The World's Reactors

No. 14—RWE 1

(Rheinisch-Westfalisches Elektrizitatswerk A.G.)

GN AND CONSTRUCTION

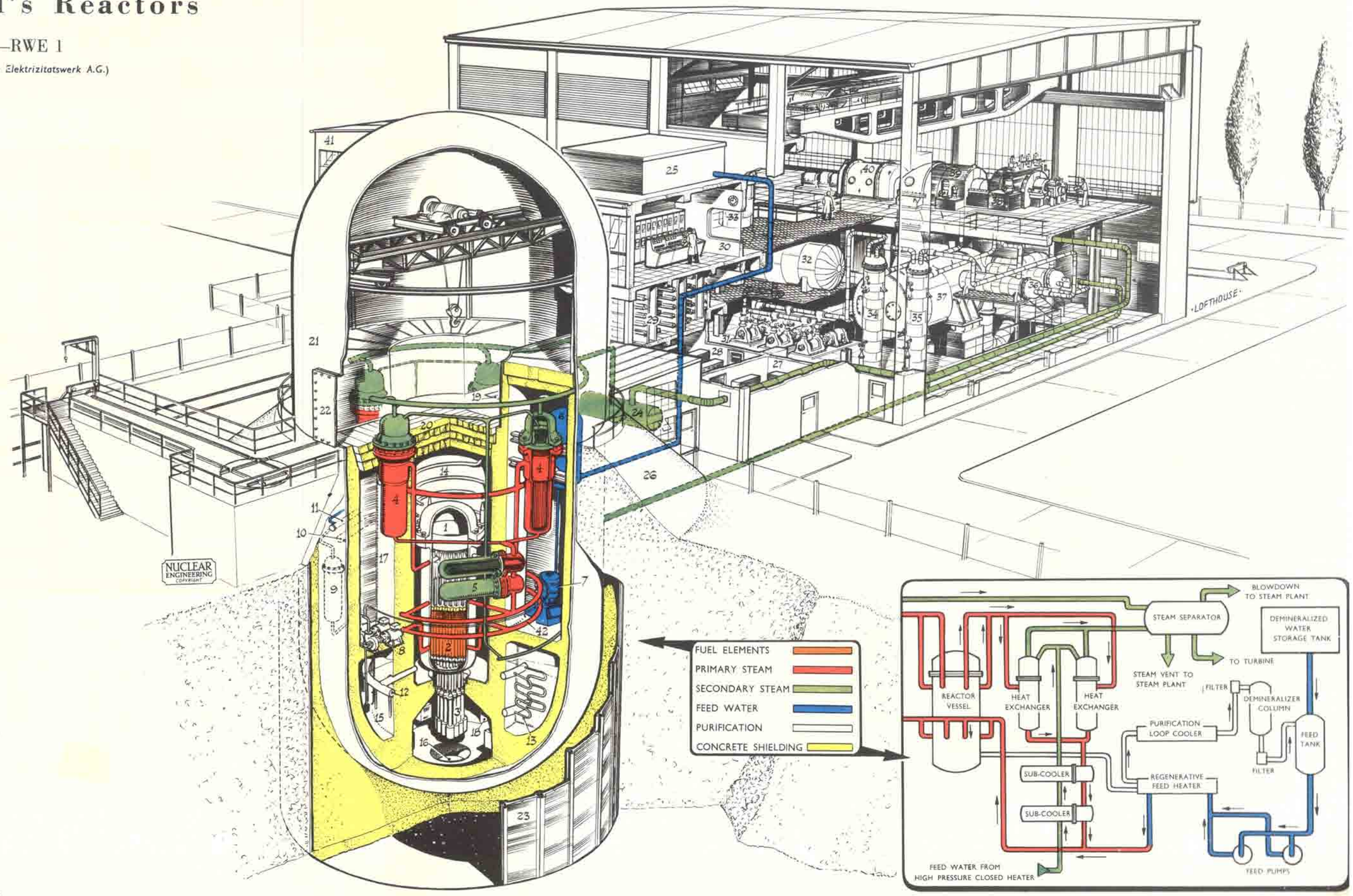
KEY

REACTOR CONTAINMENT

1. Reactor vessel
2. Fuel elements
3. Control rods (16)
4. Heat exchangers (4)
5. Sub-coolers (4)
6. Feed tank (2)
7. Feed pump (2)
8. Quench tank dump pumps (2)
9. Demineralizing column
10. Regenerative feed heater
11. Purification loop cooler
12. Reactor space pressure relief pipe
13. Quench tank cooling coils
14. Reactor space cooling coils
15. Quench tank (steel lined)
16. Sump
17. Used fuel storage space (steel lined)
18. Maintenance access
19. Maintenance access closure
20. Top shield
21. Steel pressure dome
22. Access door
23. Sheet steel piling
24. Steam separator
25. Demineralized water supply tanks (2)
26. Soil backfill
42. Reserve ring main

TURBINE HOUSE

27. Battery room
28. Switchgear room
29. Cable room
30. Control room
31. Feed water pumps (2 electro, 1 turbo)
32. Feed water storage tank
33. De-aerator
34. L.P. preheater
35. H.P. preheater
36. Vacuum preheater
37. Condenser
38. L.P. turbine
39. H.P. turbine
40. 15 MW generator
41. Administrative buildings and water treatment plant



DESIGN AND CONSTRUCTION

A. M. F. Atomics Inc. New York.
Mitchell Engineering Ltd. London.
Siemens Schuckertswerke Erlangen.

The World's Reactors

No. 14 RWE 1

TYPE : Boiling water reactor.

