PRESENTATION TO NRC

ON

CECO PWR FUEL MANAGEMENT CAPABILITY

(MAY 12, 1981)

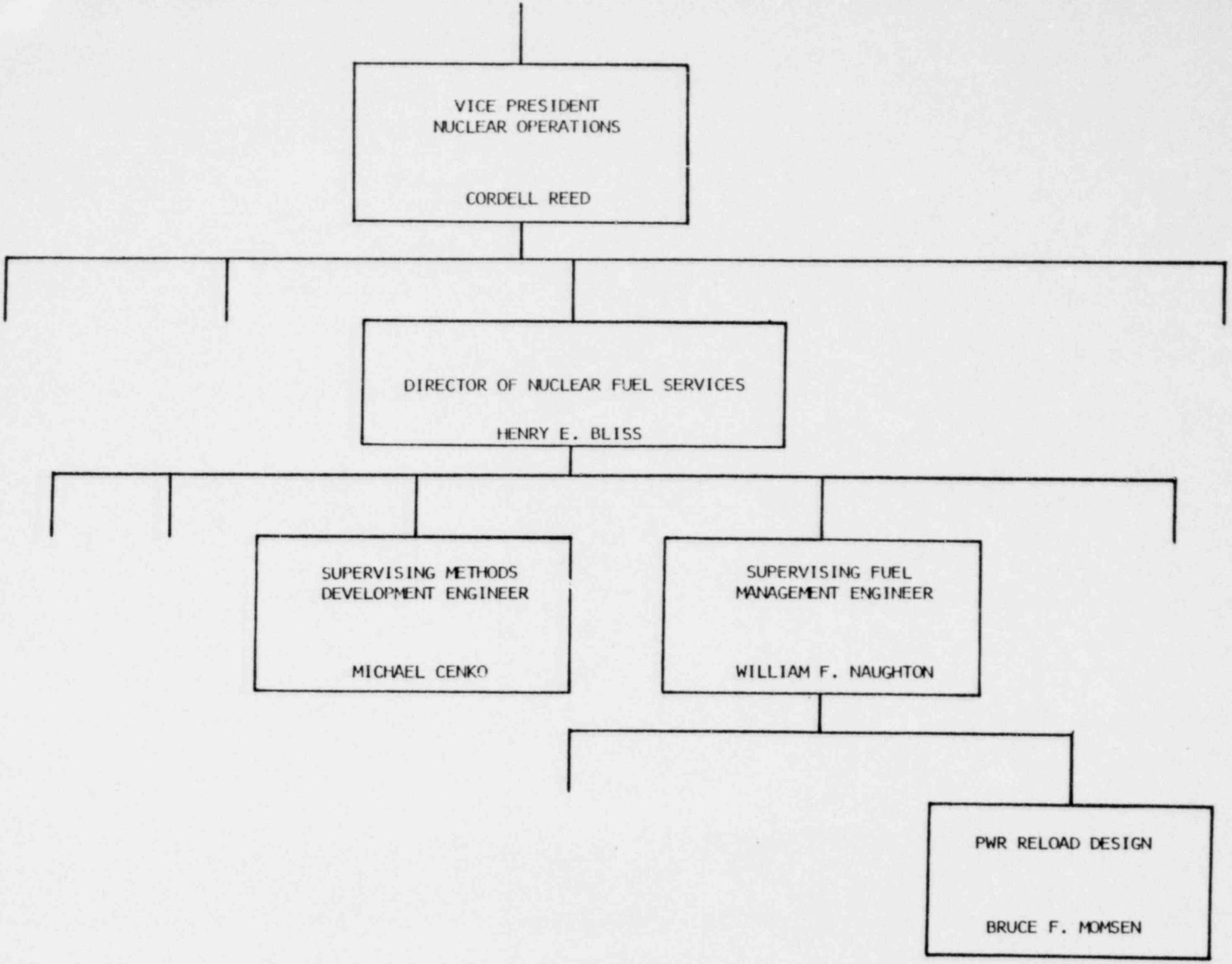
- INTRODUCTION
  - MEETING OBJECTIVES (INCLUDES NRC FEEDBACK)
  - UNIQUENESS OF CECO APPROACH
  - PROGRAM SCHEDULE
  - CECO PWR VIP TASK FORCE

