RAS 8914

November 24, 2004

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of

Docket No. 70-3103

Louisiana Energy Services, L.P.
National Enrichment Facility

ASLBP No. 04-826-01-ML

EXPERT REPORTS ON BEHALF OF NUCLEAR INFORMATION AND RESOURCE SERVICE AND PUBLIC CITIZEN PURSUANT TO ORDER DATED OCTOBER 20, 2004

Pursuant to the Memorandum and Order of the Atomic Safety and Licensing Board dated October 20, 2004, Petitioners Nuclear Information and Resource Service and Public Citizen ("NIRS/PC") hereby file reports by persons who may be used at trial to present evidence under 10 CFR 2.711. The following reports contain the substance of the opinions and the bases therefor to be presented by expert witnesses on behalf of NIRS/PC. The data or other information considered by the witnesses in forming their opinions are identified in the reports. Exhibits to be offered at the hearing in support of the opinions are referred to in the reports. Such exhibits are either documents previously produced or identified in discovery in this case or publicly available items, with sources identified. The qualifications of the witnesses, their publications, and the cases in which they have testified are identified in their resumes, which were previously produced as attachments to the NIRS/PC Petition or to the Responses on Behalf of Petitioners NIRS/PC to Interrogatories by Commission Staff, dated September 23, 2004. An updated resume of Dr. Makhijani is also provided.

Template=SECY-049

SECY-02

(a) Report by George Rice:

Comments on Louisiana Energy Services' Environmental Reports and the Nuclear Regulatory Commission's Draft Environmental Impact Statement for the Proposed National Enrichment Facility in Lea County

George Rice
November 23, 2004

The Draft Environmental Impact Statement (DEIS) and the Environmental Reports for the Proposed National Enrichment Facility (NEF) are deficient. The Nuclear Regulatory Commission (NRC) and Louisiana Energy Services (LES) have not performed investigations necessary to properly characterize existing groundwater conditions. Nor have they performed investigations necessary to determine how the proposed facility will affect groundwater in the future.

Background

The proposed NEF site is underlain by about 20 to 60 feet of soil, dune sand, and alluvium[1]. The alluvium is underlain by the Dockum Group. The Dockum Group is composed of two subunits: the Chinle Formation and the Santa Rosa Aquifer. The Chinle immediately underlies the alluvium[2]. Water exists in the Chinle at a depth of about 220 feet[3]. Water has also been found in a 100 foot-thick sandstone layer at a depth of about 600 feet[4]. The Santa Rosa is about 1100 feet below land surface[5].

No studies designed to identify fractures have been performed at the proposed site. However, at the WCS site, approximately one mile east of proposed NEF site, the Chinle is known to contain fractures. Many of the fractures are associated with faults[6]. According to G.L. Environmental Inc., a fault also exists beneath the proposed site[7].

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[8]. Approximately 2540 m^3 of effluent will be discharged to the basin each year[9].

[1] NRC, 2004a, table 3-8; and Cook-Joyce Inc., 2003a, table 1. Alluvium is stream deposited clay, silt, sand, and gravel.
[2] Louisiana Energy Services, 2003a, page 3.3-2.
[3] Louisiana Energy Services, 2003a, page 3.4-12.
[4] NRC, 2004a, page 3-36.
[5] NRC, 2004a, page 3-36. 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 (Louisiana Energy Services, 2003a, pages 3.4-12 and 3.4-13).
[6] Cook-Joyce Inc., 2004a, pages 4-6 – 4-8. Fractures at the WCS site are also mentioned in Rainwater, 1996, page 8.
[7] G.L. Environmental Inc., 2004, Bates stamp: LES-00122.
[8] NRC, 2004a, page 4-11.
[9] NRC, 2004a, page 4-12.

- Stormwater runoff from the uranium byproduct cylinder (UBC) storage pad and cooling tower blowdown will be directed to a single lined evaporation basin[10]. This basin will be able to hold approximately 77,700 m^3[11].

- Stormwater runoff from the plant (except the UBC storage pad) will be directed to an unlined basin[12]. This basin will be able to hold approximately 23,350 m^3 of runoff[13]. Overflow from the basin will be discharged to ground surface[14].

- Sewage will be discharged to six septic leach fields[15]. Approximately 7300 m^3 of sewage will be discharged annually[16].

Presence of alluvial groundwater

LES has not determined whether groundwater exists in the alluvium at the proposed site. LES drilled 14 borings at the site[17]. Logs indicate that some of the borings were backfilled on the same day they were drilled[18]. Thus, LES may not have allowed sufficient time for water to enter the borings. Water levels in the alluvial groundwater system at the nearby Waste Control Specialists (WCS) site are known to recover slowly[19].

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[20], 2) about ½ mile northeast at Baker Spring[21], and 3) about 2/3 mile east at the WCS site[22].

Source of moisture in alluvium

According to NRC, "... no precipitation recharge (i.e., rainfall seeping deeply into the ground) occurs in thick, desert vadose zones with desert vegetation (Walvoord et al., 2002)"[23]. However, cuttings from one of the borings drilled in September 2003 were "slightly moist"[24]. In addition, the clay at the bottom of boring B-2 was "moist"[25]. This moisture may represent residual water from episodic recharge events.

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[10] NRC, 2004a, pages 4-11 and 4-12.
[11] Louisiana Energy Services, 2004b, page 5 of 36.
[12] NRC, 2004a, pages 4-12 and 4-13.
[13] Louisiana Energy Services, 2004b, page 4 of 36.
[14] Louisiana Energy Services, 2003a, page 4.4-7.
[15] NRC, 2004a, figure 4-2.
[16] Louisiana Energy Services, 2004b, page 7 of 36.
[17] Louisiana Energy Services, 2003b, page 3.2-20.
[18] Louisiana Energy Services, 2003b, figures 3.2-10 – 3.2-14.
[19] Louisiana Energy Services, 2003b, page 3.2-15. The WCS site is about ½ mile east of the proposed NEF site (Cook-Joyce Inc., 2003a, page 2).
[20] Louisiana Energy Services, 2003a, page 3.4-2; Louisiana Energy Services, 2003c.
[21] Louisiana Energy Services, 2003a, pages 3.4-2 and 3.4-3; Louisiana Energy Services, 2003c.
[22] Louisiana Energy Services, 2003a, pages 3.4-3 and 3.4-4; Louisiana Energy Services, 2003c.
[23] NRC/LES, 2004a, page 3-35.
[24] Louisiana Energy Services, 2004a, page 3.4-2. Cuttings from depths of 6 – 14 feet.
[25] Louisiana Energy Services, 2003b, figure 3.2-11. Moist clay at depth of about 35 feet.

