

MODULE 3

**CONFIGURATION
MANAGEMENT**

MODULE 3 OBJECTIVE

- To understand what configuration management is.
- To appreciate why it is required.
- To examine how it is achieved.
- To understand the consequence of not achieving configuration control.

MODULE 3 MAIN TOPICS

- Examination of configuration management
- AECB Operating license
- Operator must demonstrate compliance
- Implications of plant changes
- Engineering related documents

MODULE 3 MAIN TOPICS

- Operational items
- Technical support
- Engineering support
- Consequence of inadequate configuration control

WHAT IS CONFIGURATION MANAGEMENT

- Managed process to ensure nuclear plant operation always meets design intent
- Control of all
 - design documents
 - operating & maintenance doc.
 - staff capability
 - business process
 - materials

WHY IS CONFIGURATION MANAGEMENT REQUIRED

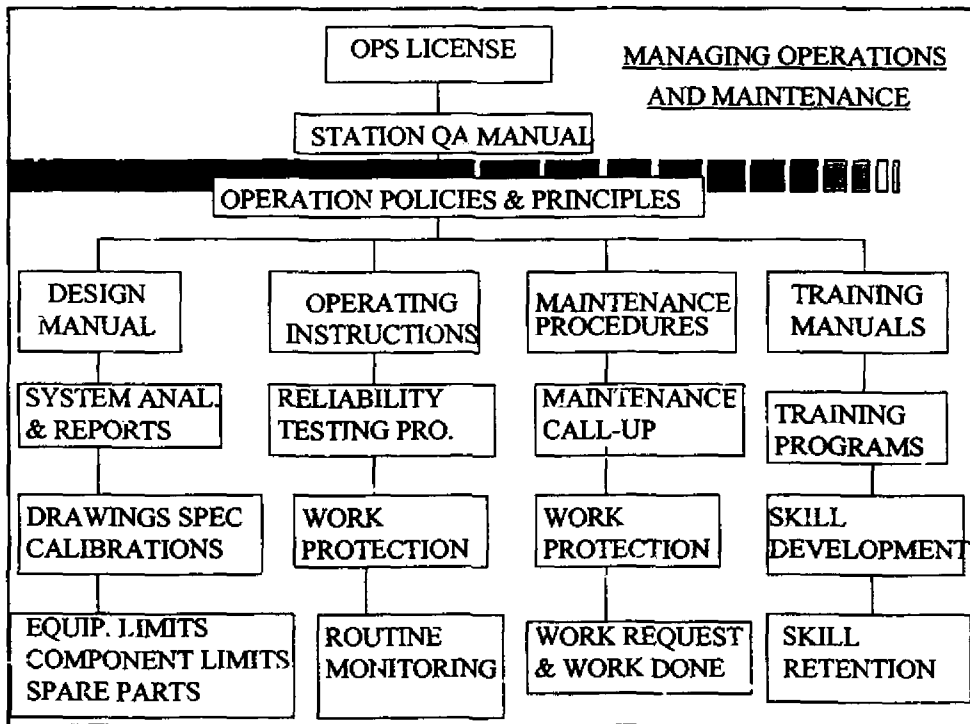
- Safeguard public interest
- Safeguard corporate investment

SAFEGUARD PUBLIC INTERESTS

- Obtain 'operating license' from the AECB
by demonstrating
- satisfactory:
 - Design
 - Material selection
 - Construction
 - Commission
 - Operation

SAFEGUARD PUBLIC INTERESTS

- Demonstrate that the design intent;
 - Protects the public
 - Plant operation meets design intent
- Operating license issued providing:
 - Capable staff
 - Satisfactory business procedures
 - Use qualified materials
 - Manage modification & changes to plant



AECB (CANADA) REGULATIONS

- Protect personnel and public radiation dose
- Transportation of radioactive material
- Installation of:
 - Nuclear Power Plants
 - Medical Facilities
 - Mining Operations



Atomic Energy Control Board
Commission de contrôle de l'énergie atomique

Ottawa, Canada
K1P 5S9

Your file / Votre référence

Our file / Notre référence
26-1-13-1-6

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**REACTOR OPERATING LICENCE
NO. 13/90
DARLINGTON NUCLEAR GENERATING STATION 'A', UNIT 2**

