis of the Obligations of the NATO Allies of the United States under the Nuclear Non-Proliferation Treaty and the Comprehensive Test Ban Treaty*, Institute for Energy and Environmental Research, Takoma Park, Maryland, October 2003.

Makhijani, A., *Manifesto for Global Democracy: Two Essays on Imperialism and the Struggle for Freedom*, Apex Press, New York, 2004.

Makhijani, A. and Michele Boyd, *Something in the Water: Threats to the Savannah River from Contamination at the Savannah River Site*, Institute for Energy and Environmental Research, Takoma Park, Maryland, forthcoming, March 2004.

- Principal Investigator/Program Director *(Last, first, middle):*

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel in the order listed for Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
David Osterberg	Associate Clinical Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Washington State University, Pullman, WA	B.A.	1966	Economics w/ dept'l distinction
University of Wisconsin-Madison	M.A.	1969	Economics
University of Wisconsin-Madison	M.S.	1972	Water Resources Management
University of Wisconsin-Madison	M.S.	1975	Agricultural Economics

NOTE: The Biographical Sketch may not exceed four pages. Items A and B, together, may not exceed two of the four-page limit.

A. Positions and Honors.

Teaching

1966-1968 Taught English to Iranian high school students and became fluent in Persian, Peace Corps, Iran Project X

1972-1973 Lecturer in Modernization Processes and Natural Resources Economics, University of Wisconsin-Green Bay, Green Bay, WI

1975-1982 Assistant Professor of Economics and Business, Cornell College, Mt. Vernon, IA

1985-2001 Adjunct Associate Professor, graduate and undergraduate courses in Environmental Policy, Department of Geography, University of Iowa

1985-2001 Taught courses for Urban and Regional Planning, Preventive Medicine, and the Labor Center, University of Iowa

1997 spr sem Taught environmental tourism and researched farm tractor injuries, Dalarna University, Borlänge, Sweden

2001-present Secondary appointment - Associate Professor, graduate and undergraduate courses in Environmental Policy, Department of Geography, University of Iowa

2001-present Associate Clinical Professor of Environmental Policy, Department of Occupational and Environmental Health, The University of Iowa

Legislative Experience

1986 sum Interviews with Swedes knowledgeable in the fields of farm chemical contamination of groundwater and the health and safety of farmers, Swedish-American Bicentennial Travel Grant, Swedish Ministry of Agriculture and the Swedish Institute

1987-1990 Chair, Committee on Agriculture, Iowa House of Representatives

1987-1989 Member, Council oversaw $1.5 million per year budget for education and demonstration on tillage practices, fertilizer management and pesticide use to reduce chemical inputs, Agricultural Energy Management Advisory Council

1991 May Ten-day trip to study Japanese Public/Private Partnerships in the field of Bio-technology, US-Japan Environmental Mission, Council of State Governments/US-Japan Foundation of New York grant

1991-1992 Chair, Committee on Energy and Environmental Protection, Iowa House of Representatives

Honors

University

Phi Eta Sigma - 1962, Phi Kappa Phi - 1965, Phi Beta Kappa - 1966

Community

1984 Sierra Club of Iowa
1986 Iowa Citizens Action Network
1988 Cedar Rapids Audubon Society, Iowa Farmers Union and Iowa Soil & Water District Commissioners
1992 Farm Unity Coalition
1994 Iowa Division Izaak Walton League, Methodist Federation for Social Action, and Iowa Farmers Union
1995 Iowa League of Women Voters and Iowa Citizen Action Network
1997 Iowa Sustainable Energy for Economic Development (SEED) Coalition

B. Selected peer-reviewed publications (in chronological order).

Osterberg D. Iowa alternative energy legislation. In: Kreith F, editor. Wind Energy for the States: A Technical and Legislative Perspective. Denver, CO: National Conference of State Legislators, 1993.

Osterberg D. Environmental agenda setting. ECOS, The Environmental Cummunique of the States 1(6):1 & 5, Jul/Aug 1994.

Rajagopal R, Osterberg D, Ogden F, Natarajan U, Emerson C, Krajewski W. Water resources of the United States: Problems, risk perceptions, and priorities. Research sponsored by the National Geographic Society, Washington, DC, 1995.

