CCS Modelling

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ESY faglig morgen
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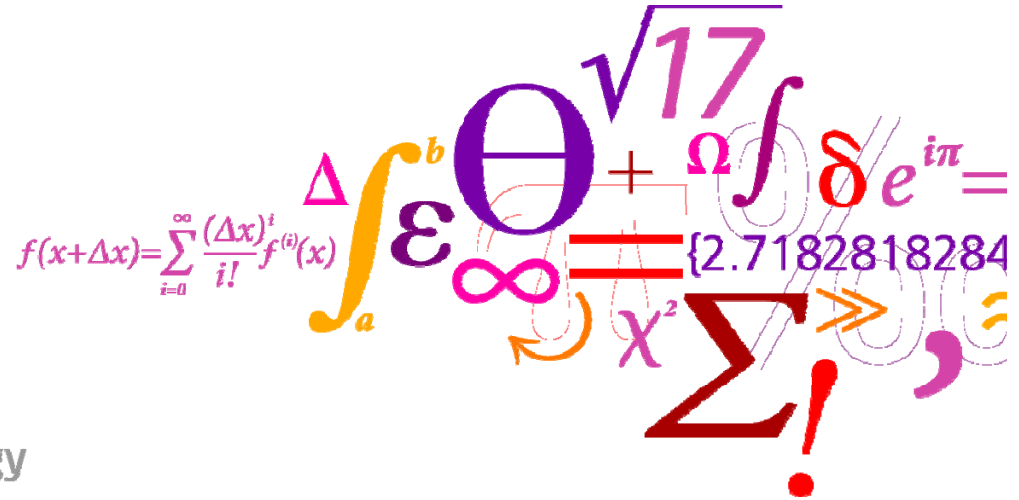


Risø DTU
National Laboratory for Sustainable Energy

Overview

- Starting point: IEA workshop on CCS modelling, November 2007
- Tasks for FENCO-ERANET project Storage Utsira
- NEEDS/TIMES Pan European model: Results for 2050
- RES-2020/TIMES Pan European model: Results for Denmark 2020
- Status for the Danish model
- Managing and documentation of TIMES models (no slide)
- Preliminary results from ETSAPs Global model TIAM
- Storage Utsira: Draft conclusions for Denmark

Status of CCS development in Denmark

GETSCO Project:

11 sites.

Total capacity 16 Gt

- The potentials for CCS in Denmark is becoming increasingly constrained
- Very little interest by Danish energy experts and the general public in many years
- Participation in the EU CASTOR project
- Pilot plant at modern coal-fired plant in Esbjerg, Denmark near the North Sea oil and gas fields
- CCS is not considered in forecasts of greenhouse gasses by official forecasts to 2030
- The technical potential for CCS is described in the newspaper Jyllands Posten, 21 October 2007

Storage Utsira Task 3.1

Running existing model

– from Kick-Off meeting February 2009

- The starting point of our analysis is the national MARKAL and TIMES models for UK, the Netherlands, Germany, Denmark and Norway developed by each of the partners involved. These models will be used with harmonised modelling assumptions and scenarios to analyse pathways for CCS for all five countries. These models will be used by each of the partners with the common assumptions that will be developed in WP2.

Existing models

- UK – *MARKAL family*
- The Netherlands – *simplified national CCS model*
- Germany – *selected sectors from Pan European Model*
- Denmark – *selected sectors from Pan European Model*
- Norway – MARKAL family

Reference from application:

- Ref 3. Fidje, A., Energy Scenarios for the Nordic Region Towards 2035, IFE report no IFE/KR/E-2008/001, Kjeller, Norway (Available online from: www.ife.no :publications)
- Ref 14. Grohnheit, P.E., Denmark: Using the IEA ETSAP modelling tools for Denmark. Risø-R-1656, Risø National Laboratory for Sustainable Energy, Technical University of Denmark, Risø-R-1656, 2008.

