

# Energy Modelling Lab's activities in the ETSAP community

Summer 2022 – Winter 2023

## Introduction

As an active member of the ETSAP community, we have expanded both the TIMES framework and network over the last six months.

On the modelling side, we have:

- Created more detailed features for the Danish TIMES models, regarding district heating and biogas.
- Connected several country models to analyse demand and supply balances for hydrogen and other synthetic fuels in Northern Europe
- Combined our experience in the development of a new clean structure for TIMES-models for countries.

Moreover, we have released a couple of scenarios from the Danish model on to our [result page](#). Now everyone can explore the consequences of a reduced animal production, an increased forest area, and how those measures affect the path to the Danish climate goals.

During the past half year, we have had the pleasure of training a talented student employee in model building. Lastly the ETSAP workshop in New York in December 2022 has been a big inspiration, but more about that later in the newsletter.

## Projects

We have been working on a series of exciting projects.

### Biogas module 2022

Detailed representation of biogas in Denmark

Biogas plays an increasing role in the Danish Energy System. Therefore, we have built a more detailed representation of both the 89 existing biogas plants, and investment options of future biogas technologies in the Danish IntERACT model.

*Model: IntERACT (Danish model)*

*Client: The Danish Energy Agency*



District Heating in Denmark 2022	<p>Detailed modelling of district heating in Denmark</p> <p>The Danish district heating system is undergoing a transformation away from fuel-based electricity and heat plants, and towards heat pumps and utilisation of surplus heat. To conduct this analysis, the TIMES-DK model has been updated with a high-resolution district heating system and ancillary services.</p> <p><i>Model: TIMES-DK</i> <i>Client: Dansk Fjernvarme</i></p>
Northern Europe 2022	<p>Combining TIMES-models to analyse trade</p> <p>To analyse the demand and supply of green hydrogen and other synthetic fuels, we have developed a new model of Northern Europe. The model is a combined TIMES-model that includes Denmark, Sweden, Norway, Germany, and Poland. The model also includes external trade-links to UK, Belgium, and the Netherlands.</p> <p><i>Model: TIMES-NEU</i></p>
Jordan 2023	<p>First steps towards a TIMES model for Jordan</p> <p>As part of a project to develop a low carbon and climate resilient strategy for Jordan, we are developing a new TIMES-Jordan model. The model will be used in the green strategy development and will also be handed over to the government of Jordan for future use.</p> <p><i>Model: TIMES-Jordan</i> <i>Client &amp; partners: World Bank, Government of Jordan, and The Danish Energy Agency</i></p>
Default model 2023	<p>A generalized structure for future TIMES-models</p> <p>During the past years, we have gathered experience on best practices and dead ends when it comes to model development. We are putting these hard-earned experiences into use in designing a clean model structure that we can use to build new country-models in the future.</p> <p><i>Model: TIMES-Default</i> <i>Internal Project</i></p>