If NRC does not believe this moisture is the result of 'precipitation recharge', it should explain the origin of this moisture.

Subsurface fate of wastewaters

Some water from the evaporation basins and septic leach fields 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.
- Flow into the Santa Rosa Aquifer.

NRC/LES have not evaluated the subsurface fate of wastewaters and runoff at the NEF. To determine where this water will go, they should answer the following questions:

- 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 fields?
- Where would water flowing along the alluvial/Chinle contact be discharged?
- How long would it take for water from the NEF to reach the discharge area?

NRC discussion of leakage from storm water detention basin and the septic leach fields

NIRS/PC agrees with the NRC that leakage from the storm water detention basin and the septic leach fields will likely result in the formation of perched bodies of groundwater at the alluvial/Chinle contact[26]. NRC has provided estimates of the dimensions of these bodies, groundwater flow rates, and has identified potential discharge areas[27].

A. Groundwater flow rates

NRC estimated the groundwater flow rate along the alluvial/Chinle contact using Darcy's Law[28]:

[26] NRC, 2004a, pages 4-13 and 4-14.
[27] One of the potential discharge areas, Custer Mountain, is approximately 20 miles south of the site (Nicholson and Clebsch, 1961, plate 2).
[28] NRC, 2004b, page 7.

$q = K (\Delta H/\Delta L)/n$

where:

K = hydraulic conductivity

$\Delta H/\Delta L$ = hydraulic gradient

n = effective porosity

NRC used the following values[29]:

K = 0.01 cm/s

$\Delta H/\Delta L = 0.02$

n = 0.25

These values resulted in a groundwater flow rate of 252 m/yr. It should be noted that the hydraulic conductivity and porosity values are not based on measurements performed at proposed site. They are based on values found in the literature[30]. The hydraulic gradient is based on the slope of the alluvial/Chinle contact[31].

Although the hydraulic conductivity used by NRC may result in a reasonable estimate of average groundwater flow rates, it underestimates the rate at which groundwater is likely to flow through the more permeable materials underlying the site (e.g. gravels).

Gravels exist beneath the site at various depths[32]. The hydraulic conductivity of gravel ranges from 0.1 cm/s to 100 cm/s[33]. The porosity of gravel ranges from 0.25 to 0.40[34].

A groundwater flow rate through the gravels is estimated using the following values in Darcy's law:

K = 0.1 cm/s

$\Delta H/\Delta L = 0.02$

n = 0.3

then:

[29] NRC, 2004b, pages 9 and 12.
[30] NRC, 2004b, pages 7, 8, 10, and 11; Louisiana Energy Services, 2004a, pages 3.4-14 and 3.4-15; and Harper and Peery, 2004a, page 54.
[31] NRC, 2004b, pages 8 and 10.
[32] NRC, 2004a, page 3-34; and Cook-Joyce Inc., 2003a, appendix A.
[33] Freeze, R.A., Cherry, J.A., 1979, page 29.
[34] Freeze, R.A., Cherry, J.A., 1979, page 37.

$$q = K (\Delta H/\Delta L)/n = 0.1 \text{ cm/s } (0.02)/0.3 = 6.67 \times 10^{-3} \text{ cm/s} \sim 1.3 \text{ mi/yr.}$$

NRC has not estimated the time required for water from the NEF to reach any discharge areas[35]. The time to reach discharge areas should be calculated using groundwater flow rates for the more permeable materials underlying the site (e.g., the value calculated above for flow through gravels).

B. Discharge areas and potential groundwater use

According to the NRC, bodies of groundwater that form beneath the site may be discharged ... *in a minor seep at Custer Mountain or in the excavation 3.2 kilometers (2 miles) southeast of Monument Draw ...* .[36]

NRC's evaluation of potential discharge areas appears to be based on a review of the literature rather than on a field investigation.

NRC should explain why it believes water from the site may discharge at the locations given. It should also explain why it did not consider closer potential discharge areas (e.g. Monument Draw[37]) or discharge to wells that may be along the flow path of groundwater emanating from the site. NRC or LES should also conduct a field investigation to locate potential discharge areas down gradient of the proposed site.

Although there may be no downgradient groundwater users within two miles of the proposed site[38], groundwater in alluvium and the Dockum Group (Chinle Formation or the Santa Rosa Aquifer) has been used in the vicinity of the site[39]. According to the Lea County Water Plan, deeper aquifers such as the Dockum Group may be developed for future water supplies[40]. The plan recommends investigating areas where faulting may have fractured these aquifers[41].

Leakage from lined basins

Treated effluent from the plant will be discharged to a double lined evaporation basin[42]. Stormwater runoff from the UBC storage pad and cooling tower blowdown will be discharged to

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[35] Discharge areas may be natural features (e.g., springs or seeps) or wells.

[36] NRC, 2004a, pages 4-13 and 4-14. Custer Mountain is approximately 20 miles from the site (Nicholson and Clebsch, 1961, plate 2).

[37] NRC's reference to " ... *the excavation 3.2 kilometers (2 miles) southeast of Monument Draw* ... " appears to be an error. NRC cites Nicholson and Clebsch, 1961 as the source of this information. However, the excavation mentioned in Nicholson and Clebsch is two miles southeast of the town of Monument, not Monument Draw (Nicholson and Clebsch, 1961, page 35 and figure 3).

[38] NRC, 2004a, page 4-13.

[39] Alluvial wells approximately three miles west of the proposed site have been used for domestic purposes (Nicholson and Clebsch, 1961, page 80 and plate 2). The City of Eunice had an old public supply well in the Dockum. This well was about six miles west of the site (Nicholson and Clebsch, 1961, page 80 and plate 2). The town of Oil Center, about 12 miles northwest of the site, obtains water from the Dockum Group (Leedshill-Herkenhoff, 2000, page 6-12, and Nicholson and Clebsch, 1961, page 69 and plate 2).

[40] Leedshill-Herkenhoff, 2000, page 8-5.

[41] Leedshill-Herkenhoff, 2000, page 8-5.

[42] NRC, 2004a, page 4-11.

a single lined evaporation basin[43]. The basins will be lined with geosynthetic materials (e.g., HDPE)[44].

