(20.7) Assume that the probability of not restoring AC power within 20 minutes is reduced by a factor of 5 in Fig. 20.8. (a) Which is now the risk dominating event chain? (b) Is it better to reduce the total risk in Fig. 20.8 by this change or by improving the stability of the HV mains with a factor of 2 by e.g. building more power stations?

Base case is:

$$p_T := \frac{1}{25}$$

$p_{noscram} := 3\cdot 10^{-7}$ $\quad r_1 := p_T \cdot p_{noscram}$

$p_{noblow} := 0$ $\quad r_2 := p_T \cdot p_{noblow}$

$p_{noel} := 1\cdot 10^{-6}$ $\quad r_3 := p_T \cdot p_{noel}$

$p_{nolpci} := 2\cdot 10^{-8}$ $\quad r_4 := p_T \cdot p_{nolpci}$

$p_{noAC} := 4\cdot 10^{-7}$ $\quad r_5 := p_T \cdot p_{noAC}$

$p_{nocool} := 6\cdot 10^{-7}$ $\quad r_6 := p_T \cdot p_{nocool}$

$$Risk_0 := \sum_{i=1}^{6} r_i \qquad Risk_0 = 9.28\cdot 10^{-8}$$

No AC-power within 20 min risk reduced by a factor of 5.

$$p_T := \frac{1}{25}$$

$p_{noscram} := 3\cdot 10^{-7}$ $\quad r_1 := p_T \cdot p_{noscram}$ $\quad r_1 = 1.2\cdot 10^{-8}$

$p_{noblow} := 0$ $\quad r_2 := p_T \cdot p_{noblow}$ $\quad r_2 = 0$

$p_{noel} := \frac{1\cdot 10^{-6}}{5}$ $\quad r_3 := p_T \cdot p_{noel}$ $\quad r_3 = 8\cdot 10^{-9}$

$p_{nolpci} := 2\cdot 10^{-8}$ $\quad r_4 := p_T \cdot p_{nolpci}$ $\quad r_4 = 8\cdot 10^{-10}$

$p_{noAC} := 4\cdot 10^{-7}$ $\quad r_5 := p_T \cdot p_{noAC}$ $\quad r_5 = 1.6\cdot 10^{-8}$

$p_{nocool} := 6\cdot 10^{-7}$ $\quad r_6 := p_T \cdot p_{nocool}$ $\quad r_6 = 2.4\cdot 10^{-8}$

$$Risk_1 := \sum_{i=1}^{6} r_i \qquad Risk_1 = 6.08\cdot 10^{-8}$$

HV-mains stability increase by 2

$p_T := \frac{1}{25} \cdot \frac{1}{2}$

$p_{noscram} := 3 \cdot 10^{-7}$ $\qquad r_1 := p_T \cdot p_{noscram}$

$p_{noblow} := 0$ $\qquad r_2 := p_T \cdot p_{noblow}$

$p_{noel} := 1 \cdot 10^{-6}$ $\qquad r_3 := p_T \cdot p_{noel}$

$p_{nolpci} := 2 \cdot 10^{-8}$ $\qquad r_4 := p_T \cdot p_{nolpci}$

$p_{noAC} := 4 \cdot 10^{-7}$ $\qquad r_5 := p_T \cdot p_{noAC}$

$p_{nocool} := 6 \cdot 10^{-7}$ $\qquad r_6 := p_T \cdot p_{nocool}$

$Risk_2 := \sum_{i=1}^{6} r_i$ $\qquad Risk_2 = 4.64 \cdot 10^{-8}$

Answers: (a) no rest heat cooling to the sea

(b): $\frac{Risk_0}{Risk_2} = 2$ $\quad \frac{Risk_0}{Risk_1} = 1.5$: *i.e.* it is better to improve the stability of the mains.