

**TRW ENVIRONMENTAL SAFETY SYSTEMS INC.
CRWM MANAGEMENT AND OPERATING CONTRACTOR**

**NUCLEAR WASTE TECHNICAL REVIEW BOARD
FULL BOARD MEETING**

SUBJECT: SYSTEM ARCHITECTURE STUDY

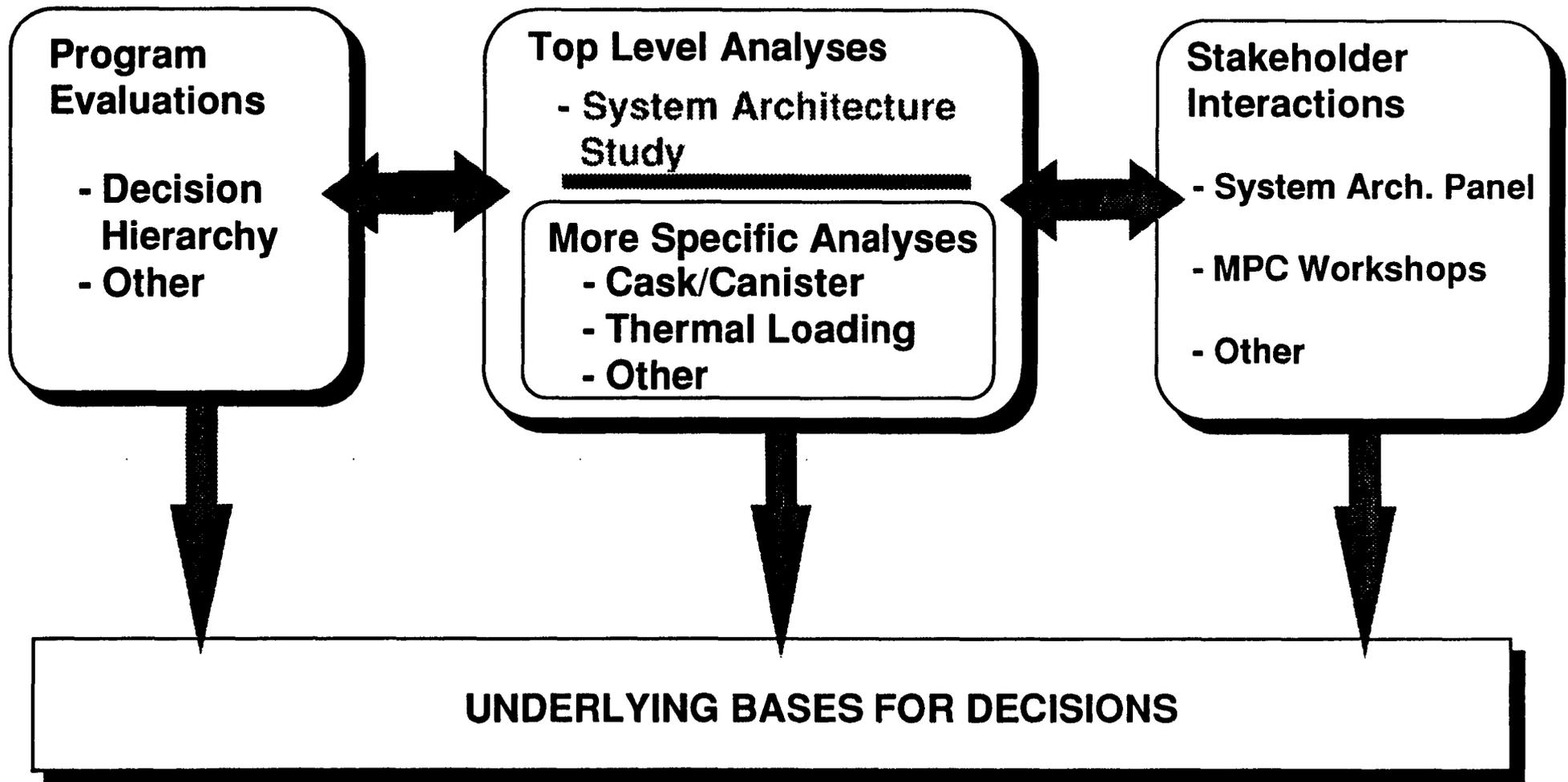
PRESENTER: Dr. DONALD GIBSON 'BUZ'