The Atomic Energy Control Board hereby authorizes Ontario Hydro to operate Darlington Nuclear Generating Station 'A', Unit 2, (hereinafter called "the nuclear facility"), located on the shore of Lake Ontario. The site lies in the Township of Darlington now in the Town of Newcastle in the Regional Municipality of Durham, in the Province of Ontario. The nuclear facility is built on those portions of Lots 18 to 24 inclusive and those portions of the road allowances between Lots 18 and 19, Lots 20 and 21, Lots 22 and 23 and that portion of the road allowance between Lots 24 and 25 designated as Parts 1 and 2 on Reference Plan 10R744 in the Broken Front Concession. The general arrangement for the nuclear facility is shown on Ontario Hydro layout drawing NK38 DOH 10220 1001 Rev. 9. Water lots were also obtained to reclaim land from Lake Ontario and to construct the water intake and outfall tunnels and the submerged effluent pipe, as shown on Ontario Hydro layout drawing NK38 DOH 10220 1002 Rev. 4. The site is entirely owned by Ontario Hydro except for the Canadian National Railway corridor.

The nuclear facility is further described in:

- (a) the report prepared by Ontario Hydro entitled "Darlington Generating Station 'A' Safety Report" dated March 1978 as amended March 1989 (hereinafter referred to as the "Safety Report"), and
- (b) the documents referred to in Ontario Hydro's application for this licence entitled "Darlington NGS Application for Operating Licence for Unit 2" submitted under cover of a letter from Mr. H.L. Austman to Mr. G.R. Schwarz dated April 27, 1988, and as revised in a letter from Mr. H.L. Austman to Dr. C.B. Parsons dated October 13, 1989.

The operation of the nuclear facility is subject to the conditions specified in Attachments A.A. and A.B. to this licence, with which Ontario Hydro shall comply.

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ATTACHMENTS "A.A" TO LICENCE NO. 13/90

FOR DARLINGTON NUCLEAR GENERATING STATION 'A', UNIT 2

CONDITIONS GOVERNING OPERATION OF THE NUCLEAR FACILITY

GENERAL REQUIREMENTS

- A.A.1 Operation of the nuclear facility shall be governed by and be in accordance with the document entitled "Operating Policies and Principles", D-SI-1.18 Rev. 8 dated 89-12-05, and prepared by Ontario Hydro, and the document entitled "Radiation Protection Regulations Part 1" as last amended in February 1986 (Rev.3) and prepared by Ontario Hydro; these documents shall not be amended except on the written instruction of or with the prior written approval of the Atomic Energy Control Board, hereinafter referred to as "the Board".
- A.A.2 Measures to ensure the physical security of fissionable and prescribed substances, and the nuclear facility, shall be maintained to the satisfaction of the Board.
- A.A.3
- i) Only personnel approved in writing by the Board shall act as Station Manager, Production Manager, Technical Manager (if delegated authority of Station Manager), Senior Health Physicist, Shift Supervisor, Shift Operating Supervisor, or Reactor First Operator at the nuclear facility;
 - ii) there shall be in attendance at all times sufficient qualified personnel to ensure the safe operation of the nuclear facility. The staff complement shall be as specified in the Station Reference Plan document entitled Station Shift Complements D-SRP-1.27-3 dated 14 November 1989, and prepared by Ontario Hydro. Except as otherwise approved in writing by the Board, there shall be in the nuclear facility at all times at least two Reactor First Operators, one unit 0 First Operator and one Shift Supervisor. At all times there shall be in the control room a minimum of one person who has been authorized in writing by the Board and who is qualified to operate the controls unless, in the judgement of the senior operations person at the nuclear facility, the hazard to personnel would be unwarranted, in which case the reactors shall be placed in an assured shutdown and safe condition;
 - iii) subject to condition A.A.3 i) and ii), the staffing and organization of the nuclear facility shall be in accordance with the Station Reference Plan document entitled Station Pattern D-SRP-0.01-6 dated 6 July 1989, and prepared by Ontario Hydro. Significant changes in staffing and organization shall be reported to the Board at least 30 working days prior to being implemented, and shall require prior written approval of the Board.

