

# **OPERATION & MAINTENANCE OF A NUCLEAR POWER PLANT**

PRESENTED BY: DENNIS McQUADE  
COURSE OUTLINE

## **MODULE 1**

OBJECTIVE: TO UNDERSTAND HOW AN NPP IS ORGANIZED, STAFFED AND OPERATED TO COMPLY WITH THE OPERATING LICENSE. CONSIDERING PLANT COSTS.

### GENERAL MANAGEMENT OF A NUCLEAR POWER PLANT

- MANAGEMENT OBJECTIVES
- PLANT ORGANIZATION
- FUNCTION OF MAIN WORK GROUPS
- PLANT OPERATING CONDITIONS AND OPERATING LICENSE
- FINANCIAL ASPECTS OF OPERATION, MAINTENANCE AND ADMINISTRATION

## **MODULE 2**

OBJECTIVE: TO REVIEW HOW THE BUSINESS OF RUNNING THE PLANT IS SET UP FROM A CORPORATE PERSPECTIVE.

### PRINCIPLES OF OPERATION AND MAINTENANCE

- PRINCIPLES RELATED TO MAIN WORK GROUPS
- REQUIREMENTS FOR TRAINED STAFF AND CAPABILITY DEVELOPMENT
- PERFORMANCE OBJECTIVES AND CRITERIA FOR OPERATING / MAINTENANCE
- SUPERVISION AND RESPONSIBILITIES
- FUNCTION OF PRIMARY MANAGEMENT POSITIONS ( PRODUCTION MANAGER, SHIFT SUPERVISOR, MAINTENANCE MANAGER)
- PREREQUISITES FOR ENABLING A 'GOOD JOB'

## **MODULE 3**

OBJECTIVE: TO BE AWARE OF THE IMPORTANCE OF CONFORMING THE PLANT SYSTEM TO REFLECT ALL THE CLAIMS MADE TO THE REGULATORS

### **CONFIGURATION MANAGEMENT**

- IMPORTANCE OF CONFIGURATION MANAGEMENT
- CONDITIONS OF THE OPERATION LICENSE
- SAFETY CLAIMS OF THE DESIGN
- DAY TO DAY OPERATION AND MAINTENANCE IMPLICATIONS
- CONTROL OF STATION DOCUMENTS
- CONTROL OF 'CHANGES'
- INTERFACE WITH DESIGN GROUP

## **MODULE 4**

OBJECTIVE: TO EXAMINE VARIOUS ASPECTS OF MAINTENANCE. REVIEW THE OPTIMIZATION OF A PROGRAM TO MINIMIZE PLANT DETERIORATION.

### **MAINTENANCE PROGRAM**

- PRINCIPLES OF MAINTENANCE
- TYPES OF MAINTENANCE
- WORK CONTROL
- SPARE PARTS
- ROLE OF MAINTENANCE ORGANIZATION
- SELECTION OF WHAT AND WHEN FOR MAINTENANCE

## **MODULE 5**

OBJECTIVE: TO UNDERSTAND THE ELEMENTS TO BE CONSIDERED AND MANAGED TO ASSURE SUCCESSFUL AND OPTIMUM OUTAGES

### **OUTAGE MANAGEMENT**

- REQUIREMENTS FOR OUTAGE PLANNING
- PLANNING ORGANIZATION
- 'OUTAGE MANAGER' RESPONSIBILITIES
- RESOURCES
- SERVICES
- DEVELOPMENT OF AN OUTAGE PLAN

## **MODULE 6**

OBJECTIVE: TO APPRECIATE THE BROAD SCOPE OF TALENT AND SKILLS NEEDED TO SUCCESSFULLY RUN A NUCLEAR POWER PLANT.

### **SPECIALIST REQUIREMENTS**

- WORK HAZARDS AND COPING WITH RADIATION
- TESTS
- TOOLS
- SPECIALIST JOBS, IN SERVICE INSPECTIONS ETC..
- REACTOR SAFETY CONSTRAINTS
- PROTECTIVE CLOTHING
- STAFF TRAINING AND DEVELOPMENT

## **MODULE 7**

OBJECTIVE: TO EXAMINE THE CHALLENGES IN ESTABLISHING THE DESIRED WORK CULTURE IN STAFF.

### **STANDARDS FOR OPERATION AND MAINTENANCE**

- STANDARDS FOR MAINTENANCE
- STANDARDS FOR OPERATIONS
- BENCHMARKING
- BEST PRACTICES
- DEVELOPMENT OF 'GOOD WORK PRACTICES' AS A CULTURE THROUGHOUT THE ORGANIZATION.
- THE CHALLENGE OF INTERNAL ASSESSMENTS

## **MODULE 8**

OBJECTIVE: TO EXAMINE THE NEED TO LEARN LESSONS AND APPLY WHAT IS LEARNED TO ENSURE A SUSTAINED GOOD PERFORMING PLANT.