**PRESENTER'S TITLE DEPARTMENT MANAGER,
AND ORGANIZATION: SYSTEM DEVELOPMENT**

**PRESENTER'S
TELEPHONE NUMBER: (703) 204-8893**

**ARLINGTON, VIRGINIA
JANUARY 11, 1994**

INTER-RELATIONSHIP OF ANALYSIS AND DECISION PROCESS



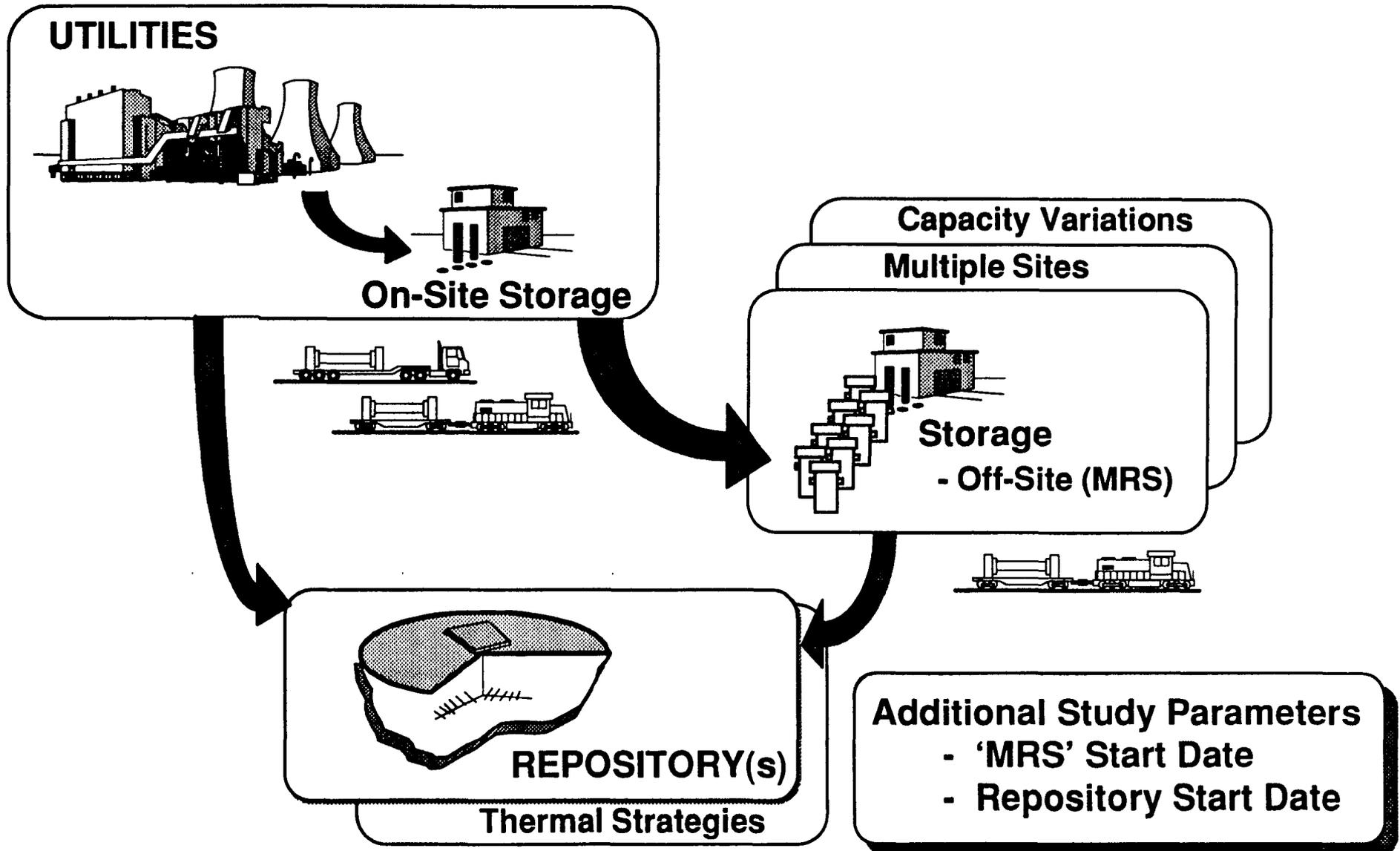
OBJECTIVES

- **Broad parametric analysis of physical and operational alternatives to ensure program doesn't preclude more desirable options**
- **Provides information to help guide program and focus specific system studies**
- **Evaluate sensitivity to constraints and contingencies**

ASSUMPTIONS

- **Waste generation consistent with NNO estimates (86,000 MTU)** *no new areas*
- **Disposal in geologic repository(s)**
- **Throughput 3000 MTU/yr.**

SYSTEM ARCHITECTURE STUDY SCOPE



TECHNOLOGY ALTERNATIVES

	Transport	Storage	Disposal
Single-Purpose Container/Casks	e.g. BR-100	<i>Dry vented concrete cask</i> e.g. DVCC	e.g. Large in-drift
Dual-Purpose Container/Casks	e.g. Transportable Storage Casks (TSCs)		e.g. Large in-drift
Triple-Purpose Container/Casks	e.g. MPCs		
Emplaceable-Storage Container/Casks	e.g. BR-100	e.g. Emplaceable MESCs	

