Technical University of Denmark

National model presentation - Denmark

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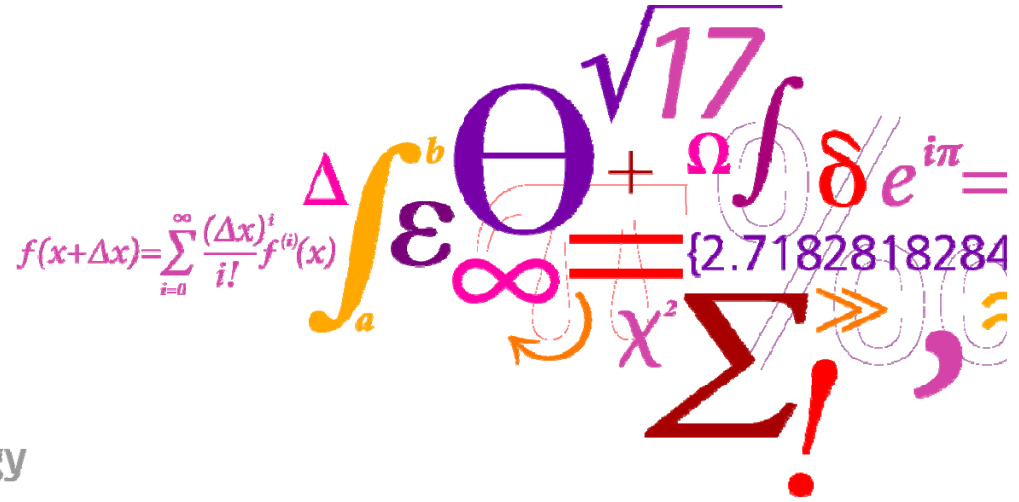


Risø DTU
National Laboratory for Sustainable Energy

Overview

- Tasks for WP3 – from Kick-Off meeting
- Pan European and national models
- RES-2020 results for Denmark
- Status for the Danish model
- CCS model issues for Denmark

WP 3. National modelling of CCS Pathways

– Kick-Off meeting

- The development of CCS pathways in the North Sea region is the results of combining information on CO2 reduction targets, mitigation technologies, costs, CO2 capture potentials and the capacity and availability of geological reservoirs in each of the countries as well as the storage capacity of the Utsira Formation and the development of the infrastructure for CO2 transport.
- Standardised data for modelling of the CCS pathways for each of the countries will be developed with WP2. This WP3 aims to implement these standardized data and parameter into a harmonised model based on the modelling tools developed within the IEA Implementation Agreement ETSAP.

Tasks

- 3.1. Running existing model:
- 3.2. Test of integer features.
- 3.3. User interface for data input and reporting of national models.
- 3.4. National reporting

