

U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

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

**SUBJECT: MINED GEOLOGIC DISPOSAL
SYSTEM (MGDS) THERMAL-LOADING
SYSTEMS STUDY**

PRESENTER: DR. STEVEN F. SATERLIE

**PRESENTER'S TITLE
AND ORGANIZATION: MGDS THERMAL LOADING STUDY MANAGER
M&O/TRW
LAS VEGAS, NEVADA**

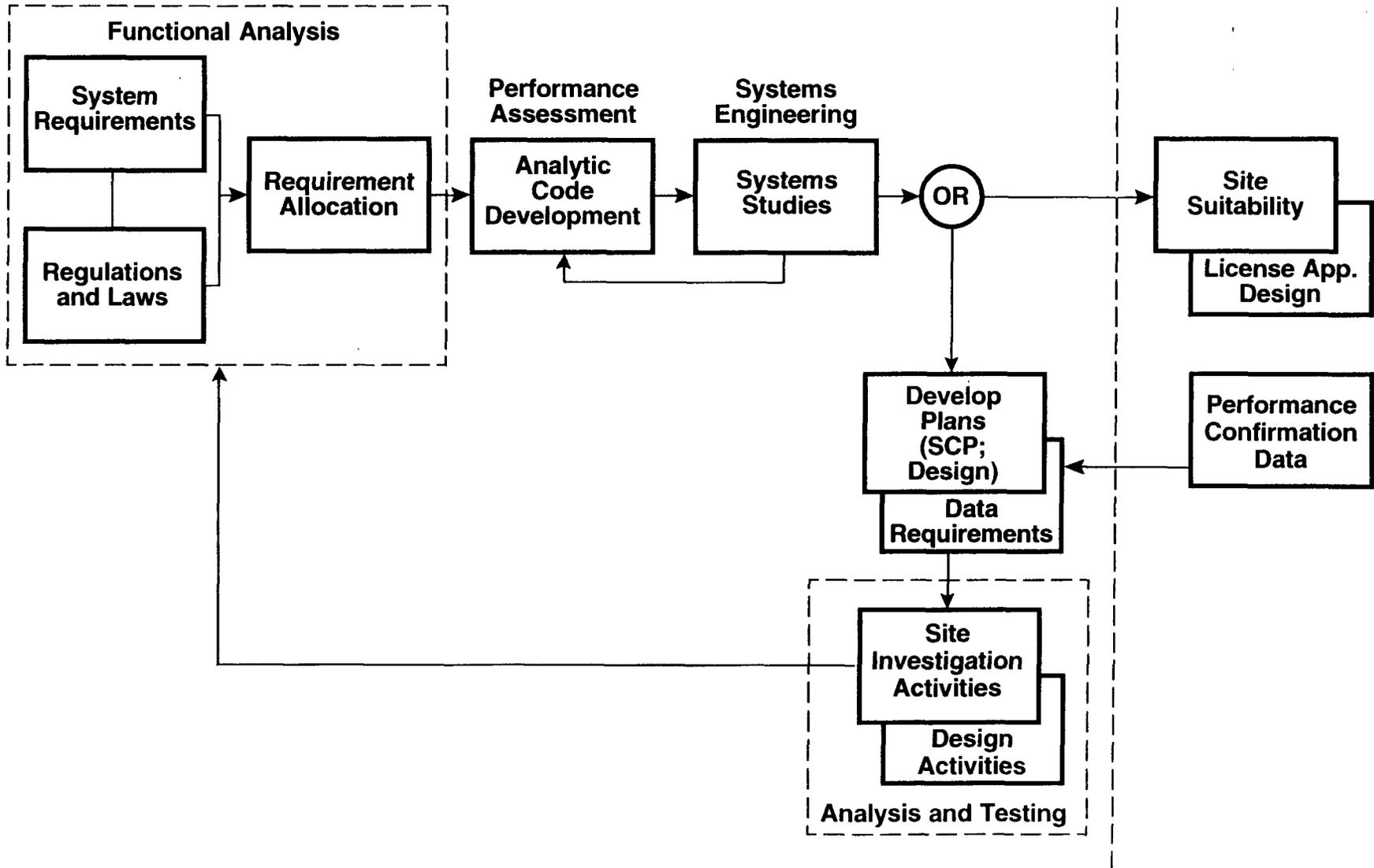
**PRESENTER'S
TELEPHONE NUMBER: (702) 794-5378**

DENVER, COLORADO
JULY 13-14, 1993

Outline

- **Thermal-loading systems process**
- **System study objectives**
- **Thermal-loading activities status**
- **System study approach**
- **Summary**

