May 17, 1982

MEMORANDUM FOR: D. Okrent, Chairman
ACRS Subcommittee on Midland Plant Units 1 & 2

FROM: D. Fischer, Reactor Engineer

SUBJECT: PROJECT STATUS REPORT FOR THE ACRS SUBCOMMITTEE MEETING ON MIDLAND PLANT UNITS 1 & 2 - MAY 20-21, 1982, MIDLAND, MICHIGAN

Attached is a project status report for the subject meeting. The purpose of the meeting is to review the application of Consumers Power Company for a license to operate the Midland Plant Units 1 & 2.

The meeting will begin at 8:30 a.m. on May 20, 1982 and will be held at the Midland Holiday Inn, 1500 Wackerly Rd., Midland, Michigan. Attendance by the following ACRS members and consultants is anticipated and hotel reservations have been made at the Holiday Inn for the nights indicated. Box lunches and buffet dinners will be available at nominal expense on Thursday, May 20th.

D. Okrent	19th & 20th
W. Mathis	"
D. Moeller	"
C. Siess	"
P. Davis (partial)	"
E. Epler	"
W. Lipinski	"
J. Osterberg	20th
F. Parker	20th
P. Pomeroy (partial)	20th
R. Scavuzzo	19th & 20th
M. Trifunac (partial)	20th
Z. Zudans	19th & 20th

Attachment:
Project Status Report

cc: ACRS Members
R. Fraley
M. Libarkin
J. McKinley
G. Quittschreiber
P. Davis
E. Epler
W. Lipinski
F. Parker
P. Pomeroy
R. Scavuzzo
M. Trifunac
~~Z. Zudans~~

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USGPO 1980—329-824

MIDLAND PLANT UNITS 1 & 2
OPERATING LICENSE REVIEW
MAY 20-21, 1982
PROJECT STATUS REPORT

PURPOSE:

The purpose of this meeting is to review the application of Consumers Power Company for a license to operate the Midland Plant Units 1 & 2.

BACKGROUND:

Pertinent facts concerning the Midland Project include:

Location:

The Midland site is located partially within the city of Midland, Midland County, Michigan. The city of Midland is approximately 105 miles NNW of Detroit and about halfway up Michigan's lower peninsula on the Lake Huron (east) side. The facility is located along the south shore of the Tittabawassee River and south of the city of Midland. The site is adjacent to the Dow Chemical Company's (Dow) main industrial complex in Midland (located on the north side of the Tittabawassee River and due north of the plant). Within 10 miles of the plant, the 1970 estimated population was 72,706, within 5 miles, there were 48,501 residents. Circulating water for the two units is obtained from a cooling pond. The cooling pond receives make-up water from the Tittabawassee River. A map of the Midland plant site is included as Attachment 1.

Plant:

Each of the two units at the Midland plant employs a Babcock and Wilcox-designed nuclear steam supply system (NSSS) consisting of a pressurized water reactor (PWR) rated at 2468 megawatts thermal (MWt), a pressurizer, two steam generators, four reactor coolant pumps, and the associated piping required to connect these components. Attachment 2 shows the NSSS arrangement. This rated power level includes 2452 MWt generated in the core plus 16 MWt added to the NSSS by the four reactor coolant pumps. The maximum core design output (excluding pump heat) is 2552 MWt. This power level is referred to as the stretch level and is the value used in the radiological accident analyses. The Midland plant is unique in that the heat generated will be used not only to produce electrical energy but also to produce steam for the Dow Chemical Company plant. The facility's turbine generators will produce 504 megawatts electrical (MWe) from Unit 1 and 852 MWe from Unit 2. The remaining heat from Unit 1 will normally be used to produce 460 kg/s (approximately 3.6×10^6 lb/hr) at 1200 kPa gauge (175 psig) and 50 kg/s (approximately 0.4×10^6 lb/hr) at 4100 kPa gauge (600 psig) of process steam for use at the Dow plant. The process steam system is a tertiary system utilizing heat extracted from the secondary steam system of the Midland plant.