CO_2 sinks

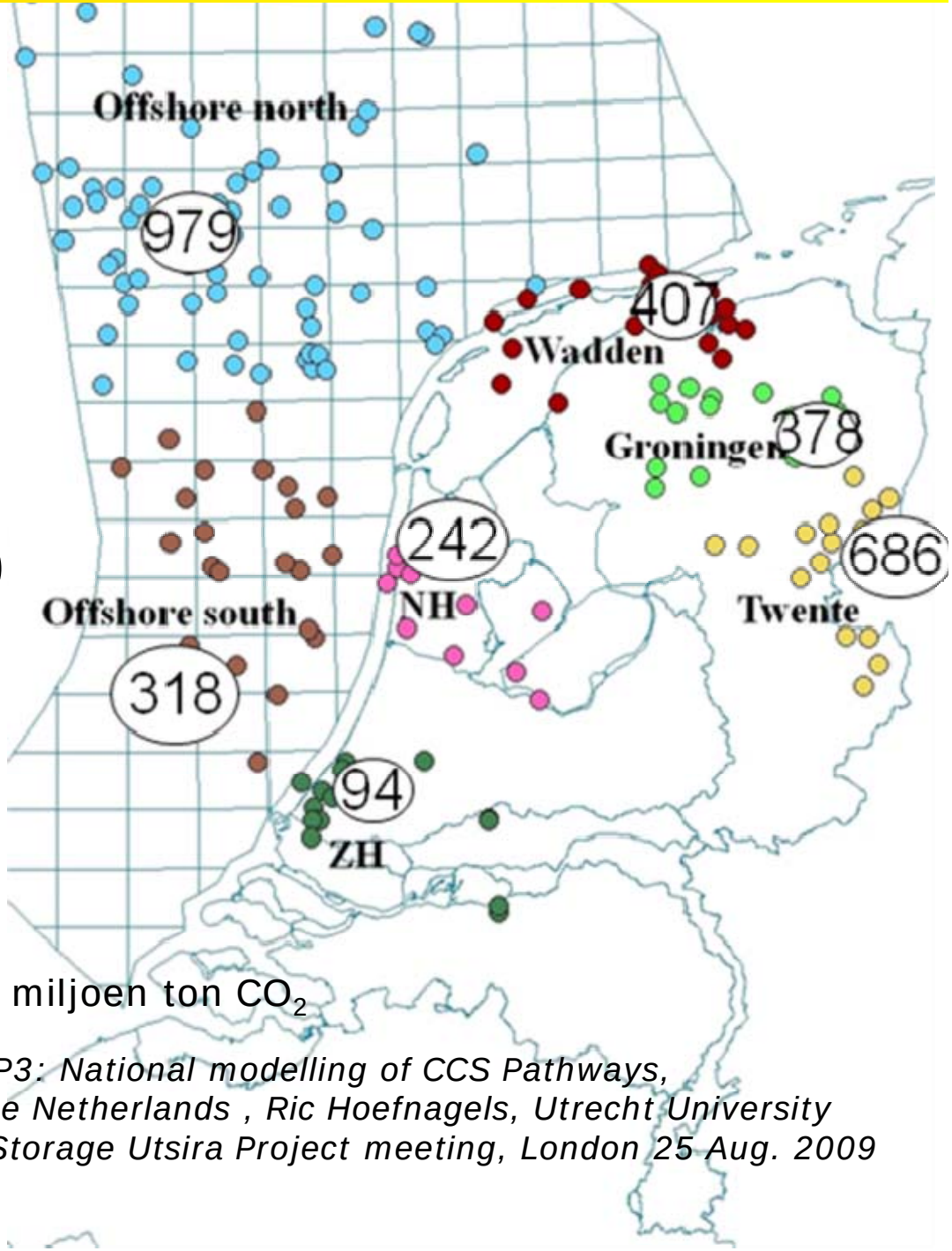
35 aquifers (> 2 Mt)

5 oil fields

131 gas fields (> 4 Mt)

