



ENERGYMATTERS

Het balanceren met stoom en stroom

Platform Industriële Warmte

Donderdag 9 maart 2017

Emmtec

Ir. Jan Martin Grift re

www.energymatters.nl

Balanceren met stoom en stroom

1. Volatiliteit van tarieven
2. Spelen met warmtekracht
3. Het sluiten van kringlopen
4. Beschikbare technologieën
5. Welke technologie waar toepassen?

Duurzaam: wind en zon

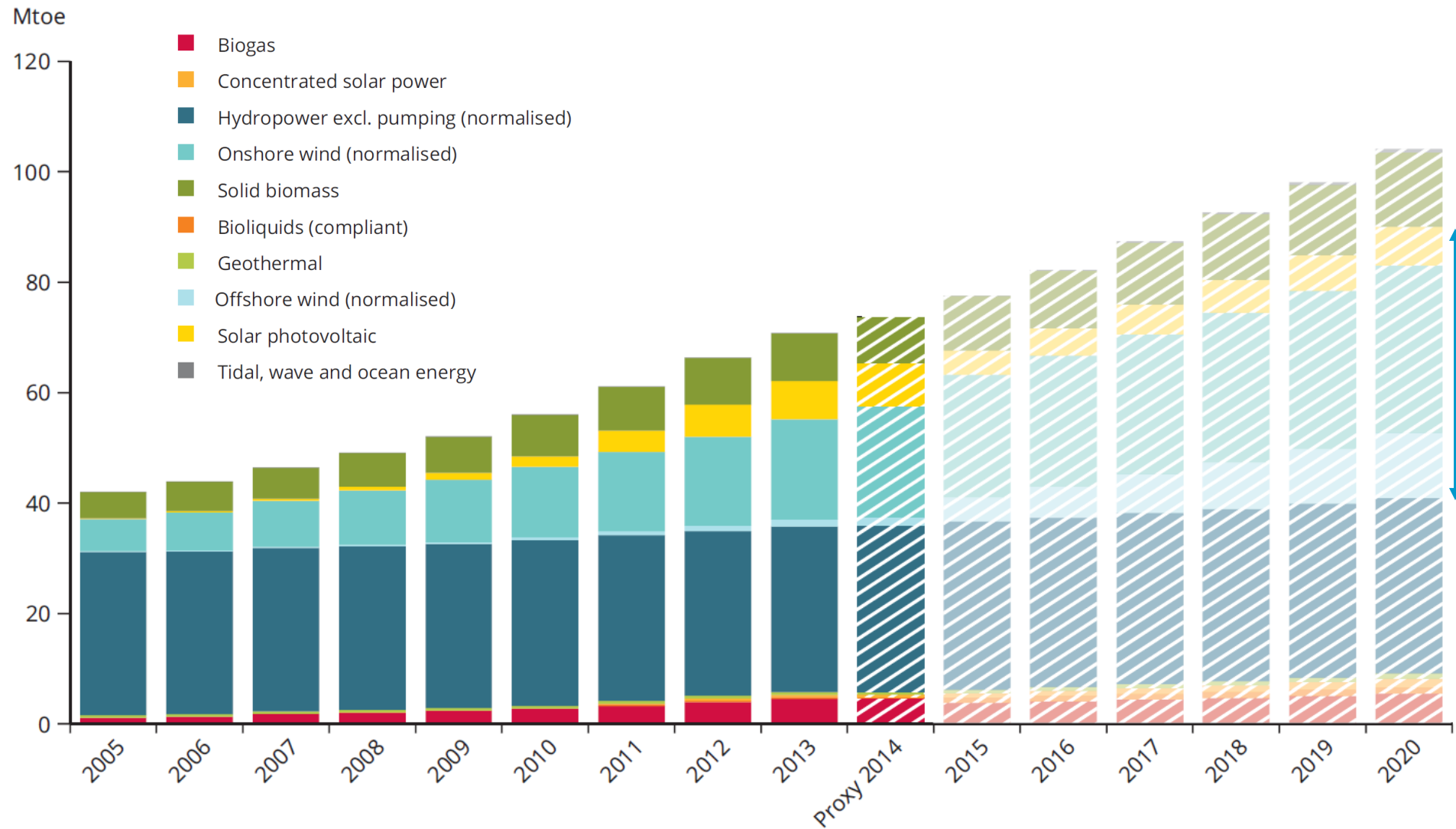


Figure 1. Renewable electricity in European Countries in Million tonne of oil equivalent. In 2014 26,9% of the total production (Tomescu, Moorkens, & e.a., 2016)

