ENOS

Enabling Onshore Storage in Europe

Onshore* storage:

Storage at your doorstep

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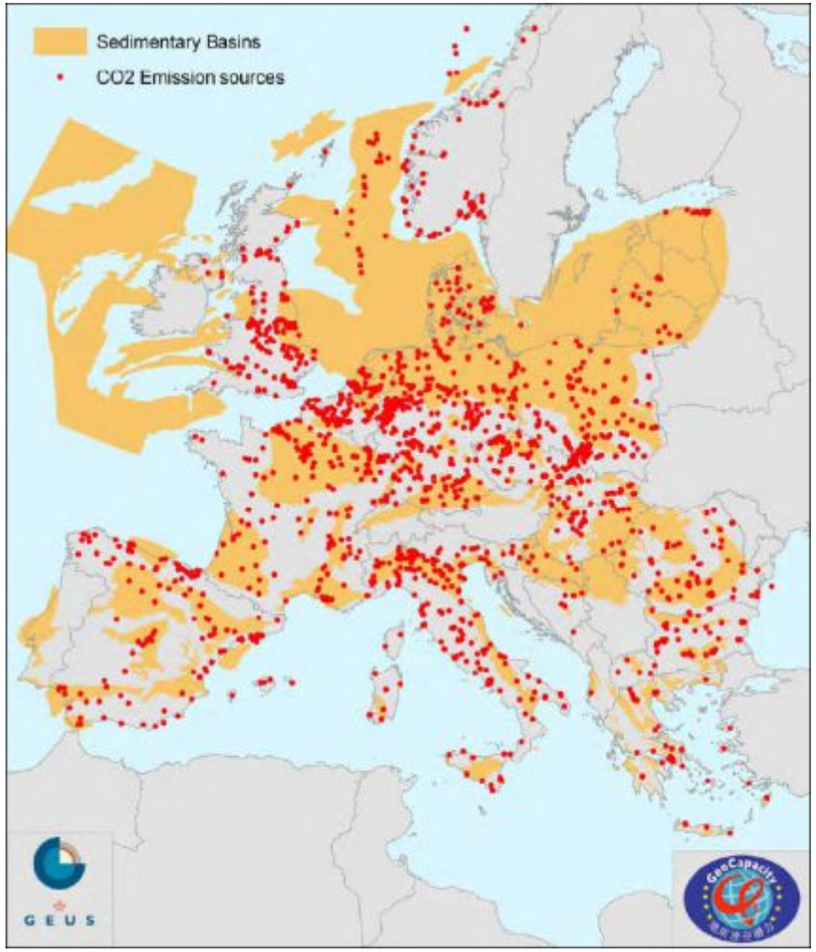
* Onshore in populated area

