Given a cost function, $c(q)$, the average cost function

$$ac(q) \equiv \frac{c(q)}{q}$$

- if higher q $\Rightarrow$ higher a.c. : diseconomies of scale
  $ac'(q) > 0$
- if higher q $\Rightarrow$ lower a.c. : economies of scale
  $ac'(q) < 0$

The hourly cost (in US dollars) of producing q kW of electricity per hour is given by

$$c(q) = 100 + 6q + 0.005q^2$$

Source: Alkhalil et al (2009) "Fuel consumption optimization of a multimachines microgrid"

$$ac(q) = \frac{c(q)}{q} = \frac{100}{q} + 6 + 0.005q$$

$$ac'(q) = -\frac{100}{q^2} + 0.005$$

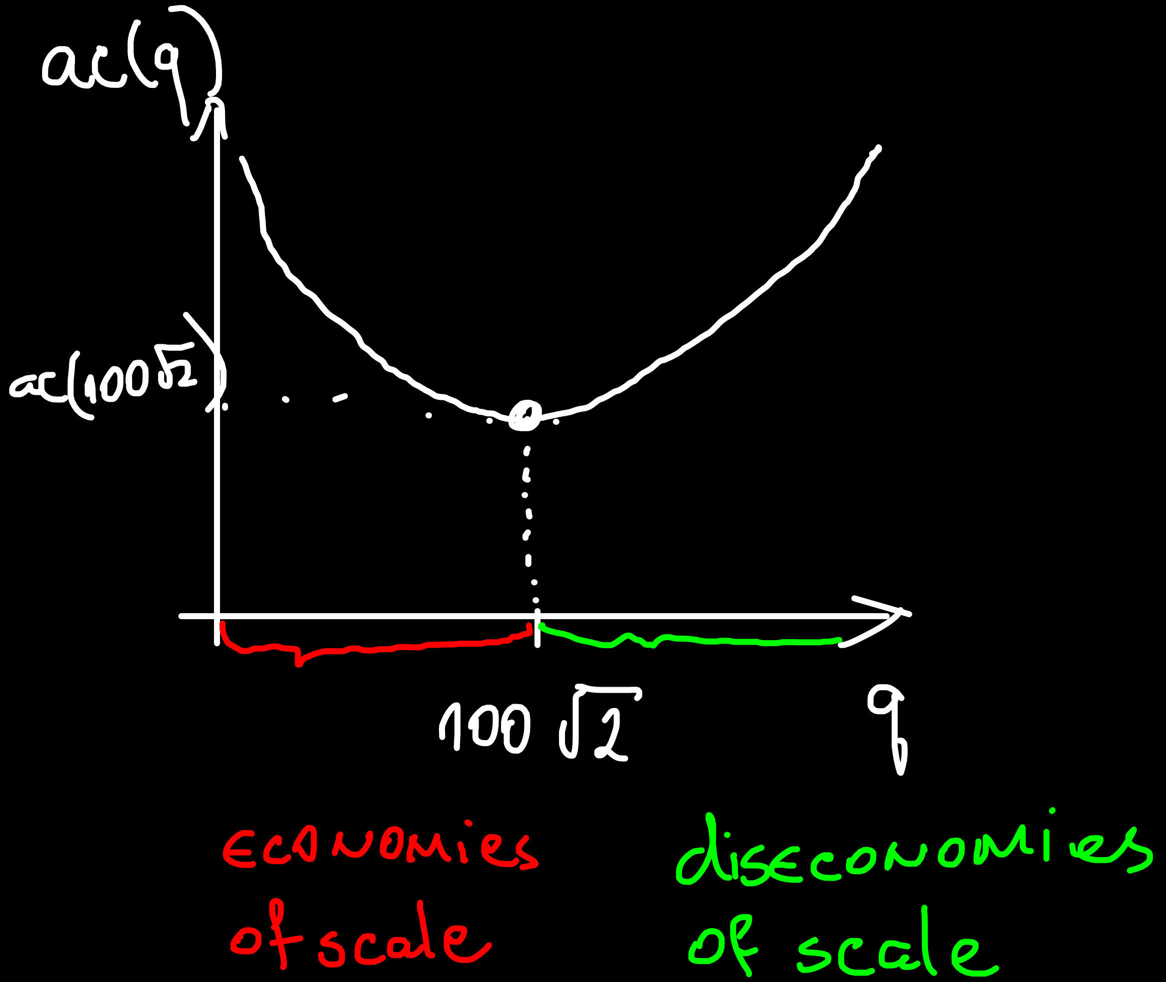
- economies of scale: $ac'(q) < 0$, $-\frac{100}{q^2} + 0.005 < 0 \Rightarrow$

$$q < 100\sqrt{2}$$

- diseconomies of scale: $ac'(q) > 0$:

$$q > 100\sqrt{2}$$

$$ac(100\sqrt{2}) = \frac{100}{100\sqrt{2}} + 6 + 0.005 \times 100\sqrt{2}$$



Minimum average cost: $ac(q) = \frac{100}{q} + 6 + 0.005q$

$$ac'(q) = -\frac{100}{q^2} + 0.005$$

$$ac''(q) = -\frac{-200}{q^3} = \frac{200}{q^3} > 0 \Rightarrow$$ when $ac'(q) = 0$ we have a local minimum

$$q = 100\sqrt{2}$$