Volatility of electricity tariffs

€/ MWh

Electricity tariffs May 11th

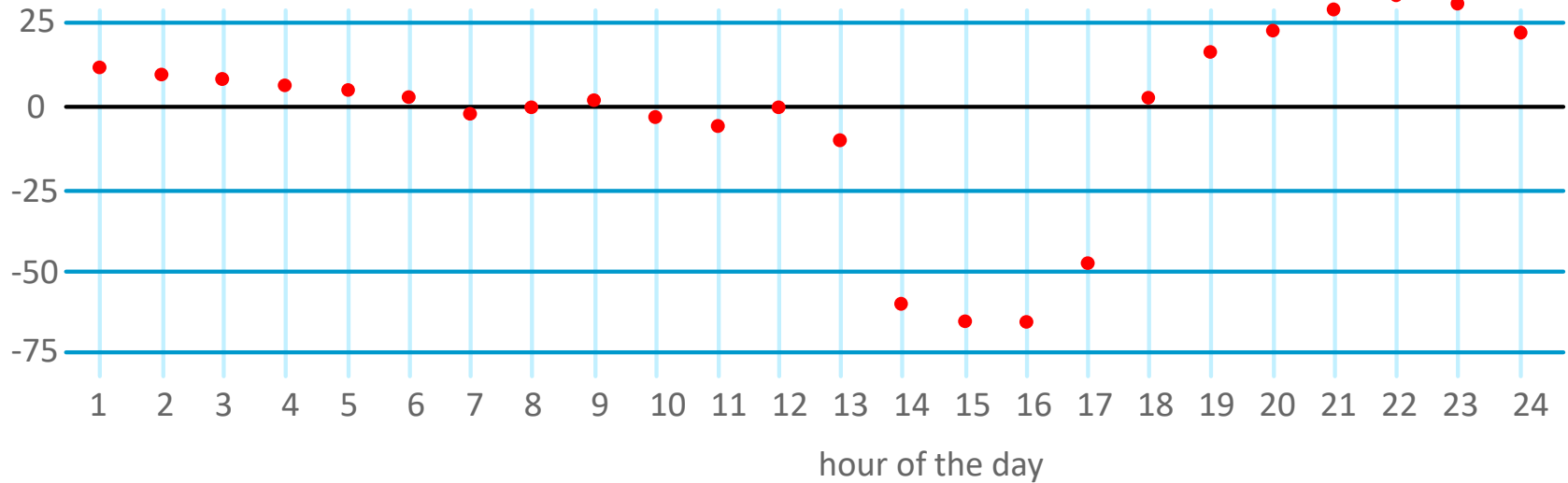
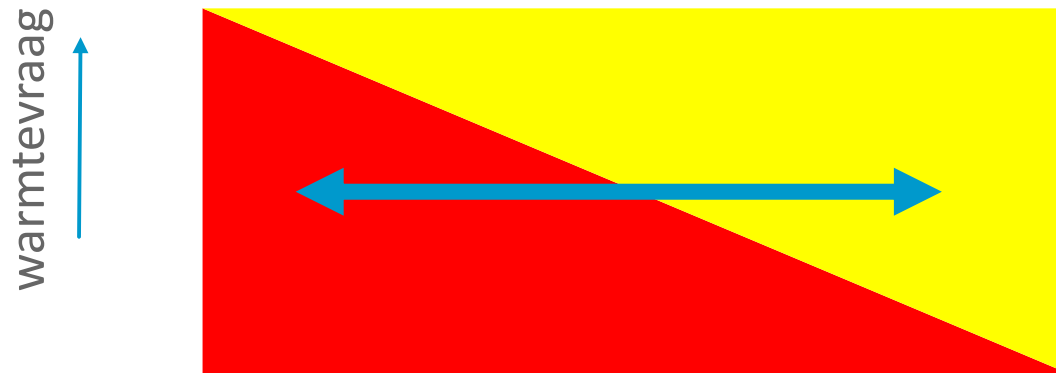


Figure 2. Electricity tariffs in Germany May 11th 2014 (Morris, 2014).

Balanceren



100% aardgas

hoog tarief elektr.

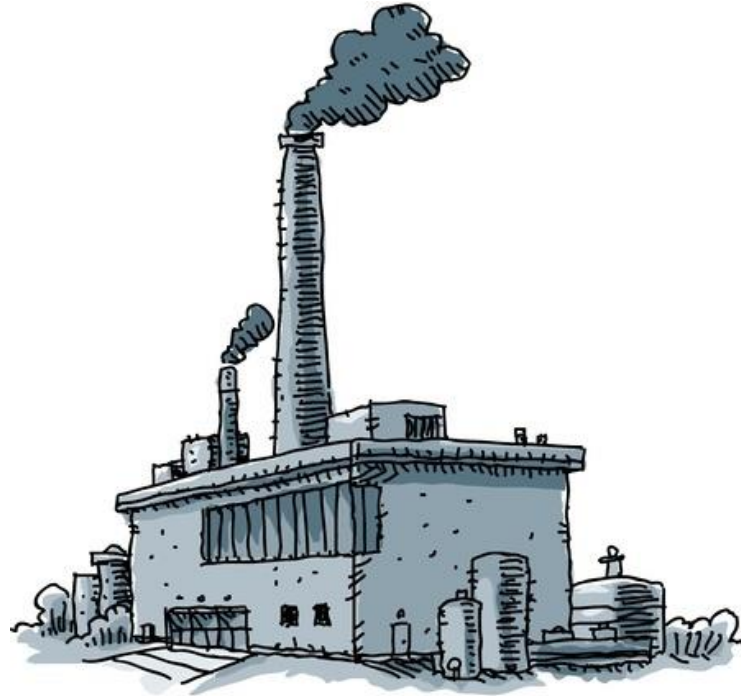
- warmtekracht
- stoom expansie

100% elektriciteit

laag tarief elektr.