Thermal-Loading Systems Process



Objectives of the FY93 Thermal-Loading Study

The MGDS Thermal-Loading Study uses a systems approach to achieve the following objectives:

- **Integrate activities pertaining to the thermal loading decision**
- **Focus thermal loading and determine what is “too hot”**
- **Provide recommendations as to a range or ranges of thermal loading that as is currently believed, would be licensable**
- **Identify work needed to resolve uncertainties**
 - **Analysis or analytic code development**
 - **Testing**

Status of Efforts

- **MGDS Thermal-Loading Study approved, funded by YMP and initiated by M&O**
 - **A systems analysis approach which utilizes full range of M&O capabilities**
 - **Involves participation by national laboratories and others**
- **Other supporting studies underway**
 - **System-wide studies (architecture, MPC, . . .)**
 - **Total Systems Performance Assessment (TSPA)**
- **Analytic code assessment underway**
 - **Identifying important aspects of the problem**
 - **Benchmarking**

Status of Efforts

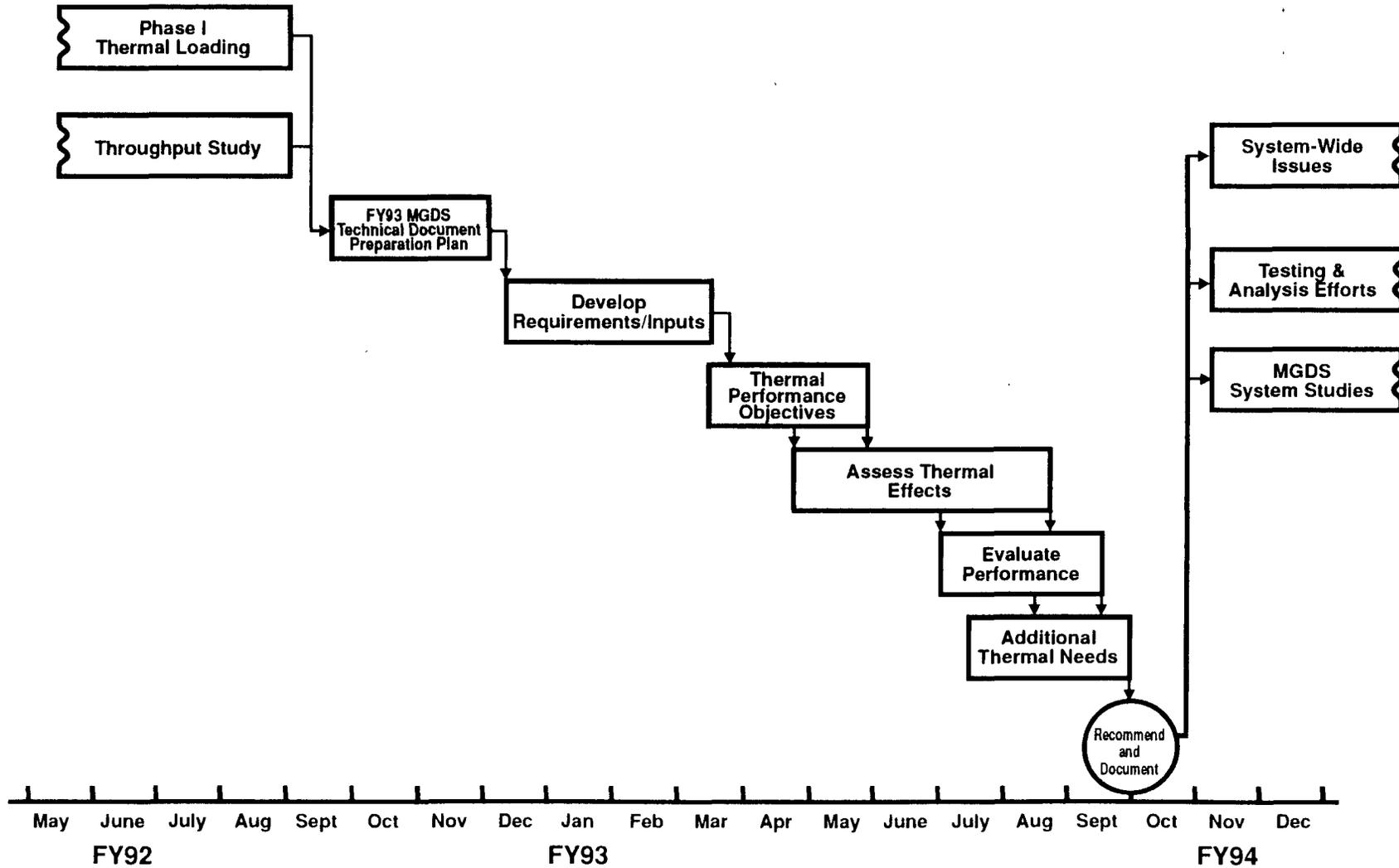
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- **Phase I Thermal-Loading Systems Study completed**
 - **CRWMS can accommodate a wide range of thermal loading from the standpoint of waste streams and acceptance rates**
- **Testing programs initiated**
 - **Laboratory testing including drill-core analysis ongoing**
 - **Heated block tests funded and planning started**
 - **ESF heater test planning started**
- **Thermal goals being re-evaluated**
 - **YMPO sponsored assessment**
 - **Preliminary draft report completed May 31, 1993**

