

# HEYSHAM 2/TORNNESS

nuclear  
engineering  
INTERNATIONAL

**OWNER OPERATOR**  
Heysham 2: Central Electricity Generating Board (CEGB)  
Tornness: South of Scotland Electricity Board (SSEB)

**SITES**  
Heysham 2: Heysham, Lancashire, England  
Tornness: Nr Dunbar, East Lothian, Scotland

**TYPE**  
Advanced gas-cooled reactor (AGR)

**SCHEDULE**  
Heysham 2: Start of construction, August 1980. Commercial operation 1987/88  
Tornness: Start of construction, August 1980. Commercial operation 1987/88

**DESIGNERS AND CONSTRUCTORS**  
Heysham 2: National Nuclear Corporation/CEGB  
Tornness: National Nuclear Corporation/SSEB

**TECHNICAL DATA**  
The main parameters below are the same for the two stations but there are some architectural differences

**CAPACITY (Station)**  
Net electrical output 2 x 620 MWe  
Net thermal efficiency 40.0 %

**FUEL ELEMENT**  
Type 36 pin cluster in graphite sleeve  
Pin Materials: Hollow UO<sub>2</sub> pellets, stainless steel clad  
Pellet diameter 14.51 mm  
Sleeve inner diameter 190.4 mm  
Element length 1039 mm  
Number of elements per channel 8  
Enrichment: Inner zone 2.11 %  
Outer zone 2.77 %

**CORE**  
Moderator Graphite  
Number of fuel channels 332  
Lattice pitch (square) 460 mm  
Number of control rods 89  
Secondary shutdown: Nitrogen and boron glass beads  
Active core mean diameter 9458 mm  
Active core height 8296 mm

**REACTOR**  
Reactor heat 1550 MWe  
Mean channel gas outlet temperature 635 °C  
Total gas mass flow through fuel channels 3911 kg/s  
Weight of uranium per reactor 113.5 tonnes  
Mean fuel loading including graphite heat 13.65 MWe/tU  
Mean fuel discharge irradiation 18,000 MWd/tU

**PRESSURE VESSEL**  
Material: Concrete, helical pre-stressed, steel lined  
Internal diameter 20.25 m  
Internal height 21.87 m  
External diameter 31.86 m  
Design pressure 45.65 bar a