Lined basins often leak. They leak because the liners contain defects. These defects exist for a variety of reasons.

- Manufacturing defects: typical geomembranes contain 0.5 to 1 pinholes per acre[45].
- Installation defects: these include unsealed seams, punctures from sharp objects, and damage caused by the operation of heavy equipment[46]. The number of defects can be reduced by careful installation. However, even with the best quality control during installation, one can expect 1 to 2 defects per acre[47].
- Deterioration after installation[48]: this includes rupture due to creep, stress cracking, and degradation due to exposure to chemicals and heat.

Laine and Miklas examined 61 geosynthetic-lined facilities[49]. The facilities included landfills and impoundments. Most of the geosynthetic liners were made of HDPE, but some were made of PVC (e.g., XR-5) or polyethylene. Leaks were detected in 58 of the 61 facilities. The average density of leaks at all facilities was about 13 per acre.

The EPA recently released a report describing various methods for detecting leaks beneath lined landfills and impoundments[50].

NRC/LES have not estimated the rate at which the lined basins may leak. Nor have NRC/LES determined the fate of the water and contaminants (e.g., flow rates, discharge areas) that may leak from the basins. NRC/LES should estimate leakage rates from the lined basins and determine the fate of the water and contaminants that may leak from the basins. When estimating lateral flow rates through the alluvium, NRC/LES should use properties of the more permeable materials underlying the site (e.g., gravels).

Apparent inconsistencies regarding fate of water discharged to septic leach fields and stormwater runoff basin

In its responses to interrogatories and questions during depositions, LES claims that water which enters the subsurface from the septic leach fields and the stormwater runoff basin will be evapotranspired[51]. The responses do not mention the possibility that the water may recharge the underlying groundwater systems.

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[43] NRC, 2004a, page 4-12.
[44] Louisiana Energy Services, 2004b, pages 11 – 13 of 36.
[45] EPA, 1994a, page 34.
[46] Yazdani, 1997.
[47] Murphy and Garwell, 1998, page xii.
[48] Reddy and Butul, 1999, pages 19, 25, and 108.
[49] Laine and Miklas, 1989.
[50] EPA, 2004a.
[51] Louisiana Energy Services, 2004e, pages 3 – 5; and Harper and Peery, 2004a, pages 35 – 37.

However, in its Groundwater Discharge Permit Application, LES makes the following statement regarding discharged sewage:

> *The infiltrated waters are expected to potentially recharge the limited ground water system at the 214 to 222 foot depth or return to the atmosphere via evapotranspiration.* [52]

LES makes the same statement regarding stormwater runoff:

> *The infiltrated waters are expected to potentially recharge the limited ground water system at the 214 to 222 foot depth or return to the atmosphere via evapotranspiration.* [53]

These statements in the Groundwater Discharge Permit Application appear to contradict LES's contention that all water which enters the subsurface will be evapotranspired. LES should explain this apparent contradiction.

Apparent inconsistency regarding fate of water discharged to lined basins

In its responses to an NIRS/PC interrogatory regarding leakage from the lined basins, LES states:

> *The basins will be designed to preclude water from infiltrating into the subsurface. Therefore, no estimates on how much water will infiltrate into the subsurface have been, or need be, made.* [54]

However, in its Groundwater Discharge Permit Application, LES makes the following statement regarding leakage from the UBC storage basin:

> *Any minor leakage past the liner will infiltrate into the ground under the basin. The infiltrated waters are potentially expected to recharge the limited ground water system at the 214 to 222 foot depth or return to the atmosphere via evapotranspiration.* [55]

This statement appears to contradict LES's contention that infiltration from the lined basins will be precluded. LES should explain this apparent contradiction.

Fast flow paths

NRC/LES have not investigated the possibility that fractures or other fast pathways may exist at the proposed site. These fast pathways could allow water to rapidly flow from the alluvium to the Chinle, or from the Chinle to the Santa Rosa.

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[52] Louisiana Energy Services, 2004b, page 19 of 36.
[53] Louisiana Energy Services, 2004b, page 17 of 36.
[54] Louisiana Energy Services, 2004e, page 6.
[55] Louisiana Energy Services, 2004b, page 18 of 36.

A pesticide was detected in a groundwater sample collected from Chinle monitor well (MW-2)[56]. This may be the result of a fast flow path from the alluvium to the Chinle. LES says the detection is probably a false positive[57].

NRC/LES should estimate the ages of water in the Chinle and Santa Rosa. Relatively young water would indicate that water reaches these units along fast flow paths.

Measured permeabilities and fractures

NRC states: "Although the presence of fracture zones that can significantly increase vertical water transport through the Chinle Formation has not been precluded, the low measured permeabilities indicate the absence of such zones."[58]

Two types of permeability measurements have been performed on the Chinle Formation near the site. One type appears to be laboratory measurements of core samples[59]. The other is a slug test performed in MW-2[60].

Laboratory measurements often underestimate the bulk permeability of a unit because they do not account for fractures and other features that may act as fast flow paths[61]. Slug tests only measure hydraulic properties in the area immediately surrounding the well[62]. NRC should explain how such limited measurements could be expected to reveal the presence of fractures that may be spaced at intervals of five feet, ten feet, or more.

Water bearing unit at 600 feet

According to NRC, there is a 100 foot-thick water-bearing sandstone layer at a depth of about 600 feet[63]. However, NRC has not answered basic questions about this water-bearing layer, including:

- Does it exist below the proposed site?
- What are the hydraulic properties?
- What is the quality of the water?
- Where does the water discharge?

Zones to be monitored

[56] Louisiana Energy Services, 2003a, page 3.4-7.
[57] Louisiana Energy Services, 2003a, page 3.4-7.
[58] NRC, 2004a, page 3-35.
[59] Louisiana Energy Services, 2004a, table 3.3-2. These core samples may have been collected at the nearby WCS site.
[60] Cook-Joyce Inc., 2003a, page 8.
[61] Linsley, Kohler, and Paulhus, 1958, page 131; Davis and DeWiest, 1966, page 165; Olson, R.E., D.E. Daniel, 1981, page 20.
[62] EPA, 1994b, page 1.
[63] NRC, 2004a, page 3-36.