## Deep dive into two development projects

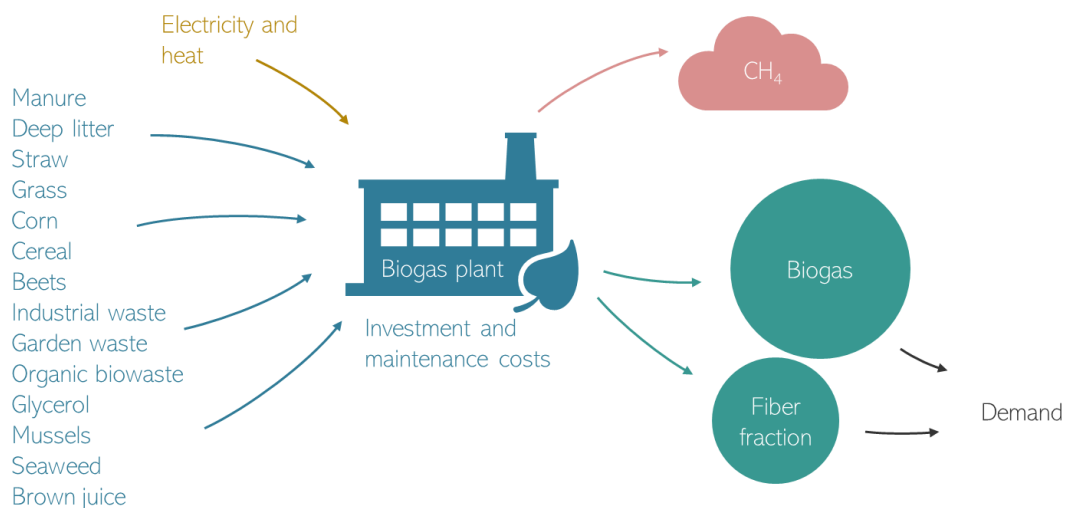
### The new biogas module

As natural gas is phased out, biogas will play an increasing role in the Danish energy system. It is therefore necessary to include a detailed representation of biogas in the Danish Energy Agency's energy system model IntERACT.

The forecasted biogas production used to be an exogenous input to the model, but with the new biogas module the production can be part of the energy system optimization alongside other energy sources.

The new module contains all 89 existing biogas plants in Denmark, and it allows the model to invest in three new types of biogas plants. The plants can take a range of different biomass commodities as input, both manure and deep litter from animal farming, but also grass, cereal and other field crops and mussels and seaweed from potential aquafarms.

The modelled biogas plants include a methane leakage and outputs both raw biogas and a fibre fraction, that potentially can be used in pyrolysis or other processes.



### The default model

During the past couple of years, we have realized how much value there is to be gained from a streamlined model structure.

Inconsistent naming conventions, different model structures between sectors, and hand-hold data-input from a myriad of different local sources. These are some of the issues we want to tackle in our new default TIMES-model.

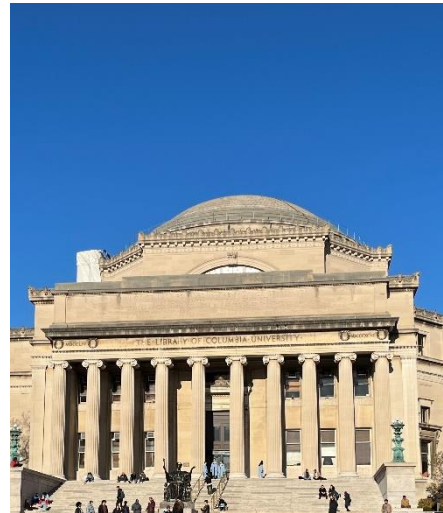
With a new streamlined model structure, we want to enable automated data input directly from international databases, thereby being able to create rough country-models fast. It is also our hope that scenario-analysis in the new models will be easier, due to the simpler structure, allowing more people to work with TIMES-models in the future.



## Community building

Over the past half year, Energy Modelling Lab has been building community, both locally and internationally.

- Student worker with a flair for modelling  
During 2022 we have had the pleasure of training a talented student employee. He has been working on the models of Germany and Poland, and we hope to see him in the model community again in the future.
- PhD student modelling Gothenburg in Sweden  
Kenneth Karlsson from Energy Modelling Lab has been co-supervising a PhD student from Chalmers University. The focus of the project is on modelling urban areas with TIMES. The idea is to develop a tool that municipalities can use for planning which climate mitigation options to invest into fulfilling local targets.
- ETSAP workshop in New York  
(December 2022)  
*Ida Græsted Jensen participated*  
As always it was inspiring to participate in the ETSAP semi-annual meetup. Some highlights are:
  - A presentation of the new biogas module
  - Pitching a project to enable faster and more detailed model-runs.
  - Getting inspired to utilize the UN database, which is now the foundation of our new default models.



## Contact

All projects above and many more can be found on [www.energymodellinglab.com](http://www.energymodellinglab.com). Feel free to contact us if you have any question or would like to start up a collaboration.

Kenneth Karlsson

*Director & partner in Energy Modelling Lab*

[Kenneth.karlsson@energymodellinglab.com](mailto:Kenneth.karlsson@energymodellinglab.com)

+45 21 32 87 33

Refshalevej 163 A

DK-1432 Copenhagen K

Denmark

