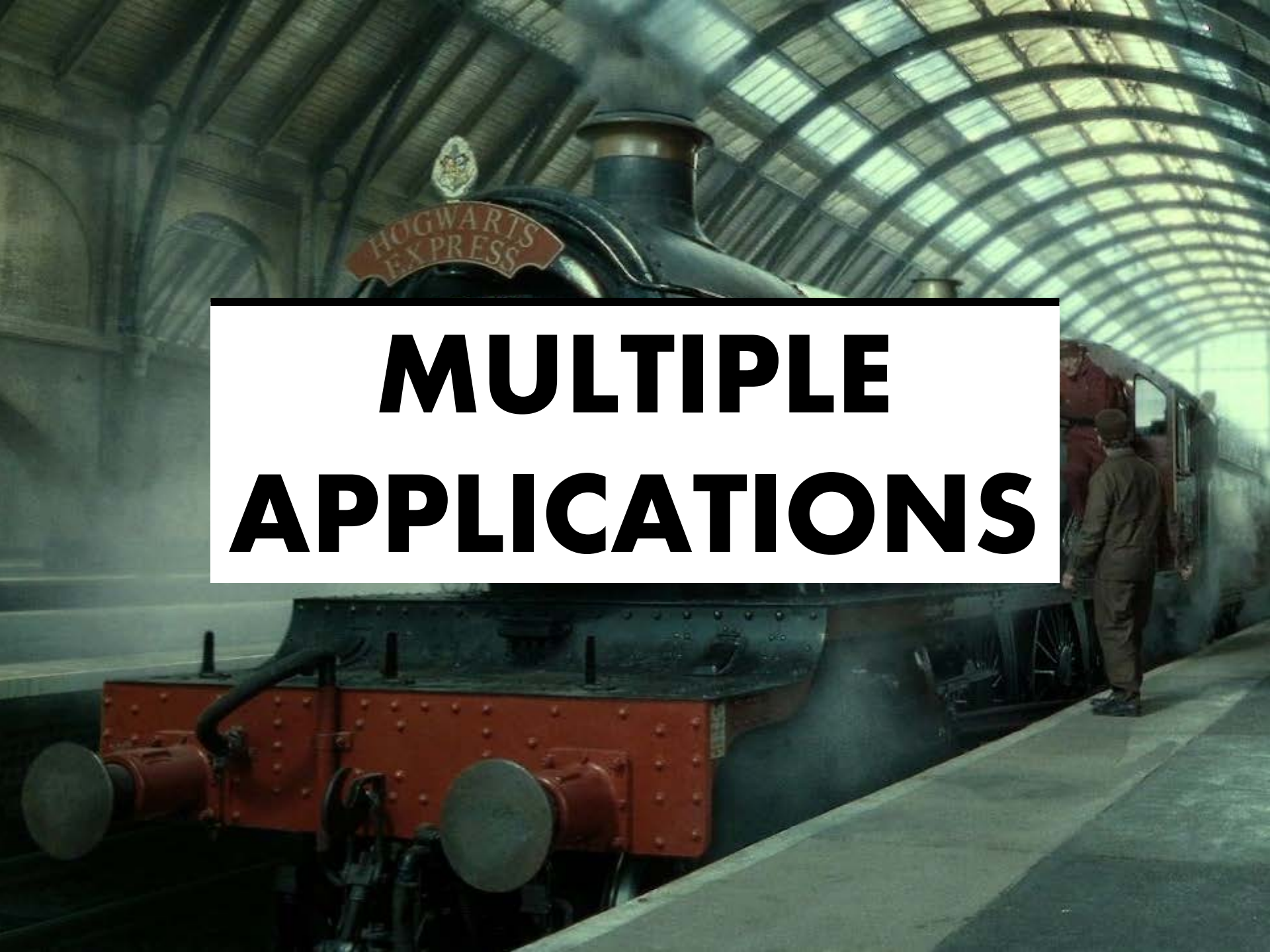


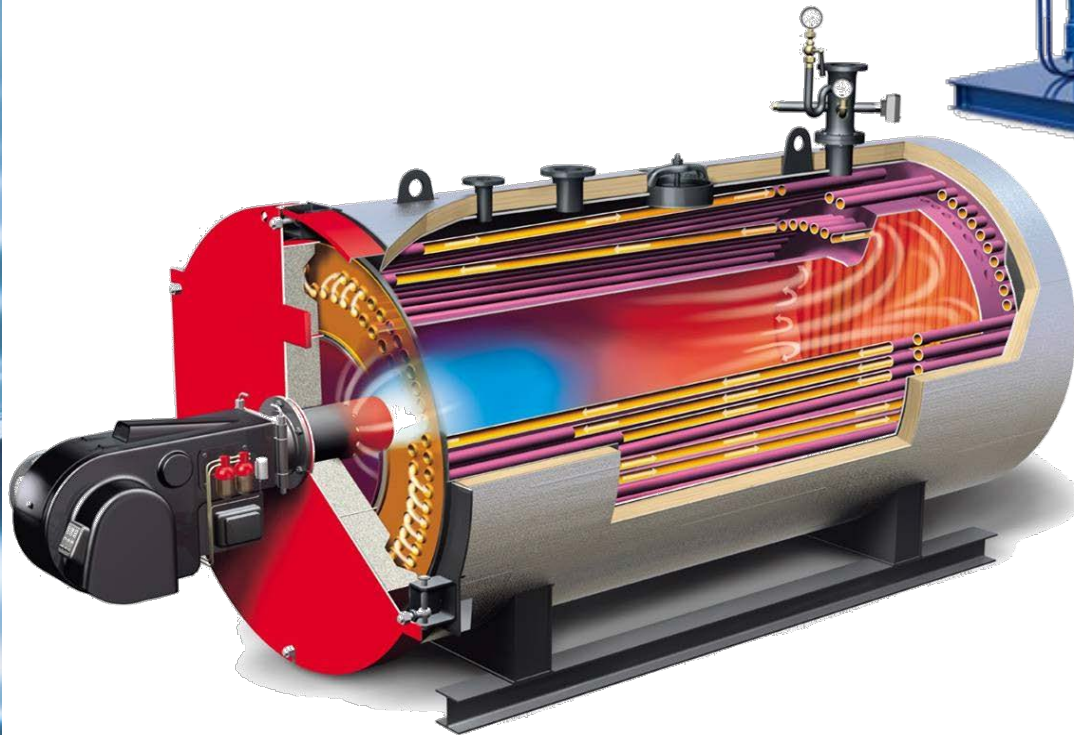
THEORETICAL ANALYSIS OF STEAM GENERATION METHODS ENERGY, CO₂ EMISSION, AND COST ANALYSIS