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The containment for the nuclear steam supply system (NSSS) is a post-tensioned, reinforced concrete structure with a steel liner to provide leak tightness. The containment which was designed and constructed by Bechtel Power Corporation has a design pressure of 70 psig.

The reactor cores will be loaded with 177 fuel assemblies (15x15). The core will have an average thermal output of 5.47 kw/ft (based on cold BOL data). The SSE is 0.12 g horizontal, 0.8 g vertical. The OBE is 0.06 g horizontal, 0.05 g vertical. A comparison of Midland features with those of similar plant designs is included as Attachment 3.

ADDITIONAL CONSIDERATIONS:

Midland Units 1 & 2 have a nominal finish grade elevation of +634 ft. The design high water level due to probable maximum flood, including wave run up effects is +635.5 ft. The design water level of the Tittabawassee River, cooling pond, and ultimate heat sink are +588 ft, +618 ft, and +604 ft, respectively.

ACRS REVIEW:

The ACRS reviewed Midland for a CP license in June 1970. A copy of the CP letter and supplement thereto is included as Attachments 4 & 5, respectively. In response to requests for additional information from the Atomic Safety and Licensing Board (ASLB) the ACRS wrote an additional Supplemental Report on Midland Plant Units 1 & 2, dated Nov. 18, 1976 and provided comments to the Commission Chairman in a letter dated March 16, 1977. These two letters are Attachments 6 and 7 to this status report. Supplement No. 2 to the NRC Staff's CP SER of the Midland Plant addresses the ACRS concerns identified in the second supplemental ACRS letter report dated Nov. 18, 1976. This Staff SER supplement (less the ACRS letter) is included as Attachment 8.

On April 29, 1982 an ACRS Ad Hoc Subcommittee met to discuss the remedial actions for soils-related structural settlement problems at the Midland site. The report of that Ad Hoc Subcommittee meeting is included as Attachment 9. Of particular note in this report is the Ad Hoc Subcommittee's recommendation (accepted by the full ACRS during the May Full Committee meeting) that the Midland Plant Subcommittee revew:

1. The adequacy of the seismic input criteria and

2. The seismic Site Specific Response Spectra and its relation to the proposed permanent site dewatering as a means of reducing the probability of liquefaction due to an earthquake.

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The full ACRS is tentatively scheduled to review the OL application during its June 1982 meeting.

OPEN ITEMS:

There are currently 16 open items. About half of these items are unresolved due to pending NRC Staff action/evaluation and half due to the need for additional information/evaluation from Consumers Power Company. Disagreements between the NRC Staff and the Applicant still exist on several soils settlement issues and on the need for a reactor vessel head vent. A list of the current open items is included in Attachment 10. Attachment 10 also lists the license conditions to be imposed on the applicant. For a description of each of these open items and license conditions, please see the indicated section of the NRC Staff's Safety Evaluation Report.

MEETING TENTATIVE SCHEDULE:

The meeting tentative schedule was issued May 12, 1982. It incorporated topics identified in the NRC Staff's SER, past ACRS letters (Attachments 4,5,6, and 7), the ACRS Staff's list of suggested discussion items for OL Subcommittee meetings, and items identified in consultant reports concerning Midland. The consultant reports are included as Attachment 11. Comments received from ACRS members and staff were factored into the tentative schedule as were the comments received from members of the public.

SUBCOMMITTEE ACTIONS REQUIRED:

The Subcommittee should decide if the full ACRS should review the application of Consumers Power Company for a license to operate Midland Plant Units 1 & 2 at the June ACRS full Committee meeting. If the Subcommitee decides that the full Committee should review Consumers application in June, then the topics to be discussed during the Midland portion of the June full committee meeting should be identified at the close of the Subcommittee meeting.

PUBLIC PARTICIPATION:

A member of the public (Mary Sinclair/Dr. Charles Anderson has requested an opportunity to make an oral statement regarding the soils/foundation question. Time has been made available on the schedule for this statement. In addition, Mrs. Sinclair has provided a letter, Attachment 12, for ACRS consideration.