Darlington NGS 'A' Licence No. 13/90
Amendment: 0

- A.A.4 The nuclear facility radiation emergency procedures shall be governed by and be in accordance with the document entitled Darlington NGS Radiation Emergency Procedures, NK38-OM-0-09071.5 Rev. 0 issued October 3, 1989. Significant amendments to this document shall require prior written approval of the Board.
- These procedures and the arrangements with authorities beyond the nuclear facility property shall be reviewed at least annually by Ontario Hydro and a report of such reviews shall be submitted to the Board pursuant to condition A.A.22 of this licence.
- A.A.5 a) The total fission power from the reactor fuel shall not exceed the lesser of 2776 megawatts or that required to achieve maximum electrical power output under steady-state operating conditions.
- b) Under steady-state operating conditions the total thermal power to the primary coolant shall not exceed the following values:
- i) 6.8 megawatts (thermal) from any one fuel channel.
 - ii) 1035 kilowatts (thermal) from any one fuel bundle.
- A.A.6 The trip setpoints in Shutdown System No. 1 and Shutdown System No. 2 shall be maintained at values approved in writing by the Board.
- A.A.7 The rate of release of prescribed substances from the nuclear facility shall be monitored and controlled and such releases shall not exceed the limits identified in the document entitled "The Derived Emission Limits of Radionuclides in the Airborne and Liquid Effluents from Darlington Nuclear Generating Station 'A', SSD-86-1", and prepared by Ontario Hydro. Notwithstanding the above, the liquid releases shall not exceed the Liquid Derived Emission Limits given in Mr. H.L. Austman's letter to Mr. G.R. Schwarz, dated June 16, 1988. Changes to these documents shall require prior written approval of the Board.
- A.A.8 Subject to the conditions of this licence, all laws of general application in the Province of Ontario are applicable to and in respect of the nuclear facility and must be complied with, except to the extent that such laws are in conflict with any applicable federal statute or any order, rule or regulation made thereunder.
- A.A.9 Ownership and control shall be maintained by Ontario Hydro and no use shall be made, without prior written approval of the Board, of any land within the Exclusion Zone referred to in the Safety Report that is owned by Ontario Hydro as of the date of this licence, and within 914 metres of any reactor building.
- A.A.10 Persons appointed under Section 12 of the Atomic Energy Control Regulations shall at all reasonable times be provided access to the nuclear facility and to all plans, drawings, documents and records pertaining to the design, construction, testing and operation of the nuclear facility.

- A.A.11 Maintenance at the nuclear facility shall be of such a standard that, in the opinion of the Board, the reliability and effectiveness of all equipment and systems as claimed in the Safety Report and the documents listed in the application are assured. Any significant changes to the maintenance program for the nuclear facility outlined in Station Reference Plan D-SRP-1.08-2 dated 1 September 1989 approved by the Board prior to their implementation.
- A.A.12 Operations, reports, tests, inspections, analyses, modifications, or procedural changes requested by the Board are to be completed expeditiously.
- A.A.13 Except as otherwise directed in writing by the Board, all systems shall be tested at a frequency sufficient in the opinion of the Board to substantiate the reliability claimed or implied in the Safety Report or in the documents listed in the application.

REQUIREMENTS FOR PRIOR APPROVAL OF DESIGN
MODIFICATIONS AND OPERATIONAL CHANGES

- A.A.14 Except with the prior written approval of the Board, no change which would render inaccurate the descriptions and analyses in the Safety Report and in the documents listed in the application shall be made to the reactor Shutdown Systems No. 1, Shutdown System No. 2, the containment system, the emergency core cooling system or associated systems necessary for the proper operation of these systems.
- A.A.15 Except with the prior written approval of the Board, no change shall be made in any equipment or procedure that could result in possible hazards different in nature or greater in probability and magnitude than those stated or implied in the Safety Report and in documents listed in the application.
- A.A.16 Except with the prior written approval of the Board, no action shall be taken which will interfere with the operation of equipment installed by or on behalf of the International Atomic Energy Agency, nor shall changes be made to any aspect of the storage and handling of fuel or in equipment or procedures which could affect the safeguarding of the nuclear facility.
- A.A.17 No fuel shall be loaded into a reactor unless the fuel design has been approved by the Board.

REPORTING REQUIREMENTS

- A.A.18 Except with prior written approval of the Board, the description of the facility in the Safety Report shall be reviewed and brought up to date at least once in any three year period during the operating life of the nuclear facility to reflect all design changes carried out to date. Changes to the description of the facility shall require the approval of the Board. The safety analyses for the facility shall be reviewed and brought up to date in accordance with a schedule approved by the Board.

