The Role of Energy Savings in Climate Mitigation - Main Character or Supporting Actor?

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Introduction

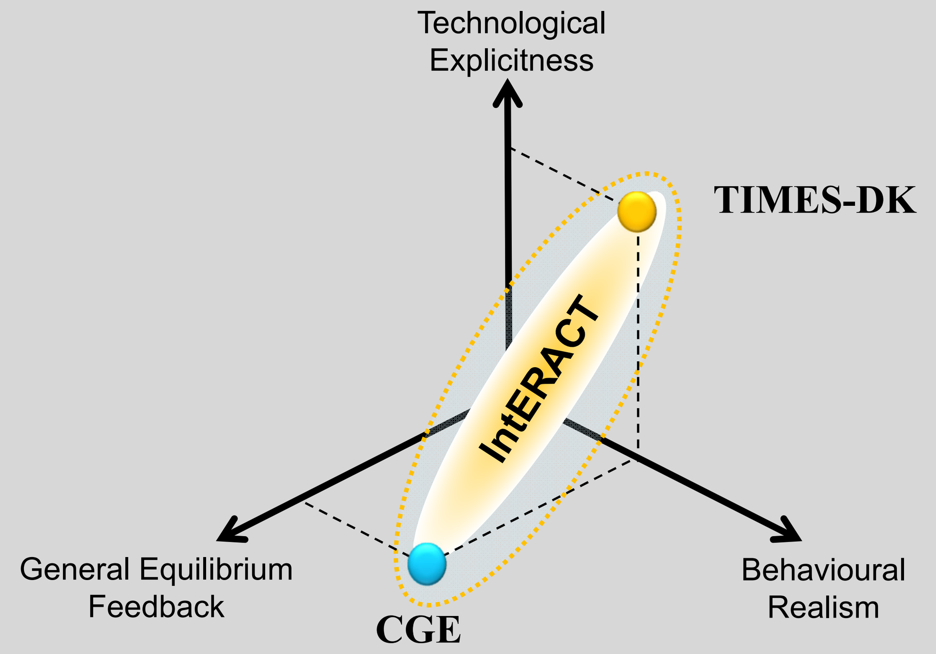
This poster illustrate how the challenge of modelling energy savings can be addressed in a domestic policy context. Appreciating both the need to ensure the technical feasibility of the energy system while accounting for behavioural demand responses and macroeconomic identities.

Why is this important

Energy efficiency is casted to play a key part in realizing the global ambition of keeping climate change well below 2 degrees. However, understanding the precise role of energy efficiency in energy and climate polices is a considerable challenge. The extend of the challenge is revealed by the vast literature, discussion issues such as additionality of energy savings polices, the existence of an energy efficiency gab and rebound effects.

Methodology

IntERACT is a hybrid model which combines top-down modelling of the Danish economy using a computable general equilibrium model (CGE) with a bottom-up linear programming model of the whole Danish energy system (TIMES-DK).



Hypothesis

Stricter climate mitigation policies in Denmark increase the level of energy savings in economics sectors compared to a baseline with no additional climate mitigation.

Results*

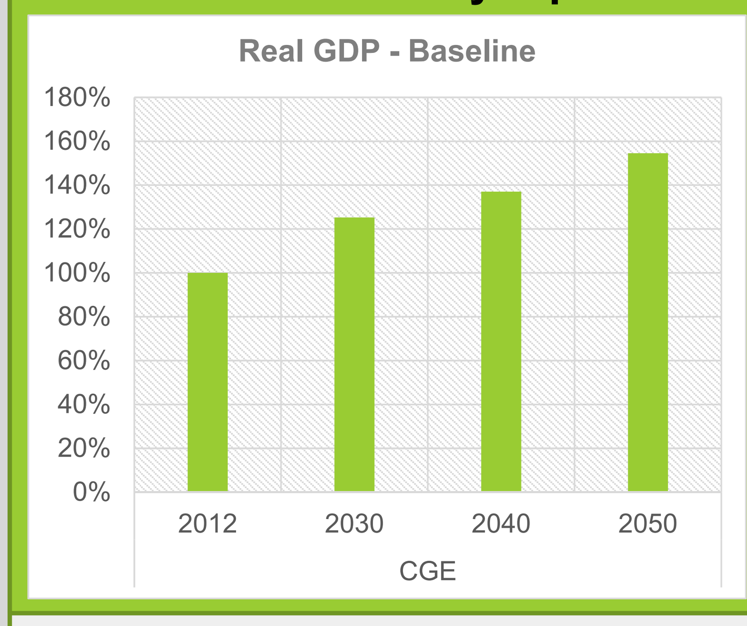
Preliminary results indicate that climate mitigation reduces the absolute level of energy savings. Whereas the share of energy saving relative to total energy service demand remains roughly constant. These results are highly dependent on the energy savings cost and potentials in TIMES-DK

