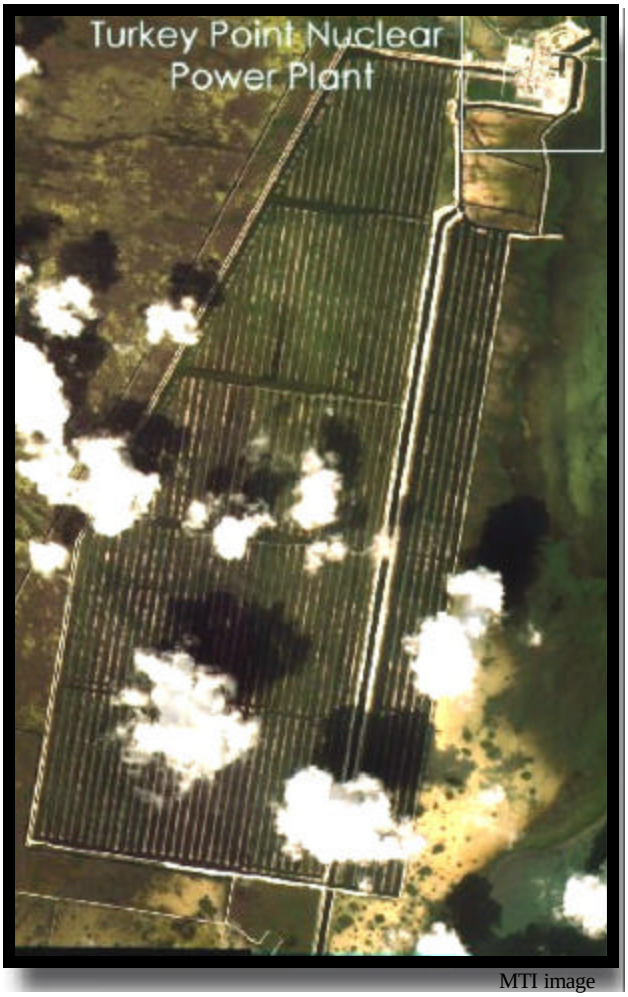

MTI image

Final MTI Data Report: Turkey Point Nuclear Power Plant (U)

Westinghouse Savannah River Company
Savannah River Site
Aiken, SC 29808

October 2002

Prepared for the U. S. Department of Energy under contract no. DE-AC09-96SR18500

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Prepared by

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INTRODUCTION

During the period from September 2000 to April 2002, surface water temperature data was collected at the Turkey Point Nuclear Power Plant near Homestead, FL (Figure 1). This effort was led by the Savannah River Technology Center (SRTC) with the assistance of local plant personnel. Permission for setting up the monitoring sites was granted by Florida Power & Light, which owns the plant site. This work was done in support SRTC's ground truth mission for the US Department of Energy's Multispectral Thermal Imager (MTI) satellite (Garrett, et al, 1999). Data described in this report are available from the authors (contact information provided at the end of report).

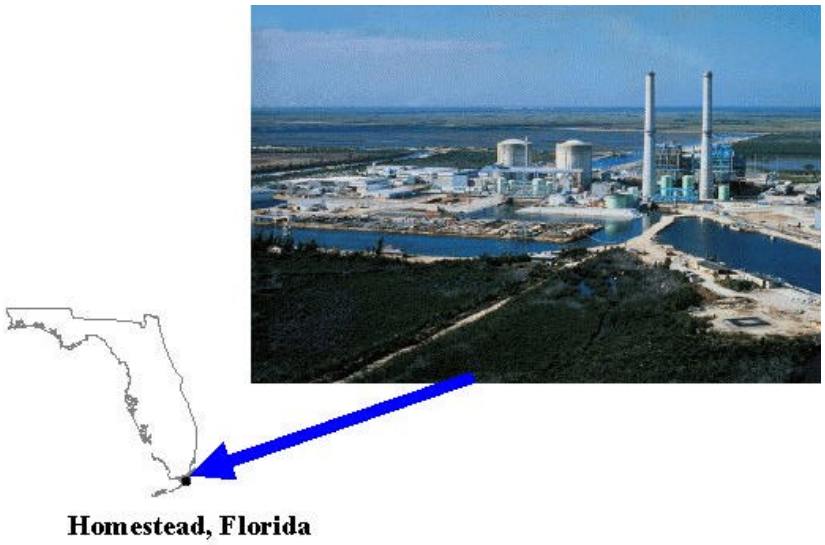

Figure 1. The location of the Turkey Point Nuclear Power Plant.

