

**DESIGN WET BULB TEMPERATURE
FOR
ULTIMATE HEAT SINK SPRAY POND
FOR
ADVANCED LIGHT WATER
REACTORS**

**FOR SPRAY POND ULTIMATE HEAT
SINK DESIGN FOR MODULAR NEXT
GENERATION NUCLEAR PLANTS:**

**ZERO PERCENT (0%) EXCEEDANCE
WET BULB TEMPERATURE MUST
BE MET TO ALLOW INSTALLATION
AT A GIVEN SITE**

**DEFINITION OF 0% EXCEEDANCE
WET BULB TEMPERATURE VALUE:**

**HIGHEST VALUE THAT CAN OCCUR
FOR CONSECUTIVE HOURS (2 OR
MORE) –**

**ANY HIGHER VALUE CAN
ONLY OCCUR 1 HOUR AT A TIME,
i.e., NO CONSECUTIVE HOURS
OCCURRENCES**

**EPRI MANUAL FOR NEXT
GENERATION MODULAR NUCLEAR
PLANTS DRAFTED IN EARLY 1990s**

**CONTRACTOR FOR EPRI
REVIEWED METEOROLOGICAL
DATA COMPILED FOR U.S.
NUCLEAR PLANT APPLICATIONS
DATED 1979 OR EARLIER**

**EPRI MANUAL 0% EXCEEDANCE
WET BULB TEMPERATURE VALUE
= 81°F, FOR ANY SITE IN U.S.**

**MASSIVE HEAT WAVE OCCURRED
OVER MUCH OF U.S. EAST OF
ROCKIES IN SUMMER 1980**

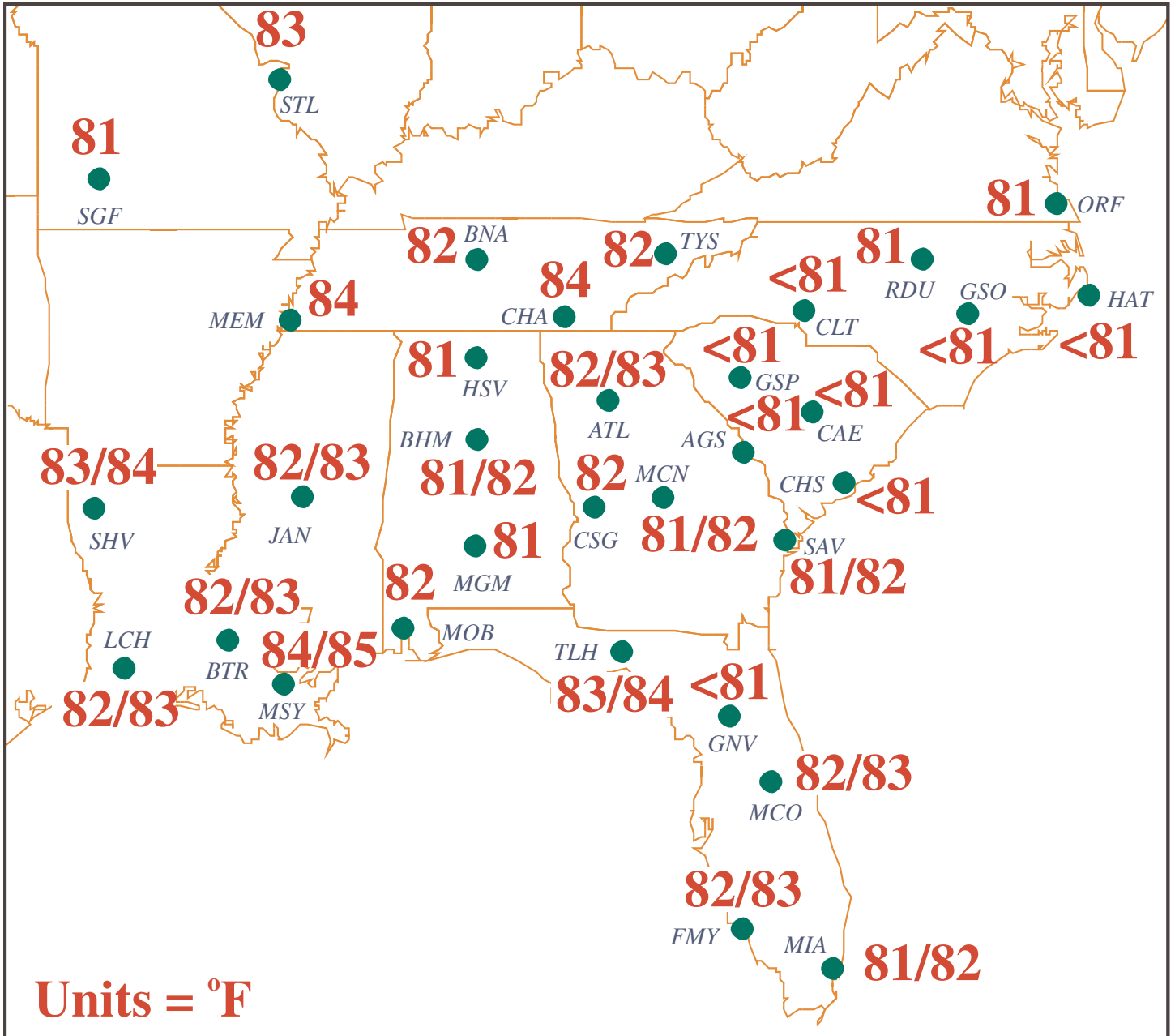
**BEGAN IN SOUTH-CENTRAL STATES
IN LATE SPRING AND EXPANDED
NORTH AND EAST, & INTENSIFIED,
DURING SUMMER MONTHS**

