NRC FORM 658
(9-1999)

U.S. NUCLEAR REGULATORY COMMISSION

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DATE OF MEETING
08/05/2003

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Docket Number(s)	**50-390**
Plant/Facility Name	**Watts Bar Nuclear Plant, Unit 1**
TAC Number(s) (if available)	**MC0106**
Reference Meeting Notice	**Dated July 24, 2003 ADAMS Accession ML032050102**
Purpose of Meeting (copy from meeting notice)	**To discuss TVA's potential amendment regarding a proposed modification to the ultimate heat sink temperature**

NAME OF PERSON WHO ISSUED MEETING NOTICE	TITLE
Kahtan Jabbour	**Senior Project Manager**

OFFICE
NRR

DIVISION
DLPM

BRANCH
PDII-2

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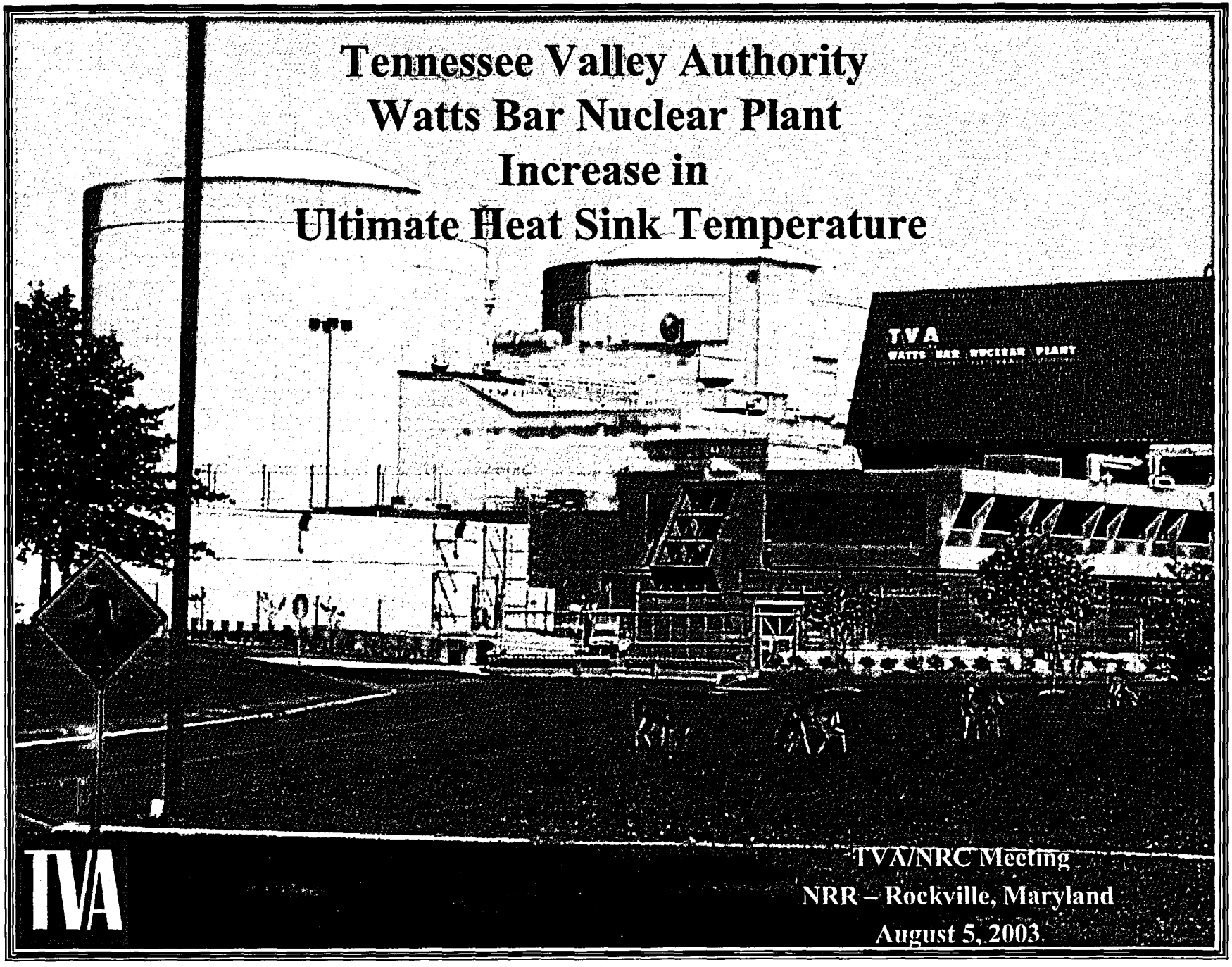
DF01