SURFACE WATER TEMPERATURE MEASUREMENTS

The Turkey Point Nuclear Power Plant utilizes an extensive canal system (shown on the cover and in Figures 2 and 3) to cool heated discharge water. Plant personnel operate three sites for permanent water temperature measurements: "Intake" (Figure 4), "Discharge" (Figure 5), and "Hotel 1" (Figure 6). These sites utilize platinum resistance probes housed in polyvinyl chloride (PVC) tubes for protection. SRTC set-up three additional sites to augment the plant water temperature measurements: "A", "B", and "C" shown in Figure (7). Figures 8 and 9 show typical installations at the "A", "B", and "C" sites.

Data described in this report are available from the authors.

Figure 2. Looking east over cooling canals toward the plant site with Biscayne Bay in the distance.

Figure 3. Looking south along the extensive network of cooling canals.

Figure 4. "Intake Site", The water temperature is located within the PVC pipe that extends into the water..

Figure 5. "Outfall" Site, looking south along the extensive network of The water temperature sensor is located within the PVC pipe that extends into the water.

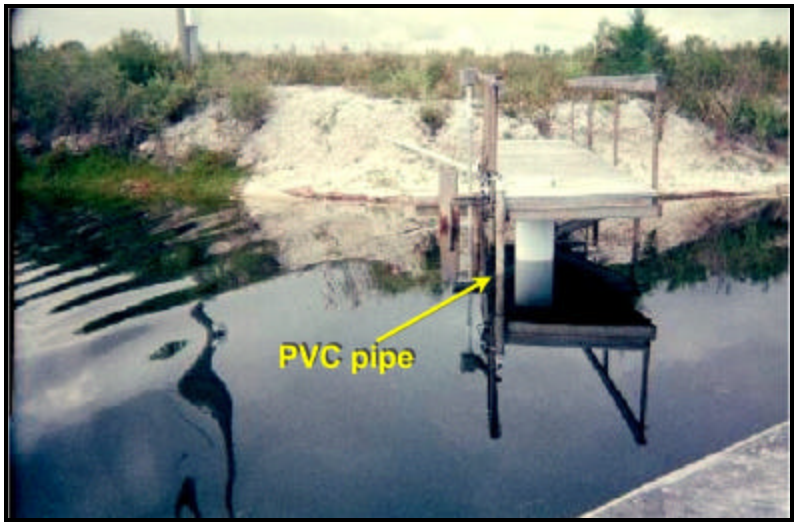

Figure 6. The "Hotel 1" site. The water temperature sensor is located within the PVC pipe that extends into the water.

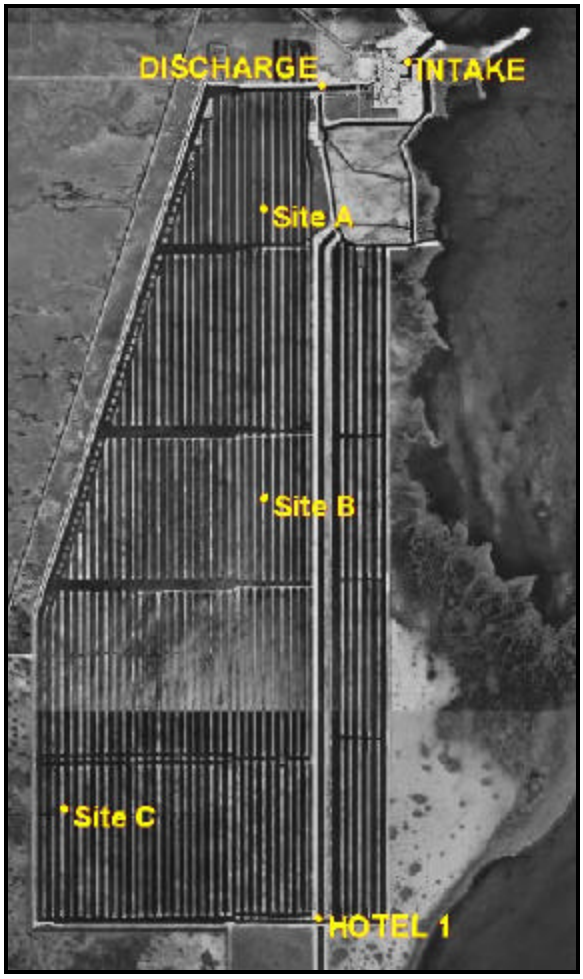

Figure 7. Location of water temperature monitoring sites.