The NRC has not clearly stated which groundwater zones will be monitored. The DEIS states that groundwater in the 220-foot zone will be monitored[64], but does not state whether the perched bodies of groundwater which form at the alluvial/Chinle interface, or other groundwater zones (e.g., sandstone at 600 feet, Santa Rosa), will be monitored. All groundwater zones beneath the proposed site should be monitored.

Quality of storm water runoff

The water discharged to the stormwater runoff basin may contain a wide variety of contaminants. According to LES, the discharge to the stormwater basin:

... will be typical of runoff from building roofs and paved areas from any industrial facility. [65]

The discharge will include:

... small amounts of oil and grease typically found in runoff from paved roadways and parking areas, ... [66]

The discharge may also contain pesticides and fertilizers that will be applied around the facility[67].

In addition, the discharge may contain other contaminants associated with roads, parking lots and industrial facilities. These include: PAHs[68], other organic compounds (e.g., aliphatic hydrocarbons, alcohols)[69], and miscellaneous contaminants resulting from spills and accidents.

However, the Stormwater Monitoring Program[70] does not include monitoring of PAHs, pesticides, or other organics. NRC/LES should include these potential contaminants in the Stormwater Monitoring Program.

Distinguishing sources of contamination

NRC/LES have not explained how they will distinguish between groundwater contamination caused by the NEF and contamination caused by other potential sources (e.g., Wallach Concrete, Sundance Services, WCS site, Lea County Landfill[71]).

NRC claims that contaminants from Wallach Concrete and Sundance Services would consist primarily of hydrocarbons[72]. NRC also claims that the proposed NEF would not emit

[64] NRC, 2004a, page 6-13.
[65] LES, 2004c, page 33.
[66] LES, 2004c, page 33.
[67] Lockwood Greene, 2004a, page 4.
[68] USGS, 2004a, table 3.
[69] Barrett et al., 1993, table 3.5.
[70] NRC, 2004a, page 6-18.
[71] The Lea County Landfill is less than 500 feet from the southeast corner of the proposed NEF site (NRC, 2004a, figure 3-2).
[72] NRC, 2004a, page 6-13.

hydrocarbons in detectable quantities[73]. However, NRC has not provided the basis for these claims.

Fault

There are faults approximately one mile east of proposed NEF site[74]. Fractures are associated with the faults[75].

Although LES provided NRC with a report on the faults at the WCS site[76], the report does not address the question of how these faults may affect groundwater flow at the NEF site. NRC/LES should answer the following questions:

- Do the faults at the WCS site extend toward or beneath the NEF site? (According to G.L. Environmental Inc., a fault also exists beneath the proposed site[77].)

- How might the faults and fractures associated with the faults affect groundwater flow at the NEF site?

Earthquakes

Earthquakes sometimes occur in the vicinity of the proposed site[78]. A magnitude 5.0 earthquake, centered 11.0 miles from the site, occurred in 1992[79]. NRC/LES have not investigated the potential effects of these earthquakes on groundwater flow at the site (e.g., formation of faults or fractures that may act as fast flow paths).

Long term effects of pumpage

The water used at the proposed facility would be pumped from the Hobbs well field (Lea County Underground Water Basin, Ogallala Aquifer)[80]. Groundwater in the Lea County Underground Water Basin is being pumped at a rate faster than it is being recharged[81].

In the DEIS NRC compares the water use of the proposed facility to the amount of water stored in the Ogallala Aquifer in the entire State of New Mexico[82]. However, NRC has not determined

[73] NRC, 2004a, page 6-13.
[74] Cook-Joyce Inc., 2004a, pages 4-6 – 4-8;NRC, 2004a, page 3-26; and Harper and Peery, 2004a, page 93.
[75] Cook-Joyce Inc., 2004a, pages 4-6 – 4-8.
[76] Cook-Joyce Inc., 2004a.
[77] G.L. Environmental Inc., 2004, Bates stamp: LES-00122.
[78] NRC, 2004a, page 3-27.
[79] Louisiana Energy Services, 2004a, table 3.3-3.
[80] Louisiana Energy Services, 2004a, page 4.4-5; and Leedshill-Herkenhoff, 2000, page 1 of Executive Summary and page 7-2.
[81] Leedshill-Herkenhoff, 2000, page 1 of Executive Summary and page 5-4.
[82] NRC, 2004a, page 4-15.

how pumpage for the proposed facility would affect water levels and the long-term productivity of the Hobbs well field or the Lea County Underground Water Basin.

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(b) Report by Michael F. Sheehan:

MICHAEL F. SHEEHAN, Ph.D.
INTERIM REPORT AND STATEMENT OF RESEARCH CONCLUSIONS

I. INTRODUCTION

This report sets forth my conclusions as of this date, the bases for those conclusions and a review of the materials supporting those conclusions. This presentation is as of this point in my research for the testimony to be presented on December 30, 2004. None of these conclusions are set in stone. The definitive work will be the actual testimony as filed.

My conclusions are as follows:

1. The assertion by LES that construction of the LES facility will produce a competitive market in the U.S. is defective given the facts of this case.

2. The construction of the LES facility would seriously jeopardize the ability of USEC to construct the U.S.-owned American Centrifuge plant with its up-to-date technology. Construction of the LES facility would also almost certainly mean the end of USEC's Paducah plant as an economically viable producer.

3. The replacement of USEC by Urenco as the dominant or single U.S. producer would sharply worsen, not improve, the security of U.S. supply.

4. There will be an adequately improved competitive supply without the LES facility.

5. The calculation of the benefits associated with the LES facility in the ER and the DEIS is faulty.

NOTE

It should be noted that the ability to present and document the conclusions in this report has been materially hindered by the closure of ADAMS and the refusal of LES to provide full discovery.

II. THE ENVIRONMENTAL REPORT AND LES'S CLAIM OF "NEED"

LES's Environmental Report sets forth its statement of need on ER pp.1.1-1 to 3.

Operation of the NEF would foster greater security and reliability with respect to the U.S. low-enriched uranium supply. Of equal importance, it would provide for more diverse domestic suppliers of enrichment services. ER p.1.1-2 and -3.

Thus "need," according to LES, is based upon the ability of LES to produce a market where there are two viable "domestic" enrichment facilities owned by different and competing entities.

Moreover, LES claims that the addition of its proposed plant in New Mexico would add substantially and over the course of the long term to the competitive character of the market for enrichment services in the United States.

Finally, LES claims that the addition of its New Mexico plant would enhance or at least not detract from the national security of the United States.