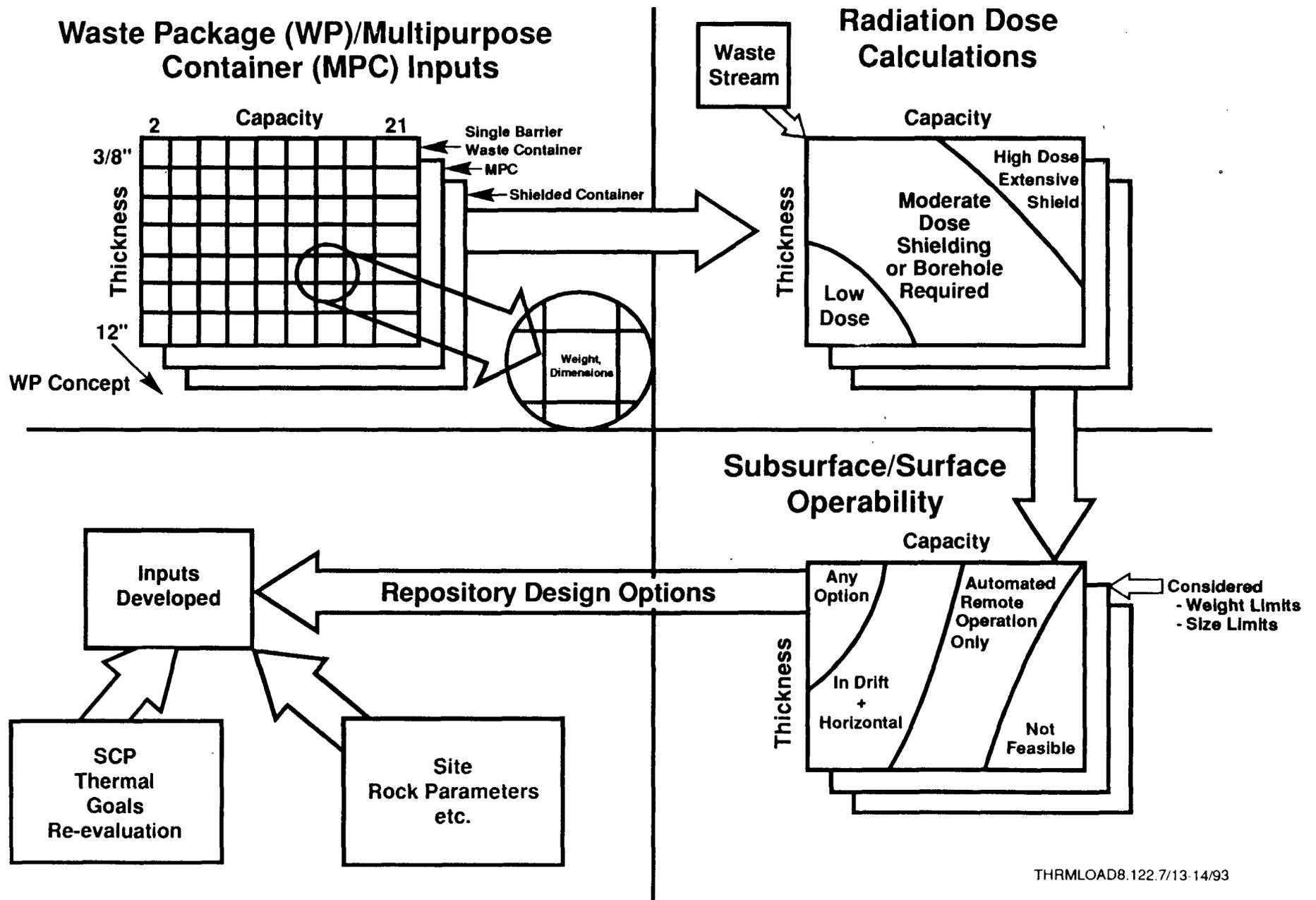
FY93 Study Approach

- **Evaluate pre-closure performance such as safety, operability, and cost**
- **Evaluate post-closure performance**
- **Identify and/or address important uncertainties associated with waste isolation**
- **Address uncertainties in performance standards**
- **Incorporate input from the national laboratories**
- **Narrow the range of thermal loading options**
- **Provide recommendations**