A photograph of a volcanic eruption. A massive, dark plume of smoke and ash rises from a mountain peak, filling much of the frame. The sky is a clear, pale blue. The word "STEAM" is overlaid in the center in a bold, black, sans-serif font, with a thin black horizontal line above it.

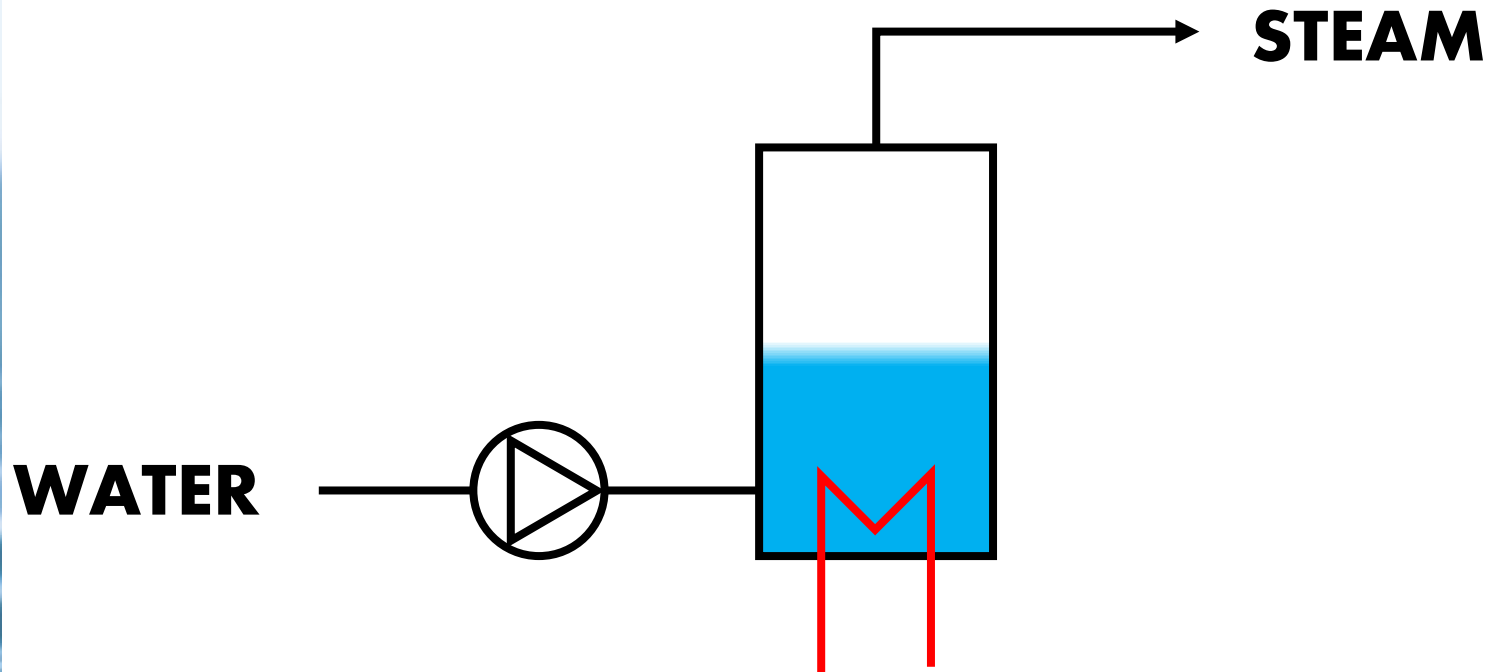
STEAM

A steam locomotive with "HOGWARTS EXPRESS" written on its side is stopped at a station platform. The station has a large, arched glass and steel roof. A person in a brown uniform stands on the platform next to the train. The scene is misty or steamy.

