



Gas Infrastructure Europe

Unlocking EU's hydrogen economy with the underground hydrogen storage GRIDTech Talk

#GRIDTech2023

Gas Infrastructure Planning: Challenges & Opportunities

Organised by Eurogas and GIE, with the technical partnership of ENTSOG

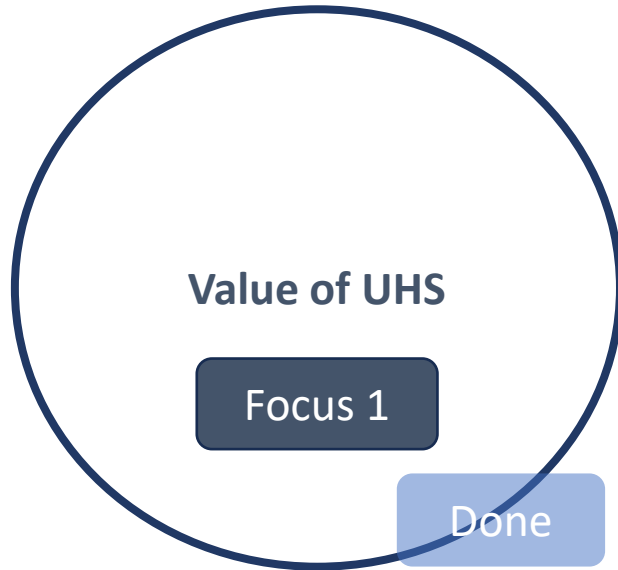
14 November 2023

Charlotte Roule, GIE Board member, GSE President
CEO of Storengy

Agenda

The cross-sectoral perspective at the core of the assessment of the need for UHS

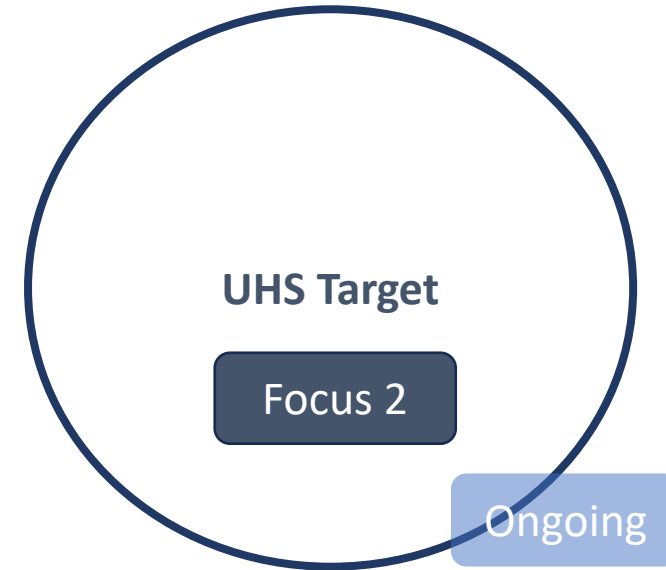
Values of UHS
(Quantification in 4 territorial use-cases)



GIE Study carried out by Artelys in 2022



UHS Target
(to comply with REPowerEU ambition by 2030 & NZ 2050 future)



GIE Study carried out by Artelys & Frontier (2023)

