

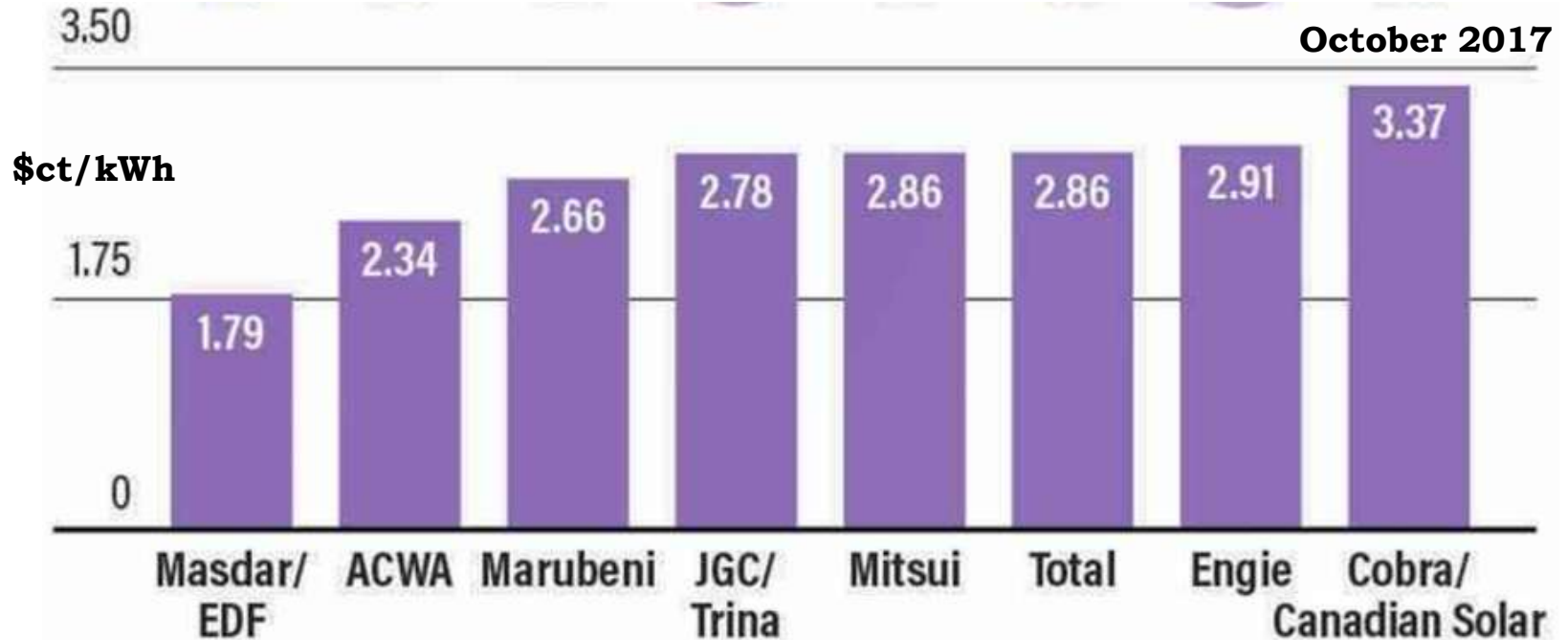
The background image shows a large, modern amphitheater with wide, light-colored concrete steps. Many people are sitting on the steps, some in groups, some alone. In the background, a prominent concrete tower with a lattice-like top structure stands against a clear blue sky. To the right, a green lawn slopes upwards, also with people sitting on it. A modern building is visible in the distance behind the tower.

