PNPP-1

The World's reactors No. 81

Philippine nuclear power plant unit No 1

Owner/Operator:	The National Power Corporation of the Philippines
Site:	Napot Point, Bataan Peninsula Luzon, the Philippines
Type:	Pressurized water reactor two-loops
Schedule:	Start of construction: March 1976 Commercial operation: January 1985
Contracts	
Lead architect-engineer	Burns and Roe
Project management	Westinghouse Electric
Nuclear steam supply system	Westinghouse Electric
Turbine generator	Westinghouse Electric
Power	
Net electrical output	621 MWe nominal
Gross thermal output	1876 MWt
Reactor Core	
Fuel material	Cylindrical UO_2 pellets
Core diameter (equivalent)	2.46 m (96.9 in)
Pellet diameter	8.2 mm (0.323 in)
Pin diameter	9.5 mm (0.374 in)
Clad thickness	0.572 mm (0.023 in)
Clad material	Zircaloy 4
Linear fuel rating	17.6 kW/m
Feed enrichment	2.1, 2.6, 3.1 per cent
Fuel discharge burn-up (average)	24 000 MWd/t
Reactivity Control	
Control rods: Number – Full length	33
– Neutron absorber	Hafnium
– Cladding material	S.S. Type 304
Fuel	Burnable poison rods
Moderator	Chemical shim
Primary Coolant System	
Type	Forced circulation
Operating pressure	158 kg/cm^2 (2250 lb/in^2)
Reactor inlet temperature	287.5°C (549.5°F)
Reactor outlet temperature	324.4°C (615.9°F)
Coolant pumps: Number	2
Type	Mixed flow
Total reactor flow	86 x 10^6 Kg/h (1.89 x 10^6 lb/h)
Reactor Pressure Vessel	
Inside diameter	3.35 m (137 in)
Inside height	11.2 m (441 in)
Wall thickness (core region)	168 mm (6.63 in)
Material	SA 533
Design pressure	174.7 kg/cm^{2}g (2485 lb/in^2)
Design temperature	343.3°C (650°F)
Containment	
Type	Steel, inside concrete shield building
Pressure suppression	Containment spray system
Emergency cooling	Containment spray system Containment fan cooler system Emergency core cooling system
Design pressure	3.15 kg/cm^2 (44.8 lb/in^2)
Inside diameter	32.0 m (1260 in)
Inside height	70.1 m (2760 in)
Steam generators	
Type	Vertical U-tube
Number	2
Tube material	Inconel
Turbine generator sets	
Type	Tandem compound 4-flow
Speed	1800 rev/min
Rating	653 MWe
Generator cooling: Stator	Water
Rotor	Hydrogen
TSV pressure	62.3 kg/cm^2 (890 lb/in^2)
TSV temperature	277°C (530.6°F)

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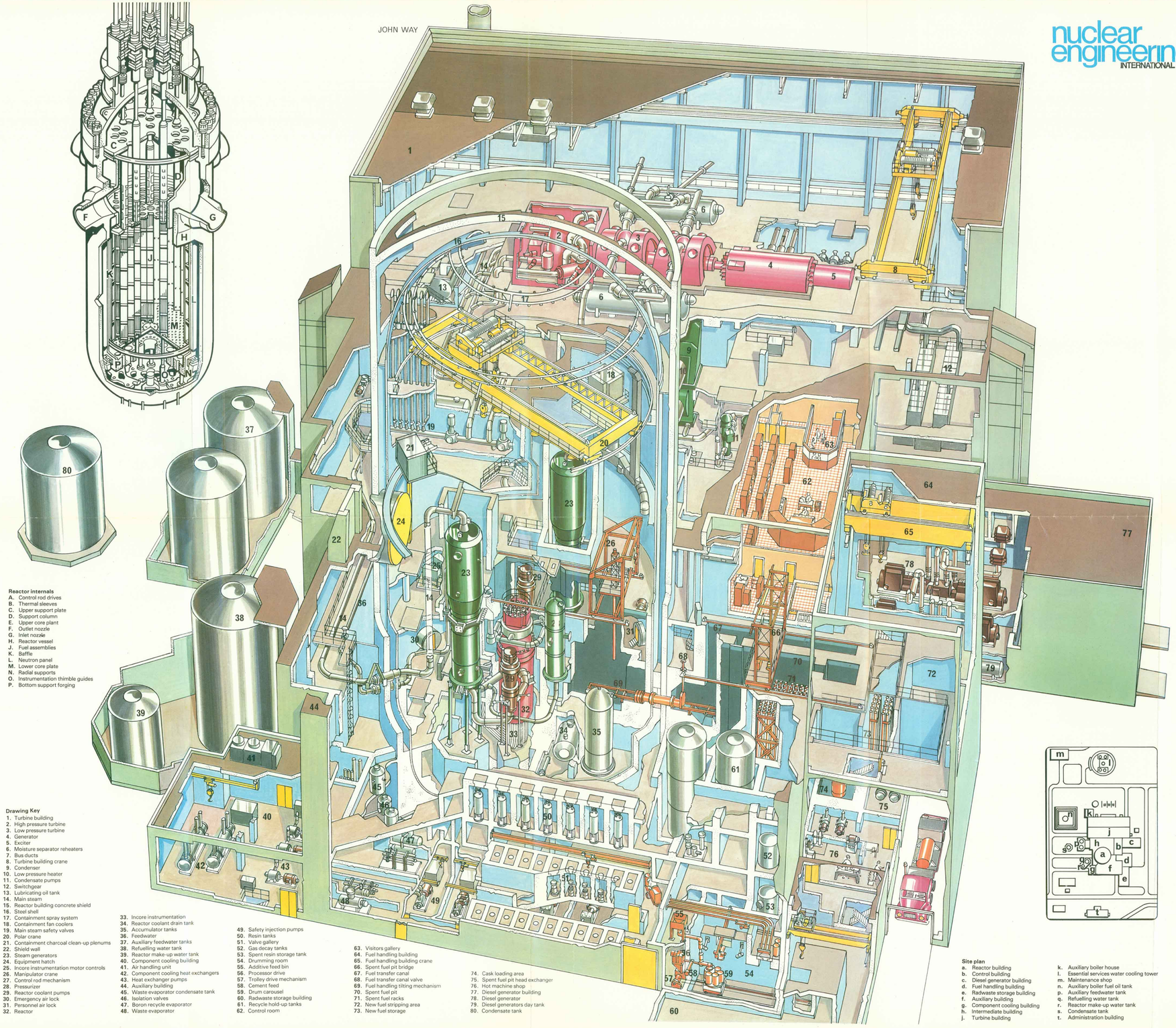

