



Environmental Effects of Trucks

—

Towards Climate Neutrality and Circularity

Online Expert Workshop

Programm

October 13 – 14, 2022

1:30 pm – 6:00 pm (CEST)

The workshop is in cooperation with the IEA AMF Task 64 “*E-Fuels and End-use Perspective*”.



Organised and moderated by:



Introduction

Electric vehicles have the potential to substitute for conventional vehicles to contribute to the sustainable development of the transportation sector worldwide, for example, in the reduction of greenhouse gas (GHG) and particulate emissions. There is international consensus that the improvement of the sustainability of electric vehicles can only be analysed on the basis of life cycle assessment (LCA), which includes the production, operation, and the end-of-life treatment of the vehicles and the fuel cycle. All environmental impacts must include the whole value chain, and - if relevant - interactions from recycling in the dismantling phase to the production phase, if recycled materials are used to produce new vehicles or other products.

Since 2011 the Technology Collaboration Program (TCP) on “Hybrid and Electric Vehicle (HEV)” of the International Energy Agency (IEA) is operating Tasks on Life Cycle Assessment, where the main focus was on passenger vehicles.

Now in Task 46 “**LCA of Electric Trucks, Buses, Two-wheelers and Other Vehicles**” all vehicles except passenger vehicles are in the focus of our work from 2022 to 2024.

The main activities influencing the environmental impacts of electric vehicles on a life cycle basis are:

- 1) Production and life time of the battery,
- 2) Electricity consumption of the vehicle in the operation phase, incl. e.g. energy demand for heating,
- 3) Source of the electricity, only additional renewable electricity maximizes the environmental benefits and
- 4) End of life treatment of the vehicle and its battery (e.g. reuse, material recycling).

The IEA HEV TCP Task 46 (2022 – 2024) focuses on environmental effects based on Life Cycle Assessment (LCA) of electricity based propulsion systems – battery electric, hydrogen fuel cell and e-fuels - in comparison to fossil fuels. In addition to the identification of the most relevant methodological issues, necessary inventory data and impact categories, new approaches for assessing “climate/CO₂-neutrality” and “circularity” in a LCA perspective are discussed and developed.

Currently 9 countries are participating in Task 46 “*LCA of Electric Trucks, Buses, Two-wheelers and Other Vehicles*” – AT, CA, CH, DE, ES, NO, SE, UK, US – represented by LCA expert and institutions.

The Task 46 is executed in a close cooperation with Task 64 “*E-fuels and End-use Perspective*” of the TCP on Alternative Motor Fuels (AMF), in which currently 8 countries are participating - BZ, CH, CN, DK, FI; DE, JP, US.

Aim of the workshop

The online expert workshop on

“Environmental Effects of Trucks – Towards Climate Neutrality and Circularity”

will take place on **October 13 – 14, 2022.**

The aim of the expert workshop is to analyse, assess and discuss the environmental effects of trucks with different propulsion systems based on LCA. The main topics of the workshop are

- Trucks and LCA
- Methodological aspects
- Group work with contributions from all participants
 - Identification of Key Issues on LCA of Trucks
 - Climate Neutrality and LCA
 - Circularity and LCA
 - E-Fuels and LCA

The format of the workshop is based on presentations, discussions and interactive group work.

The workshop is online and virtually hosted by IREC, Spain, October 13&14, 2021. The link is sent to the registered participant a few days before the workshop.

For further information and registration please contact the Task manager Gerfried Jungmeier from JOANNEUM RESEARCH in Austria (gerfried.jungmeier@joanneum.at).

The participation is free of charge.

The management of the task and the Austrian participation are financed by the Austrian Climate and Energy Fund and the FFG.



