DEVELOPING CO_2 STORAGE IN THE SKAGERRAK REGION

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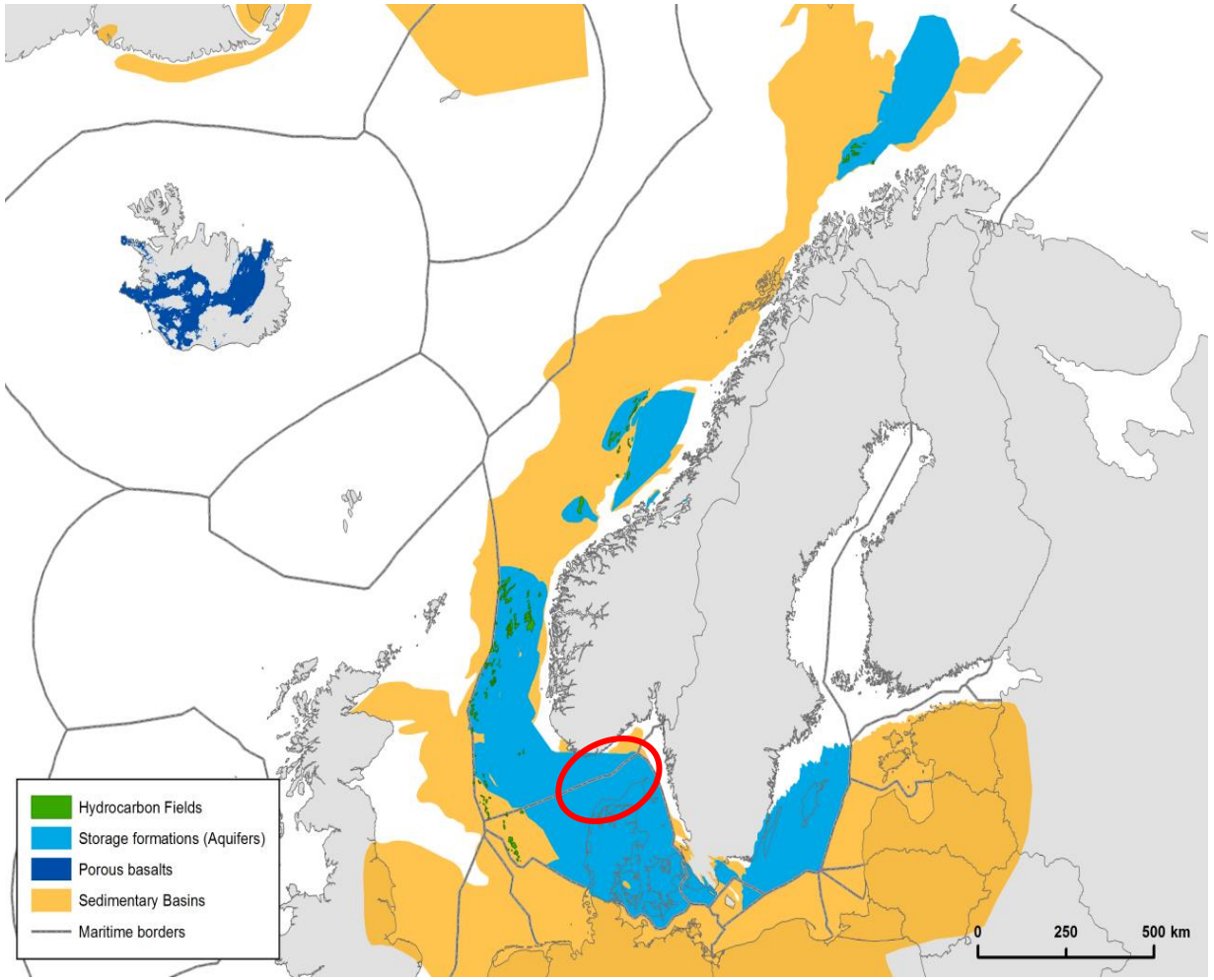

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Background

- IPCC scenario suggests that storage in the order of Gt CO_2 per year is required within 2050
- Several new storage complexes needs to be identified and qualified
- Qualification/development of a storage site can take on the order of five years or more
- It is of major importance to start planning of expandable storage hubs that can give sufficient operative storage capacity for the expected increasing supply of captured CO_2.
- **H-2020 call next year on CO_2 storage qualification**

