Ministerie van Klimaat en
Groene Groei

Salt cavern use and abandonment

Bridging the technical and social perspectives

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Mission Ministry of Climate Policy and Green Growth

future-proof clean economy.
Sustainable energy system in 2050

- Energy neutral
- Affordable
- From fossile to renewable energy
- Safe and responsible use of the deep subsurface

Sustainable use of the subsurface

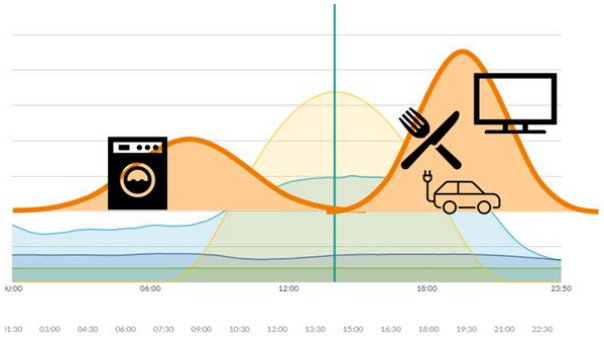
now and in the future

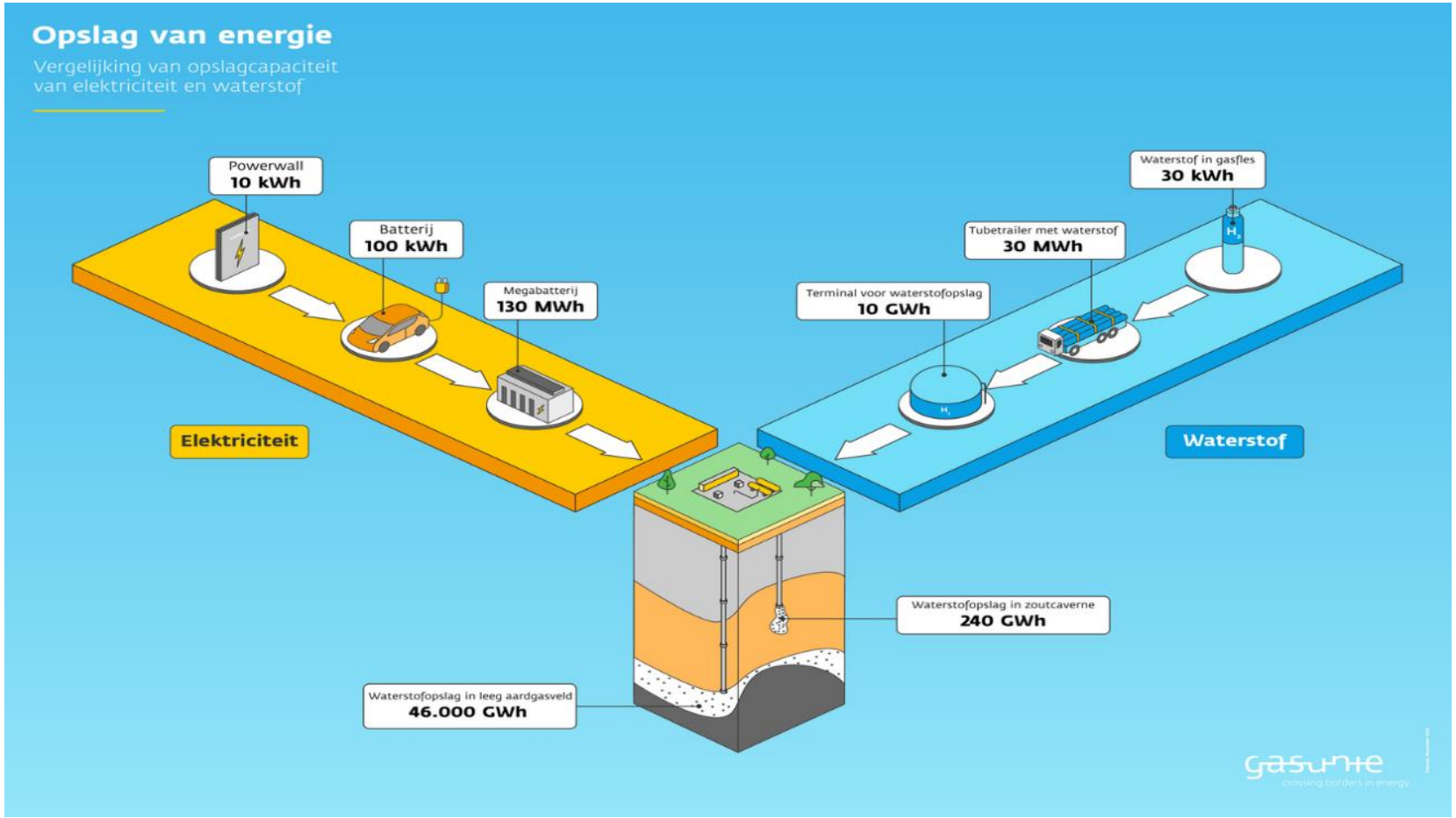
- Important role for the subsurface
  - Gas production
    - 1/3 of current energy consumption
    - Production in NL before import
  - Gas storage
  - Geothermal energy
  - Salt production and storage
    - Raw material
      - Strategic independence
      - Reliable availability
    - Hydrogen storage
      - Energy transition
  - CO_2 storage

