

SPOT PROJECT

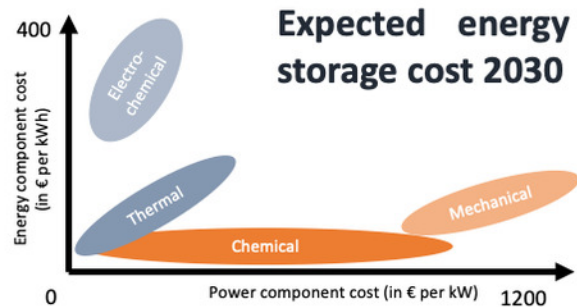
SUSTAINABLE PROCESS HEATING

In the SPOT project the costs of power-to-heat supply chains have been researched, that would be able to supply the whole Dutch industry with sustainably generated and stored heat.

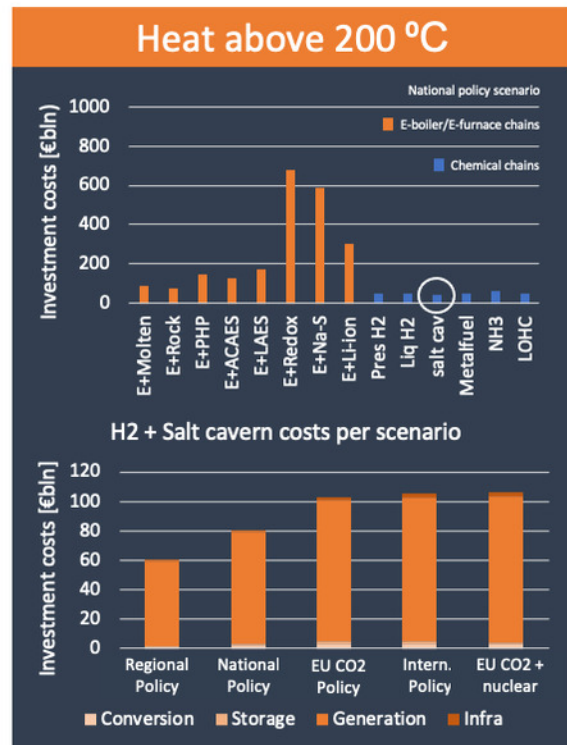
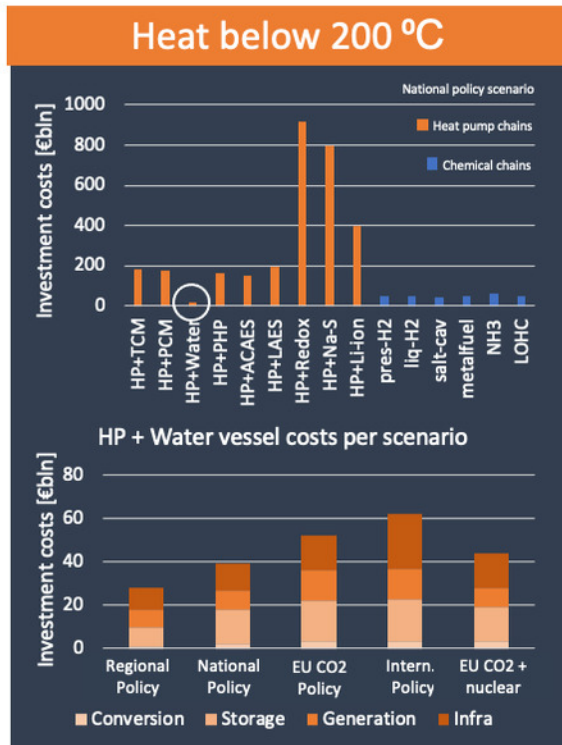
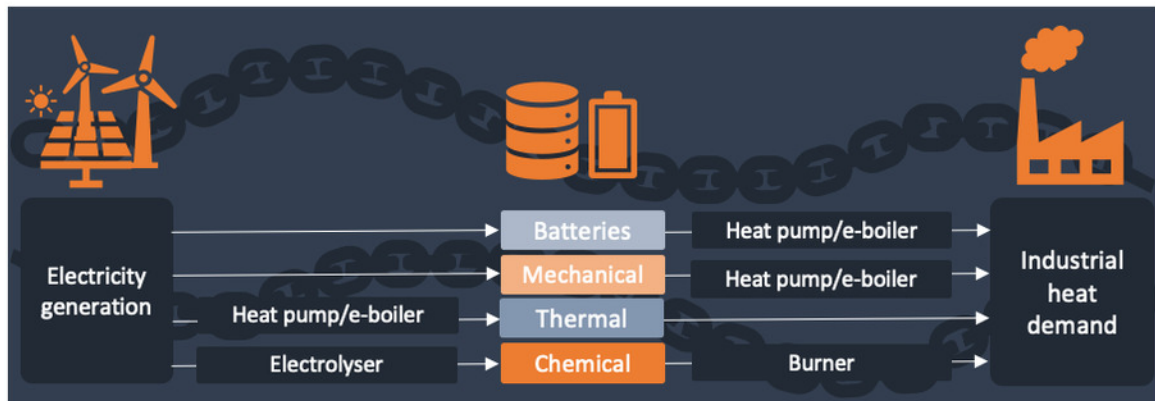
Industrial energy demand in NL



Electrochemical <ul style="list-style-type: none"> Redox Na-S Li-ion 	Mechanical <ul style="list-style-type: none"> Pumped hydro PHP Compressed air ACAES Liquid air LAES
Thermal <ul style="list-style-type: none"> Sorption Molten salt Water vessel Rock Latent 	Chemical <ul style="list-style-type: none"> Pressurized H2 Liquified H2 Metal fuel NH3 & LOHC Salt cavern H2



The costs of electricity generation, storage technologies and conversion like heat pumps and electrolyzers have been modelled separately.



CONCLUSIONS

- The power generation mix (ratio solar/wind/nuclear) is an important factor for the amount of energy storage required.
- Long-duration energy storage will be given a place in the chain from generation to 100% sustainable heat production.
- Energy storage costs will become a major contributor to total energy system costs.
- Energy storage in a water vessel with a heat pump is the most attractive option for heat chains below 200 degrees C.
- Energy storage in the form of hydrogen in underground salt caverns in combination with a hydrogen burner is the most attractive option for heat chains above 200 degrees C.
- CO2-free baseload generation such as nuclear energy results in lower requirements for long-duration energy storage and may result in lower overall investment costs depending on chain efficiency. Nuclear energy thus competes with seasonal energy storage, not with renewable energy generation.