

The World's Reactors no.77

GRAND GULF

OWNER OPERATOR
Middle South Energy Inc./Mississippi Power and Light

MAIN CONTRACTORS
Bechtel Power Corp (Architect Engineer), General Electric (NSSS)

LOCATION
Near Port Gibson, 60 miles south west of Jackson, Mississippi, USA

TYPE
Two units equipped with boiling water reactor (BWR/6) nuclear steam supply systems, incorporating Mark III Containment.

SCHEDULE	Unit 1	Unit 2
Commence construction	April 1974	April 1974
Commercial operation	February 1982	April 1986

TECHNICAL DATA
All data listed below refers to one reactor-turbine unit, the values for each of the two units being identical.

POWER	
Net electrical output	1254 MW(e)
Gross electrical output	1306 MW(e)
Gross thermal output	Rated 3833 MW(th)
	Maximum 3996 MW(th)

REACTOR CORE	
Thermal output at max. overpower	13.4kW/ft (44 kW/m)
Core diameter (equivalent)	191.5in (4.86 m)
Core height (active)	150in (3.81 m)
Number of fuel assemblies	800
Fuel pin lattice pitch	636 inches (16.15m)
Average heat flux	160 200 Btu/h ft ² (50.53W/cm ²)
Maximum heat flux	362 000 Btu/h ft ² (114.2W/cm ²)
Weight of fuel as UO ₂	365 618 lb (166 t)

FUEL ASSEMBLIES	
Number in core	800
Fuel material	UO ₂
Pellet diameter	0.410 in (10.414mm)
Clad material	Zircaloy 2
Clad thickness	0.032 in (0.813mm)
Pin diameter	0.483 in (12.268mm)
Number of fuel/water rods per assembly	62/2
Maximum fuel central temperature	3430°F (1888°C)
Initial average U-235 enrichment	1.7 % w/t
Fuel average discharge exposure	25 800 MWd/short ton (28 450 MWd/t)

CONTROL RODS	
Neutron absorber	B,C granules
Cladding material	Stainless steel type 304
Number in core	193
Shape	Cruciform
Overall length	174 in (4.42m)
Length of poison section	144 in (3.66m)