Conclusion

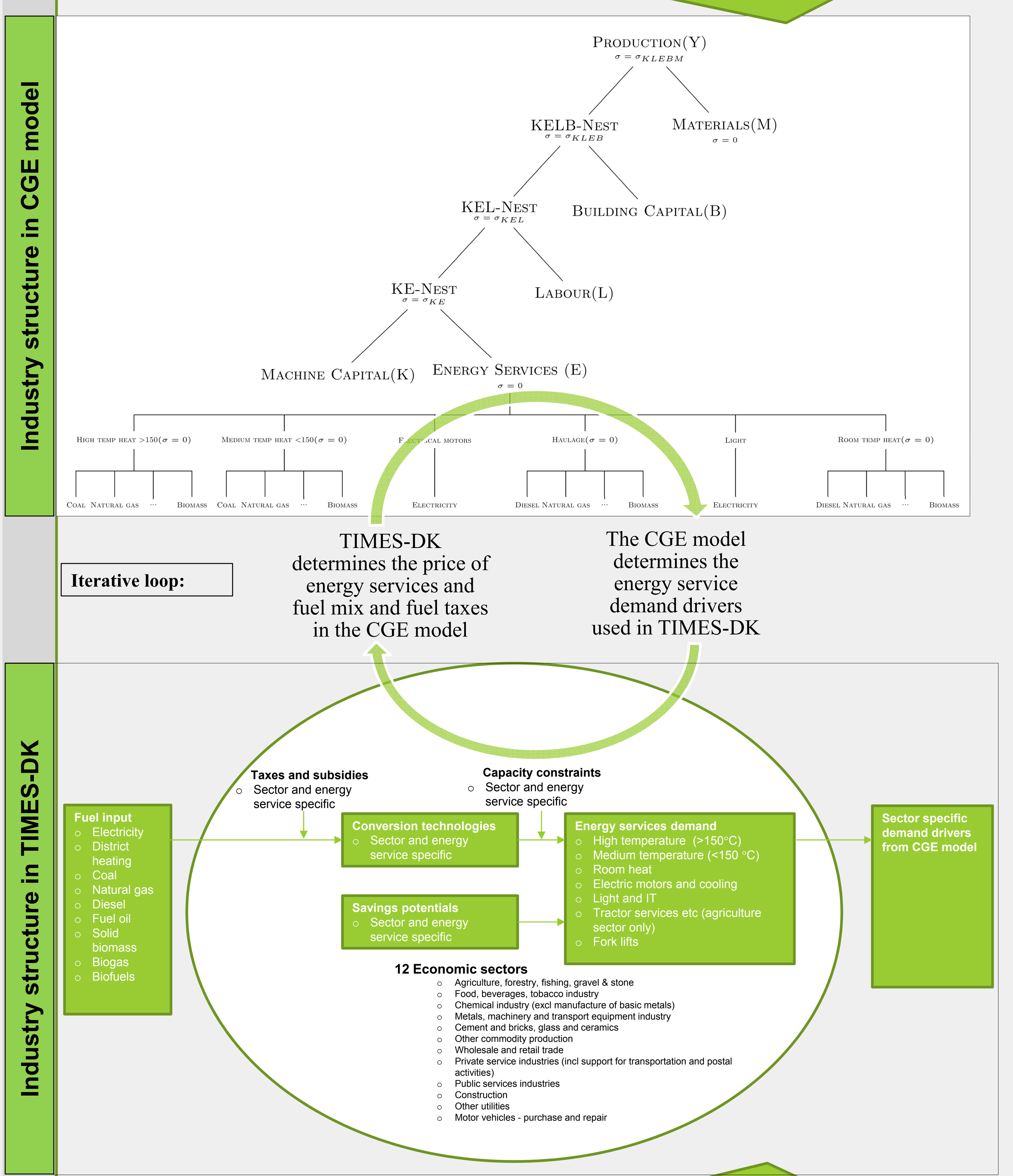
The real value of this hybrid modelling approach, is that it allows for a decomposition energy demands. Thereby improving our understanding of how energy efficiency and savings interact with the wider economy.

