Overview of conventional hydrocarbon resources in the North Sea Basin – harmonization of assessments, cross-border play mapping and new concepts

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OUTLINE

- Project aims
- Methodology
- Results
  - Survey
  - Data Themes
  - GIS project
  - What is unique about GARAH?
  - Next Steps and Questions

Geological
Analysis and
Resource
Assessment of selected
Hydrocarbon systems

COUNTRIES, AREA OF INTEREST AND AIMS

- Netherlands, Germany, UK, Denmark (and Norwegian data)
- Regional collation of hydrocarbon-related information and resource assessments for the North Sea
- Harmonisation of methods and resource assessment results
- Resolve cross-border issues in understanding petroleum geology
- Identify play concepts across North Sea and explore potential across borders
- Identify data gaps in geological understanding
- Collate information for alternative resources such as geothermal, CCS and wind energy
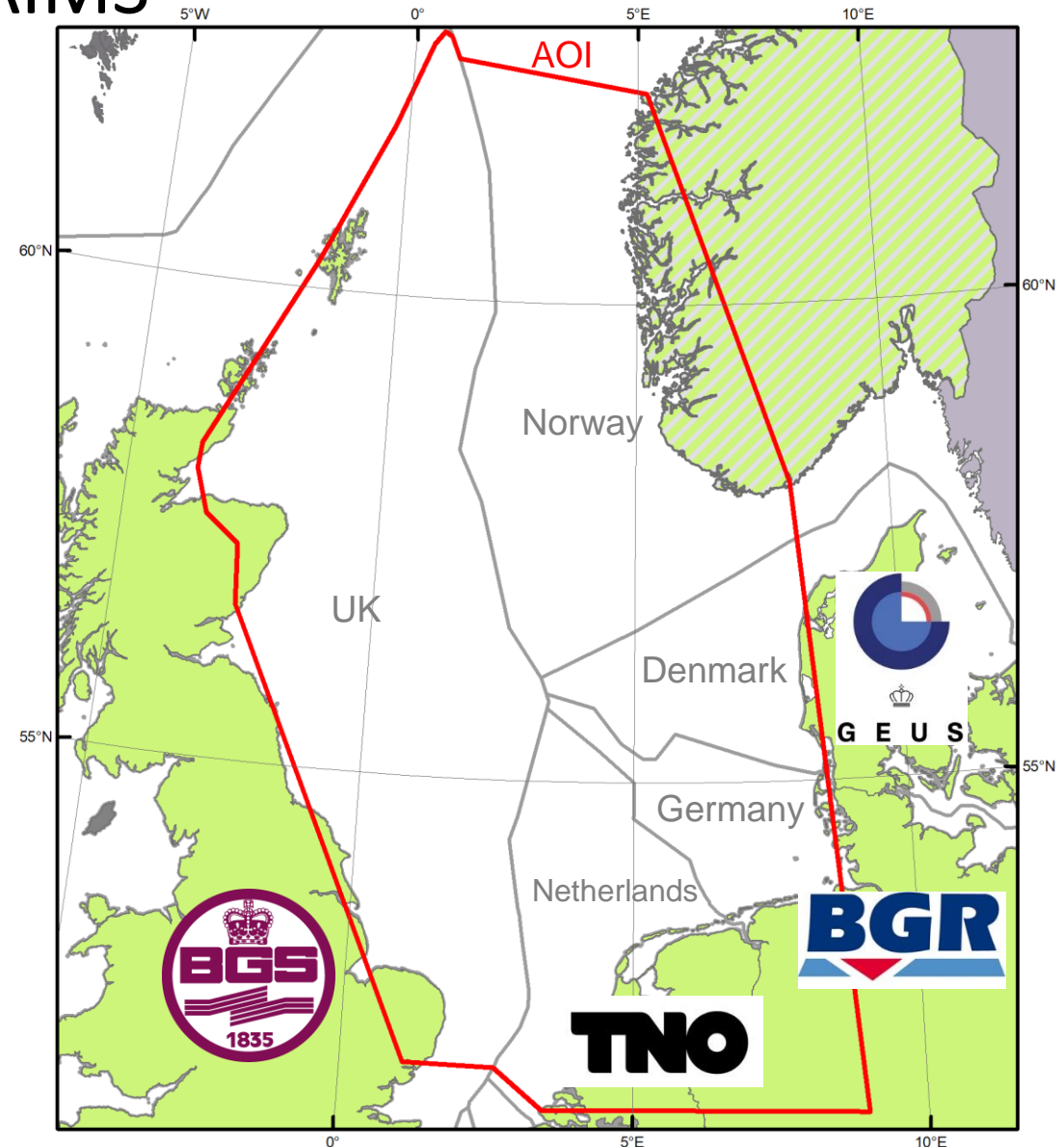
METHODOLOGY – SURVEYS for ALL COUNTRIES

CAPTURE:

- Summary of exploration history, main plays, current methods for resource assessments across borders
- Quantitative descriptions of reserves, resources, yet to find – all in same units
- Summary of play types across borders – reservoir, source, seal
- List of exploration wells for each country from 2000 – name, location, company, dates drilled and completed, target formation if possible.

METHODOLOGY – DATA THEMES AND AVAILABILTY

- Identification of hydrocarbon themes: fields; infrastructure; facies maps; play maps; reservoir distribution; salt structure; temperature; permeability

- Resource assessment parameters: selected intervals; thickness etc.

- Other themes such as data relating to CCS; geothermal; marine environment

- Decision on feasibility for creating new data and maps e.g. areas of HPHT where not previously collated

- Understanding static versus dynamic data

METHODS – static vs. dynamic data processing

- Static data (e.g. shapefiles or raster files) – GIS data is produced but not updated automatically: Fine for geological data (e.g. facies maps, play maps).

- Dynamic data by using WFS (Web Feature Services) – GIS data is produced and updated regularly by the owner/sourceholder to provide the latest status: Preferably used for data showing policies and infrastructure (e.g. pipelines, windparks, production data from gasfields). Disadvantage; Dynamic data is not always available and every country has different source holders.