### **SYSTEM SURVEILLANCE**

- NEED FOR MONITORING PLANT PERFORMANCE
- SYSTEM SURVEILLANCE MECHANISM
- SCOPE OF SYSTEMS AND EQUIPMENT SURVEYED
- ESTABLISHING AN EFFECTIVE PLANT OPERATING HISTORY
- BENEFITS FROM SYSTEM SURVEILLANCE
- LESSONS LEARNED

## MODULE 9

OBJECTIVE: TO ACCEPT THE PRINCIPLES OF SEEKING AND ESTABLISHING A SUPPORT NETWORK BEYOND THE PLANT FROM NUMEROUS CAPABLE SOURCES.

BUILDING THE TOTAL TEAM - UTILIZATION OF EXTERNAL SUPPORT

- DESIGN ORGANIZATION
- MANUFACTURERS OF MAJOR EQUIPMENT
- SPECIALIST SUPPORT ORGANIZATIONS
- WANO
- INPO
- IEAE
- COG
- OTHER UTILITIES

## MODULE 10

OBJECTIVES: TO OBSERVE “REAL WORK” BEING DONE

REVIEW OF ACTUAL JOB

- VIDEO PRESENTATION
- SLIDES
- PHOTOGRAPHS
- PREPARATION AND MAJOR JOB EXECUTION
- DISCUSSION OF PRACTICAL IMPLICATIONS

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## **MODULE 10**

### **PRESENTATION OF SPECIFIC PLANT PROBLEMS**



## MANAGEMENT FUNCTION

- Preparation of operating and maintenance procedures.
- Specifying the requirements for surveillance and testing.
- Identifying and resolving deficiencies.
- Using approved and where applicable, authorized procedures.
- Adhering to all applicable codes, standards, regulations and practices.

##

## TECHNICAL MANAGER RESPONSIBILITIES


- Operating memos
- Training resource material
- Maintenance program

## WORK MANAGEMENT SYSTEM

- Requirements for system & equipment condition and isolations are identified.
- All resources required are requisitioned and ordered.

##

## SYSTEMS SURVEYED

- 
- Reliability of special safety systems, testing results from
    - SDS I & SDS II
    - ECC
    - Containment
  - Reliability of standby safety support system
    - Standby generators
    - Emergency power generators, EPS & Emergency water system
    - SG emergency make up water

##

## ASPECTS MONITORED

- Important component equipment performance

- Non return valves
- Motor operated valves
- Air operated valves
- Major rotating equipment
- Major heat exchangers

##

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OPERATION &  
MAINTENANCE OF  
NUCLEAR POWER PLANT

By: Dennis McQuade  
Presented to Chulalongkorn  
University  
Bangkok, Thailand  
Sept. 22 - Oct. 3 1997

## INTRODUCTION

- Presenter: Dennis McQuade B.Sc.,  
Electrical & Electronic Engineering
- 29 yrs. experience in commissioning,  
operation & maintenance of PHWR Power  
Plants.

## INTRODUCTION

- 1969 - 1981: Pickering NPP 4 X 520 MW, Ontario Hydro, Canada; Various positions including Shift Supervisor & Technical Superintendent
- 1981- 1992: Darlington NPP 4 X 935 MW, Ontario Hydro, Canada; Commission Superintendent, Technical Manager & Production Manager

## INTRODUCTION

- 1993 - 1995: Cernavoda NPP 1 X 720 MW, AECL, Romania
- 1996 - Present: Consultant; Specialist for commissioning operations & maintenance, assignments with AECL on Pt Lepreau; Candu 9 & 6 development, Cernavoda & Wolsong NPP's

## COURSE INTRODUCTION

- Will cover the major aspects of managing an operating Nuclear Power Plant, focusing on the main elements of the required organization; management goals & performance.
- Costs will be explained which relate to operation, maintenance & administration (OM & A)

## COURSE INTRODUCTION.

- Explain the key roles of the Production Manager, Maintenance Superintendent & the Shift Supervisor.
- The main activities of operation and maintenance; training & radiation protection will also be covered.
- Important functions of Configuration Management, Maintenance Programs & Outage Management.

## OVERALL OBJECTIVES

- To provide a compilation of material which reflects the experience and current efforts required to manage the operation and maintenance of Nuclear Power Plants.
- To layout some of the major management challenges and show examples of how these are being addressed.
- To provide an insight into the details of 'operations' and 'maintenance'.
- To provide a reasonable understanding of the wide diversity of issues to be taken into account to operating and maintaining a Nuclear Power Plant.