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Zeolitic Ice for Energy Transition: Storing Methane & Hydrogen in Economic Conditions!

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Zeolitic Ice Can Store Methane & Hydrogen in Economic Conditions!

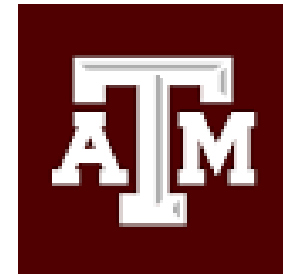
Zeolitic Ice for Energy Transition

Ahmed Omran, Valentin Valtchev

CNRS, Normandie Université, ENSICAEN, UNICAEN, Laboratoire Catalyse et Spectrochimie (LCS), France

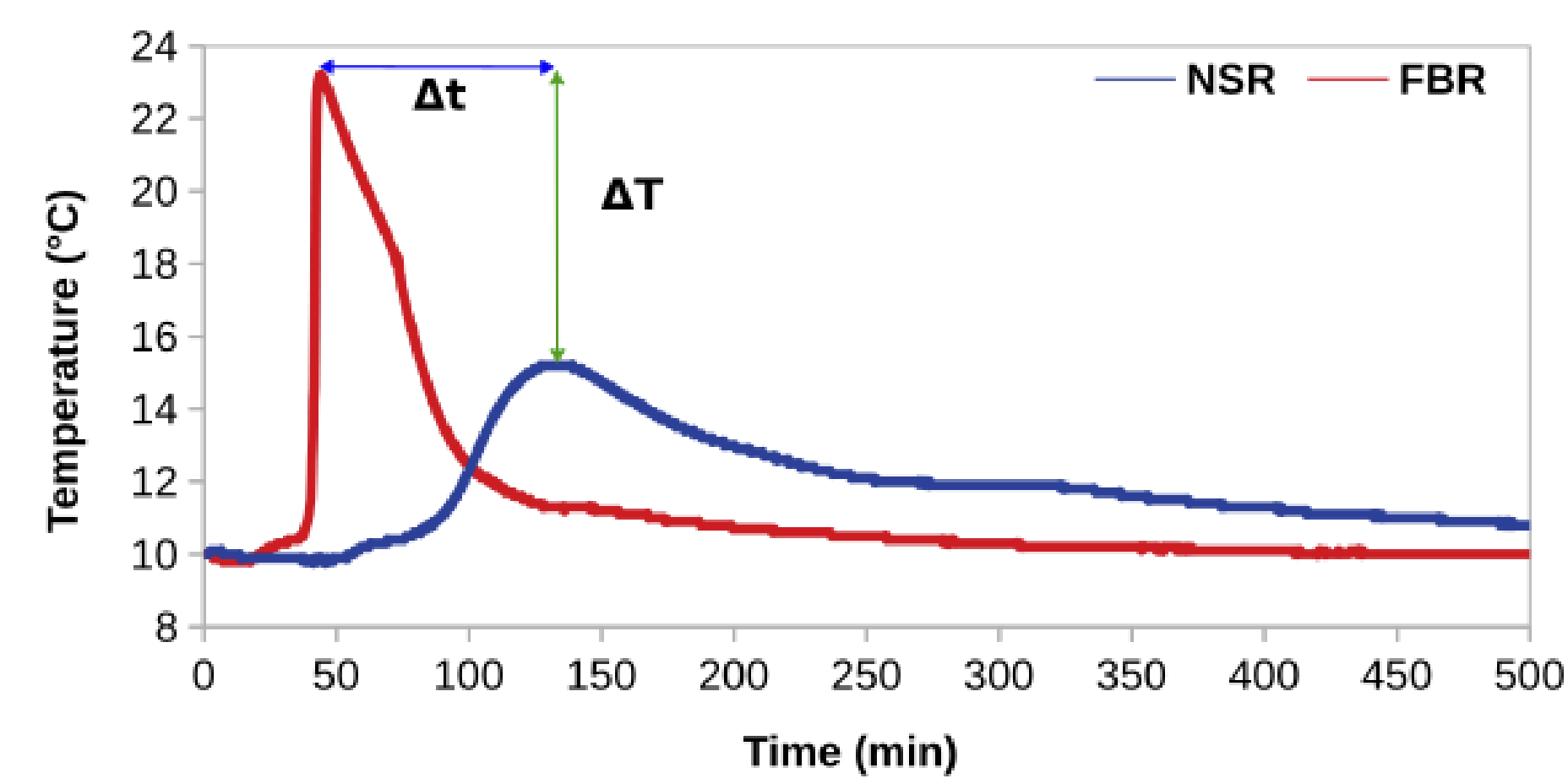


Multi-scale Process Design

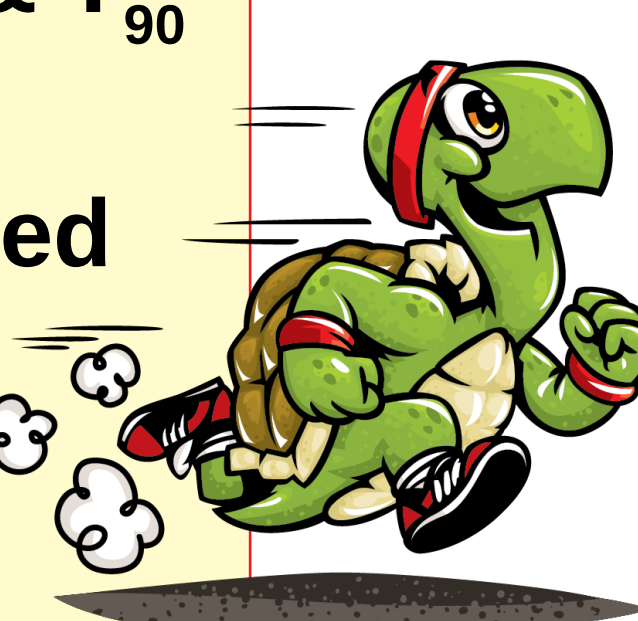


How we improved the kinetics?