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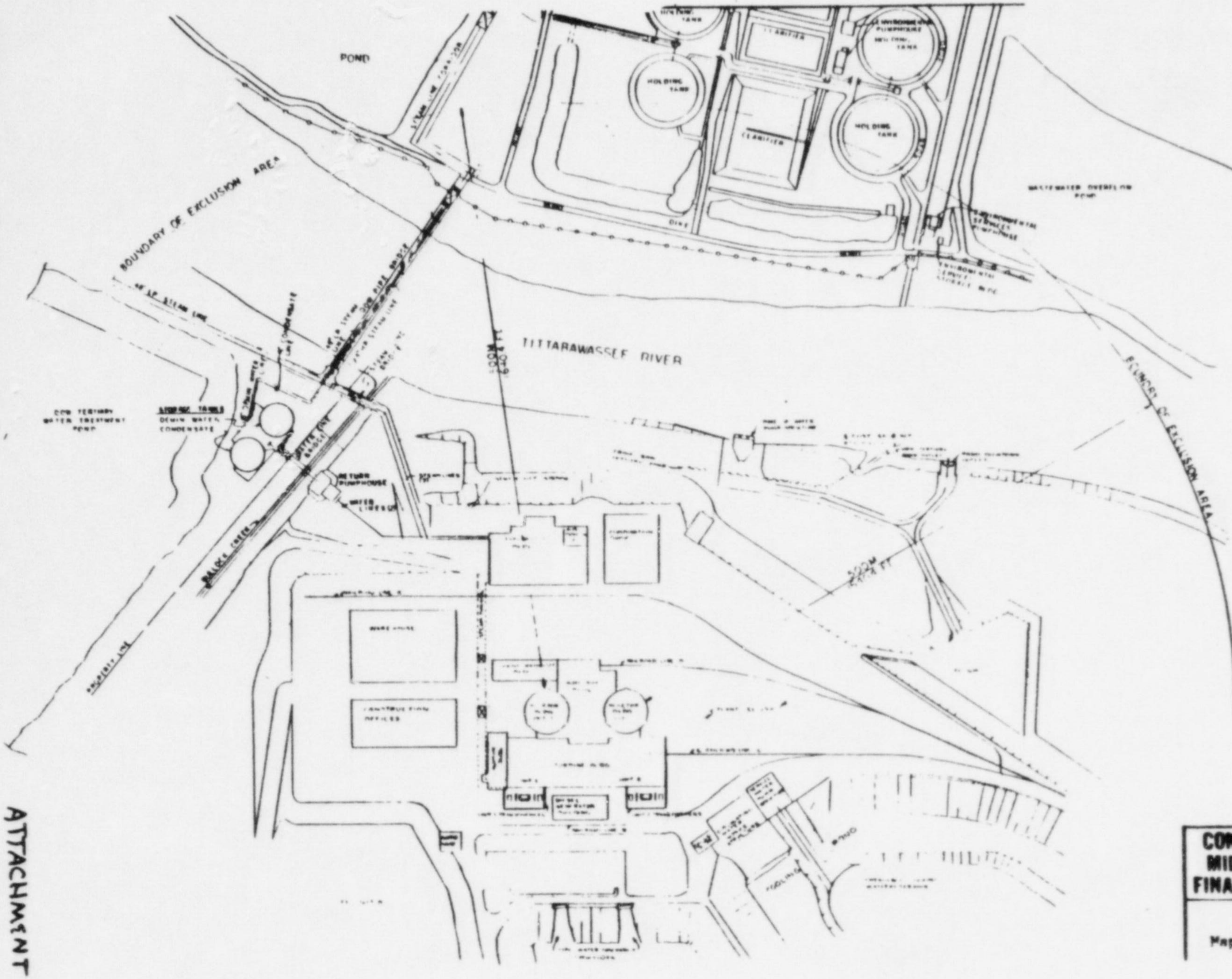
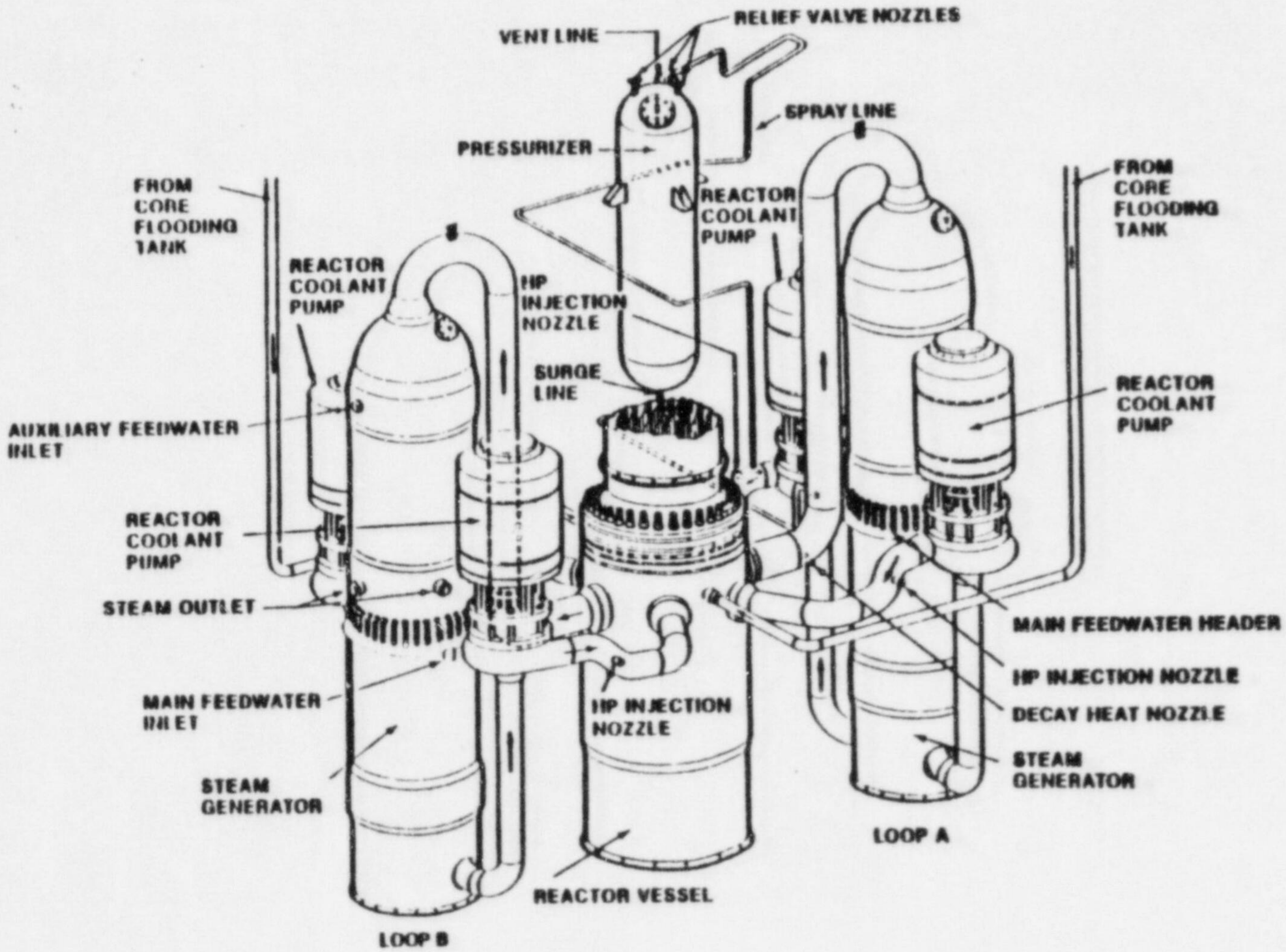


CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 & 2
FINAL SAFETY ANALYSIS REPORT

Map of Midland Plants of the
Dow Chemical Company

ATTACHMENT 1



Midland reactor coolant system

ATTACHMENT 2

TABLE 1.3-1

COMPARISON OF MIDLAND FEATURES WITH SIMILAR DESIGNS[1]

System	Midland	Rancho Seco	Oconee	Turkey Point	
Reactor and Reactor Coolant System (ref Chapters 4 and 5)					
Rated heat output (core), MWt	2,452	2,772	2,568	2,200	
Maximum overpower, %	12	12	14	12	
Reactor coolant pressure (operating), psia	2,200	2,200	2,200	2,250	32
Power distribution factors					
Heat generated in fuel and cladding, %	97.3	97.3	97.3	97.4	
$F_{\Delta h}$ (nuclear)	1.78	1.78	1.78	1.77	
DNB ratio at rated conditions	2.50	1.75(W-3)	2.0	1.81	
DNB ratio at design overpower	2.07	1.39(W-3)	1.55	-	32
Coolant flow					
Total flowrate, lb/hr x 10^6	131.3	137.8	131.3	101.5	16
Effective flow area for heat transfer, ft^2	48.9	49.17	49.19	41.8	32
Average velocity along fuel rods, ft/s	15.5	16.5	15.73	14.3	32
Coolant temperature					
Nominal inlet (vessel)	555.2	556.5	554	546.2	
Nominal outlet (vessel)	602.8	607.7	604.7	602.1	
Nominal outlet (core)	605.9	---	605.5	604.5	32
Maximum fuel temperature, °F	3,980	4,400(hotspot)	4,250	4,400(overpower)	
Heat transfer at 100% power					
Active heat transfer surface area, ft^2	49,130	49,734	49,734	42,460	
Average heat flux, Btu/hr/ft^2	166,000	185,090	171,470	171,600	32
Average thermal output, kW/ft	5.47	6.10	5.65	5.5	
Core mechanical design parameters					
Fuel assemblies	177	177	177	157	
Design	CRA canless	CRA canless	CRA canless	RCC canless	

ATTACHMENT 3

TABLE 1.3-1 (continued)

System	Midland	Rancho Seco	Oconee	Turkey Point
Rod pitch, in.	0.568	0.568	0.568	0.563
Overall dimensions, in.	8.587 sq	8.536 sq	8.536 sq	8.426 sq
Number of grids per assembly	8	8	8	7
Fuel rods				
Number	36,816	36,816	36,816	32,028
Outside diameter, in.	0.430	0.430	0.430	0.422
Clad thickness, in.	0.0265	0.0265	0.0265	0.0243
Clad material	Zircaloy-4	Zircaloy-4	Zircaloy-4	Zircaloy
Fuel pellets				
Material	UO_2, sintered	UO_2, sintered	UO_2, sintered	UO_2, sintered
Density, % of theoretical	95.0	92.5	93.5	94,93,92
Diameter, in.	0.3686	0.370	0.370	0.3659,0.3659,0.3649
Control rod assemblies (CRA)				
Neutron absorber	5%Cd-15%In-80%Ag	5%Cd-15%In-80%Ag	5%Cd-15%In-80%Ag	5%Cd-15%In-80%Ag
Cladding material	304SS-cold worked	304SS-cold worked	304SS-cold worked	304SS-cold worked
Clad thickness, in.	0.021	0.021	0.021	0.019
Number of assemblies	61	61	61	53
Number of control rods per assembly	16	16	16	20
Burnable poison rod assemblies (BPRA)	68	68	68	68
Nuclear Design Data				
Structural characteristics				
Fuel weight as UO_2, lb	93.1 metric tons	204,820	207,486	176,000
Core diameter, in. (equivalent)	128.9	128.9	128.9	119.5
Core height, in. (active fuel)	141.8	144	144	144
Performance characteristics				
Loading technique	3 region	3 region	3 region	3 region
Fuel discharge burnup, MWd/mtU				
average first cycle	13,746	14,250	14,250	13,000
equilibrium core average	27,789	---	---	24,500

Revision bars in right margin: 33 (fuel pellet density/diameter), 33 (core height), 32 (fuel discharge burnup).

