





UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 13, 2002

MEMORANDUM TO: Melvyn N. Leach, Chief
Special Projects and Inspection Branch
Division of Fuel Cycle Safety
and Safeguards

THRU: Joseph G. Giitter, Chief 
Special Projects Section
Special Projects and Inspection Branch, FCSS

FROM: Timothy C. Johnson 
Senior Mechanical Systems Engineer
Special Projects Section
Special Projects and Inspection Branch, FCSS

SUBJECT: AUGUST 8, 2002, MEETING SUMMARY: LOUISIANA ENERGY
SERVICES PRE-APPLICATION MEETING ON INSTRUMENTATION
AND CONTROLS AND INTEGRATED SAFETY ASSESSMENT

On August 8, 2002, U.S. Nuclear Regulatory Commission (NRC) staff met with staff from Louisiana Energy Services (LES) to discuss the LES approach for gas centrifuge instrumentation and controls and for performing integrated safety assessments. These were pre-application discussions related to LES's planned submittal of an application for a gas centrifuge enrichment plant in December 2002. I am attaching the meeting summary for your use. This summary contains no proprietary or classified information.

Docket: 70-3103

Attachment: Louisiana Energy Services
Meeting Summary

cc: William Szymanski/DOE
Rod Krich/Exelon
James Curtiss/W&S
Mario Robles/USEC

Louisiana Energy Services Pre-Application Meeting Summary

Dates: August 6, 2002

Place: U.S. Nuclear Regulatory Commission (NRC) offices;
Rockville, MD

Attendees: See Attachment 1

Purpose:

The purpose of this meeting was to discuss with Louisiana Energy Services (LES) staff gas centrifuge instrumentation and control and the LES approach for performing an integrated safety assessment applicable to LES' planned gas centrifuge license application. The meeting agenda is provided in Attachment 2. LES presentation handouts are provided in Attachment 3.

Discussion:

Following introductions, R. Krich provided a general update on the status of partnership negotiations and site selection. He also indicated that the site selection process is proceeding and LES expects to announce its short list of potential sites by August 16, 2002, and make a final decision by the end of August 2002. R. Krich also stated that a Memorandum of Agreement to consider Westinghouse and Cameco as new partners in the LES Partnership was announced in July. He said that a final partnership agreement is planned to be signed at the end of this year.

LES staff discussed their design philosophy for instrumentation and control (I&C) systems. I&C system design priorities are first, safety; second, asset protection; and third, production. For safety systems, the controls are all automatic and hardwired such that the operator has no role in system activation. If normal control systems, which use programmable logic controllers (PLCs), fail, safety systems are actuated independent of PLCs. While safety systems can be manually initiated, manual initiation of safety systems is not credited in the safety analyses.

For asset protection, that is protection of production equipment that has no safety significant function, LES will use process redundancy and protection system redundancy. Process redundancy will ensure that more than one method is available to conduct operations. For example, to remove uranium hexafluoride from the cascade, the normal withdrawal system can be used as well as the contingency dump system. Protection system redundancy involves use of dual control systems using PLCs. For these dual control systems, only one of the systems is needed to actuate to initiate a protective function.

For production protection, the objective is to minimize production downtime. LES staff indicated that the current design provides a 99.5 percent system availability. Instrument redundancy and process redundancy are used. Instrumentation intended to protect production functions are based on two out of three sensors tripping to actuate the protective function. Examples of process redundancy, include having multiple feed and withdrawal stations that can be used if a station fails or is taken out of service for maintenance.

The plant control system is designed to have central and local control systems. The central control system uses a central control room to control plant operations and a supervisory control and data acquisition system. Operators in the central control room use overview screens to monitor plant functions and control stations for changing plant operations. Operator stations are designed for simplicity to minimize the actions needed to initiate a control function and allows the use of a minimum of operators to control plant operations.

Local control systems are PLC-based and use redundant communication links to the central control system. This system provides operators with direct links to equipment and is designed so that communication failures will not affect the initiation of protective functions.

Operator training is performed using a stand-alone control system identical to that used in the plant. This system can also be used for new software development.

For integrated safety assessments (ISAs), LES prepared a plan that includes a preparation phase, an execution phase, and a documentation phase. The preparation phase includes development of a procedure for conducting the work, forming an analysis team, training the team, and compiling information for the analysis. At this point a draft procedure has been developed and a team has been formed to do the work. The procedure will be formal process for performing the analyses in accordance with an NQA-1 quality assurance program. Identification of hazards to be covered by the analyses will use a HAZOP approach based on previous Urenco safety analyses.

