

Thailand's Net-zero Emissions by 2050: Analysis of Economy-wide Impacts



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Introduction

- A transition towards net-zero economy is a necessary challenge for Thailand.
- This study makes an effort to develop Thailand's net-zero GHG emission 2050 pathways based on the country's aspiration to contribute to the global efforts and be in line with the Paris Agreement.
- Such deep decarbonization targets are likely to increase the adoption of several cleaner mitigation options and relevant policies that are expected to lessen the risk of energy burden and help to mitigate GHG emissions. However, the introduction of such options and policies would bring changes in the existing national economy in terms of the structure of production sectors, national welfare, carbon intensity, carbon price and other economic impacts.
- This paper attempts to analyze the economy-wide consequences of achieving net zero GHG emissions in 2050 in the case of Thailand, one of the emerging economies in Asia.

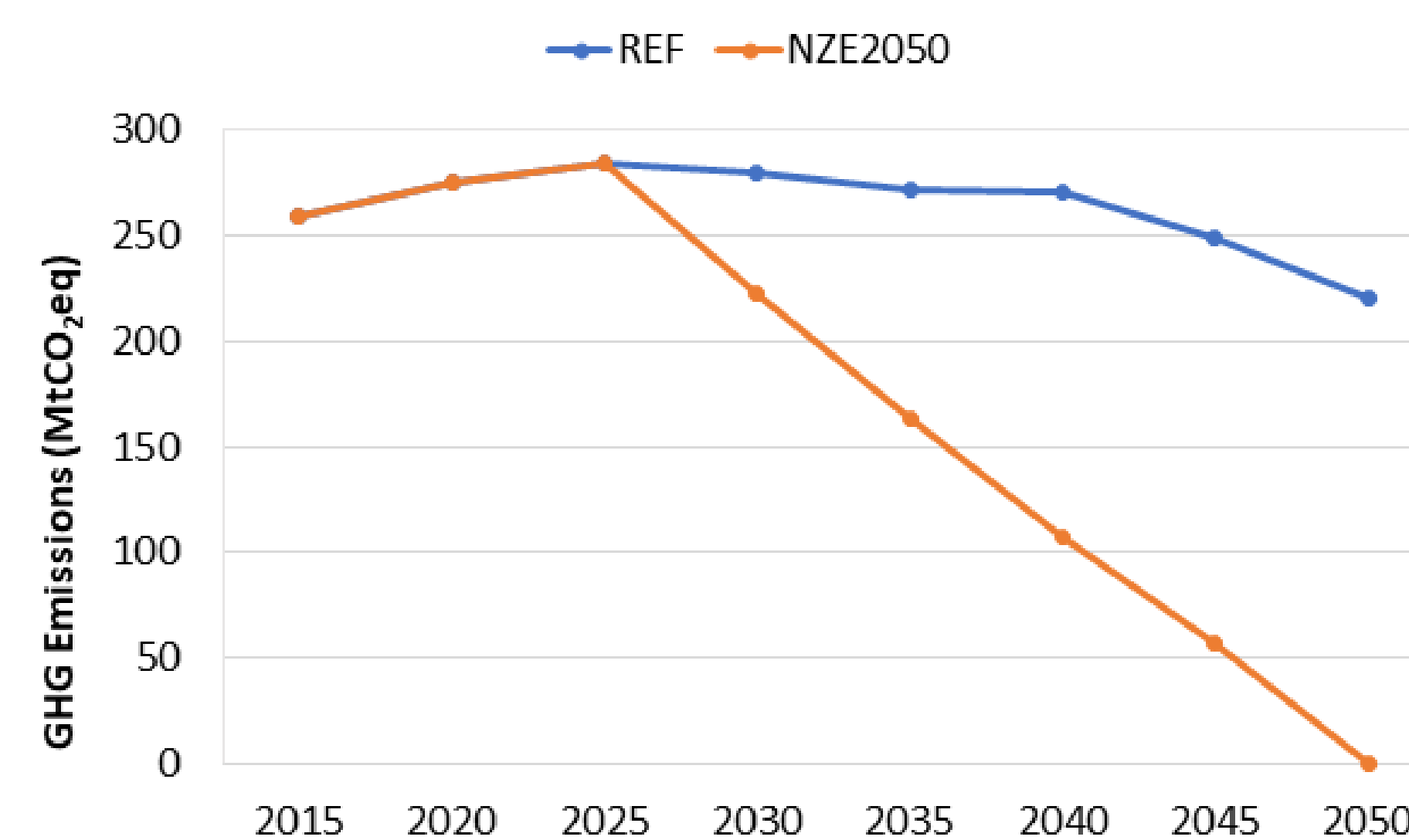


Fig. 1 Net GHG Emissions in the REF and NZE2050 Scenarios

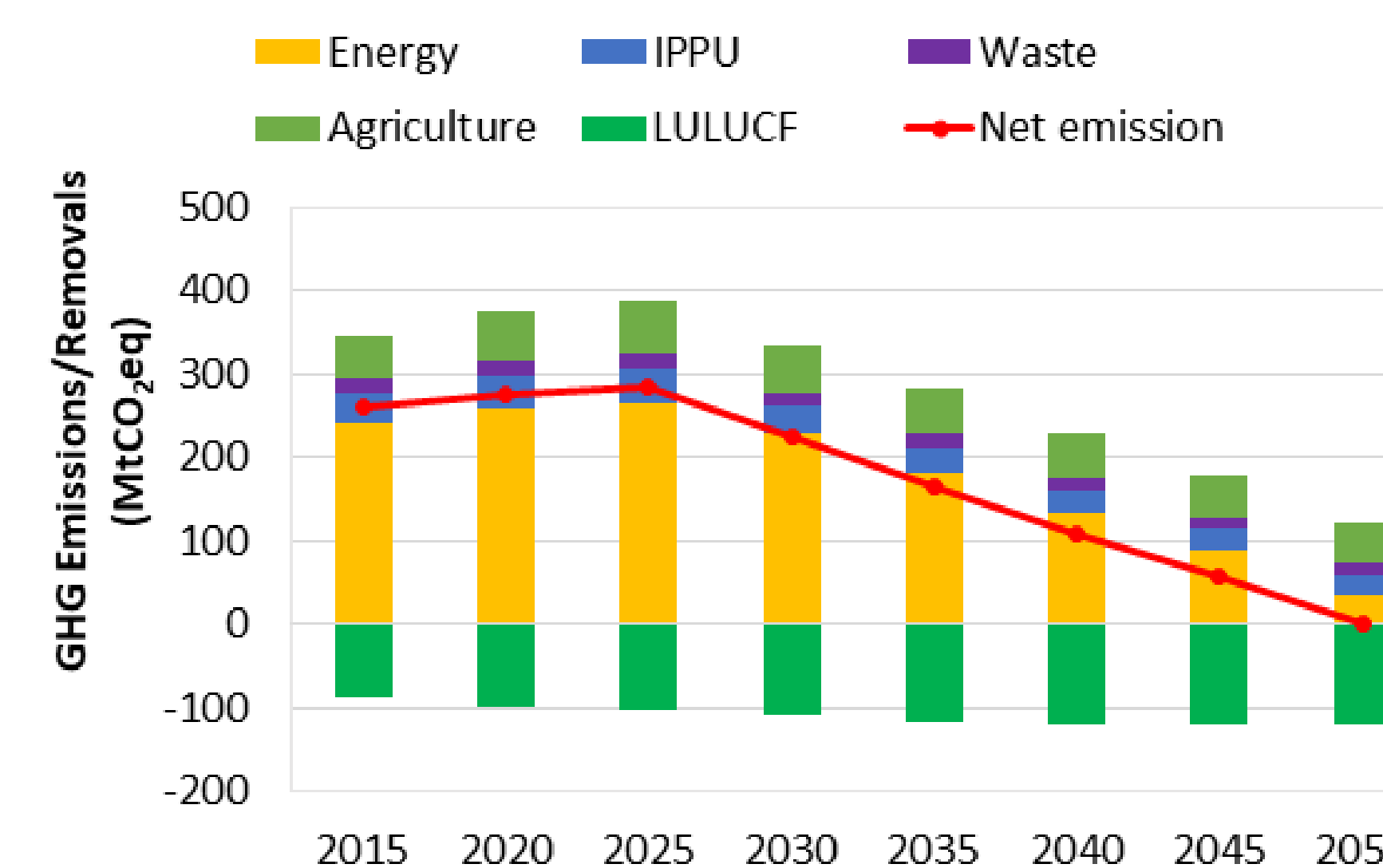


Fig. 2 GHG Emissions/Removals by Sectors in the NZE2050 Scenario

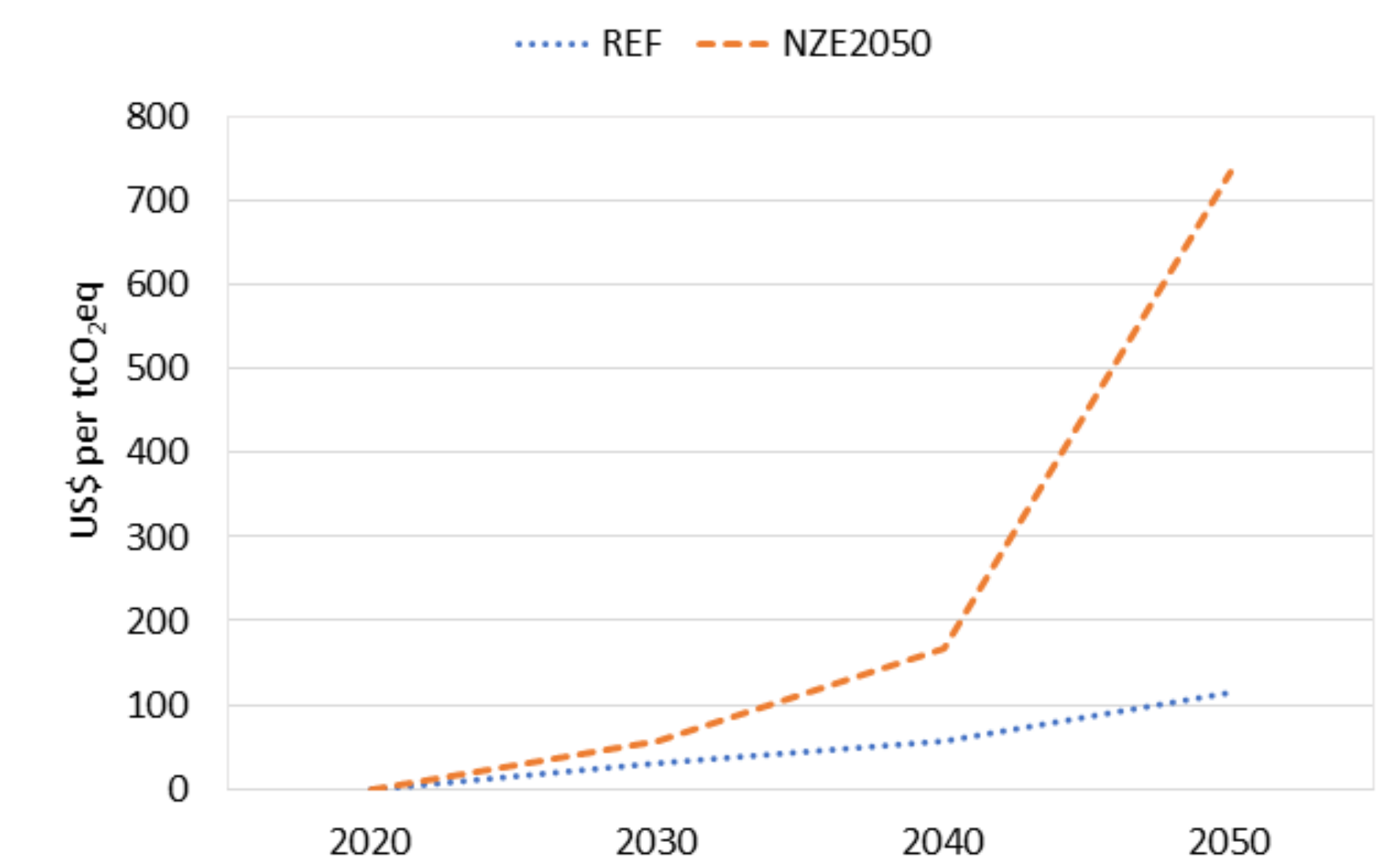