III. LEU SUPPLY AND DEMAND IN THE U.S.[83]

Demand for SWU in the United States is approximately 11 million SWU per annum. USEC supplies a little over half of this demand. USEC supply is derived from two sources: Russian downblended HEU and production from its Paducah plant. The Russian HEU agreement is in effect at least through 2013. The Paducah plant is a gaseous diffusion plant, which has to be operated at approximately 5.5 m SWU per annum to keep its average costs in the range of competitive supply.[84] The Russian HEU agreement is of great national security significance for the United States. USEC is the U.S. Government's agent for assuring the success of this venture.

There is a 2002 agreement between USEC and DOE, setting forth the obligations of both DOE and USEC. This agreement requires that, in exchange for being appointed selling agent for the Russian HEU, USEC will maintain production at Paducah at at least 3.3 m SWU per annum and maintain the production capability of the plant at 5.5 m SWU per annum. In addition, USEC is to license and build the American Centrifuge plant such that it will be on line with a capacity of at least 1.0 m SWU by March 2010 and 3.5 m SWU by 2012.

The creation of an indigenous[85] domestic supplier of enrichment was seen as a matter of substantial national security significance. The NRC itself has said that this requirement is "principally directed to the possibility of foreign entities gaining control and undermining U.S. domestic enrichment capabilities.[86] The USEC Privatization Act is clear that one of the central purposes of establishing USEC was to ensure that the U.S. market would not fall into the hands of European suppliers, without the safeguard of an indigenous supplier not controlled by foreign companies or governments.

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[83] The detail of this section will be based on the research of Charles Komanoff.

[84] PACE, USEC–Heading Into the Perfect Storm (September 2003). www.usec-watch.org.

[85] "Indigenous" meaning supply either by the U.S. government or by a private corporation with minimum foreign ownership. See 10 CFR 70.40(a) and the USEC Privatization Act, Section 3116.

[86] SECY 02-0122, Attachment 1, Section 16.4.2.3.

III. URENCO AND EUROPEAN SUPPLY

For the last several years Urenco has been sharply increasing both the capacity of its three European plants and its market share.[87] Enrichment capacity has increased from 4.8 m SWUs in 2000 to 6.5 m in 2003. This is an increase of 35 percent. Urenco's market share has increased from 13 percent in 2000 to 18 percent in 2003, an increase of 38 percent in three years. These figures do not include the LES plant. Urenco plans to continue to expand its business worldwide and has many multinational connections and relationships.

A second element of European supply is Russian. Russian supply can be divided into two parts: the HEU agreement and Russian non-HEU supply. Early in the 1990s the Russians got themselves into trouble for "dumping" SWU on the U.S. market at subsidized prices, thereby damaging the ability of the indigenous supplier to compete. This resulted in action by the U.S. Department of Commerce.

The result was what came to be known as the Suspension Agreement. Under the terms of this agreement the Russians agreed not to ship subsidized SWU into the U.S. market. The agreement expired March 2004, and there is some amount of uncertainty about what the result will be going forward.

Were the Russians to resume the shipment of low priced SWU into the U.S. market, the viability of the indigenous supply would be undercut, i.e. to the extent that the Paducah plant is forced to produce at an uneconomic output level, this would impair USEC's cash flow and its ability to generate both internal and external financing for the American Centrifuge plant. It is also important to recall the feedback loop between the successful construction and operation of the American Centrifuge plant, the continuation of USEC's profitable role in the Russian HEU agreement, and USEC's creditworthiness in gaining financing for the $1.2 to 1.5 billion in capital costs for its new plant.

A third major element of European supply is the French enricher Eurodif, an entity owned by the French holding company Areva. Eurodif owns and operates the Georges Besse plants at Tricastin in France. The current plant utilizes gaseous diffusion technology and is currently being replaced by the new Georges Besse II plant using Urenco's gas centrifuge technology. The new plant will be a significant and competitive player in world markets when completed.

The story doesn't end here, however. Areva, the parent company of Eurodif (and much else) also owns Cogema, a major nuclear fuel cycle player in its own right. Cogema was the entity which attempted to buy a substantial interest in Urenco's enrichment operations in 2000, when they were up for sale. The sale was seen as anti-competitive and dangerous by European regulators and fell through at that time. Cogema would be an affiliate of LES, were the LES plant to be built.[88]

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[87] Urenco annual reports.

[88] LES says it has had conversations with Cogema about building a deconversion plant in the U.S. to solve its DUF disposal problem. 23021.

A final major development, however, has provided a firm link between LES's principal owner, Urenco, and Areva, and the supply of several hundred million dollars in centrifuges to the LES plant if built. Urenco has sold Areva a 50 percent share of its centrifuge manufacturing enterprise in Europe. This makes Urenco and Areva partners and dominant players in the supply of Urenco's proprietary centrifuges worldwide.

IV. TECHNOLOGY AND THE STRUCTURE AND EVOLUTION OF THE MARKET FOR ENRICHMENT

The U.S. market at this point has certain characteristics. About half the supply has been provided by USEC either from Paducah or from the Russian HEU. The Paducah plant is outdated and economically vulnerable when faced with competition from gas centrifuge plants.

European producers are rapidly converting to gas centrifuge plants and sharply expanding supply. Western European demand going forward does not appear to justify this rapid expansion in supply. Both Urenco and Areva advertise their dedication to the expansion of their markets worldwide.

Both Urenco and Areva have been cited by the U.S. International Trade Commission for anti-competitive tactics in their sales to the U.S. market.[89] The Russians have also shown a proclivity for such behavior in dealings with the U.S. market, as noted above.

Enrichment plants are very capital intensive. Once built, they need to be operated near full capacity to amortize their high capital costs over as many units of production as possible.

USEC is not financially strong and has had trouble maintaining its bond ratings in the last several years. It is about a year behind LES in its application for a license to build its American Centrifuge plant. That plant will be very expensive to build and equip. To get financing for the $1.2 to 1.5 billion it will cost, USEC will have to be able to demonstrate that it will be able to operate the plant at the 3.5 m SWU level mandated in the USEC/DOE agreement. Operating the plant at this full production level, while also maintaining sales of the downblended Russian HEU, means that USEC will have to maintain a very large share of the American market and will have to be able to demonstrate its ability to maintain that market share before investors will be willing to invest the very large amounts required.