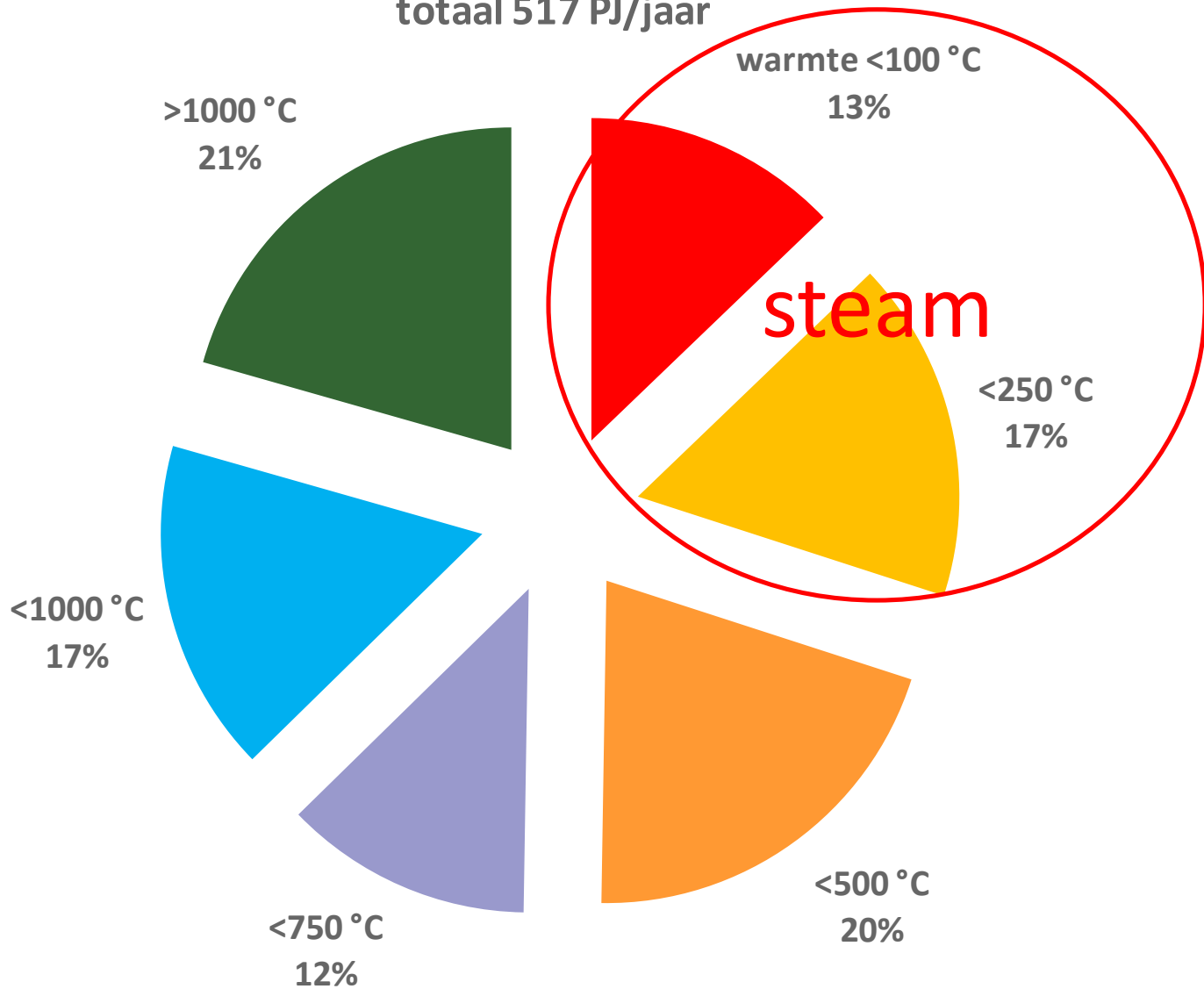
- damprecompressie
- warmtepompen

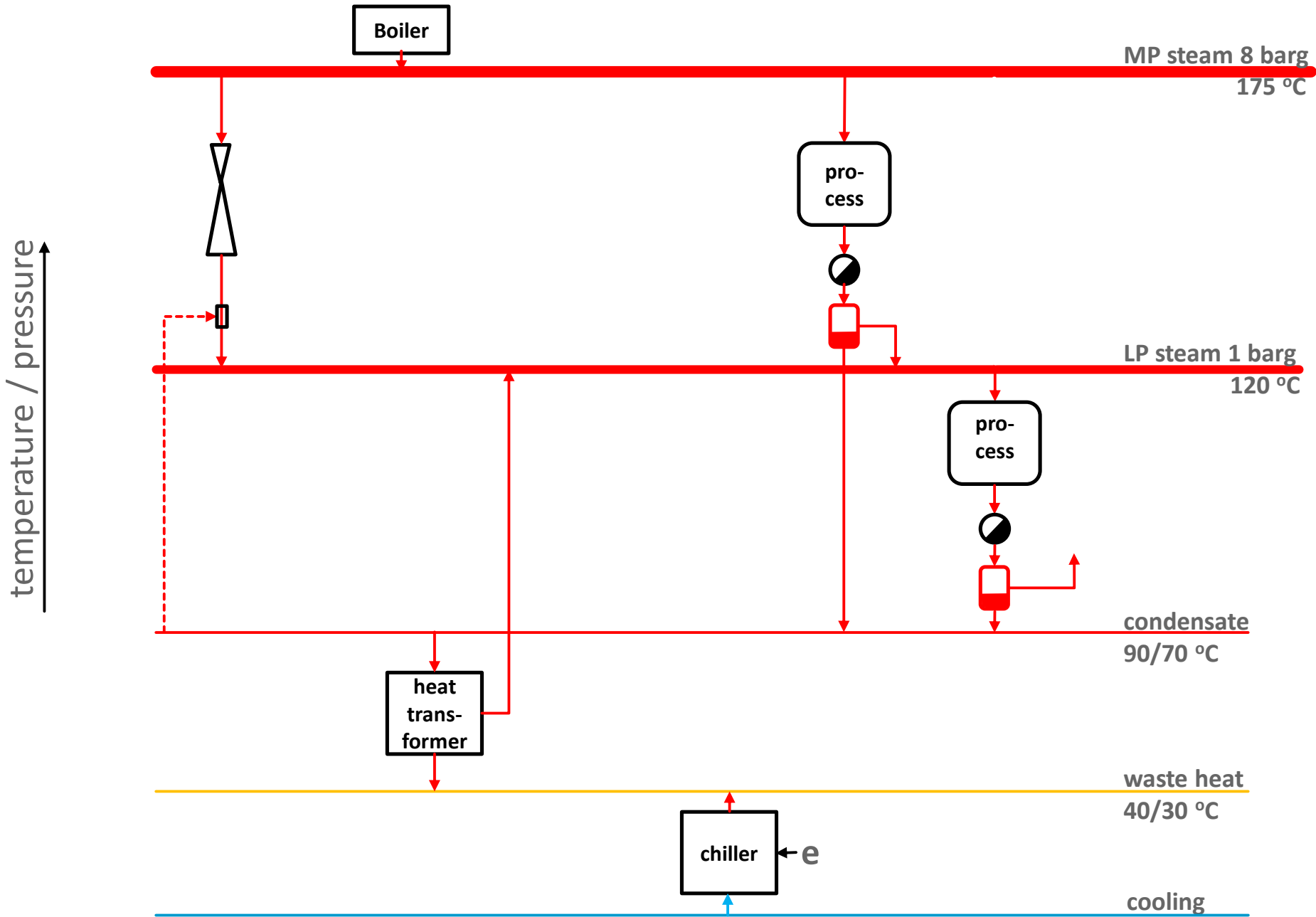
Waarom warmte nodig?



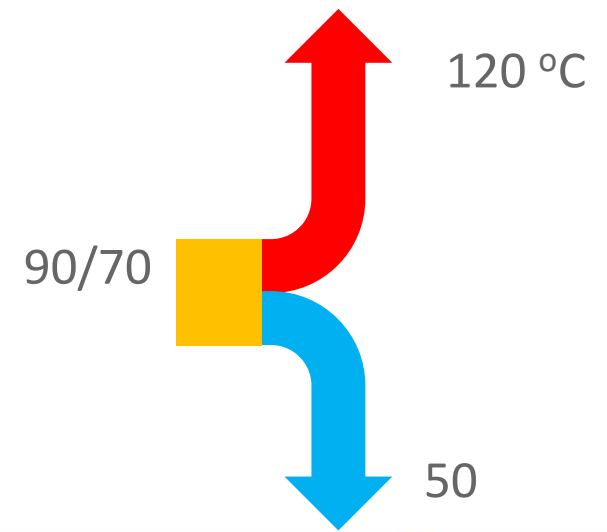
Veel LT en MT warmte in Nederland

verdeling primair energiegebruik tbv warmte in de industrie Nederland,
totaal 517 PJ/jaar