PROGRAMM

October 13, 2021

1.30 pm – 6:00 pm (CEST)

The workshop is moderated by Gerfried Jungmeier (JOANNEUM RESEARCH, AT)

1:30 – 1:45 Welcome and **Introduction** - Aims of the Workshop (*Gerfried Jungmeier, JOANNEUM RESEARCH, AT*)

Trucks and LCA

1:45 – 2:10: **Keynote: Perspectives of Electric Trucks** (N.N.) tbd

2:10 – 2:30: **The Environmental Performance of Current and Future Lorries – Drivetrain and Fuel Options** (*Romain Sacchi, PSI, CH*)

2:30 – 2:50: **An Updated Comparative LCA of European Heavy Duty Vehicles** (*Nikolas Hill, Ricardo, UK*)

2:50 – 3:15 Discussion (incl. break)

3:15 – 3:35: **LCA and LCC of Fuel Cell and Battery Electric Trucks** (N.N., *DLR, DE*)

3:35 – 3:55: **Comparative Life-cycle Analysis of Medium- and Heavy- Duty Trucks** (*Jarod Kelly, Argonne, US*)

3:55 – 4:15: **E-fuel Production Pathways** (*Zoe Stadler, OST, CH*)

4:15 – 4:30 Discussion (incl. break)

Group work

4:30 – 5:30: Group work in two groups

Group 1: **Identification of Key Issues on LCA of Trucks** (*Simone Ehrenberger, DLR, DE*)

- What are the main conclusions?
- What are most relevant influences on results?
- What are open and/or controversial issues?

Group 2: **E-Fuels and LCA** (*Farid Bensebaa, National Research Council Canada, CA*)

- Key aspects of LCA and e-fuels?
- Handling of CO₂ from fossil fuel combustion, steel and concrete production?
- What are methodological issues in LCA of e-fuels?

5:30 – 5:55: **Presentation and discussion of group work** (*S. Ehrenberger, F. Bensebaa*)

5:55 – 6:00: **Conclusions** (*Gerfried Jungmeier, JOANNEUM RESEARCH, AT*)

PROGRAMM

October 14, 2021

1:30 pm – 6:00 pm (CEST)

The workshop is moderated by Gerfried Jungmeier (JOANNEUM RESEARCH, AT)

1:30 – 1:45 Welcome and **Introduction** *Gerfried Jungmeier, JOANNEUM RESEARCH, AT)*

Methodological aspects

1:45 – 2:05: **Aspects of Circularity in LCA – Case of Reusing and Recycling of Batteries** *(Gabriela Benveniste Pérez, IREC, ES)*

2:05 – 2:25: **Scenarios for a Climate Neutral Truck-Fleet in Austria 2040** *(Gerfried Jungmeier, JOANNEUM RESEARCH, AT)*

2:25 – 2:45: **Life Cycle Assessment of Direct Air Carbon Capture and Storage** *(Tom Terlouw, PSI, CH)*

2:45 – 3:05: **E-Fuel LCA Methodology** *(Michael Wang, ARGONNE, US)*

3:05 – 3:30 Discussion (incl. break)

Group work

3:30 – 5:00: Group work in two groups

Group 3: **Climate Neutrality and LCA** *(Jarod Kelly, Argonne, US)*

- What is climate neutrality?
- What is the possible role of LCA to assess climate neutrality?
- Are there case studies/example for LCA&climate neutrality?
- Necessary LCA methodology development for climate neutrality assessment?

Group 4: **Circularity and LCA** *(Gabriela Benveniste Pérez, IREC, ES)*

- What is circularity?
- What is the possible role of LCA to assess circularity?
- Are there case studies/example for LCA&circularity?
- Necessary LCA methodology development for circularity assessment?
- Are there key (raw) materials with high relevance on circularity aspects?

5:00 – 5:30: **Presentation and discussion of group work** (J. Kelly, G. Benveniste Pérez)

5:30 – 6:00: **Conclusions and outlook** (Gerfried Jungmeier, JOANNEUM RESEARCH

REGISTRATION

For registration please send an e-mail latest by October 8, 2022 to

gerfried.jungmeier@joanneum.at

There is no registration fee for this online Workshop. Further information and the access link will be sent after your registration close before the workshop.

