

MRS Design Process and Status

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INTRODUCTION

- **SYSTEMS ENGINEERING APPROACH**
- **ALLOCATION OF FUNCTION**
- **CONFIGURATION ITEMS**
- **INTERFACES**
- **DESIGN CRITERIA**
- **STATUS OF MRS & CDR**

SYSTEMS ENGINEERING APPROACH

- **MRS IS ONE OF SEVERAL CRWMS ELEMENTS**
- **ENSURE INTEGRATION WITH OTHER ELEMENTS BY CAREFUL DEFINITION OF OVERALL SYSTEM REQUIREMENTS**
- **ALLOCATE FUNCTIONAL REQUIREMENTS TO SPECIFIC SYSTEMS AND SUBSYSTEMS**
- **PROVIDE INTERFACES WITH ALL ELEMENTS THROUGHOUT DESIGN PROCESS**

SYSTEMS ENGINEERING PROCESS REQUIREMENTS HIERARCHY

- **NWPA**
- **OCRWM MISSION PLAN**
- **PHYSICAL SYSTEMS REQUIREMENTS - STORE WASTE - TECHNICAL BASELINE FOR CDR**
- **MRS REQUIREMENTS DOCUMENT - TECHNICAL BASELINE FOR SAR DESIGN REQUIREMENTS**
- **CONCEPTUAL DESIGN REPORT - COST AND SCHEDULE BASELINE**
- **CDR AND REQUIREMENTS DOCUMENT DEVELOPED IN PARALLEL**

ALLOCATION OF FUNCTIONS

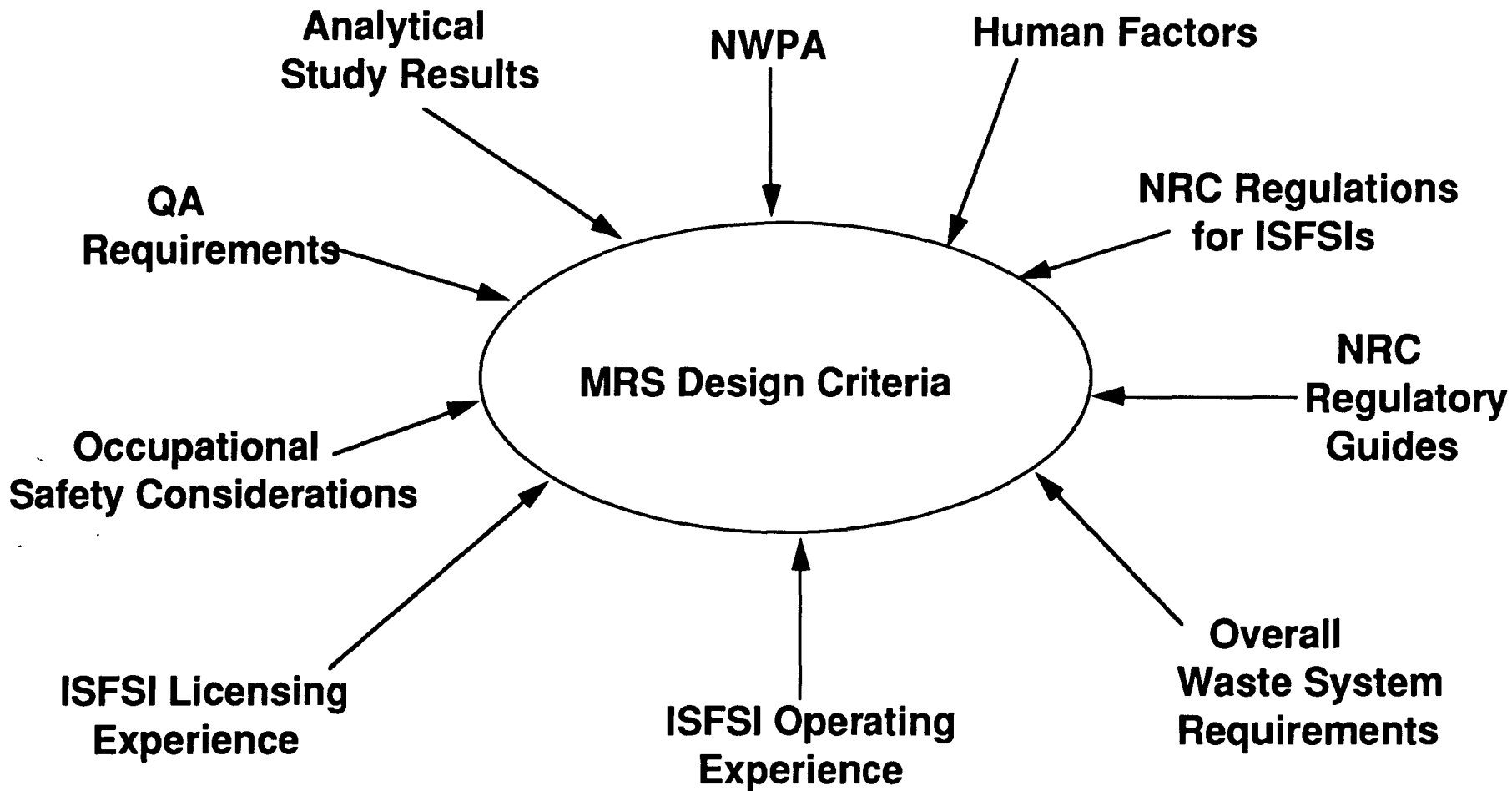
- **FUNCTIONAL REQUIREMENTS FROM STORE WASTE ALLOCATED TO CONFIGURATION ITEMS**
- **PROVIDES TRACEABILITY FROM REQUIREMENTS TO DESIGN**
- **APPLIES TO FUNCTIONS, PERFORMANCE REQUIREMENTS AND CODES AND REGULATIONS**