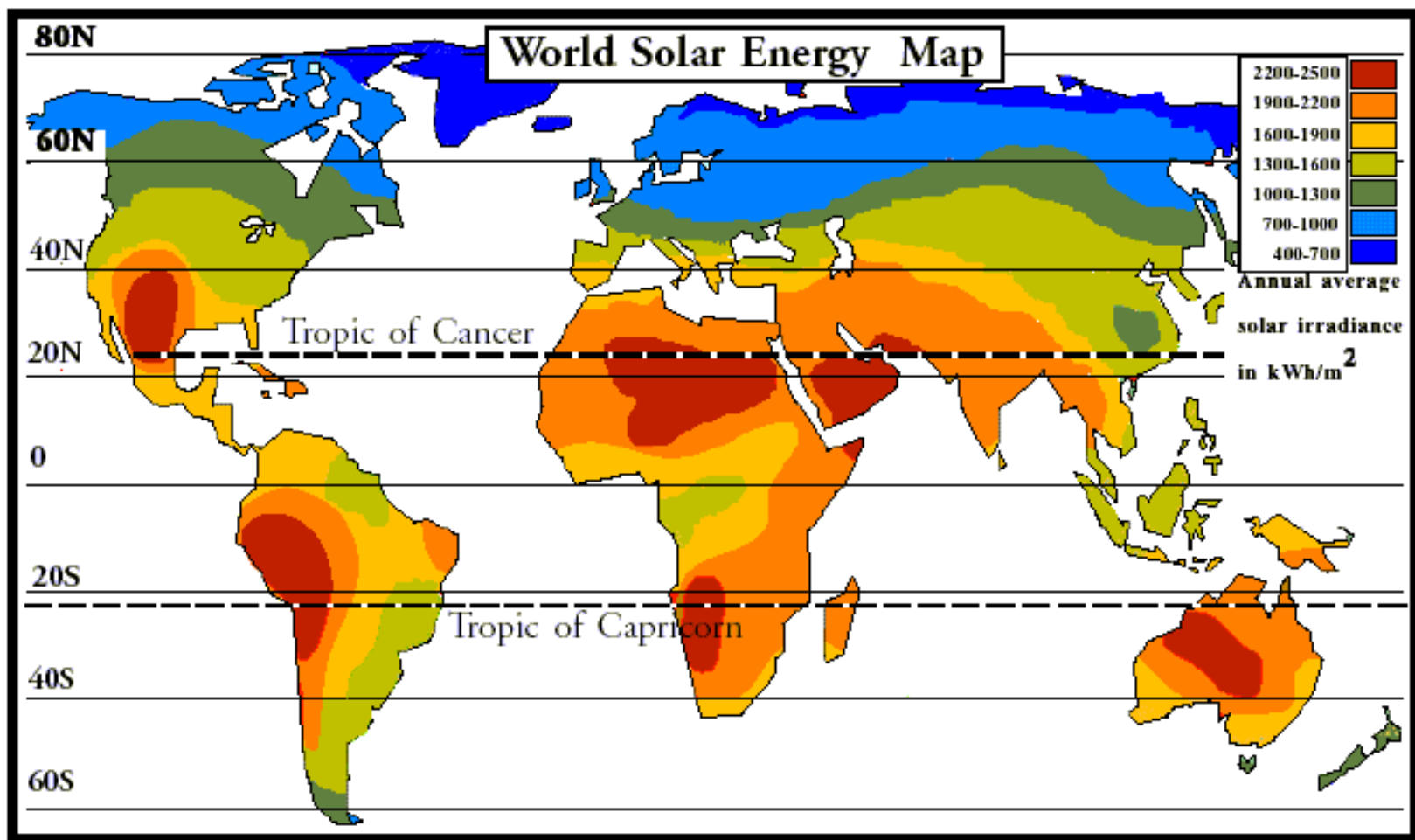
Hergebruik van het gasnet

Prof. Dr. Ad van Wijk

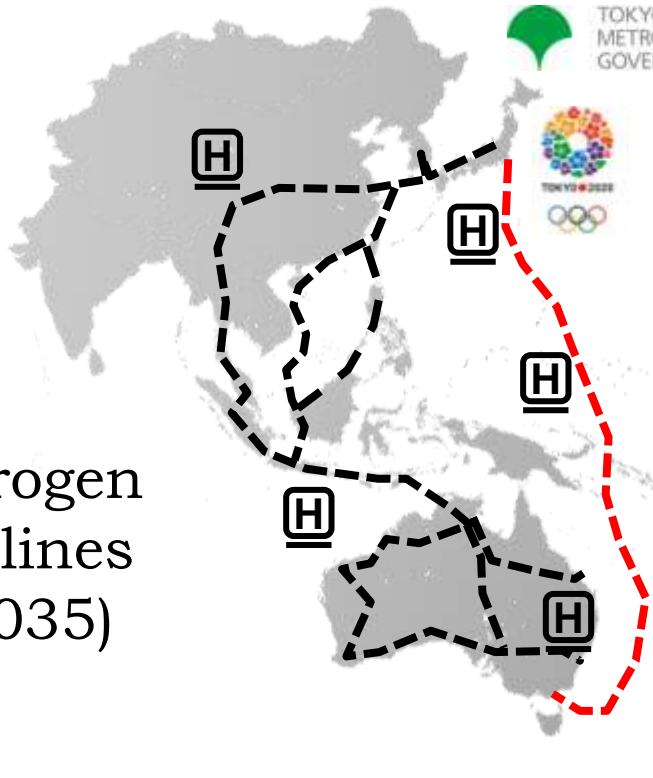
18-4-2018

Bids for Saudi Arabia's 300 MW Solar Plant





Tokyo Olympic Games 2020



Hydrogen Pipelines (~2035)

Hydrogen Shipping (~2025)