Fig. 3 Variation in Carbon Price across the REF and NZE2050 Scenarios

Methodology

- A multi-sector, recursive dynamic Asia-Pacific Integrated Model/Computable General Equilibrium model, named "AIM/CGE" model of Thailand, has been constructed to analyze the economy-wide implications of attaining net zero GHG emissions by 2050.
- A soft linkage has been established between the bottom-up AIM/Enduse model and the top-down AIM/CGE model of Thailand to assess the macroeconomic aspects of technological innovation.
- A soft linkage between these models has been established using the sector-specific GHG emissions and techno-specific data generated by the AIM/Enduse model as an input to the AIM/CGE model.
- The AIM/CGE model includes the following blocks: production, government and household income, and expenditure blocks, and a market block considering both domestic and international transactions.
- The AIM/CGE model of Thailand is constructed using the input-output table of 2015 to calibrate the model.

Results

- Results show that a net-zero future is achievable by 2050 at the expense of GDP loss, requiring a drastic cut in household consumption accompanied by welfare losses in Thailand.
- The cumulative welfare loss would be 6.8% in the NZE2050 scenario during 2020–2050. The steeper GHG emission reductions towards 2050 would cause a larger welfare loss of about 34.8% in 2050. This is because the sharp decline in the GHG emissions towards 2050 would cause a drop in household consumption by 3.6% in 2030 to 42.4% in 2050 due to steep decline in the consumer spending for goods and services.
- Identified key pillars of decarbonization to achieve net-zero emissions include energy efficiency; electrification; renewable energy development; hydrogen and hydrogen-based fuels; bioenergy; carbon capture, utilization, and storage (CCUS); and behavioral changes.
- The level of technology introduction and selections lead to a wide variation in the prices of carbon in both the scenarios. Higher carbon prices are required to attain the NZE2050 scenario during 2025–2050. The carbon price would shoot up to reach US\$ 734 per tCO₂eq towards 2050 to attain net-zero emissions in the NZE2050 scenario.

Discussions and Conclusions

- Results show that a net-zero future is achievable by 2050 at the expense of GDP loss, requiring a drastic cut in household consumption accompanied by welfare losses in Thailand. Such a drastic cut would have severe impact on the country's economy in the longer run giving rise to unemployment, declining real income, and reduced production of goods and services.
- Results suggest that the pathway to net-zero emissions requires immediate and massive deployment of all the available and emerging clean and efficient energy technologies.
- The real-world implementation would pose significant challenges in terms of technological deployment and dissemination and would call for huge supply-side as well as demand-side investments.
- Research on negative carbon technologies and emerging options such as CCS, BECCS, and green hydrogen are still inadequate in Thailand and need to be addressed before concluding that these are promising solutions to attain net-zero emissions in 2050.

Scenarios	Description
Reference (REF)	<ul style="list-style-type: none"> Considers the GHG emissions in Thailand's 2-degree pathways as reported in the "Mid-century, Long term Low Greenhouse Gas Emission Development Strategy (LT-LEDS)" of Thailand (MNRE 2021).
Net-zero Emission 2050 (NZE2050)	<ul style="list-style-type: none"> To achieve net-zero GHG emission in 2050, the LULUCF sector is expected to sequester 120 MtCO₂ from 2037 to 2050. The capacity of carbon sequestration from the LULUCF sector is derived based on the forest and green area targets as mentioned in the National Strategy (2018–2037) of Thailand (MNRE 2022). The net GHG emissions are expected to reach the peak level of 285 MtCO₂eq by 2025 in this scenario.