Rajagopal R, Osterberg D. A framework for state environmental priorities: Midwestern perspectives, research notes #1 - #6, comparative risk assessment, environmental justice, pollution prevention, environmental innovations, unfunded mandates and takings/private property rights. Research sponsored by the Joyce Foundation, Chicago. Department of Geography, The University of Iowa, 1995.

Osterberg D. Iowa forum on risk based corrective action and underground tanks. Iowa Groundwater Quarterly 6(4):6, Winter 1995-1996.

Osterberg D. Learning from the success stories of non-regulatory conservation alternatives. Iowa Natural Heritage Foundation, 1996.

Osterberg D. The future of rural water supplies: Health and infrastructure policy issues workshop. Iowa Groundwater Quarterly 8(4):1-4, Winter 1997/1998.

C. Research Support.

ONGOING

5 P30 ES05605-12 (Thorne) 09/29/90-03/31/04
NIEHS
Environmental Health Science Research Center
The main goal of the EHSRC is to promote research interactions among environmental health researchers at the UI, enhancing ongoing environmental health research and facilitating initiation of new collaborative and interdisciplinary environmental health research.

Community Outreach & Education Core (Associate Director-
Policy Initiative)
The primary goal of the COEC is the translation of research results into knowledge applied to public health, as a local, state, national and international resource, and assisting community organizations and populations with special needs.

(Weyer, PI) 12/01/01-11/30/02
U.S. Geological Survey
Statewide Study of Drinking Water Quality in Iowa Communities Without Public Water Supply Systems (Osterberg, Co-Investigator)

The major goal of this project is to test and evaluate private groundwater supplies in rural Iowa to assess potential public health impacts.

COMPLETED

(Peter Fisher, PI) 1990
Iowa Natural Heritage Foundation
The Local Economic and Fiscal Impacts of a National Forest in Southern Iowa (Osterberg, Investigator)
Report documenting the fiscal and tax consequences of creating a national forest in Iowa.

(Rajagopal, PI) 1993-1995
Joyce Foundation
A Policy Framework for State Environmental Priorities (Osterberg, Investigator)
Grant to sponsor workshops with approximately 50 Midwest state legislators on risk assessment, environmental justice, takings/property rights and pollution prevention.

1994
Northwest Area Foundation
Six Iowa farm organizations, the Iowa Natural Heritage Foundation, and the Des Moines Waterworks environmental grant. (Grant writer only)

1996 summer
Joyce Foundation / Iowa Natural Heritage Foundation
Learning From the Success Stories of Non-Regulatory Conservatin Alternatives (Osterberg, Investigator)
Contract to investigate locally initiated programs that encourage conservation practices by landowners.

George Rice
Groundwater Hydrologist

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San Antonio, TX 78212
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General

More than 20 years experience in hazardous waste investigations.

Education

M.S. Hydrology, University of Arizona, 1991
B.S. Hydrology, University of Arizona, 1979

Employment History

1993: Consultant
1988 - 1993: The MITRE Corporation, Brooks Air Force Base, Texas
1983 - 1988: SHB Geotechnical Engineers, Inc., Albuquerque, New Mexico
1980 - 1983: University of Arizona, Tucson, Arizona
1979 - 1980: U.S. Forest Service, Gifford Pinchot National Forest, Vancouver, Washington

Experience

- Design and install monitor well networks.
- Design, perform, and analyze aquifer tests.
- Design and install vadose zone monitor networks.
- Design and conduct groundwater sampling programs.
- Apply groundwater flow and contaminant transport models to predict the fate of groundwater contaminants (MODFLOW, MT3D, MOC3D).
- Participate in multidisciplinary teams to select and design hazardous waste disposal sites.
- Conduct third party reviews of environmental documents and field programs.
- Expert Witness.