The analyses will be performed for non-classified and classified systems. The ISA team will perform the analyses for the non-classified systems and a Urenco team, having the proper clearances, will perform the classified system analyses. The analyses will be based on the risk index method suggested in NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility." Probabilistic risk assessments would be used only for high consequence events such as plane crashes into the tails storage pad.

Supporting documentation and an ISA summary document will be prepared. The ISA summary would be non-classified and non-proprietary, and would be suitable for demonstrating compliance with the requirements in 10 CFR 70.61.

Action Items:

None

Attachments: 1. Attendee List
2. Meeting Notice and Agenda
3. LES Presentation Handouts

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Docket: 70-3103

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cc: William Szymanski/DOE
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*SEE PREVIOUS CONCURRENCE

OFC	SPIB		SPIB	2E	FCFB		SPIB	
NAME	TCJohnson:dw		DHoadley		FBurrows		JGiitter	
DATE	08/09/02		08/10/02		08/13/02		08/09/02	

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JCalvert/RES	APersinko		Hearing file

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Louisiana Energy Services Pre-Application Meeting on
Instrumentation and Controls and Integrated Safety Assessment
Date: August 6, 2002

NAME	AFFILIATION	PHONE	EMAIL ADDRESS
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Mike Sexton	VEDP	804-371-8187	msexton@yesvirginia.org

Attachment 1

Louisiana Energy Services Pre-Application Meeting on
Instrumentation and Controls and Integrated Safety Assessment

Date: August 6, 2002

[illegible]



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

July 17, 2002

MEETING NOTICE

Applicant: Louisiana Energy Services
Suite 610
2600 Virginia Avenue, NW
Washington, DC 20037

Docket: 70-3103

Date and Time: August 6, 2002; 1:00 P.M.

Location: U.S. Nuclear Regulatory Commission
One White Flint North Building, Room O-4B6
11555 Rockville Pike
Rockville, Maryland

Purpose: To discuss instrumentation and controls and integrated safety analysis applicable to a gas centrifuge license application.

NRC Attendees: M. Leach, J. Giitter, T. Johnson, J. Lieberman, J. Calvert, F. Burrows, J. Kramer; technical staff

Other Attendees: R. Krich/Exelon; C. Andrews/LES; D. Marcelli/Framatome DES; technical staff

Contact: T. Johnson; 301-415-7299; tcj@nrc.gov

Attendance at this meeting by other than those listed above should be made known via phone to above contact.

Category: Category 1 Meeting: The public is invited to observe this meeting and will have one or more opportunities to communicate with the NRC after the business portion, but before the meeting is adjourned.

NOTE: NRC Meetings are open for interested members of the public to attend pursuant to the "Enhanced Public Participation in NRC Meetings; Policy Statement," 67 *Federal Register* 36920, May 28, 2002.

Attachment: Meeting agenda

Attachment 2

Louisiana Energy Services Pre-Application Meeting Agenda
August 6, 2002

- ___ Purpose/Introductions (TJohnson)
- ___ Plant Instrumentation and Controls Approach
- ___ Integrated Safety Analysis Plan
- ___ Summary and Conclusions

Louisiana Energy Services - NRC Meeting

Pre-Application Review

Separation Plant Plant Control System

LES

Attachment 3

Design Priorities

- **Public, Environment and Personnel**
- **Asset Protection**
- **Production (maximize availability)**

Public, Environment and Personnel

- **First Principle**
 - **Process is intrinsically safe**
 - **Sub-atmospheric pressure operation (except liquid sampling)**
 - **Safe by design**
 - **Protection is automatic. The operator has no role to play in protection.**
- **Second Principle**
 - **Protection is Local, Simple and Direct**
 - **Adequate protection for hazard**
Consequence based.
This is outer envelope, Programmable Logic Controller will act first.
 - **Independent of plant control system**

Asset Protection

- **Process Redundancy**
 - **Alternative process routes**
 - Dual UF₆ take-off routes
 - Primary and secondary systems
- **Protection Redundancy**
 - **Dual control systems 'protection'**
 - **1 out of 2 logic**
 - Taken once.