- Dynamic data is processed by using FME software (from Safe Software) (see image below for example). By using FME, dynamic data can be updated, harmonized and edited to be more comprehensible. Also static data can be harmonized/edited in FME (but not updated!).
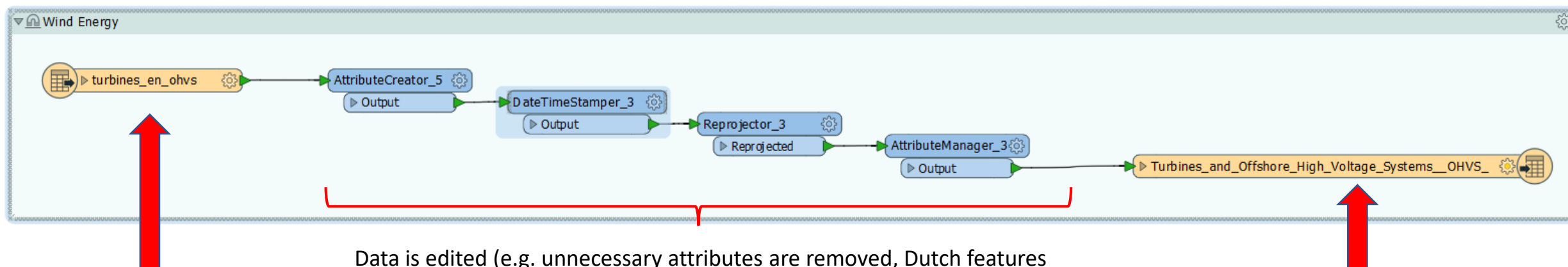
Server from sourceholder (in this case Dutch Rijkswaterstaat) is requested by using WFS

Data is edited (e.g. unnecessary attributes are removed, Dutch features are translated into English and metadata (data of last update) is added)

Updated server request is saved as feature class in geodatabase

METHODS – static vs. dynamic data processing

Attributes are removed/translated to make it more comprehensible

Metadata is added

AttributeCreator Parameters

Transformer

Transformer Name: AttributeCreator_5

> Advanced: Attribute Value Handling

Attributes To Create

New Attribute	Attribute Value
Link WFS	https://geoservices.rijkswaterstaat.nl/apps/geoserver/windenergiegeb...
Source Holder	Rijkswaterstaat
Website of origin	https://data.overheid.nl/dataset/58341-windparken-noordzee--nederl...

Filter: Import ...

Help   Defaults ▼   OK   Cancel

Attribute Actions

Input Attribute	Output Attribute	Attribute Value	Action
OPMERKING	TYPE		Rename
OPMERKING.xsi_nil			Remove
GEBIEDNR	AREA_NUMBER		Rename
GEBIEDNR.xsi_nil			Remove
TURBINE_NR	TURBINE_NUMBER		Rename
TURBINE_NR.xsi_nil			Remove
EIGENAAR	OWNER		Rename
EIGENAAR.xsi_nil			Remove
SHAPE	SHAPE		Do Nothing
SE_ANNO_CAD_DATA			Remove

Filter: Import ...

Help   Defaults ▼   OK   Cancel
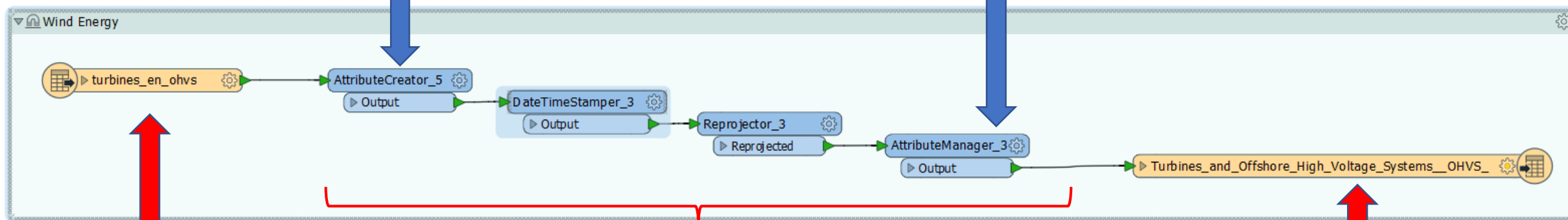
Wind Energy

turbines_en_ohvs → AttributeCreator_5 → Output → DateTimeStamper_3 → Output → Reprojector_3 → Reprojected → AttributeManager_3 → Output → Turbines_and_Offshore_High_Voltage_Systems__OHVS_