For Urenco, building a plant inside the United States allows it to avoid the protective barriers that sort out unfair international trade practices and enhances its ability to do the equivalent of dumping or predatory pricing for long enough to dispose of USEC's ambitions.

Recall that all of the European enrichers have had problems in this area in the past. Moreover, they all have sharply expanded their supply, for which they would like to have a

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[89] See USITC, Determinations and Views of the Commissions, USITC Publication No. 3486, (February 2002).

market. If the construction of the American Centrifuge plant can be prevented, then the European centrifuge plants will make short work of the outdated Paducah plant. If the American Centrifuge plant is not built, then under the DOE/USEC agreement the Russian HEU deal becomes imperiled, and it is likely that USEC itself will be in precarious financial shape. Or, as MIT's Thomas L. Neff put it when discussing USEC, "As a business, they are dead."[90]

To sum up, consider the following factors:

1. Rapid increase in centrifuge capacity on the part of both Urenco and Areva;

2. A history of trade violations against the U.S. market by all three major European producers;

3. Vertical integration between Urenco, the owner of LES, and Areva, the joint supplier of the centrifuges.

4. Vertical integration downward between the owners of LES in the form of the major American nuclear utilities, and the enricher, LES;

5. The possible collapse of the Russian Suspension Agreement—which might well open the American market to a flood of Russian SWUs at less than fair value;

6. The determination of the U.S. Court of International Trade that SWUs were a "service" and not a product along with the pending appeal in the Federal Circuit. Loss of the appeal might well open the U.S. market to predatorily priced SWUs from Europe;

7. USEC's delay in being ready to enter the market at the time the LES would come on line;

8. The doubtful ability of USEC to gain financing under these circumstances.

All these factors taken together lead me to the following conclusions. First, USEC would have a difficult time getting financing. Second, even if it did get financing it would not survive the ensuing price war against its vertically integrated opponents, including several utilities which it would also like to have as customers. In sum, considering all the circumstances, LES's claim that building the plant in New Mexico will result in the creation of a competitive two-producer domestic market is not credible.

V. URENCO VERSUS USEC

LES has raised the issue of both energy security and national security in the provision of enrichment services. President Bush addressed the issue of the proliferation of nuclear

[90] New York Times, "U.S.-Europe Group Wants to Build Nuclear Fuel Plant in U.S.," July 23, 2002.

technology in a speech on February 11, 2004.[91] The majority owner of LES is Urenco. Urenco has had a very checkered past with respect to the proliferation of nuclear technology to third world persons and nations where it shouldn't be. The case of A.Q. Khan is prominent in this history.

In this light, it should be a matter of great concern that the dominant, and perhaps the only domestic producer in the United States, might well come to be this very same Urenco. This is especially poignant given that the explicit language of the USEC Privatization Act limits the foreign ownership of USEC to 10 percent.

I conclude from all this that the approval of LES would not lead to the achievement of a sustainable two-producer market, would not lead to the creation of competitive gains which might arise from a two-producer market, and would indeed not enhance U.S. national security–in fact the very opposite–by eliminating USEC in favor of Urenco and its allies both foreign and domestic.

VI. OTHER ASPECTS OF THE COST-BENEFIT ANALYSIS FOR LES AS SET FORTH IN THE ER AND THE DEIS

The presentation by LES of its cost benefit analysis embodies several unreasonable assumptions about the impact on the American Centrifuge plant of the construction of the LES plant:

First, LES assumes that the job and tax benefits claimed for the construction and operation of the NEF will not be offset by a loss of corresponding benefits, if the construction of the Urenco plant results in the elimination of the American Centrifuge plant in Ohio.

Second, to the degree that the NEF is not built, and USEC does not expand its aggregate capacity (switching from Paducah to American Centrifuge in roughly equal capacity), and expansions in demand by American utilities are served by Urenco's newly expanded European capacity, the environmental effects of DUF_6 disposal are shifted to Europe and out of the cost benefit calculus.[92]

Third, water for the NEF will come in whole or in part from the Ogallala Aquifer. This is a very important, multi-state water resource that is currently being mined. Establishing the NEF plant in this area of New Mexico will exacerbate this problem, compared with establishing the equivalent plant in Ohio.

Fourth, DUF_6 disposal. The competitiveness of NEF relative to European supply will be affected by the cost of disposal of DUF_6 in the US compared to the cost of disposal of DUF_6 for European plants.

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[91] See the White House Fact Sheet: Strengthening International Efforts Against WMD Proliferation. February 11, 2004.

[92] The dollar cost of the disposal would of course be reflected in the price.

Fifth, LES is equivocal about movement of DUF_6 offsite. The longer the material stays onsite, other things equal, the greater the environmental risk. LES has agreed to no "long term storage" of the DUF_6 on site. See, e.g. ER 8.10-1. At the same time LES says the decommissioning of the plant will end no later than 2038. See DEIS 7-5. On the other hand, LES defines "long term storage" not as storage past 2038, but as storage "beyond the life of the plant." See ER 8.10-1. The expectation that all DUF_6 will be offsite by 2038 is thus hedged by the possibility of a license renewal that might be allowed, were it for some reason not cost effective to remove the DUF_6 by 2038. A clear statement by LES that all the DUF_6 will be offsite by 2038, without fail, and that there will be no license renewals justifying further and longer term storage does not appear in the ER.

VI. CONCLUSIONS

Cost and price data would be useful in the analysis of the markets involved here to determine the likely impact of the LES facility on the viability of the American Centrifuge and Paducah plants. Unfortunately this data is being withheld by LES.

Based on the data at hand, then, it would appear that a likely outcome of the construction of the LES plant would be the displacement of the American Centrifuge Plant. If this were to happen, then there would be two plants–the LES plant and Paducah. LES claims that Paducah would not be price competitive when faced with a centrifuge plant. This would either mean that the two plants divide the market as oligopolists, in which case there would be no benefits of a competitive market, since the market would be oligopolistic and not competitive even in LES's terms.

The alternative would be that LES would take advantage of its lower production costs and drive the Paducah plant out of business. This would leave the NEF plant with a monopoly of domestic production, as well as an identity of interest with its European controllers—which would not bode well for American purchasers.

There are other problems with the analysis in the ER which I have touched on above.

Note again that I am only part way through my research agenda–some of which is held up the refusal of the Applicant to comply with a number of discovery request and deposition questions–and I expect that the analyses above will be further elaborated as more data becomes available and it becomes possible to examine the ER and the DEIS in greater depth.