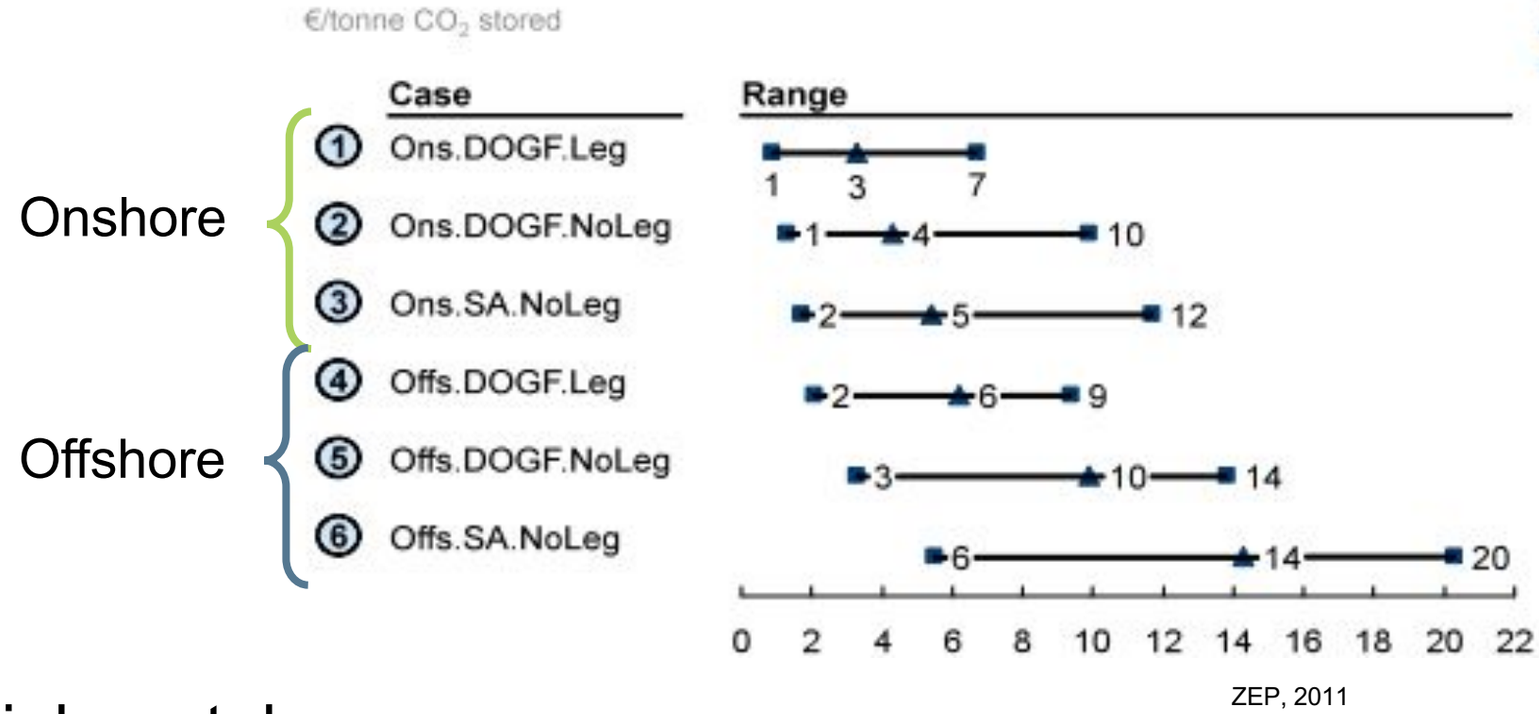
Need for CCS onshore

- EU commitment of an overall reduction of greenhouse gas emissions of at least 80% by 2050
- This means storing 3 to 13 billion tonnes of CO_2 across Europe by 2050
- North Sea can provide great and readily available storage potential,



Only a matter of Costs?

Onshore storage is potentially **cheaper**



ZEP, 2011

But **higher uncertainties** with higher stakes

Onshore storage: common sense

When communicating about CCS:

Common feed-back:

« It feels like **hiding the dust** under the carpet »

« Storing all offshore is like hiding it all where **no one can see** »

« Can't we do anything better with CO_2? »

Storing CO_2 at your doorstep can make more sense:

Need onshore storage, relatively near the emission points, to reduce the costs of CCS, but above all enable **territories** to manage their CO2 emissions **locally**, and build lasting **public confidence** in CCS.

Nothing to hide!

