

The World's Reactors No.47 HARTLEPOOL

HARTLEPOOL NUCLEAR POWER STATION

DESIGNER AND CONTRACTOR
British Nuclear Design & Construction Ltd., Wilsstone.

OWNER OPERATOR
Central Electricity Generating Board.

LOCATION
Hartlepool, County Durham, England.

TYPE
Advanced Gas-cooled Reactor.

CONSTRUCTION SCHEDULE
Site work started: October 1968
Full power operation (1st Unit): 1973

CAPACITY
Gross electrical output: 2 x 666 MW(e)
Net electrical output: 2 x 625 MW(e)
Net thermal efficiency: 41.65%

FUEL ELEMENT
Material: Hollow UO₂ pellets, stainless steel clad
Type: 36 pin cluster in graphite sleeve
Pin diameter (Pellet O.D.): 0.57" (14.48 mm)
Inner sleeve diameter: 7.5" (191 mm)
Element length: 41" (1,041 mm)
Number of elements per channel: 8
Enrichment:
Inner zone: first charge: 1.4%, feed 2.1%
Outer zone: first charge: 1.6%, feed 2.6%

CORE
Moderator and reflector material: Graphite
Mean diameter of active core: 30.5 ft (9.3 m)
Active core height, cold: 27 ft (8.2 m)
Diameter of fuel channel: 10.625 in (269.9 mm)
Number of fuel channels: 324
Diameter of control rod channel: 4.5 in (114 mm)
Number of control rod channels: 81
Lattice pitch (square): 18.0 in (457.2 mm)

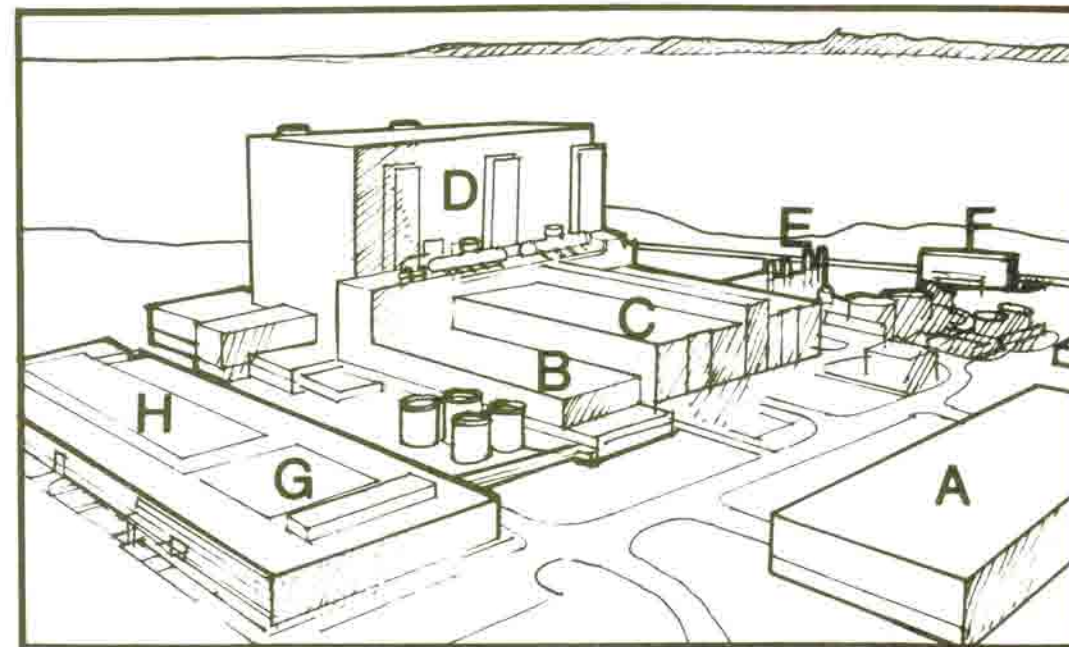
REACTOR
Reactor heat: 1 500 MW(t)
Reactor gas inlet temperature: 285°C
Mean channel gas inlet temperature: 317°C
Mean channel gas outlet temperature: 648°C
Total gas mass flow at reactor outlet: 7 587 lb/sec (3 623 kg/sec)
Reactor coolant: CO₂
Weight of uranium: 120 tonnes per reactor
Mean fuel rating including graphite heat: 12.5 MW(t)/TeU
Discharge irradiation: 18 000 MWd/TeU

PRESSURE VESSEL
Material: Concrete, re-inforced and pre-stressed, lined with mild steel
Internal diameter: 43 ft (13.1 m)
Internal height: 60 ft (18.3 m)
External diameter: 85 ft (25.9 m)
External height: 96 ft (29.3 m)
Design gas pressure: 644 psig (45.3 kg/cm²)

CIRCULATORS
Type: Centrifugal with integrated canned motor
Drive: Constant speed electrical motor
Flow control: Variable guide vane
Speed: 2 370 rev/min
Gas pressure at circulator outlet: 600 psia (42.2 kg/cm²abs)
Gas temperature at circulator outlet: 286.4°C
Motor input power: 34.4 MW(e)/reactor
Number of circulators: 8/reactor