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RESULTS – GIS collation

UK & Danish top Chalk

UK & Dutch Zechstein thickness
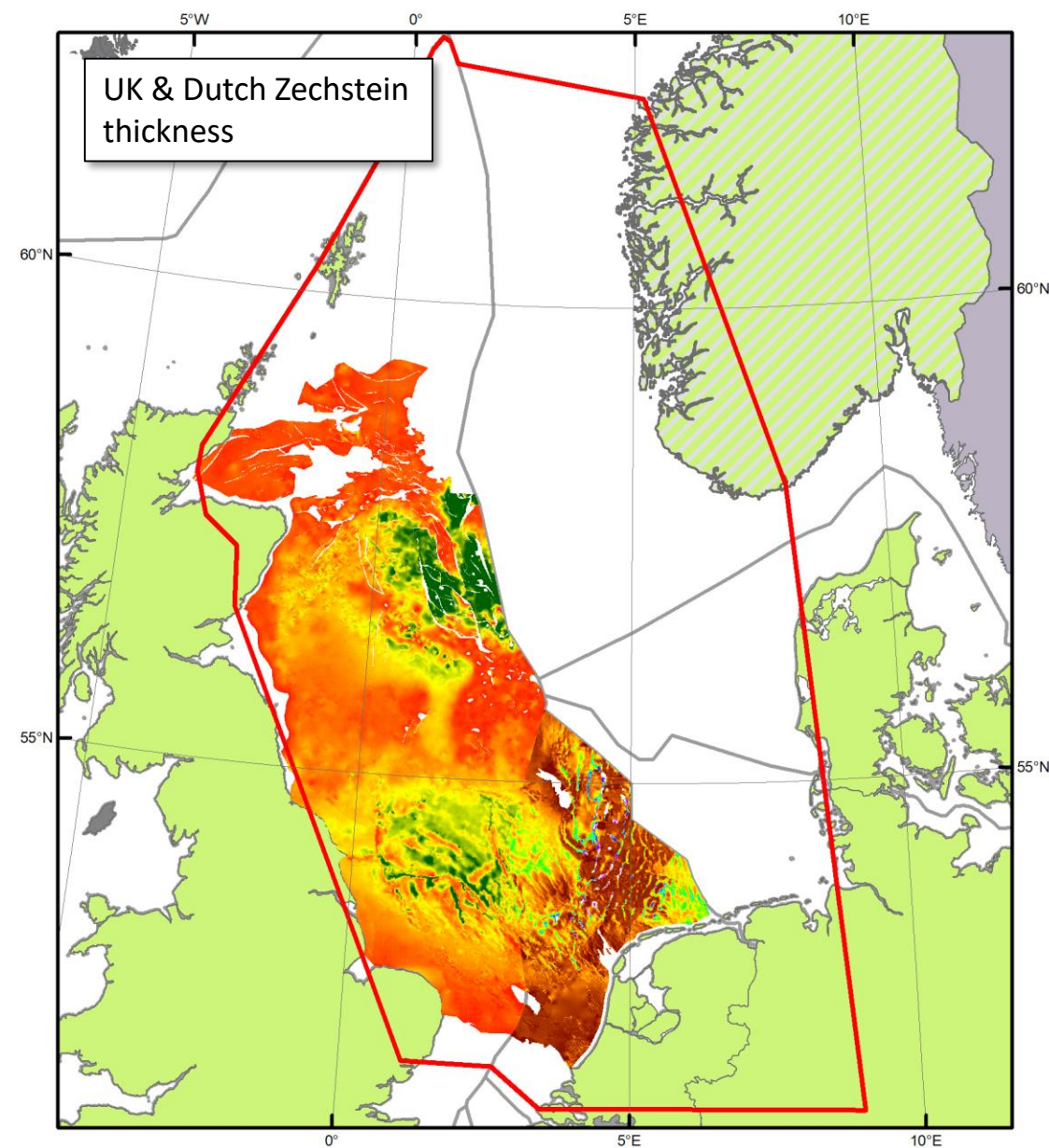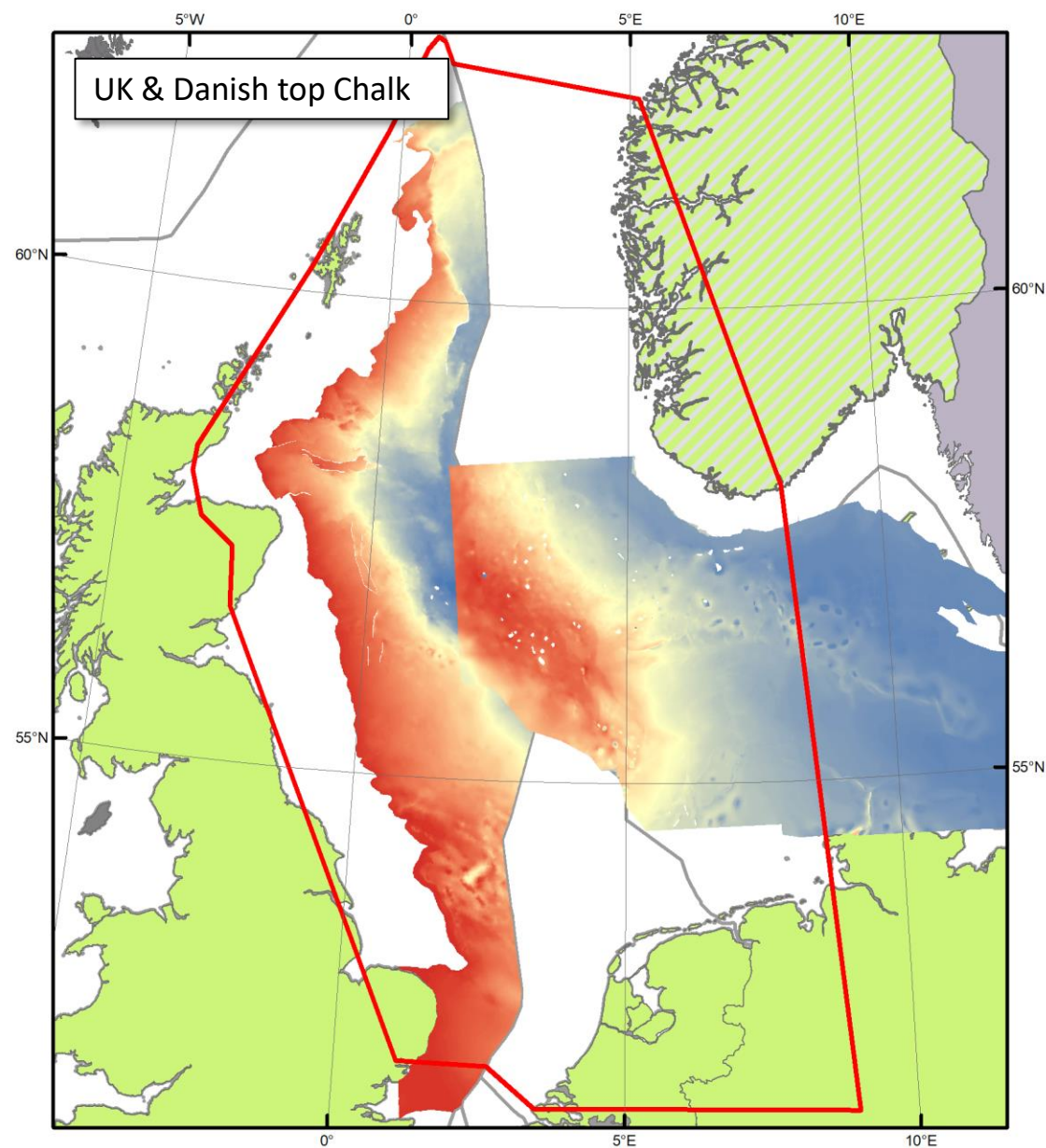
RESULTS – GIS collation