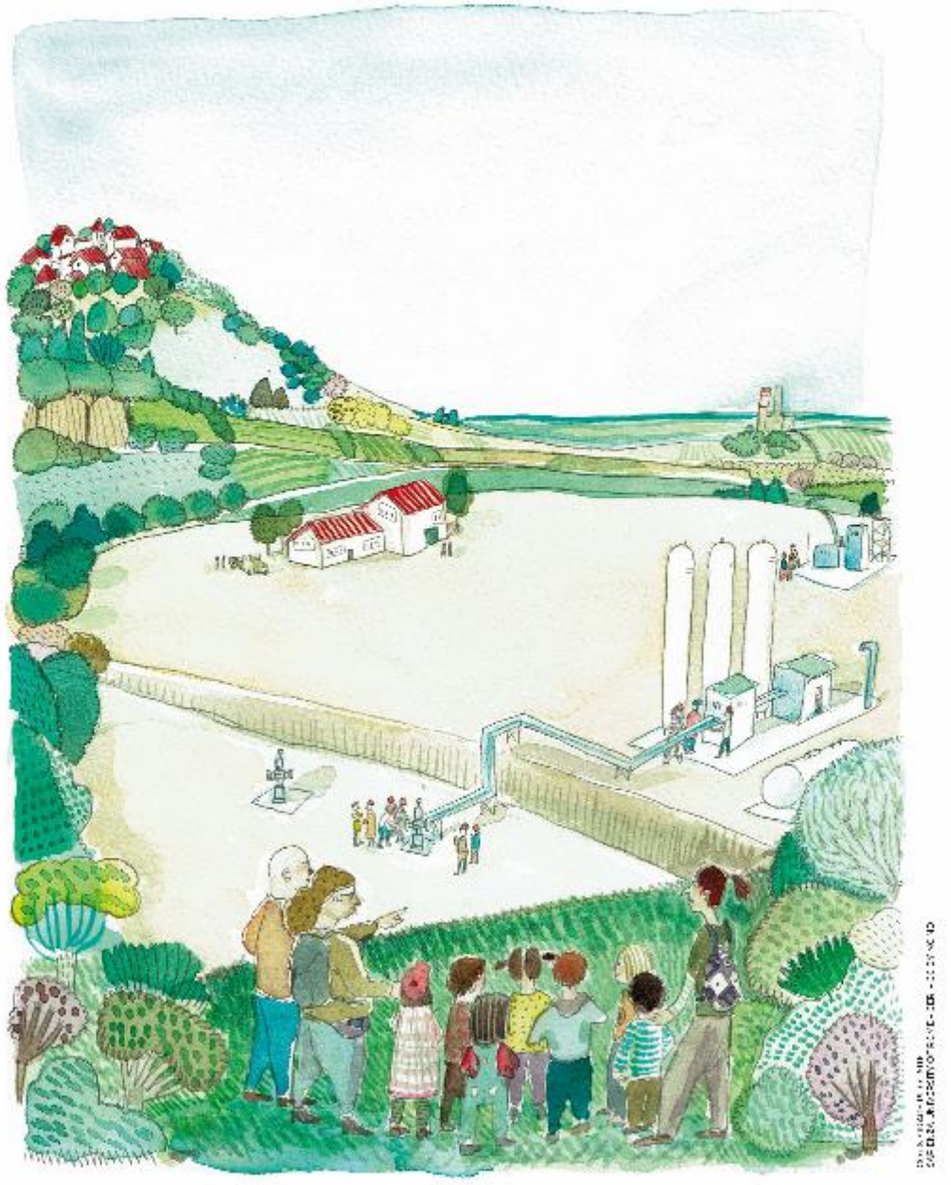
Stakes are higher onshore, but

We are all **convinced** that
Storage is **safe**

So having storage onshore is necessary,

for people **to see** there is **nothing to see**

This will give **moral license to operate offshore**



As of today

All large scale projects onshore Europe were cancelled or stalled due to too high uncertainties:

Geological high costs to explore and characterise potential sites,

Social and political: lack of local support, concerns for safety and environment, no local benefits for storage

Legal and regulation: implementation of the directive, modelling and monitoring, climate policy and incentives

Economical : lack of visibility on CO_2 price, + all above uncertainties

Overcoming the main hurdles to onshore storage

To enable onshore storage we need to :

- Ensure **safe** operations
- Demonstrate we can **manage** leakage risks and **protect** the environment and the ground water
- **Lower** costs and uncertainties at appraisal stage
- Integrate CO2 storage with **local economic** activities
- Work together with the local **communities**
- Prepare **next generation** scientists and engineers
- Support the emergence of **pilots** and **demos**
- Support **policy** / advocate for CCS incentives

Enabling CO_2 storage onshore in Europe: ENOS Project

- Demonstrating through practical experience that injection operations can be run safely and efficiently onshore, which is key for optimising operations and to enable a positive regulatory environment;
- Ensuring that estimated matched storage capacities are sufficiently reliable and also affordable to verify, which is needed to enable investment in projects and therefore the deployment of CCS;
- Demonstrating our capacity to understand, detect and manage potential leakage risks, which is key for regulatory issues and to demonstrate storage is environmentally sound and safe for human health;
- Integrating CO_2 storage into the local economic activities so that the benefits are also reflected at the local scale, which is vital to enable the deployment of CCS;
- Engaging the local population in the storage projects, without which project development is impossible.

Enabling CO_2 storage onshore in Europe

Create favourable environment for onshore storage across Europe by:

- support knowledge sharing to maximise the benefits of site demonstrations,
- integrate research results and creating best practices from real-life experiments,
- support preparation of new pilot projects and upscaling to demonstration,
- bring innovation to society through dialogue and communication,
- promote CCS through training and education.