Surface needed to produce all the world's energy 556 EJ = 155.000 TWh

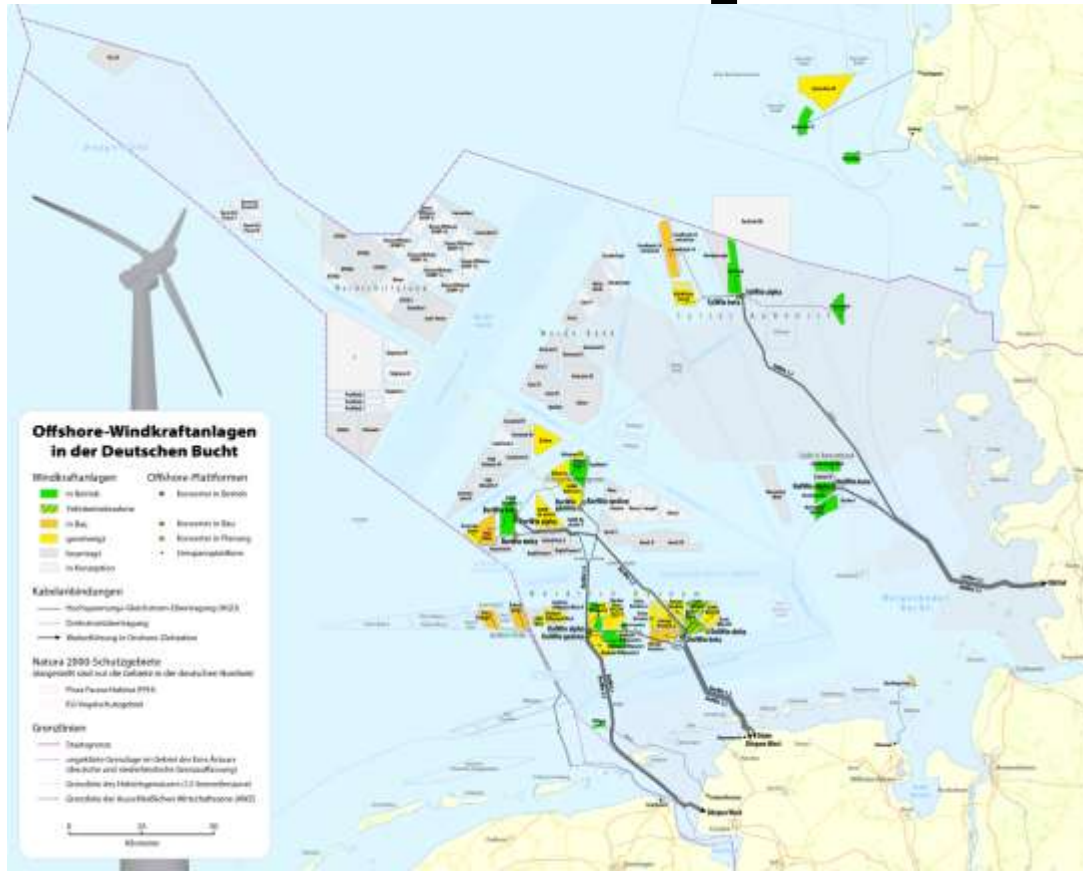


10% SOLAR AUSTRALIA



1.5% WIND PACIFIC OCEAN

Offshore Wind Development Germany



VATTENFALL BOUWT WINDPARK ZONDER SUBSIDIE

19 MAART 2018

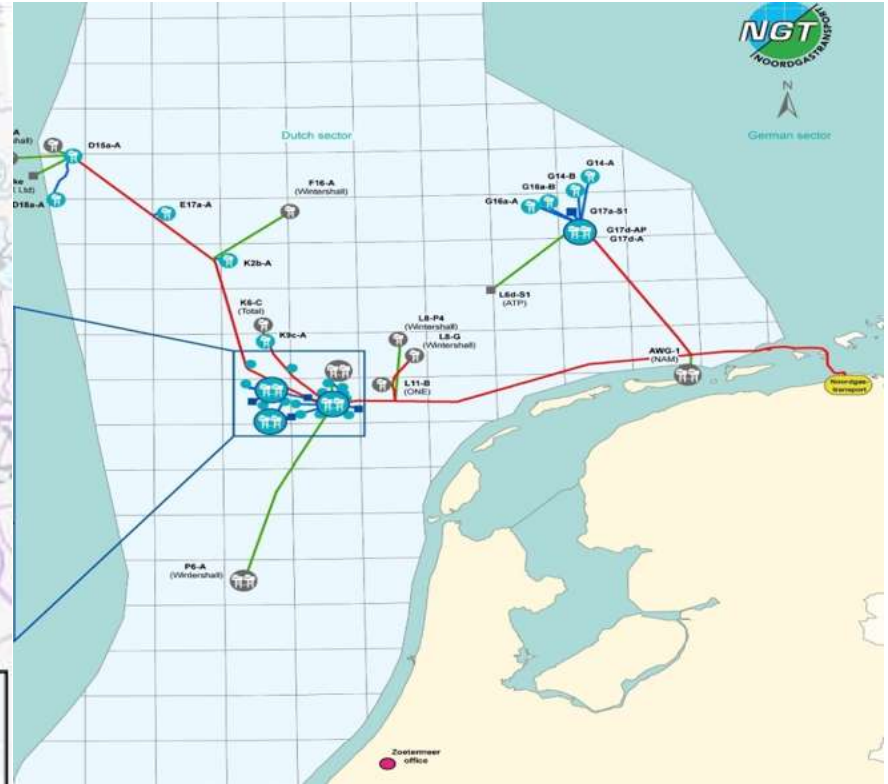
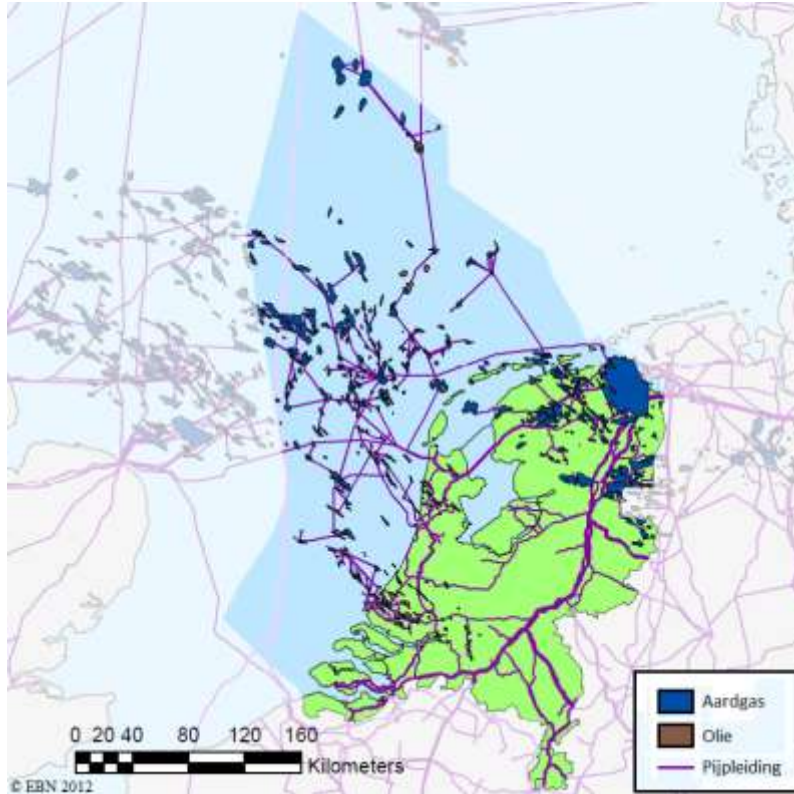
- Chinook, daughter Vattenfall
- 700 MW wind farm
- Operational 2022
- Location Hollandse Kust (Zuid)
- 22 km from the coast



Electricity and Gas Transport Grid



Gas Pipelines at the North Sea



Cable versus pipeline cost

	Cable (BritNed)	Pipeline (BBL)
Capacity	1 GW	15 GW
Construction Cost	€ 500 mln	€ 500 mln
Volume (year)	8 TWh	120 TWh