Tennessee Valley Authority
Watts Bar Nuclear Plant
Increase in
Ultimate Heat Sink Temperature



TVA

TVA/NRC Meeting
NRR – Rockville, Maryland
August 5, 2003

Agenda

- Introduction and Purpose
- Current UHS Technical Specification (TS) Requirements
- UHS Temperature History and Challenges
- UHS / Essential Raw Cooling Water (ERCW) Design Basis
- Analysis Methodology And Results
- Precedents
- Conclusions

Introduction and Purpose

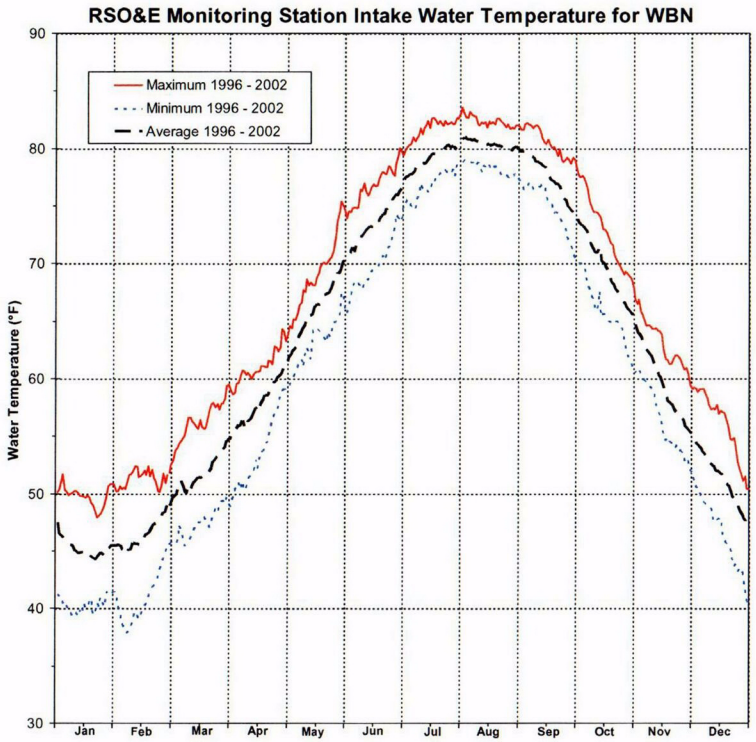
- Peak river water (ERCW) temperatures in recent summers have approached UHS Limits in Watts Bar Technical Specifications
- WBN plans to submit a TS Change which will increase UHS temperature limit from 85°F to 88°F
- TS submittal expected August 2003
- Approval to be requested before Summer 2004

Current UHS TS Requirements

- LCO 3.7.9 – Ultimate Heat Sink
  - UHS is the TN River, also known as Chickamauga Lake
  - Requires UHS to be Operable in Modes 1-4
- Surveillance Requirement (SR) 3.7.9.1 (Perform every 24 hours):
  - "Verify average water temperature of the UHS is ≤ 85°F"
  - Surveillance Instruction (SI) – 1-SI-0-2B
    - Temperature measured daily (with installed instrumentation) at each of four supply headers in the Auxiliary Building, indicated on the plant computer, averaged, and compared to the limit
    - Current limit is ≤ 84°F to account for instrument uncertainty (more accurate instrumentation is being installed)
    - Limit is close to 85°F if using precision M&TE