BOILERS
Type: Helically wound, integrally finned pod boiler
Number of pod units per reactor: 8
Gas inlet temperature: 639°C
Gas outlet temperature: 278°C
Heat transferred to steam per reactor: 1 521 MW(t)
Superheater outlet header pressure: 2 485 psia (174.7 kg/cm²abs)
Superheater outlet temperature: 543°C
Steam generation per reactor: 1 063 lb/sec (482.0 kg/sec)
Reheater inlet header pressure: 610 psia (42.9 kg/cm²abs)
Reheater inlet temperature: 342°C
Reheater outlet header pressure: 571 psia (40.3 kg/cm²abs)
Reheater outlet temperature: 539°C
Reheater steam flow per reactor: 972 lb/sec (441 kg/sec)

TURBINE GENERATOR
Gross electrical output: 666 MW(e)
HP cylinder TSV pressure: 2 315 psia (162.8 kg/cm²abs)
HP cylinder TSV temperature: 538°C
IP cylinder TSV pressure: 645 psia (38.3 kg/cm²abs)
IP cylinder TSV temperature: 538°C
Mean condenser vacuum: 28.75 in Hg (730 mm Hg)
Final feed water temperature: 156°C
Power factor: 0.85



A. 275 kV Switch House
B. Services Block
C. Turbine House
D. Reactor Block
E. Gas Turbine House
F. C.W. Pump House
G. Administration & Canteen
H. Workshop & Stores

KEY TO DRAWING

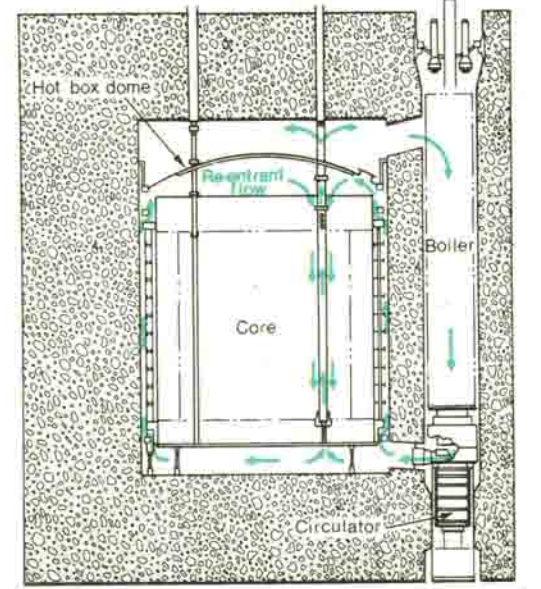
- Charge Face.
- Pressure Vessel Wire Winding Annulus.
- Pre-Stress Cables.
- Flux Scanning Penetration.
- Boiler Pod 1.B.1. (8 pods per reactor)
- Boiler Pod 1.C.2.
- Boiler Liner.
- Reheater.
- Superheater.
- Evaporator.
- Economiser.
- Reheater Pipework.
- Main Steam Pipework.
- Core Liner.

- Standpipes.
- Hot Box Dome.
- Guide Tubes.
- Top Neutron Shield.
- Bottom Neutron Shield.
- Core & Reflector.
- Core Restraint Structure.
- Gas Inlet Duct.
- Gas Outlet Duct.
- Gas Circulator.
- Pre-stressed Concrete Pressure Vessel.
- Vessel Ventilation Annulus.
- Reactor Ancillary C.W. Pipework.
- Valve Access Gallery.
- Removable Decking (Ground Floor).
- Pressure Vessel C.W. Pipework.
- Circulator Maintenance Track.

- Circulator Loading Bay.
- Circulator Crane (45 Ton).
- Gas Circuit Drier Plant.
- Top Neutron Shield.
- Active Ventilation Plant.
- Ventilation Filters.
- Boiler Pod Shield.
- Fuelling Machine Gantry.
- Fuelling Machine.
- Pile Cap Maintenance Shop.
- Pile Cap Store.
- Tank Room.
- Pile Cap Sub-Change Room.
- Valve Access Gallery.
- Pile Cap Crane Rails.
- Pile Cap Maintenance Crane (160 Ton).
- Concrete Towers.

- Visitors Viewing Gallery.
- Ventilation CO₂ Exhaust Stack.
- Ventilation Exhaust Stack.
- Deaerator.
- Shield Facilities Block.
- Irradiated Fuel Discharge Facility.
- Irradiated Fuel Discharge Blower Room.
- Control Rod Maintenance Room.
- Manipulator Maintenance Room.
- Manipulator Maintenance Room.
- Cooling Pond.
- Skip Handling Machine.
- Flask Handling Crane (50 Ton)
- Flask Wash-down.
- New Fuel Store.
- Flask Access Bay.
- Decontamination and Maintenance Shop.

- Maintenance Shop Crane (45 Ton)
- Circulator Maintenance Pit.
- Maintenance Shop Access Bay.
- Deaerator.
- Shield Facilities Block.
- Active Ventilation Plant.
- Active Effluent Treatment Plant.
- Main Control Room.
- Unit Auxiliary Transformers.
- Services Block.
- Access to Main Change Rooms & Switchgear Plant.
- Turbine Hall.
- Safety Valve Escape Pipes.
- Safety Valve Pipework.
- Control Rod Marshalling Cubicles.
- CO₂ Inlet Penetration.
- Non-Active Ventilation Plant.



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