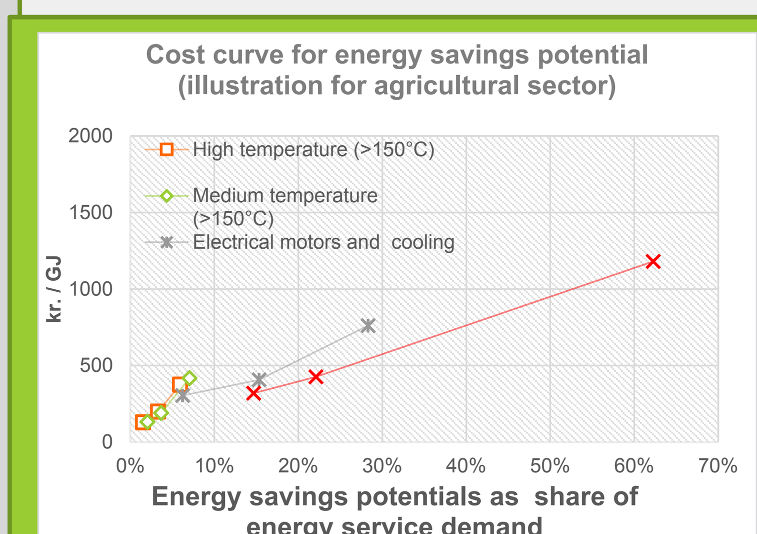
Modelling industry energy demand

Key top-down input and assumptions



- Baseline is calibrated on real GDP growth assumptions.
- Numerous substitution and Armington elasticities
- Homogenous capital and labor market assumptions
- Perfect competition.
- Fixed foreign trade and government budget balance