Total 3 Gt

GIS→opslag



WP3: National modelling of CCS Pathways, The Netherlands , Ric Hoefnagels, Utrecht University - Storage Utsira Project meeting, London 25 Aug. 2009

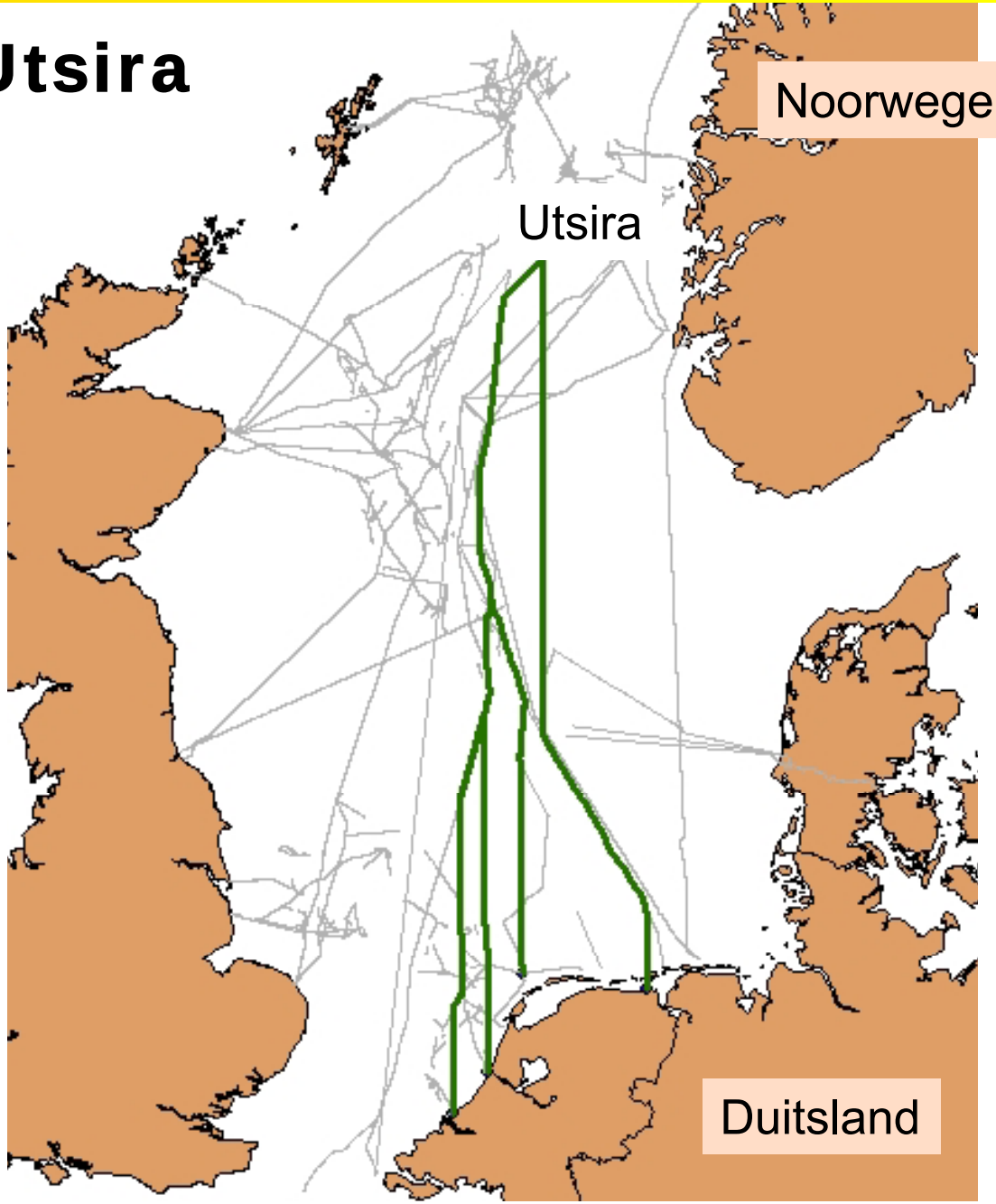
CO_2 transport to Utsira

Aquifer

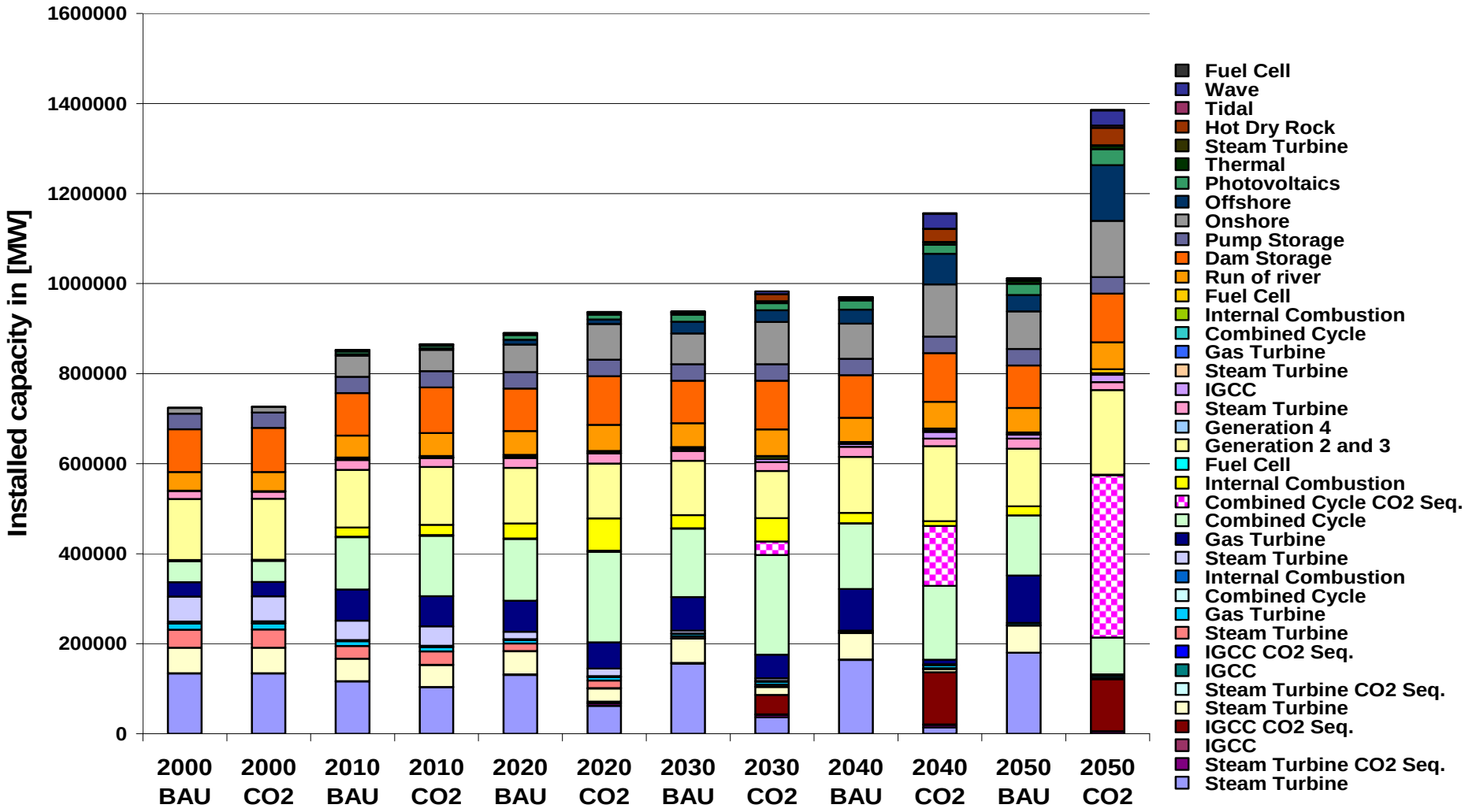
~42 Gt (now)