UK & Dutch Facies maps for Zechstein intervals
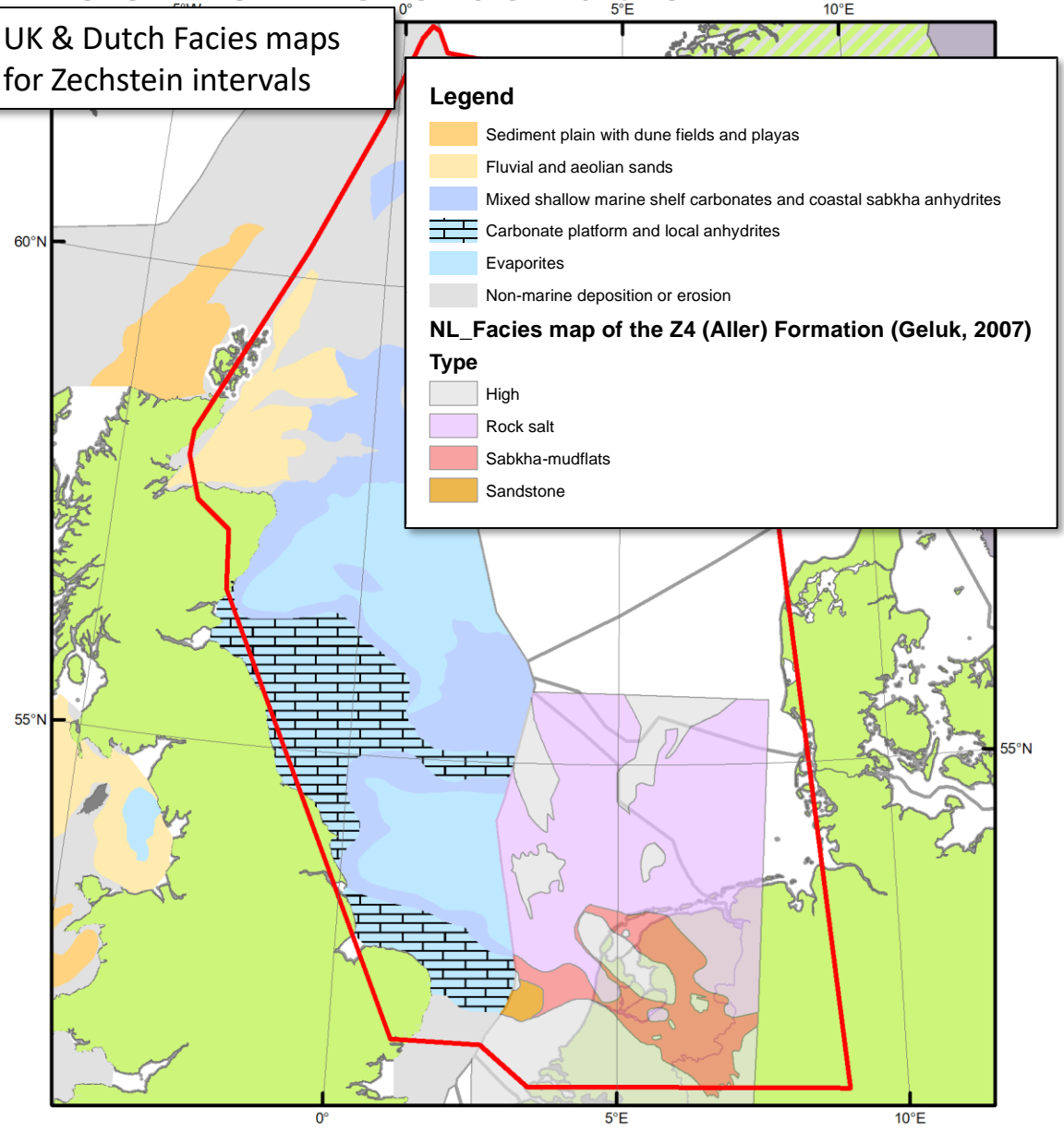
Danish, Norwegian & Dutch salt structures

Legend

- Sediment plain with dune fields and playas
- Fluvial and aeolian sands
- Mixed shallow marine shelf carbonates and coastal sabkha anhydrites
- Carbonate platform and local anhydrites
- Evaporites
- Non-marine deposition or erosion

NL_Facies map of the Z4 (Aller) Formation (Geluk, 2007)

Type

- High
- Rock salt
- Sabkha-mudflats
- Sandstone

?
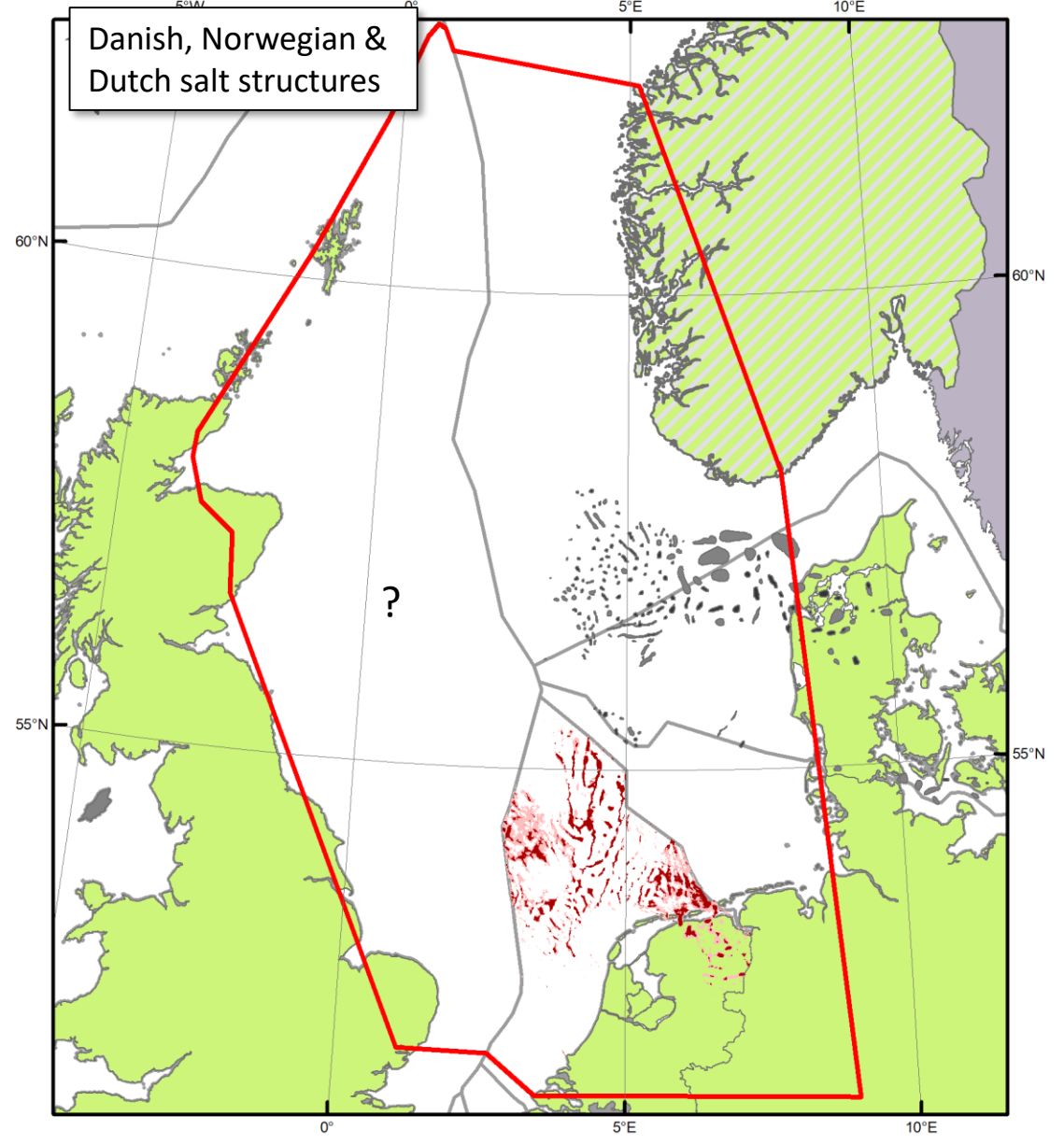
RESULTS – GIS – PAST WORK – avoid duplication