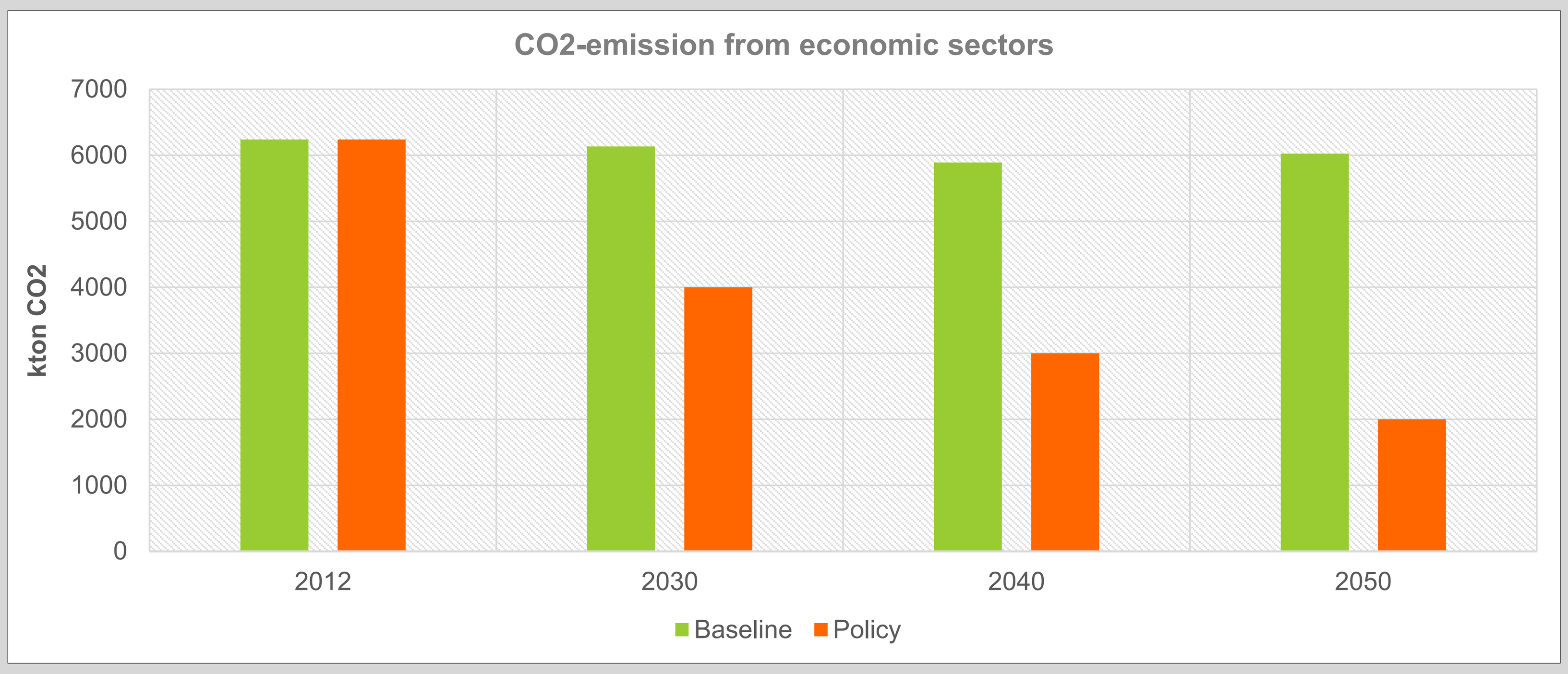


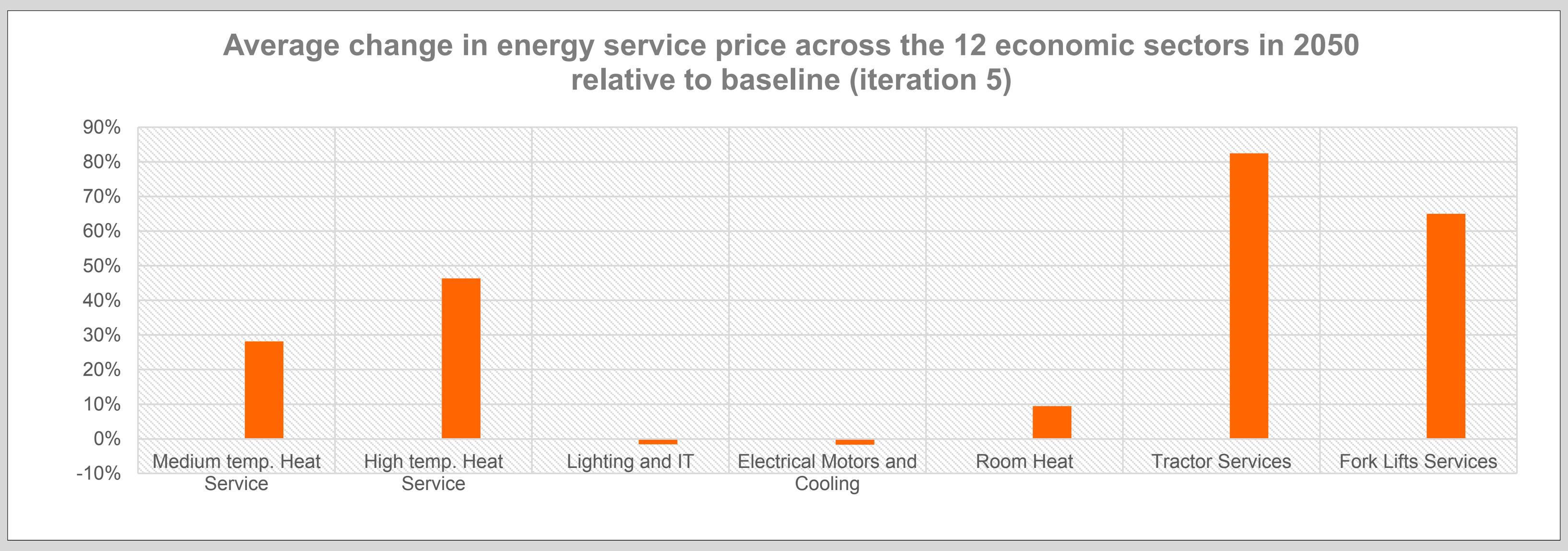


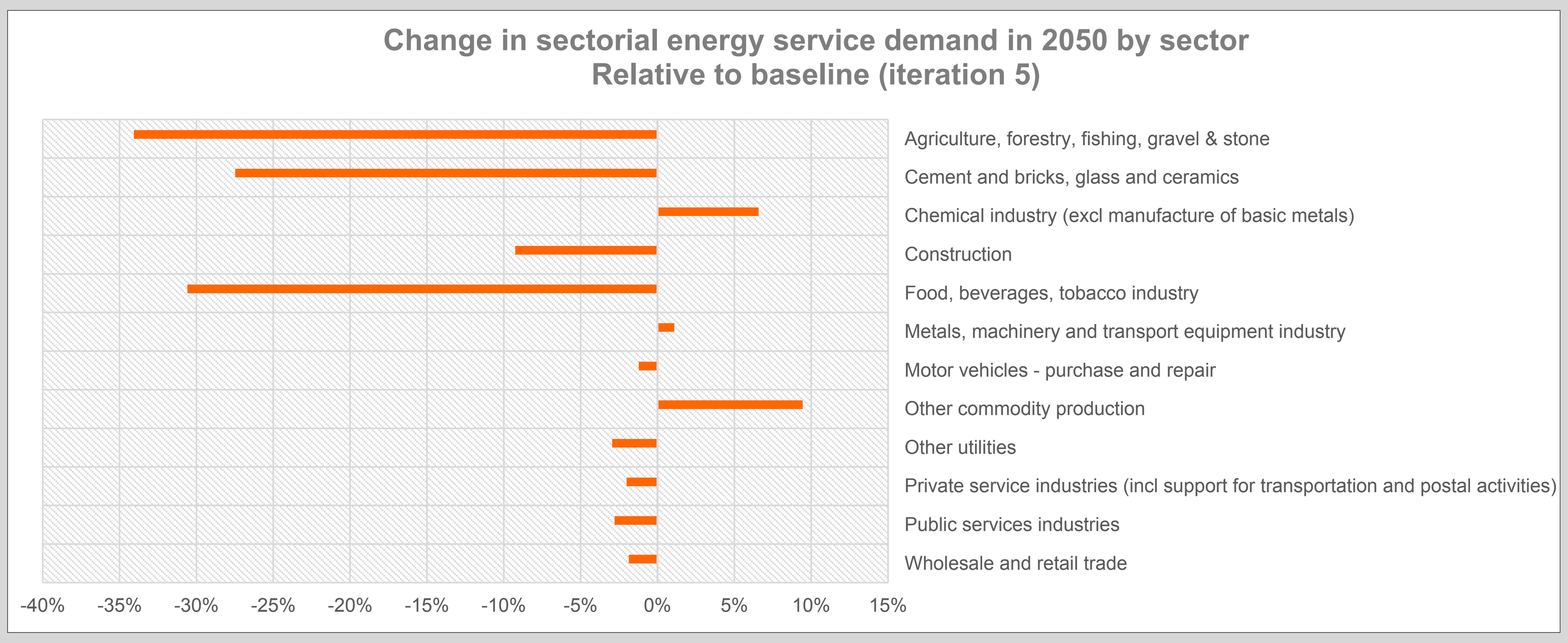
- Energy savings cost curve (sector and energy service specific)
- Sector specific hurdle rates
- Technology assumptions for conversion technologies
- Fuel prices
- Sector and fuel specific taxes
- Sector and fuel specific capacity constraints