Importance of salt production/storage

- Raw material
- Strategic independance
- Reliable availability
- Critical Raw Materials act 2023
  - Magnesium salt
- Energy transition=> hydrogen storage

Energy storage is needed!





Social perspective on risk of hydrogen storage in salt caverns

- Damage
  - Related to salt production or other causes?
  - Payment of damages
  - Procedure how to deal with mining damage
- Long term subsidence
- Perceptions:
  - Risk acceptance
  - Balance benefits and burden
  - General focus on very low risk high impact

Technical perspective on risk hydrogen storage in salt caverns

- Risks:
  - Subsidence risks
  - Seismicity risks
  - Environmental risks
- Reducing/mitigating risk:
  - Monitoring
  - Modelling
  - Experiments
  - (pilot) projects

Leading to conditions on licensing

Bridging the technical and social perspectives

- How to bridge the gap?
  - Government needs to be clear about ambitions
  - Involve stakeholders at an early stage
  - Address public concerns
- Your views?

Website: KEMprogramma.nl

Mining activity versus H&R type		Seismic hazards and risks	Subsidence hazards and risks	Environmental hazards and risks
Oil and gas reservoir production	Groningen	KEM-02, KEM-04, KEM-05, KEM-08, KEM-09, KEM-14, KEM-19a, KEM-19b, KEM-24a, KEM-24b, KEM-34, KEM-36	KEM-19a, KEM-19b	KEM-18, KEM-19a, KEM-19b
	Small gas fields	KEM-07	KEM-16a	KEM-16b
	Oil fields			
Underground storage in porous reservoirs	Methane cyclic storage	KEM-01, KEM-48	KEM-48	KEM-48
	Hydrogen cyclic storage	KEM-39		
	Production water injection	KEM-24a		
	CO2 storage	KEM-27, KEM-39	KEM-27	KEM-27
Geothermal reservoir energy production	Conventional doublet systems	KEM-06, KEM-15	KEM-06	KEM-06, KEM-18
	Enhanced Geoth. Systems (EGS)	KEM-06	KEM-06	KEM-06
Salt cavern development and production	Shallow caverns (<750m)		KEM-17	
	Deep Caverns (>750m)		KEM-16a, KEM-17, KEM-26	KEM-13
Underground storage in caverns	Methane cyclic storage			
	Oil strategic storage			
	Hydrogen cyclic storage	KEM-28	KEM-28	KEM-28
	Nitrogen cyclic storage			
	Compressed Air			
Mining infrastructures	Wells	KEM-31		KEM-13, KEM-18, KEM-28
	Installations	KEM-31		KEM-33
	Pipelines	KEM-31		
Coal mining domains and infrastructure	Limburg			

H&R measures vs H&R type		Seismic risks	Subsidence risks	Environmental risks
Public HRA instruments		KEM-03, KEM-10, KEM-34	KEM-03, KEM-16a, KEM-16b, KEM-47	
Public monitoring systems		KEM-11, KEM-27		
Public norms, TL systems and mitigating actions				

Legend		5 = high	3 = medium	1 = low