SPBA Permian subcrop
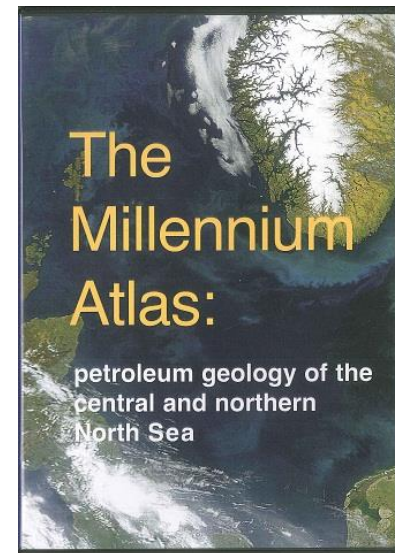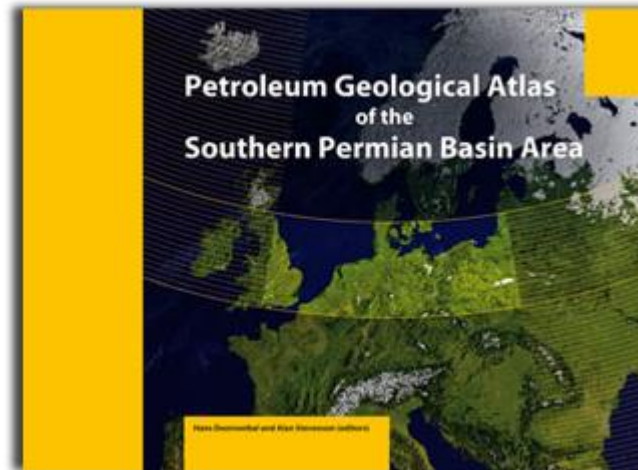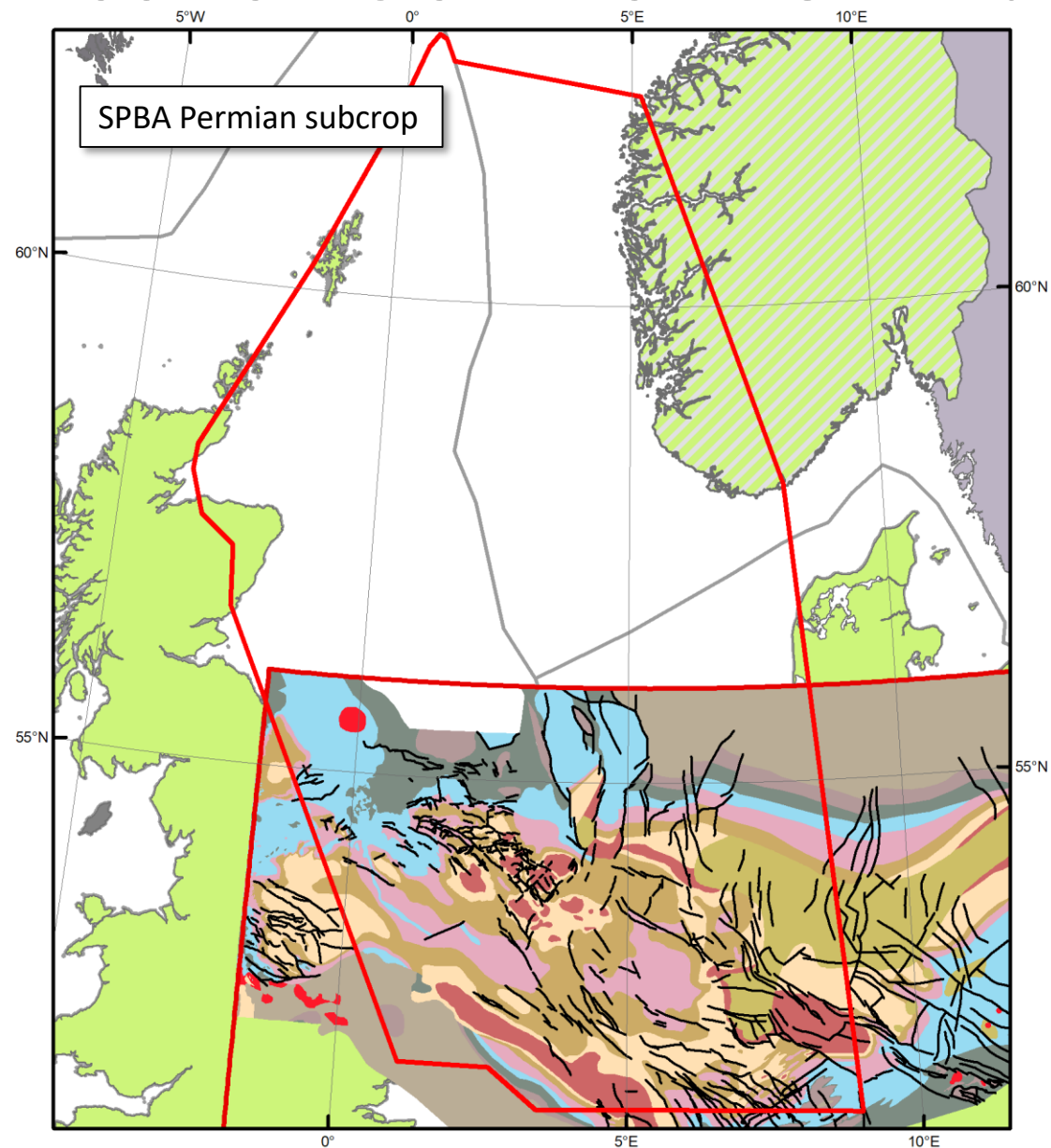
CURRENT RESULTS – GIS collation – new work