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(Note Duplication at 15000)

15000 USEC form S-8 Registration Statement 2August2004

15012 USEC Form 8-K 4August2004

15025 USEC Form 10-Q 6August2004

GENERAL DATA

16000 Almelo and Gronau expansions. October 2004

16001 Platt's: Areva-Urenco Joint Venture 6Oct04
16002 Capacity expansions at Almelo New license 23Feb04

16003 Cogema and its Joint Venture with Urenco for centrifuges at Tricastin.

16004 Urenco, Areva win EC approval for joint venture, ESA will monitor market.

16006 DOE to sell up to 17.4 MT HEU for downblending

16008 USEC Am.Cent. 3.5 M SWU but a possible modular expansion to 7 M SWU. <AmC> See also 5027

16009 Brazil and inspection problems and sales of uranium to Saddam Hussein.

16010 Countervailing Duty (CVD) on Urenco's Imports into US Reduced. 2Feb2004

16011 Chairman of Urenco is Mr. Neville Chamberlain

16012 DUF Time line. DUF stored in cylinders. See GL for UBCs

16013 Urenco Releases Statement on Iranian Centrifuge Technology. Denial of any "direct" link. 28Nov03

16015 On Exelon Nuclear

16016 Vitas of LES Witnesses

16016 James Malone, VP Exelon.

16017 James Ferland, LES President

16018 Daniel Peteralski, Progress Energy (Florida P&L)

16020 Rod Krich, VP Licensing for Exelon

16023 Kirk Schnoebelen, Florida P&L

16025 Michael Schwartz, ERI

16027 Papers to ****OBTAIN****

MOTIONS AND ORDERS

17000 LES Objections to NIRS' DRs 12Oct04

17013 LES Objections to NM AG DRs 12Oct04

17028 LES Opposition to NIRS Motion to Compel as to ITRs 12Oct04

17054 NIRS Response to LES' Motion to Compel 12Oct04

17071 NIRS DR sand ITRs to NRC Staff 14Oct04

17078 NM AG Supplemental Response to LES' and Staff ITRs

17089 NIRS Motions to Amend and Supplement Contentions 20Oct04

17111 Order on Discovery 20Oct04

17130 NIRS Motion to Compel Concerning the Market for Uranium Enrichment 8Oct04. Lots of good material here.

17141 Sheehan's Declaration in Support of the Motion

PANEL DEPOSITION

21000

Chris Chater
Bernard Duperret
Rodney Fisk
Rod Krich
Robert Pratt
Paul Schneider
Michael Schwartz
Julian Steyn

KOMANOFF DEPOSITION
13Oct2004

21200

DUMPING CASES

22000 Cogema News Release December 8, 2000 On USEC's Anti-dumping Case filing.

22002 DOC, Final Remand Decision, *USEC v. US*, March 25, 2003.

22101 *USEC v. US*, Slip Opinion Citing other related decisions 22Dec03

22114 *USEC v. US*, US Court of International Trade, Certifying Appeal 22Dec03

22118 *USEC v. US*, USCA(Fed Ct) Allowing Interlocutory Appeal. 2Feb04

22120 US ITC LEU Investigations 701 and 731. February 2002.

USEC MISC

23000 PACE: Proposed USEC Nuclear Energy Plant: Financing Challenges Fact Sheet, 12Jan04

23003 USEC Decides to Withdraw From Silex May 2003

23004 Jethro, "Competitor Not Seen as Being a Threat to USEC" 17Feb04

23006 Wald, US-Europe Group Wants to Build a Nuclear Fuel Plant in US 23July02

23011 Cogema wants to buy Urenco Consortium July 2000

23012 PACE, Study Warns of USEC Bumbling on New Plant–National Security at Risk. 10Sept03

23014 PACE, USEC–Heading into the Perfect Storm September 2003

23021 Knapik, "LES files application with NRC" 12Jan04

23022 Porter, Nation's Only Remaining Uranium Enrichment Plant Failing 11Sept03

23024 Walker, "Factors that Could Close Plant, cited by PACE 11Sept03

23026 PACE: USEC Debt Becoming Unsustainable; Future Uncertain nd

23029 USEC/DOE Agreement 17June 02

23047! USEC Comments to the NRC 4Nov02

USEC MISC

23250 UxC Special Report: Market Viability of USEC, Inc. (Advertisement) 15Nov04

USEC
ENVIRONMENTAL REPORT
(Some Pages)

23500 Chapter 1

23532 Chapter 2

23558 Chapter 4 (selected)

(c) Report by Charles Komanoff:

Report of Charles Komanoff / November 23, 2004

Need for the facility:

Concerning the subject of the need for the proposed National Enrichment Facility ("NEF"), I will testify that the worldwide uranium enrichment supply-demand balance will be more favorable to buyers and less favorable to sellers than LES has represented, rendering the need for additional enrichment supply questionable.

Arriving at a realistic appraisal of the enrichment supply-demand balance is important because an oversupply of enrichment capability could put LES in financial jeopardy. Insofar as modern (centrifuge) enrichment facilities are characterized by high fixed costs relative to operating costs, an oversupply of enrichment services could lead to predatory pricing (selling below costs), which in turn could threaten LES's financial health. LES might be unable to decommission the facility and to complete the dispositioning of depleted uranium, with negative consequences for safety and the economic well-being of the county in which it is located.

I expect to find that LES has overstated future worldwide demand for enrichment services and understated future worldwide enrichment capability.

LES represents that world average annual uranium enrichment requirements during 2016-2020 will be 41.6 million SWU (Table 1.1-3, ER), and that annual economically competitive and usable enrichment capability in 2016 will be only 39.2 million SWU without the NEF (Table 1.1-5, ER; calculated by netting the NEF's 3.0 million SWU capability from the world total including NEF of 42.2). The effective annual shortfall forecast by LES in its application for the 2016-and-beyond time frame is thus 2.4 million SWU, approximately the capacity of the proposed NEF.

I take issue with many of the assumptions that underlie LES's aggregate demand and supply forecasts. I will testify as to each such assumption, explaining why I regard it as questionable and estimating the quantitative impacts of alternative assumptions that I consider more plausible.

I am assembling a probabilistic model with which I can integrate the various scenarios and present probability-based estimates of supply exceeding demand (or vice-versa) by various amounts. This model is still in preparation. Pending its completion, I am presenting below brief accounts of some of the LES assumptions I intend to challenge.

