

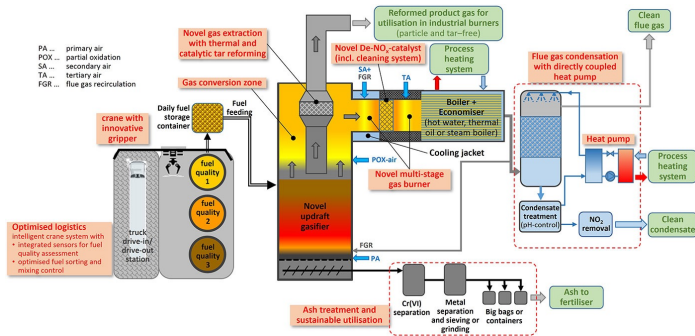
PRELIMINARY IMPACT ASSESSMENT OF AN INNOVATIVE NEAR-ZERO EMISSIONS BIOMASS ENERGY SUPPLY SYSTEM (CBE4I)

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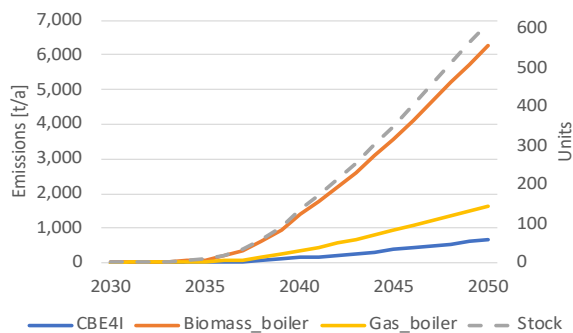
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Introduction and Objectives

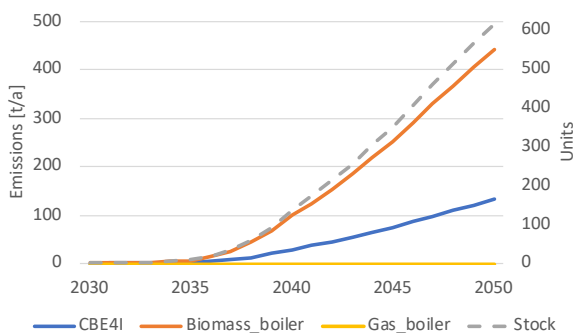
Preliminary scenario-based assessment of potential environmental and major economic impacts: CBE4I vs. state-of-the-art biomass systems or natural gas boilers on Austrian and German greenhouse gas (GHG) emissions and air pollutant emissions (TSP, CO and NO_x)



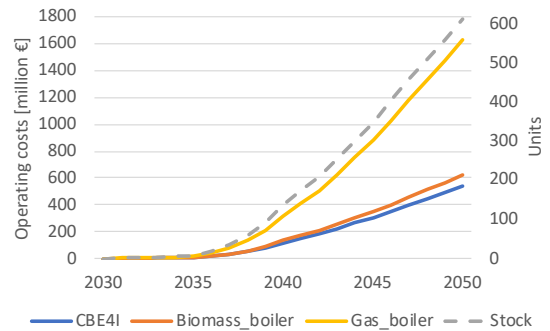
Process scheme of the CBE4I system.¹



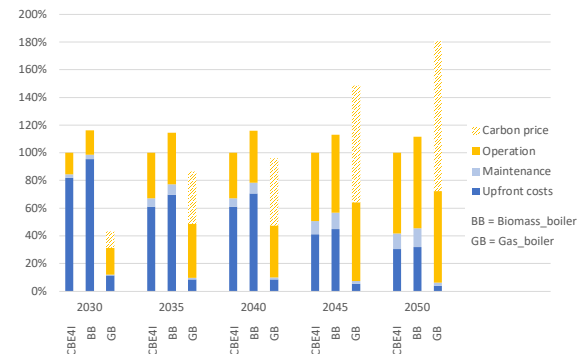
Stock volume (dashed line) of 5 MW units for pulp & paper industry in Germany and total annual NO_x (nitrogen oxides) emissions (solid lines) for CBE4I technology, biomass boiler with flue gas condensation and heat pump, and gas boiler



Stock volume (dashed line) of 5 MW units for pulp & paper industry in Germany and total annual TSP (total suspended particles) emissions (solid lines) for CBE4I technology, biomass boiler with flue gas condensation and heat pump, and gas boiler



Stock volume (dashed line) of 5 MW units for pulp & paper industry in Germany and cumulated annual operating costs (solid lines) for CBE4I technology, biomass boiler with flue gas condensation and heat pump, and gas boiler



Composition of total annual costs for CBE4I technology, biomass boiler with flue gas condensation and heat pump, and gas boiler, normalised to the cost of the CBE4I system (= 100%) in the respective year

Approach and preliminary results

- Sales and stock model for two industry sectors: pulp & paper and dairy
- Choice of ambitious sales scenario within EU Reference scenario² for projection of heat demand
- Significant reduction of GHG emissions (~90%) of biomass-based vs. fossil-fuelled systems
- Conventional biomass boilers would increase TSP, NO_x and CO emissions
- Highly efficient CBE4I system with near-zero emissions clearly at advantage
- Future fuel and carbon prices hardly predictable and dependent on national as well as international political developments^{3,4,5}
- Transitional financial support for biomass-based systems needed in case of low wholesale fossil gas prices
- Economic advantage of CBE4I system over gas boilers in case of high wholesale fossil gas and/or carbon prices
- Adaptable policy mechanisms required to ensure support

¹ <https://cbe4i.eu/project>

² Kernell, K., & Crijns-Graus, W. (2020). Assessment of reference scenarios for industry [Dataset].

³ International Energy Agency (IEA) (Ed.), (2024). World Energy Outlook 2024. International Energy Agency (IEA).

⁴ Mendelevitch, R., Repenning, J., Matthes, F. C., & Deurer, J. (2024). Treibhausgas-Projektionen 2024 für Deutschland – Rahmendaten.

⁵ Schumacher, K., Appenfelder, D., Cludius, J., bei der Wieden, W., Kasten, P., Kreye, K., Götz, W. K., Jansen, L. L., Loreck, C., Förster, H., Harthan, R., Sievers, L., Grimm, A., Stijepic, D., Rehfeldt, M., Deurer, J., & Steinbach, J. (2024). Sozio-ökonomische Folgenabschätzung zum Projektionsbericht 2023. Federal Environment Agency (UBA).



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