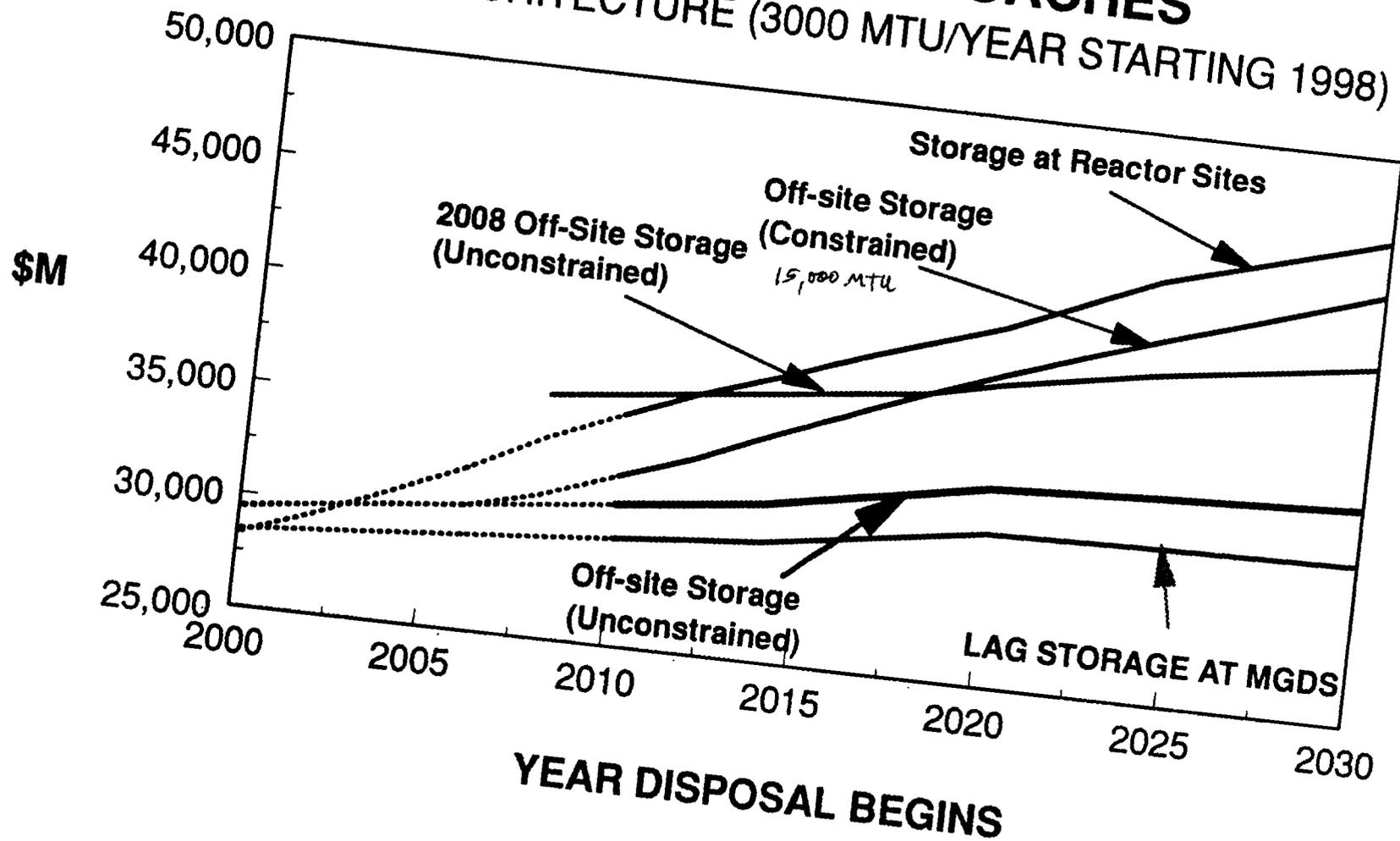
SYSTEM COST TRENDS FOR PRE-DISPOSAL STORAGE ALTERNATIVES

- **System cost for At-Reactor Storage vs repos. start date**
 - Primarily driven by yearly operating costs at each of ~70 sites
- **System cost for Off-Site Storage vs repos. start date**
 - Increases slower than at-reactor storage system until site capacity is reached
- **Unconstrained off-site storage vs repos. start date**
 - Cost increases remain below at-reactor storage system
- **Delayed off-site storage availability vs repos. start date**
 - Higher initial cost due to at-reactor costs prior to off-site availability
- **At-repository lag storage system for comparison**
 - Lower at-repository costs a consequence of commonality of facilities

\$2 billion worth?? page 7

SYSTEM COST TRENDS FOR ALTERNATIVE STORAGE APPROACHES

SPC ARCHITECTURE (3000 MTU/YEAR STARTING 1998)