- DETAILS OF CECO PWR FUEL MANAGEMENT APPROACH
  - METHODOLOGY
  - CODES USED
  - CECO TRAINING

- VERIFICATION OF CECO APPROACH (BENCHMARKING)
  - CECO DATABASE
  - PARAMETERS FOR BENCHMARKING
  - CRITERIA FOR ACCEPTANCE OF CECO RESULTS

- CLOSING STATEMENTS
  - CECO TOPICAL REPORT OUTLINE
  - REVIEW SCHEDULE

- CAUCUS (OPTIONAL)/NRC DISCUSSION


VICE PRESIDENT
NUCLEAR OPERATIONS
CORDELL REED
DIRECTOR OF NUCLEAR FUEL SERVICES
HENRY E. BLISS
SUPERVISING METHODS
DEVELOPMENT ENGINEER
MICHAEL CENKO
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WILLIAM F. NAUGHTON
PWR RELOAD DESIGN
BRUCE F. MOMSEN

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MEETING OBJECTIVES

- DISCUSS
  - CECO ASSUMPTION OF FUEL MANAGEMENT RESPONSIBILITY
  - CECO APPROACH (MULTIDISCIPLINED TASK FORCE)
- OBTAIN
  - NRC FEEDBACK ON CECO PROGRAM

UNIQUENESS OF CECO APPROACH

- EXTENSIVE USE OF WESTINGHOUSE
  - NEUTRONIC CODES
  - DESIGN PARTICIPATION TRAINING
  - FUEL MANAGEMENT METHODOLOGY (WCAP-9272)

SCHEDULE

FOR

IMPLEMENTATION OF CECO PROGRAM

DATE	EVENT
8/78	CECO CONTRACTS FOR WESTINGHOUSE NUCLEAR DESIGN CODES AND TRAINING
1/79	FIRST CECO TEAM TO WESTINGHOUSE FOR NUCLEAR DESIGN TRAINING
6/79	RECEIVE WESTINGHOUSE COMPUTER CODES
9/79	SECOND TEAM TO WESTINGHOUSE
11/80	THIRD TEAM TO WESTINGHOUSE
5/81	CECO MEETS WITH NRC TO DISCUSS FUEL MANAGEMENT PLANS AND TOPICAL REPORT
11/81	CECO DESIGN TASKS COMMENCE ON ZION 1 CYCLE 8
3/82	CECO SUMMARY PRESENTATION TO NRC OF TOPICAL RESULTS
3/82	CECO PWR METHODOLOGY TOPICAL SUBMITTED TO NRC FOR REVIEW
1/83	CECO TOPICAL REFERENCED IN CECO RELOAD "50.59" LETTER TO NRC FOR ZION 1, CYCLE 8
4/83	ESTIMATED STARTUP OF FIRST CYCLE DESIGNED BY CECO

CECO PWR VIP TASK FORCE

- CODE CONVERSION AND INSTALLATION
- METHODS IMPLEMENTATION AND AUTOMATION
- BENCHMARKING
- Q/A PROGRAM
- TOPICAL REPORT/LICENSING
- INTERFACE WITH VENDOR

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SCOPE OF CECO METHODOLOGY

1.0 INTRODUCTION

2.0 RELOAD SAFETY EVALUATION PROCESS

3.0 NUCLEAR DESIGN - CECO PORTION

- 3.1 INTRODUCTION
- 3.2 PRELIMINARY DESIGN PHASE
- 3.3 DETERMINATION OF NUCLEAR RELATED KEY SAFETY PARAMETERS
  - 3.3.1 CORE REACTIVITY PARAMETERS AND COEFFICIENTS
  - 3.3.2 CONTROL ROD WORTH PARAMETERS
  - 3.3.3 KEY SAFETY PARAMETERS FOR SPECIFIC EVENTS
- 3.4 FINAL DESIGN PHASE
- 3.5 CALCULATION OF STARTUP MEASUREMENTS PARAMETERS

4.0 THERMAL AND HYDRAULIC ANALYSIS

5.0 SAFETY EVALUATION

FROM WESTINGHOUSE RELOAD SAFETY EVALUATION METHODOLOGY, WCAP-9272, TABLE OF CONTENTS.