MULTIPLE APPLICATIONS



STEAM BOILERS



- **gas-fired boiler (>95%)**
- **electrical heating (~100%)**

STEAM BOILER

THE END

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OTHER WAYS

USING

WASTE HEAT

OTHER WAYS



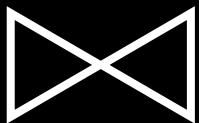
- Gas-fired boiler



- Electrical heating



- High-temperature HP



- Heat Pump



- Waste heat evaporation



Example:

- **Initial state: 25°C, 1 bar**
- **Final state: 133°C, 3 bar**

=> 2620 kJ per kg of steam

Example:

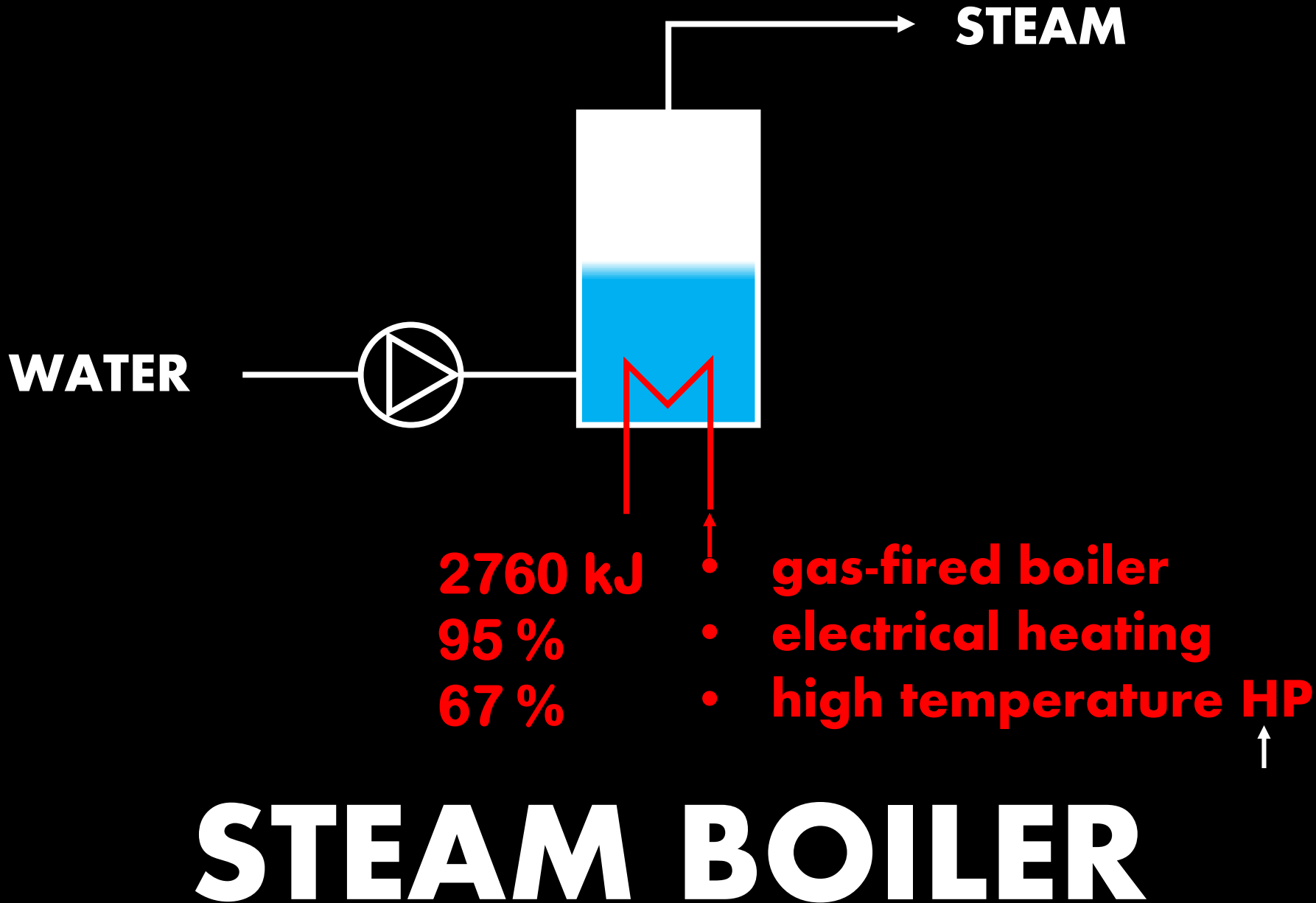
• **Waste heat**

⇒ **30-80 °C**

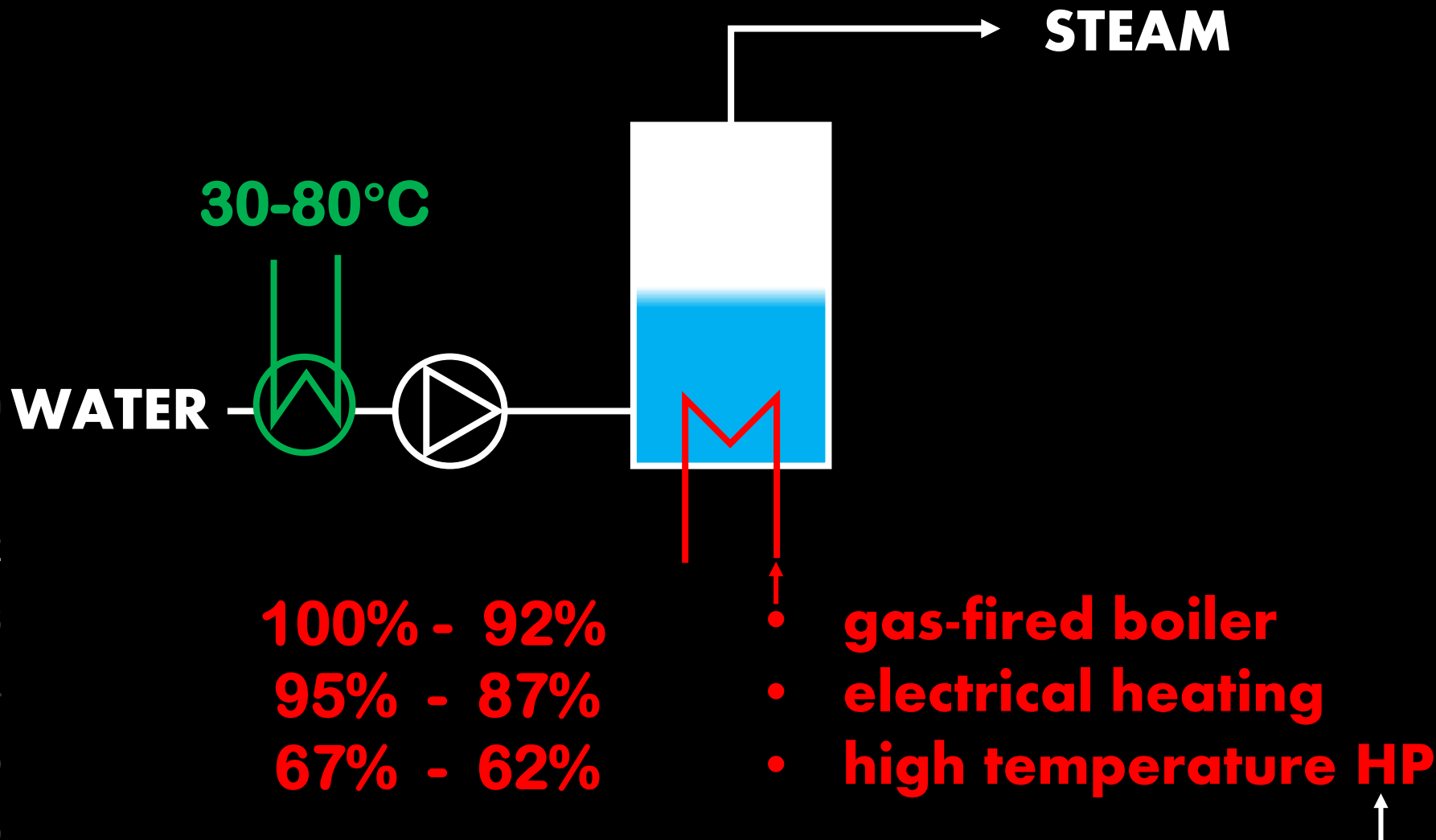
Assumptions:

- Waste heat is infinite and free
- Heat source for heat pumps is 18°C if no waste heat
- Pinch point of 5K used in the heat exchangers

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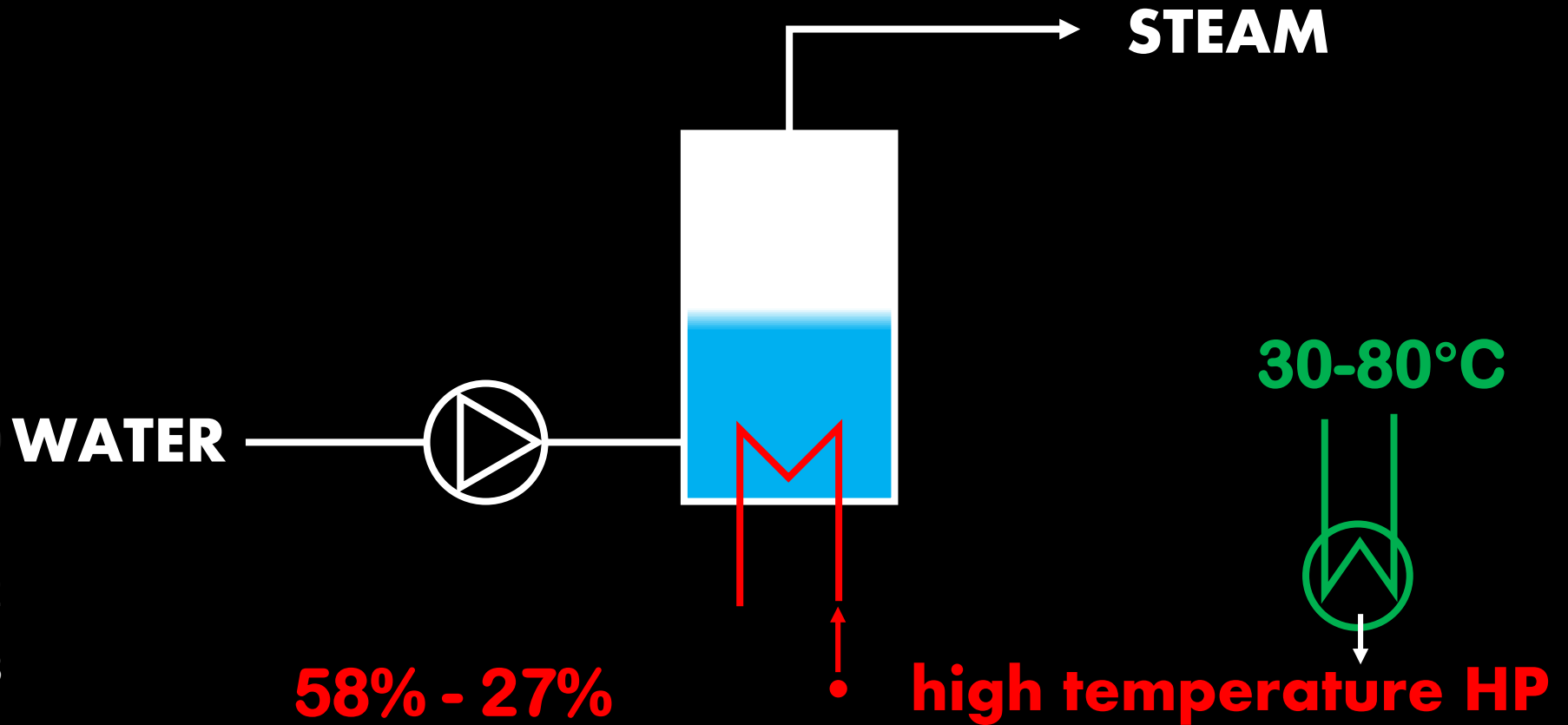