A.A.19 Reports shall be made promptly to the Board of:

- i) any degradation, weakening or incipient failure of components or systems whose failure would constitute or significantly increase the probability of a hazard to the health and safety of the public or the nuclear facility operating staff;
- ii) information revealing that information in the Safety Report and in documents listed in the application is inaccurate or incomplete;
- iii) a hazard different in nature or greater in probability or magnitude than previously represented to the Board to be associated with the operation of the nuclear facility;
- iv) any attempted or actual breaches of security, any threats, and any attempted or actual acts of sabotage;
- v) actual or impending instances of industrial disputes or civil demonstrations which could affect the safety or security of the nuclear facility;
- vi) any failure of equipment or procedures which led to any detectable fuel failure or statistically significant release of prescribed substances from the nuclear facility, or which, in the absence of Shutdown System No. 1, Shutdown System No. 2, the containment system or the emergency core cooling system could have led to such failure or release;
- vii) any failure of Shutdown System No. 1, Shutdown System No. 2, the containment system or the emergency core cooling system which did or could prevent the system from performing in accordance with the Safety Report and the documents listed in the application;
- viii) any coincident or causally-connected failure of two or more parts of Shutdown System No. 1, Shutdown System No. 2, the containment system or the emergency core cooling system;
- ix) any event which constitutes or reveals a violation of the conditions of this licence, the Physical Security Regulations or the Atomic Energy Control Regulations.

A.A.20 Reports shall be made promptly to the Board of any unusual occurrence or series of occurrences which led, might have led, or might lead to any person receiving a dose of ionising radiation exceeding the doses prescribed in Schedule II of the Atomic Energy Control Regulations for that person.

A.A.21 Modifications to fuel or equipment and significant changes in operating procedures shall be reported to the Board at least each calendar quarter.

- A.A.22 Review reports concerning the operation and maintenance of the nuclear facility, including changes in personnel and procedures, modifications of equipment, any occurrence which increased or could have increased the risk to persons, release of prescribed substances, radiation fields, personnel radiation exposures, emergency procedures (mentioned in condition A.A.4 of this licence), a list of all completed reactor trips from high and low power, events reported under conditions A.A.19, A.A.20 and A.A.21 of this licence, an evaluation of the results of any testing program (mentioned in condition A.A.13 of this licence) and the acquisition and transfer of prescribed substances shall be sent to the Board at regular intervals acceptable to the Board. Such reports covering the preceding calendar year shall be submitted by the 1st day of March of each year.
- A.A.23 A report of the estimated population exposure for the preceding calendar year shall be submitted by the 1st day of May of each year.

REQUIREMENTS FOR RECORD KEEPING:

- A.A.24 Adequate records shall be kept of operation, maintenance, test results, periodic inspections, any occurrence which increased or could have increased the risk to persons, personnel radiation exposures, prescribed substances released from the nuclear facility, and disposition of prescribed substances to demonstrate compliance with the Atomic Energy Control Regulations and this licence.
- A.A.25 A register of all current documentation relevant to the licensing of the nuclear facility shall be established and maintained by Ontario Hydro to the satisfaction of the Board.

ATTACHMENT "A.B" TO LICENCE NO. 13/90
FOR DARLINGTON NUCLEAR GENERATING STATION 'A', UNIT 2
CONDITIONS GOVERNING THE OPERATION OF THE STATION

- A.B.1 The containment envelope shall be as described in letters dated October 20, 1989 and October 24, 1989 from Mr. J. McCredie to Dr. C.B. Parsons as "stage 1" containment except as otherwise approved in writing by the Board.
- A.B.2 The Emergency Filtered Air Discharge System shall be operated only in accordance with procedures which have received prior approval of the Board.
- A.B.3 The operating requirements for the special safety systems shall accord with the Board's Consultative Documents C7, C8 and C9, all dated May 21, 1982 (Rev. 1), except as otherwise approved by the Board.
- A.B.4 An Operations quality assurance program shall be established to cover both commissioning and operations activities and approved by the Board.
- A.B.5 The following operations in Unit 2 are prohibited without prior written approval of the Board:
- a) Phase C commissioning up to a reactor power level of 60% of full power (total thermal power from the fuel not to exceed 1590 MW);
 - b) Phase C commissioning up to a reactor power consistent with maximum electrical power output.
 - c) On-power refueling or fuel shuffling.
- A.B.6 Measures for the application of safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons shall be maintained by the licensee to the satisfaction of the Board.
- A.B.7 Except with prior written approval of the Board operation with less than four primary heat transport pumps is prohibited above 2% full power.