Hydrogen storage in Salt Caverns



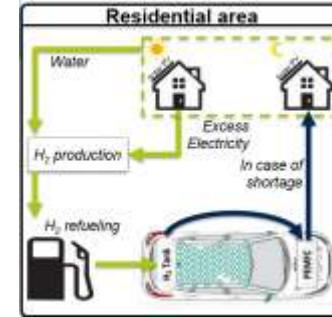
1 salt cavern can contain 6,000 ton hydrogen
Equivalent of 17 million Tesla Power walls

Green Hydrogen Markets

Chemical Feedstock



Electricity Balancing



Transport



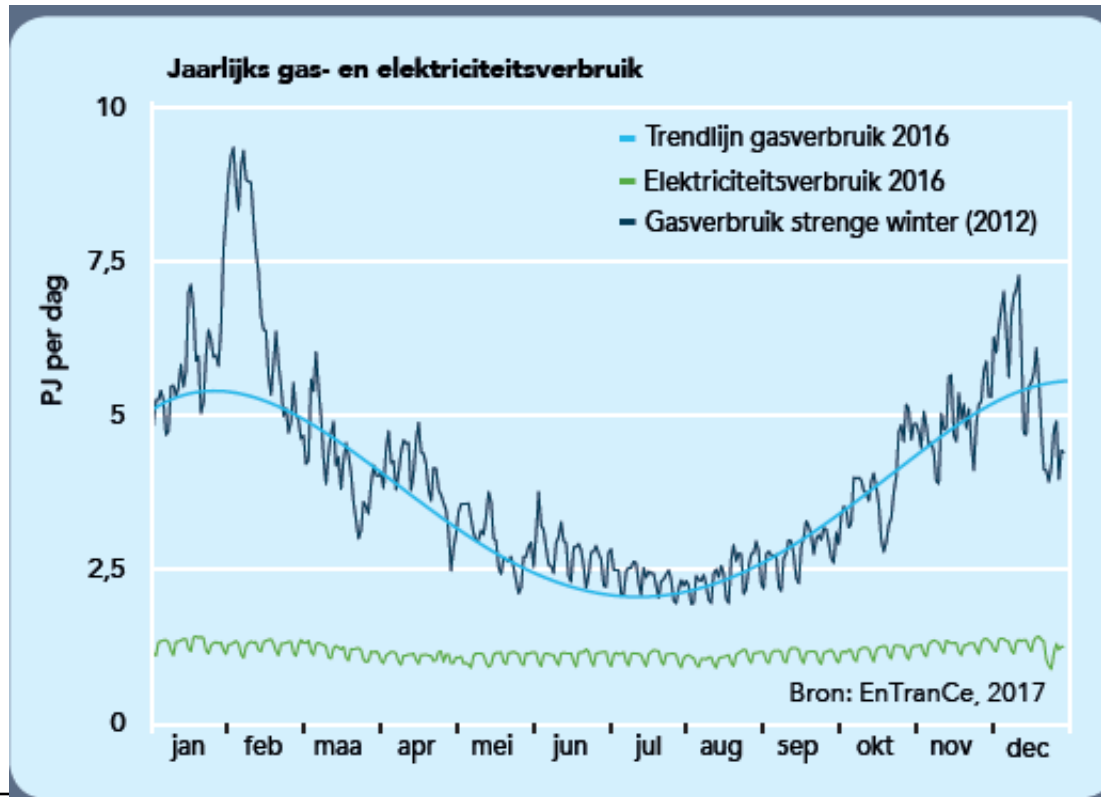
Heating



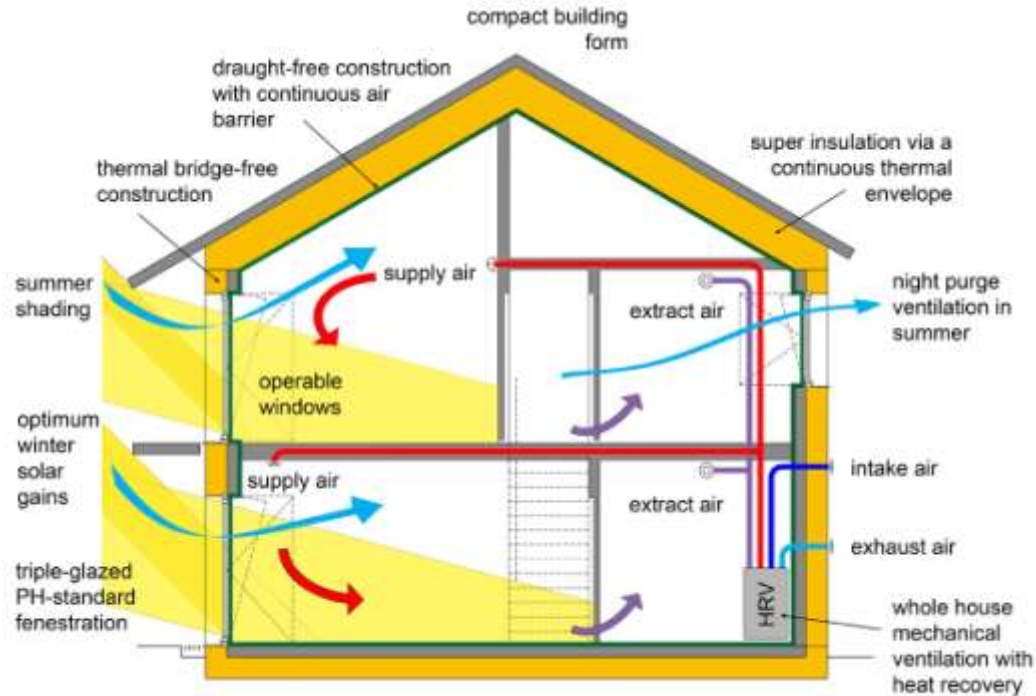
Energy for heating buildings

- Energy use for heating and cooling our buildings is roughly 25% of all energy.
- But why do we use energy in our buildings?
 - In winter time it is too cold and we have to heat our buildings
 - In summer time it is too hot and we have to cool our buildings
- It is not an energy problem it is a storage problem