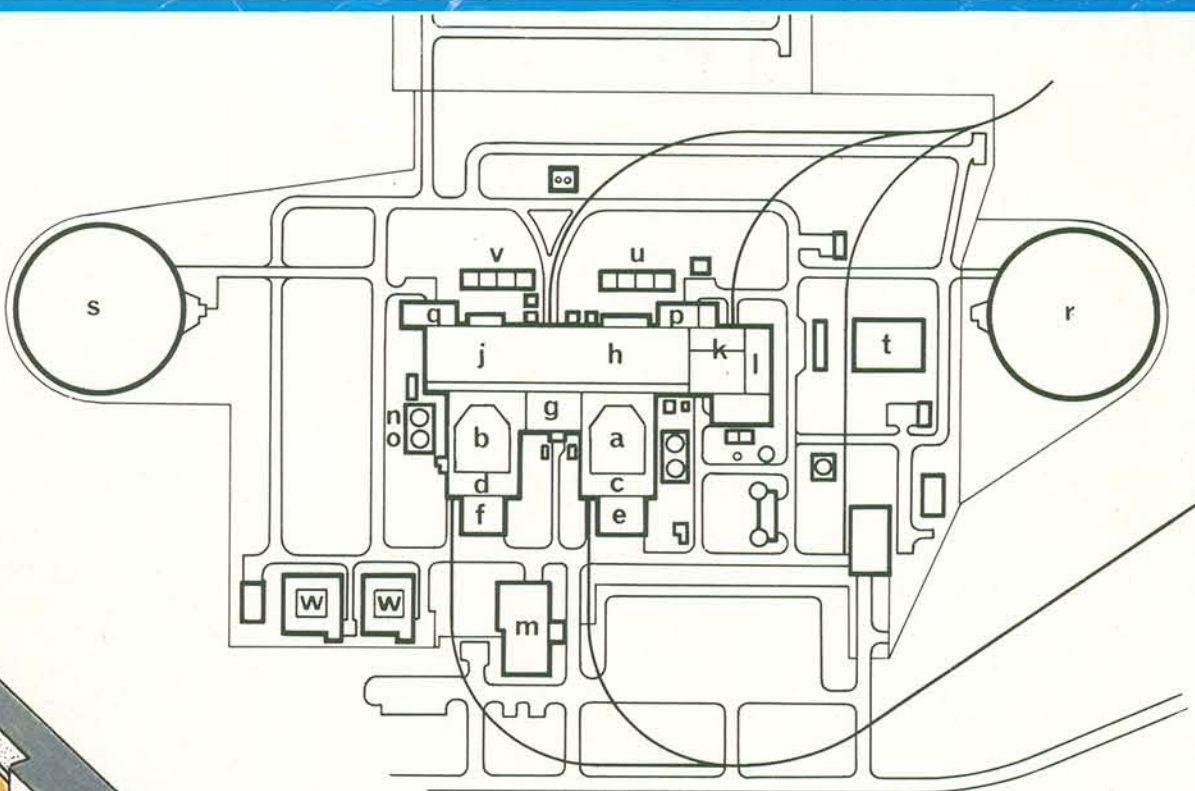
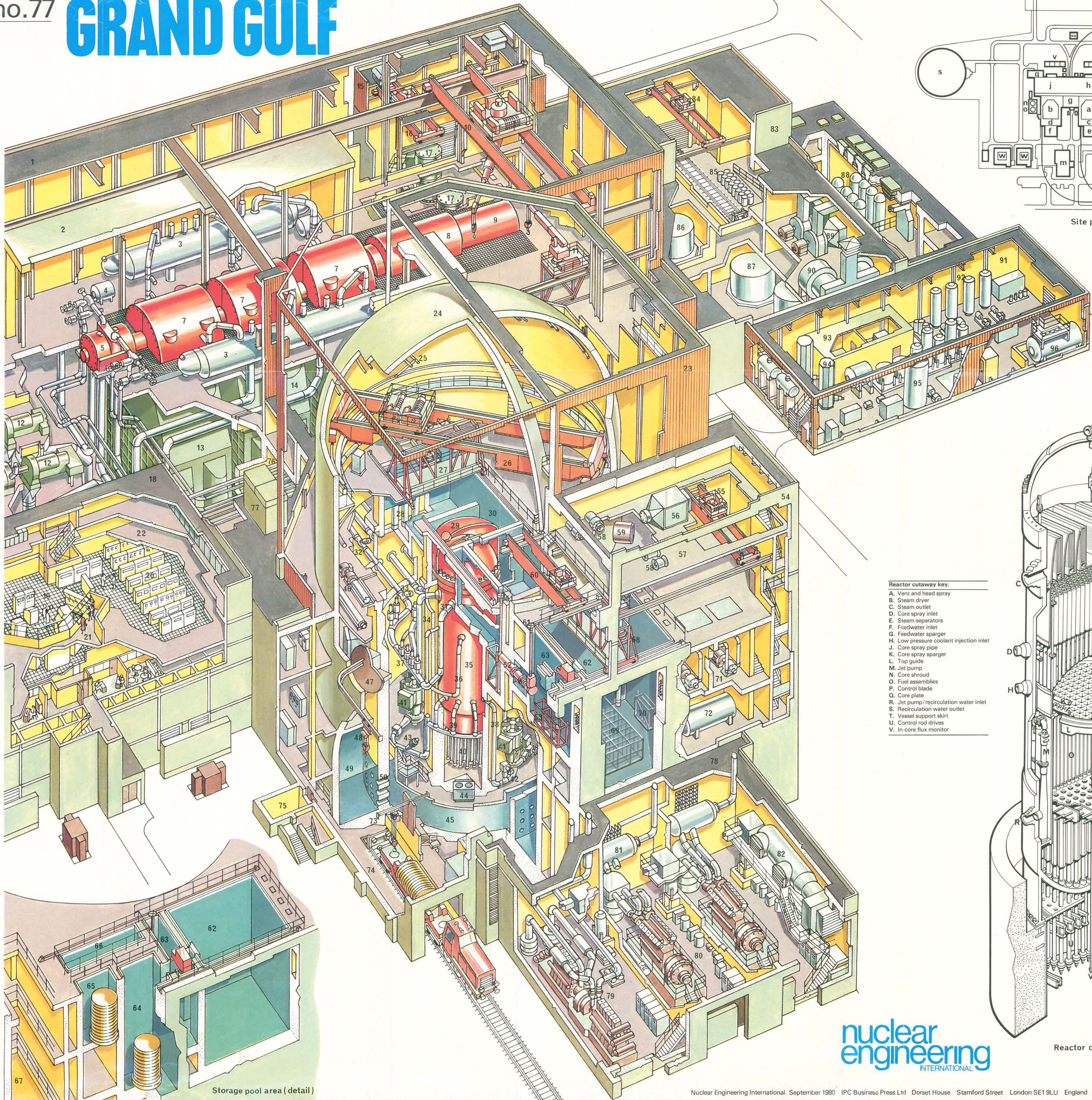
PRIMARY COOLANT SYSTEM	
Type: Forced circulation, two primary loops, two recirculating loops	
Operating pressure	1040 lb/in ² abs (71.7 bar)
Reactor inlet temperature	533°F (278°C)
Reactor outlet temperature	551°F (289°C)
Total core flow	113.5 x 10 ⁶ lb/h (30 754 t/h)
Coolant pumps	2