1. In preparing its application over the course of 2003, LES raised its estimate of world annual enrichment requirements during 2016-2020, from 38.2 million SWU to 41.6 million — an increase of 3.4 million SWU. Some 2.5 million of this increase, or almost three-fourths, was arithmetically attributable to a decrease in the amount of electric generating capacity that can be supported by a given amount of separative work capacity. LES's forecast worldwide ratio of GWe to million SWU per year for 2016-2020 declined from 10.0 estimated in January 2003, to 9.4 in the December 2003 used in the current Environment Report — a drop of 6%. LES has not

provided an explanation for this change. Obviously, if the GWe/SWU forecast ratio from January 2003 is restored, world annual enrichment requirements during 2016-2020 would decline by 2.5 million SWU.

2. LES's forecast ratio of GWe to SWU for the CIS (former Soviet Union) and Eastern European region is far lower than that for any other region. In the current (Dec. 2003) forecast, this ratio is 6 for CIS/EE, compared to approximately 9 for the U.S., 9.7 for East Asia, and 10 for Western Europe. Evidently, the low ratio forecast for CIS/EE is attributable to the extremely low tails assay of 0.11 attributed to that region, compared with tails assays of roughly 0.30 for the world's major nuclear generators such as France, Japan and the U.S.

Insofar as both uranium and uranium enrichment services are bought and sold in worldwide markets, there is no apparent reason that the optimal ratio between the two should differ so radically from one region to another. It is therefore implausible that the CIS/EE region will conduct its nuclear fuel procurement with such a low tails assay. Applying the 2016-2020 U.S. forecast GWe/SWU ratio to the CIS/EE region would reduce world annual enrichment requirements in that period by 2.6 million SWU.

That persistent "pockets" of markedly different tails assays are unlikely is supported by the following testimony of LES witness Michael H. Schwartz in his deposition conducted on Sept. 29, 2004 (p. 70):

> MR. LOVEJOY: Okay. Why do you believe tails assay of a value as low as .11 weight percent are in effect in the -- in Russia and Eastern Europe?
>
> WITNESS SCHWARTZ: Because of their -- what they consider to be very low cost of enrichment and therefore, they are able to use a very low tails assay. And for them it is economic relative to the other resources that are available to them.

If indeed Russia and Eastern Europe enjoy a low cost of enrichment, they will be driven to exploit that advantage, to maximize it by selling enrichment services to utilities, rather than squandering it by operating with very low tails assays. They will do so up to the point that the cost of conserving enrichment (in terms of additional purchase requirements for uranium ore) begins to outweigh its value (in terms of sales to utilities). Insofar as uranium and enrichment markets are fairly seamless throughout the world, there is no reason that the optimization point (as reflected in the tails assay) should be different for Russia and Eastern Europe than for other regions.

3. Not only are the 2016-2020 CIS/EE tails assay (0.11) and GWe/SWU ratio (6.0) far lower than for other regions; but they both were reduced markedly in LES's Environmental Report as compared to LES's estimates in January 2003, which were 0.20 and 7.9, respectively. If LES simply maintained these earlier values, it would reduce the region's, and therefore the world's, projected annual enrichment requirements for 2016-2020 by 1.9 million SWU.

4. Western Europe's GWe/SWU ratio is projected, based on LES' figures, to decrease from the present (as represented by 2002, when the ratio was 11.3) to the 2016-2020 period (when it is forecast by LES to be 10.0). No explanation for the decline has been given. If the ratio were

maintained at its 2002 level, then annual SWU requirements for Western Europe in 2016-2020 would be 9.2 million rather than the 10.4 million forecast by LES. The difference is 1.2 million SWU/year.

5. I will make similar representations on the enrichment "supply side" as well, in developing the point that the claims of need for the proposed NEF are unsubstantiated.

Decommissioning costs:

I am still in the research phase of this investigation. From Chapter 10 of the Safety Analysis Report, I understand that LES has estimated that it will cost $837 million to decommission the NEF (in January 2002 dollars). LES's estimate appears to have been based directly on cost data developed at Urenco in Europe and based upon "Urenco decommissioning experience" in Europe. The contractors (i.e., Framatome personnel in the United States) who prepared estimates of the cost of decommissioning the NEF appear to have made few adjustments in applying European data to a new U.S. plant, to be decommissioned in the 2030's. From the materials provided by LES, it does not appear that LES made any adjustments for the following factors: (i) possible differences in regulatory criteria between Europe and the United States; (ii) possible differences in regulatory criteria between the earlier period[s] in which Urenco decommissioning activities were carried out in Europe and the later period in which the NEF will be decommissioned in the U.S.; (iii) possible differences between the location[s] in which Urenco decommissioning activities were carried out in Europe and the NEF's remote location. In addition, decommissioning standards are likely to be further constrained for NEF, vis-à-vis the standards that applied in Urenco's European data, (iv) because of new emphases in the U.S. on security, and (v) because first-of-a-kind activities, such as the NEF decommissioning, tend to be particularly scrutinized in the U.S., causing additional delays and cost increases. These omissions and others to be identified as investigation is completed, I expect, will tend to show that the allowance for contingencies contained in the cost estimate by LES is not adequate to account for potential cost increases and should be increased. I expect to draw upon documents such as E.W. Merrow et al., *Understanding Cost Growth and Performance Shortfalls in Pioneer Process Plants,* Rand Corp., R-2569-DOE, 1981.

(d) Report by Arjun Makhijani:

The report by Dr. Arjun Makhijani contains materials protected under the confidentiality order entered in this case. Consequently, it is being served separately by expedited delivery.

Respectfully submitted,

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November 24, 2004

CERTIFICATE OF SERVICE

Pursuant to 10 CFR § 2.305 the undersigned attorney of record certifies that on November 24, 2004, the foregoing Expert Reports on Behalf of Nuclear Information and Resource Service and Public Citizen Pursuant to Order Dated October 20, 2004 was served by electronic mail and by first class mail upon the following:

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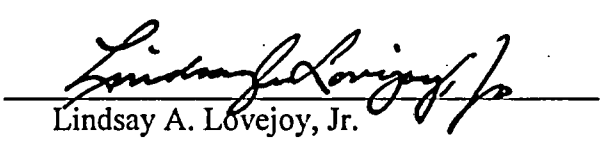

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