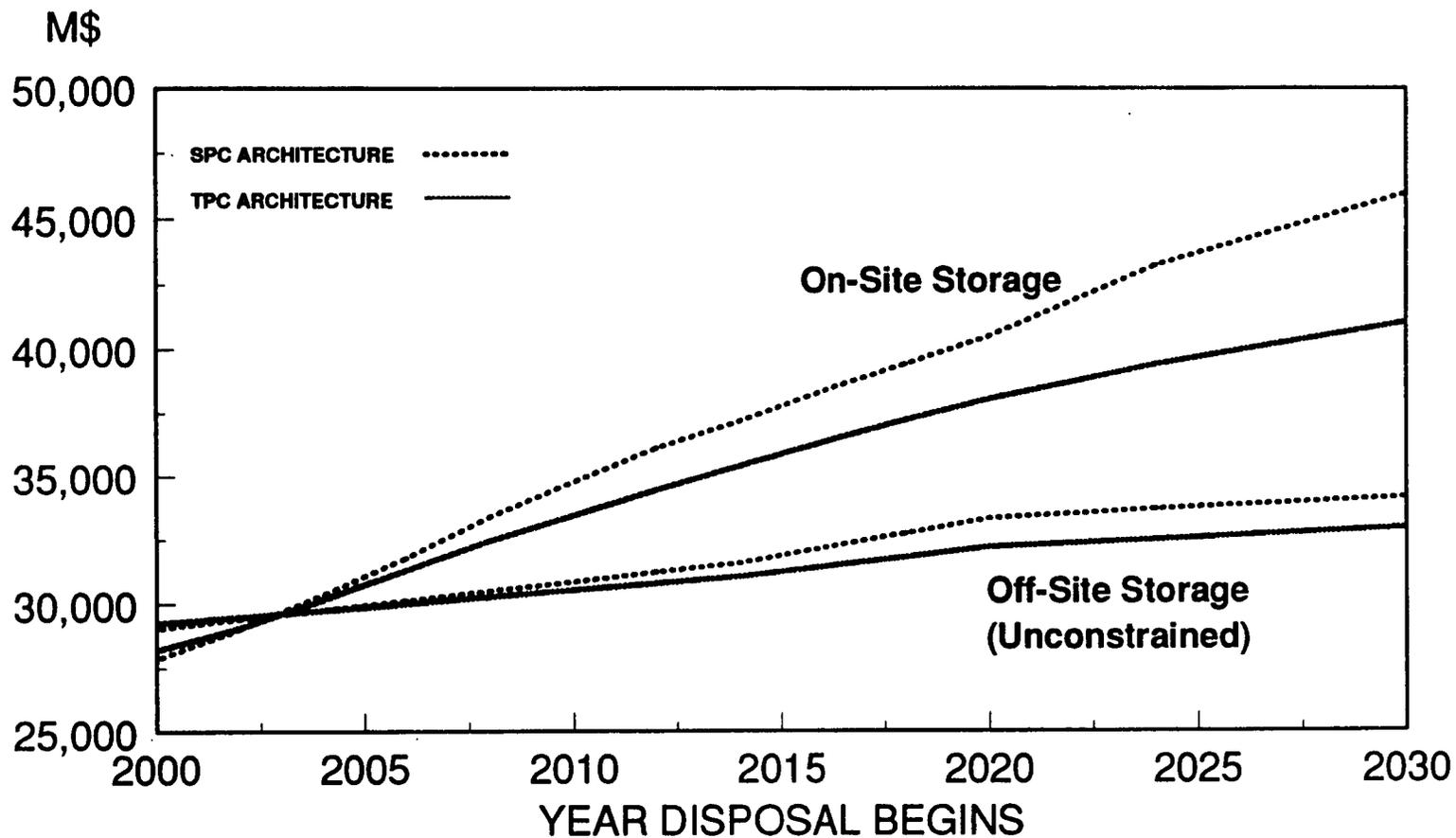


SYSTEM COST TRENDS FOR DIFFERENT TECHNOLOGIES

- **Similar system cost behavior for delays in repository start for all technologies examined**
- **At-reactor operational approach impacts long term costs**
- **Cost trends for different technologies similar for all storage locations examined**

SYSTEM COST TRENDS FOR ALTERNATIVE TECHNOLOGIES

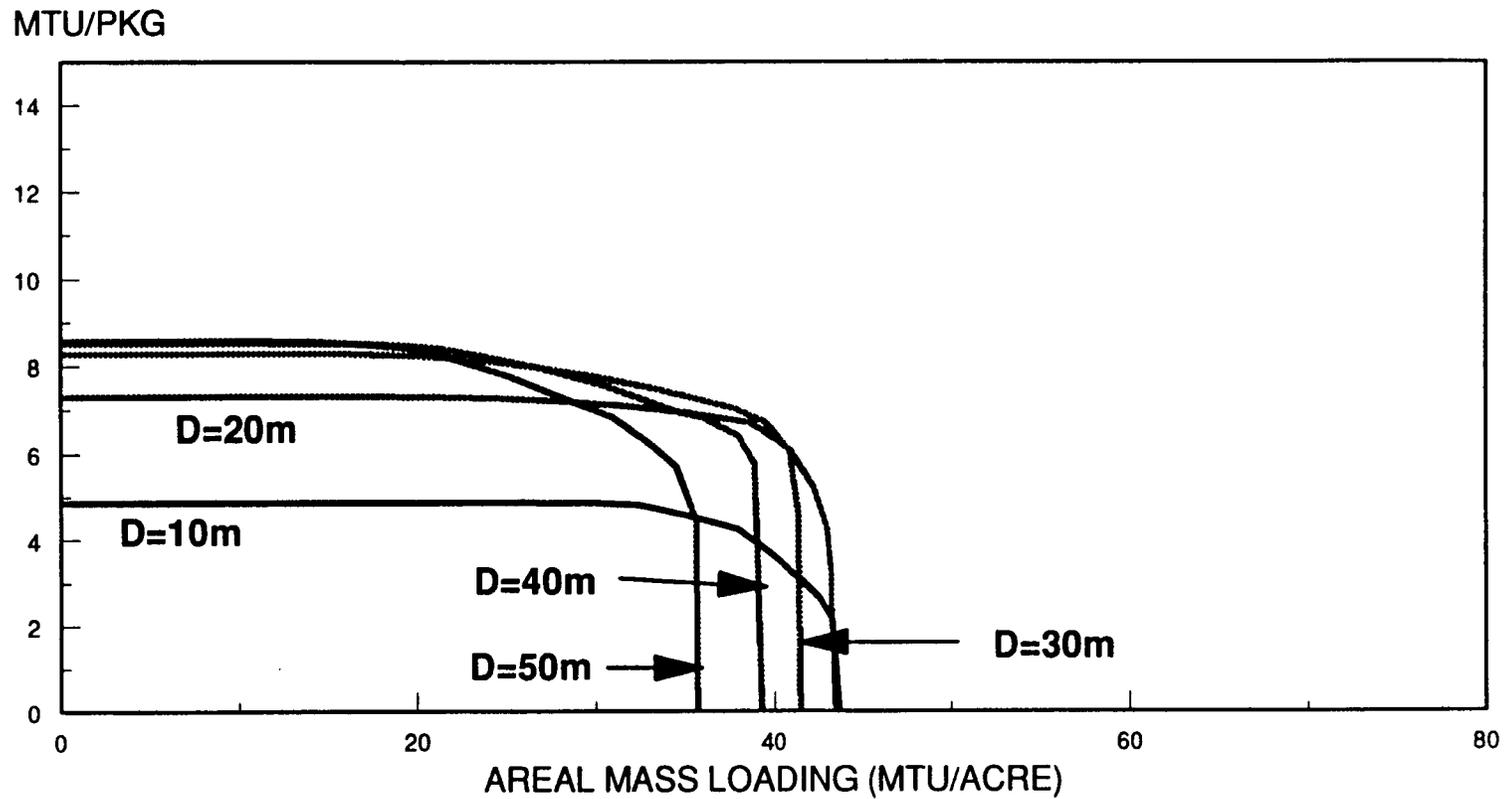
(POOL CONVERSION FOR TPC ARCHITECTURE)



