Lifecycle climate impact and primary energy use of electric and biofuel cargo trucks

References

- [1] IPCC (Intergovernmental Panel on Climate Change). 2022. Climate Change 2022: Impacts, Adaptation and Vulnerability.
- [2] IPCC (Intergovernmental Panel on Climate Change). 2022. Climate Change 2022: Mitigation of Climate Change.
- [3] IEA (International Energy Agency). 2021. Key World Energy Statistics 2021.
- [4] UNEP (United Nations Environment Programme). 2021. Making Peace with Nature: A scientific blueprint to tackle the climate, biodiversity and pollution emergencies.
- [5] UNEP (United Nations Environment Programme). 2022. Emissions Gap Report 2022.
- [6] FAO (Food and Agriculture Organization of the United Nations). 2016. Forestry for a Low-carbon Future: Integrating Forests and Wood Products in Climate Change Strategies. FAO Forestry Paper 177.
- [7] SCB (Statistics Sweden). 2021. Statistical Database. Web-accessed at https://www.scb.se/finding
- [8] IEA (International Energy Agency). 2022. World Energy Outlook 2022.
- [9] Earl T, Mathieu L, Cornelius S, Kenny S, Ambel CC, Nix J. 2018. Analysis of long haul battery electric trucks in EU: Marketplace and technology, economic, environmental, and policy perspectives. 8th Commercial Vehicle Workshop, Graz.
- [10] Liimatainen H, van Vliet O, Aplyn D. 2019. The potential of electric trucks An international commodity-level analysis. Applied Energy 236: 804-814.
- [11] Lombardi S, Tribioli L, Guandalini G, Iora P. 2020. Energy performance and well-to-wheel analysis of different powertrain solutions for freight transportation. International Journal of Hydrogen Energy 45: 12535-12554.
- [12] Liu X, Elgowainy A, Vijayagopal R, Wang M. 2021. Well-to-wheels analysis of zero-emission plug-in battery electric vehicle technology for medium- and heavy-duty trucks. Environmental Science & Technology 55: 538-546.
- [13] Holmgren K, Takman J, et al. 2021. KNOGA. Fossilfri framdrift för tunga långväga transporter på väg: Kostnadsfördelning och risker för olika aktörer (Fossil-free propulsion for heavy long-distance road transport: Cost allocation and risks for different actors). Rapport nr FDOS 12:2021. (in Swedish)
- [14] Nykvist B, Olsson O. 2021. The feasibility of heavy battery electric trucks. Joule 5: 901-913.
- [15] Zhang X, Lin Z, Crawford C, Li S. 2022. Techno-economic comparison of electrification for heavy-duty trucks in China by 2040. Transportation Research Part D 102: 103152.
- [16] Trafikverket 2020. Analysmetod och samhällsekonomiska kalkylvärden för transportsektorn: ASEK
 7.0 (Analytical method and socio-economic calculation values for the transport sector: ASEK 7.0).
 Version 2020-06-15. (in Swedish)
- [17] Zetterberg, L. 1993. A method for assessing the expected climatic effects from emission scenarios using the quantity radiative forcing. Swedish Environmental Research Institute, Stockholm; IVL Report No. B1111.
- [18] IPCC (Intergovernmental Panel on Climate Change). 2013. Anthropogenic and Natural Radiative Forcing. Supplementary Material to Chapter 8, Climate Change 2013: The Physical Science Basis.
- [19] Sathre R, Gustavsson L. 2011. Time-dependent climate benefits of using forest residues to substitute fossil fuels. Biomass & Bioenergy 35: 2506-2516.
- [20] UCS (Union of Concerned Scientists), 2015. Cleaner Cars from Cradle to Grave: How Electric Cars Beat Gasoline Cars on Lifetime Global Warming Emissions.