- Smart Design for Kinetic Hydrate Promoter (KHPs).
- Innovative Reactor Design

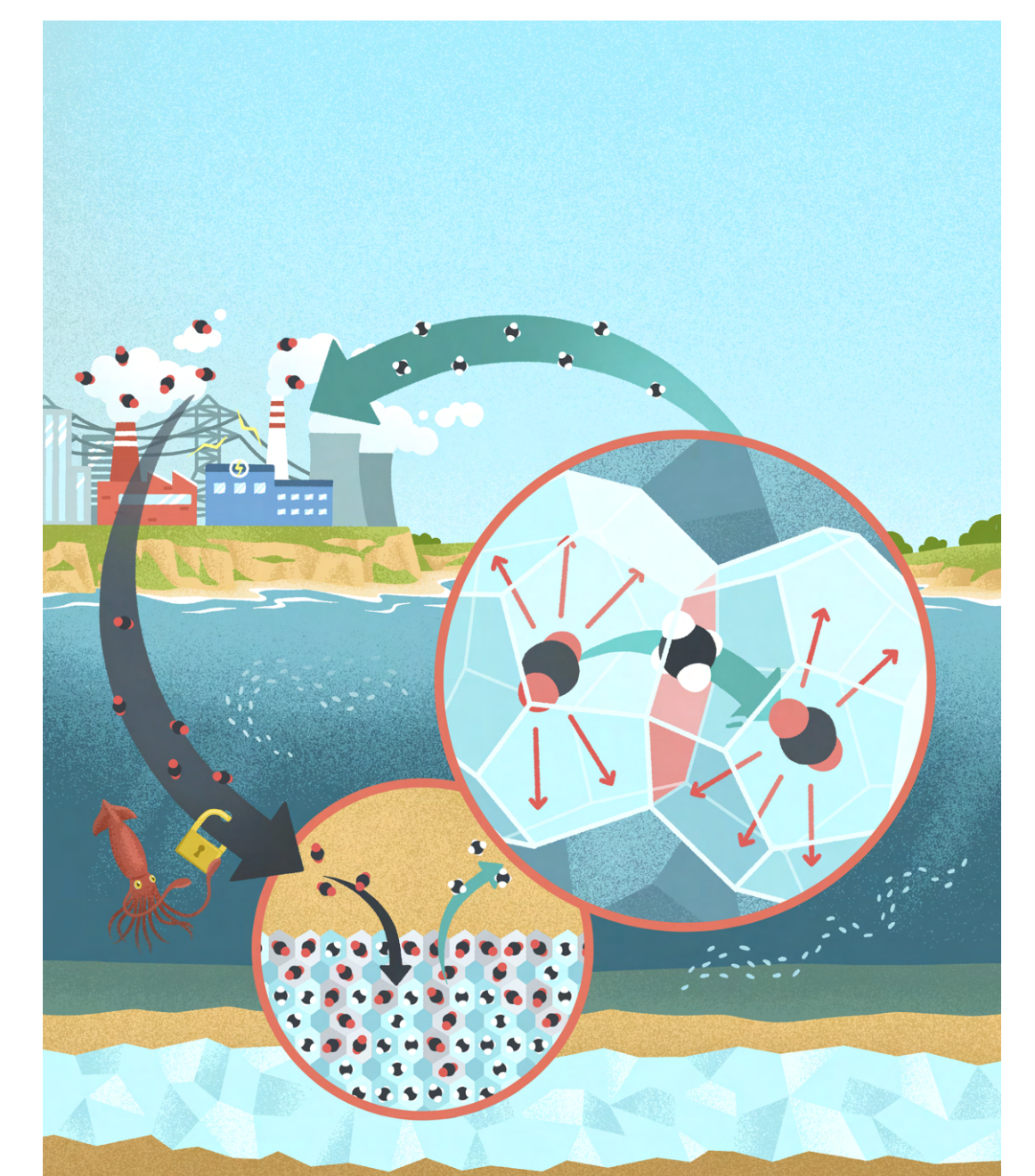


- ✓ Reduced Induction time & T_{90}
- ✓ CH_4 Conversion maintained
- ✓ +95% methane Recovery