PEAK OF HEAT WAVE IN JULY 1980

**RESULT OF NIELSEN (TVA) REVIEW
OF OBSERVATION RECORDS FOR
SELECTED FIRST ORDER STATIONS
IN TVA REGION & OTHER PARTS OF
SOUTHEAST THIRD OF U.S. –**

**0% EXCEEDANCE WET BULB
VALUES >81°F AT A NUMBER OF
STATIONS – POSSIBLY AS MANY AS
20 OF 33 STATIONS SHOWN ON
NEXT SLIDE**

0% Exceedance Wet Bulb Temperature (Summer 1980)



**Chattanooga, Tennessee, NWS Station
Number of Hourly Wet Bulb Values
>81°F, by Year for 1948-1988 Period**

<u>Year</u>	<u>82°F</u>	<u>83°F</u>	<u>84°F</u>	<u>85°F</u>
1964	4	1		
1980	16	10	8 *	2 *
1987	2			

*** 3 consecutive hours $\geq 84^\circ\text{F}$ on 7/11/80
(including one 85°F), 2 consecutive hours
 $\geq 84^\circ\text{F}$ on 7/13/80 (including one 85°F),
and 2 consecutive hours = 84°F on 7/15/80**

Memphis, Tennessee, NWS Station Number of Hourly Wet Bulb Values >81°F, by Year for 1948-1988 Period

<u>Year</u>	<u>82°F</u>	<u>83°F</u>	<u>84°F</u>	<u>85°F</u>
1952	4			
1953	2			
1954	9	3		
1955	1			
1957		1		
1958	3			
1962	7	1		
1963	17	4		
1964	9			
1973	21	5		
1974	4	1		
1975	1			
1977	9	1		
1978	34	18	3	
<u>1980</u>	43	18	7 *	1 *
1981	6			
1982	37	10		
1983	41	5		
1984	5	2		
1985	3			
1986	10	3		
1987	2		1	
1988	4			

* 3 consecutive hours = 84°F on 6/28/80, and 3 consecutive hours \geq 84°F on 7/2/80 (including one = 85°F)

RESULTS OF COMMUNICATION OF THESE FINDINGS TO EPRI AND TO VENDORS & RECOMMENDATION OF 84°F VALUE INSTEAD OF 81°F:

- EPRI DECLINED TO CHANGE THE VALUE IN THEIR MANUAL BASED ON THEIR OPINION THAT 80% OF POTENTIAL SITES WOULD BE ENVELOPED BY 81°F**
- GE CHANGED THEIR DESIGN TO ENVELOPE THE WET BULB VALUES IN THE MULTIPLE-STN TABLE PREPARED BY NIELSEN**
- OTHER VENDOR MODIFIED THEIR ULTIMATE HEAT SINK TO REMOVE DEPENDENCE ON EXTREME WET BULB VALUES**

REVIEWS OF POST-1988 DATA FOR STATIONS IN THE TVA REGION HAVE CONFIRMED 1980 AS THE WORST SUMMER FOR WET BULB TEMPERATURES TO DATE SINCE 1947

SOURCES FOR THESE DATA REVIEWS WERE LOCAL CLIMATOLOGICAL DATA SUMMARIES WHICH INCLUDE SYNOPTIC-TIME DATA, WHICH IS IN 3-HOUR INTERVALS

CONCLUSION – CAREFUL REVIEW OF WET BULB TEMPERATURE CLIMATOLOGY IS WARRANTED FOR ANY SITE CONSIDERED FOR A FUTURE NUCLEAR PLANT USING A SPRAY POND ULTIMATE HEAT SINK DESIGN

CAREFUL REVIEW OF DESIGN METEOROLOGICAL VALUES FOR A GIVEN VENDOR'S MODULAR ADVANCED LIGHT WATER REACTOR PLANT IS NEEDED TO DETERMINE WHETHER WET BULB TEMPERATURE MAY BE A SITING PROBLEM

SUMMER 1980 SHOULD BE A CANDIDATE WORST CASE, BUT ANOTHER SUMMER MAY BE WORSE FOR A GIVEN SITE