3 DZ

1. $a_{ge}^2 = (0,206)^2 = 0,042436 \, m^2$

   $A_j = 243 \cdot a_{ge}^2 = 10,311948 \, m^2$

   $D = \sqrt{\dfrac{4 A_j}{\pi}} = 3,62 \, m$

2. $Q''' = ?$

   $Q''' = \dfrac{P_t}{V} = \dfrac{P_t}{A_j \cdot L}, \quad L = l_{\check{s}}$

   $Q''' = \dfrac{P_t}{242 \cdot a_{ge}^2 \cdot l_{\check{s}}} = 97,83$

3. $q' = ?$

   $q' = \dfrac{\eta \cdot P_t}{N_{GE} \cdot N_{\check{s}} \cdot l_{\check{s}}} = \dfrac{0,96 \cdot 3781 \, MW}{240 \cdot 235 \cdot 3,78 \, m} = 17,025 \, kW/m$

4. $q'' = ?$

   $q'' = \dfrac{\eta \cdot P_t}{2 \pi \cdot r_{\check{s}} \cdot N_{GE} \cdot N_{\check{s}} \cdot l_{\check{s}}} = 0,574 \, MW/m^2$

5. $P_S = 30,2 \text{ kW/kgU}$

$\varrho = 0,03$

$\bar{\sigma} = 580 \text{ barn} = 580 \cdot 10^{-28} \text{ m}^2$

$k = 200 \text{ MeV} = 200 \cdot 10^6 \cdot 1,6 \cdot 10^{-19} = 3,2 \cdot 10^{-11} \text{ J}$

$\phi = ?$

$$\phi = \frac{P_S}{k \cdot N_{U235} \cdot \bar{\sigma}} \qquad N_{U235} = \varrho \cdot m \cdot \frac{N_A}{A} =$$

$$= 2,12 \cdot 10^{17} \ n \ m^{-2} s^{-1} \qquad = 0,03 \cdot 1 \cdot \frac{6,022 \cdot 10^{26}}{235}$$

$$= 7,688 \cdot 10^{22} / kg$$

6. $\eta = 0,33$

$P_0 = 951 \text{ MW}_6$

$h_{ULAZ} = 908 \text{ kJ/kg}$

$h_{IZLAZ} = 2846 \text{ kJ/kg}$

$\dot{m} = ?$

$$\dot{m} = \frac{P_T}{h_{12} - h_{UL}} \qquad P_T = \frac{P_0}{\eta}$$

$$= \frac{P_0}{\eta(h_{12} - h_{UL})}$$

$$\dot{m} = 1488,54 \ kg/s$$

7. $\dot{Q} = 2985 \, MW = P_J$

$N = 3$

$P_{PUMPE} = 3 \, MW$

$\Delta p = 629 \, kPa$

$\rho_{PV} = 738 \, kg/m^3$

$c_p = 5,48 \, kJ/kgK$

$\underline{T_{ULAZ} = 281°C \doteq 554,15 \, K}$

$\underline{T_{IZLAZ} = ?}$

$P_{PUMPE} = N_{\Delta} \cdot \Delta p \Rightarrow V_p = 4,77 \, m^3$

$m_p = \rho \cdot V_p = 3519,87 \, kg$

$m_j = m_p \cdot N = 10559,62 \, kg$

$\Delta t = \dfrac{P_J}{m_j \cdot c_p \cdot \Delta t} = \dfrac{2985 \cdot 10^6}{10559,62 \cdot 5,48 \cdot 10^3}$

$\Delta T = 51,58$

$T_{IZ} - T_{UL} = \Delta T$

$T_{IZ} = 605,73 \, K$

$T_{IZLAZ} = 332,58°C$

8. $m_{UO_2} = 61,2 t$

$l = 0,04$

$\overline{\Phi} = 2,6 \cdot 10^{17} \, n/m^2 s$

$G = 580 \, barn = 580 \cdot 10^{-28} \, m^2$

$t = 200 \, MeV = 200 \cdot 10^6 \cdot 1,6 \cdot 10^{-19} = 3,2 \cdot 10^{-11} \, J$