GIS→routes

WP3: National modelling of CCS Pathways, The Netherlands, Ric Hoefnagels, Utrecht University - Storage Utsira Project meeting, London 25 Aug. 2009

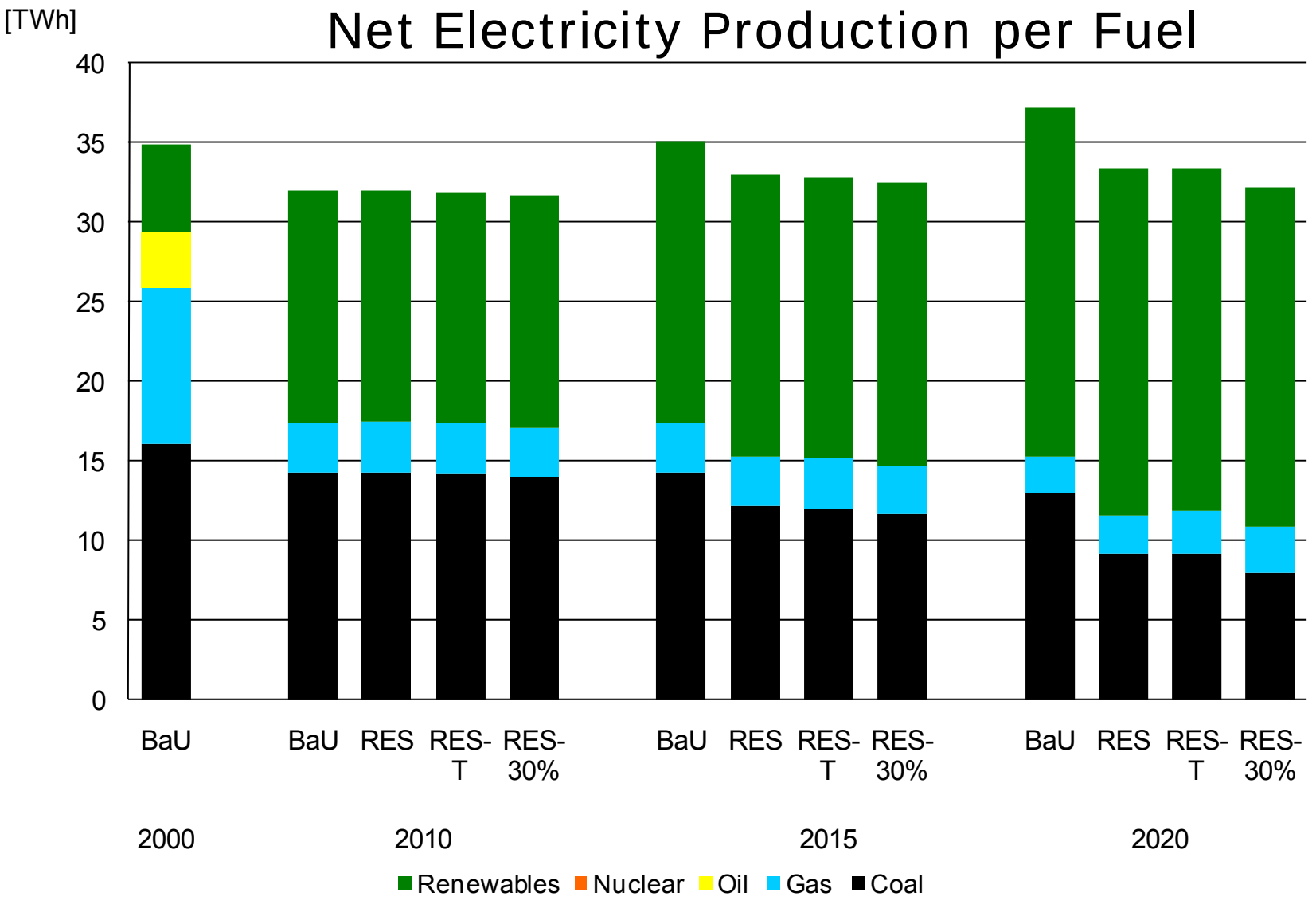


NEEDS-TIMES – Results of Pan European Model



Source: Markus Blesl, IER Stuttgart. NEEDS Project. Results Oct. 2007, CEEH Workshop Risø DTU Feb. 2008

