

# Final report

## 1. Project details

<b>Project title</b>	IEA TCP ETSAP Annex XV
<b>File no.</b>	64019-0610
<b>Name of the funding scheme</b>	EUDP
<b>Project managing company / institution</b>	Energy Modelling Lab ApS
<b>CVR number</b> (central business register)	DK 40941622
<b>Project partners</b>	
<b>Submission date</b>	06 March 2023

## 2. Summary

*Describe the objectives of the project, the obtained results and how they will be utilised in the future.*

*The short description should be in two versions:*

- *English version*

The project will continue the Danish participation in IEA-ETSAP (Energy Technology Systems Analysis Program, [www.iea-etsap.org](http://www.iea-etsap.org)), Annexes X to XIV under the new Annex XV. The main activity will be participation in semi-annual workshops, which will focus on presentations of model analyzes and the use of ETSAP's model tools, i.e., MARKAL / TIMES model family, participation in training activities regarding ETSAP's tools, and participation in collaborative projects regarding application of improvement of ETSAP's tools. The contributions to these workshops will be based on past, present and future collaborative projects, especially within the EU, Nordic, and Danish research programs - with the involvement of PhD students from Danish universities. Results from ETSAP's activities will be disseminated through participation in workshops within the Danish model environment, at meetings prior to ETSAP's semi-annual workshops and newsletters

- *Danish version*

Projektet vil fortsætte den danske deltagelse i IEA-ETSAP. Hovedaktiviteten vil være deltagelse i halvårige workshops, som vil fokusere på præsentationer af modelanalyser og brug af ETSAPs modelværktøjer, dvs. MARKAL/TIMES modelfamilie, deltagelse i træningsaktiviteter vedr. ETSAPs værktøjer, og deltagelse i samarbejdsprojekter vedr. anvendelse af forbedring af ETSAPs værktøjer. Bidragene til disse workshops vil være baseret på tidligere, nuværende og fremtidige samarbejdsprojekter, især inden for EU, nordiske og danske forskningsprogrammer - med inddragelse af ph.d.-studerende fra danske universiteter. Resultater fra ETSAPs

aktiviteter vil blive formidlet gennem deltagelse i workshops indenfor det danske modelmiljø, på møder forud for ETSAPs halvårlige workshops og nyhedsbreve.

*Each version should be brief, no more than 2000 characters (including spaces).*

### 3. Project objectives

- *What was the objective of the project?*
  - *To ensure Danish modellers keep up to speed with the modellers internationally*
  - *Improve TIMES modelling applications*
  - *Being a part of an important global network*
- *Which technology area was in focus?*
  - *All energy consuming technologies in all sectors in a systems perspective*
  - *Special focus has been on modelling PtX technologies and fuel use*

### 4. Project implementation

- *How did the project evolve?*  
*Well. Gave basis for EML to follow the international modelling community and communicate back to Danish stakeholders*
- *Did the project develop as foreseen and according to milestones agreed upon?*  
*Yes*
- *Did the project experience problems not expected?*  
*Corona restrictions caused the normally physical meetings became web based. As a result of this there are now a mix of web-based and physical meetings.*

### 5. Project results

- *Was the original objective of the project obtained? If not, explain which obstacles that caused it and which changes that were made to project plan to mitigate the obstacles.*  
*The objectives of the project have been met.*
- *Describe the obtained technological results. Did the project produce results not expected?*  
*No specific technologies have been the focus of this project. It has focussed on international and national network building.*
- *Target group and added value for stakeholders? Describe for each solution/technology if several.*  
*The target groups of this project are Danish energy system modelling teams at universities, companies, and authorities.*
- *Where and how have the project results been disseminated? Specify for Danish stakeholders.*  
*The project results have been disseminated through meetings, news-letters, journal papers and workshops.*

- *Specify which conferences, journals, workshops, websites etc. where the project has been disseminated.*

In the appendix (point 8) are links to the different types of disseminations from the project

## 6. Utilisation of project results

- *Describe how the obtained technological results will be utilised in the future and by whom.  
As the outcome of the project is improved energy system modelling capacity among Danish modellers, this can be utilised both in the Danish Energy Agency, at the universities and in consultancy companies.*
- *How does the project results contribute to realise energy policy objectives?  
As the project improves the tools used for energy planning, this is directly linked to analysis of policies within the energy sector.*
- *If Ph.D.'s have been part of the project, it must be described how the results from the project are used in teaching and other dissemination activities.  
No PhD's*