UHS Temperature History & Challenges

- The region is generally experiencing hotter than normal summers
  - August 2, 2002 – UHS temperature approached T/S limit of 85°F
  - Maximum general river water temperatures for 1996 – 2002 approximately 83°F
- TVA River Systems Operations can manipulate river temperature by special operations of larger & cooler upstream reservoirs, but with limited success
  - Can involve significant operating expenses & coordination difficulties with unpredictable results – influenced by weather



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UHS/ERCW Design Basis

- UHS - Defined as the TN River, including the TVA controlled dams upstream of the intake structure, Chickamauga Dam (nearest downstream dam), and the plant intake channel (Reference WBN UFSAR Section 9.2.5)

- Provides a heat sink for removing heat from safety-related components during transients or accidents as well as normal operation

- The maximum UHS temperature of 85°F ensures adequate heat load removal capacity for a minimum of 30 days after reactor shutdown or following an accident, including worst case LOCA

- The system is designed in accordance with RG-1.27, Revision 1, March , 1974

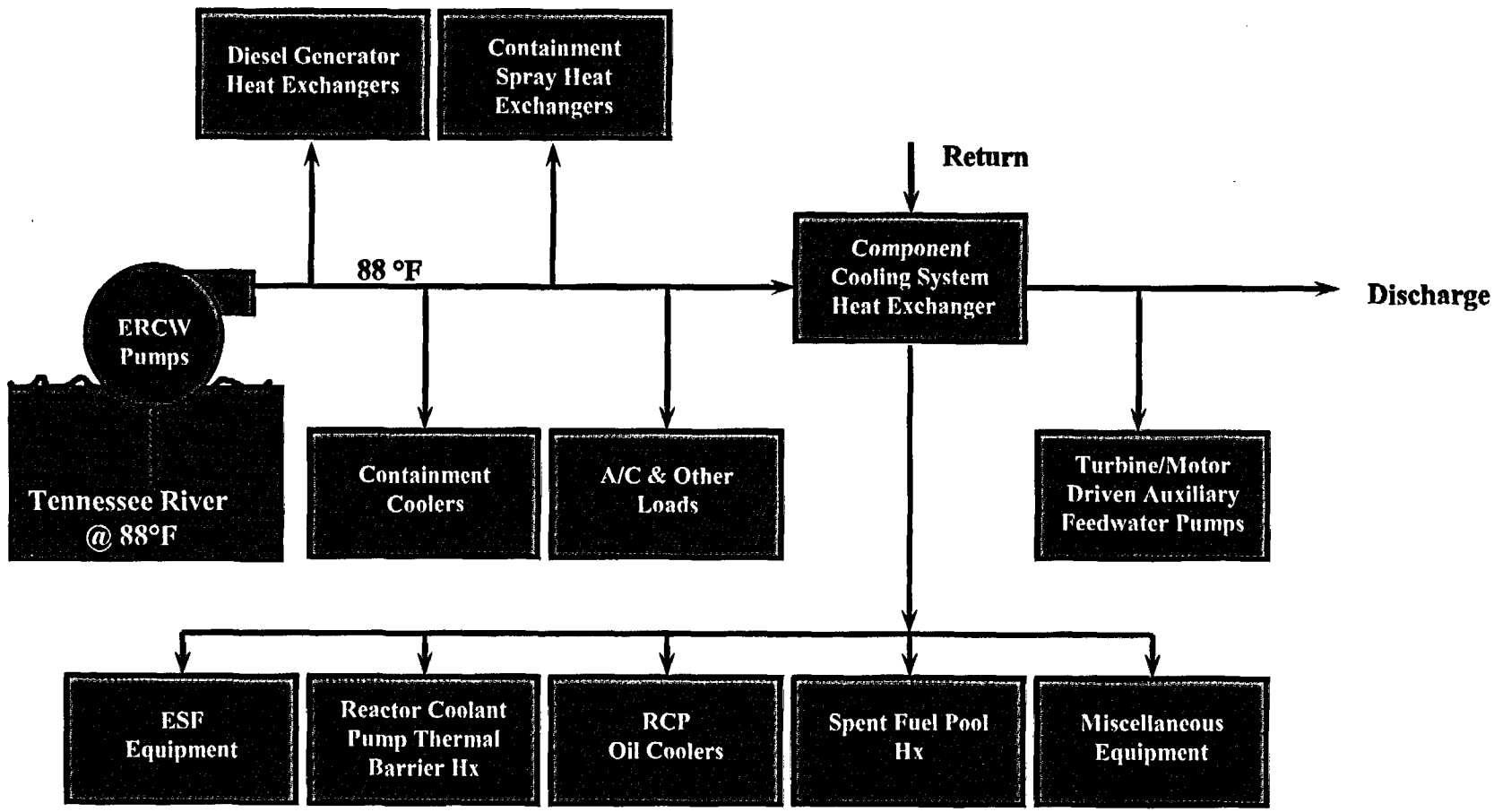
UHS/ERCW Design Basis

- Design basis of ERCW is for one train (2 ERCW pumps & associated piping, etc.) in conjunction with component cooling, containment spray, & RHR to remove core decay heat following a LOCA
  - Assumes simultaneous LOCA, with loss of downstream dam, loss of offsite power, with a worst case single failure
  - Design basis worst case lake level assumptions have not changed – Assumes Watts Bar Hydro water release of 2,000 CFS
- Maximum post-accident LOCA heat load occurs approximately 20 minutes after accident
- Worst-case heat load results during RHR cool-down following shutdown from 100 percent power
- UHS impacts post-LOCA containment pressure response
- UHS and ERCW design basis requirements continue to be satisfied with the subject change in TS temperature limit from 85°F to 88°F

UHS/ERCW Design Basis

- WBN Design Bases will be revised to reflect UHS limit of 88°F for:
  - Containment Accident Analysis
    - Containment integrity analysis
    - Long-term cooling analysis
  - Residual Heat Removal Cooldown Analysis
- WBN Design Bases will continue to reflect UHS limit of 85° for:
  - UHS Design
  - ERCW Design
  - Future modifications will address impact of revised UHS limit of 88°F