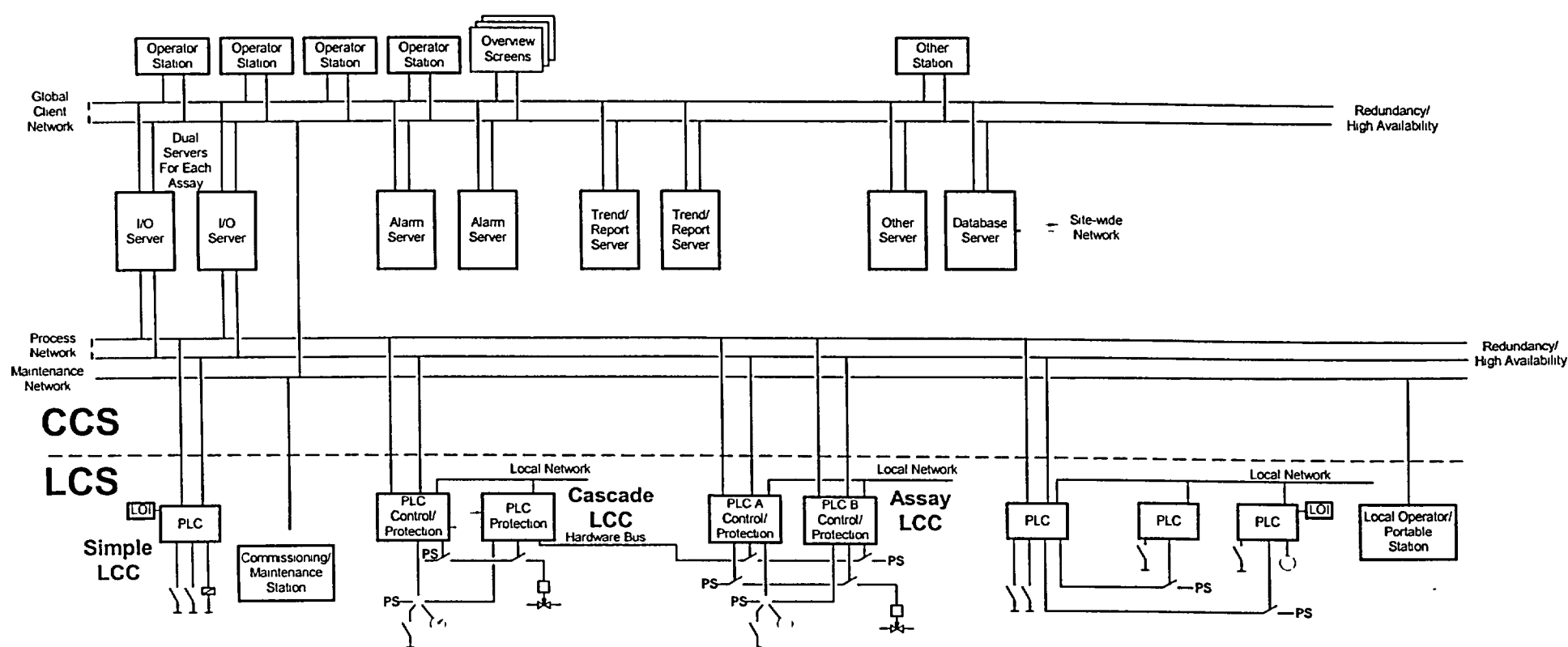
Production

- **Design provides adequate (99.5%) availability**
 - Minimizes production downtime
- **Instrument redundancy**
 - 2 out of 3 logic
- **Process redundancy**
 - Multiple UF₆ take-off routes
 - Multiple feed sources

Plant Control System - Architecture

- **Central Control System**
- **Local Control System**
- **Plant Equipment Interface**