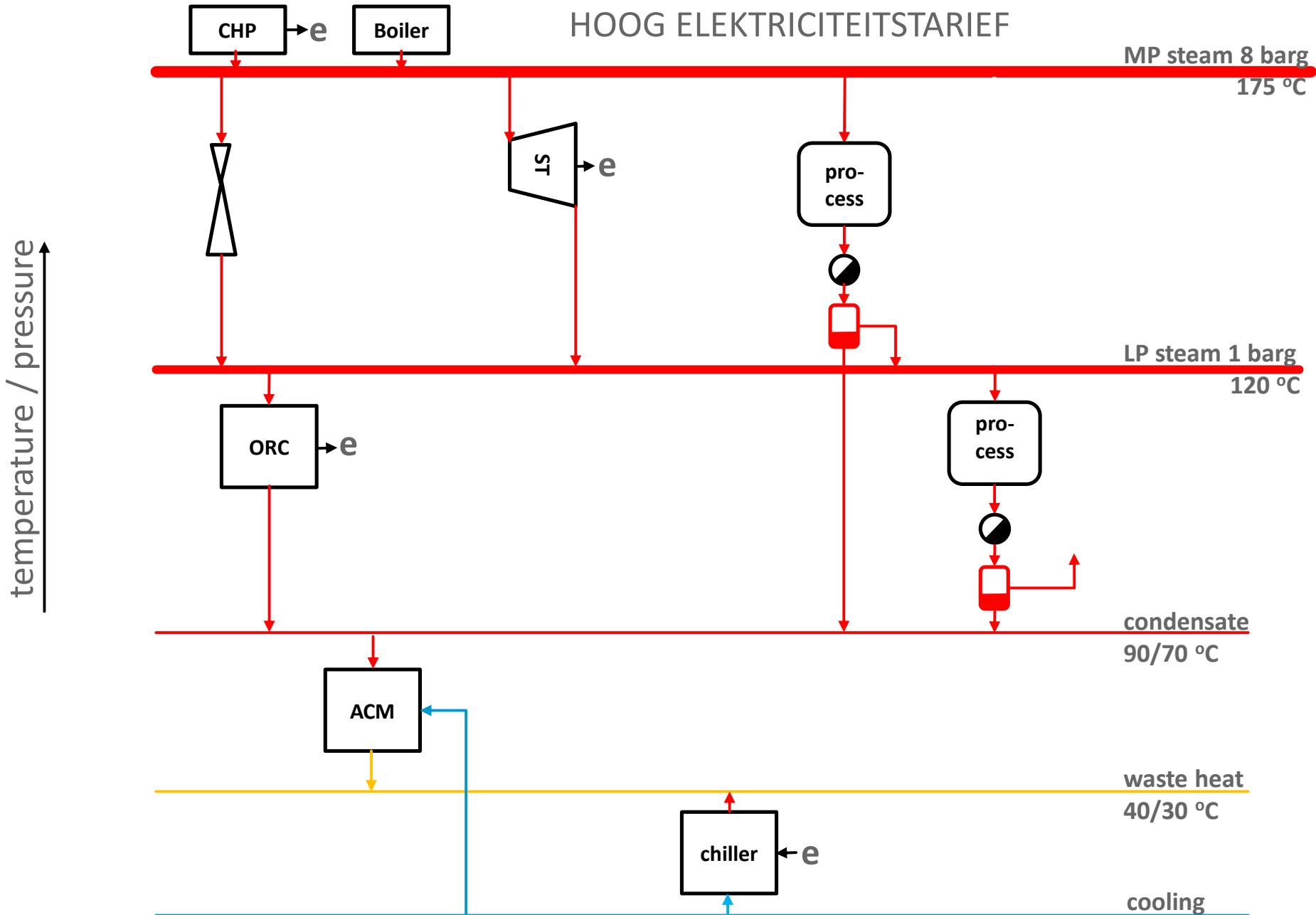




Wärmetransformatoren



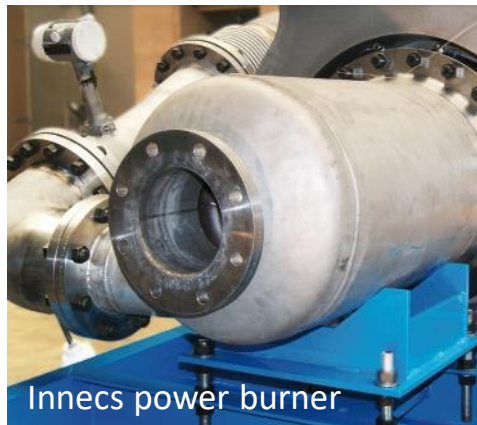
HOOG ELEKTRICITEITSTARIEF



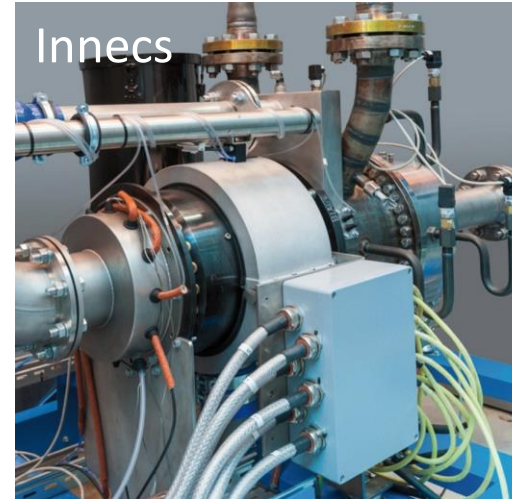