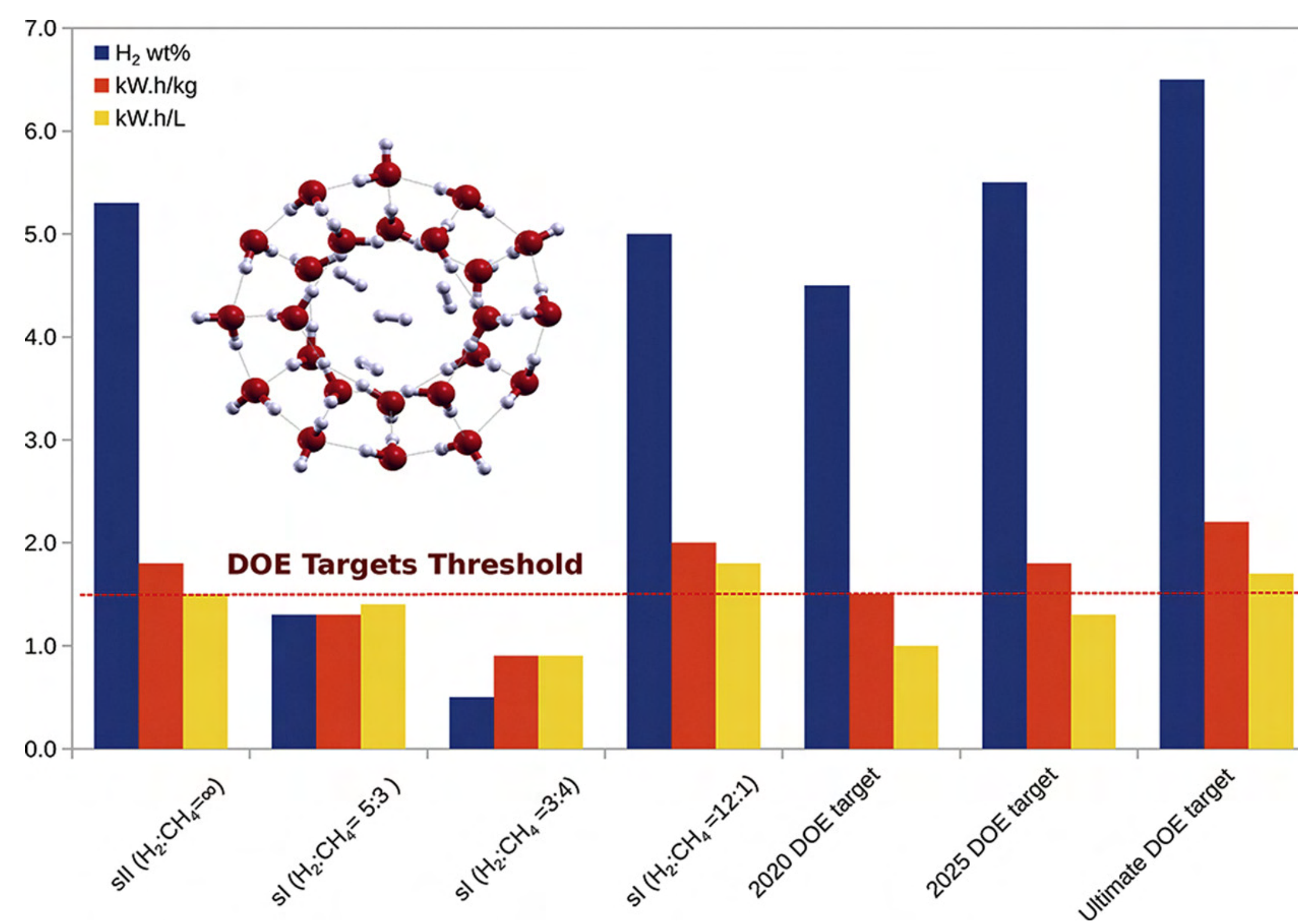
Ongoing Work

- H_2 Storage (Experimental)
- Combined CCS & Energy Recovery

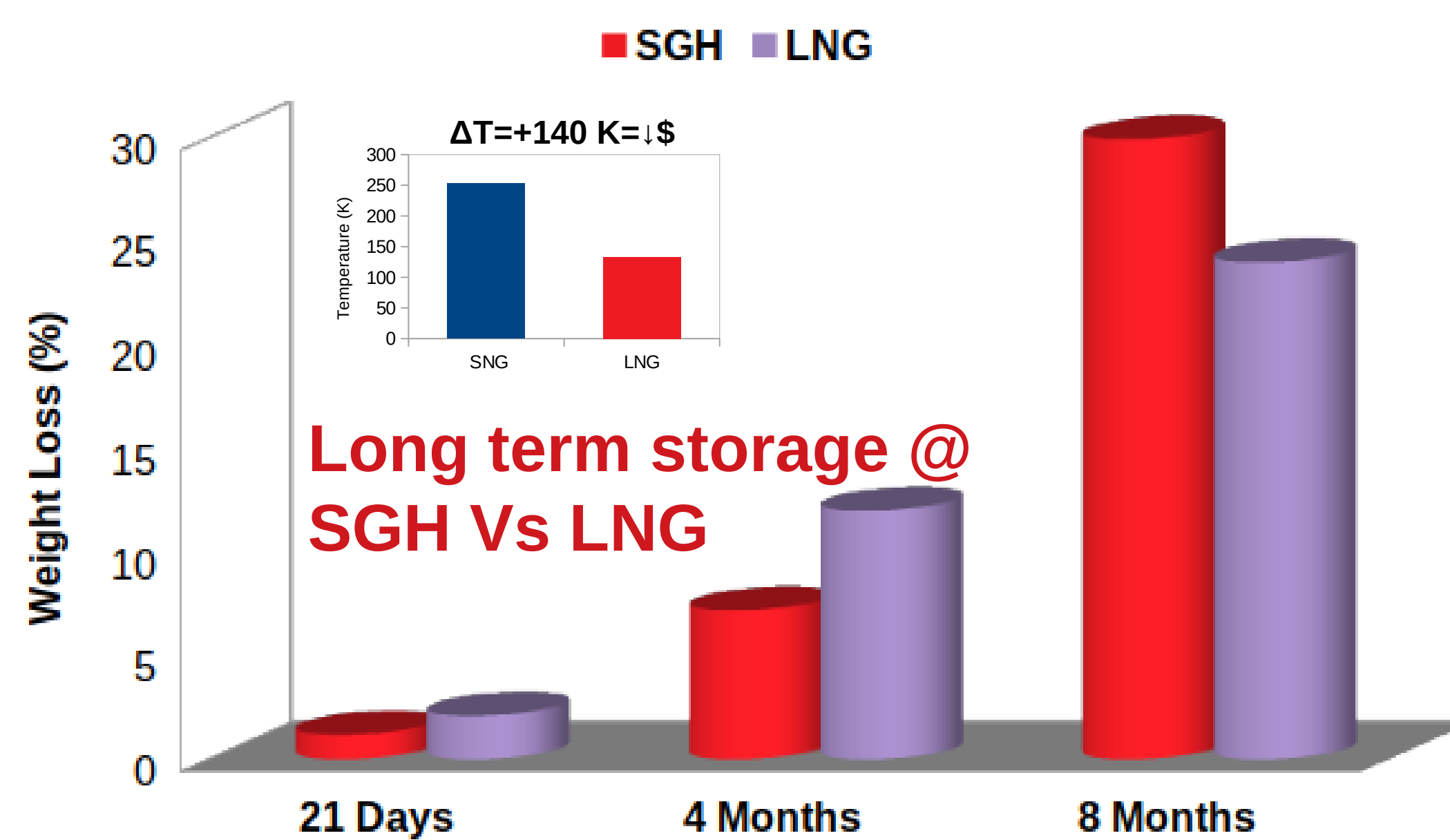
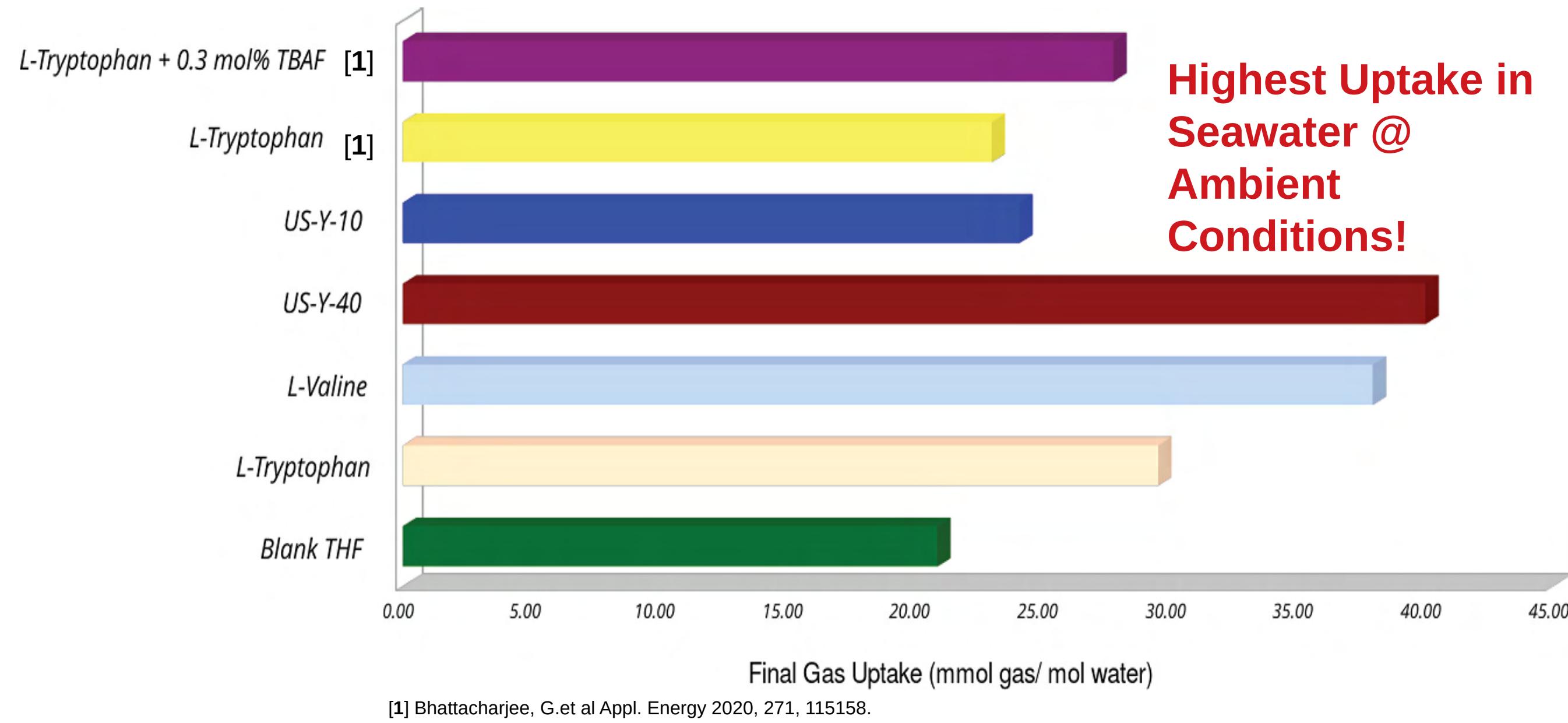