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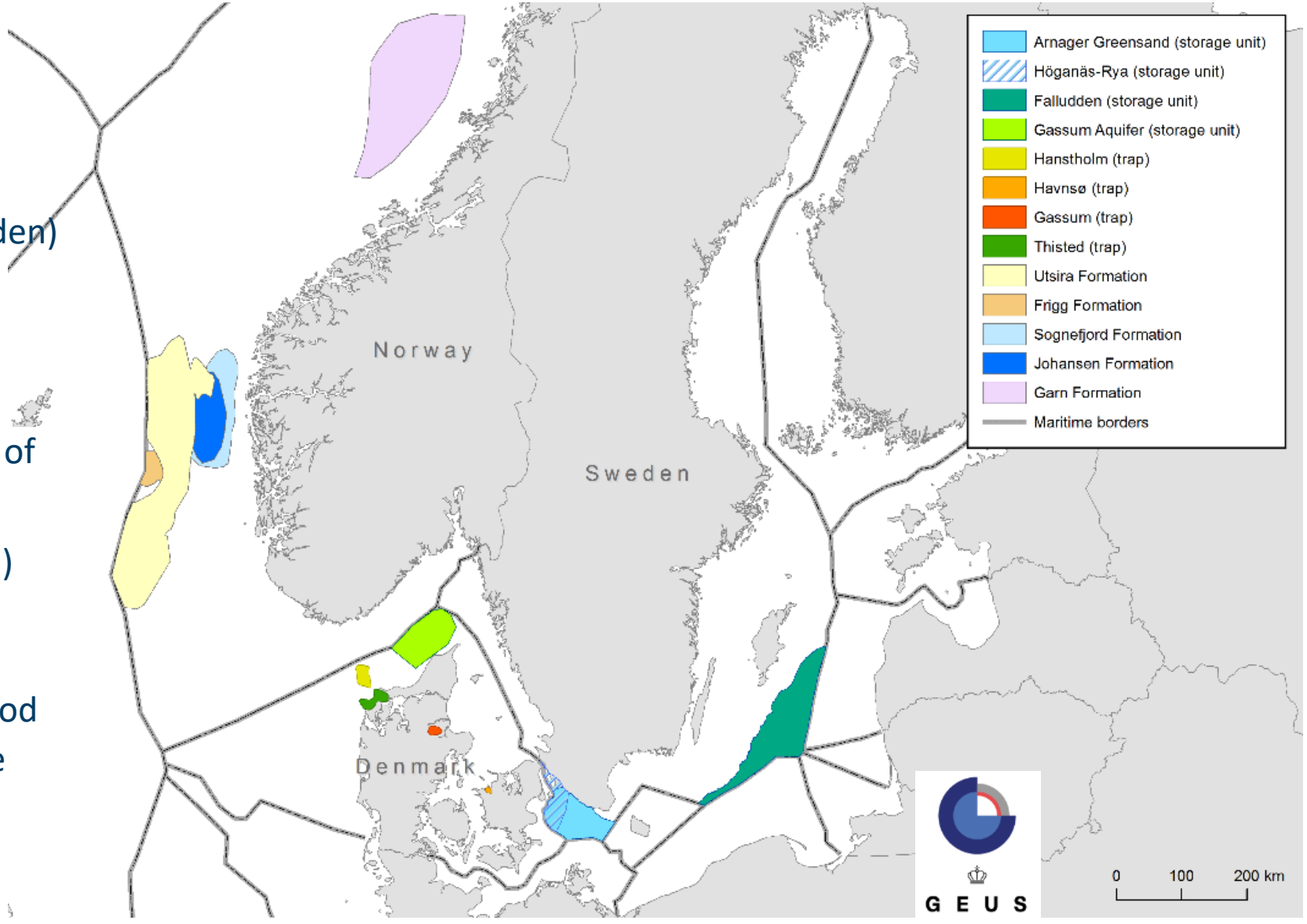
Storage options for the Baltic Sea Region

Example: Bothnian Bay

Focusing on CO_2 sources in Sweden and Finland (here around the Bothnian Bay), the NORDICCS project (2011 – 2014) analysed several transport alternatives to identified possible storage sites. The Gassum Formation offshore Denmark was one of these.