Task 3.1 Running existing model
– Kick-Off meeting

- 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

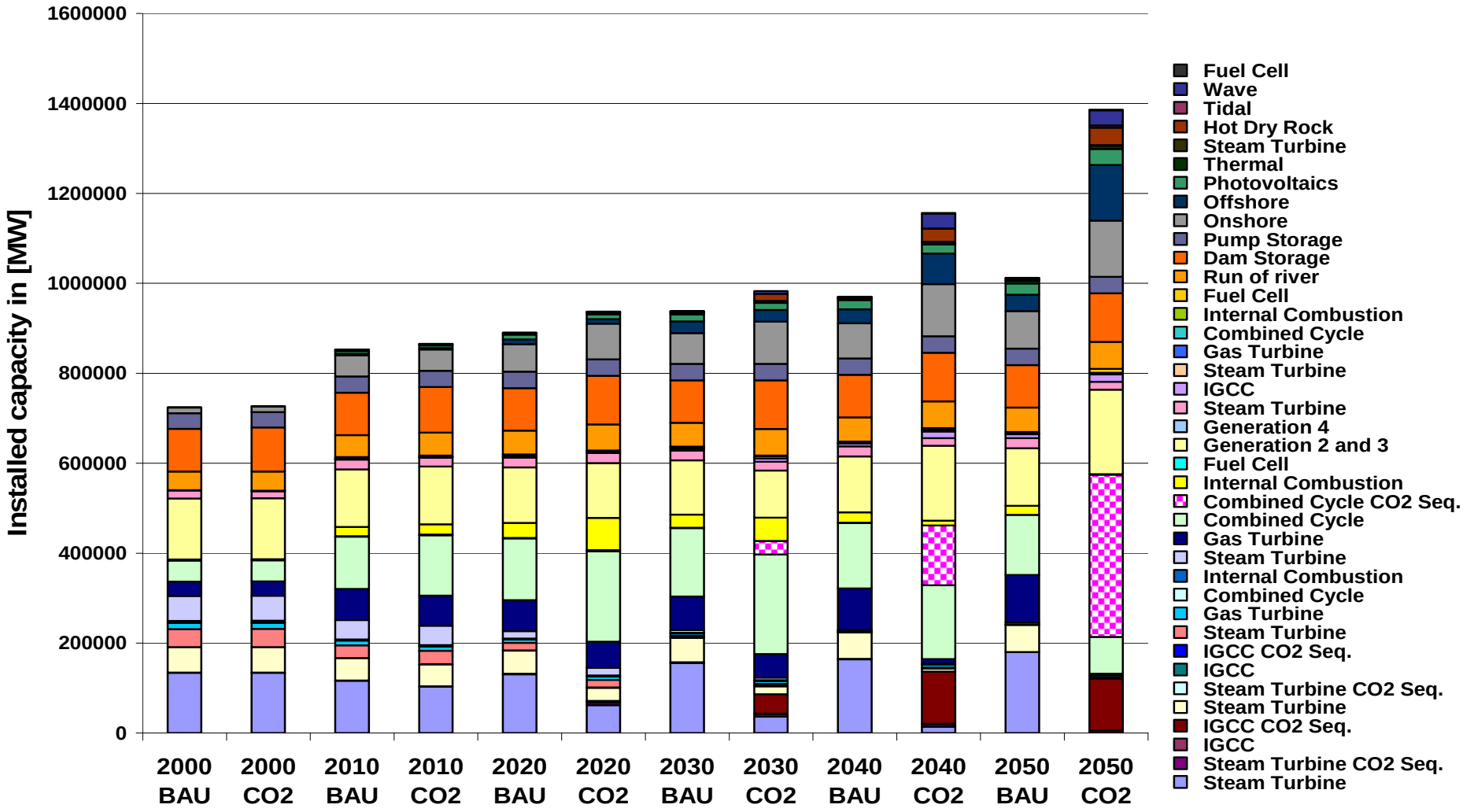
Reference from application:

- 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.