System Architecture



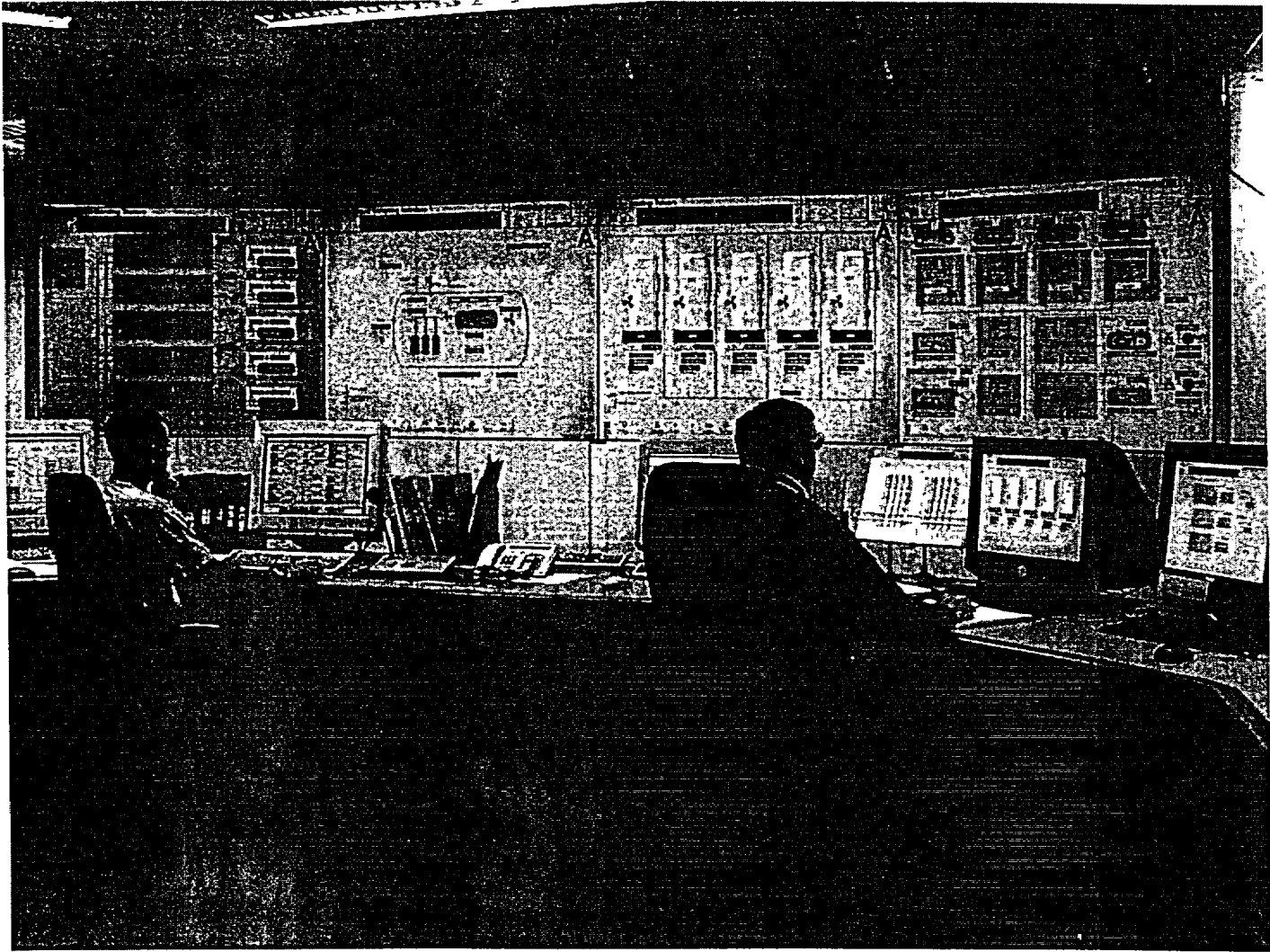
Central Control System (CCS)

- **Provides:**
 - **Supervision and control of plant operations**
 - **Supervisory interface for auxiliary systems**
- **Consists of:**
 - **Control room**
 - **Supervisory Control And Data Acquisition (SCADA) system**
 - **Overview screens**
 - **Operator stations**
 - **Control desk**
 - **Redundant client networks (High level plant wide)**
 - **Redundant process networks (Assay based)**
 - **Client / Server architecture**
 - **System / database servers**

Control Room

- **Overview screen**
 - Alarm based
 - Assay / Plant based
 - One glance visualization of plant state
- **Operator stations**
 - Allows minimum number of operators to supervise plant
 - Minimum number of keystrokes from system to object
- **SCADA**
 - CiTechnologies Pty - CITECT
- **Environment**
 - Quiet (No through route)
 - Ergonomically designed layout of SCADA screens and room.