SYSTEM COST TRENDS FOR SATISFYING A REPOSITORY THERMAL LOADING

- **Impacts system cost through its integrated effect on:**
 - Repository layout (e.g. drift and package spacing)
 - Waste package design (e.g. capacity)
 - Storage subsystem (e.g. extended storage for cooling)
- **Example is for a <95 degree C repository**
- **Maximum package size for a given areal mass loading and drift spacing may be estimated**
- **Increase in maximum package size as waste is cooled**
- **System cost along maximum package contours for different cooling periods**

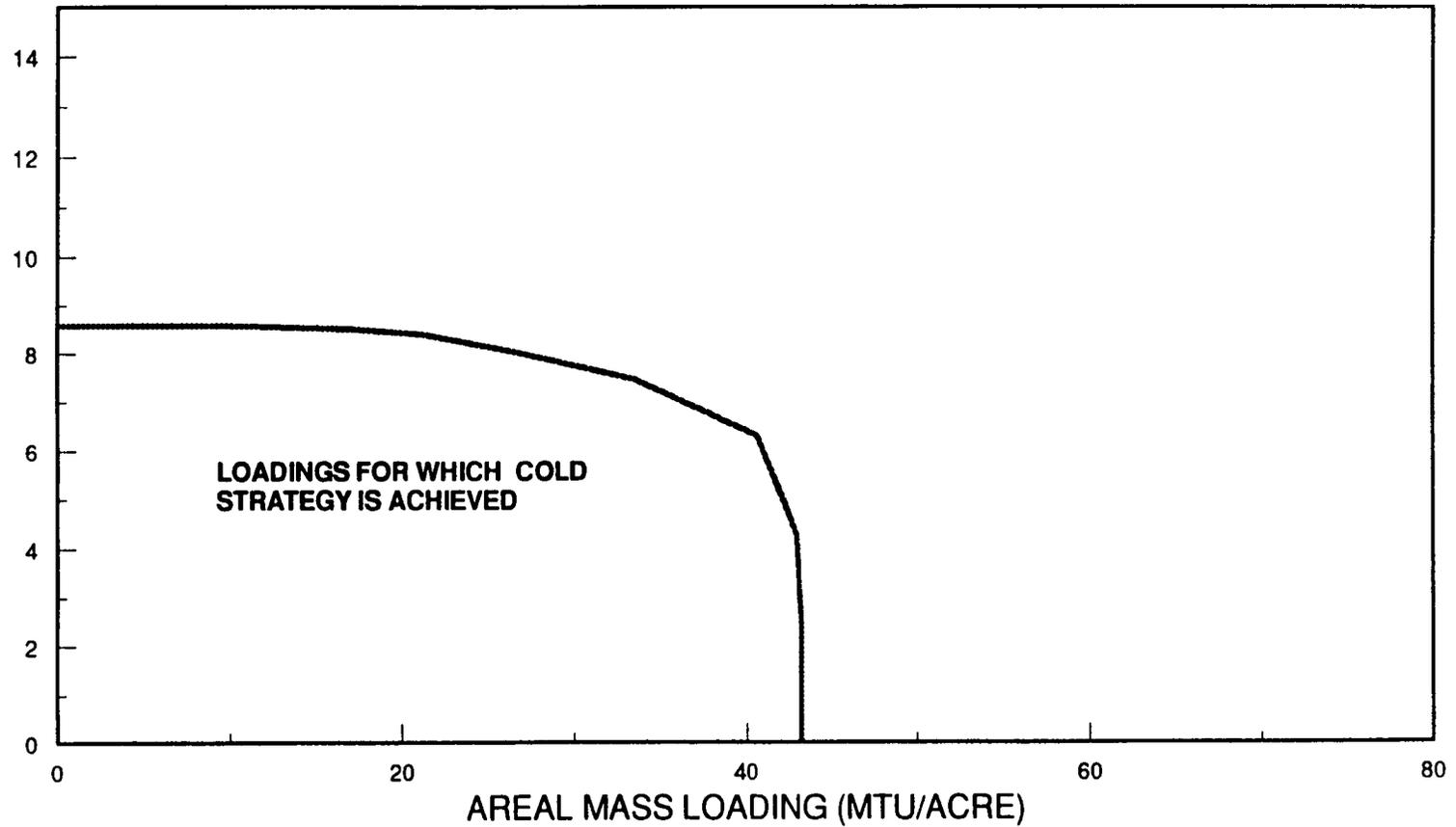
THERMAL LOADING CONTOURS FOR COLD STRATEGY
T < 95 C MORE THAN 4 M FROM WASTE PACKAGE
AVERAGE SPENT FUEL