ATTACHMENT "B" TO LICENCE NO. 13/90
FOR DARLINGTON NUCLEAR GENERATING STATION 'A'
CONDITIONS GOVERNING THE ACQUISITION, POSSESSION
AND USE OF FISSIONABLE AND PRESCRIBED SUBSTANCES

General Requirements

- B.1 Possession of fissionable substances is restricted to those listed in the attached Schedule 1.
- B.2 Personnel supervising operations involving fissionable and prescribed substances shall have been trained in the fundamentals of radiation protection and criticality control.

Physical Security Requirements

- B.3 Access to fissionable and prescribed substances shall be controlled and restricted to those authorized by Ontario Hydro or by the Board.

Requirements for Transfer

- B.4 Transfers of prescribed substances in Canada shall be made only to persons who have previously agreed to the transfer and who are authorized by virtue of the Atomic Energy Control Regulations to possess such substances.

Requirements for Record Keeping

- B.5 A prescribed substance accounting and reporting system shall be established and maintained in accordance with board document ABCB-1049 entitled "Reporting Requirements for Nuclear Materials".

Darlington NGS 'A' Licence No. 13/90

REQUIREMENTS OF AECB IN CHARGE OF PUBLIC INTEREST

- How will systems be designed?
- How will it be built?
- How will it be operated?
- How will disasters be handled?

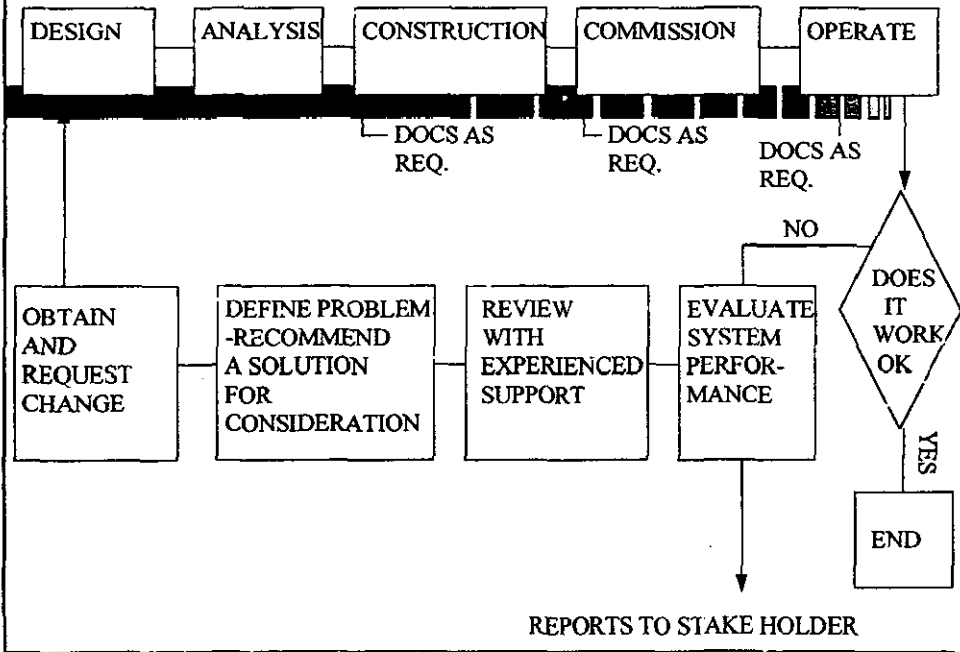
OPERATOR MUST DEMONSTRATE COMPLIANCE

- Design intent provides public safety
- Analysis is realistic & conservative
- Material selection appropriate
- Staff understand how the system works

OPERATOR MUST DEMONSTRATE COMPLIANCE

- Staff appreciate the effects of upsets.
- Operations are done with approved procedure.
- Maintenance is done with approved procedure.
- Changes are completely managed.

SYSTEM MONITORING AND CHANGE CONTROL



WHY SO MUCH CONTROL ON CHANGE?

■ Remember;

- Three Mile Island
- Chernobyl
- Windscale
- others

■ What happened?

- Process at fault?
- People at fault?