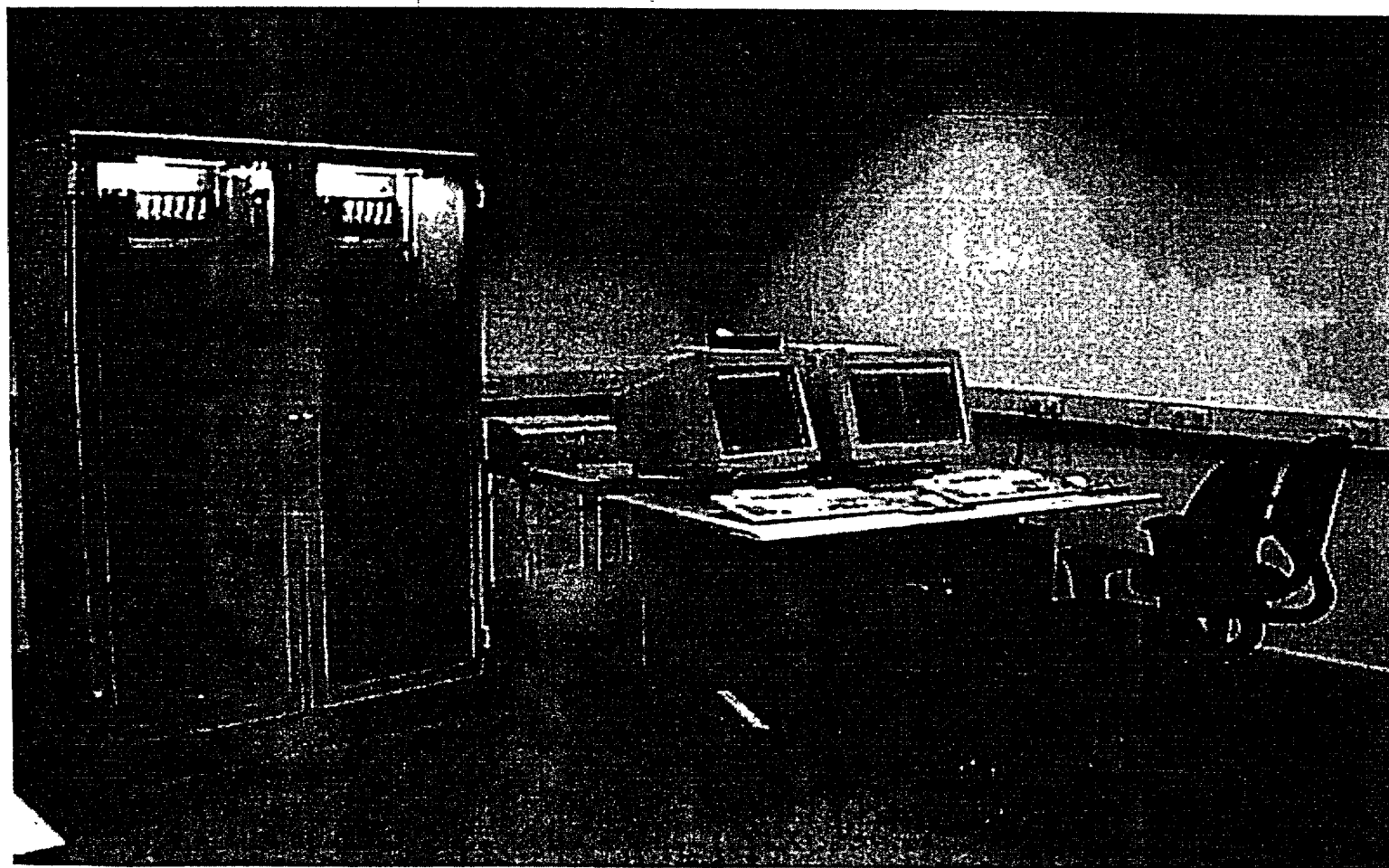
Typical Control Room (UK E23 Facility)



Training System

- **Stand-alone system**
- **Clone of Plant Control System**
 - Software and hardware functionality
- **Used to develop and test software**
- **Support operator training**
- **Sited adjacent to control room**
 - Operators can use system to check procedures

Training System



Local Control System

- **Local Control Centres (LCC)**
- **PLC based**
- **Communicates to CCS via redundant communications**
- **Provides operator with local operator interface (LOI)**
- **Provides interface to plant equipment**
- **Failure of communications has no effect on protection actions**
- **Any local failure cannot propagate to produce a system-wide failure.**