RESULTS

- Adjust H_2 - CH_4 Mix in Hydrates achieves DOE targets 2025:

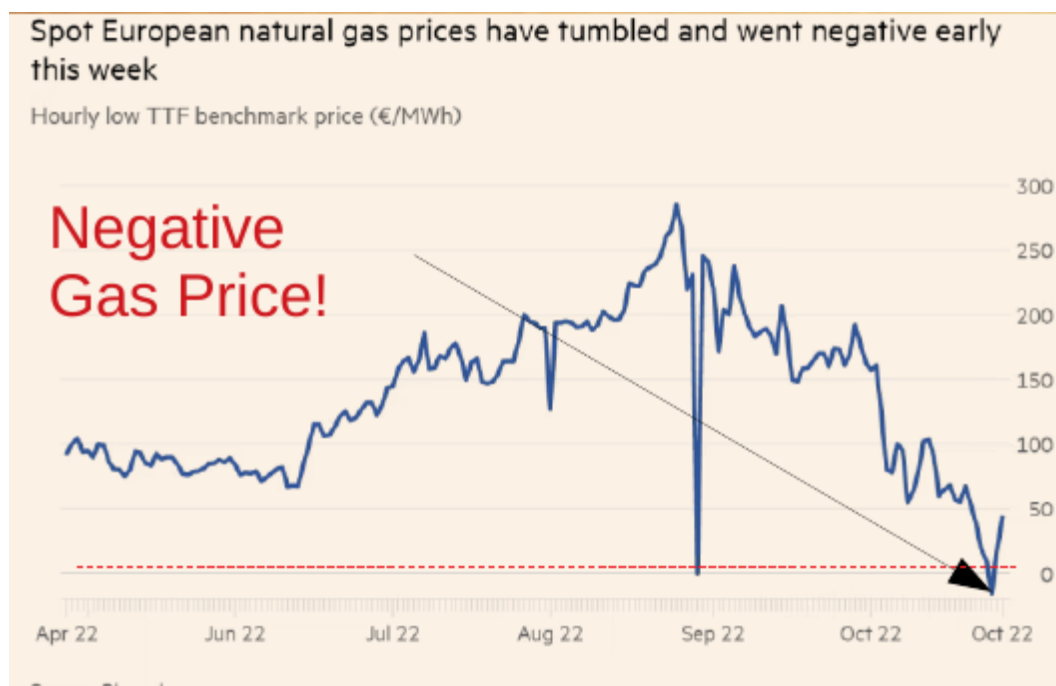
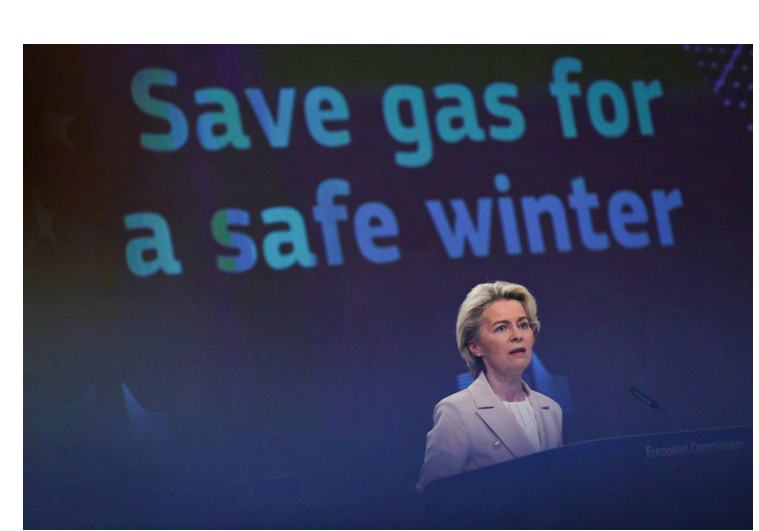