- [21] EECA (Energy Efficiency and Conservation Authority), 2015. Life Cycle Assessment of Electric Vehicles: Final Report.
- [22] Yazdanie M, Noembrini F, Heinen S, Espinel A, Boulouchos K. 2016. Well-to-wheel costs, primary energy demand, and greenhouse gas emissions for the production and operation of conventional and alternative vehicles. Transportation Research Part D 48: 63-84.
- [23] EEA (European Environment Agency), 2018. Electric vehicles from life cycle and circular economy perspectives. TERM 2018: Transport and Environment Reporting Mechanism (TERM) report.
- [24] Galitsky C, Worrell E. 2008. Energy Efficiency Improvement and Cost Saving Opportunities for the Vehicle Assembly Industry. Report LBNL-50939-R, Lawrence Berkeley National Laboratory.
- [25] Ambrose H, Kendall, A. 2016. Effects of battery chemistry and performance on the life cycle greenhouse gas intensity of electric mobility. Transportation Research Part D 47: 182-194.
- [26] Hao H, Mu Z, Jiang S, Liu Z, Zhao F. 2017. GHG emissions from the production of lithium-ion batteries for electric vehicles in China. Sustainability 9, 504; doi:10.3390/su9040504.
- [27] IVL (Swedish Environmental Research Institute) 2019. Lithium-Ion Vehicle Battery Production: Status 2019 on Energy Use, CO₂ Emissions, Use of Metals, Products Environmental Footprint, and Recycling. IVL Report No. C 444.
- [28] Cusenza MA, Bobba S, Ardente F, Cellura M, Di Persio F. 2019. Energy and environmental assessment of a traction lithium-ion battery pack for plug-in hybrid electric vehicles. Journal of Cleaner Production 215: 634-649.
- [29] Almeida A, Sousa N, Coutinho-Rodrigues, J. 2019. Quest for sustainability: Life-cycle emissions assessment of electric vehicles considering newer li-ion batteries. Sustainability 11, 2366.
- [30] Nyland NO, Erkkilä K. 2005. Heavy-duty truck emissions and fuel consumption: Simulating real-world driving in laboratory conditions. VTT Finland.
- [31] Hill N. 2020. A comparative life-cycle analysis of low GHG HGV powertrain technologies and fuels. Decarbonisation of Heavy Goods Vehicle Transport, EC JRC Online Workshop.
- [32] Forrest K, MacKinnon M, Tarroja B, Samuelsen S. 2020. Estimating the technical feasibility of fuel cell and battery electric vehicles for the medium and heavy duty sectors in California. Applied Energy 276: 115439.
- [33] Harto C. 2020. Electric Vehicle Ownership Costs: Chapter 2—Maintenance. Consumer Reports.
- [34] McKone T, Rice D, Ginn T, Bastani M, Levy A, Lenhart A, Syz BA, Boudreaux R. 2015. California Dimethyl Ether Multimedia Evaluation. California Environmental Protection Agency.
- [35] NREL (National Renewable Energy Laboratory). 2015. Process Design and Economics for the Conversion of Lignocellulosic Biomass to Hydrocarbons via Indirect Liquefaction.
- [36] Nguyen T, Gustavsson L. 2020. Production of district heat, electricity and/or biomotor fuels in renewable-based energy systems. Energy 202: 117672.
- [37] Lönnqvist T, Hansson J, Klintbom P, Furusjö E, Holmgren K. 2021. Drop-in the tank or a new tank? Report No. FDOS 17:2021, Swedish Energy Agency and The Swedish Knowledge Centre for Renewable Transportation Fuels.
- [38] Danish Energy Agency. 2020. Technology Data: Energy Plants for Electricity and District Heating Generation.
- [39] Bonou A, Laurent A, Olsen SI. 2016. Life cycle assessment of onshore and offshore wind energy from theory to application. Applied Energy 180: 327-337.
- [40] Chipindula J, Botlaguduru VSM, Du H, Kommalapati RR, Huque Z. 2018. Life cycle environmental impact of onshore and offshore wind farms in Texas. Sustainability 10: 2022.
- [41] Mendecka B, Lombardi L. 2019. Life cycle environmental impacts of wind energy technologies: A review of simplified models and harmonization of the results. Renewable & Sustainable Energy Reviews 111: 462-480.