$t - t_0 = 4 \, dana$

$t = 16 \, mj = 480 \, dana$

$P = ?$

$P = 0,0061 \cdot P_0 \left[(t-t_0)^{-0,2} - t^{-0,2} \right]$

$P_0 = 200 \cdot 1,6 \cdot 10^{-13} \cdot l \cdot m \cdot m_{UO_2} \cdot \dfrac{238}{270} \cdot \dfrac{N_A}{235} \cdot G \cdot \overline{\Phi}$

$P_0 = 2668 \cdot 10^9 \, W$

$P = 0,0061 \cdot P_0 \left[4^{-0,2} - 480^{-0,2} \right] = 7,6 \, MW$

10. $P_T = \dot{m}(h_1 - h_2)$

$P_{el} = (P_T - P_{kon}) \cdot \eta = (\dot{m}(h_1 - h_2) - P_{kond}) \cdot \eta$

$P_{el} = 1701 \, MW$

12. $\dot{m}_{uk} = 71,9 \cdot 10^6 \, kg/h$

$P_T = \dot{m} \cdot (h_{ul} - h_{iz}) = 3,94 \, GW$

$P_e = \eta \cdot (P_T - P_{kon}) = 1,27 \cdot GW$

$\dot{m}_{se} = \dfrac{P_T}{N \cdot (h_{iz} - h_{ul})} = 42,55 \, kg/s$

11. $\eta_T = ?$

$\eta_t = \dfrac{P_e}{P_T} = $ $\qquad$ $P_T = m \cdot (h_{VL} - h_{IZ}) = 4,176 \, GW$

$\qquad\qquad\qquad\qquad\qquad$ $P_e = \eta_{TG} (P_T - P_{KOND}) = 1,53 \, GW$

$\eta_T = 0,3667$

$\eta_T = 36,67 \%$

13. $\bar{\Phi} = ?$

$\bar{\Phi} = \dfrac{P_J}{200 \cdot 1,6 \cdot 10^{-13} \, N \cdot \sigma_f} = 2,88 \cdot 10^{17} \, N/m^2 s$

$N = \ell m \dfrac{238}{270} \cdot \dfrac{N_A}{235} = 0,03 \cdot 99,2 \cdot 10^3 \cdot \dfrac{238}{270} \cdot \dfrac{6,022 \cdot 10^{26}}{235} = 6,72 \cdot 10^{27}$

$P_J = P_T - N_P \cdot P_{PUMP_1} = $ $\qquad$ $P_T = m_{VK} \cdot (h_{VE} - h_{VL}) = 3,6 \, GW$

$P_J = P_T - 4 \cdot 3,4 \, MW$

$P_J = 3,59 \, GW$

14. $Po - 210:$

$P = \dfrac{P_e}{\eta} = \dfrac{98}{0,15} = 653,33 \, W$

$\lambda_{PO} = \dfrac{\ln 3}{T_{1/2,PO}} = 5,81 \cdot 10^{-8} \, s^{-1}$

$N = \dfrac{P}{\lambda \cdot Q_\alpha} = 1,3 \cdot 10^{22}$

$N_0 = N \cdot e^{\lambda t} = 2,86 \cdot 10^{26}$

$N_0 = \dfrac{m \cdot N_A}{A_{PO-210}} \Rightarrow m_{PO} = N_0 \cdot A_{PO-210}/N_A = 99,81 \, kg$

$A_m - 241$:

$$P = 653,33 \, W$$

$$\lambda_{AM} = 5,1 \cdot 10^{-11}$$

$$N = 1,48 \cdot 10^{25}$$

$$N_0 = N e^{\lambda t} = 1,493 \cdot 10^{25}$$

$$m_{AM} = N_0 \cdot A_{AM} / N_\Delta = 5,975$$

$$\Delta m = m_{PO} - m_{AM} = 93,83 \, kg$$

9. $t_0 = 128 \, dana$

$$\tau - t_0 = 11/24 \, dana$$

$$P = 0,0061 \, P_0 \left[(\tau - t_0)^{-0,2} - t^{-0,2} \right]$$

$$P = 5615591,225 \, W$$

$$P_t = \frac{P}{\eta} \Rightarrow P = \dot{m} \cdot c_p \cdot \Delta T$$

$$\dot{m}_2 = \frac{P}{c_p \cdot \Delta T} = 461,1 \, kg/s$$

$$\dot{m}_{12} = \frac{\dot{m}_1}{br. \, petlji} = 153,68 \, kg/s$$