EU underground hydrogen storage targets



Values of UHS

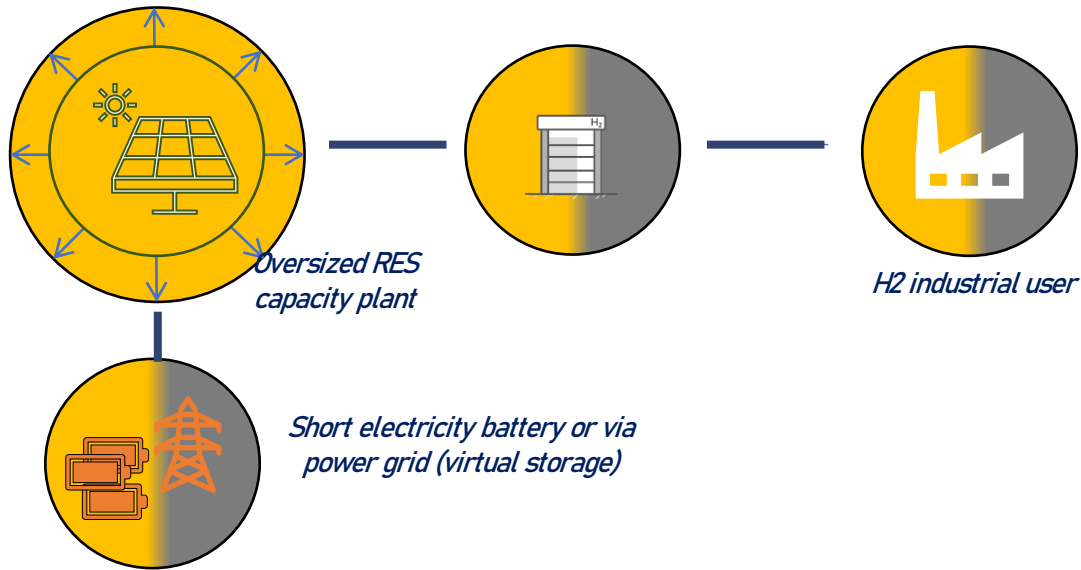


The power system evolves as the power mix changes,
requiring in turn that the role of storage evolves

Focus on Artelys study 2022 – Value of UHS

The role of storage in the power system evolves as power-mix changes

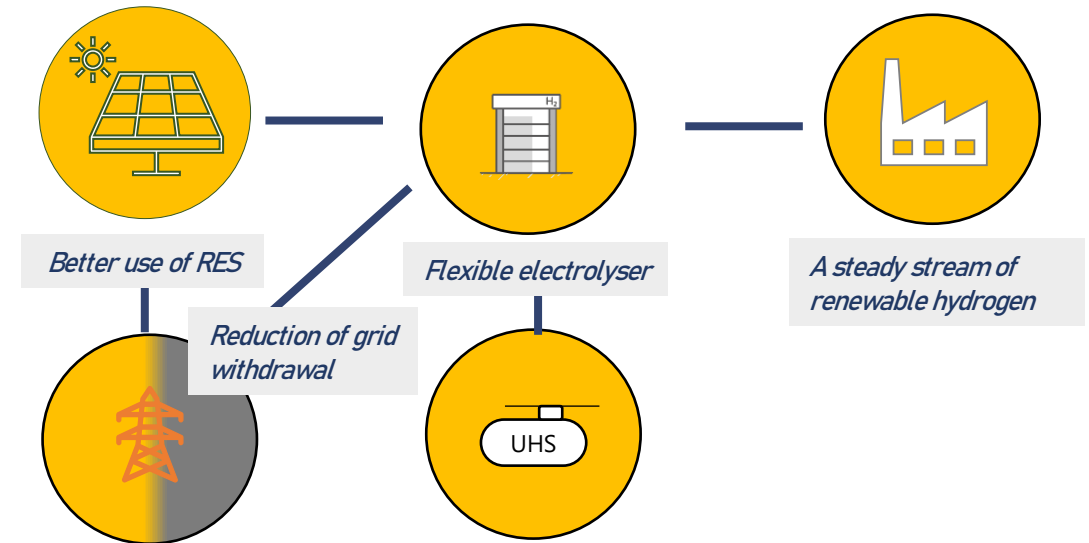
Renewable electrolysis system using electricity storage for storing any excess of RES



NOW - Batteries in the electricity system enabling to store any excess of RES

Savings eroding over time as deeper RES penetration further increases storage costs

Renewable electrolysis system using UHS for a better use RES-deployment & a reduction of grid withdrawals