Representative Projects

Site Characterization - Principal hydrologist responsible for the hydrologic characterization of low-level radioactive and hazardous waste sites throughout the western United States. The goals of these studies were to determine the extent and intensity of any metals or radionuclide contamination, estimate the rate and direction of contaminant movement, and predict future concentrations at receptor sites. Achievement of these goals required the installation of monitor well networks, installation of vadose zone monitoring instruments, groundwater sampling, the performance and analysis of aquifer tests, and the integration of data into a coherent conceptual model of each site.

Contaminant Transport Modeling - Used two and three-dimensional models to design pump and treat systems and estimate the effects of proposed remedial actions on future water quality. Conducted studies to estimate the time required for contaminants to reach potential receptors and estimate contaminant concentrations after plumes reached receptors.

Waste Repository Design - Principal hydrologist responsible for estimating the effects of remedial designs on future groundwater quality at low-level nuclear waste repositories in Arizona and Colorado. This required working closely with geotechnical and civil engineers to produce designs that incorporated the hydrologic characteristics required to meet water quality standards.

Field Methods Instructor - Member of a team that taught environmental field techniques to Air Force personnel. The four-day course consisted of lectures and field trips. It focused on monitor well design, monitor well construction, sampling program design, and groundwater sampling techniques.

Quality Assurance Manager - Manager of hydrology group responsible for evaluating environmental work performed at Air Force bases throughout the United States. Evaluated reports, hydrologic analyses, and field work related to Preliminary Assessments and Site Inspections (PA/SI), Remedial Investigations and Feasibility Studies (RI/FS), and Remedial Actions (RA). These evaluations usually resulted in recommendations for improving overall program design, analytical techniques, or field procedures.

Bibliography

Rice, G., 1987. *Design of Low Level Radioactive Waste Repositories to Minimize Groundwater Contamination*. Presented to Rocky Mountain Association of Environmental Professionals, Albuquerque, New Mexico.

Rice, G., Brinkman, J., and Muller, D., 1988. *Reliability of Chemical Analyses of Water Samples -- The Experience of the UMTRA Project*. Ground Water Monitoring Review, Vol. VIII, No. 3, pp. 71-75.

Casagrande, D., Price, F., Rice, G., Vogel, G., 1989. *Geochemistry Manual*, MITRE Working Paper WP-89W00180. The MITRE Corporation, Civil Systems Division, 7525 Colshire Drive, McLean, Virginia.

Rice, G., Green, R., Pohle, J., 1993, *Reduction in Uncertainty in the Geologic Setting Performance Measure, 10 CFR 60.113(a)(2): Computer Code Selections, Conceptual Models, and Databases*, Prepared for Nuclear Regulatory Commission Contract NRC-02-88-005, Center for Nuclear Waste Regulatory Analyses, San Antonio, Texas.

Rice, G. 1994, *AGUA Report, Contamination of the Edwards Aquifer in Bexar County*, A presentation of contaminant concentrations and a discussion of the relationship between contamination and development of the Edwards Aquifer Recharge Zone.

Green, R., Meyer, K., Rice, G., 1994, *Hydraulic Characterization of Hydrothermally-Altered Nopal Tuff*, Prepared for Nuclear Regulatory Commission Contract NRC-02-93-005, Center for Nuclear Waste Regulatory Analyses, San Antonio, Texas.

Green, R.T., Dodge, F.T., Svedeman, S.J., Manteufel, R.D., Rice, G., Meyer, K.A., Baca, R.G., 1995, *Thermally Driven Moisture Redistribution in Partially Saturated Porous Media*, Prepared for Nuclear Regulatory Commission Contract NRC-02-93-005, Center for Nuclear Waste Regulatory Analyses, San Antonio, Texas.

Rice, G., 1996, *The BFI Tessman Road Landfill: Hydrologic Issues*, Prepared for Larry R. Daves and Associates, San Antonio, Texas.

Rice, G., 1997, *Groundwater and Groundwater Contamination in the Vicinity of Mr. Quintanilla's House, 710 price Avenue, San Antonio, Texas,* Prepared for Tinsman & Houser, San Antonio, Texas.

Rice, G., 2001, *Evaluation of Groundwater Characterization and Modeling at the Pantex Plant,* June 2001. Prepared for Serious Texans Against Nuclear Dumping (STAND).