Demonstrate safe operations

Further demonstration that :

CO_2 can be injected **safely**

Technologies and **modelling** tools to control operations are available

Working on **Pilot** : can test different strategies and « play » with the conditions and parameters to **optimise** injection

Demonstrate leakage management

Release of CO_2 in shallow environment

Demonstration that, in case something goes wrong:

we can **detect** CO_2 leakage

we **understand** leakage process and migration

we have **adequate** monitoring tool portfolio
and **efficient** monitoring strategies

In case of leakage: we know it and can react

Engaging with local communities

Finding solutions together: direct input of the population to identify the “good conditions” for onshore storage

Exchange between scientists and citizen to **make sense** of the technology together

Public information tool: an online communication infrastructure for storage pilots

Develop onshore storage: Create local benefit

The development of storage can be **beneficial locally** by:

- Maintaining /creating **Jobs**:

  maintain clean industry and support new markets

- Providing **resources**:

  H_2, Heat, CO_2, Oil

- Complementarity to **CCU**

It is key for storage to **develop synergies** in relation with the local economy.

Then storage will **make sense** for all and not only operators

Example: Buffer storage for CO_2 use

Support **seasonal CO_2 buffering concept** for use in greenhouses

- To make efficient use of waste CO_2: match supply and demand
- Support geothermal energy development in horticulture sector

Presentation by Marielle Koenen in session 5

Example EOR

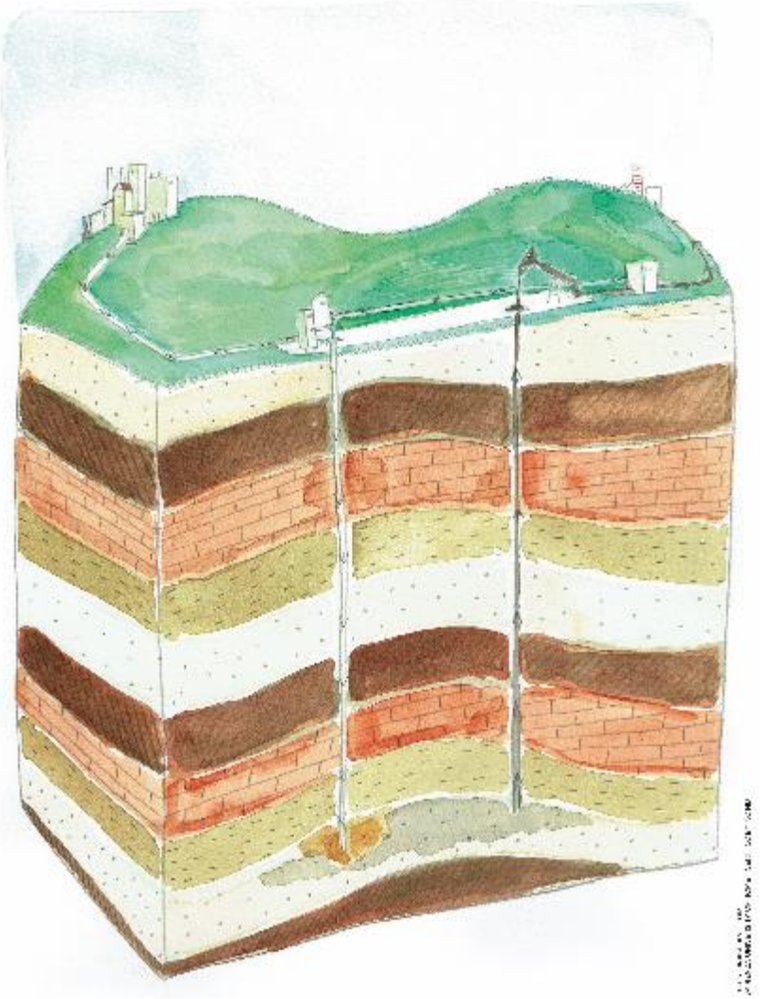
EOR is common in the USA, but not Europe.

Business as usual EOR is carbon positive.

Development of **joint optimisation** of CO_2 Storage (carbon negative) and Oil production (ensure revenues) **over time**

case study and up scaling on **basin scale**.