SOON - UHS enabling to store at large scale

Benefits increasing with RES deployment & electricity grid constraints

- Kick-start value Facilitating the emergence of an H₂ ecosystem with more ren. H₂ in the H₂ mix
- Arbitrage value Increasing the renewable electrolytic H₂ production
- System value Lower LCOH
- Env. Value Reducing carbon emissions of H₂ ; Compliancy to RPNBC
- Insurance value Decreasing the capacity needs of a back-up H₂ supplier

Focus on Artelys study 2022 – Value of UHS

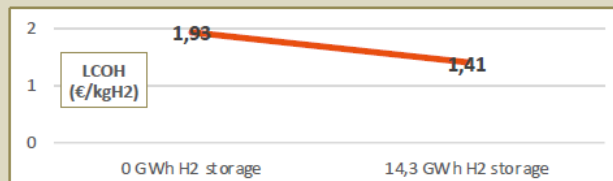
Assessment of the full value of UHS for different territorial use case



Illustration – On-site green H2 production for industrial consumer

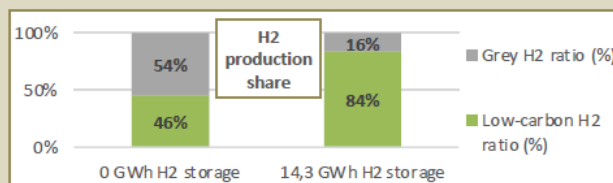
System value

Hydrogen storage enables to better use the cheapest hydrogen sources and to decrease full cost of hydrogen production.



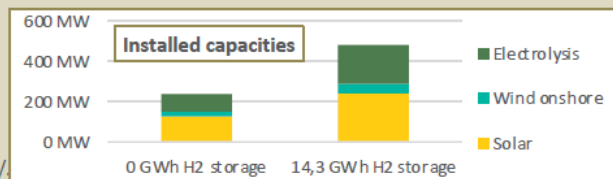
Arbitrage value

Hydrogen storage fosters renewable hydrogen production by allowing a better use of local RES resources.



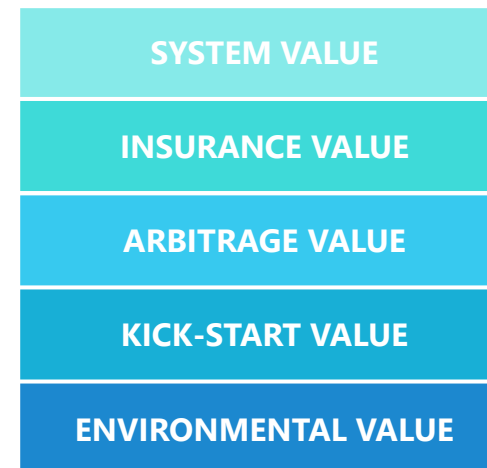
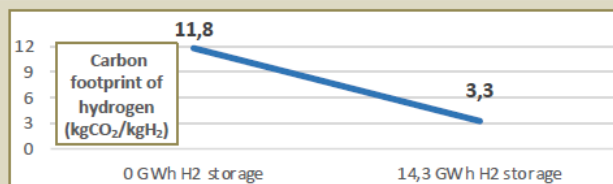
Kick-start value

Hydrogen storage allows for a system-level optimization of electrolysis and RES sources, facilitating the emergence of a hydrogen economy.



Environmental value

Hydrogen storage allows the system to withdraw decarbonised electricity for hydrogen production, thereby reducing carbon emissions.