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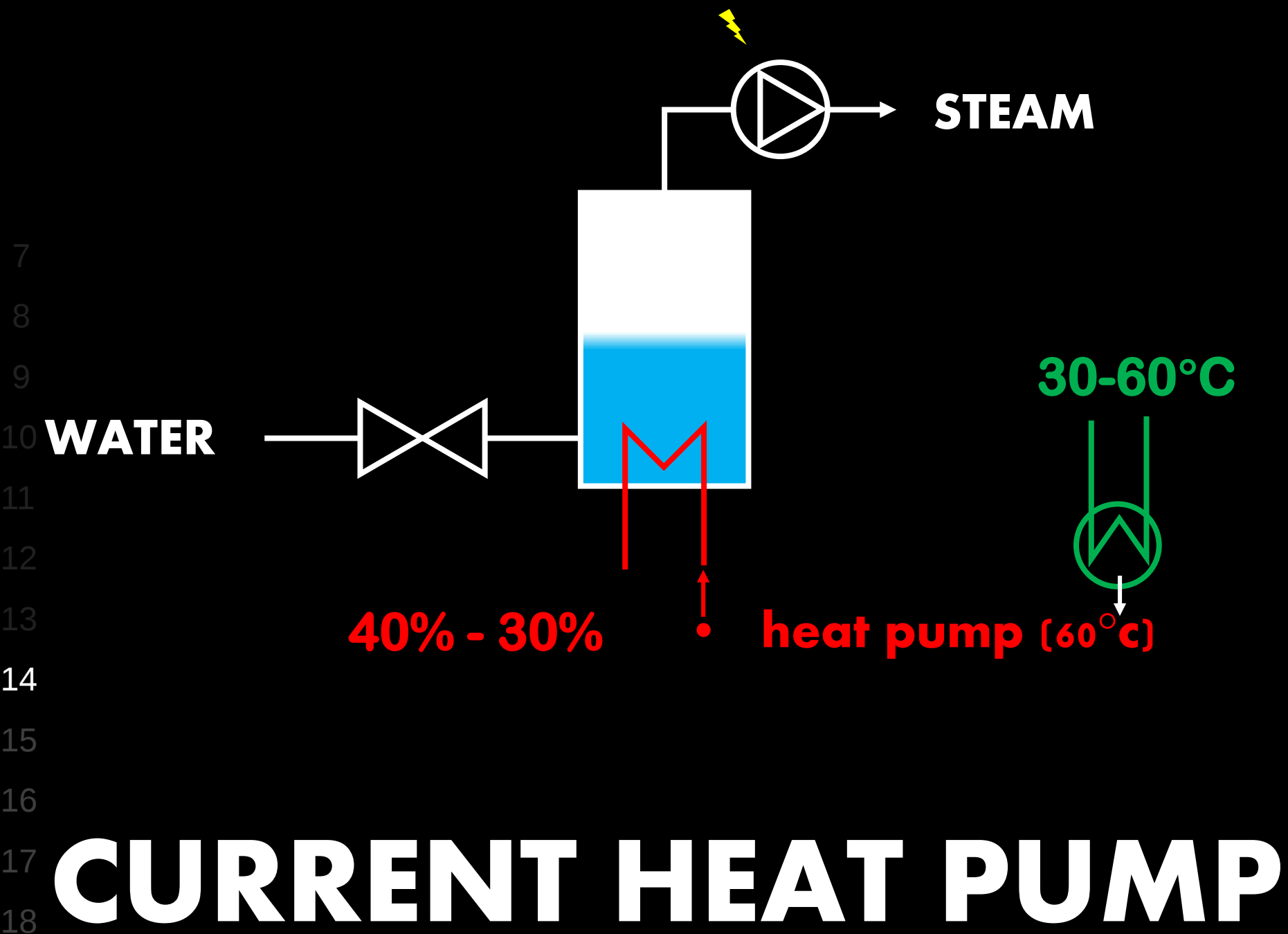


