

July 30, 2004

NEF#04-031

ATTN: Document Control Desk  
Director  
Office of Nuclear Material Safety and Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

Louisiana Energy Services, L. P.  
National Enrichment Facility  
NRC Docket No. 70-3103

Subject: Human Factors Considerations in the Urenco Design Process

- References:
1. Letter NEF#03-003 dated December 12, 2003, from E. J. Ferland (Louisiana Energy Services, L. P.) to Directors, Office of Nuclear Material Safety and Safeguards and the Division of Facilities and Security (NRC) regarding "Applications for a Material License Under 10 CFR 70, Domestic licensing of special nuclear material, 10 CFR 40, Domestic licensing of source material, and 10 CFR 30, Rules of general applicability to domestic licensing of byproduct material, and for a Facility Clearance Under 10 CFR 95, Facility security clearance and safeguarding of national security information and restricted data"
  2. Letter NEF#04-002 dated February 27, 2004, from R. M. Krich (Louisiana Energy Services, L. P.) to Director, Office of Nuclear Material Safety and Safeguards (NRC) regarding "Revision 1 to Applications for a Material License Under 10 CFR 70, "Domestic licensing of special nuclear material," 10 CFR 40, "Domestic licensing of source material," and 10 CFR 30, "Rules of general applicability to domestic licensing of byproduct material"
  3. Letter dated April 19, 2004, from T. C. Johnson (NRC) to R. Krich (Louisiana Energy Services) regarding "Request for Additional Information on Louisiana Energy Services Project License Application"
  4. Letter NEF#04-018 dated May 19, 2004, from R. M. Krich (Louisiana Energy Services, L. P.) to Director, Office of Nuclear Material Safety and Safeguards (NRC) regarding "Response to NRC Request for Additional Information Regarding National Enrichment Facility Safety Analysis Report and Emergency Plan"

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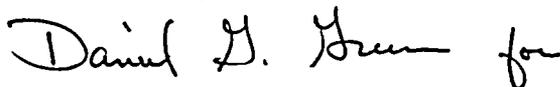
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By letter dated December 12, 2003 (Reference 1), E. J. Ferland of Louisiana Energy Services (LES), L. P., submitted to the NRC applications for the licenses necessary to authorize construction and operation of a gas centrifuge uranium enrichment facility. Revision 1 to these applications was submitted to the NRC by letter dated February 27, 2004 (Reference 2). By letter dated April 19, 2004 (Reference 3), the NRC provided the initial technical review of the license application and requested additional information and clarifications be provided.

The Reference 3 letter includes NRC Request for Additional Information (RAI) ISA-14, which requested that a description of the process used to conduct the human factors engineering review of Items Relied on For Safety requiring operator actions be provided. The LES response to NRC RAI ISA-14 was provided in the Reference 4 letter. In a June 29, 2004, conference call between LES and NRC representatives concerning clarification of the response to NRC RAI ISA-14, the NRC requested a non-proprietary characterization of the Urenco design procedures for human factors, including examples of the application of these procedures, be provided. This information is included in the Enclosure, "Human Factors Considerations in the Urenco Design Process."

If you have any questions or need additional information, please contact me at 630-657-2813.

Respectfully,

A handwritten signature in black ink that reads "Daniel D. Green for". The signature is written in a cursive style.

R. M. Krich  
Vice President – Licensing, Safety, and Nuclear Engineering

Enclosure:  
Human Factors Considerations in the Urenco Design Process

cc: T.C. Johnson, NRC Project Manager

**ENCLOSURE**

**Human Factors Considerations in the Urenco Design Process**

## Human Factors Considerations in the Urenco Design Process

The Urenco design process for human factors considerations is based primarily on use of operating experience and input from experienced operations personnel. The Urenco design process requires every element of the design to be subjected to formal design review and operations experienced personnel are mandatory participants during such design reviews. Urenco design review guidelines include design review topics of functionality, operability, maintenance, layout, and orientation. One of the strengths of the design reviews is the presence of the breadth of experience from many disciplines, similar to the Integrated Safety Analysis team approach. The Urenco engineering design safety principles do address the human factors engineering issues. Specifically these principles state that the design of all interfaces between operating personnel and the plant should follow good human factors and ergonomics practice. These principles note that analysis of the safety function tasks requires determination of the demands on personnel in order to evaluate the feasibility of the tasks and provide input to the design interfaces. These principles also note that the design of tasks and equipment should be fully compatible with training arrangements for operations personnel, proposed staffing levels, and the development of operating procedures. However, these design principles/procedures do not specifically reference industry standards for human factors for the implementation of these principles. As a result, for those National Enrichment Facility (NEF) Items Relied on for Safety (IROFS) requiring operator actions, a human factors engineering review of the human-system interfaces shall be conducted using the applicable guidance in NUREG-0700, "Human-System Interface Design Review Guidelines," Revision 2, dated May 2002, and NUREG-0711, "Human Factors Engineering Program Review Model," Revision 2, dated February 2004.

Examples of weaknesses that existed in the past in Urenco plant designs that have since been resolved through the application of the human factors principles in the Urenco design process are best reflected in the development of the SP5 facility control room design in Almelo, The Netherlands. The SP5 control room design is the basis for the NEF control room design. The following discussion provides details of the human factors weaknesses that existed with the Urenco control room design, guidance and processes used to resolve these weaknesses, and the design results.

### Early Urenco Control Room Design Development

Due to the rapid development of the centrifuge technology, the control room functionality tended to follow the requirements of each separate, improved process. In addition, the technology of the control systems, methods of supervisory control and personnel shift patterns changed considerably over time. This approach resulted in control room design human factors weaknesses.

### Early Control Room Design (SP3)

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## Human Factors Considerations in the Urenco Design Process

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### SP5 Control Room Design (Basis for NEF Control Room)

Recognizing the human factors weakness associated with the design of the SP3 control room, Urenco operations and design personnel agreed to use the following industry standards, as guidance, during the development of the new SP5 control room design.

- ISO 11064, "Ergonomic Design of Control Centres"
- ISO 6385, "Ergonomic Principles in the Design of Work Systems"
- ISO 9241, "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs)"
- ISO/CIE 8995, "Lighting of Indoor Work Places"
- NUREG-0700, "Human-System Interface Design Review Guidelines"
- NUREG/CR-5908, "Advanced Human-System Interface Design Review Guideline"

To implement this guidance, an external design consultant with human factors expertise in the design of permanently manned control centers was used. Particular emphasis was therefore applied to the use of human factors principles in the control room design.

To ensure that operations personnel input was included in the control design, an operator consultation group developed a requirements basis for the form and function of the overall control complex (of which the control room is a part).

The resultant control room design, which has been successfully implemented at SP5, includes the following features.

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## Human Factors Considerations in the Urenco Design Process

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