Warmtekracht – warmte en LD stoom



**i.c.m. ORC of
warmtetransformator**



Stoomturbines / motoren



ORC

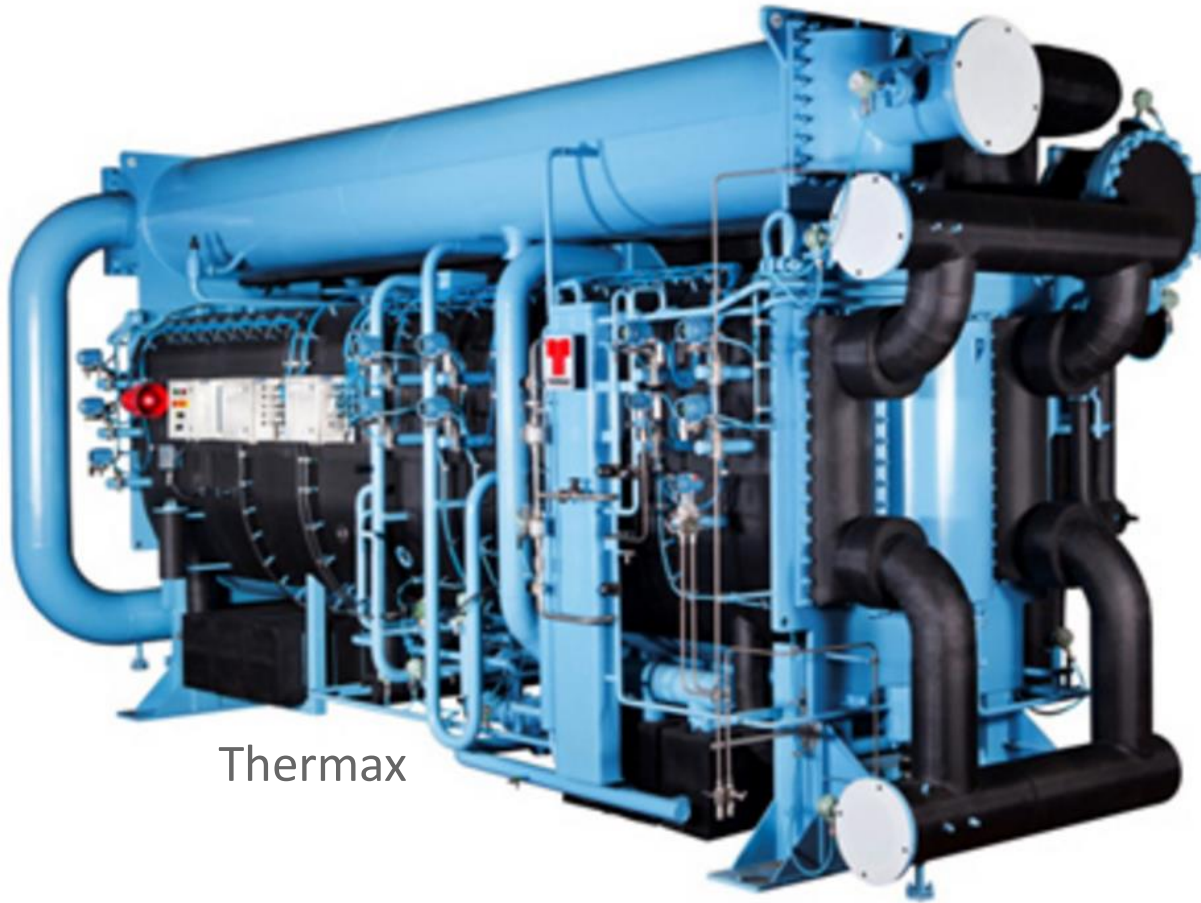


Turboden

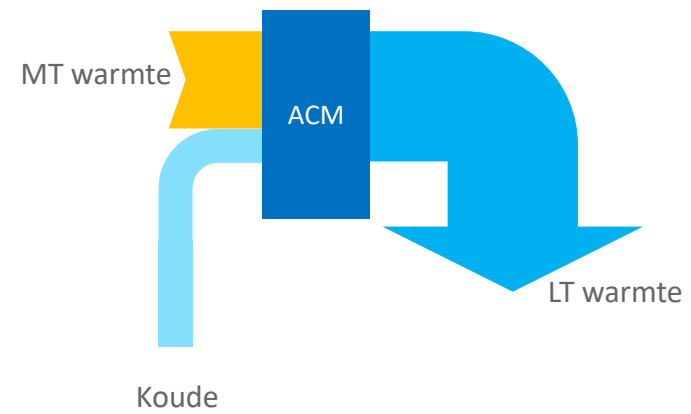