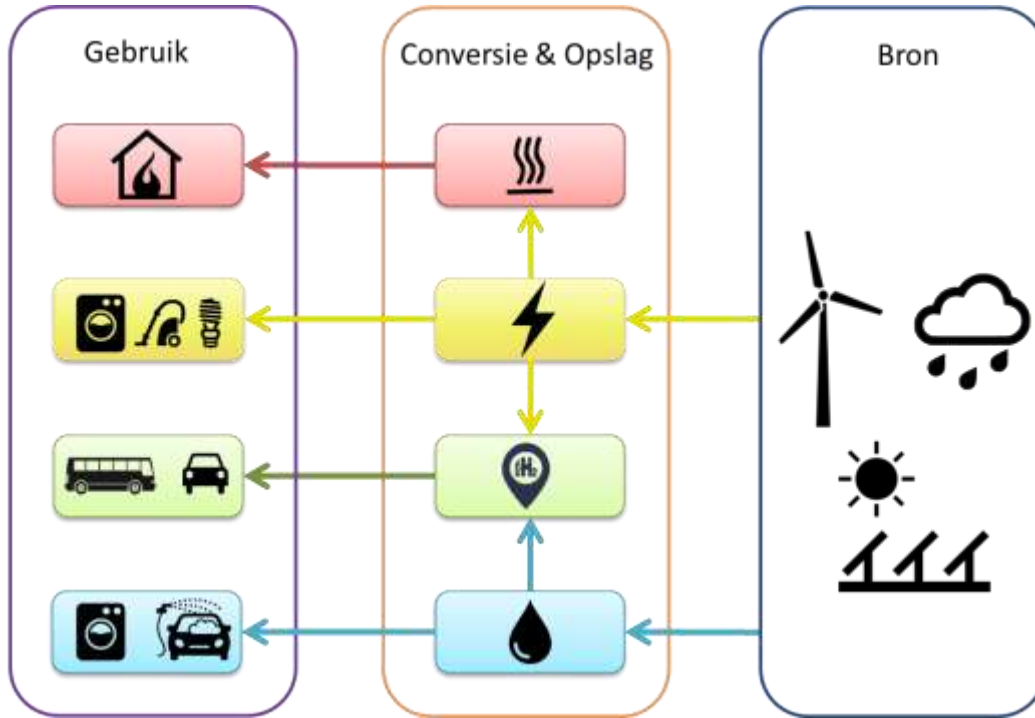
Gas and Electricity consumption the Netherlands