Figures 8 and 9. Typical installations for sites "A", "B" and "C" are shown. The image on the right is a downward looking view of the protective case, which houses the sensor, suspended over a small anchor.

Surface water temperature measurements were made with the StowAway® TidbiT® (Figure 10) manufactured by Onset Computer (www.onsetcomputer.com). Sensors were suspended within a protective case approximately in the middle of the 1 m (approximate average depth) water column. Data collection was fairly good except for periods where sensors were damaged by resident wildlife, i. e. American Crocodiles (Figure 11).

Figure 10. The StowAwayÒ TidbiTÒ (front view, left, and rear view, right).

Figure 11. Photograph of an American Crocodile in a cooling canal.

Hand-held GPS coordinates for each site are as follows:

Site	WGS 84
Intake	N 25° 25.347' W 80° 20.624'
Outfall	N 25° 25.991' W 80° 20.275'
Hotel 1	N 25° 21.429' W 80° 20.338'
A	N 25° 25.348 W 80° 20.624'
B	N 25° 23.758' W 80° 20.630'
C	N 25° 22.053

DATA DESCRIPTION

The following information in Table I describes surface water temperature data within the file ABCall.xls. All times are local Eastern Time (Standard or Daylight). Turkey Point plant personnel have compiled daily plant operating and meteorological data summaries corresponding to each month of the collection campaign.

Table I. Description of Data Nomenclature

SURFACE WATER TEMPERATURES	
Name	**Description (All temperatures °C)**
"A"	Water temperature in the upper canal system
"B"	Water temperature in the middle canal system

PLANT OPERATING DATA

Name	Description
"JULIAN"	Julian date
"UNIT 1 MW"	Power level of Unit 1 in megawatts
"MAX OUTLET T"	(3rd Column) Unit 1 maximum outlet water temperature during the day of record
"UNIT 2 MW"	Power level of Unit 2 in megawatts
"MAX OUTLET T"	(5th Column) Unit 2 maximum outlet water temperature during day of record
"UNIT 3 MW	Power level of Unit 3 in megawatts
"MAX OUTLET T"	(7th Column) Unit 3 maximum outlet water temperature during day of record
"UNIT 4 MW"	Power lever of Unit 4 in megawatts
"MAX OUTLET T"	(9th Column) Unit 4 maximum outlet water temperature during day of record
"PTF CWP OUT"	Number of cooling water pumps (fossil) not operating
"PTN CWP OUT"	Number of cooling water pumps (nuclear) not operating
"FLOW"	Cooling water flow rate/gpm

METEOROLOGICAL DATA

"JULIAN"	Julian data
"HOUR"	Time in Easter Standard Time
"DISCHARGE"	Plant discharge water temperature in °F
"INTAKE"	Plant intake water temperature in °F

"HOTEL 1"	Water temperature (°F) at the end point in the canal system before water is transported back to the plant
"WIND SPD"	Wind speed in MPH
"WIND DIR"	Wind direction in degrees
"AIR TEMP"	Air temperature in °F
"RH"	Relative humidity in %
"PRESSURE"	Barometric pressure (Note: This data is rarely available)
"COVER"	Solar radiation in langleys per hour

Note: *"NR" means "NOT REPORTED" in the data files*

DATA QUALITY ASSURANCE

All surface water temperature collected by SRTC data were reviewed for accuracy. Erroneous data were deleted and left as "blanks" in the data files.

EXAMPLE DATA

An example surface-water temperature plot of quality assured data is shown in Figure 12. An example of plant data is shown in Figure 13.