## 7. Project conclusion and perspective

- *State the conclusions made in the project.*

*EML has within this project developed/improved modelling of auxiliary services in the power system, storage, time granularity, PtX solutions, agriculture, and the visualisation of modelling results.*

*EML has been coordinator of a large Nordic TIMES model and several smaller models for countries and cities.*

- *What are the next steps for the researched technology area?*

*In the next phases, automatization of data harvest and model structure creation is some of the new development areas. But we are also planning to make "How to guides" for utilising existing options in the TIMES modelling framework.*

*We will still have a focus on stakeholder involvement and visualisation when creating scenarios for the future.*

- *Put into perspective how the project results may influence future development.*

The EUDP funding creates the room for more collaboration with other modelling teams and for development of special model features. This possibility to active in this global ETSAP network is an important measure to keep the Danish energy modelling environment up to speed internationally.

- *For ExCo delegates: list meeting attendance for meetings during the project period*

Originally the ExCo meeting sequence was physical meetings twice a year, but during and after corona it has been possible to attend through web link, which also have made it possible to have shorter ExCo meetings with less things on the agenda but more often.

ExCo meetings and workshops in the project period:

#### Workshops

Place	Participants
Online June 2020	Mikkel Bosack Simonsen
Online December 2020	-
Online June 2020	Mikkel Bosack Simonsen
Oslo November 2021	Kenneth Karlsson, Till Benbrahim
Fraunhofer May 2022	-
New York December 2022	Ida Græsted Jensen

#### ExCo meetings

Place	Participants
No. 79 - Online 24 June 2020	Kenneth Karlsson
No. 80 - Online 14 September 2020	Kenneth Karlsson
No. 81 – Online 25 March 2021	Kenneth Karlsson
No. 82 – Online 18 June 2021	Kenneth Karlsson
No. 83 – Online 28 September 2021	Kenneth Karlsson
No. 84 – Oslo 29 November 2021	Kenneth Karlsson
No. 85 – Online 23 February 2022	Kenneth Karlsson
No 86 - Fraunhofer 23 May 2022	Kenneth Karlsson (online)
No 87 – Online 12 September 2022	Kenneth Karlsson
No. 88 – New York	Ida Græsted Jensen

## 8. Appendices

- *Add link to Annual reports that are published in the project period.*

Årsrapportskema IEA\_2020 - 2021:

[https://energymodellinglab.com/wp-content/uploads/2023/02/Arssrapportskema-IEA\\_2020-2021.pdf](https://energymodellinglab.com/wp-content/uploads/2023/02/Arssrapportskema-IEA_2020-2021.pdf)

Årsrapportskema IEA\_2021\_2022:

[https://energymodellinglab.com/wp-content/uploads/2023/02/Arssrapportskema-IEA\\_2021\\_2022.pdf](https://energymodellinglab.com/wp-content/uploads/2023/02/Arssrapportskema-IEA_2021_2022.pdf)

- *Add link to other relevant documents, publications, home pages etc.*

#### **Newsletters:**

[https://energymodellinglab.com/wp-content/uploads/2021/03/iea-etsap\\_newsletter2021\\_emi-1.pdf](https://energymodellinglab.com/wp-content/uploads/2021/03/iea-etsap_newsletter2021_emi-1.pdf)

<https://energymodellinglab.com/etsap-newsletter-2022-an-active-member-of-the-modelling-community/>

<https://energymodellinglab.com/newsletter-winter-2023-an-inpiring-visit-to-ny/>

**Nordic Clean Energy Scenarios:**

<https://www.nordicenergy.org/project/nordic-clean-energy-scenarios-solutions-for-carbon-neutrality/>

Result visualisation: <https://cleanenergyscenarios.nordicenergy.org/>

**Publications:**

Energy system and cost impacts of heat supply to low-energy buildings in Sweden

<https://doi.org/10.1016/j.energy.2023.126743>

Carrying out a multi-model integrated assessment of European energy transition pathways: Challenges and benefits

<https://doi.org/10.1016/j.energy.2022.124329>

The role of data centres in the future Danish energy system

<https://doi.org/10.1016/j.energy.2020.116928>

“Optimal placement of P2X facility in conjunction with Bornholm energy island: Preliminary overview for an immediate decarbonisation of maritime transport”

<https://findit.dtu.dk/en/catalog/5fb4fec5d9001d013f2016da>