FY93 MGDS Thermal-Loading Study



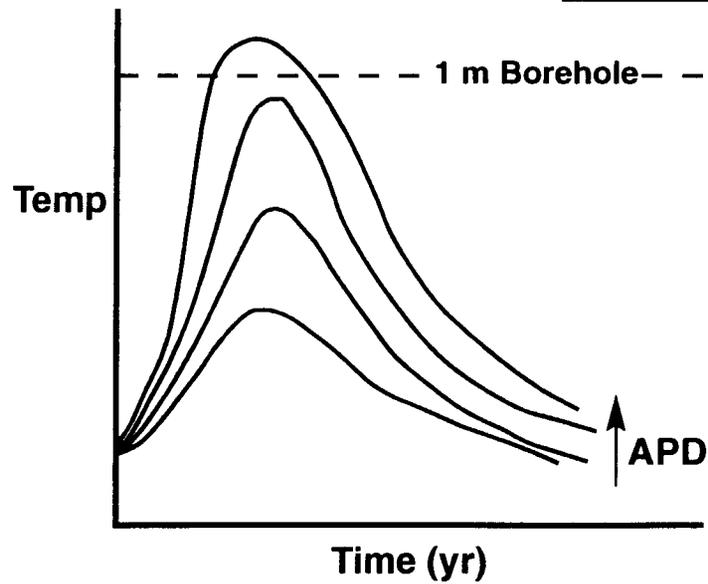
Develop Requirements/Inputs



Establish Upper Thermal Bounds

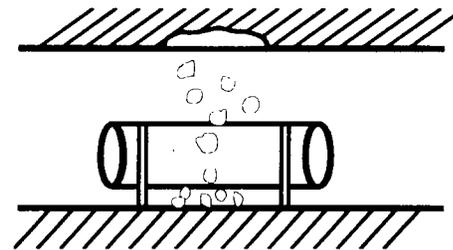
Evaluation of thermal load

- Near-field effects
- Various emplacements
- Waste stream



Perform rock mechanics calculations

- Some estimates for vertical borehole used for existing criteria
- Calculations for drift wall needed
- Ventilation effects



Subsurface operability evaluated

- Considerations - ventilation, safety and retrievability
- Output
 - Regimes for wheeled emplacement
 - Regimes for tracked vehicles

Establish Upper Bound - "Too Hot"

Examine Thermal Effects

Perform parametric thermal calculations for all selected waste packages and thermal loadings

- 3D large area thermal calculations
- Emplaced in vertical or horizontal borehole
- Emplaced in-drift
- Hydrologic changes

Geochemical evaluation

- Assess changes due to temperature increases
- Evaluate affects of changes in liquid saturation
- Water chemistry changes

Evaluate performance against thermal goals

- Utilize goals established by expert assessment group
- Examples of possible goals
 - Centerline WP temperature
 - 1m rock temperature
 - TSW3/2 temperature

Additional Thermal Needs

- **Perform sensitivity analyses to evaluate options and to identify risks**
- **Assess additional needs**
 - **Test data required to reduce uncertainties**
 - **Additional analysis**
 - **Integrate with testing**
- **Identify system-wide issues**

Summary

What do we expect the study will accomplish?

- **Provide input to integrate activities supporting thermal loading decision process**
- **Establish thermal bounds as to what may be “too hot”**
- **Recommend a range or ranges of thermal loading that, as is currently believed, would be licensable**
- **Identify uncertainties that are affected by thermal loading and that could impact waste isolation**
- **Reassess thermal goals**
- **Identify system wide impacts of thermal loading**

Summary

(Continued)

Where do we go from here?

- **Coordinate with testing activities to ensure that desired data with adequate accuracy is being collected**
- **Develop approaches to reduce uncertainties**
- **Update analysis (TSPA, operations, cost) as improved data and models become available**
- **Continue providing analysis framework for Thermal Loading Decision and assure that the decision is updated as data becomes available**