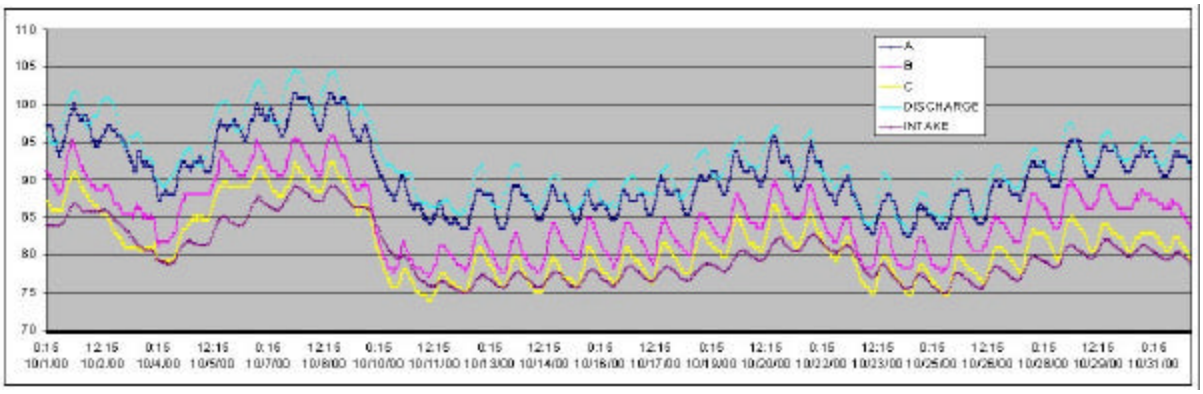

Figure 12. Time series plot of water temperature (°F) data collected at sites "A", "B", "C", "Discharge" and "Intake" ("Hotel 1" data not available) in October 2000.

JULIAN	UNIT 1 MW	MAX OUTLET T	UNIT 2 MW	MAX OUTLET T	UNIT 3 MW	MAX OUTLET T	UNIT 4 MW	MAX OUTLET T	PTF CWP OUT	PTN CWP OUT	FLOW
275	6,877	100	6,227	100	17,820	NR	0	NR	0	4	759,333
276	7,415	99	6,173	99	17,782	NR	0	NR	0	4	759,333
277	3,708	94	6,444	94	17,949	NR	0	NR	0	4	759,333
278	0	82	6,900	95	18,023	NR	0	NR	0	4	759,333
279	5,923	98	7,369	98	17,874	NR	0	NR	0	4	759,333
280	8,045	100	7,109	101	17,741	NR	0	NR	0	4	759,333
281	6,845	102	6,125	101	17,663	NR	0	NR	0	4	759,333
282	6,437	102	5,614	101	17,679	NR	0	NR	0	4	759,333
283	3,912	96	4,736	95	17,772	NR	0	NR	0	4	759,333
284	0	84	5,103	90	18,056	NR	0	NR	0	4	759,333
285	0	79	3,741	84	18,295	NR	0	NR	0	4	759,333
286	4,080	89	5,734	88	18,182	NR	0	NR	0	4	759,333
287	3,908	90	6,244	88	18,185	NR	0	NR	0	4	759,333
288	1,595	84	5,492	88	18,198	NR	0	NR	0	4	759,333
289	0	79	4,999	89	18,185	NR	0	NR	0	4	759,333
290	4,953	90	1,835	82	18,171	NR	0	NR	0	4	759,333
291	5,007	91	0	78	18,164	NR	0	NR	1	4	690,583
292	5,407	91	0	80	18,154	NR	0	NR	1	4	690,583
293	5,029	93	0	81	18,088	NR	0	NR	1	4	690,583
294	4,953	94	0	82	19,010	NR	0	NR	1	4	690,583
295	4,240	95	2,719	91	17,956	NR	0	NR	0	4	759,333
296	3,242	93	0	82	17,948	NR	0	NR	0	4	759,333
297	4,215	91	2,776	91	18,075	NR	2,014	NR	0	0	1,728,000
298	5,093	90	0	78	18,187	NR	3,903	NR	0	0	1,728,000
299	4,518	91	3,742	91	18,209	NR	7,686	NR	0	0	1,728,000
300	4,029	91	14	79	18,176	NR	12,580	NR	0	0	1,728,000
301	4,573	92	0	81	18,099	NR	17,625	NR	0	0	1,728,000
302	4,550	95	3,155	94	18,066	NR	17,633	NR	0	0	1,728,000
303	4,426	95	0	83	18,742	NR	18,178	NR	0	0	1,728,000
304	5,658	95	0	82	18,812	NR	17,500	NR	0	0	1,728,000
305	4,846	93	3,050	90	18,036	NR	17,630	NR	0	0	1,728,000
	NR - NOT REPORTED										

Figure 13. An example of the plant data for October 2000. See Table I "Plant Operating Data" for a description.

ACKNOWLEDGEMENTS

Special thanks to Ralph Heistand and Kirk Dudley of Florida Power & Light for assisting with sensor deployment and recovery. Eliel Villa-Aleman of WSRC provided aerial imagery of the cooing canal system.

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Garrett, A. J., R. J. Kurzeja, B. L. O'Steen, M. J. Parker, M. M. Pendergast, and E. Villa-Aleman, 1999: Ground-Truth Measurements Plan for the Multispectal Thermal Imager (MTI) Satellite. WSRC-TR-99-00455. Westinghouse Savannah River Company, Aiken, SC.