Storage options for the Baltic Sea Region

- The NordiCCS project has investigated:
  - Faludden Fm. (Baltic Sea)
  - Arnager Greensand (Southern Sweden)
  - Gassum Formation (Skagerrak, Denmark)
  - North Sea (Several formations, Johansen Fm. is currently the focus of the Northern Light project)
  - Norwegian Sea (Trøndelag platform)
- Skagerrak region:
  - Previous projects have indicated good potential for large scale CO_2 storage
  - There are large CO_2 sources around Skagerrak and in the Baltic region



Storage potentials (trap capacity)

Several projects have assessed storage options in the Skagerrak region:

- **CCS in Skagerrak/Kattegat region**, (Tel-Tek, UiO, Chalmers, SINTEF, GEUS, industry partners, ….)
- **Nordiccs** (GEUS, VTT, Chalmers, UiO, SINTEF, SGU …..)
- **Up-slope**, (UiO, SUCCESS, SINTEF, GEUS)
- Other (**Joule II, GeoCapacity, GestCO**, ..)

Storage potential: (from NORDICCS)

Gassum aquifer (storage unit)	3.7 Gt
Hanstholm (trap)	2.7 Gt
Thisted (trap)	11 Gt
Faludden (unit)	10-70 Mt
Arnager Greensand (unit)	10-115 Mt

Other storage options in the Baltic Sea exists but are not listed here!

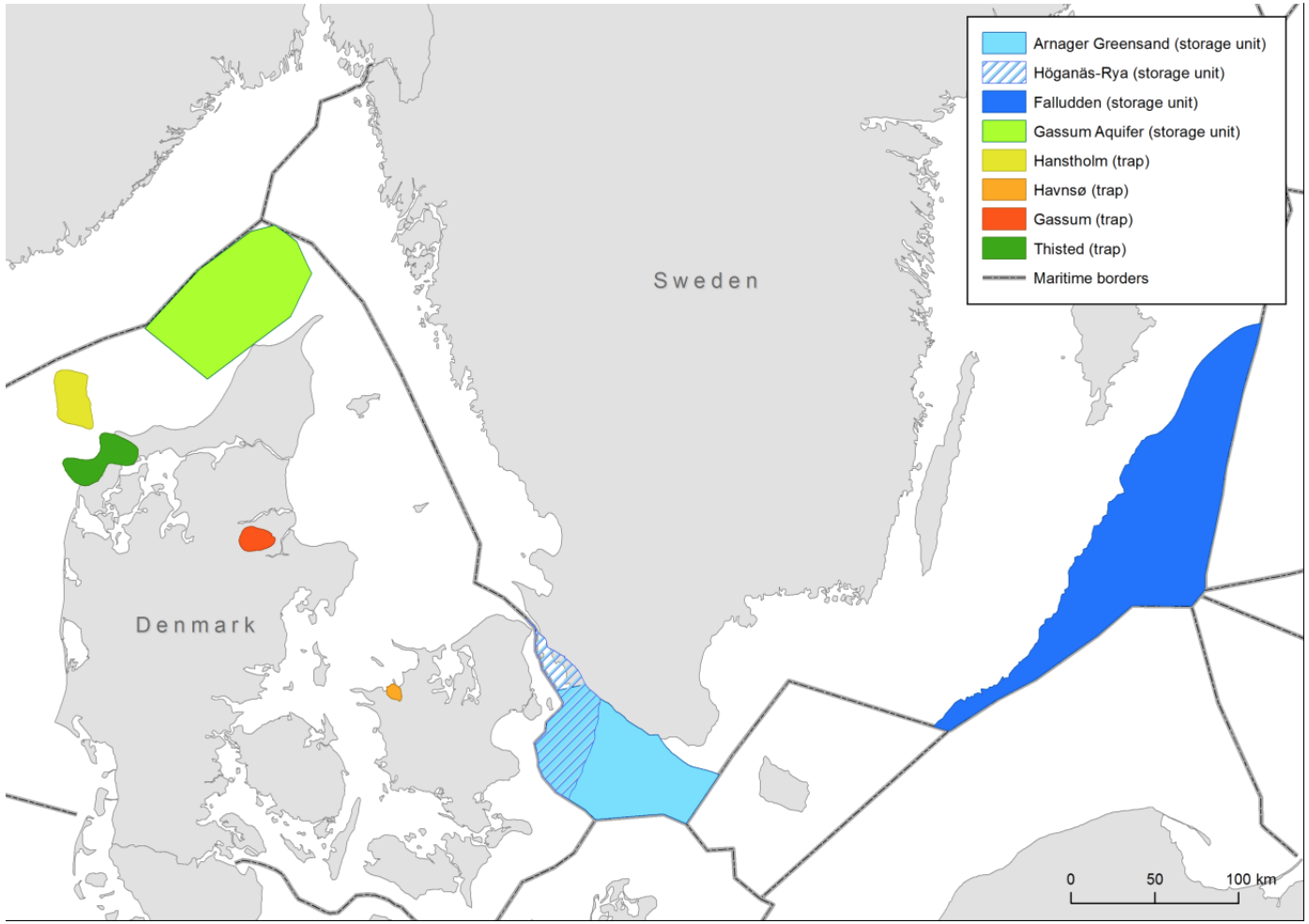


Figure from NORDICCS

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H-2020 – call next year (opens 05. May)