RES2020: PanEuropean TIMES – Denmark



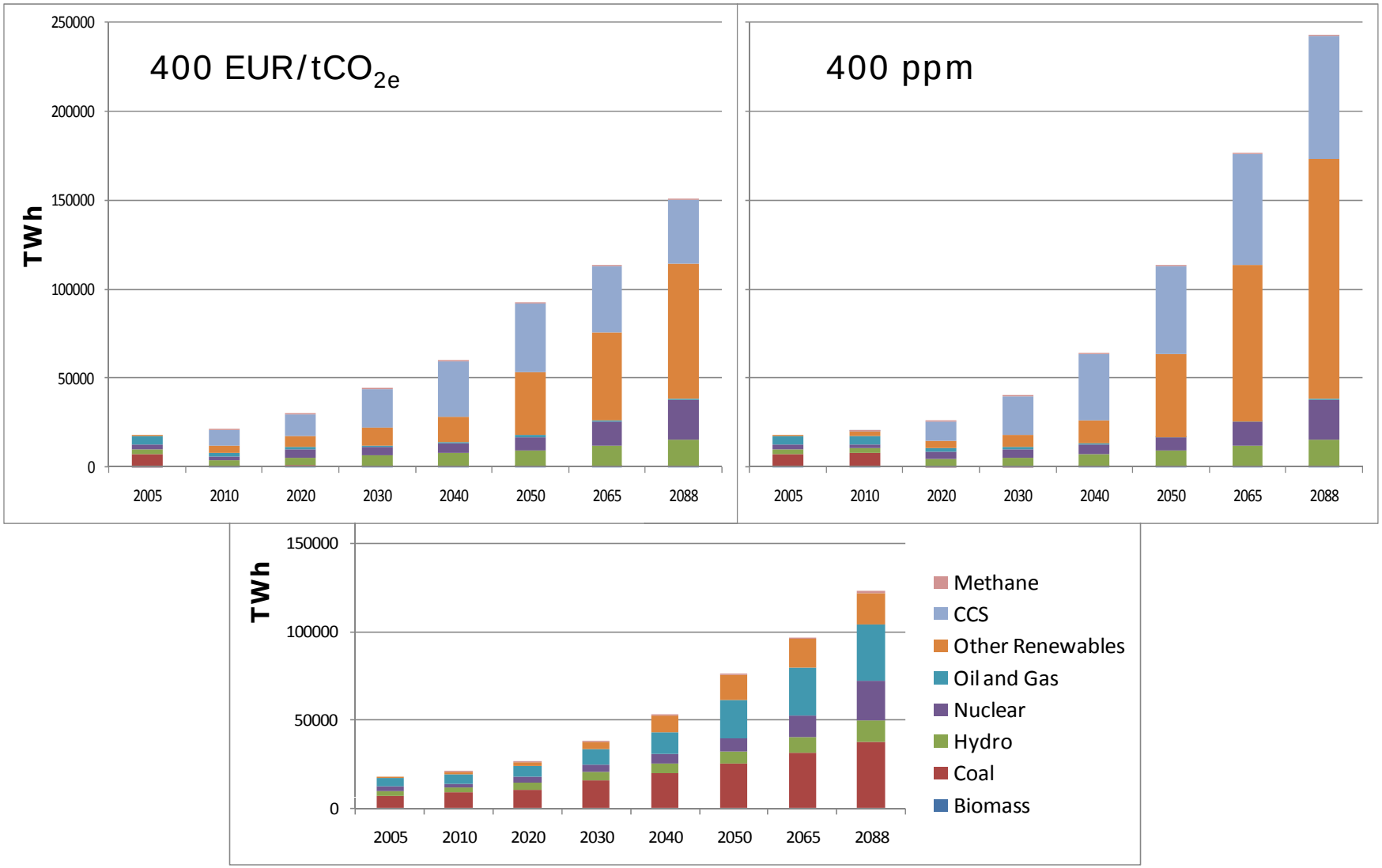
Status for the Danish model

- Storage Utsira Project meeting, London 25 August 2009

- Latest distributed version of RES2020 Pan-European model (time horizon 2050) – November 2008
- Danish model developed in parallel with RES2020 Pan-European model
- Modelling of CHP/DH infrastructure not satisfactory in the Pan-European model
- RES2020-TIMES Pan-European results and national report (time horizon 2020) – May 2009
- Detailed survey of model data and parameters – August 2009
- RES 2020 Northern workshop 28 August 2009
- Continued exchange of experience with the model development for Sweden