IMPLICATIONS OF CHANGE



- Engineering disciplines

MECHANICAL

- Piping
- Equipment
- Stress analysis
- Valves
- Routine equipment
- Registrations
- Drawings

PROCESS


- Nuclear
- Conventional
- Support systems

ELECTRICAL



- High voltage
- Medium voltage
- Low voltage
- Cables
- Distribution

INSTRUMENTATION AND CONTROL


- 
- Instrumentation
 - Electronic
 - Firmware
 - Control content
 - Communications
 - Environmental qualification

CIVIL



- Embedments
- Seismic
- Stress
- Layout
- Architectural

SOFTWARE

- 
- Requirements docs
 - Software specification and development process
 - Validation process
 - Testing program
 - Software revision control
 - Software deliverables
 - Verification of deliverables
 - Fixed testing and assessment
 - Fixed installation & control of revisions

LIST OF ENGINEERING RELATED DOCS TO UPDATE

■ Engineering drawings;

- Elementary wiring diagrams
- Power supply, Fuse & Instrument list
- Mcc data sheets
- Electrical panel layout
- Calibration sheets
- Main control room panel layout
- Relay panel layout
- Control equipment room instrument layout

LIST OF ENGINEERING RELATED DOCS TO UPDATE

■ Engineering drawings

- Field drawing for instrument/pressure transmitter racks
- Cable routing diagrams
- Computer wiring programs
- Valve lists, Junction box lists
- Piping drawings and isometrics
- Radiographs & welding history docket
- Equipment layout - general arrangements

LIST OF ENGINEERING RELATED DOCS TO UPDATE

■ Engineering drawings;

- Piping flow sheets with seismic boundaries
- Computer codes and listing
- Eprom codes, listing and configuration of revisions etc.

LIST OF ENGINEERING RELATED DOCS TO UPDATE

■ Revisions to supporting documentation:

- Stress and Reliability analysis
- Seismic qualification report
- Over pressure protection report
- MCCR registration
- Probabilistic safety analysis
- Safety assumption data list (SADL)
- Safety analysis reports
- AECB submissions

LIST OF ENGINEERING RELATED DOCS TO UPDATE

■ Material management:

- Revised specification
- Revised purchase order
- Revised purchase requisitions
- Q.A. Compliance documentation
- Equipment compliance documentation
- Establish re-order points
- Revise stock code numbers

LIST OF ENGINEERING RELATED DOCS TO UPDATE

■ Material management con't;

- Revise station computerized material list
- File all certificates as required
- Obtain manufacturers manuals
- Remove/replace existing manuals
 - retain both during transtion
- Etc, etc.

MATERIALS

- Specification
- Requisitions
- Procurement
- Inventory
- Warehousing
- Management
- Shelf life

ANALYSIS

- Finite stress analysis
- Seismic analysis
- Reactor safety analysis
- P.S.A.
- Hydraulic




OPERATIONAL ITEMS

OPERATIONS
MAINTENANCE
TECHNICAL SUPPORT


OPERATIONS CHANGES TO:

- Operating manual
- Testing program
- Training material
- Staff knowledge
- Staff skills

MAINTENANCE CHANGES TO:

- 
- Maintenance procedures
 - Calibration records
 - Special tools
 - Special training
 - Special skills
 - Maintenance call-ups

TECHNICAL SUPPORT CHANGES TO:

- 
- Inservice inspections
 - Surveillance programs
 - Licensing notifications-permits -approvals
 - Inservice reports
 - Disposal of removed material & equipment
 - Financial cases/rationalization and explanation

TECHNICAL SUPPORT CHANGES TO:



- Managing support material
 - masters
 - software
 - history docket
- Reports on impact and effect on change

WHAT CAN ENGINEERING DO TO HELP?

- Provide all the information correct on drawings
- Make sure details for equipment are clear for components
- Design manuals must agree with the drawings
- Safety analysis & design docs agree
- Ensure all tables are complete & in agreement with the relevant design documents

CONSEQUENCE OF INADEQUATE CONFIGURATION MANAGEMENT

- Lose control of plant system & status
- Errors introduced into ops & maintenance
- Plant performance will deteriorate
- Plant safety margins will be lost
- Probability of serious accidents will increase
- Severe accidents may result
- Licensing group may impose 'institutional shutdown'
- Nuclear plants are out of business