- Scope: The objective is to carry out the identification and geological characterisation of new prospective storage sites for CO_2 (including the 3D architecture of the storage complex) in promising regions of future demonstration and deployment (onshore or offshore) through the implementation of **new CO_2 storage pilots**.
- The Commission considers that proposals requesting a contribution from the EU in the range of EUR 7 to 10 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.
- https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/lc-sc3-nze-6-2020

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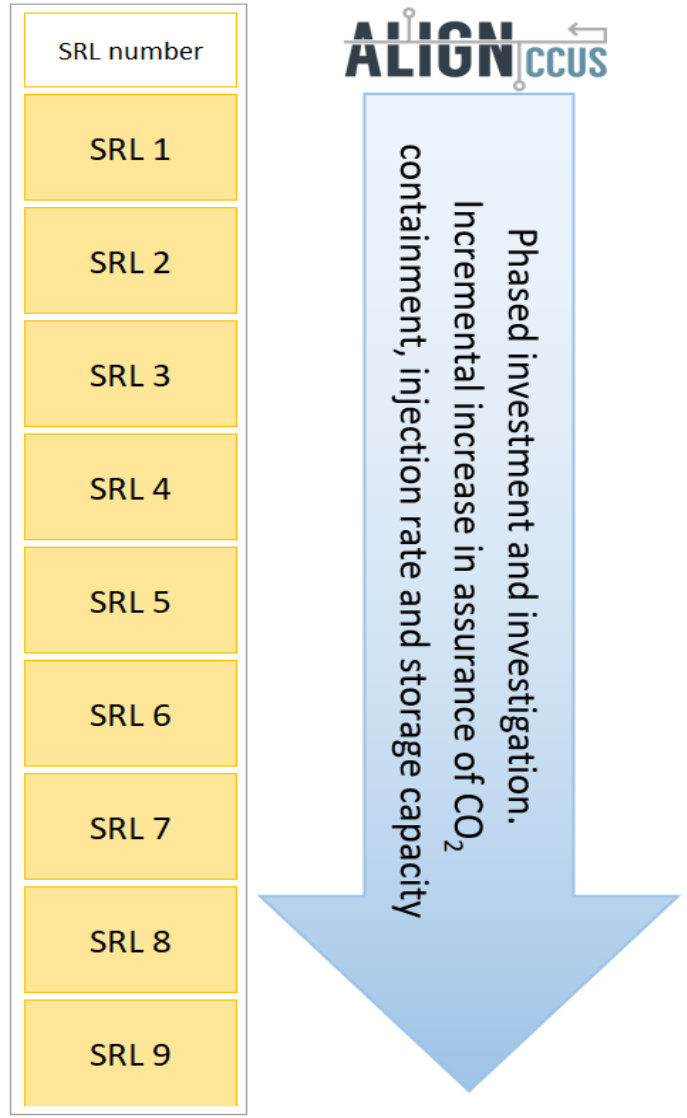
Objective and activities

- Qualification of large scale storage in the Skagerrak region
  - Advance from SRL 2 -3 to SRL 5 - 6
    - Storage Readiness Levels (ALIGN CCUS)
- Activities
  - Map existing data and models
  - Build/update geological models
  - Perform simulations, screen future storage options
  - Data acquisition (new seismic and well data)
  - Perform injection test (pilot injection)
  - Risk Assessment
  - Public acceptance



Akhurst et al., GHGT-14 (2018)

Details from the ALIGN CCUS Storage Rediness Levels are under preparation for publishing.