(sheet 2)
Revision 33
4/81

TABLE 1.3-1 (continued)

System	Midland	Rancho Seco	Oconee	Turkey Point
Control characteristics				
Effective multiplication (BOL)				
Cold, zero power, clean, no burnable poison	1.24	1.252	1.248	1.180
Hot, zero power, clean, no burnable poison	1.19	1.19	1.198	1.138
Hot, rated power, equilibrium Xe, with burnable poison	1.11	1.12	1.134	1.077
Boron concentrations				
To shutdown with rods inserted, clean, cold/hot, ppm	1,143/641	1,099/605	992/493	780/510
Boron worth, hot, %(Δk/k)/ppm	1/96	1/100	1/100	7.3/---
Boron worth, cold, %(Δk/k)/ppm	1/74	1/75	1/75	5.6/---
Principal design parameters of the reactor coolant system				
System heat output, MWt	2,468	2,772	2,584	2,200
Operating pressure, psig	2,185	2,185	2,185	2,235
Reactor inlet temperature, °F	555.2	556.5	554	546.2
Reactor outlet temperature, °F	602.8	607.7	604	602.1
Number of loops	2	2	2	3
Design pressure, psig	2,500	2,500	2,500	2,485
Design temperature, °F	650	650	650	650
Hydro test pressure (cold), psig	3,125	3,125	3,125	3,107
Principal design parameters of reactor vessel				
Material	SA-533 Gr B, 18-8SS clad	SA-533, Gr B 18-8SS clad	SA-533, Gr B, 18-8SS clad	SA-302 Gr B, low alloy steel, internally clad with SS
Design pressure, psig	2,500	2,500	2,500	2,485
Design temperature, °F	650	650	650	650
Operating pressure, psig	2,185	2,185	2,185	2,235
Inside diameter of shell, in.	171	171	171	155.5
Overall height of vessel and closure head (over CRD nozzles), ft-in.	40/8-7/8	40/8-3/4	40/8-3/4	41/6

TABLE 1.3-1 (continued)

System	Midland	Rancho Seco	Oconee	Turkey Point
Minimum clad thickness, in.	1/8	1/8	1/8	5/32
Principal design parameters of the steam generators				
Number of units per reactor	2	2	2	3
Type	Vertical, once-through, integral superheater, straight-tube	Vertical, once-through, integral superheater, straight-tube	Vertical, once-through, integral superheater, straight-tube	Vertical U-tube, integral moisture separator
Tubeside design pressure, psig	2,500	2,500	2,500	2,485
Tubeside design temperature, °F	650	650	650	650
Shell side design pressure, psig	1,050	1,050	1,050	1,085
Shell side design temperature, °F	600	600	600	556
Operating pressure				
Tubeside, psig	2,185	2,185	2,185	2,235
Shell side, psig	910	910	910	1,020
Hydrostatic test pressure, cold, tubeside, psig	3,125	3,125	3,125	3,107
Principal design parameters of reactor coolant pumps				
Number of pumps	4	4	4	3
Type	Vertical, single stage	Vertical, single stage	Vertical, single stage	Vertical, single stage
Design pressure, psig	2,500	2,500	2,500	2,485
Design temperature, °F	650	650	650	650
Design capacity, gpm	88,000	92,400	88,000	89,500
Design total developed head, ft	327	362	396	260
Hydrostatic test pressure (cold), psig	3,125	---	---	3,107
Motor type	ac, induction, single speed	ac, induction, single speed	ac, induction, single speed	ac, induction, single speed
Motor rating, hp	9,000	10,000	9,000	6,000
Reactor coolant piping				
Hot leg (id.) in.	36	36	36	29
Cold leg (id.) in.	28	28	28	27-1/2

TABLE 1.3-1 (continued)

