

NUCLEAR POWER DEMONSTRATION REACTOR

PURPOSE: Power Production

DATE OF INFORMATION: March 1961

GENERAL

1. Reactor type	Natural uranium, heavy water moderated and cooled, pressure tube type	6. Owner and operator	Atomic Energy of Canada Ltd. Hydro-Electric Power Commission of Ontario
2. Number of reactors in plant	1	7. Designers	Canadian General Electric Co. Ltd.
3. Rated output per reactor	Gross heat 83.3 MW (+5.6 MW in moderator, not used for power production) Gross elect. 22.0 MW Net elect. 19.3 MW Self-consumption 12.3%	8. Main contractors	Canadian General Electric Co. Ltd.
4. Net efficiency	23.2% (21.7%, moderator included)	9. Present status	In operation
5. Location	Des Joachims, Ontario, Canada	10. Construction schedule	Start of construction 1958 Reactor critical April 1962

REACTOR PHYSICS

11. Neutron energy and lifetime	0.028 eV 0.9×10^{-3} sec	14. Neutron flux	Thermal av. 2.6×10^{13} n/cm ² sec Thermal max. 1.1×10^{14} n/cm ² sec Fast av. 1.6×10^{13} n/cm ² sec Fast max. 6.0×10^{13} n/cm ² sec Flux distribution radial 0.65 Flux distribution axial 0.68
12. Core parameters	At operating temperature $\eta = 1.230$ $\epsilon = 1.020$ $f = 0.935$ $p = 0.908$ $k_{gp} = 1.065$ $k_{eff} = 1.000$ $L^2 = 223$ cm ² $\tau = 140$ cm ² $B^2 = 1.76$ m ⁻² Thermal leakage factor 0.961 Fast leakage factor 0.975	15. Excess reactivity to compensate for	Temperature 1.5% Xe and Sm at rated power 3.7% On-power fuelling requires no excess for burnup
13. Conversion ratio	0.8 (initial)	16. Maximum excess reactivity	Clean, cold 5.2%

CORE

17. Shape and dimensions	Horizontal cylinder 335 cm (11 ft) diam. 384 cm (12 ft 7 in.) long	23. Average power density in core	2.63 kW/liter
18. No. of channels & subassemblies	132 pressure-tube channels, each containing 9 fuel slugs of which 8 are within the active zone; Zircaloy-2 pressure tube has a 8.25 cm (3.25 in.) id. and a wall thickness 0.414 cm (0.163 in.)	24. Burnup	7300 MWd/t
19. Lattice	Square Pitch 26 cm (10.25 in.)	25. Fuel loading and unloading	Refuelling at full power by 2 remotely operated machines
20. Critical mass	4770 kg nat. U (cold, clean)	26. Irradiated fuel storage	Spent fuel storage bay, wire baskets holding 36 subassemblies each, 180 days under 4.4 m (14.5 ft) water
21. Core loading at rated power	15000 kg nat. U	27. Refuelling schedule	Refuelling under operation
22. Average specific power in fuel	5.55 kW/kg nat. U	28. Moderator	33000 kg D ₂ O in core (excluding reflector) 49—82° C (120—180° F), cooled by heat exchangers to river water
		29. Blanket gas	Helium, slightly below atmospheric pressure