Triogen

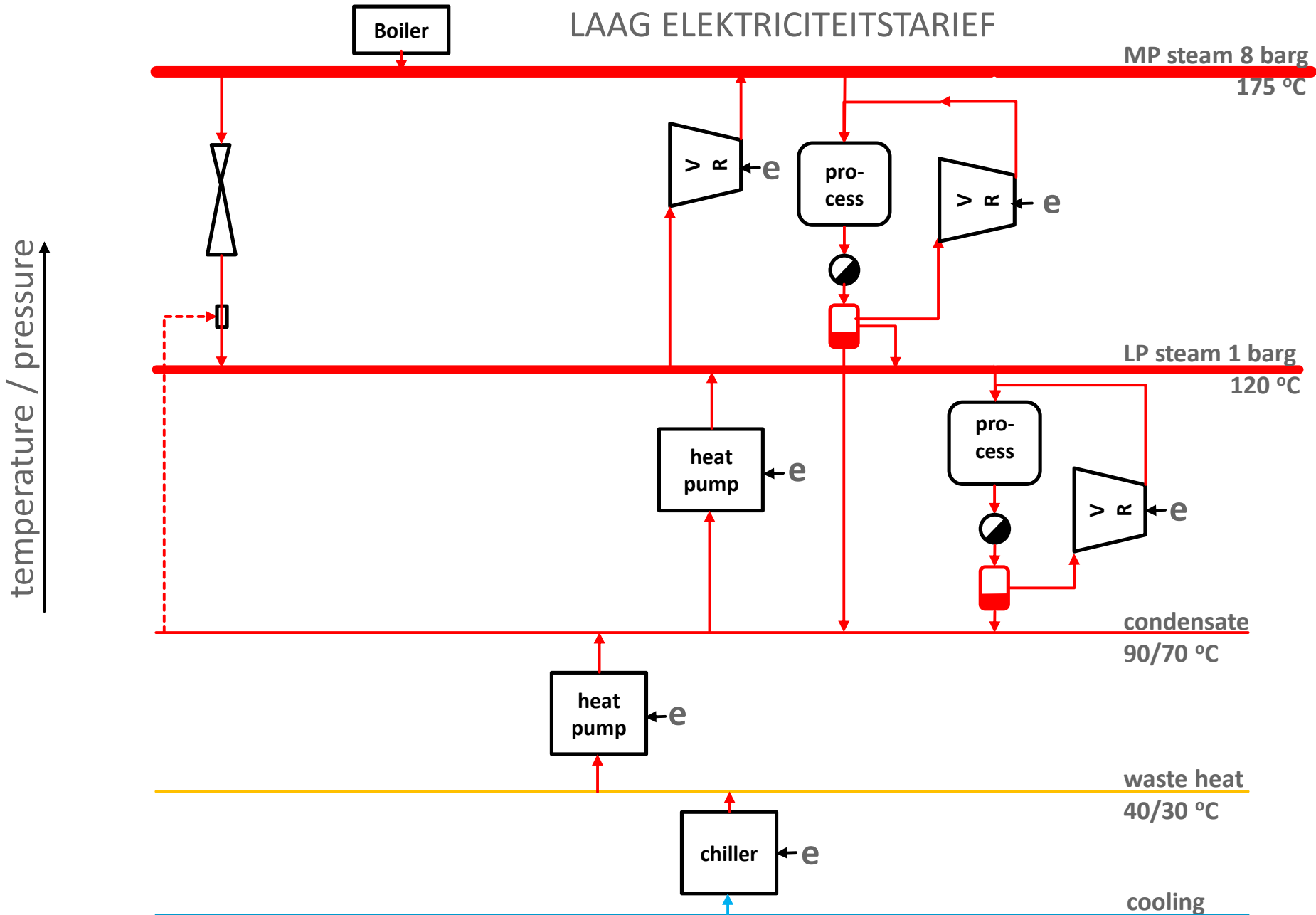
Absorptiekoelmachines



Thermax

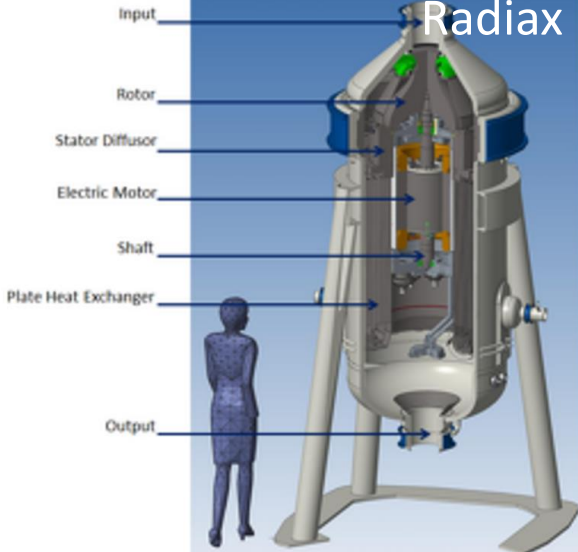
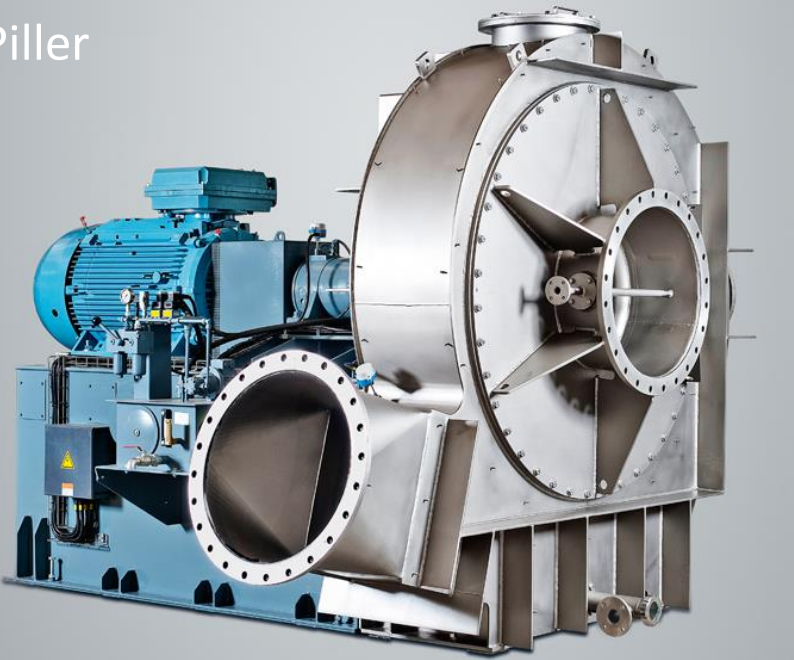