System	Midland	Rancho Seco	Oconee	Turkey Point	
Engineered Safety Features (ref Chapter 6)					
Safety injection system					
Number of high head pumps	3	3	3	4 (shared)	
Capacity each, gpm/ft	250/6,000	300/5,850	250/5,900	300/2,700	15
Number of low head pumps	2	2	2	2	
Capacity each, gpm/ft	3,000/370	3,000/350	3,000/350	3,750/240	
Containment coolers					
Type	Fan coolers	Fan coolers	Fan coolers	Fan coolers	
Number of units	4	4	3	3	
Capacity, Btu/hr each, at accident	50×10^6	60×10^6	80×10^6	60×10^6	
Core flooding system					
Number of tanks	2	2	2	3	
Total water volume, each ft^3	1,040	1,040	1,040	1,200 (total volume) 775 water vol min	
Containment spray					
Number of pumps	2	2	2	2	
Capacity, each, gpm	1,300	1,500	1,500	1,450	13
Spray additive for iodine removal	N_2H_4	NaOH	None	None	
Emergency power					
Type	Diesel	Diesel	Various	Diesel	
Quantity	2/5,250kW each continuous	2/2,600kW each continuous	7 sources of significant capacity	2/2,500kW each continuous	
Power Conversion System (ref Chapter 10)[1]					
Turbine-generator	Unit 2 / Unit 1				
Gross generator output, MW	Unit 2: 852; Unit 1: 504.8,[2] 595.2[3]	850	847	728	1
Cylinders, high-pressure, low-pressure	Unit 2: 1 hp, 2 lp; Unit 1: 1 hp, 1 lp	1 hp, 2 lp	1 hp, 3 lp	1 hp, 3 lp	

TABLE 1.3-1 (continued)

System	Midland		Rancho Seco	Oconee	Turkey Point
Steam conditions at throttle valve					
Flow, 10^6 lb/hr	9.77	9.62	10.77	11.17	8.97
Pressure, psia	900	900	900	900	745
Temperature, °F	566.4	566.4	595	568.8	510
Moisture content, %	0	0	0	0	0.25
Steam flow to Dow Chemical					
Pressure, psig hp/lp	-/-	632/198(4)	-	-	-
Flow, lb/hr hp/lp	-/-	400,000/3.65×10^6(2)	-	-	-
	-/-	6.84×10^5/1.8×10^6(3)			
Turbine cycle arrangement					
Steam reheat stages, no.	2	2	2	2	1
Feedwater heating stages, no.	5	5	6	6	6
Strings of feedwater heaters, no.	2	2	2	2	2
Heaters in condenser necks, number	2	2	0	1	2
Heater drain system	Deaerator cycle	Deaerator cycle	Cascade	Pumped forward	Pumped forward
Number of condensate pumps	2	2	3	3	2
Number of condensate booster pumps	2	2	0	3	0
Number of main feedwater pumps	2	2	2	2	2
Number of auxiliary feedwater pumps	2 1-turbine 1-motor	2 1-turbine 1-motor	2 1-turbine 1-motor	1 with interties to other 2 units - turbine driven	3-turbine
Capacity, each, gpm	885	885	840	7-1/2% full feedwater capacity	600

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TABLE 1.3-1 (continued)

System	Midland		Rancho Seco	Oconee	Turkey Point
Main steam turbine bypass capacity, %	15%	15%	15%	25%	40%
Final feedwater temperature °F at mgl	430	430	471	460	436
Condenser					
Type	Dual pressure	Single pressure	Dual pressure	-	Single pressure
Condenser shells	2	1	2	-	2
Design pressure Hg abs hp/lp	4.07/2.77	2.83	2.5 average	-	2.5
Total condenser duty, Btu/hr x 10^9	5.51	2.14	6.24	-	5.02
Circulating water system	Cooling pond	Cooling pond	Cooling tower (hyperbolic)	Once through Lake Keowee	Once through Biscayne Bay
Circulating water pumps	2/Unit 2	2/Unit 1	4/Unit	4/Unit	2/Unit
Flow, gpm x 10^5/unit	2.64	3.90	4.47	7.08	3.12
Ultimate heat sink	Cooling pond	Cooling pond	Spray pond	Lake Keowee	Biscayne Bay
Service water pumps, no.	2/Unit 2 (Plus one common spare for Units 1&2)	2/Unit 1	2/Unit	3 shared	3 shared
Flow, gpm/each pump	21,000	21,000	16,000	15,000	16,000
Radioactive Waste Management Systems (ref Chapter 11)					| 32
Liquid radwaste treatment	Degasified, filtered, demineralized, evaporated		Degasified, filtered, demineralized, evaporated	Degasified, evaporated	Degasified, demineralized evaporated

TABLE 1.3-1 (continued)