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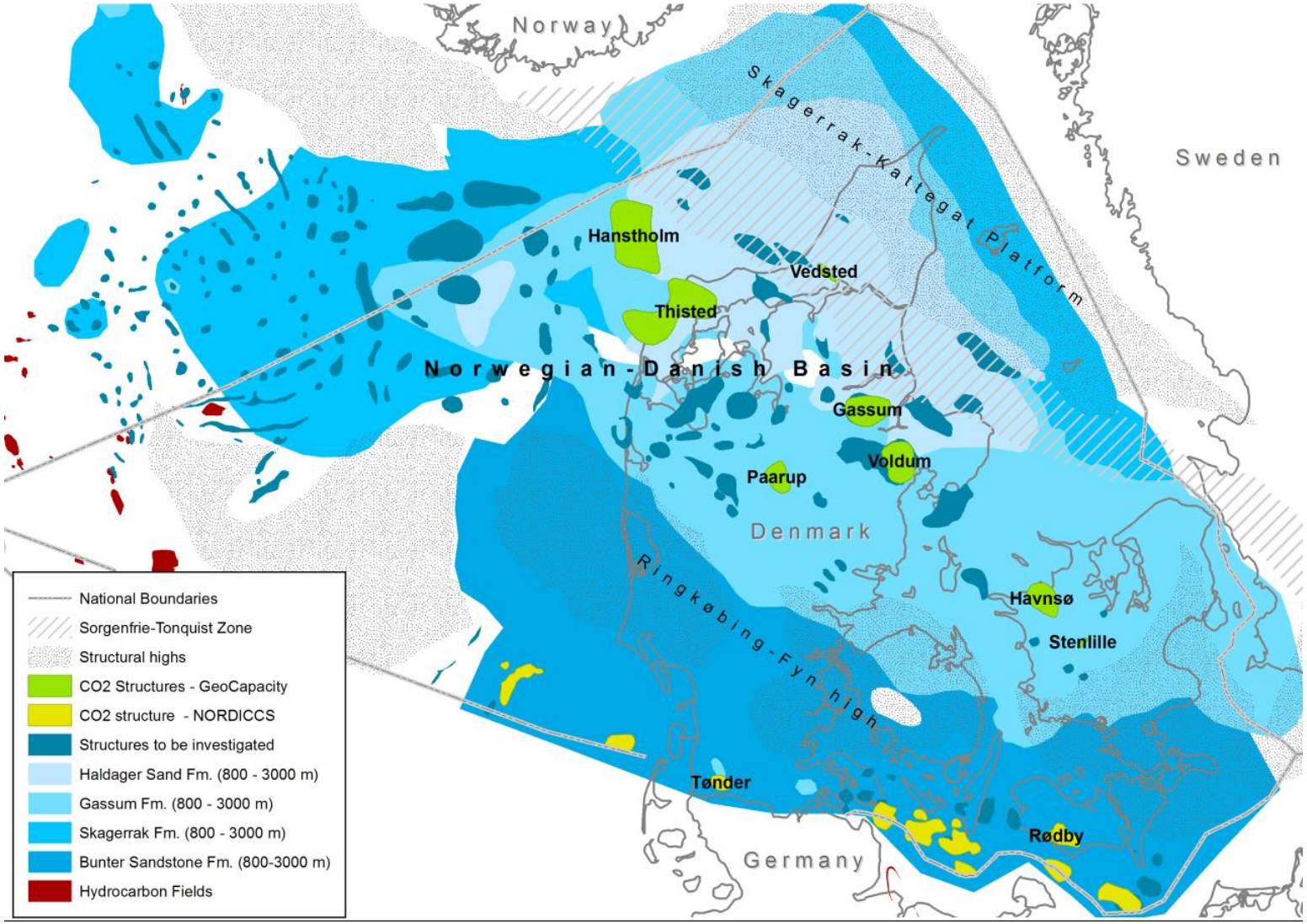
Proposed scenario: CO_2 storage offshore Denmark

- On- and offshore
- Large storage capacities
- Onshore pilot?
- Offshore structure?

- **Hanstholm structure**
  - Drill a well down to Gassum Fm. on the Thisted structure (onshore pilot)
  - New 3D seismic of Hanstholm (with tie to the Thisted dataset and the new well)

Figure from NORDICCS showing mapped structural closures in The Gassum Fm.



Project structure (preliminary):

- WP1 Seismic data interpretation
- WP2 Well data interpretation
- WP3 Geological model

} Site characterisation

- WP4 Injection scenarios, risk reduction, storage capacity, injectivity
- WP5 Pilot and storage concept (cost, subsea template, well design, on-shore hub, ship etc)
- WP6 Risk assessment and mitigation actions
- WP7 Outreach – public acceptance (involve stakeholders)
- WP8 Administration

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Road ahead

- We are aiming at the H-2020 call (SINTEF and GEUS)
- We are in the process of building a research consortium:
  - Contact and discuss with possible (interested) industry partners
  - Invite institutes/universities that can give a substantial contribution to the project
- Invite stakeholders and industry to collaborate
- Contact:

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Thank you for your attention!