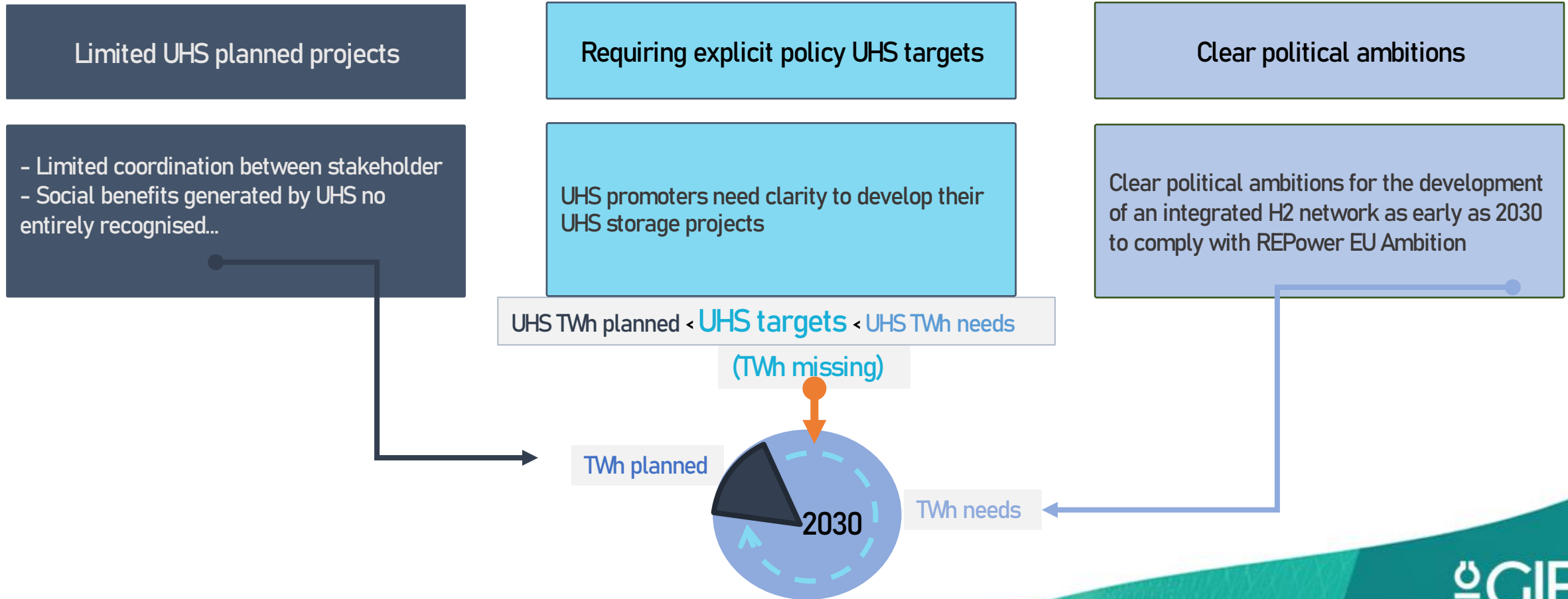
Artelys
OPTIMIZATION SOLUTIONS

Defining an UHS target

EU underground hydrogen storage
targets

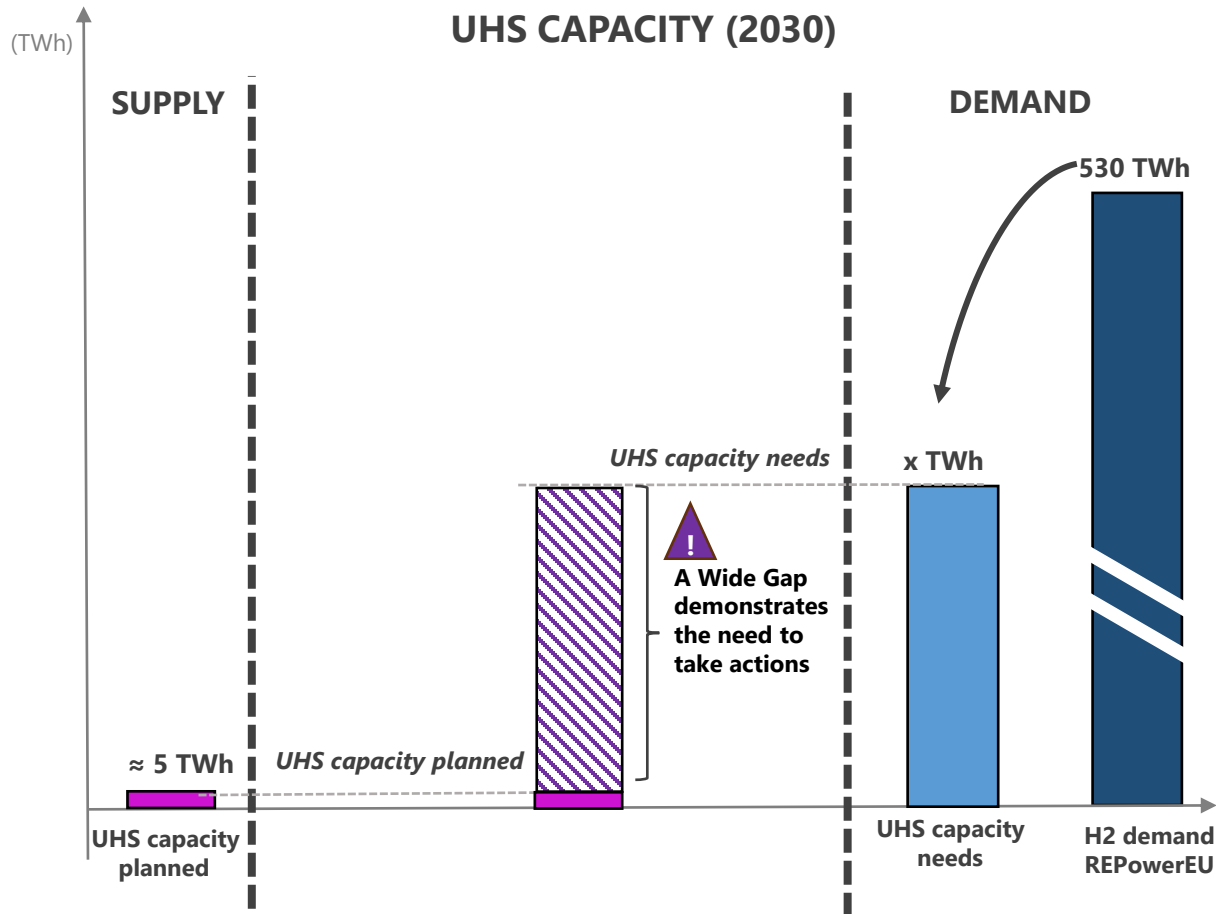
Defining UHS targets

Needs for UHS likely still exceed future flexibility offered by announced projects



EU UHS required by 2030

to comply with REPower EU ambition



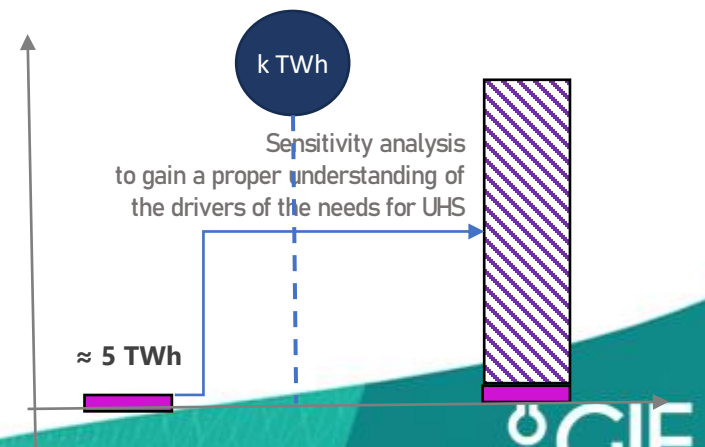
UHS planned (announced/operational storage projects)

UHS needs

Outcome of the model (to comply with REPowerEU ambition, considering demand as fixed)

→ This does not mean that the technical capacity is available or that the storage cavities exist

UHS Targets (required)



(UHS) Underground Hydrogen Storage



Gas Infrastructure Europe

Unlocking EU's hydrogen economy with the underground hydrogen storage GRIDTech Talk

#GRIDTech2023

Gas Infrastructure Planning: Challenges & Opportunities

Organised by Eurogas and GIE, with the technical partnership of ENTSOG

14 November 2023

Charlotte Roule, GIE Board member, GSE President
CEO of Storengy