Maintain **local** and « **clean** » production oil and with the related jobs and enable « soft » and flexible transition



Other possibilities

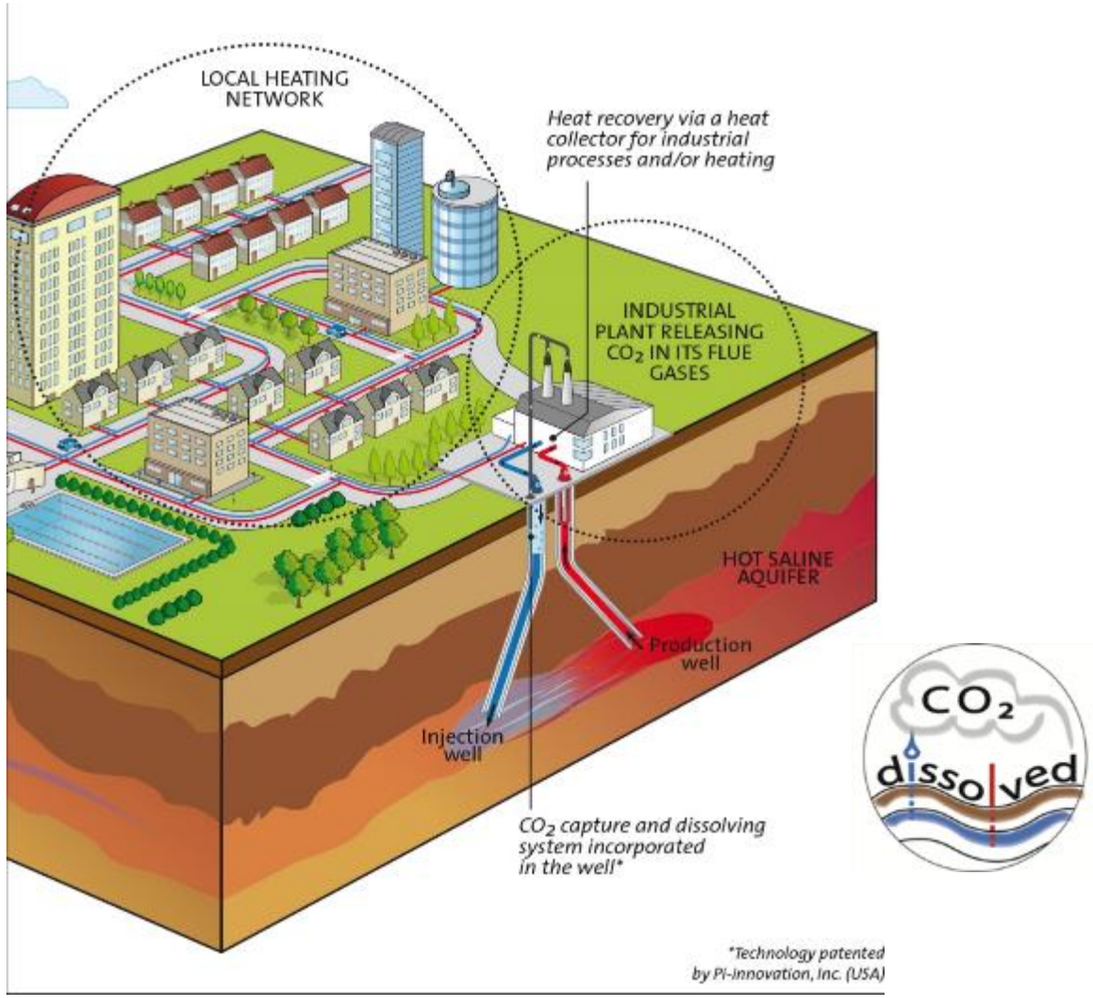
Coupled **CCS** and **geothermal** energy production:

heat for district heating or industrial processes

From grey H_2 to blue **H_2**

support transition from O&G H_2 production

Other possibilities to be developped



http://co2-dissolved.brgm.fr/

Territorial approach

Every doorstep is **different**…

So there should not be one kind of storage
But storage **tailored** to the **local** conditions: geological but also economics and social
Need for an **integrated** approach with onshore storage one of the solutions

Strategy CCUS

New H2020 Project :Strategic planning of Regions and Territories in Europe for low-carbon energy and industry through CCUS