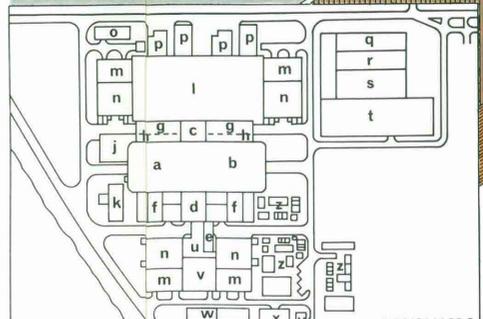
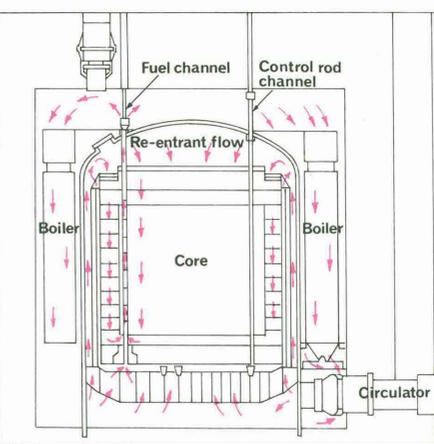
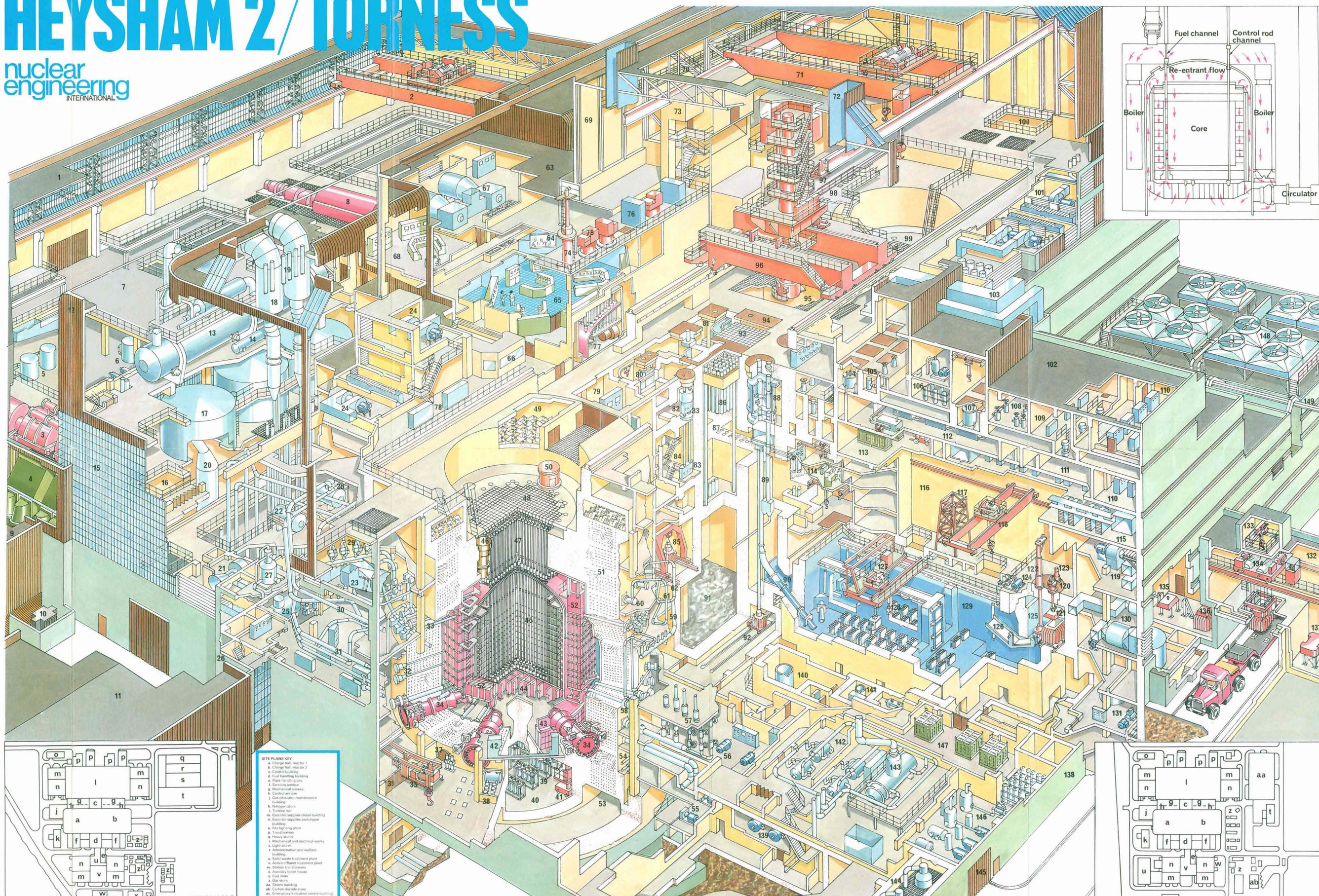
**CIRCULATORS**  
Type: Centrifugal, single stage  
Number/reactor 8  
Drive: Constant speed induction motor  
Flow control: Variable inlet guide vanes  
Speed 2970 rpm  
Outlet gas pressure 43.6 bar a  
Gas flow (weight circulators) 4271 kg/s  
Pressure rise 2896 m bar  
Outlet gas temperature 299 °C  
Motor input power/reactor 42.6 MWe

**BOILERS**  
Type: 2 start, once-through serpentine platen, rectangular unit  
Number of boilers per reactor 4 (3 units per boiler)  
Gas inlet temperature to reheater 615 °C  
Gas outlet temperature 290 °C  
Heat transferred to stream 1577 MWe  
Superheater outlet header pressure 166 bar a  
Superheater outlet temperature 541 °C  
Steam generation 500 kg/s  
Reheater outlet manifold pressure 40.7 bar a  
Reheater outlet temperature 539 °C

**TURBINE**  
HP cylinder t.s.v. pressure 160 bar a  
HP cylinder t.s.v. temperature 538 °C  
IP cylinder t.s.v. pressure 39.1 bar a  
IP cylinder t.s.v. temperature 538 °C  
Final feedwater temperature 156 °C  
Nominal gross electrical output 660 MWe