Rice, G., 2001, *Evaluation of HDR/SAWS Modeling of the Carrizo-Wilcox Aquifer in Lee, Bastrop, and Milam Counties, Texas.*

Rice, G., 2002, *Groundwater Modeling at Pantex, and Recommendations of the Technical Advisory Group,* Prepared for Serious Texans Against Nuclear Dumping (STAND), September 2002.

Rice, G, 2003, *Background Concentrations of Contaminants in the Ogallala Aquifer at Pantex, an Evaluation*, Prepared for Serious Texans Against Nuclear Dumping (STAND), May 2003.

CURRICULUM VITAE

WILLIAM J. WEIDA
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McCall, Idaho 83638
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EDUCATION

D.B.A., Econometrics and Operations Research, UNIVERSITY OF COLORADO, 1975
M.B.A., Management Theory, UNIVERSITY OF CALIFORNIA AT LOS ANGELES, 1966
B.S., Engineering, UNITED STATES AIR FORCE ACADEMY, COLORADO, 1965

PROFESSIONAL EXPERIENCE

Sept. 2002 – Present: Director, Factory Farm Project, Global Resource Action Center For The Environment
Senior Status Professor, Dept. of Economics, The Colorado College, Colo. Springs, CO

Jan. 1997 – Aug. 2002: Project Director, Global Resource Action Center For The Environment
and Professor, Dept. of Economics, The Colorado College, Colo. Springs, CO

May 1993 – Dec. 1996: National Director, Community Education Campaign, Nuclear Site
Cleanup and Conversion, Economists Allied for Arms Reductions and
Professor, Dept. of Economics, The Colorado College, Colorado Springs, CO

June 1990 – June 1993: Professor and Chair, Department of Economics & Business,
The Colorado College, Colorado Springs, CO

Aug. 1985 – May 1990: Professor and Co-Chair (1988-1990), Assoc. Prof. (1985-1988)
Dept. of Economics & Business, The Colorado College, Colorado Springs, CO

Mar. 1982 – July 1985: Director (1984-1985) and Asst. (1982-1984) for Econ Policy and Analysis
OASD/ISA, International Economic and Energy Affairs, Pentagon
Formulated Department of Defense policy on international economic and energy issues including security assistance, burdensharing, sanctions and economic warfare trade restrictions, energy and defense trade.

Feb.-Sept. 1983: Economist, Blue Ribbon Commission on Security & Economic Assistance
Economic analysis of security assistance matters including alternative methods of financing, the economic impact of loan payments on LDCs, and U.S. agreements and treaties that determine assistance amounts.

U.S. AIR FORCE ACADEMY, COLORADO, Department of Economics

June 1981 – Mar. 1982: Professor and Acting Head
Responsible for curricula, pedagogy, budget and administration of economics faculty. Taught courses in macro and micro economics, statistics and econometrics.

June 1978 – May 1981: Associate Professor and Director of Instruction
Responsible for faculty and courses in economics and quantitative management. Director, Operations Research major. Tenured June 1978. (Ten percent of faculty tenured.)

Jan. 1975 – May 1978: Assistant Professor and Director of Research, USAF Academy
Director, USAF Procurement Research Office, USAF Academy.

June 1972 – Jan. 1975: Doctoral Candidate, University of Colorado

Jan. 1970- June 1972	Instructor, U.S. Air Force Academy Department of Economics
June 1965- Jan. 1971	Professional assignments as an U.S. Air Force officer and combat pilot in Vietnam.

RESEARCH AND PUBLICATIONS

Selected journal articles: "General Weapon Expenditure Forecasting with Risk as a Determinant of Development Time," The Journal of Technology Transfer, 1981, "Military Weapon Systems Expenditures and Risk: Theory and Evidence," International Journal of Social Economics, 1985 (with Dr. Frank L. Gertcher), "The Ethics and Economics of Foreign Sales of U.S.-Made Weapons," International Journal of Social Economics, London, 1986.