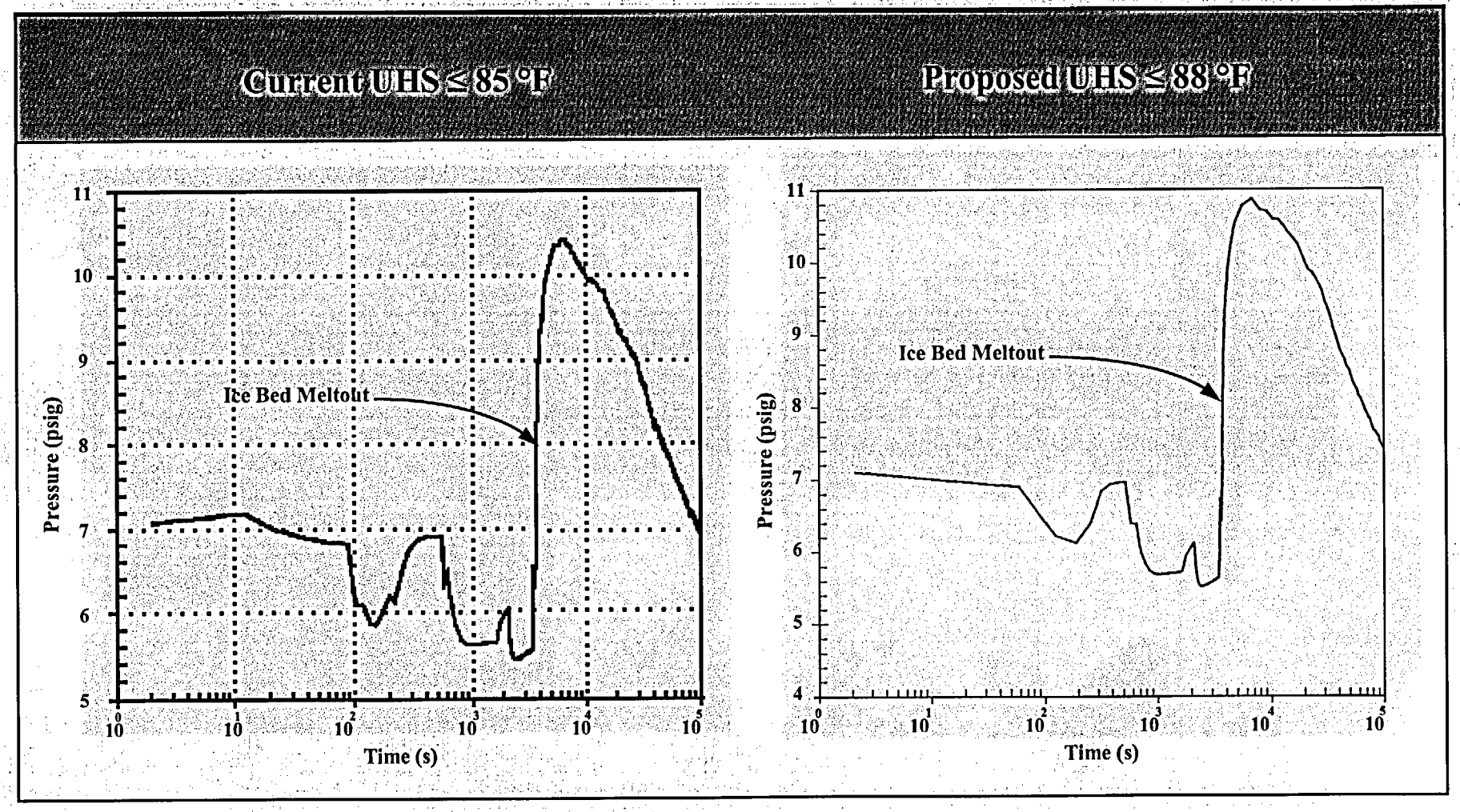
Simplified Diagram - Primary ERCW Users



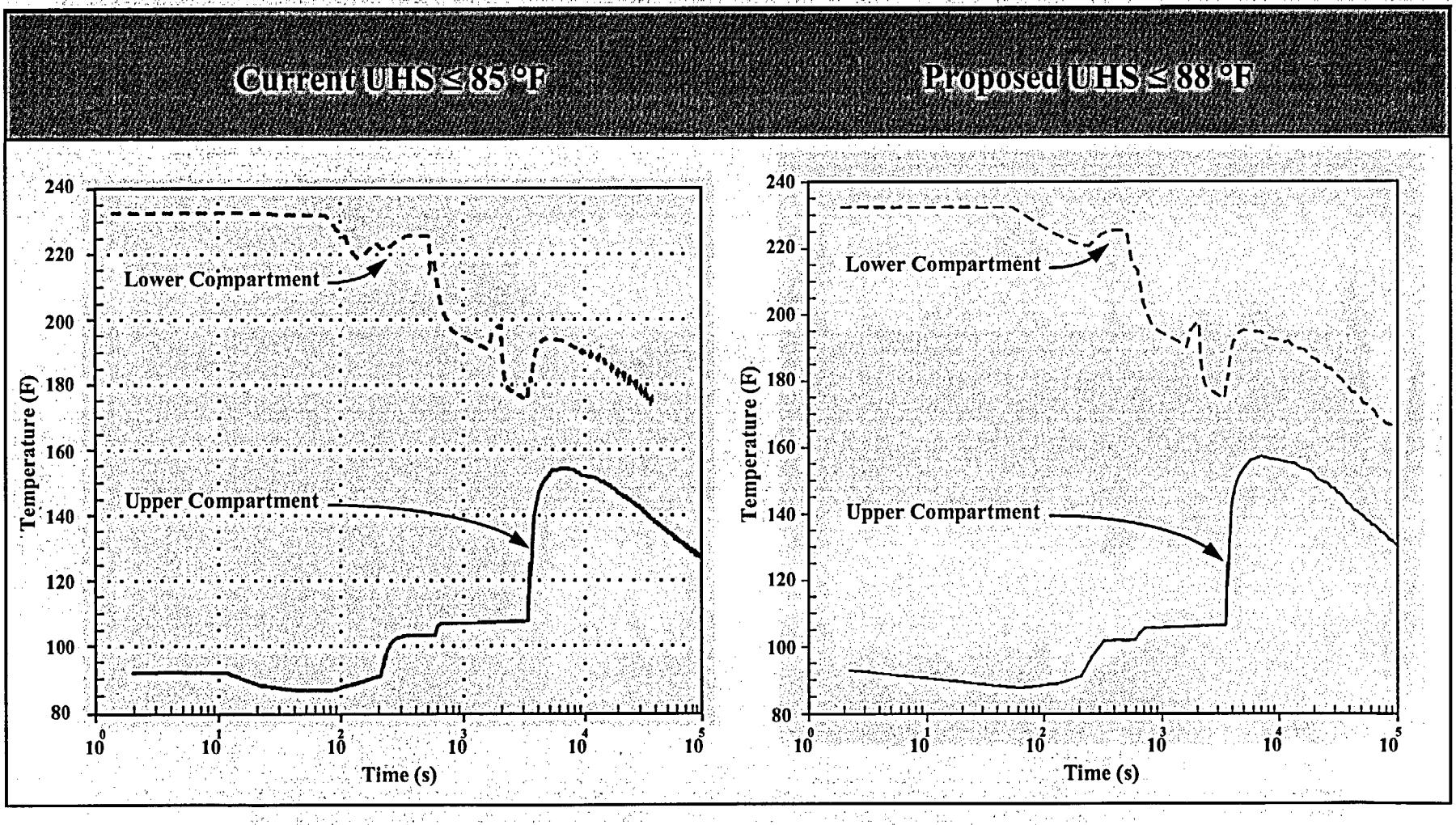
Analysis Methodology and Results

- Containment Pressurization Re-analysis
  - Westinghouse performed based on 88°F ERCW
  - No changes in analysis assumptions or methods
  - ERCW is a minor contributor during ice melt phase
  - Pressure increased from 10.64 psig to 10.90 psig
  - Insignificant reduction in ice melt time (1 hour nominal)
- Containment Cooling Re-analysis
  - Westinghouse performed based on 88°F ERCW
  - No changes in analysis assumptions or methods
  - Results acceptable – No long-term impact on equipment environmental qualification

Containment Pressure
UFSAR Figure 6.2.1-1



Upper and Lower Compartment Temperatures - UFSAR Figure 6.2.1-2



Analysis Methodology and Results

- Residual Heat Removal (RHR) - Shutdown And Cooldown
  - Westinghouse performed based on 88°F ERCW
  - No changes in analysis methods; Revised assumptions/procedural controls Required (See Below)
  - 2 Train cooldown within 23 hours of shutdown can be achieved
  - 1 Train cooldown within 36 hours of shutdown (as required by Tech Specs) can be achieved if:
    - Remaining RCP secured at 25 hours after shutdown
    - Securing RCP during cooldown is consistent with current operational practices during a Loss of Offsite Power event
    - SFP heat exchanger isolation limited to five hours (Previously 9 hours)