Local Control System - LCC



Plant Equipment Interface

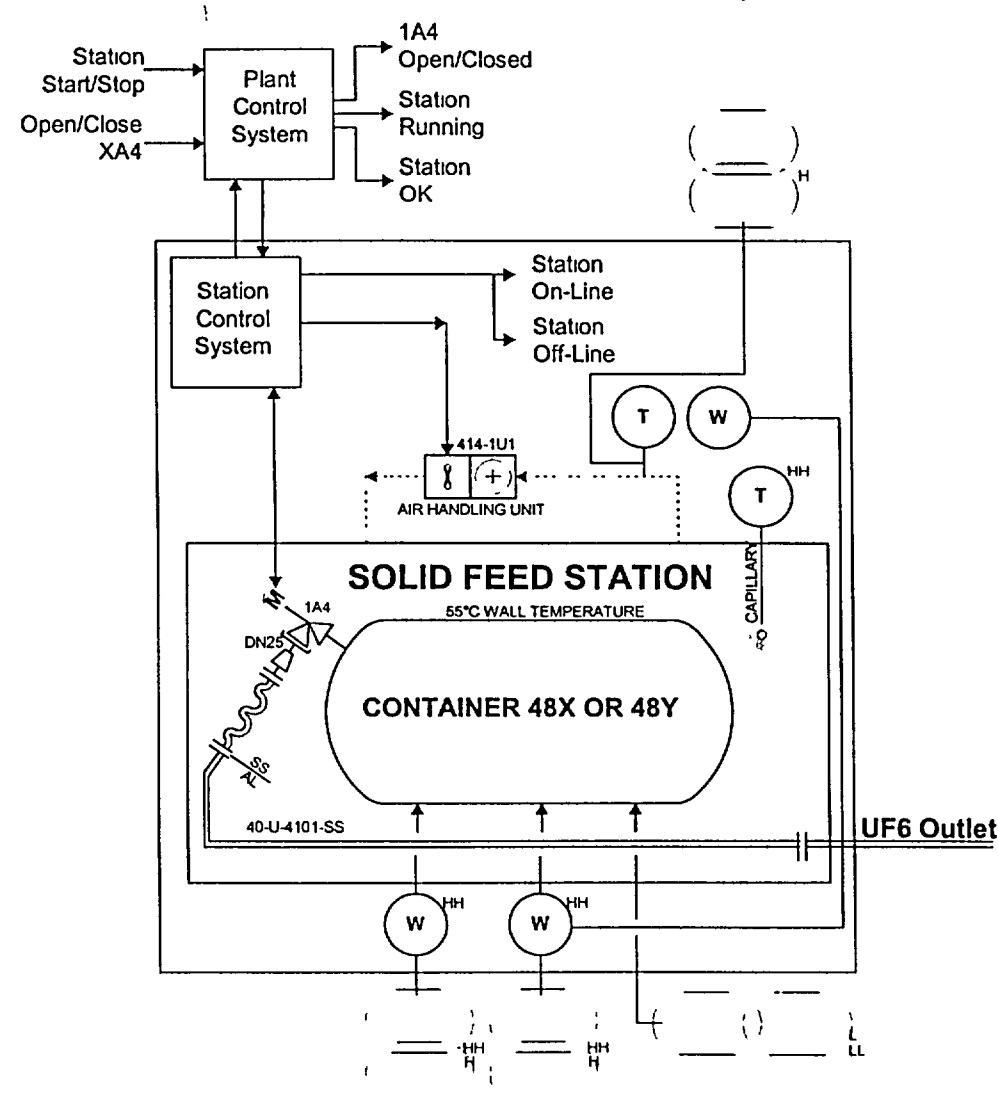
- **Direct from Local Control Cabinet (LCC)**
- **Simple and hardwired**
- **Failsafe**
- **No effect on independent equipment protection**
- **LCC with local operator interface mounted close to equipment**
 - **Ergonomic local preparation of plant**