UK, DK, NL field information
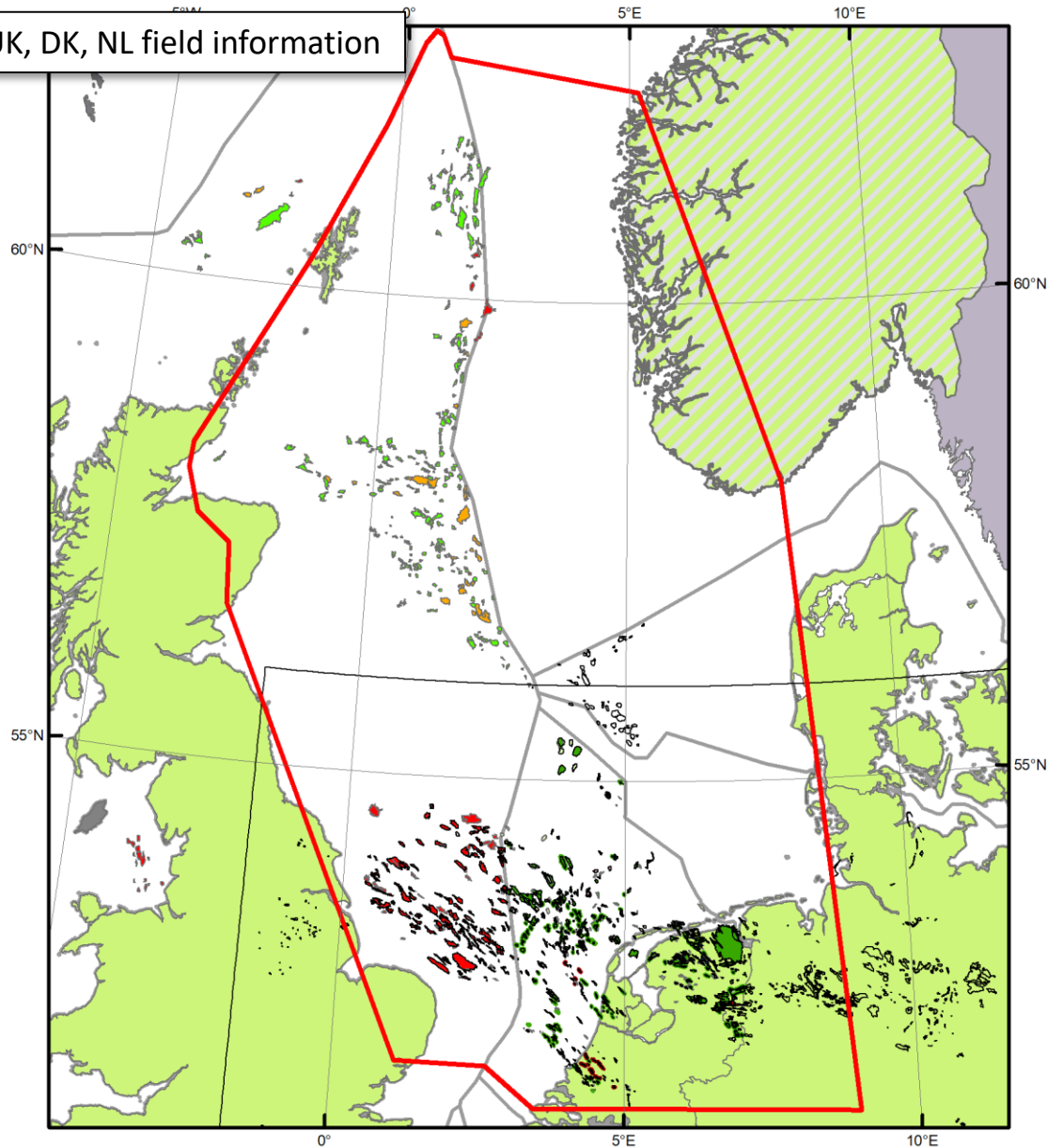
Hydrocarbon Field Information UK, NL, DK

SPBA_fields — Denmark

Hydrocarbon fields

Type

Gas field out of production

Gas field in production

Undeveloped gas field

Subsurface gas storage

Temporarily abandoned gas field — Netherlands

Oil field out of production

Oil field in production

Undeveloped oil field

COND

GAS — UK

OIL

- Various levels of detail e.g. Dutch information captures production status; UK does not include gas storage
- Different definitions depending on country
- **What is relevant to the future?**

CURRENT RESULTS – GIS collation – Undeveloped fields

UK, DK, NL field information

Undeveloped Discoveries

- ● Predominantly Gas
- ● Predominantly Gas
- ● Gas Condensate   UK
- ● Predominantly Oil
- ● Predominantly Oil