PURPOSE : Power production.

LOCATION : Dettingen, near Frankfurt-Main.

OPERATION :
Site clearance begun : Aug., 1957.
Commissioning : Oct., 1959.

RATING :
Reactor : 58 MW (heat).
Guaranteed net output : 16.2 MW.
Installed capacity : 17.13 MW.

FUEL :
Thorium oxide (75%), enriched uranium oxide (25%).
Max. fuel temp. $\gtrsim$3,200°F.
Max. heat flux $\gtrsim$450,000 BTU/h,ft².
Average heat flux $\gtrsim$114,000 BTU/h,ft².

CORE :
80 assemblies, each of 49 elements, in 0.078 in Zircaloy frame.
Active volume : 5 ft dia. × 5 ft high.
Weight (including cladding) : 6 ton.
Excess reactivity : 6%.

FUEL ELEMENTS :
Cylindrical : 5 ft high × 0.425 in dia.
Cladding : zirconium alloy, 0.03 in thick.
Zircaloy tubes filled with short ceramic slugs.
Riser sections : 5 ft high.
Max. fuel surface temp. $<$800°F.
Max. cladding surface temp. $<$565°F.

MODERATOR : Light water.

CONTROL :
16 cruciform rods, in two groups (12 safety and 4 control).
Blade span : 11 in, thickness $\frac{1}{4}$ in.
Stroke : 4 ft 6 in.
Material : 4 inner rods hafnium,
12 outer rods borated stainless steel.
Electro-mechanical drive from bottom of reactor.

PRESSURE VESSEL :
26 ft high × 7 ft 6 in i.d.
Wall thickness : 4 in.
Material : SA 212 B.
Internal cladding : $\frac{1}{4}$ in stainless steel, SA 312 type 304 L.

COOLANT :
Boiling light water, natural circulation.
Inlet temp.: 400°F.
Outlet temp.: 533°F.
Pressure (saturation) : 900 p.s.i.g.
Flow (at 58 MW) : 241,000 lb/h.
Av. vol. steam in core : 13%.
Max. solids conc.: 2 ppm.
Purification bleed : 10 gal/min.

BOILERS :
4 in number, type C.T.
Secondary steam formed in annulus between $\frac{1}{2}$ in o.d. carbon steel tube and 1 in o.d. 16 s.w.g. stainless steel tube.
Dimensions : 3 ft 3 in i.d.,
length below tube plate : 14 ft,
above tube plate : 3 ft 6 in.
Vessel : Carbon steel SA 212 B, $1\frac{3}{4}$ in thick over main length.
Cladding (primary steam side) : $\frac{1}{8}$ in type 304 stainless steel.
Tube plate : 212 B carbon steel, clad on lower side with $\frac{1}{8}$ in type 304 stainless steel.

SECONDARY COOLANT :
Steam to turbine.
Flow at max. rating : 224,000 lb/h.
Inlet temp. sub-coolers : 350°F.
Outlet temp. at T.S.V.: 497°F.
Pressure : 600 p.s.i.g.

ALTERNATOR :
17.13 MW.
6 kV, 3 ph, 50 c/s.

SHIELDING :
1 in steel thermal shield in vessel, and concrete.
Sides 5 ft thick round vessel,
Additional 2 ft round primary circuits.
Top : 8 ft over vessel, 5 ft over primary circuits.
Bottom : 1 ft lead below p.v.
Lining : 1 in aluminized steel in reactor space, $\frac{1}{4}$ in aluminized steel in quench tank and fuel storage space.

CONTAINMENT :
Cylindrical steel vessel, hemispherical ends.
Plate thickness : side $\frac{3}{8}$ in, ends $\frac{3}{8}$ in.
Overall dimensions : 47 ft 6 in dia. × 110 ft high.

Data sheets in this series already published in "Nuclear Engineering" are:

No. 1. *BEPO* (*April*, 1956)
No. 2. *CP5* (*May*, 1956)
No. 3. *NRX* (*June*, 1956)
No. 4. *DIMPLE* (*August*, 1956)
No. 5. *ZEUS* (*September*, 1956)
No. 6. *CALDER HALL* (*October and December*, 1956)
No. 7. *RUSSIAN 5 MW* (*November*, 1956)
No. 8. *DIDO* (*January*, 1957)
No. 9. *THE SOUTH OF SCOTLAND ELECTRICITY BOARD STATION* (*February*, 1957)
No. 10. *BERKELEY POWER STATION* (*March*, 1957)
No. 11. *BRADWELL POWER STATION* (*April*, 1957)
No. 12. *DOUNREAY FAST REACTOR* (*June*, 1957)
No. 13. *EBWR* (*July*, 1957)