WESTINGHOUSE COMPUTER CODES USED

CODE NAME	DESCRIPTION
FIGHT-H	EFFECTIVE FUEL TEMPERATURES
LEOPARD*/ CINDER*	MACRO- AND MICROSCOPIC FEW-GROUP CROSS SECTIONS FISSION PRODUCT CROSS SECTIONS
HAMMER/ AIM	TRANSIENT THEORY CONTROL ROD CONSTANTS 1D DIFFUSION THEORY
TURTLE*	2- AND 3D SPATIAL FEW-GROUP DIFFUSION CALCULATIONS
PANDA*	AXIAL FEW-GROUP DIFFUSION CALCULATIONS
PALADON*	2- AND 3D FEW-GROUP NODAL CALCULATIONS

* VERSION UPDATED BY WESTINGHOUSE

CECO TRAINING

(WESTINGHOUSE AREAS)

GENERAL AREAS OF TRAINING AT WESTINGHOUSE	PERSON-YEARS (TO DATE)
PARTICIPATORY NUCLEAR DESIGN	4
CODE METHODS AND W AUTOMATION	1
MANAGEMENT ASPECTS	1

CECO TRAINING

(PARTICIPATORY NUCLEAR DESIGN)

- SCOPE OF PARTICIPATORY NUCLEAR DESIGN*
  - NUMBER OF ASSEMBLIES & ENRICHMENT
  - LOADING PATTERN SELECTION
  - NEUTRONIC KEY SAFETY PARAMETERS
  - NEUTRONIC PARAMETERS FOR OPERATION
  - STARTUP PHYSICS TEST PARAMETERS

- NUCLEAR DESIGNS COMPLETED BY CECO PERSONNEL
  - ZION UNIT 1 CYCLE 6
  - ZION UNIT 2 CYCLE 5

- NUCLEAR DESIGNS IN PROGRESS BY CECO PERSONNEL
  - ZION UNIT 1 CYCLE 7
  - ZION UNIT 2 CYCLE 6

* DESCRIBED IN CHAPTER 3 OF WCAP-9272

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CECO DATA BASE

- 10 PWR CYCLES
  - FULL AND PART POWER OPERATION AND COASTDOWN
  - WITH AND WITHOUT BURNABLE POISONS
  - RELOADS FROM 60 TO 72 ASSEMBLIES
  - RELOAD ENRICHMENTS FROM 2.8 W/O TO 3.2 W/O
  - STANDARD AND LOW LEAKAGE LOADING PATTERNS

- 11 SETS OF STARTUP PHYSICS TEST DATA
  - ZION UNIT 1, CYCLES 1-6
  - ZION UNIT 2, CYCLES 1-5

PARAMETERS FOR BENCHMARKING

- CORE REACTIVITY
- POWER DISTRIBUTION
- CONTROL ROD WORTH
- MODERATOR TEMPERATURE COEFFICIENT

CECO ACCEPTANCE CRITERIA

- VERIFY BY STATISTICAL ANALYSIS CECO RESULTS ARE COMPARABLE TO WESTINGHOUSE ANALYTICAL ACCURACIES

PARAMETER	ACCURACY*
- CORE REACTIVITY	± 50 PPM
- POWER DISTRIBUTION	± 3%
- CONTROL ROD WORTH	± 0.2% $\Delta\rho$
- MODERATOR TEMPERATURE COEFFICIENT	± $2 \times 10^{-5} \Delta\rho/^{0}F$

* REFERENCE: WCAP-9500

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CECO TOPICAL REPORT OUTLINE

FOR

PWR NEUTRONIC METHODOLOGY

- INTRODUCTION

- DESCRIPTION OF PWR NEUTRONIC METHODS

  - BASIC NEUTRONIC COMPUTER CODES
  - DATA PROCESSING AND LINKAGE COMPUTER CODES
  - CALCULATIONAL OVERVIEW

- VERIFICATION OF PWR NEUTRONIC METHODS

  - INTRODUCTION
  - COMPARISONS WITH PLANT OPERATION AND PHYSICS TESTS

    - CORE REACTIVITIY
    - POWER DISTRIBUTION
    - CONTROL ROD WORTH
    - MODERATOR TEMPERATURE COEFFICIENT

- CALCULATIONAL UNCERTAINTY

  - INTRODUCTION
  - UNCERTAINTY OF INDIVIDUAL PARAMETERS

    - CORE REACTIVITY
    - POWER DISTRIBUTION
    - CONTROL ROD WORTH
    - MODERATOR TEMPERATURE COEFFICIENT

- CONCLUSIONS

- REFERENCES

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