Hydrocarbon Field Information UK, NL, DK

☐ SPBA_fields

Hydrocarbon fields

Type

- ☐ Gas field out of production
- ☐ Gas field in production
- ☐ Undeveloped gas field
- ☐ Subsurface gas storage
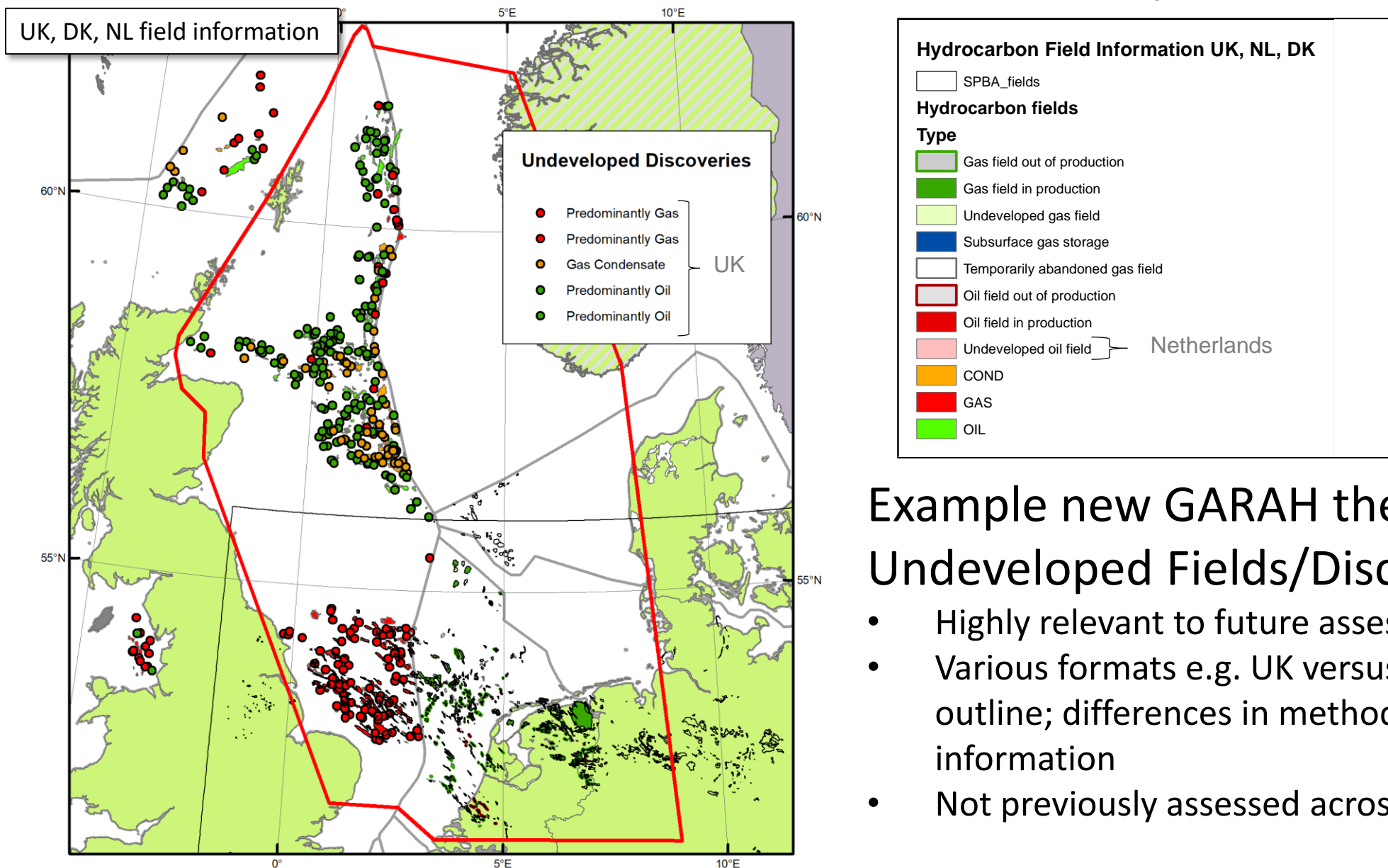- ☐ Temporarily abandoned gas field
- ☐ Oil field out of production
- ☐ Oil field in production
- ☐ Undeveloped oil field ⎫ Netherlands
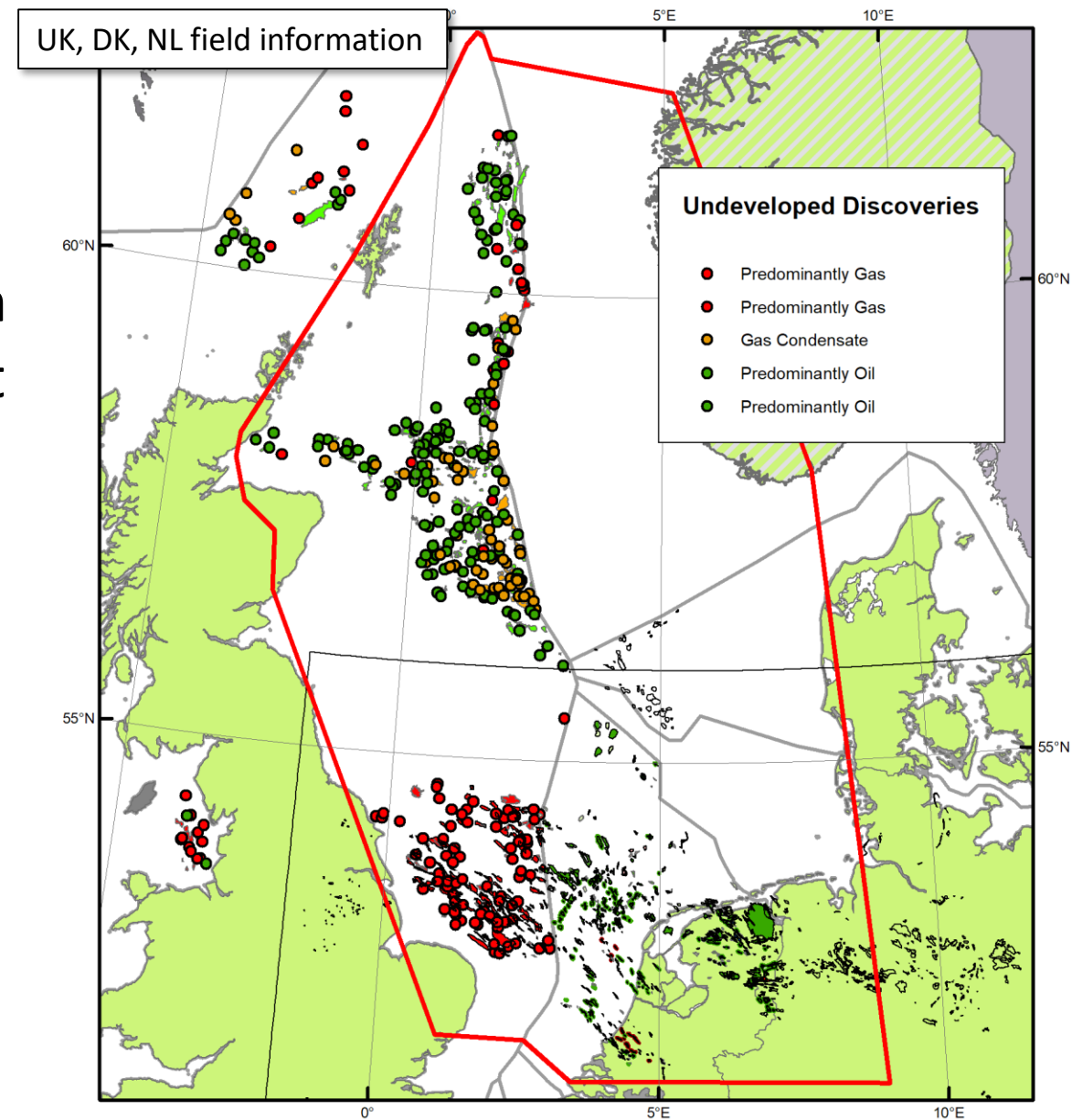- ☐ COND
- ☐ GAS
- ☐ OIL

