The World's Reactors No. 56
HEYSHAM

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DESIGNER AND CONTRACTOR
British Nuclear Design & Construction Ltd., Whetstone, Leicester.

OWNER OPERATOR
Central Electricity Generating Board.

LOCATION
Heysham, Morecambe, Lancs.

TYPE
Advanced Gas-cooled Reactor.

CONSTRUCTION SCHEDULE

Site work started:	October 1970
Full power operation (1st Unit):	1975

CAPACITY

Gross electric output:	2 × 666 MW(e)
Net electrical output:	2 × 622 MW(e)
Net thermal efficiency:	41·2%

FUEL ELEMENT

Material:	Hollow UO_2 pellets, stainless steel clad
Type:	36 pin cluster in graphite sleeve
Pin diameter (Pellet O.D.):	0·57 in (14·48 mm)
Inner sleeve diameter:	7·5 in (191 mm)
Element length:	41 in (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 or 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:	1 510 MW(t)
Reactor gas inlet temperature:	287°C
Mean channel gas inlet temperature:	318°C
Mean channel gas outlet temperature:	651°C
Total gas mass flow at reactor outlet:	7 965 lb/sec (3 613 kg/sec)
Reactor coolant:	CO_2
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 prestressed, 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 electric motor
Flow control:	Variable guide vane
Speed:	2 970 rev/min
Gas pressure at circulator outlet:	600 psia (42·2 kg/cm²abs)
Gas temperature at circulator outlet:	287°C
Motor input power:	38·2 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:	642°C
Gas outlet temperature:	278°C
Heat transferred to steam per reactor:	1 530 MW(t)
Superheater outlet header pressure:	2 485 psia (174·7 kg/cm²abs)
Superheater outlet temperature:	543°C
Steam generation per reactor:	1 072 lb/sec (486 kg/sec)
Reheater inlet header pressure:	609 psia (42·8 kg/cm²abs)
Reheater inlet temperature:	343°C
Reheater outlet header pressure:	571 psia (40·1 kg/cm²abs)
Reheater outlet temperature:	539°C
Reheater steam flow per reactor:	972 lb/sec (441 kg/sec)

TURBINE GENERATOR

Gross electrical outlet:	666 MW(e)
HP cylinder TSV pressure:	2 315 psia (162·8 kg/cm²abs)
HP cylinder TSV temperature:	538°C
IP cylinder TSV pressure:	543 psia (37·4 kg/cm²abs)
IP cylinder TSV temperature:	538°C
Mean condenser vacuum:	28·79 in Hg (731 mm Hg)
Final feed water temperature:	157°C
Power factor:	0·86