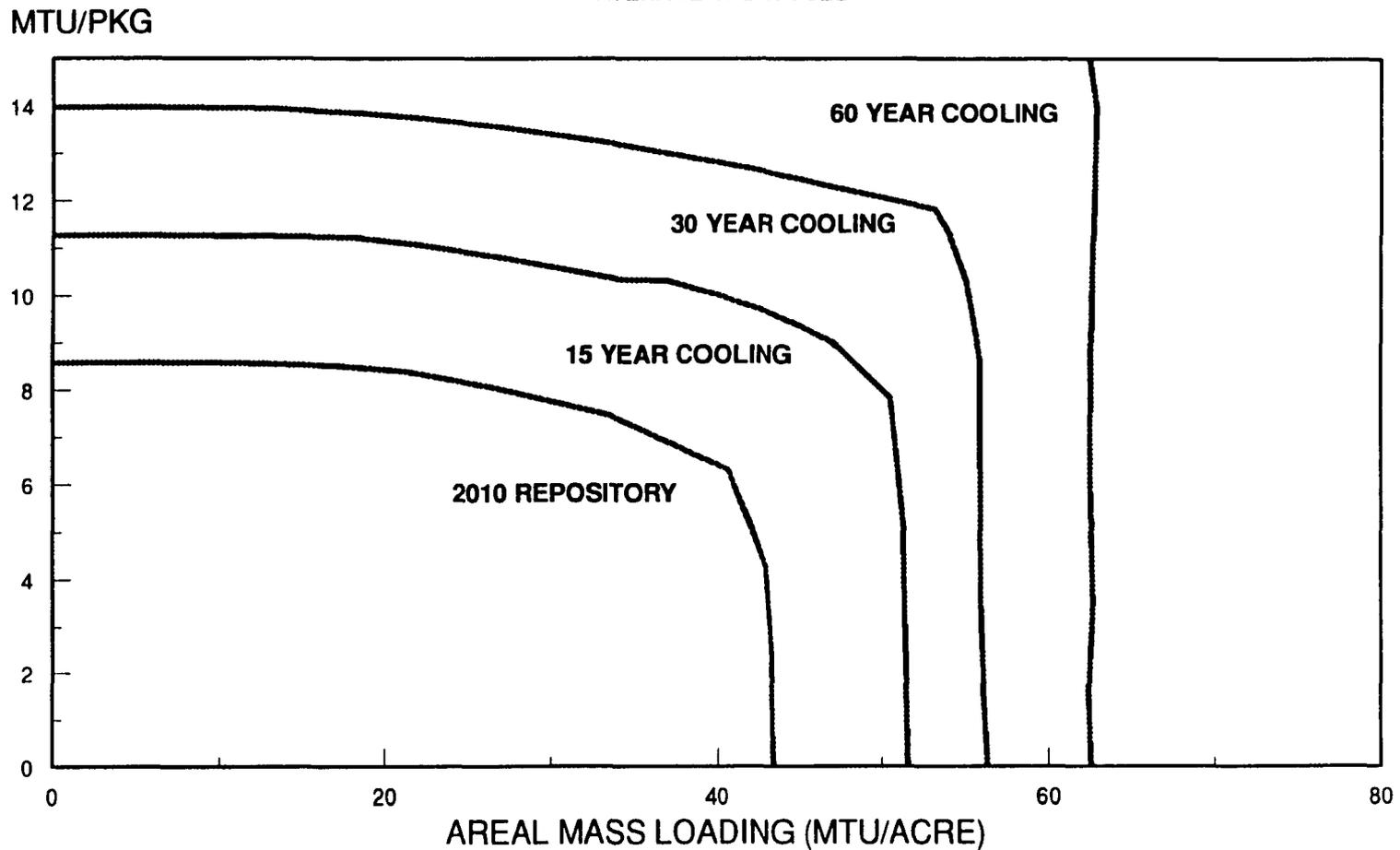
AVERAGE SPENT FUEL BURNUP
PWR 42 GWD/MTU
BWR 33 GWD/MTU