Books: Paying for Weapons: The Politics and Economics of Offsets and Countertrade, Frost and Sullivan, 1986; The Political Economy of National Defense , Westview Press, 1987 (with Dr. Frank L. Gertcher); Beyond Deterrence: The Political Economy of Nuclear Weapons, Westview Press, 1990 (with Dr. Frank L. Getcher); *Substituting Employment From Environmental Cleanup Of Defense Facilities For Jobs Lost Through Disarmament*, in Jurgen Brauer and Manas Chatterji, (ed.), Economic Issues of Disarmament, MacMillan Co., December, 1992; *The Political Economy of Nuclear Weapons and Economic Development after the Cold War,* in Akira Hattori, ed., Disarmament and Restructuring of the World Economy After The End Of The Cold War, Tokyo, Japan, May 20, 1994; *Nuclear Weapons and Economic Development,* in Chatterji, Fontanel and Hattori, eds., Arms Spending, Development and Security, Ashish Publishing House, New Delhi, India, May, 1996. Regaining Security--A Guide to the Costs of Disposing of Plutonium and Highly Enriched Uranium , Avebury Press, London, 1997, *The Economic Implications of Nuclear Weapons* in Schwartz, Steven I., ed., Atomic Audit--The Costs and Consequences of Nuclear Weapons Since 1940, Brookings Institution, Washington, DC, 1998.

SELECTED CONSULTING

Air Force Systems Command Cost Analysis Group: 1979-1982 Assistant Secretary of the Air Force (Manpower, Reserve Affairs and Logistics: 1979-1981
Assistant Secretary of the Air Force (Financial Management): 1980
National Association of Church Business Administrators: 1979-1983
Atlantic Richfield Corporation: 1982-1983
Commission on Security and Economic Assistance: 1983
Sears World Trade, Inc: 1983-1985
Department of Defense: 1985-1988
Offset Managers Group: 1985-1988
Georgetown Center for Strategic and International Studies: 1985-1987
American Numismatic Association: 1990
Greenpeace: 1988-1991
Natural Resources Defense Council: 1987-1992
Shoshone-Bannock Tribes: 1991-1992
Ferrellgas, 1992
Economic Development Corporation, Colorado Springs, CO: 1991-1992
Alliance for Nuclear Accountability (40 Regional Organizations): 1991-Present
Legal Consulting on Statistical and Economic Issues--1988-Present--including:
Subway, Delta Dental, Prudential, NBA Ventures, Los Alamos National Laboratory, United Airlines, Benson Pump, Cotter Corporation.

PUBLICATIONS--WILLIAM J. WEIDA

Books:

The Political Economy of National Defense, published January, 1987, by Westview Press, Boulder, Colorado. (With Dr. Franklin Gertcher)

Paying For Weapons: The Politics and Economics of Offsets and Countertrade. Published by Frost and Sullivan, New York, August, 1987.

Beyond Deterrence: The Political Economy of Nuclear Weapons, Westview Press, Boulder, Colorado, January, 1991. (With Dr. Franklin Gertcher)

Regaining Security--A Guide To The Costs of Disposing of Plutonium and Highly Enriched Uranium, Avebury Press, England, 1997.

Book Chapters

The ILO and Depopulation of Rural Agricultural Areas: Implications for Rural Economies in Cananda and the U.S. in Alexander Ervin, Cathy Holtslander, Darrin Qualman, and Rick Sawa, eds., Beyond Factory Farming, Canadian Centre for Policy Alternatives, Saskatoon, SK., 2003.

Using Employment Created By Environmental Cleanup of Defense Facilities As A Substitute for Jobs Lost Through Disarmament. in Jurgen Brauer and Manas Chatterji, (ed.), Economic Issues of Disarmament, New York University Press, New York, NY., published January, 1993.

The Political Economy of Nuclear Weapons and Economic Development after the Cold War, in Akira Hattori, ed., Disarmament and Restructuring of the World Economy After The End Of The Cold War, ECAAR Japan, Tokyo, May, 1994.

The Political Economy of Nuclear Weapons and Economic Development After the End of the Cold War, Arms Spending, Development and Security, Chatterji, Fontanel and Hattori, eds., Ashish Publishing House, New Delhi, India, May, 1996.