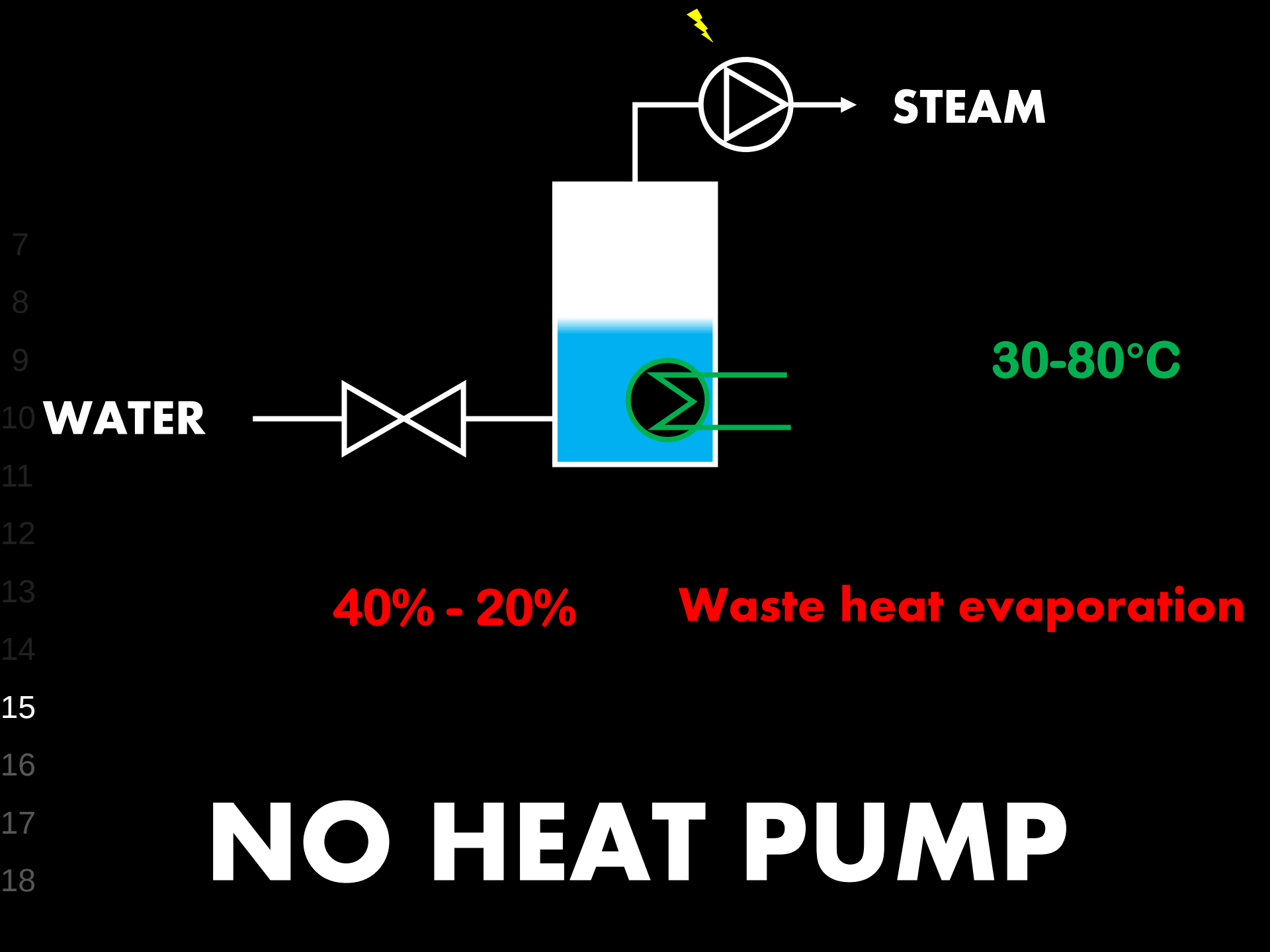
STEAM BOILER

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STEAM BOILER