For questions, please contact

Gerfried Jungmeier

Manager of IEA HEV Task 46 „LCA of Electric Trucks, Buses, Two-wheelers and Other Vehicles”

JOANNEUM RESEARCH Forschungsgesellschaft mbH

LIFE – Institute for Climate, Energy and Society

Wagner-Biro-Strasse 100, A-8020 Graz, Austria; +43 664 602 876 7630,
gerfried.jungmeier@joanneum.at

Task 46 “LCA of Electric Trucks, Buses, Two-wheelers and Other Vehicles”

Members: Austria, Canada, Germany, Norway, Spain, Sweden, Switzerland, UK, USA

1 Introduction

Electric vehicles (EVs) have the potential to substitute conventional vehicles to contribute to the sustainable development of the transportation sector worldwide, for example, in the reduction of greenhouse gas (GHG) emissions, fossil energy consumption and particle emissions. There is international consensus that the improvement of the sustainability of EVs can only be analyzed based on life cycle assessment (LCA), which includes the production, the operation, and the end of life (EoL) management of the vehicles and the fuel cycle.

In recent Tasks 19 and 30 there was a strong focus on LCA of passenger vehicles and its comparison to gasoline and diesel vehicles. However, due to the strong development and market introduction of other battery electric vehicles this new task will focus on LCA of other battery electric vehicles (BEV) than passenger cars and will also compare the environmental effects it to other fuels made from electricity like hydrogen and e-fuels. These are hydrogen fuel cell vehicles (H₂-FCV) and internal combustion engines using e-fuels (e-fuel ICE).

2 Objectives

The new IEA HEV TCP Task 46 (2022 – 2024) “LCA of electric Trucks, Buses, 2-Wheelers and other Vehicles” started in January 2022.

The main objectives are (Figure 1)

- Stakeholder involvement in three expert workshops
- Technology and system description with vehicle and infrastructure data, relevant issues and LCA data on buses, trucks, 2-wheelers and other vehicles with different fuel/propulsion systems
- Case studies on LCA of
 - Buses (urban and rural)
 - Trucks (from delivery truck to huge trucks incl. overhead line)
 - Two-wheelers
 - Other vehicles e.g. mining trucks (e.g. in ore mining Erzberg/Austria)
- LCA comparison to renewable hydrogen, e-fuel systems and conventional fuels (Figure 2)
- Assessing “climate/CO₂-neutrality” and “circularity” in a LCA perspective and methodology

- Dissemination and publications, e.g. presentations/contribution at conferences, Contributions to Annual Report and newsletter
- Identify R&D demand