ENVELOPE OF THERMAL LOADINGS FOR COLD STRATEGY
AVERAGE SPENT FUEL

MTU/PKG



EFFECT OF EXTENDED STORAGE ON ENVELOPE
AVERAGE SPENT FUEL

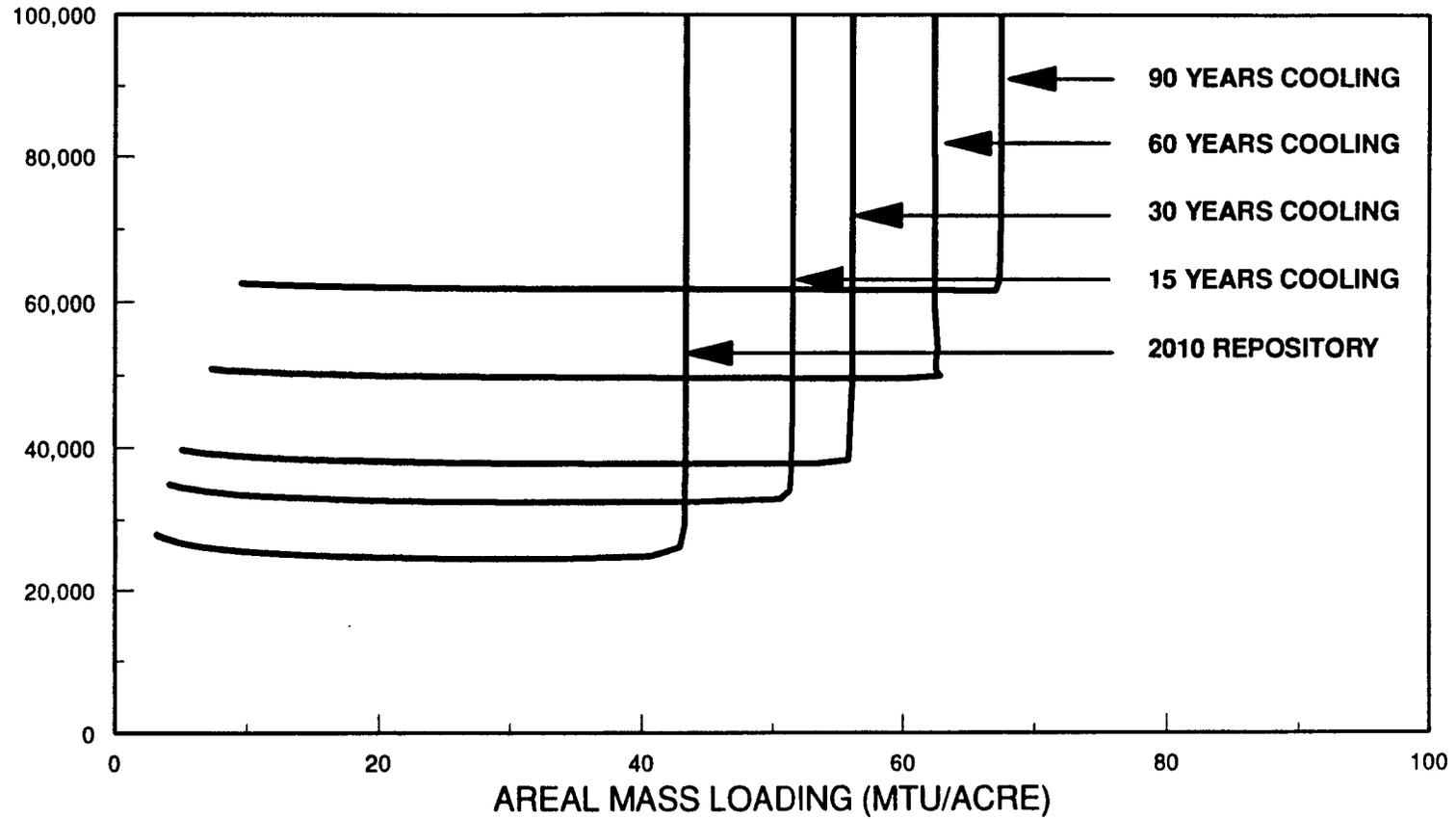


EFFECT OF EXTENDED STORAGE ON SYSTEM COSTS

CONSTRAINED OFF-SITE STORAGE

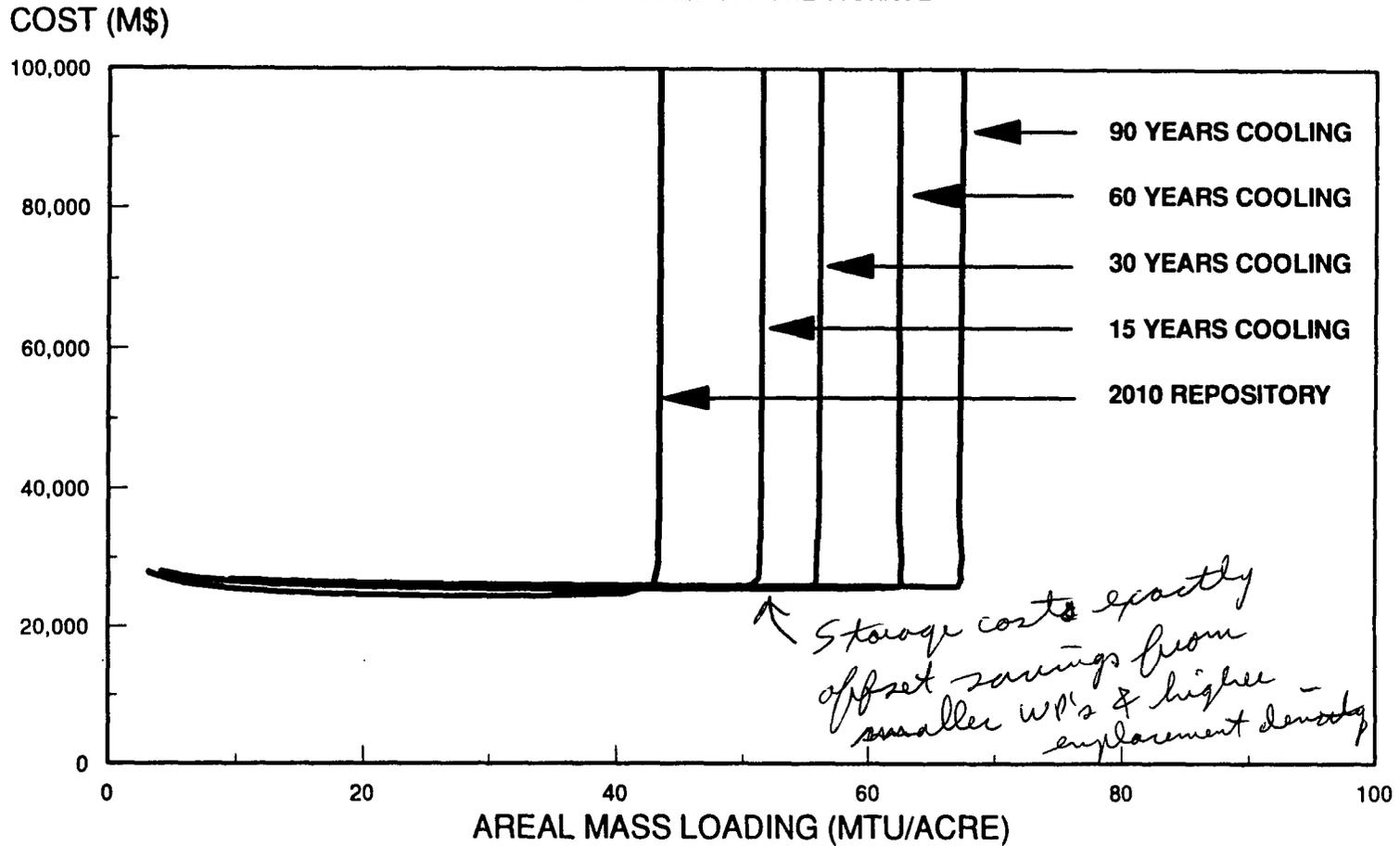
(157000 MTU)