Key bottom-up input and assumptions

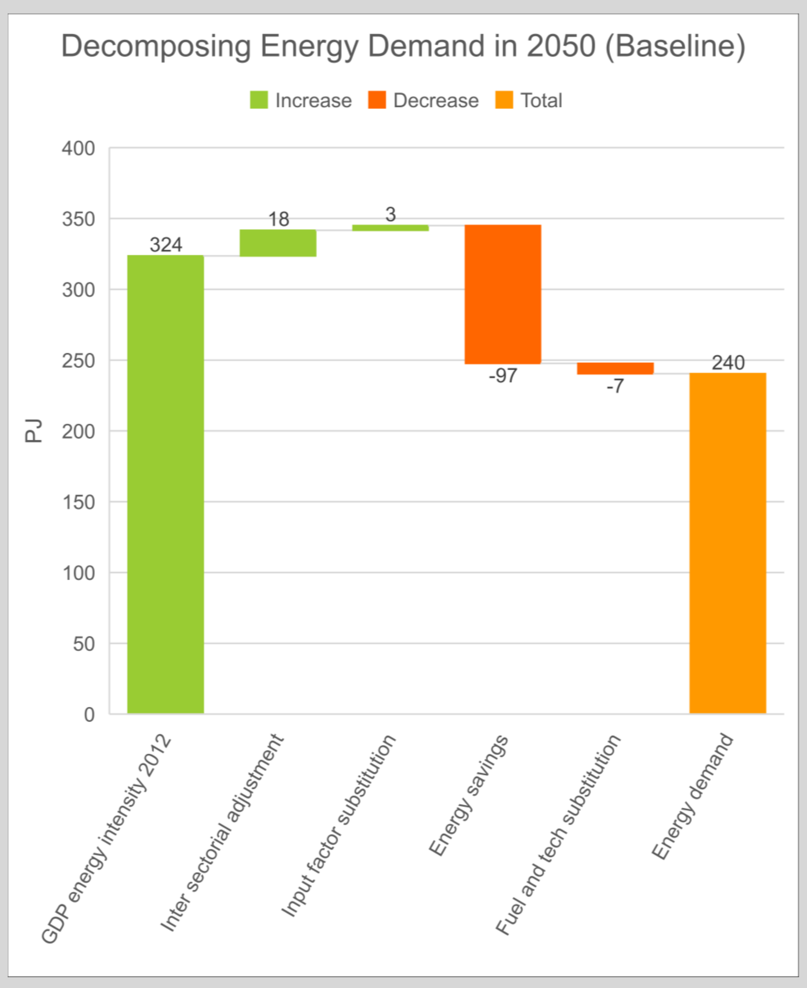
Climate mitigation policy*

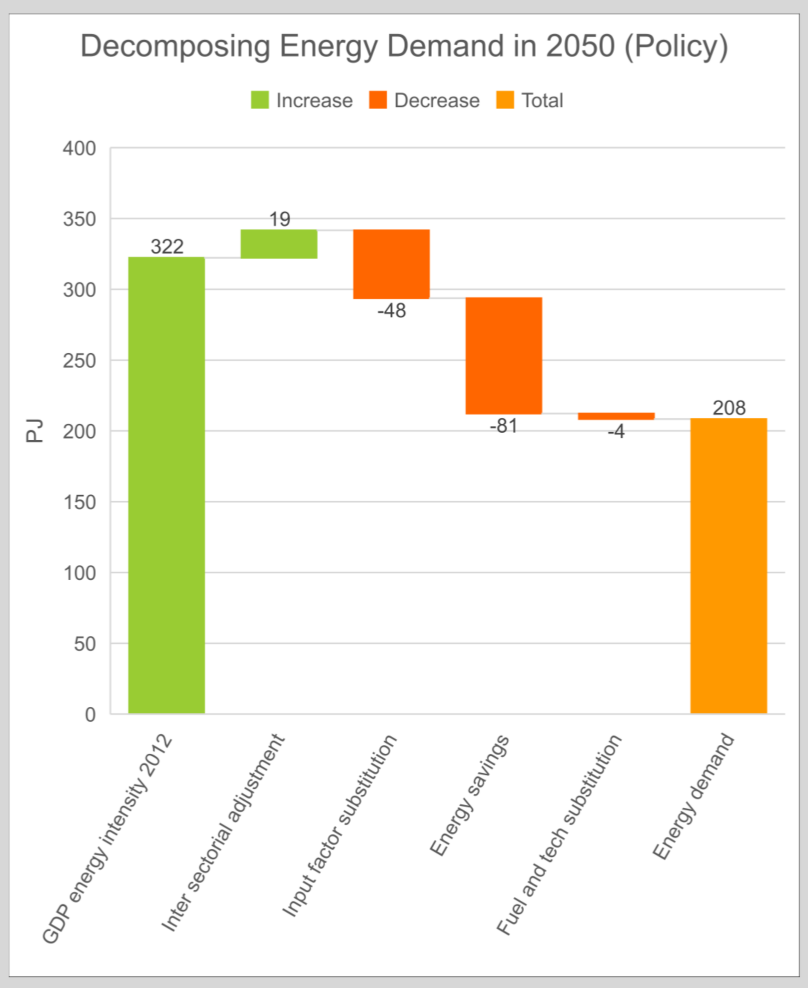






Decomposing energy demand*





Element	Description
GDP energy intensity 2012	Energy consumption if GDP energy intensity in 2050 was the same as in 2012
Inter sectorial adjustment	Change due to structural adjustment relative to 2012 (CGE model)
Input factor substitution	Change due to input substitution within each sector relative to 2012 (CGE model)
Energy savings	Change due energy savings in 2050 (TIMES-DK model)
Fuel and tech substitution	Change due to fuel and conversion technology substitution 2050 (TIMES-DK model)
Energy demand	Estimated energy demand in 2050 (IntERACT model)

* The results are intended for illustrative purposes, as the IntERACT model and its assumptions are currently undergoing validation.

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