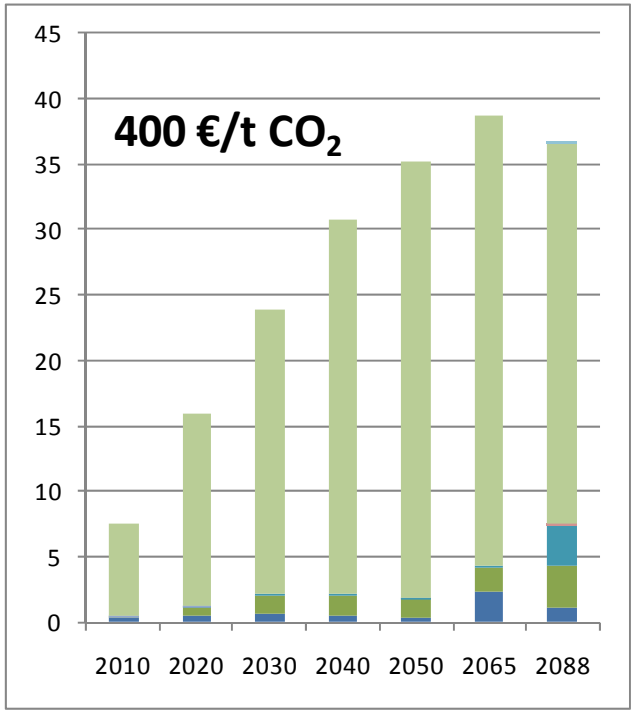
Power Generation

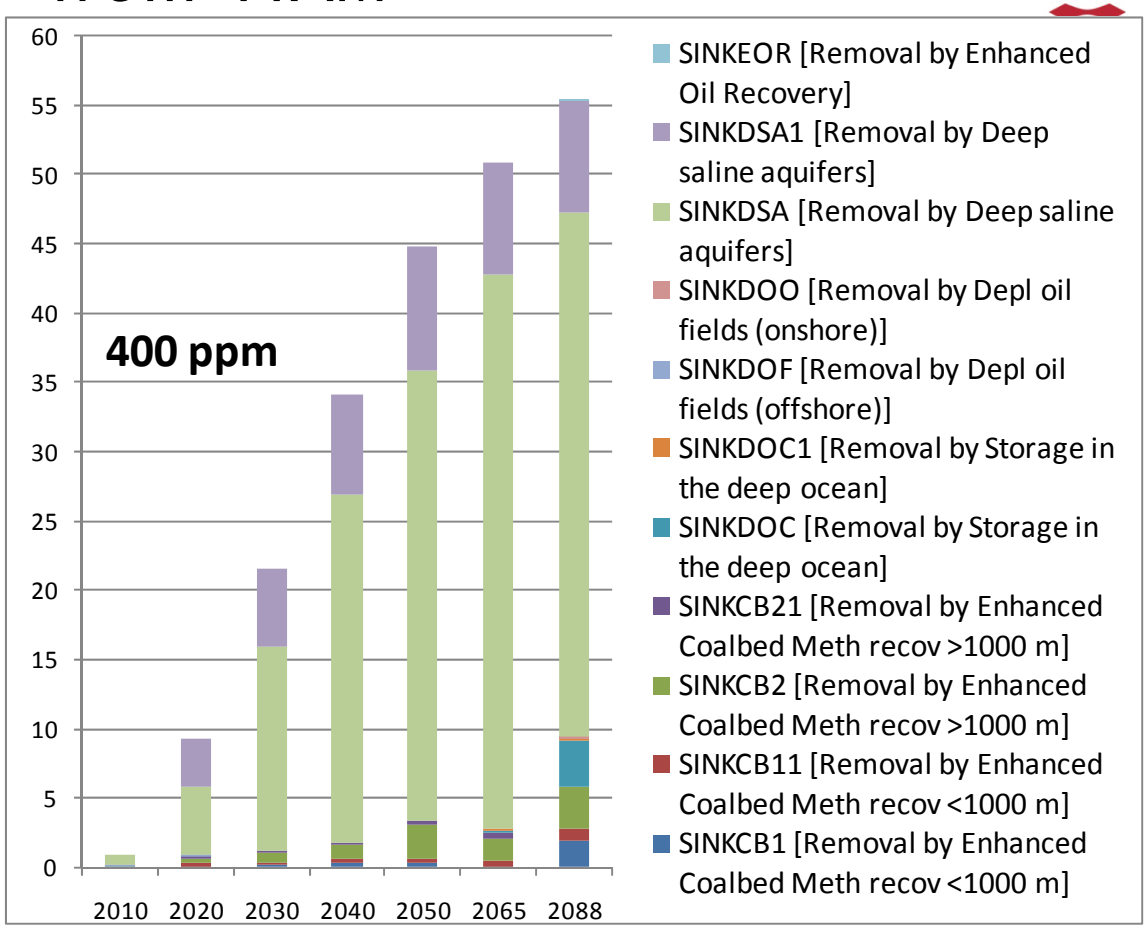
- from TIAM (ETSAPs TIMES Integrated Assessment Model)

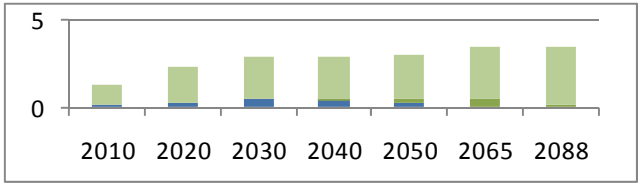


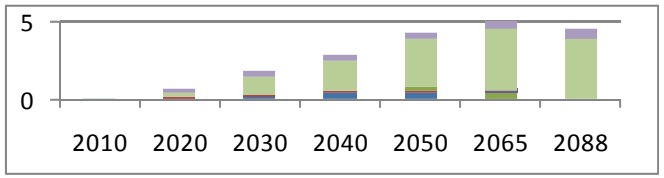
CO_2 storage, Gt – *from TIAM*

Global









Regions
EEU + WEU

Storage Utsira: Draft conclusions for Denmark

- Little public interest and no official standpoint on the use of CCS in Denmark
- Industry and GEUS are very active in international research on CO_2 capture and storage
- The structure of thermal power plants reflects the structure of large-scale and small-scale district heating systems
- The infrastructure for biomass supply of power plants is being established
- The current and future structure of thermal power plant is an opportunity for more efficient use of CCS
- The need for large-scale base-load capacity is constrained by the large amount of wind power
- The onshore and near-shore capacity for carbon storage is abundant
- The Utsira formation is unlikely to be important for Denmark