**Power station cutaway key.**

- 1. Turbine hall
- 2. Turbine hall crane
- 3. Turbine, reactor no. 1
- 4. Condenser
- 5. Control assembly shop maintenance room
- 6. Water treatment plant
- 7. Loading bay
- 8. Generator, turbine no. 2
- 9. Essential supplies building
- 10. Transformer room
- 11. Gas circulator maintenance building
- 12. Dissolver room
- 13. Dissolver
- 14. Dissolver warm up heater
- 15. Mechanical services
- 16. Reserve feed tanks
- 17. Reserve feed tanks
- 18. LP vent flash vessels
- 19. LP vent vessel relief pipes
- 20. HP steam drains flash vessel vent
- 21. Control assembly ventilation plant
- 22. Boiler start up vessels
- 23. Change hall ventilation equipment
- 24. Quasidry supply ventilation plant rooms
- 25. Clean drains tank
- 26. Reactor building
- 27. Vent degassers
- 28. HP steam
- 29. HP steam relief valves
- 30. Hot re-heat
- 31. Boiler feed
- 32. Thermocouple penetrations
- 33. HP feed penetrations
- 34. Gas circulator (B)
- 35. Circulator house crane
- 36. Dissolver primary (B) boiler
- 37. Side access penetration
- 38. Fuel element handling equipment
- 39. Beam access
- 40. Reactor no. 1 change face
- 41. Service inspection gallery
- 42. Main access
- 43. Lower stressing cables
- 44. Boilers 120
- 45. Lower stressing cables
- 46. Pressure vessel cooling pipes
- 47. Circulator auxiliary drive cooling system pumps
- 48. Dissolver heat boiler system pumps
- 49. Steam re-heater penetrations
- 50. Reactor penetrations
- 51. HP feed
- 52. Steam re-heater penetrations
- 53. Re-heat out
- 54. Re-heat in
- 55. Control building
- 56. Visitors viewing gallery
- 57. Dissolver heat boiler feed pumps
- 58. Change hall viewing gallery
- 59. Air conditioning ventilation plant
- 60. Reactor room
- 61. Change hall
- 62. Crane and roof access stairs
- 63. Change hall maintenance crane
- 64. Vent stack
- 65. Fueling machine upper maintenance room
- 66. Plug unit transfer tank
- 67. Gas baffle cylinder and dome manipulators
- 68. In service inspection training facilities
- 69. Reactor quadrant extract boards
- 70. Control assembly shop maintenance room
- 71. Control rod disposal vault
- 72. Upper new fuel cell
- 73. Glove box
- 74. Lower new fuel cell
- 75. Gantry transporter
- 76. Reserve disc store
- 77. Storage tubes
- 78. Plug unit assembly travelling lift crane
- 79. Te bar and assembly storage frame
- 80. Reactor no. 2 change face
- 81. Host wall
- 82. Quasidry supply and recirculation ventilation plant
- 83. Fuel handling building
- 84. Consummated air extract ducts
- 85. Inlet absorber
- 86. Point source absorber filter
- 87. Auxiliary blow down plant room
- 88. Fueling machine emergency cooling particulate filter
- 89. Fueling machine emergency cooling plant room
- 90. Fueling machine emergency cooling compressors
- 91. Switchgear room
- 92. Materials specimen and gas sampling laboratory
- 93. Fuel stores
- 94. Inactivated fuel decontamination control room
- 95. Consummated ventilation extract plant
- 96. Portal equipment maintenance room
- 97. Maintenance room
- 98. Portal equipment maintenance room crane
- 99. Fuel storage pond consummated ventilation extract plant
- 100. Rotary shield plug
- 101. Shielded tank lid hoist
- 102. Shielded skip hoist
- 103. Plug drive unit
- 104. Skip transfer cradle town cable hoist
- 105. Skip transfer cradle
- 106. Fuel handling cell
- 107. Fuel skip crane
- 108. Fuel element manipulator
- 109. Fuel storage pond
- 110. Dissolver heat boiler system ventilation room
- 111. Point water treatment plant
- 112. Fuel transfer bay
- 113. Maintenance crane
- 114. Fuel manipulator crane
- 115. Fuel lid maintenance
- 116. Fuel leak test
- 117. Reactor services annexe
- 118. Dissolver heat boiler feed pumps
- 119. Reactor coolant processing plant
- 120. Decay heat boiler feed pumps
- 121. Reactor coolant processing plant
- 122. Decay heat boiler feed pumps
- 123. Reactor coolant processing plant
- 124. LP breathing air plant
- 125. Buffer fuel store
- 126. Decay heat feed draught cooling towers
- 127. Reactor coolant processing system runways beam
- 128. Fuel element handling equipment
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- 200. Fuel element handling equipment



- SITE PLAN KEY.**
- a. Change hall, reactor 1
  - b. Change hall, reactor 2
  - c. Control building
  - d. Fuel handling building
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  - uy. Fuel handling building
  - uz. Fuel handling building
  - va. Fuel handling building
  - vb. Fuel handling building
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  - ve. Fuel handling building
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  - vm. Fuel handling building
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  - vu. Fuel handling building
  - vv. Fuel handling building
  - vw. Fuel handling building
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  - vy. Fuel handling building
  - vz. Fuel handling building
  - wa. Fuel handling building
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  - xs. Fuel handling building
  - xt. Fuel handling building
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  - xw. Fuel handling building
  - xx. Fuel handling building
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