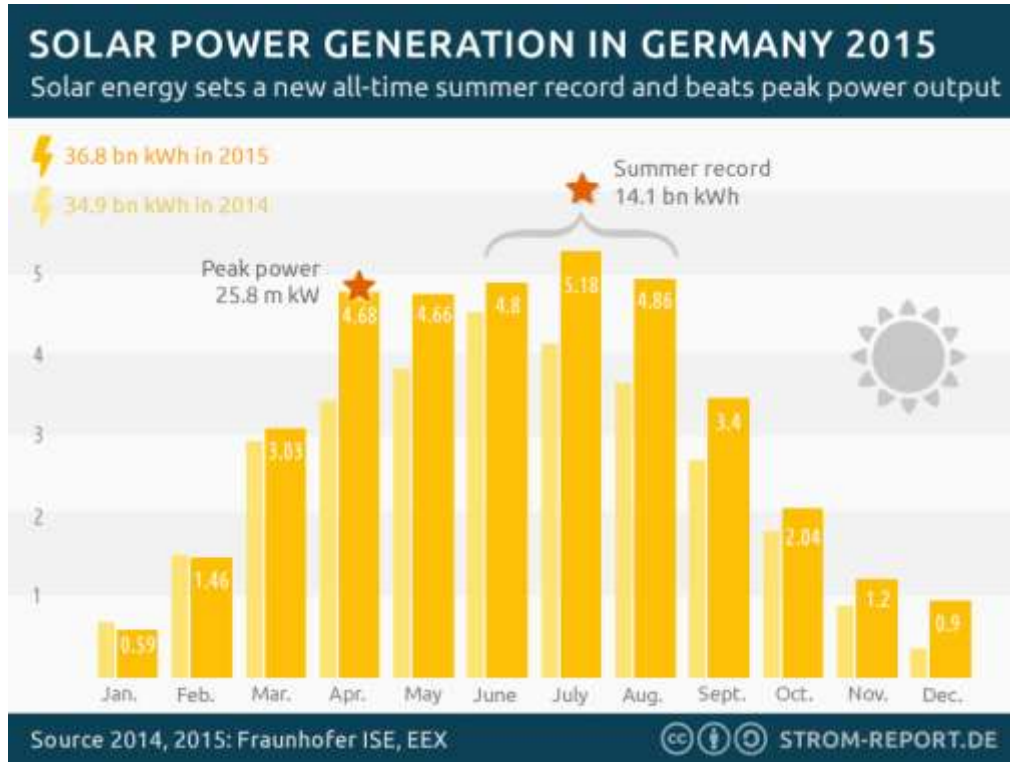
Passive House



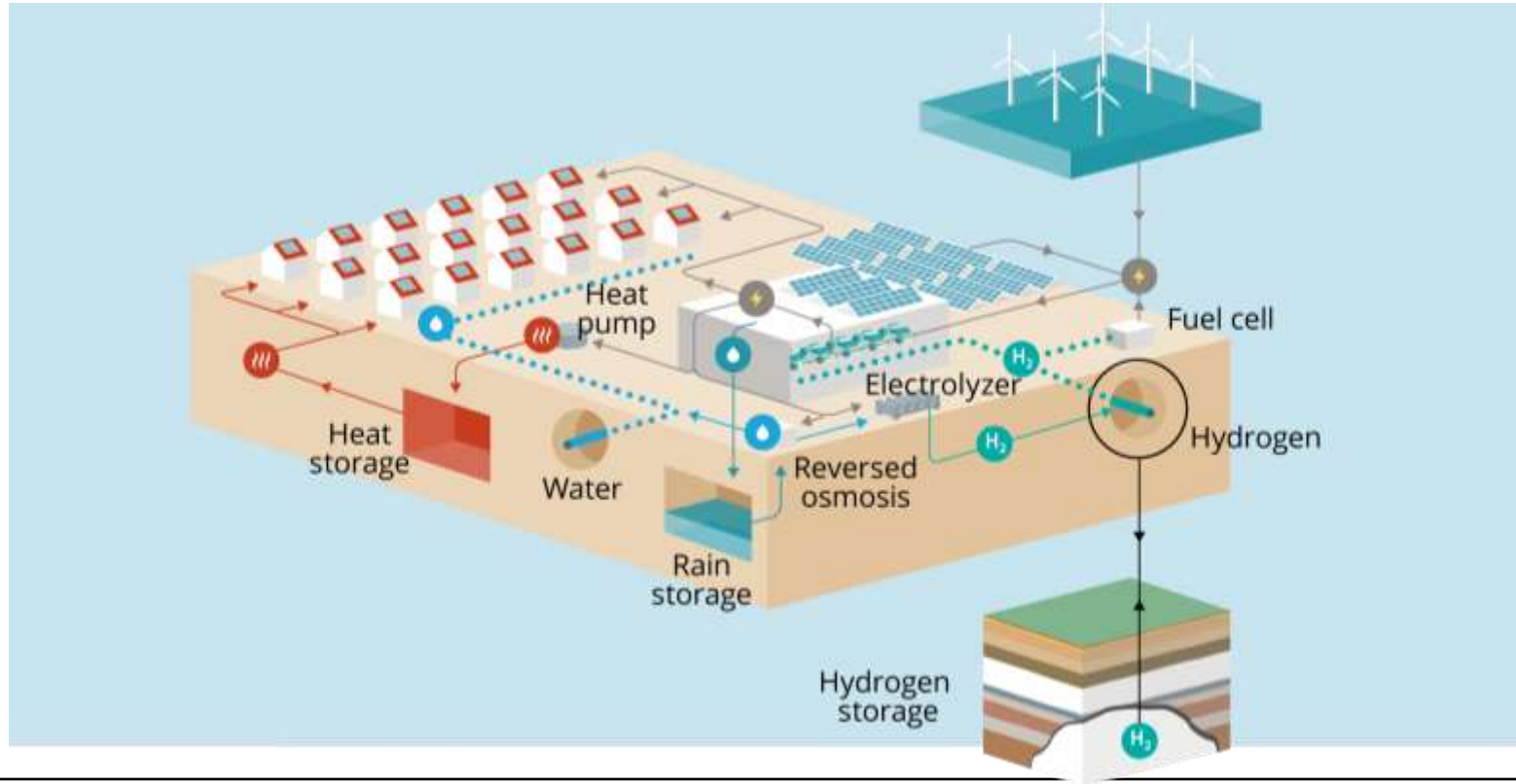
Power to X (heat and hydrogen)