Analysis Methodology and Results

- Evaluation of Other Major Components
  - Three critical areas were evaluated for impact:
    - Major safety related component heat transfer adequacy
    - Room / Area cooling capability
    - Impact on piping and piping support analyses
  - Margin was obtained using ERCW flows based on pre-operational test data, where necessary
  - The lowest preoperational test flow value was used (either from Appendix R or LOCA test configuration)
  - Sensitivity studies were performed on Aux Building temperature using TMG analysis
  - Piping / support analyses were evaluated at revised higher temperatures; significant margin existed in the few civil problems in which the analyzed temperature was exceeded.
  - Cooling capability analytically evaluated for Emergency Diesel Generators, Component Cooling System Hx, Containment Spray System Hx
  - Additional margin realized but not credited based on updated dam breach criteria. Resulted in revised WBH water release of 14,000 CFS, additional 7 feet of head above analysis basis.

Analysis Methodology and Results

- Results - Evaluation of Other Major Components

  Emergency Diesel Generator Jacket Water Heat Exchanger (Hx) Cooling
  - Analysis performed at 88°F ERCW – results were sensitive to fouling assumptions
  - Analysis utilized ERCW flow margin, a relaxed maximum temperature limit, and revised maximum heat loads
  - Marginal performance at design fouling at 85°F
  - Analysis performed using actual fouling trends over a cleaning cycle period
  - Annual spring cleaning of EDG Hx will result in acceptable summer operation at 88°F (procedure change planned)

  Room/Area Cooling - Safety Related Chillers
  - SR Chillers are greatly oversized; therefore a loss of efficiency was not a concern
  - MCR & EBR chillers (screw compressors) were determined to be acceptable up to 95°F
  - Safety-Related Equipment Room & Area Coolers – Acceptable based on margins for ERCW flow and more accurate heat loads
  - SDBR chiller compressors require re-gearing:
    - 88°F ERCW was determined by vendor to be unacceptable for SDBR chiller operation
    - Effort underway to re-gear and derate the SDBR chiller and revise design basis documentation
    - Both compressors to be rebuilt before 88°F TS is implemented

Analysis Methodology and Results

Environmental Qualification

- 100 days is still assumed for EQ; however, margin is realized due to hypothetical nature of ERCW temperature remaining elevated at 88°F for a 100 day duration
- TMG analysis of Auxiliary Building areas – Maximum EQ temperature not exceeded
- Maximum containment temperature not impacted based on Westinghouse analysis
- No impact on EQ Binders or program

Other Major Areas Evaluated Acceptably

Acceptable evaluation results achieved for the following:

- ERCW Design Basis Events (LOOP, SBO, pipe breaks, etc.)
- Auxiliary Feedwater
- Appendix-R Safe Shutdown
- Spent Fuel Pool Cooling
- Flood Mode Operations
- Tritium Production

Precedents

- TVA reviewed the submittals approved for Cooper, Palisades, and Braidwood
- WBN approach is similar
- TVA's submittal will addresses evaluation/analytical methods, assumptions, results
- TVA's submittal to provide detail list of components/calculations affected and basis for conclusions
- TVA reviewed TSTF-330 (Adoption of 24-hour temperature averaging) for UHS – Does not provide adequate relief for postulated, sustained high temperature conditions for UHS

Conclusions

- WBN will submit a TS Change to increase UHS temperature from 85°F to 88°F
- Effects of proposed change have been examined in detail on equipment, components, systems, and safety-analyses. Included reviews of over 140 design documents and calculations
- Analysis methodologies and assumptions for major analyses (Containment and RHR cool-down) have not changed
- Component evaluations considered available margins and included sensitivity studies
- Modification of SDBR chiller compressors required prior to implementation
- Procedural controls to be revised as required (e.g., single-train RHR cool-down)
- Emergency Diesel Generators will require annual spring cleaning
- Proposed change is acceptable. No adverse affect on the safety of plant operations or the public