1 Assignment 1

1.1 formulary

1.1.1 annuity

$$\epsilon_{r,n} = \frac{r}{1-(1+r)^{-n}} \tag{1}$$

where

- n: economic lifetime (years)
- r: interest rate ($\frac{p}{100}$)

1.1.2 annual payment of initial cost (t=0)

$$I = \epsilon_{r,n} \cdot K_0 \tag{2}$$

where

- $\epsilon_{r,n}$: annuity
- K_0: initial cost

1.1.3 investment costs per MWh

$$f = \frac{I}{E} \tag{3}$$

where

- I: annal payment cost
- E: annual energy production

1.1.4 total cost

$$k = d + f \tag{4}$$

where

- f: investment costs per MWh
- d: operation costs per MWh

1.2 total cost

1.2.1 hydro power plant

$$\epsilon_{8\%,30} = \frac{0.08}{1-(1+0.08)^{-30}} = 0.0888$$
$$f = \frac{2300\,MNOK \cdot \epsilon_{8\%,30}}{600GWh} = 340.505\,NOK/MWh$$
$$k = 25\,NOK/MWh + 340.505\,NOK/MWh = 365.51\,NOK/MWh$$

1.2.2 thermal power plant

$$\epsilon_{8\%,20} = \frac{0.08}{1-(1+0.08)^{-20}} = 0.1019$$
$$f = \frac{600\,MNOK \cdot \epsilon_{8\%,20}}{600GWh} = 101.85\,NOK/MWh$$
$$k = 180\,NOK/MWh + 101.85\,NOK/MWh = 281.85\,NOK/MWh$$

1.3 impact of halved interest rate

interest rate: 4%

1.3.1 hydro power plant

$$\epsilon_{4\%,30} = \frac{0.04}{1-(1+0.04)^{-30}} = 0.0578$$

$$f = \frac{2300\,MNOK \cdot \epsilon_{4\%,30}}{600GWh} = 221.68\,NOK/MWh$$

$$k = 25\,NOK/MWh + 221.68\,NOK/MWh = 246.68\,NOK/MWh$$

1.3.2 thermal power plant

$$\epsilon_{4\%,20} = \frac{0.04}{1-(1+0.04)^{-20}} = 0.0736$$

$$f = \frac{600\,MNOK \cdot \epsilon_{4\%,20}}{600GWh} = 73.58\,NOK/MWh$$

$$k = 180\,NOK/MWh + 73.58\,NOK/MWh = 253.58\,NOK/MWh$$

1.4 impact of doubled economic life

1.4.1 hydro power plant

$$\epsilon_{8\%,30} = \frac{0.08}{1-(1+0.08)^{-60}} = 0.0808$$

$$\epsilon_{4\%,60} = \frac{0.04}{1-(1+0.04)^{-60}} = 0.0442$$

1.4.2 thermal power plant

1.5 salvage value

1.5.1 hydro power plant

1.5.2 thermal power plant

2 Assignment 2

2.1 annuity

2.2 greatest interest rate