Reactor internals
- A. Control rod drives
- B. Thermal sleeves
- C. Upper support plate
- D. Support column
- E. Upper core plant
- F. Outlet nozzle
- G. Inlet nozzle
- H. Reactor vessel
- J. Fuel assemblies
- K. Baffle
- L. Neutron panel
- M. Lower core plate
- N. Radial supports
- O. Instrumentation thimble guides
- P. Bottom support forging

Drawing Key
1. Turbine building
2. High pressure turbine
3. Low pressure turbine
4. Generator
5. Exciter
6. Moisture separator reheaters
7. Bus ducts
8. Turbine building crane
9. Condenser
10. Low pressure heater
11. Condensate pumps
12. Switchgear
13. Lubricating oil tank
14. Main steam
15. Reactor building concrete shield
16. Steel shell
17. Containment spray system
18. Containment fan coolers
19. Main steam safety valves
20. Polar crane
21. Containment charcoal clean-up plenums
22. Shield wall
23. Steam generators
24. Equipment hatch
25. Incore instrumentation motor controls
26. Manipulator crane
27. Control rod mechanism
28. Pressurizer
29. Reactor coolant pumps
30. Emergency air lock
31. Personnel air lock
32. Reactor
33. Incore instrumentation
34. Reactor coolant drain tank
35. Accumulator tanks
36. Feedwater
37. Auxiliary feedwater tanks
38. Refuelling water tank
39. Reactor make-up water tank
40. Component cooling building
41. Air handling unit
42. Component cooling heat exchangers
43. Heat exchanger pumps
44. Auxiliary building
45. Waste evaporator condensate tank
46. Isolation valves
47. Boron recycle evaporator
48. Waste evaporator
49. Safety injection pumps
50. Resin tanks
51. Valve gallery
52. Gas decay tanks
53. Spent resin storage tank
54. Drumming room
55. Additive feed bin
56. Processor drive
57. Trolley drive mechanism
58. Cement feed
59. Drum carousel
60. Radwaste storage building
61. Recycle hold-up tanks
62. Control room
63. Visitors gallery
64. Fuel handling building
65. Fuel handling building crane
66. Spent fuel pit bridge
67. Fuel transfer canal
68. Fuel transfer canal valve
69. Fuel handling tilting mechanism
70. Spent fuel pit
71. Spent fuel racks
72. New fuel stripping area
73. New fuel storage
74. Cask loading area
75. Spent fuel pit head exchanger
76. Hot machine shop
77. Diesel generator building
78. Diesel generator
79. Diesel generators day tank
80. Condensate tank

Site plan
- a. Reactor building
- b. Control building
- c. Diesel generator building
- d. Fuel handling building
- e. Radwaste storage building
- f. Auxiliary building
- g. Component cooling building
- h. Intermediate building
- j. Turbine building
- k. Auxiliary boiler house
- l. Essential services water cooling tower
- m. Maintenance shop
- n. Auxiliary boiler fuel oil tank
- p. Auxiliary feedwater tank
- q. Refuelling water tank
- r. Reactor make-up water tank
- s. Condensate tank
- t. Administration building