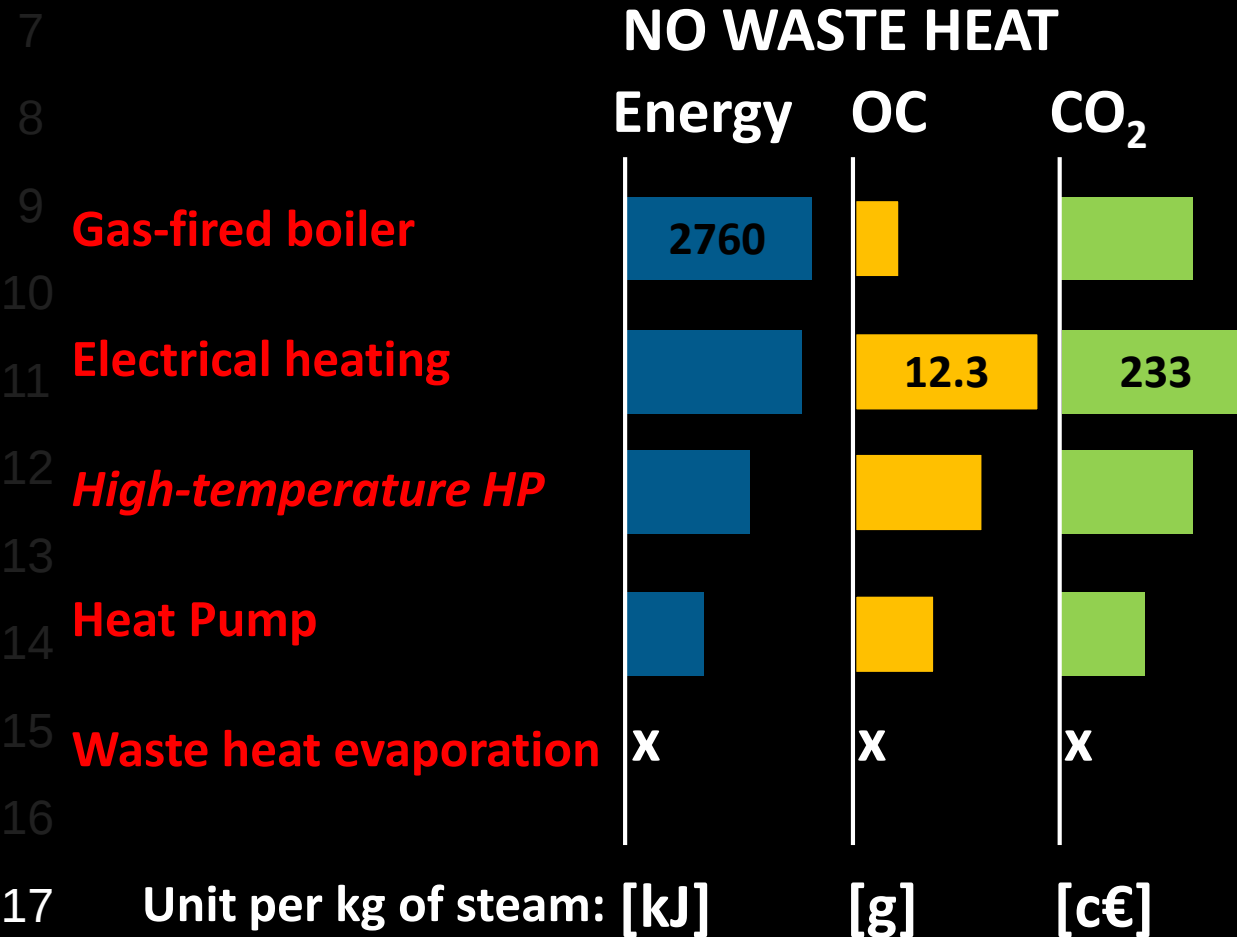




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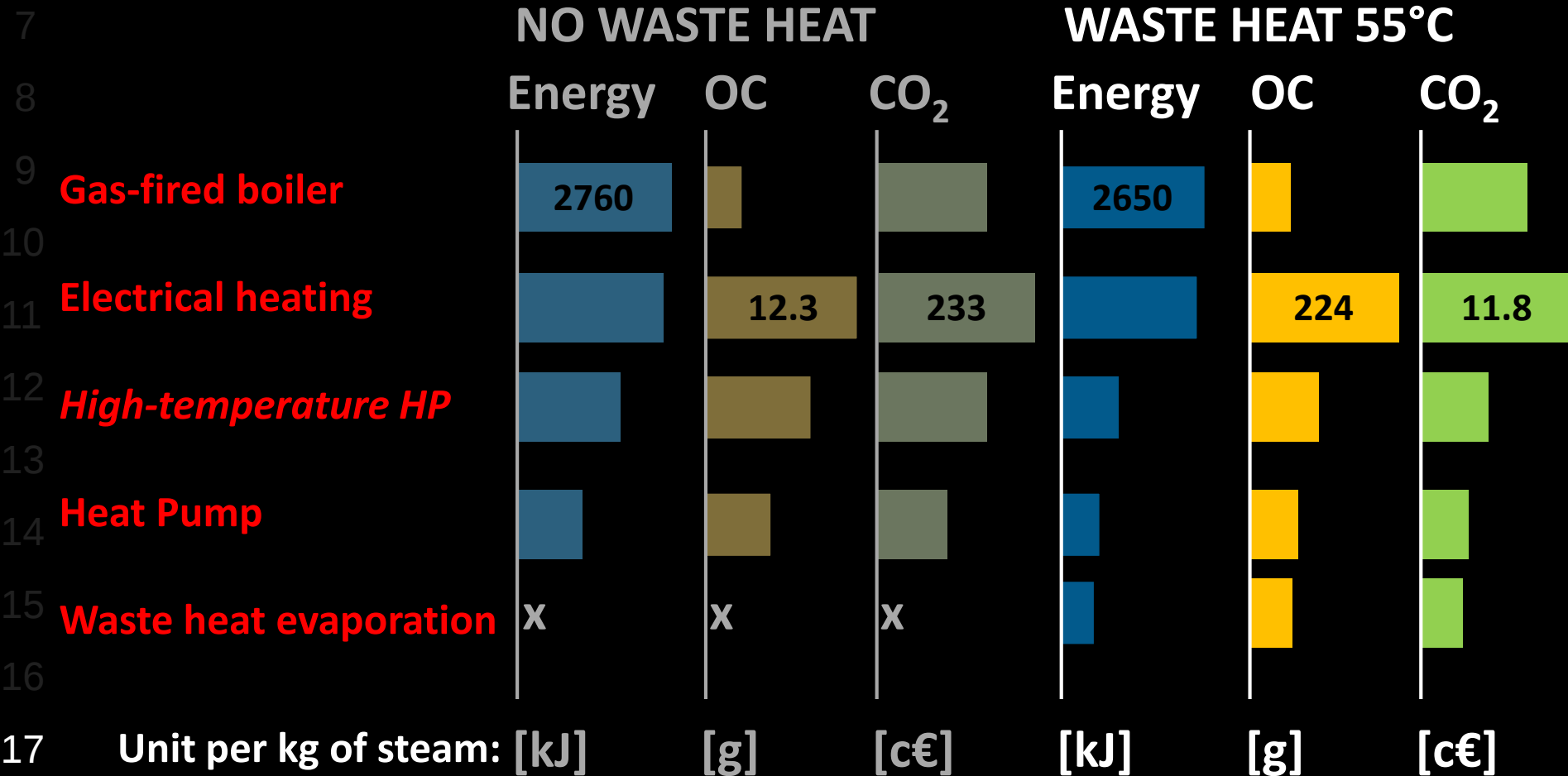
SUMMARY