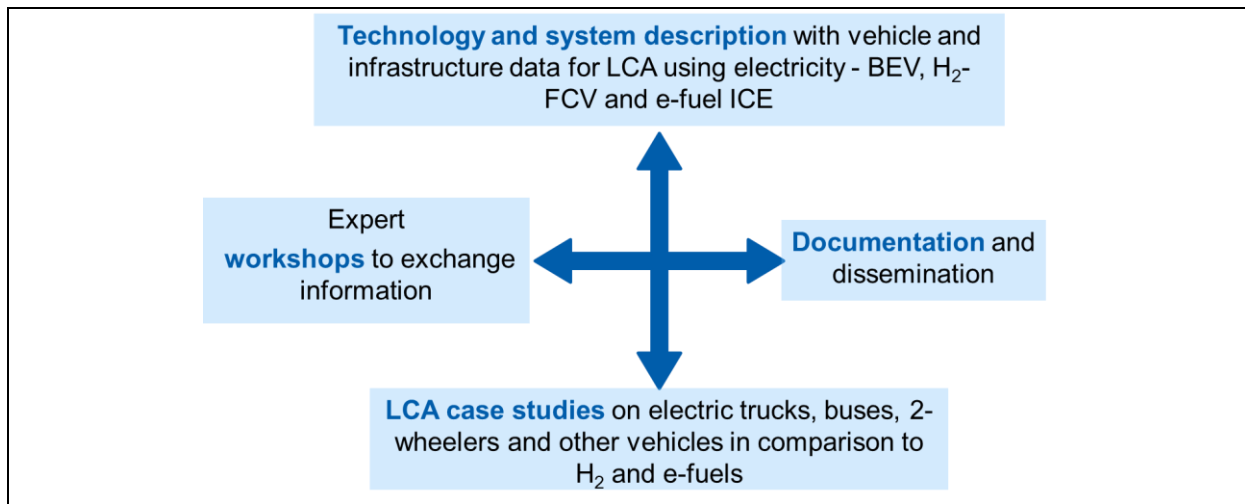


Figure 1: Main objectives of Task 46

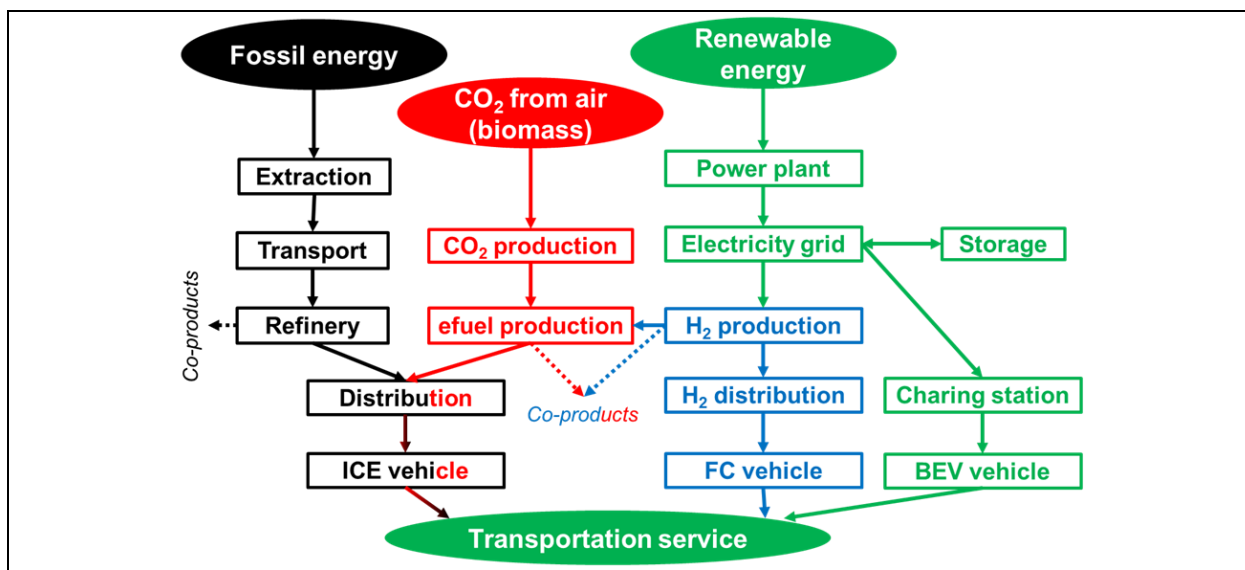


Figure 2: LCA comparison to renewable hydrogen, e-fuel systems and conventional fuels

3 Working Method

Within Task 46, methodologies are developed to help countries to implement EVs by identifying possibilities to maximize the environmental benefits. Besides, various case studies are analyzed and networking combined with information exchange is supported within the Task’s frames.

The Task proceeds by organizing a series of expert workshops covering the objectives described above with a focus on

- LCA of e-Trucks
- LCA of e-Buses
- LCA of e-2-Wheelers and other e-Vehicles

4 Contact Details of the Task manager

For further information, please contact the Task 46 Task Manager:

Dr. Gerfried Jungmeier
JOANNEUM RESEARCH Forschungsgesellschaft mbH
LIFE – Institute for Climate, Energy and Society
Waagner Biro Strasse 100
A-8020 Graz, Austria
gerfried.jungmeier@joanneum.at
+43 316 876 7630

Dr. Simone Ehrenberger
DLR/Germany
simone.ehrenberger@dlr.de

Acknowledgement

The Austrian participation (2022 – 2024) and the management of the task are financed by the Austrian Climate and Energy Fund and the FFG.