- [42] Davidsson S, Höök M, Wall G. 2012. A review of life cycle assessments on wind energy systems. International Journal of Life Cycle Assessment 17: 729-742.
- [43] Hsu DD, O'Donoughue P, Fthenakis V, Heath GA, Kim HC, Sawyer P, Choi JK, Turney DE. 2012. Life cycle greenhouse gas emissions of crystalline silicon photovoltaic electricity generation: Systematic review and harmonization. Journal of Industrial Ecology 16(1): S122-S135.
- [44] Kim HC, Fthenakis V, Choi JK, Turney DE. 2012. Life cycle greenhouse gas emissions of thin-film photovoltaic electricity generation: Systematic review and harmonization. Journal of Industrial Ecology 16(1): S110-S121.
- [45] Finnegan S, Jones C, Sharples S. 2018. The embodied CO_{2e} of sustainable energy technologies used in buildings: A review article. Energy & Buildings 181: 50-61.
- [46] Zhou Z, Carbajales-Dale M. 2018. Assessing the photovoltaic technology landscape: Efficiency and energy return on investment (EROI). Energy & Environmental Science 11: 603-608
- [47] Masnadi MS, El-Houjeiri HM, et al. 2018. Global carbon intensity of crude oil production. Science 361(6405): 851-853.
- [48] Gode J, Martinsson F, Hagberg L, Öman A, Höglund J, Palm D. 2011. Miljöfaktaboken 2011: Estimated emission factors for fuels, electricity, heat and transport in Sweden. Stockholm: Värmeforsk.
- [49] Sathre R, Cain J, Chester M, Masanet E. 2011. The role of Life Cycle Assessment in identifying and reducing environmental impacts of CCS. Report LBNL-4548E, Lawrence Berkeley National Laboratory.
- [50] Wilcox J. 2012. Carbon Capture. Springer.
- [51] Hankin A, Shah N. 2017. Process exploration and assessment for the production of methanol and dimethyl ether from carbon dioxide and water. Sustainable Energy & Fuels 1, 1541.
- [52] Fortin C, Gianfolcaro N, et al. 2020. Dimethyl ether, A review of production processes and a modeling of the indirect route. Liege University, PROJ0012-1.
- [53] IRENA (International Renewable Energy Agency), 2019. Bioenergy from Boreal Forests: Swedish Approach to Sustainable Wood Use.
- [54] de Jong D, Akselsson C, Egnell G, Löfgren S, Olsson BA. 2017. Realizing the energy potential of forest biomass in Sweden: How much is environmentally sustainable? Forest Ecology & Management 383: 3-16.
- [55] Swedish Forest Agency. 2019. Regler och rekommendationer för skogsbränsleuttag och kompensationsåtgärder (Rules and recommendations for forest fuel extraction and compensation measures). Report 2019/14. (in Swedish).
- [56] Gustavsson L, Haus S, Ortiz C, Sathre R, Truong N. 2015. Climate effects of bioenergy from forest residues in comparison to fossil energy. Applied Energy 138: 36-50.
- [57] Rolff C, Ågren GI. 1999. Predicting effects of different harvesting intensities with a model of nitrogen limited forest growth. Ecological Modelling 118(2-3): 193-211.
- [58] Hyvönen R, Ågren GI. 2001. Decomposer invasion rate, decomposer growth rate, and substrate chemical quality: how they influence soil organic matter turnover. Canadian Journal of Forest Research 31(9): 1594-1601.
- [59] Lehtonen A, Mäkipää R, Heikkinen J, Sievänen R, Liski J. 2004. Biomass expansion factors (BEFs) for Scots pine, Norway spruce and birch according to stand age for boreal forests. Forest Ecology & Management 188(1-3): 211-224.
- [60] EEA (European Environment Agency). 2018. Average age of the vehicle fleet. Web-accessed at https://www.eea.europa.eu/data-and-maps/indicators/average-age-of-the-vehicle-fleet/averageage-of-the-vehicle-8

- [61] Eurostat. 2020. End-of-life vehicle statistics. Web-accessed at https://ec.europa.eu/eurostat/statistics-explained/index.php/End-oflife_vehicle_statistics#Number_of_end-of-life_vehicles
- [62] Sathre R, Scown CD, Kavvada O, Hendrickson TP. 2015. Energy and climate effects of second-life use of electric vehicle batteries in California through 2050. Journal of Power Sources 288: 82-91.
- [63] Lv W, Wang Z, Cao H, Sun Y, Zhang Y, Sun Z. 2018. A critical review and analysis on the recycling of spent lithium-ion batteries. ACS Sustainable Chemistry & Engineering 6(2): 1504–1521.
- [64] Harlow JE, Ma X, et al. 2019. A wide range of testing results on an excellent lithium-ion cell chemistry to be used as benchmarks for new battery technologies. Journal of The Electrochemical Society 166(13): A3031-A3044.
- [65] Trafikanalys. 2019. Körsträckor med svenskregistrerade fordon (Mileage with Swedish-registered vehicles). Web-accessed at https://www.trafa.se/vagtrafik/korstrackor/ (in Swedish).
- [66] Masanet E, Chang Y, Gopal AR, Larsen P, Morrow WR, Sathre R, Shehabi A, Zhai P. 2013. Life-cycle assessment of electric power systems. Annual Review of Environment & Resources 38: 107-136.
- [67] Truong NL, Gustavsson L. 2013. Integrated biomass-based production of district heat, electricity, motor fuels and pellets of different scales. Applied Energy 104: 623-632.
- [68] IPCC (Intergovernmental Panel on Climate Change). 2021. Climate Change 2021: The Physical Science Basis.