- Economic Seawater-based Methane Storage at ambient T.



INTRO

Problem: Energy Crisis & Transition in Europe.



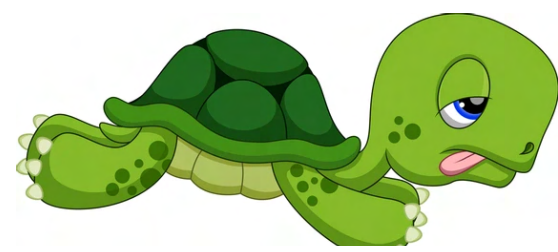
Save Store gas for a safe winter!



Long Term & Sustainable Energy Storage is Needed

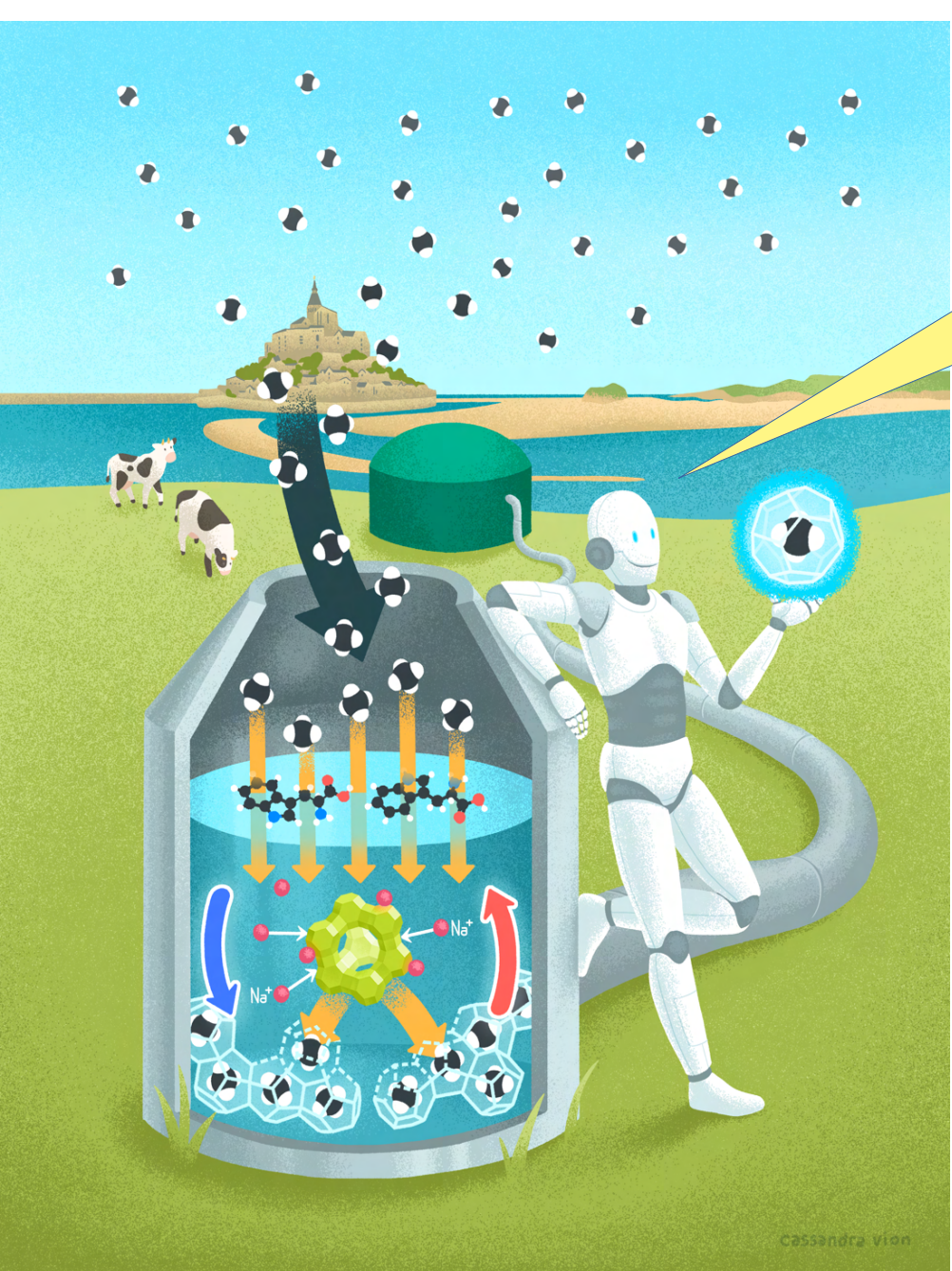


But TOO SLOW Kinetics!



METHODS

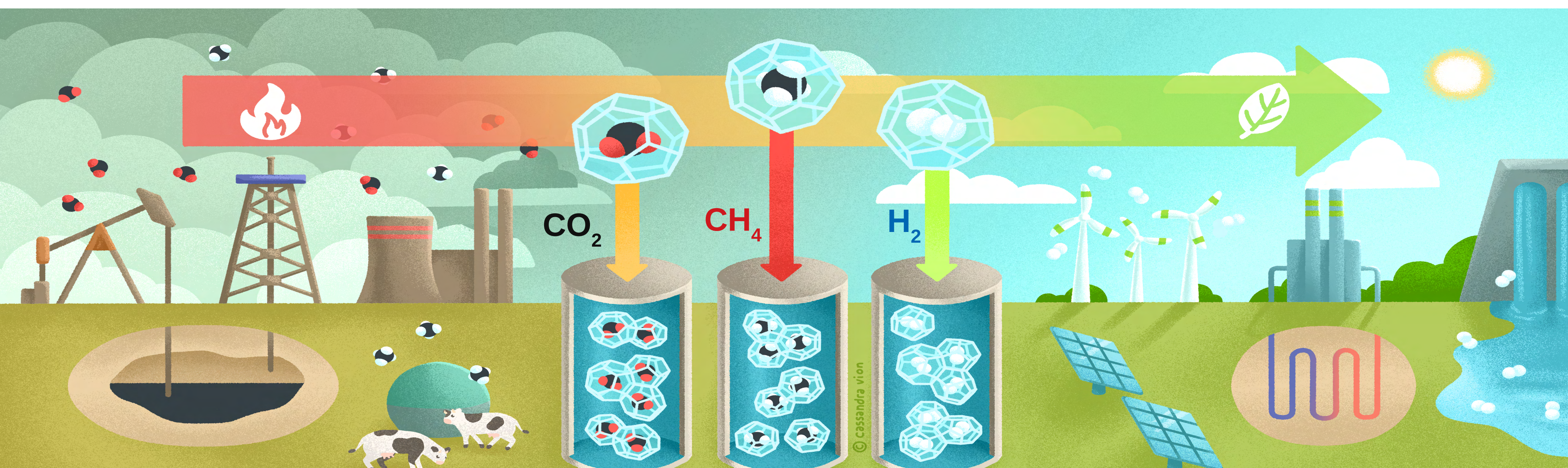
1. Experimental Studies and *in situ* Characterization @ LCS
2. Computational & AI studies



Smart, Green & Sustainable

- Energy vectors (H_2 , CH_4)
- Water or Seawater
- Zeolites or Amino Acids
- ~ 100 % Recovery
- Safe & long-term Storage

Increase the storage capacity from 6 to 12 wt% near the theoretical limit.



Take a picture to download the full papers