<https://ieahev.org/tasks/46/>



ADVANCED MOTOR FUELS

Technology Collaboration Programme on
Advanced Motor Fuels

AMF Task 64 “E-fuels and end-use perspectives”

Partner countries: Brazil, China, Denmark, Finland, Germany, Japan (AIST), Switzerland, USA

Purpose and Objectives

The focus within the e-fuels task is an informative exchange on the production and application of different e-fuels as well as the corresponding regulatory framework and standards. The output of the task is a concise report answering the following questions:

Demo sites / Pilot programmes:

- Which demo sites focusing on the development and improvement of e-fuel production technologies exist in the participating countries? Which production pathways are investigated? Which case studies are developed and evaluated?
- What were the chosen technology routes and what is their state of development?
- Which technical challenges were faced in the demonstration plants?

Resources: CO₂ and H₂:

- Which resources of CO₂ are promising in key countries?
- What renewable power for hydrogen production is considered promising for the production of e-fuels in the different countries?

Application side:

- Which experiences were made in the application of e-fuels with special regard to the use of e-fuels in the aviation and maritime sector as well as in road transportation?
- Which e-fuels are regarded promising in which sectors (technically as well as cost wise)? Which of these should be prioritised?
- Which challenges in the use of e-fuels arise?

Regulations and standards:

- Which norms, standards and/or regulations for the application of e-fuels exist in the different countries?
- What experiences have been made in dealing with regulations and policies at demo sites?
- Are there regulations concerning decarbonisation which could foster the implementation of e-fuels on the market? What incentives will be available in different countries to promote e-fuel production and utilization?

Techno-economic evaluations (TEE) and Life-cycle assessments (LCA) / Well-to-wheel (WTW):

- What are the costs of the different e-fuel production in the different countries?
- What costs arise on the application side when switching to e-fuels?
- What kind of methodologies for TEE, LCA and WTW are used in the different countries/regions (e.g. REDII in EU)?
- What are the net GHG effects of e-fuel production and utilization?
- What is the result of other sustainability evaluations related to air pollutant emissions and water consumption?

Based on these questions and topics, workshops are organised in which key messages and joint conclusions are formulated. These will be incorporated into a final report, which will provide an overview of ongoing activities worldwide as well as past and present technical, economic and regulatory challenges and best practice examples. Next to information sharing, the report is to support a raise in awareness concerning the importance and the global activities in the e-fuels field.

Activities

In the E-fuels task, workshops / virtual meetings are held four times a year on specific issues and (if possible) pilot plants are visited. The output of each workshop / meeting is a summary of common findings, which are then included in the final report. At the end of the task, a web seminar is held at which the main findings are presented.

The duration of the task is two years. Within these two years, the following activities are planned:

- Task management
 - Preparation of task documentation
 - Facilitation of information exchange between task participants
 - Progress reports at ExCo meetings
 - Contributions to the AMF Annual Report
 - Preparation of final report (with individual contributions of the participants)
 - Printing of final report (if desired)
 - Preparation of key messages
- Task meetings
- Workshops / virtual meetings on different topics in which the participating countries can contribute their expertise and gain knowledge. Depending on the topic of the workshop, stakeholders could be involved through hybrid / virtual events to reach more people. In total:

- Three face-to-face workshops combined with visitations of pilot plants (depending on the Covid development), combined with the AMF ExCo meetings
- Four virtual meetings

The workshops / meetings will include an inventory of ongoing and past demonstration projects around the world, as well as examples of good practice and case studies. They include individual contributions of the participants to the work scope.

- One public web-seminar at the end of the task to present the key findings.
- Concise report on the key findings of the workshops including an introduction part and take home messages.
- Final report outline (including abstract or summary) and individual contributions
- In-depth review of final report through task participants

Expected Results

Key messages and shared insights will be formulated from each workshop, which will then serve as the basis for the final summary report and the public web seminar.

Therefore, the following results are available at the end of the task:

- Concise final report
- Key messages
- Web seminar
- Conclusion points and key messages from each workshop

Contact Details

For further information, please contact the Task 64 Task Manager:

Zoe Stadler
OST - Ostschweizer Fachhochschule
zoe.stadler@ost.ch

https://iea-amf.org/content/projects/map_projects/64?_ga=2.34312033.1303181004.1658997881-1675570031.1658997881