Stepwise development of national and Pan-European models

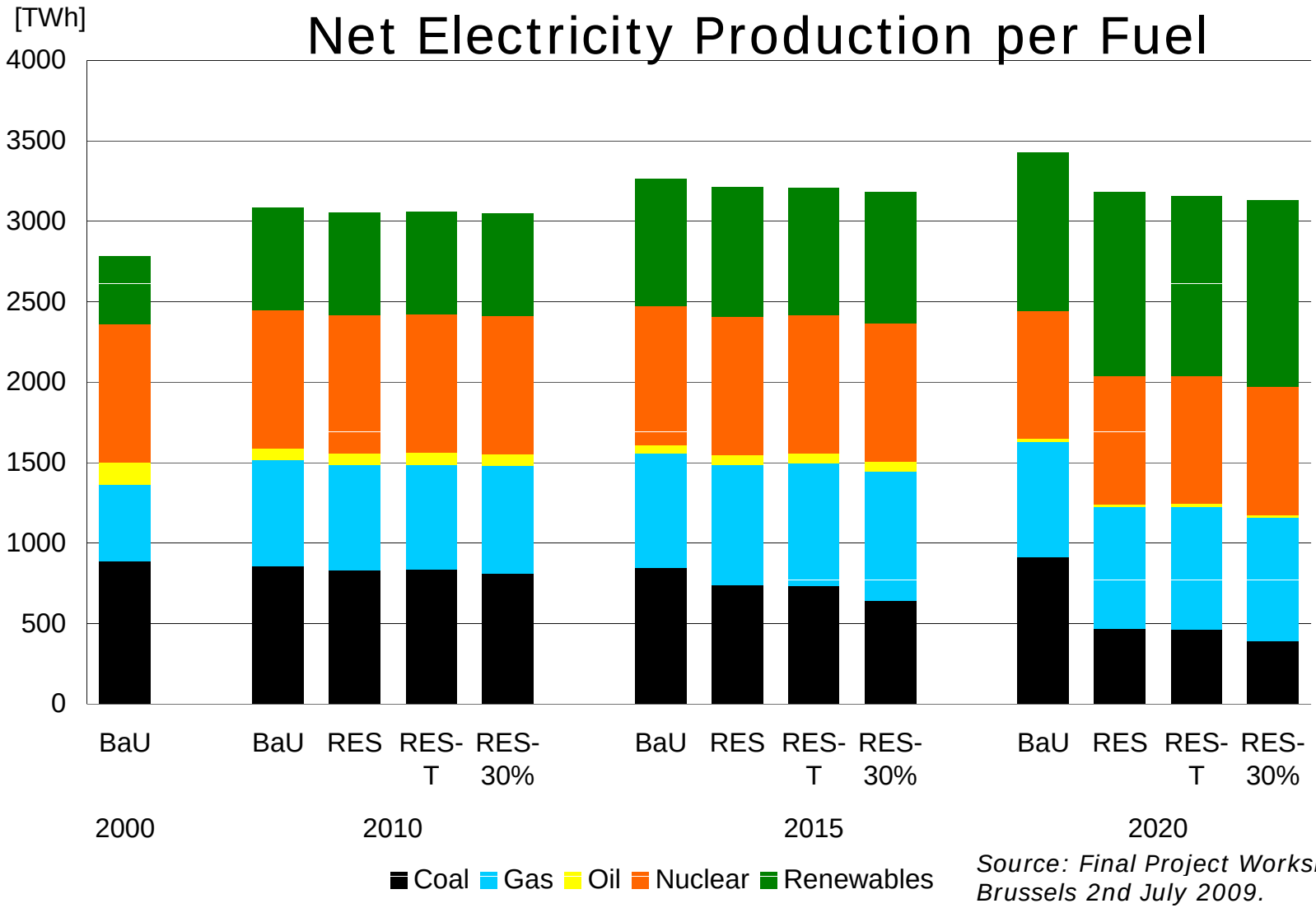
- Common Base-Year templates with Eurostat 2000 data
- Common data for new technologies
- Demand forecasts by GEM-E3, POLES, etc.
- NEEDS national models submitted to Pan-European model (End 2006)
- First run of Pan-European model (March 2007)
- Harmonisation and modification of national models (until July 2007)
- Scenario results of Pan-European model for EU 27 (October 2007)
- Results of RES2020 Scenario Analyses for EU27 (May 2009)
- Parallel development of national models – national studies (ongoing).
- Regional studies (e.g. Storage Utsira) – 2009
- Need for harmonisation and exchange of experience