Solar power production in Germany

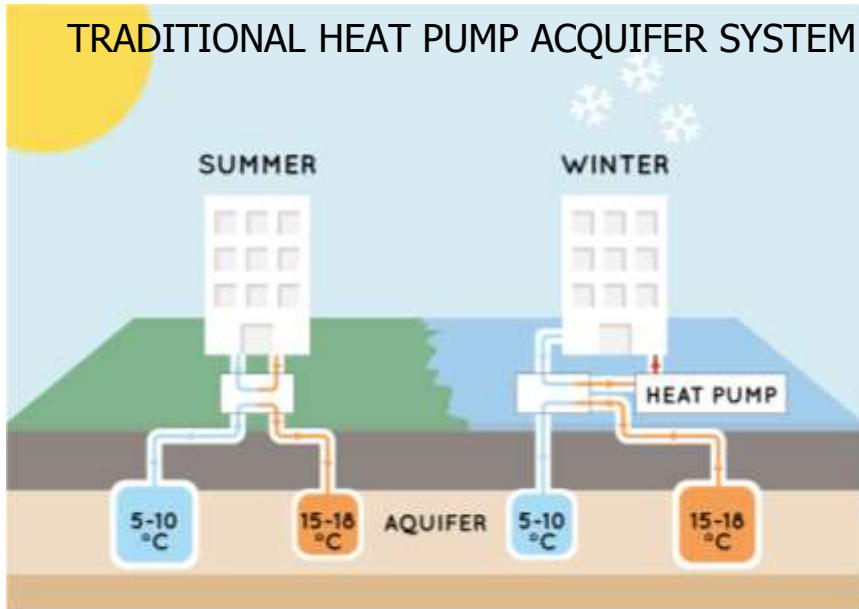


Solar power to heat and hydrogen

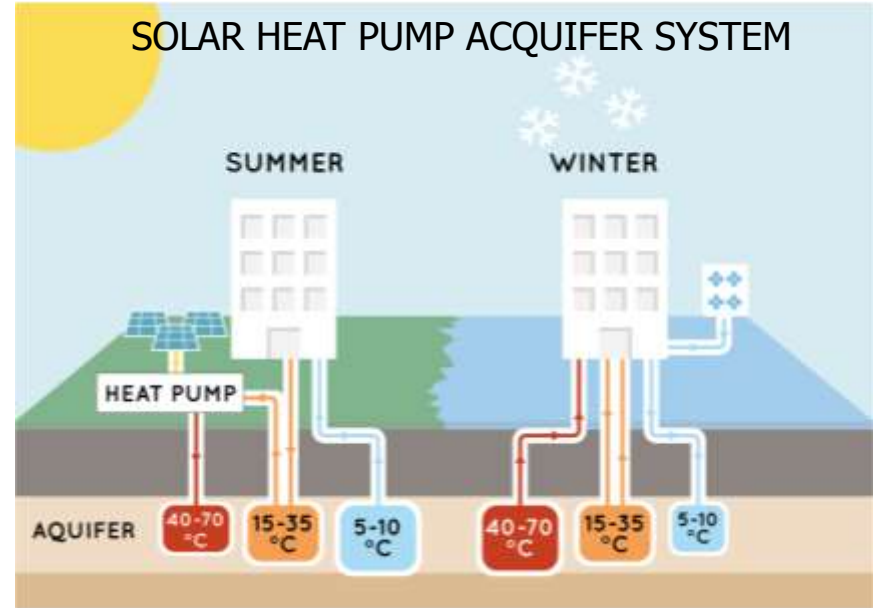


Heat production and storage

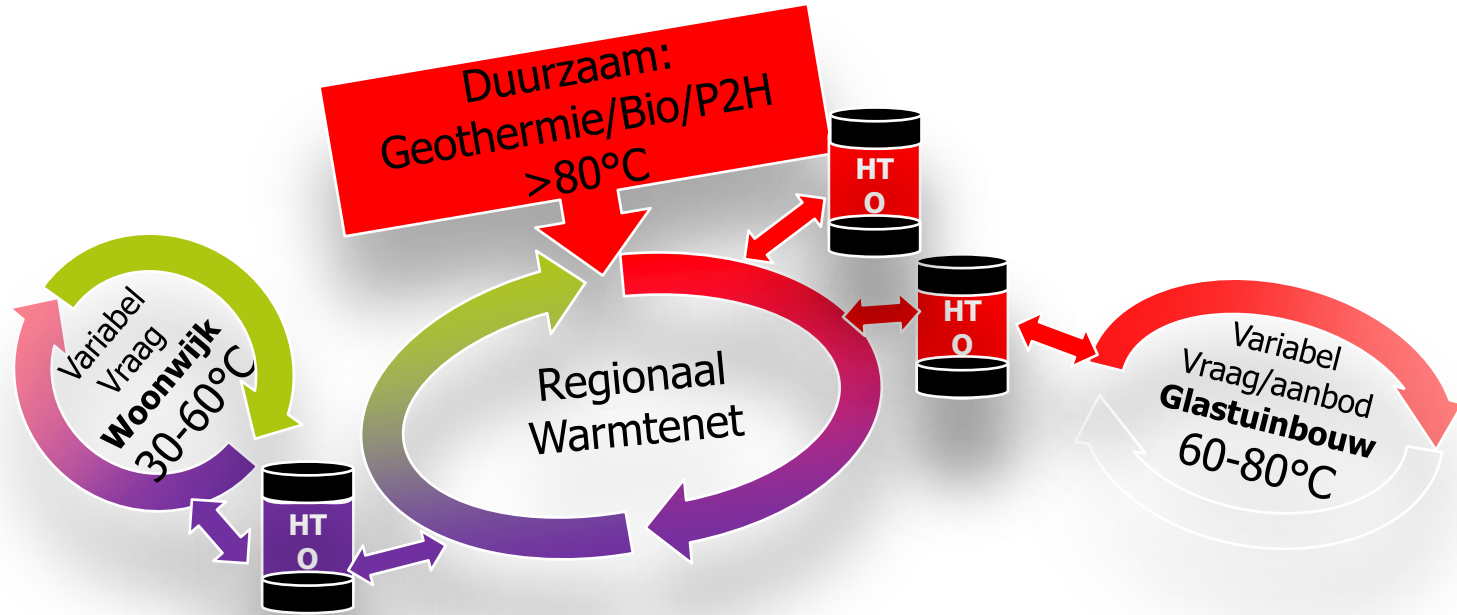
TRADITIONAL HEAT PUMP ACQUIFER SYSTEM



SOLAR HEAT PUMP ACQUIFER SYSTEM



Higher Temperature Storage

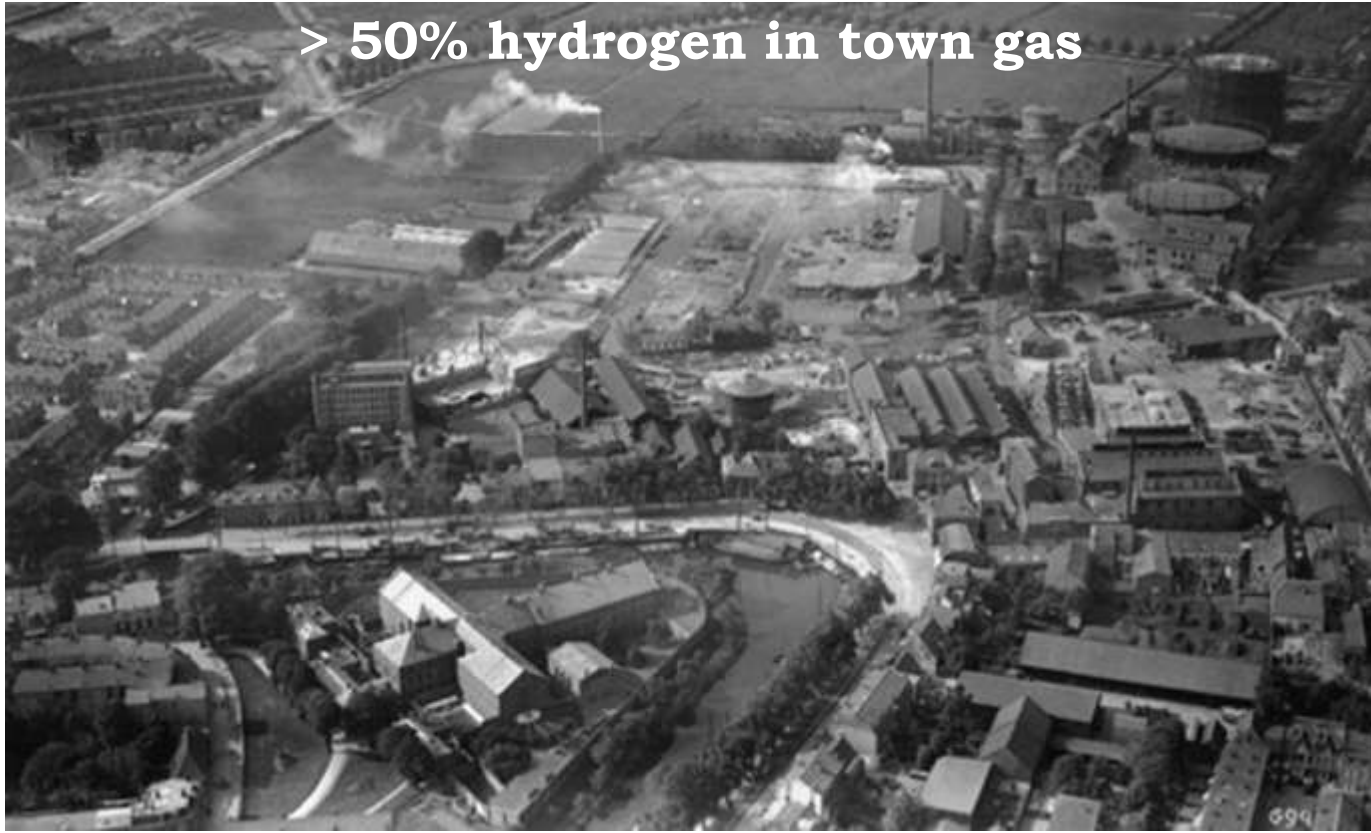


The Green Village Prêt-à-Loger house

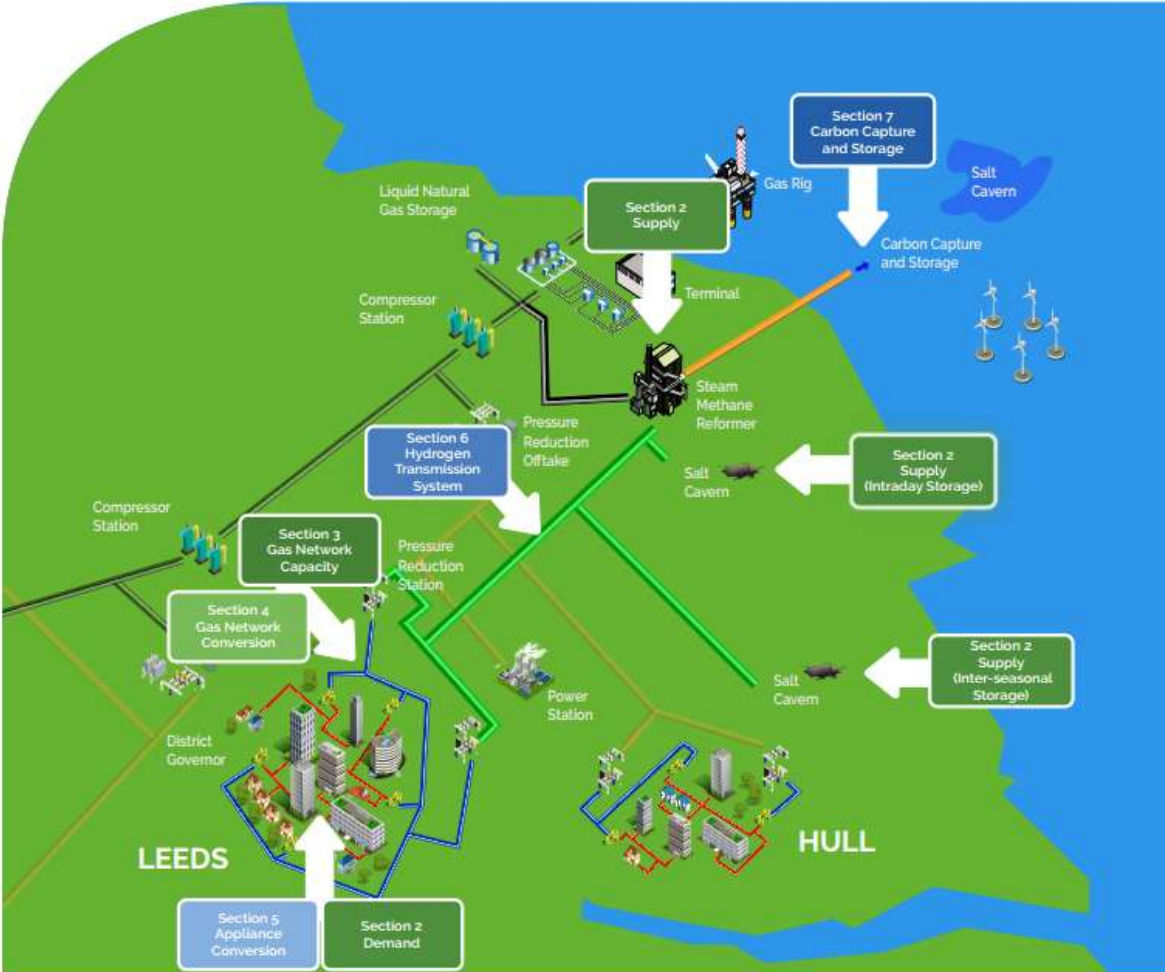


Town Gas production Utrecht 1862-1959

> 50% hydrogen in town gas



Leeds City Gate Project



H21 Leeds City Gate project

The H21 project has shown that (11-6-2016)

- The gas network has the correct capacity for a conversion to 100% hydrogen
- The network can be converted incrementally with minimal disruption to customers
- A conversion could be undertaken with minimal impact on gas customers bills
- Minimal new energy infrastructure will be required when compared to alternatives
- The existing heat energy demand can be provided by hydrogen generated via steam methane reforming
- Inter-seasonal energy storage can be managed utilising salt cavern storage
- All the technology in the proposal is already in existence
- <http://www.northerngasnetworks.co.uk/archives/document/h21-leeds-city-gate>

Hydrogen from your wall