CONFIGURATION ITEMS (CIs)

- **LOGICAL GROUPINGS OF STRUCTURES, SYSTEMS, COMPONENTS, OR ACTIVITIES**
- **DESIGN IS DESCRIBED IN TERMS OF CIs**
- **CIs FORM BASIS OF CONCEPTUAL DESIGN DESCRIPTIONS IN THE CDR**
- **22 CIs FOR MRS FACILITY**

CRWMS INTERFACES

- **TRANSPORTATION**
- **MINED GEOLOGICAL DISPOSAL SYSTEM (MGDS)**
- **WASTE ACCEPTANCE**



CRITERIA DEVELOPMENT PROCESS

- EXISTING CRITERIA
 - NRC REGULATIONS
 - DOE REQUIREMENTS
 - ANALYTICAL STUDY RESULTS
- INTERPRETATIONS
 - OPERATING EXPERIENCE
 - LICENSING EXPERIENCE (ISFSIs)
 - DESIGN EXPERIENCE
 - ANALYTICAL METHODS



MRS DESIGN CRITERIA

NRC CRITERIA

- **NUCLEAR POWER PLANT CRITERIA**
 - **NUREG 0800 (FIRE PROTECTION)**
 - **REGULATORY GUIDE 1.143 (RADWASTE)**
 - **SEISMIC DESIGN**
- **ISFSIs**
 - **10 CFR 72**
 - **REGULATORY GUIDES**
 - **DRY STORAGE -- 3.60**
 - **WET STORAGE -- 3.49**
- **MRS**
 - **10 CFR 72**

NWPA REQUIREMENTS

- **15,000 MTU CAPACITY**
- **SNF AND COMPONENTS ONLY**
- **RETRIEVABILITY**

OVERALL WASTE SYSTEM REQUIREMENTS

- **RECEIVE/REPACKAGE FOR STORAGE**
- **INTERFACES WITH OTHER SYSTEM ELEMENTS**
- **RETRIEVE FROM STORAGE/SHIP TO REPOSITORY**
- **UNDETERMINED FUTURE ISSUES**
 - **FUEL ROD CONSOLIDATION?**
 - **DESIGNER HEAT LOADING AT REPOSITORY?**
 - **ADDITIONAL MRS FUNCTIONS IN OVERALL SYSTEM?**

DESIGN EVENTS

- **DESIGN EVENTS I (NORMAL OPERATION)**
 - **FUEL TRANSFER**
- **DESIGN EVENTS II (ONCE PER YEAR)**
 - **MINOR TRANSFER MACHINE MALFUNCTION**
- **DESIGN EVENTS III (ONCE PER LIFETIME)**
 - **LOSS OF EXTERNAL POWER FOR AN EXTENDED INTERVAL**
- **DESIGN EVENTS IV (DESIGN BASIS ACCIDENTS)**
 - **FUEL HANDLING ACCIDENT**

NATURAL PHENOMENA

- **EARTHQUAKES**
- **TORNADOES**
- **FLOODS**
- **HURRICANES**
- **TSUNAMIS**
- **SEICHES**

MRS DESIGN SAFETY CONSIDERATIONS

- **ENVIRONMENTAL CONDITIONS AND NATURAL PHENOMENA**
- **FIRE PROTECTION AND PREVENTION**
- **CRITICALITY CONTROL**
- **PERSONNEL EXPOSURE CONTROL**
- **ALARA DESIGN**
- **RADIATION MONITORING**
- **WASTE MINIMIZATION**
- **SNF CHARACTERISTICS**