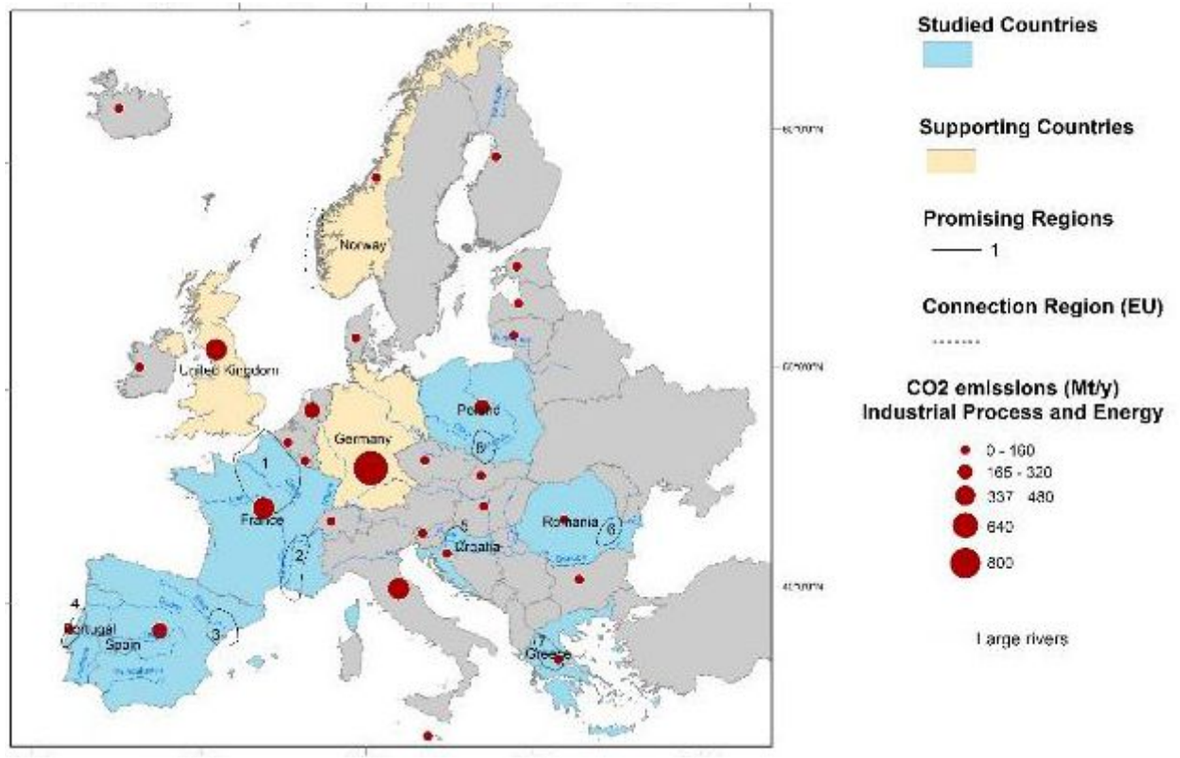
Coordination and Support Action

STRATEGY-CCUS aims to develop strategic plans for CCUS development in Southern and Eastern Europe in the short term (up to 3 years), medium term (3-10 years) and long term (more than 10 years).

Specific objectives are:

• Elaborate local CCUS development plans, with local business models, within promising start-up regions;

• Develop connection plans with transport corridors between local CCUS clusters, and with the North Sea CCUS infrastructure, in order to improve performance and reduce costs, and contribute to build a Europe-wide CCUS infrastructure.



Please visit the poster

Conclusion

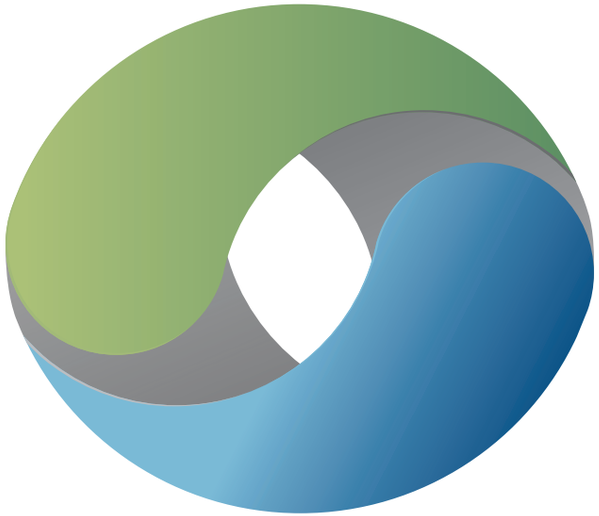
Offshore and **Onshore** storage: both part of the solution

Onshore storage

- smaller but **integrated** with CCUS
- **tailored** to local context
- **making sense** to local stakeholders

Key to give us **license** to operate **offshore**

Offshore storage will probably provide massive capacities



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Enabling Onshore CO_2 Storage

www.enos-project.eu

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