LAAG ELEKTRICITEITSTARIEF



Mechanische damprecompressie

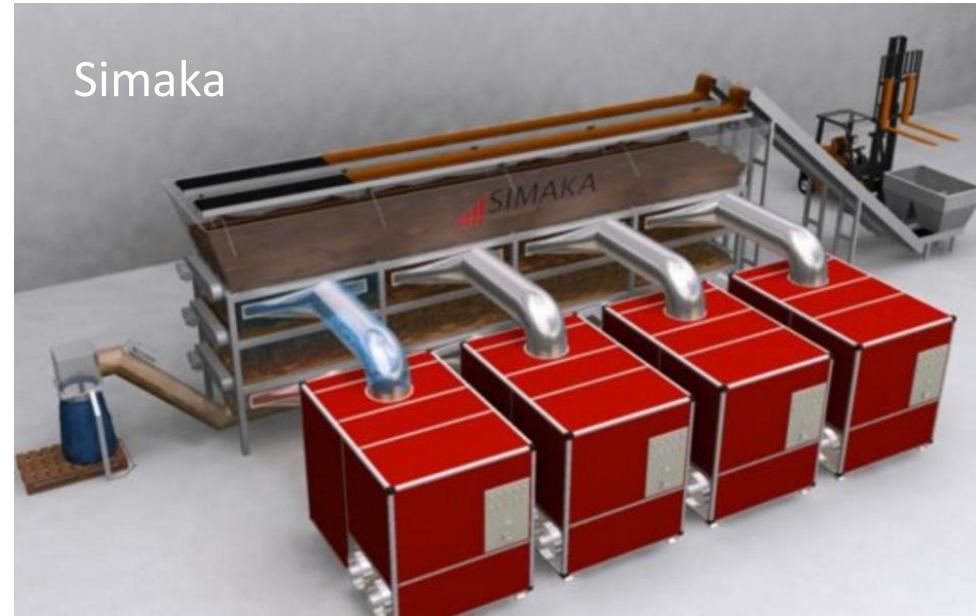
Piller



Siemens



HT warmtepompen

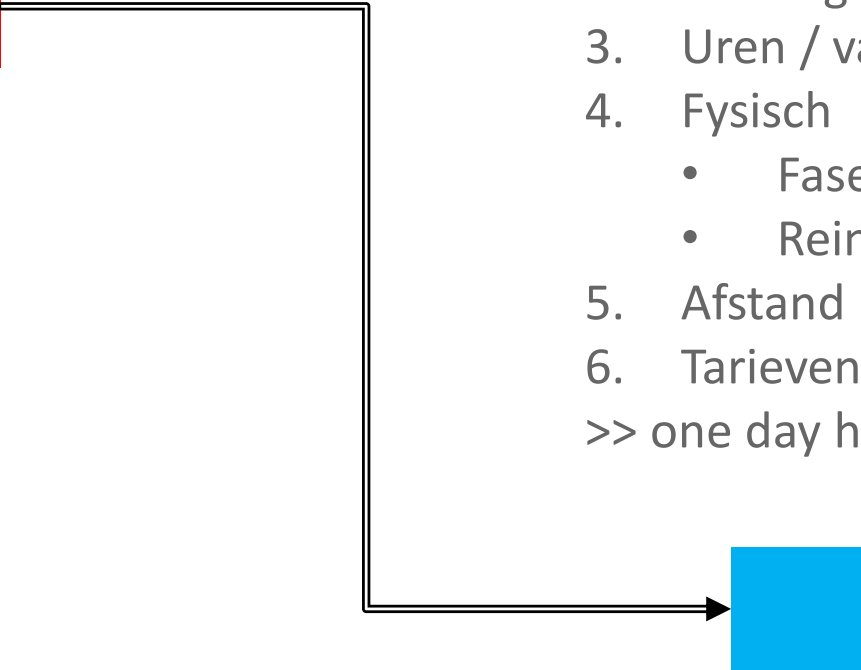


LT warmtepompen



Waar is welke technologie interessant?

1. Temperatuur (niveau / sprong)
 2. Vermogen
 3. Uren / variaties (buffering)
 4. Fysisch
 - Fase (overgang)
 - Reinheid
 5. Afstand
 6. Tarieven
- >> one day heat pump scan



Conclusies

- Flexibilisering biedt kansen
- Sluiten kringlopen technisch veelal mogelijk
- Vaak geen inzicht in mogelijkheden
 - > inventariseer restwarmtestromen
- Rentabiliteit nu vaak lastig
- Maak lange termijn plan (backcasting)