System	Midland	Rancho Seco	Oconee	Turkey Point
Evaporators, waste capacity, gpm	30	30	10 approx	20
Quantity	1	1	1	1
Demineralizers, waste capacity, gpm	150	150	None	1,000 gal. batch @ 2 gpm
Quantity	2	2	-	1
Gaseous radwaste treatment	Holdup tanks for decay, charcoal, and HEPA filters	Holdup tanks for decay, charcoal, and HEPA filters	Holdup tanks for decay, prefilter, absolute, and charcoal filters	Holdup tanks for decay, monitored, released to atmosphere
Holdup Tanks				
Quantity	6	4	2	6
Capacity, cubic ft (each)	390	490	1,100	525
Solid radwaste treatment				
Containers	55 gallon drum	55 gallon drum	55 gallon drum	55 gallon drum
Containment (ref Subsection 6.2.1				
Type	Steel lined, prestressed, post-tensioned concrete cylinder with curved dome roof	Steel lined, prestressed, post-tensioned concrete cylinder with curved dome roof	Steel lined, prestressed, post-tensioned concrete cylinder with curved dome roof	Steel lined, prestressed, post-tensioned concrete cylinder with curved dome roof
Leak rate, %/day	0.1	0.1	0.25	0.25
Design pressure, psig	70	59	59	49.9
Free volume, ft^3 x10^6	1.67	1.98	1.91	1.55
Cylinder inner diameter, ft	116	130	116	116
Inside height, ft	193	185	208-1/2	169

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TABLE 1.3-1 (continued)

System	Midland	Rancho Seco	Oconee	Turkey Point
Structural Design Requirements (ref Section 3.8)				
Operating basis earthquake (horiz g)	.06	0.13	0.05	0.05
Safe shutdown earthquake (horiz g)	.12	0.25	0.10	0.15
Vertical seismic ground motion (% of horizontal)	67	68	-	66
Maximum sustained wind, mph	85	90	95	145
Tornadoes, mph	360 max	-	300	225
Electrical Systems (ref Chapter 8)[4]				
Number of offsite circuits	2	5	12	(4 from 2 nuc units, 3 from fossil fuel) 32
Number of auxiliary power sources	2-startup transformers (shared) 2-unit aux transformers	2-startup transformers 1-unit aux transformer	1-startup transformer 1-unit aux transformer	1-startup transformer 1-unit aux transformer
Number of preferred power to ESF buses	2	2	-	2
Number of 4.16kV ESF buses/unit (4kV)	2	2	3	2
Number of Class 1E 125Vdc systems supplying buses/unit	2	4	2	2
Number of Class 1E 120Vac preferred buses/unit	4	4	4	4 32
Sharing of standby power	none	none	none	none
Fuel Handling Equipment and Facilities (ref Section 9.1)				
Reactor building crane				
Type	polar	polar	polar	polar
Capacity, tons	190 main, 25 aux	180	-	135 main, 35 aux

TABLE 1.3-1 (continued)

System	Midland	Rancho Seco	Oconee	Turkey Point	
Transfer tubes/unit					
Number	1	2	2	1	
Capacity	dual	dual	dual	single	
Spent fuel storage					
Capacity (number of fuel assemblies)	1,049	242	336	217	15
New fuel storage					
Type					
Wet or dry storage	Dry	Dry	Wet	Wet	
Capacity/unit	66	20	168 (new & spent)	53	32
Cask handling crane					
Type	Double girder bridge	Gantry crane	Double girder bridge	Double girder bridge and trolley	
Capacity, tons	125 main, 15 aux	185 main, 35 aux cask weight = 100	100	105 main, 15 auxiliary	

[1]Midland data given for Unit 2, unless Unit 1 data given in addition. All data for other plants given on per unit basis.

[2]Design steam flow to Dow at rated reactor power. High-pressure process steam flow may exceed 400,000 lb/hr, up to a maximum of 800,000 lb/hr, when low-pressure process steam production is less than 3,650,000 lb/hr. 32

[3]Based on maximum calculated electrical production at 2,468MWt with a minimum corresponding steam flow to Dow.

[4]Represents total incoming and outgoing circuits.

[5]Data on plants other than Midland not maintained current after August 1977. 32