Example new GARAH theme:
Undeveloped Fields/Discoveries

- Highly relevant to future assessment for mature basin
- Various formats e.g. UK versus NL – point versus outline; differences in methodology; 'hidden' information
- Not previously assessed across borders

WHAT MAKES GARAH UNIQUE?

- Avoid point duplicating past work (i.e. SPBA, MA, NAGTEC)

- Influence of government policy and carbon commitments – mature basin environment

- Focus on cross-border play analysis and resource assessment rather than just 'joining up maps'. What is left in the N. Sea?

- Focus on alternatives to traditional oil and gas; what do we need for cross-border assessment of CCS/geothermal/energy storage? What/where are the main data gaps?

UK, DK, NL field information

Undeveloped Discoveries
- Predominantly Gas
- Predominantly Gas
- Gas Condensate
- Predominantly Oil
- Predominantly Oil

NEXT STEPS/COLLABORATION

- Refinement of themes

- Harmonisation of data and metadata

- Identification of data gaps

- Resource assessment (of what?)

- Work with geoERA – what about offshore structure?

- Dynamic versus static outputs?
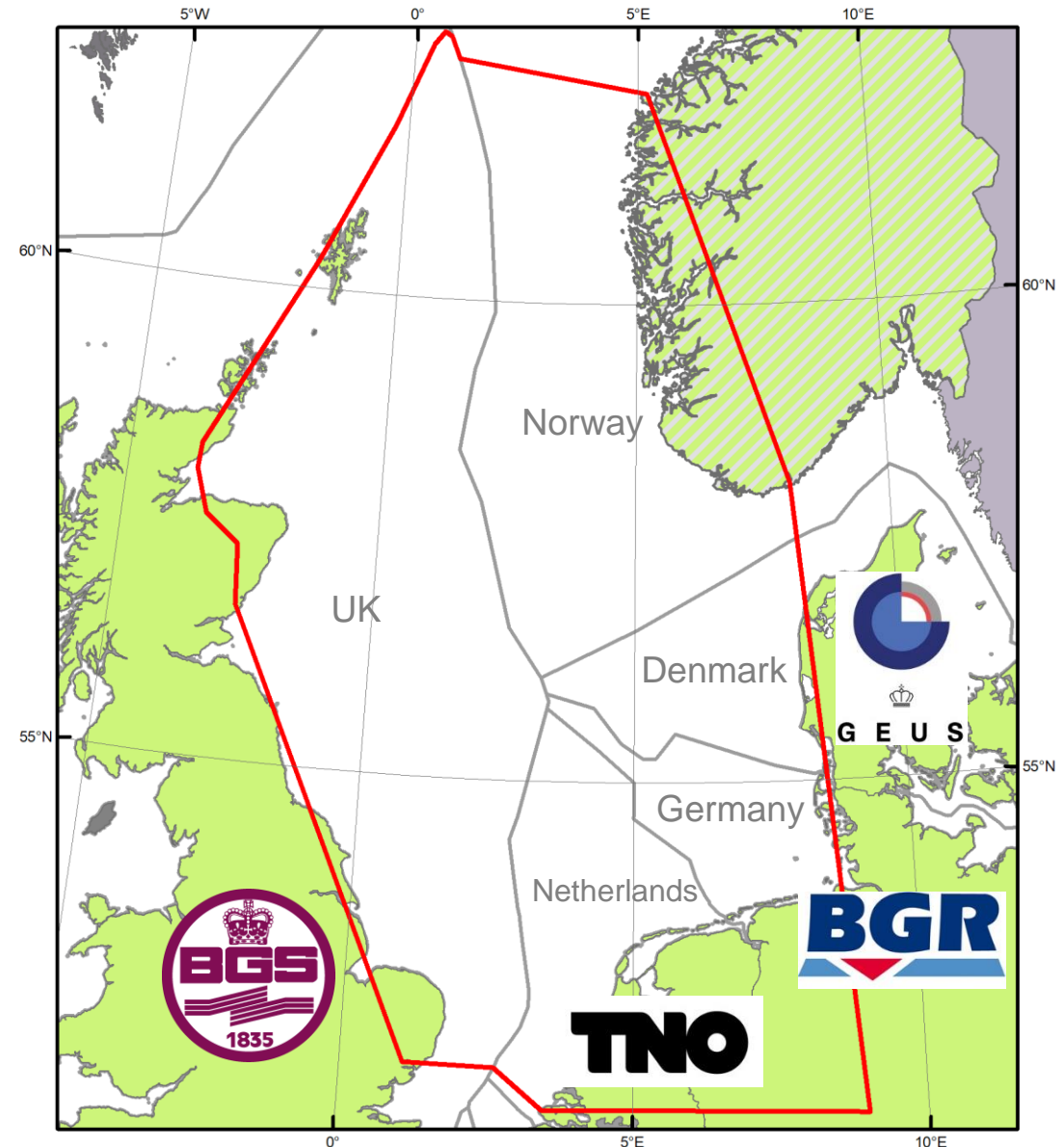
THANK YOU!

QUESTIONS

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