NEEDS-TIMES – Results of Pan European Model



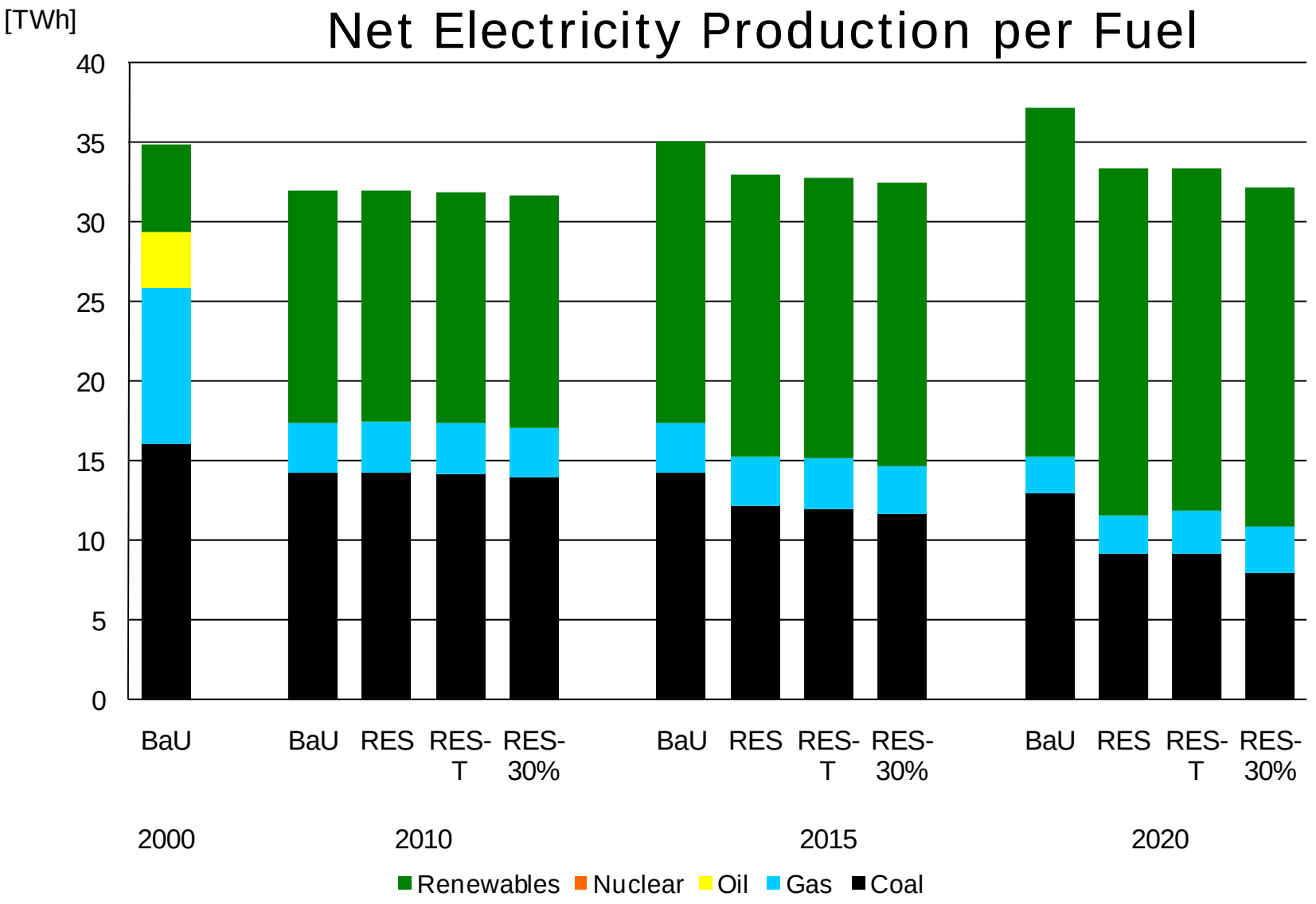
Source: Markus Blesl, IER Stuttgart. NEEDS Project. Results Oct. 2007, CEEH Workshop Risø DTU Feb. 2008