The Economic Implications of Nuclear Weapons in Steven I. Schwartz, ed., Atomic Audit--The Costs and Consequences of Nuclear Weapons Since 1940, Brookings Institution, Washington, DC, 1998.

Nuclear Energy/Nuclear War, Encyclopedia of Political Economy, 1999.

Procurement: Nuclear Weapons Industry, The Oxford Companion to American Military History, Oxford University Press, New York, 1999.

Selected Papers

A Comparison of Conversion Experience at Lowry Air Force Base and Rocky Flats, Colorado, Presented to the American Economic Association Conference, Anaheim, California, January 5, 1993.

Research, Teaching and Policy on the Military Industrial Economy, Journal of Peace Economics, Peace Science, and Public Policy, Volume 2, No. 3, Spring, 1995. (with Ann Markuson)

An Alternative to the Galvin Report on Futures for the DOE Nuclear Weapons Laboratories, Working Paper No. 87, Center for Urban Policy Research, Rutgers University, 1995. (with Ann Markuson)

Research, Teaching and Policy on the Military Industrial Economy, Working Paper No. 89, Center for Urban Policy Research, Rutgers University, 1995. (with Ann Markuson)

Plutonium & HEU Disposal and Disposition Options, American Economic Association, 7 January, 1996.

The Disposition of Weapon-grade Plutonium: Costs and Tradeoffs, Proceedings of the International Conference on Military Conversion and Science, Volume 1, Como, Italy, June, 1996.

Other Selected Publications

Raising, Cutting Military Spending for the Wrong Reasons, The Denver Post, May 31, 1987.

Editor, *Monetary Policy and Inflation*, the Hon. Wayne D. Angell, Colorado College Study, April, 1987.

Editor, *Restoring American Competitiveness*, Dean Lester Thurow, Colorado College Study, September, 1987.

The use of offsets in the Middle East, Middle East Executive Report, December, 1987.

Editor, *Fundamental Reasons for America's Competitiveness Problems*, John Knight, Colorado College Study, February, 1988.

Editor, *U.S. Trade Policy: The Path to Competitiveness*, Jay Bruns, Colorado College Study, March, 1988.

Editor, *Divestiture and Competition in the U.S. telephone Industry*, Joseph T. Dwyer, Colorado College Study, April, 1988.

Editor, *The Worst Kept Secret in the World: Managing Total Quality*, William H. Hudson, Colorado College Study, November, 1988.

From SDI Setbacks Arise New Opportunities for Defense Department, Colorado Springs, The Rocky Mountain News, January 11, 1991 with Jim Wilson,.

Service Academy Cuts, Not Nice, But Necessary, The Wall Street Journal, June 11, 1991.

The Faustian Economics of Nuclear Weapon Production in South Carolina, The Christian Science Monitor, December 9, 1991.

Restarting The K-Reactor: Weighing The Risks, The Christian Science Monitor, April 26, 1992, with Laura Ludwick.

Privatizing the Labs, Positive Alternatives, Volume 6, Number 1, Fall, 1995.

Four Trillion Dollars and Counting, The Bulletin of the Atomic Scientists, Vol. 51, No. 6, November/December 1995. (with David Albright, Bruce Blair, Tom Blanton, Bill Burr, Steve Kosiak, Arjun Makhijani, Bob Norris, Kevin O'Neill, George Perkovich, John Pike, and Steve Schwartz--The Nuclear Weapons Cost Study Project Committee of the Brookings Institution)

The Stockpile Stewardship Charade, Issues in Sceince and Technology, Vol. XV, No. 3, Spring, 1999. (with Greg Mello and Andy Lichterman)

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE SECRETARY

In the Matter of Docket No. 70-3103

Louisiana Energy Services

National Enrichment Facility

CERTIFICATE OF SERVICE

Pursuant to 10 CFR § 2.305 the undersigned attorney of record certifies that on April 6, 2004, the foregoing Petition, Declarations, and Contentions were served by electronic mail and by first class mail upon the following:

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Attention: Associate General Counsel for Hearings, Enforcement, and Administration

Secretary
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Attention: Rulemakings and Adjudications Staff (original and two copies)

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