COST (M\$)



EFFECT OF EXTENDED STORAGE ON SYSTEM COSTS

UNCONSTRAINED OFF-SITE STORAGE



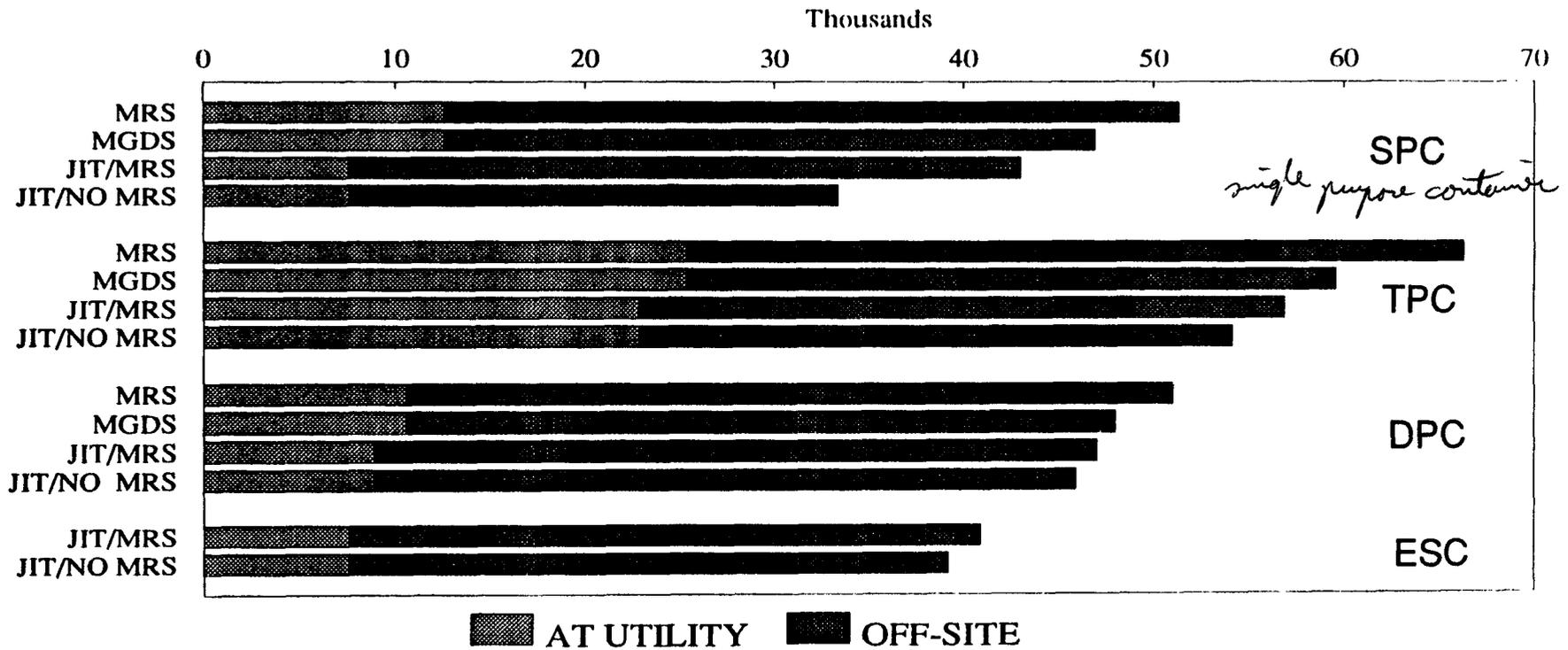
HEALTH AND SAFETY RISK TRENDS

- All alternatives evaluated were assumed to meet applicable requirements
- Study looked for any inherent system risk trends
- Occupational risk trends dependent on cask/canister handlings
- Transportation risk trends are a function of shipment miles
 - Interesting trade is non-radiological vs. radiological risk for different modal splits



OCCUPATIONAL RADIATION EXPOSURE FROM OPERATIONS

RADIATION EXPOSURE (PERSON-REM)



JIT: PICKUP TO ELIMINATE NEED FOR DRY STORAGE AT REACTOR SITES

ESC: EMPLACEABLE STORAGE CASK

Just in time

AREAS NEEDING FURTHER PROGRAM LEVEL STUDY

- **Other HLW from the DOE Defense Complex**
- **System trends as influenced by Thermal Loading strategies at the repository**
- **Expanded study of attributes**
 - **Influenced by stakeholder activities**