Example

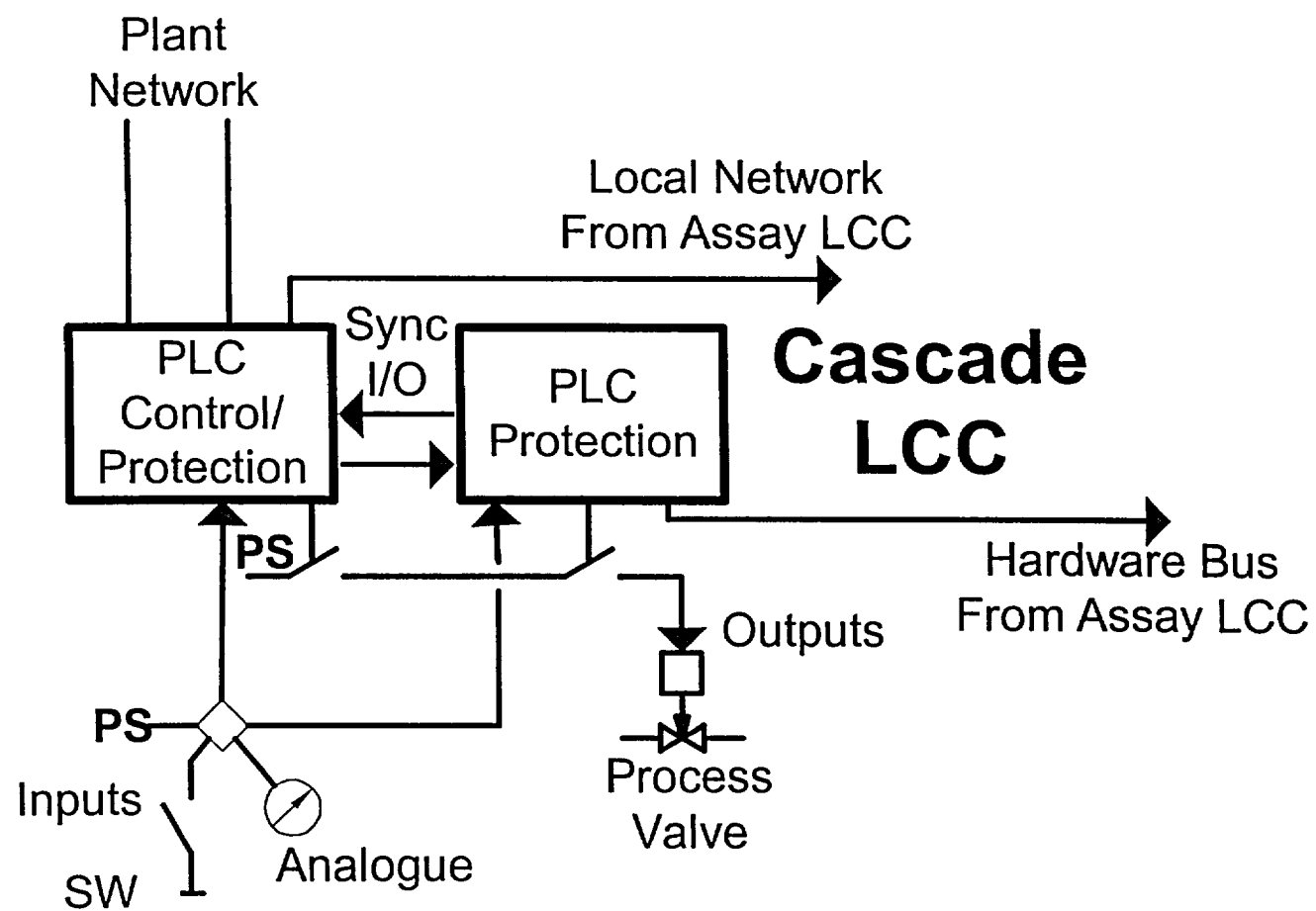
Control and Protection – Feed Station

- **Self-contained control system**
- **Independent of plant control system**
- **Temperature control separate from protection systems**
- **No alarms during normal operation**
- **Protection systems are diverse, and failsafe**
 - **capillary device**
 - **hardwired temperature sensor**

Control and Protection – Feed Station



Example Asset Protection



Summary

- ☐ **Chemical Plant with Nuclear Material**
- ☐ **Intrinsically Safe**
- ☐ **Local, Simple and Diverse Protection System**
- ☐ **Modular In Design**
- ☐ **Control System Keeps Plant Within Operating Envelope**
- ☐ **Protection Systems Utilize 1 out of 2 Logic**

Louisiana Energy Services – NRC Meeting Pre-Application Review

Integrated Safety Analysis Plan

August 6, 2002

Rockville, MD

LES

Integrated Safety Analysis (ISA) Plan

- ☐ **Purpose of this presentation is to communicate the elements of the ISA Plan to be utilized in support of the LES-2 License Application**