MRS DESIGN SAFETY CONSIDERATIONS

- **PREVENT DAMAGE TO SNF**
 - **MEET NORMAL OPERATING LIMITS 10 CFR 72.104**
- **MITIGATE CONSEQUENCES OF POTENTIAL DAMAGE**
 - **MEET ACCIDENT LIMITS 10 CFR 72.106**

MRS DESIGN DESIGN FEATURES

- **DESIGN TO MITIGATE CONSEQUENCES OF DESIGN BASIS EVENTS**
- **INSTRUMENTATION & CONTROL FEATURES**
- **ALARMS & MONITORING**
- **POST - ACCIDENT IRS SYSTEMS**
- **CONSERVATIVE RADIONUCLIDE RELEASE PARAMETERS**
- **IRS CONTROL ROOM HABITABILITY**
- **ACCIDENT RELEASE LIMITS OF 10 CFR 72.106**
- **HUMAN FACTORS ENGINEERING**

DESIGN CRITERIA ASSESSMENT

- **POSTULATED ACCIDENTS MUCH LESS SEVERE THAN WITH NUCLEAR POWER PLANTS**
- **ACCIDENT CONSEQUENCES MUCH LESS SEVERE THAN WITH NUCLEAR POWER PLANTS**
- **AVAILABLE TECHNOLOGY SUFFICIENT TO MEET DESIGN AND LICENSING CRITERIA**
- **ENGINEERING PROJECT, NOT RESEARCH AND DEVELOPMENT**

WORK TO DATE

- **PRELIMINARY ANALYTICAL WORK**
- **SHIELDING AND EFFLUENTS ANALYSES**
- **EVALUATION OF WORST-CASE RELEASES AND REQUIRED SITE BOUNDARY DISTANCES**
- **SCOPING STUDIES AND EVALUATION OF SENSITIVITY OF ANALYSES TO FUEL AGE, BURNUP, ETC.**
- **SITE LAYOUTS**
- **GENERAL ARRANGEMENT DRAWINGS**
- **FLOW DIAGRAMS**

CONCEPTUAL DESIGN REPORT STATUS/SCHEDULE

- **TECHNICAL DOCUMENT PLAN COMPLETED AND APPROVED**
- **PRELIMINARY DESIGN REVIEWS WITH DOE AND M&O**
 - **2/20/92 WET TRANSFER & STORAGE CI**
 - **3/12/92 (TENTATIVE) DRY TRANSFER FACILITY CI
VAULT TRANSFER & STORAGE CI**
- **SECTIONS SUBMITTED FOR M&O REVIEW AS THEY ARE DEVELOPED**
- **COMMENCE M&O REVIEW - MARCH 31, 1992**
 - **QAP 3-2 DESIGN REVIEWS**
- **SUBMITTAL TO DOE MAY 1, 1992**

CDR BASIS FOR COST/SCHEDULE BASELINE

- **PROJECT LEVEL WORK BREAKDOWN STRUCTURE (PWBS)**
 - **EXTEND TO CONTRACT WORK BREAKDOWN STRUCTURE (CWBS)**
 - **WRITE DETAILED CWBS DICTIONARY**
- **ENGINEERING AND CONSTRUCTION**
 - **DEVELOP COSTS**
 - **DEVELOP SCHEDULES**
- **INTEGRATION**
 - **PROJECT LEVEL COST AND SCHEDULE**
 - **COST AND SCHEDULE AT TOTAL M&O LEVEL**
 - **TOTAL PROGRAM COST AND SCHEDULE**

**DEVELOP
ESTIMATES**

**DEVELOP C/S/A
CONSTRUCTION
ESTIMATE**

**DEVELOP
MECHANICAL
CONSTRUCTION
ESTIMATE**

**DEVELOP
ELECTRICAL/
INSTRUMENT.
ESTIMATE**

**DEVELOP MGMT/
ENGRG/ INDIRECT/
PRICING/
PRECONCEPTUAL
ESTIMATES**

- BASIS OF ESTIMATE
- ASSUMPTIONS & CONDITIONS
- TASK DESCRIPTIONS
- "TAKE OFFS" (QUANTITIES)
- PRICING: LABOR/MATERIAL/ SUBCONTRACTS/EXPENSES
- VENDOR PRICING
- CONTINGENCY
- ESCALATION
- TIME PHASED SCHEDULE
- RISK ANALYSIS