REACTOR PRESSURE VESSEL	
Material: Low alloy steel: stainless steel cladding	
Inside diameter	251in (6.38m)
Inside height	72ft 2in (22.2m)
Wall thickness (core region)	8.4in (213mm)
Design pressure	1250lb/in ² (g) (86 bar)
Design temperature	575°F (302°C)

CONTAINMENT BUILDING	
Type: Cylindrical, with hemispherical head; reinforced concrete, steel-lined	
Pressure suppression: water pool	
Design pressure	15lb/in ² (g) (1.05kg/m ²)
Free air volume	1.67 x 10 ⁶ ft ³
Inside diameter (steel vessel)	124ft (37.8m)
Inside height (steel vessel)	206ft 9in (63m) to underside of dome

TURBOGENERATOR	
Rating	1525 MVA at 0.9p.f.
Speed	1800 rev/min
T.s.v. pressure	965 lb/in ² (69.25kg/cm ²)
T.s.v. temperature	540°F (282°C)
Turbine configuration:	1h.p. 3 l.p. double-flow; tandem compound; multiple pressure condenser

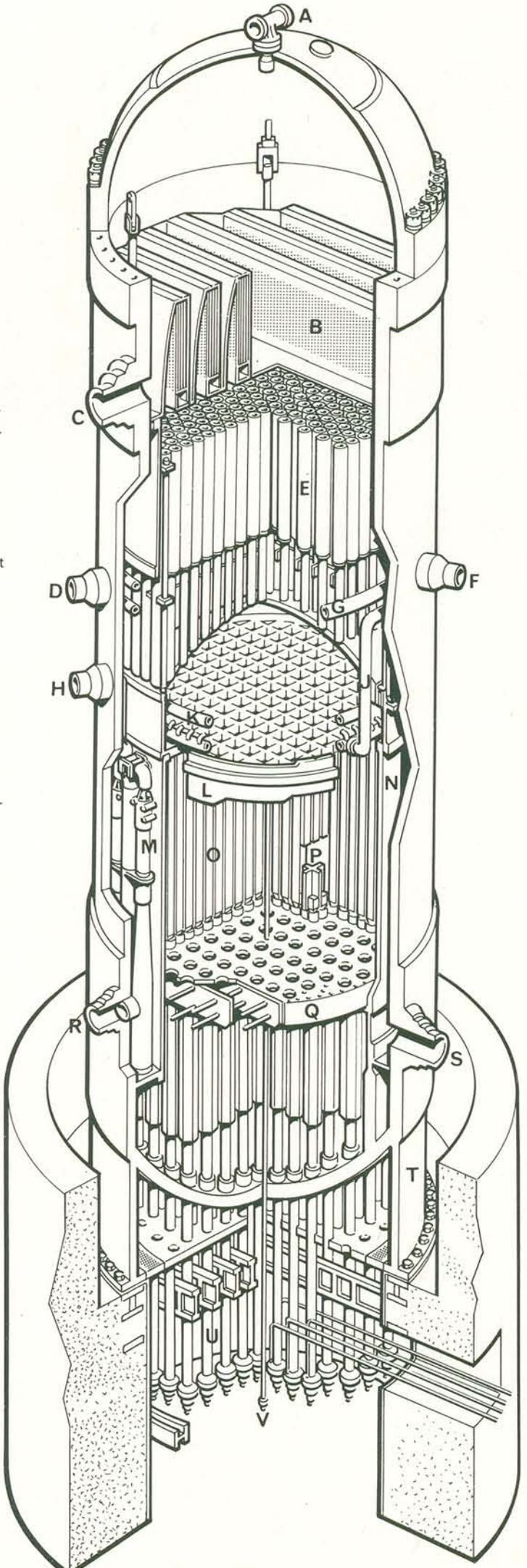
Power station cutaway key.	
1. Turbine building no.1	49. Pressure suppression pool
2. Moisture separator/reheater shield roof	50. Pool vents
3. Moisture separator/reheater	51. Containment fuel transfer valve
4. 2nd stage heater drain tanks	52. Fuel transfer tube
5. High pressure turbine	53. Fuel transfer table upender
6. Main steam stop and control valves	54. Auxiliary building
7. Low pressure turbines	55. Spent fuel 150 ton crane
8. Generator	56. Fan coil unit
9. Exciter	57. Fuel handling area
10. Turbine building 250 ton crane	58. Exhaust fans
11. Turbine building gantry crane	59. Containment personnel hatch
12. Reactor feed pump turbines	60. New fuel 5 ton crane
13. High pressure condenser	61. Fuel transfer canal valve
14. Intermediate pressure condenser	62. Spent fuel pool
15. Circulating water pump house	63. Fuel transfer canal
16. Pump house crane	64. Shipping cask storage pool
17. Circulating water pumps	65. Cask wash-down area
18. Control building	66. New fuel storage vault
19. Control room	67. Spent fuel cask loading area
20. Control cabinets	68. Fuel handling platform
21. Visitors' viewing gallery	69. Spent fuel racks
22. Upper cable spreading room	70. Channel storage racks
23. Reactor enclosure building	71. Fuel pool filter demineralizers
24. Reactor containment	72. Backwash receiving tank
25. Containment spray piping	73. Cask loading area monorail
26. Reactor building 125 ton polar crane	74. Cask loading bay
27. Refuelling platform	75. Freight elevator