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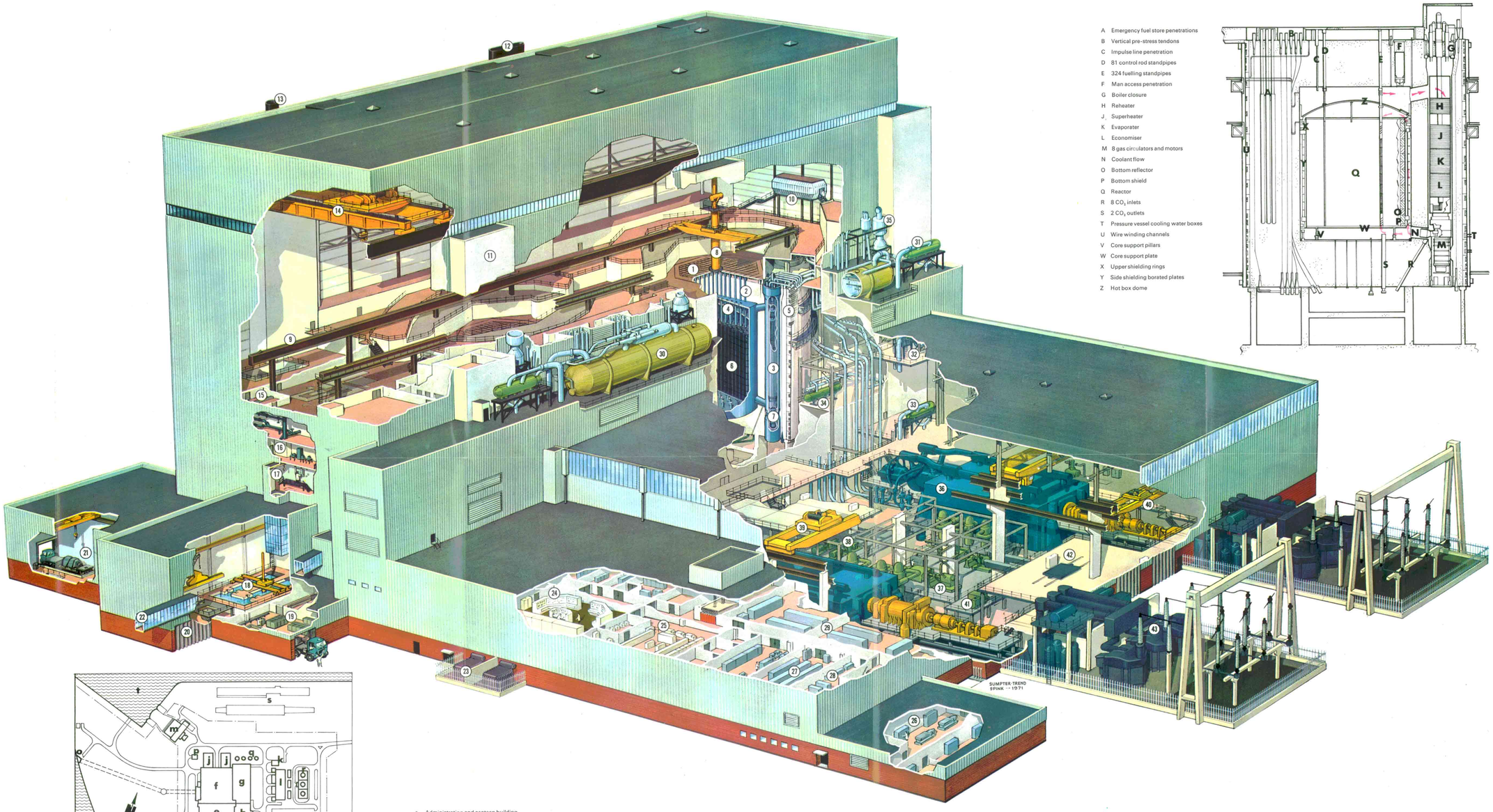
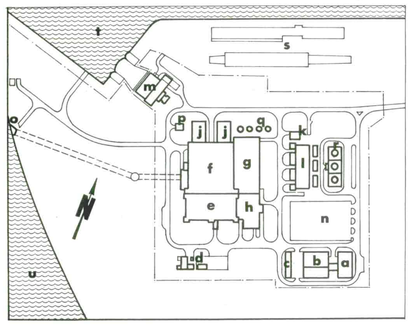


A Emergency fuel store penetrations
B Vertical pre-stress tendons
C Impulse line penetration
D 81 control rod standpipes
E 324 fuelling standpipes
F Man access penetration
G Boiler closure
H Reheater
J Superheater
K Evaporater
L Economiser
M 8 gas circulators and motors
N Coolant flow
O Bottom reflector
P Bottom shield
Q Reactor
R 8 CO_2 inlets
S 2 CO_2 outlets
T Pressure vessel cooling water boxes
U Wire winding channels
V Core support pillars
W Core support plate
X Upper shielding rings
Y Side shielding borated plates
Z Hot box dome



a Administration and canteen building
b Workshop and stores
c Garages and fire station
d Gas store compound
e Reactor hall
f Turbine hall
g Services building
h Fuel handling block
j Generator transformers
k Auxiliary boiler house
l Gas turbine house
m Cooling water pump house
n Car park
o Cooling water outfall
p Hydrogen store
q R.F.W. tanks
r Fuel oil tanks
s Heysham railway station
t Heysham harbour
u Morecambe bay

1 Charge face
2 Standpipes
3 Boiler pod (8 pods per reactor)
4 Hotbox dome
5 Pressure vessel pre-stressing cables
6 Core and reflector
7 Gas circulator
8 Fuelling machine
9 Fuelling machine gantry
10 Visitors viewing gallery
11 Slipformed concrete towers
12 Ventilation CO_2 exhaust stack
13 Ventilation exhaust stack
14 Pile cap maintenance crane (220 tons)
15 Pile cap maintenance shop
16 Control rod maintenance room
17 Manipulator gallery
18 Irradiated fuel cooling pond
19 New fuel store
20 Flask loading bay
21 Maintenance shop
22 Covered access to admin. building
23 Unit auxiliary transformers
24 Central control room
25 Computer and data processing room
26 Control rod supplies motor alternator room
27 Low voltage switchgear room
28 Battery room
29 Essential supplies switchgear rooms
30 Deaerator
31 1st stage L.P. D.C. feed heater
32 2nd stage L.P. D.C. feed heater
33 3rd stage L.P. D.C. feed heater
34 Start-up vessel
35 H.P. steam safety relief valve silencer
36 666 MW turbine generator
37 50% motor driven boiler feed pump
38 Emergency boiler feed pumps
39 120 ton/35 ton main turbine house crane
40 10 ton auxiliary turbine house crane
41 Dump condenser
42 Turbine house loading bay
43 Generator transformer

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