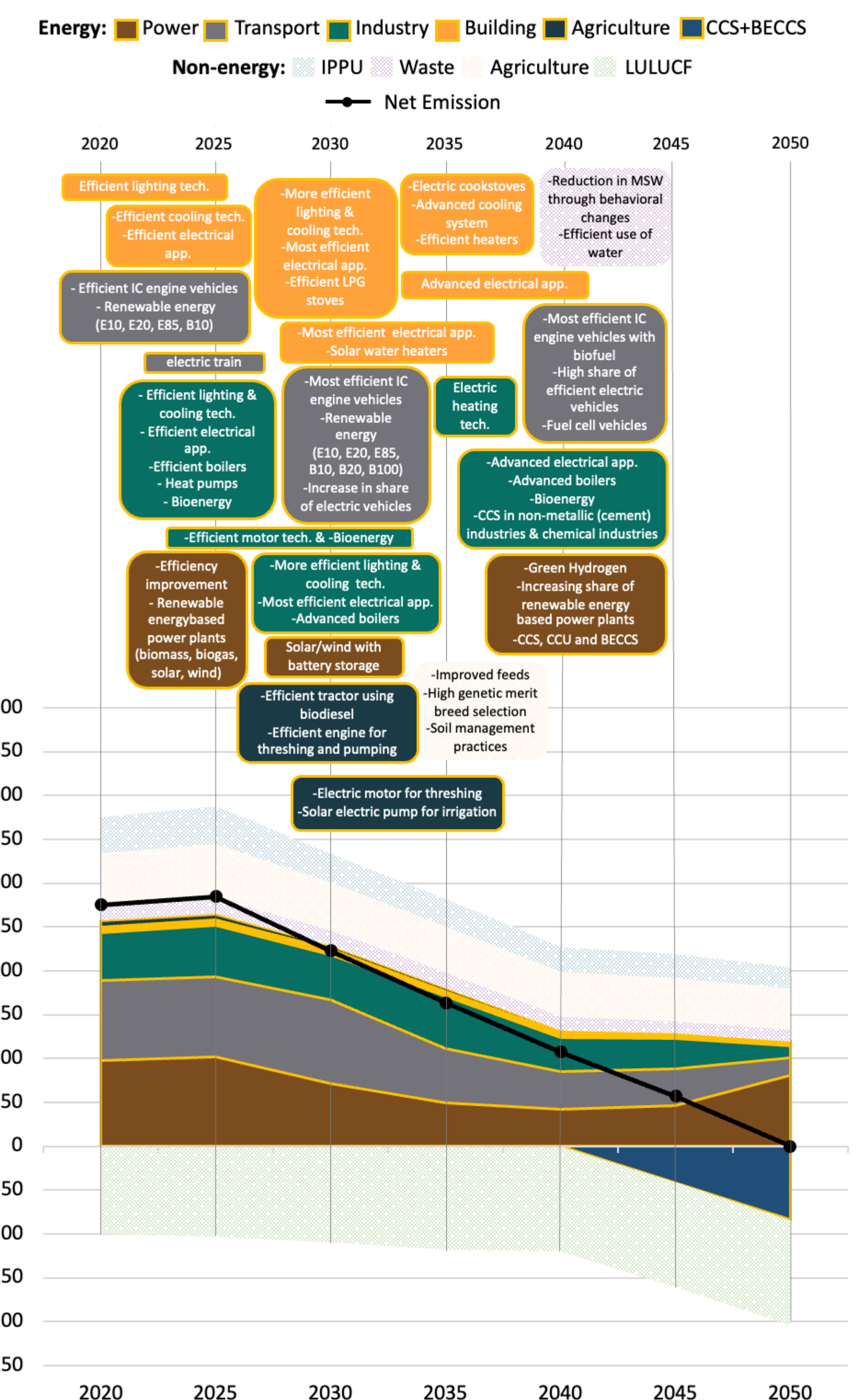


Fig. 4 Key Mitigation Actions in the Pathways to Achieve Net Zero Emissions in 2050

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