RESULTS

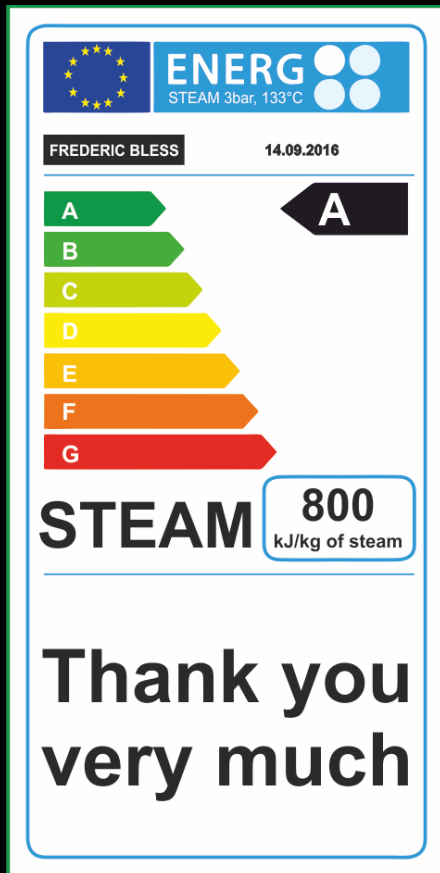


*Using values for Germany

RESULTS



*Using values for Germany



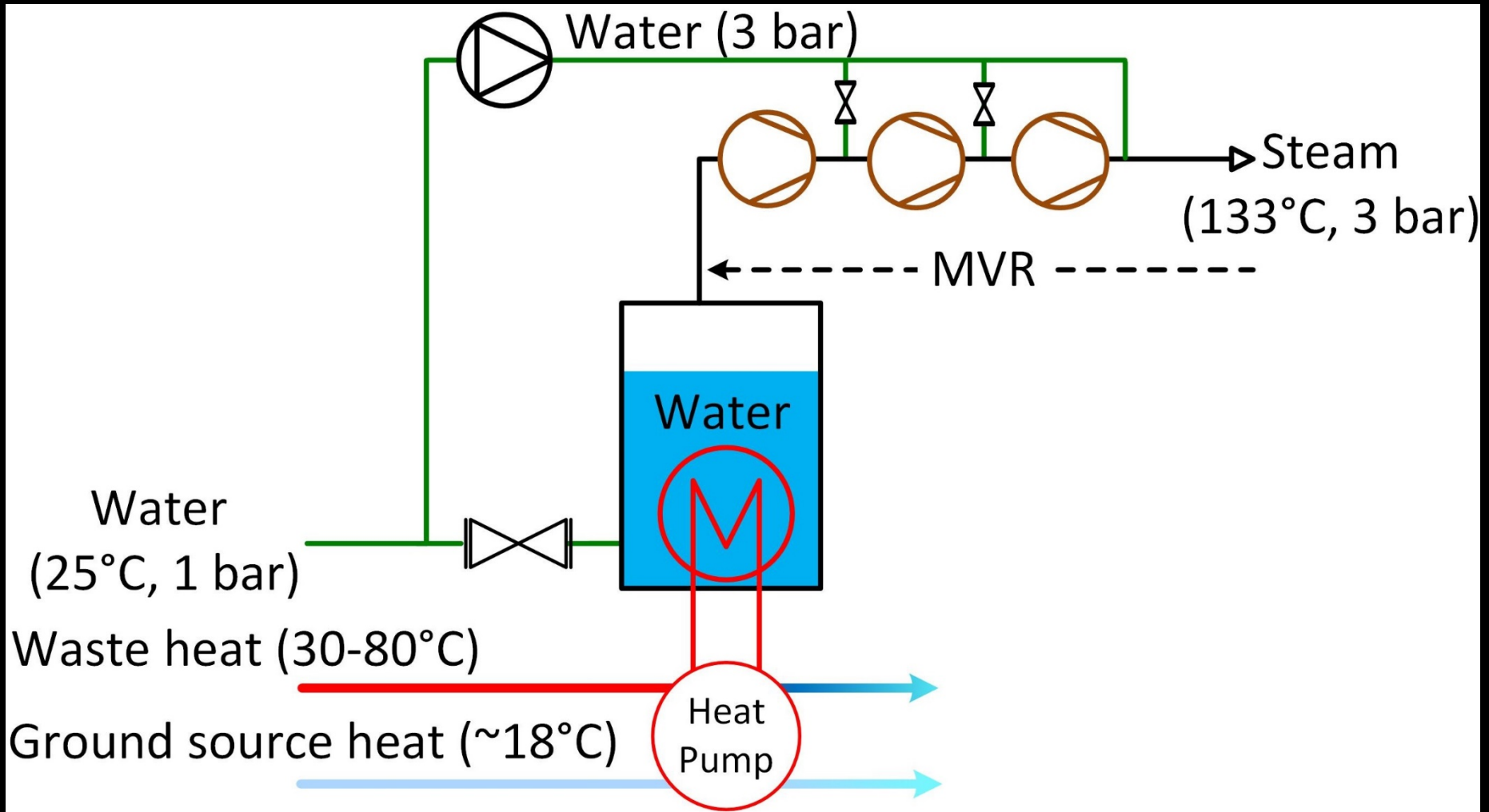
Contact:

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THANK YOU

EXAMPLE OF A PRATICAL CONCEPT



Additional slides