Elements of ISA Plan

- ☐ **ISA Preparation**
- ☐ **ISA Execution**
 - **Non-Classified Systems**
 - **Classified Systems**
- ☐ **ISA Documentation**
 - **ISA Supporting Material**
 - **ISA Summary Report**

ISA Preparation

☐ Develop ISA Procedure

- Formalize process for conducting ISA

☐ Form ISA Team

- Safety specialists, design and operational experts, specialists in ISA methodology

☐ Train ISA Team

- Combined ISA Leader and Validation Training Courses conducted by Process Safety Institute

☐ Compile Process Safety Information

- System data (system descriptions, piping & instrumentation diagrams, flow diagrams)
- Hazard and operability (HAZOP) analyses
- Hazard analyses (criticality, chemical, fire, radiation, external events)

ISA Procedure

- ☐ **Formal process to govern execution of the ISA**
 - **ISA inputs and outputs will be in accordance with applicable quality assurance program requirements**
- ☐ **Hazard identification will utilize the HAZOP methodology**
 - **Consistent with Urenco approach**
 - **Maximizes use of Urenco safety analysis and design information**
 - **Facilitates integration of Urenco personnel into ISA team**
- ☐ **HAZOP Guidewords expanded to include consideration of complete range of U. S. natural phenomena (e.g., tornadoes, hurricanes, etc.)**
- ☐ **Defines hazard analysis process to establish Items Relied On For Safety (IROFS) through development of accident sequences and risk index tables**
 - **Consistent with guidance in NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility"**

ISA Team

- ☐ ISA team will be consistent with requirements of 10 CFR 70.62, “Safety Program and Integrated Safety Analysis,” as well as guidance in NUREG-1513, “Integrated Safety Analysis Guidance Document,” and NUREG-1520
- ☐ Team Composition
 - Team Leader
 - Scribe
 - Criticality Expert
 - Fire Safety Expert
 - Chemical Safety Expert
 - Radiation Safety Expert
 - Process Design Expert (Urenco)
 - Operations and Maintenance Expert (Urenco)
 - Engineering Design Expert (Architect/Engineer)

ISA Execution

☐ Non-Classified Systems

- ISA to be conducted using team and process described in this presentation
- Probabilistic risk assessment approach to be used only for high consequence events such as plane crash into tails storage pad
- HAZOP methodology and risk index approach to be applied for all other hazard analyses

☐ Classified Systems

- Urenco to conduct ISA using appropriate team of experts (including Urenco members of U.S. ISA team) with the proper security clearances
- Urenco ISA team will follow U.S. ISA team procedure

ISA Execution (cont'd)

- Procedure-driven process implemented by ISA Team**
 - Validate HAZOP analyses from Urenco and A/E
 - Identify accidents resulting in consequences of concern
 - Generate accident sequences
 - Identify initiating event frequency
 - Determine accident likelihoods
 - Determine consequences for potential accident sequences
 - Develop Risk Index Tables (Uncontrolled / controlled)
 - Identify IROFS
 - Confirm IROFS design specifications
 - Assess Management Controls and Measures
 - Review system integration for system and IROFS interactions

ISA Documentation

- ☐ **ISA Supporting Documentation – Complete project file**
 - **Process Safety Information**
 - **Minutes of Team Meetings**
 - **Action Items and Resolutions of the Action Items**
 - **Calculations, technical evaluations, data, etc,**
- ☐ **ISA Summary – To be submitted as part of license application**
 - **Site Description**
 - **Facility Description**
 - **ISA Team Qualifications**
 - **Principle Processes**
 - **Process Safety Information**
 - **Accident Methodologies**
 - **Accident Summaries**
 - **Items Relied on for Safety**
 - **Demonstration of Compliance to 10 CFR 70.61, “Performance requirements”**
 - **Will reflect Results of Classified and Non-classified ISAs**

Summary

- ☐ LES has developed an ISA Plan to support the License Application
- ☐ ISA approach is fully compliant with 10 CFR 70.62 requirements and the guidance provided in NUREG-1520 and NUREG-1513
- ☐ ISA will make use of the existing Urenco information to the maximum extent
 - Validated using full ISA Team and guided by a project procedure
- ☐ ISA inputs and outputs will be developed in accordance with the quality assurance program requirements
- ☐ ISA documentation will be developed and retained as a project record
- ☐ Key ISA results will be provided in the ISA Summary