28. Reactor water clean-up heat exchangers	76. Main steam tunnel
29. Dry well head	77. Blow-out shaft
30. Upper containment pool	78. Diesel generator building
31. Main steam outlets	79. High pressure core spray diesel generator
32. Outer main steam isolation valves	80. Standby diesel generators
33. Inner main steam isolation valves	81. Exhaust system
34. Reactor shield wall	82. Outside air fans
35. Reactor	83. Radwaste building
36. Feedwater pipes	84. Radwaste handling crane
37. Main steam safety relief valves	85. Drum preparation area
38. Recirculation pump suction piping	86. Reactor water clean-up decay tanks
39. Recirculation discharge piping	87. Waste storage tanks
40. Control rod drives	88. Charcoal absorbers
41. Reactor recirculation pumps	89. Fan units
42. Recirculation loop suction valve	90. Filter units
43. Recirculation loop shut-off valve	91. Water treatment building
44. Drywell cooler	92. Air receivers
45. Weir wall	93. Laboratory
46. Containment cooling system charcoal filters	94. Auxiliary boilers
47. Equipment hatch	95. Domestic water
48. Equipment hatch monorail	96. Caustic storage tank



Site plan

Site plan key.
a. Reactor building no.1
b. Reactor building no.2
c. Auxiliary building no.1
d. Auxiliary building no.2
e. Diesel generator building no.1
f. Diesel generator building no.2
g. Control building
h. Turbine building no.1
i. Turbine building no.2
j. Radwaste building no.1
k. Water treatment building
l. Administration building
m. Condensate storage tank
n. Refuelling water storage water tank
o. Circulating water pumphouse no.1
p. Circulating water pumphouse no.2
q. Cooling tower unit 1
r. Cooling tower unit 2
s. Low volume waste water basin
t. Main transformers unit 1
u. Main transformers unit 2
v. Standby service water cooling towers and pumps

Reactor cutaway key.
A. Vent and head spray
B. Steam dryer
C. Steam outlet
D. Core spray inlet
E. Steam separators
F. Feedwater inlet
G. Feedwater sparger
H. Low pressure coolant injection inlet
J. Core spray pipe
K. Core spray sparger
L. Top guide
M. Jet pump
N. Core shroud
O. Fuel assemblies
P. Control blade
Q. Core plate
R. Jet pump/recirculation water inlet
S. Recirculation water outlet
T. Vessel support skirt
U. Control rod drives
V. In-core flux monitor



Reactor cutaway

nuclear
engineering
INTERNATIONAL