RES2020: PanEuropean TIMES – EU27

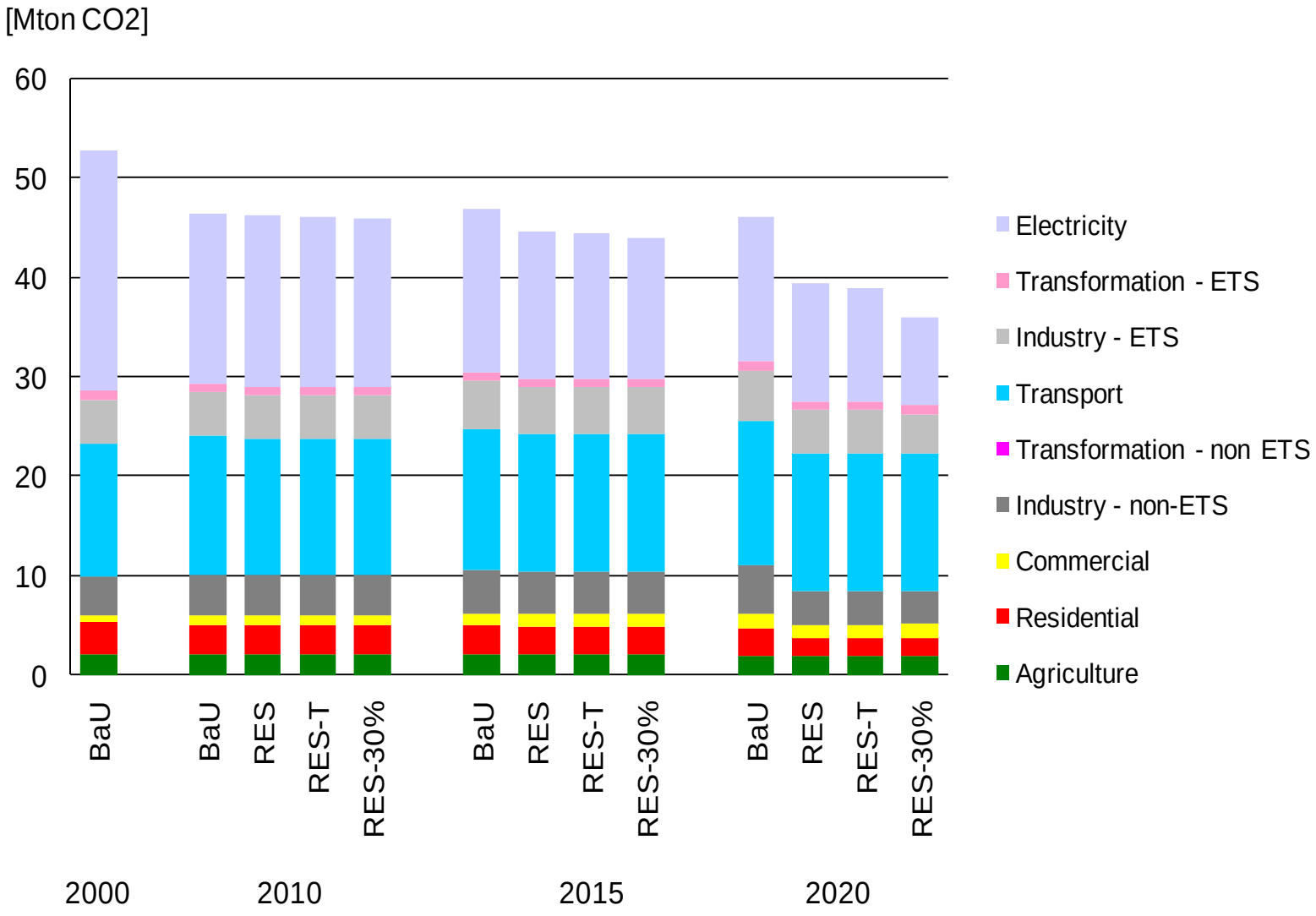


Source: Final Project Workshop. Brussels 2nd July 2009. George Giannakidis

RES2020: PanEuropean TIMES – Denmark



CO2 emissions from each sector



Status for the Danish model

- 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

CCS model issues for Denmark

- Data from forecasts to 2050 from national models (e.g. DTU Climate Centre)
- Model constrains for CHP/DH infrastructure
- Calibration and test of model with comparison to other studies
- Parameters for CHP plants with carbon capture
- Simplified geographical representation of power plants, CO2 pipes and national CO2 storage options
- Connection to CO2 storage in the North Sea
- Harmonisation to other national models within the StorageUtsira project