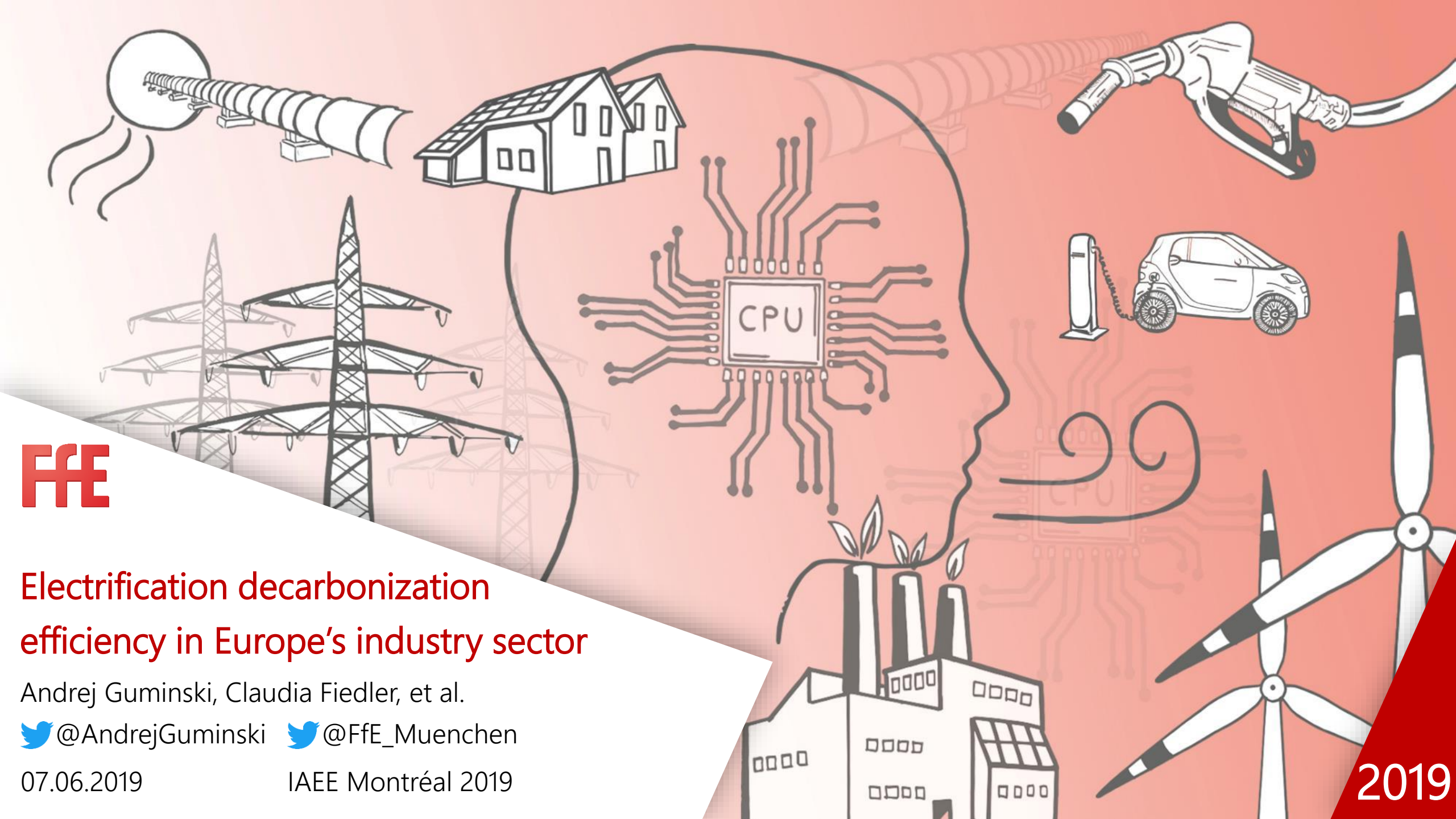

Electrification decarbonization efficiency in Europe's industry sector

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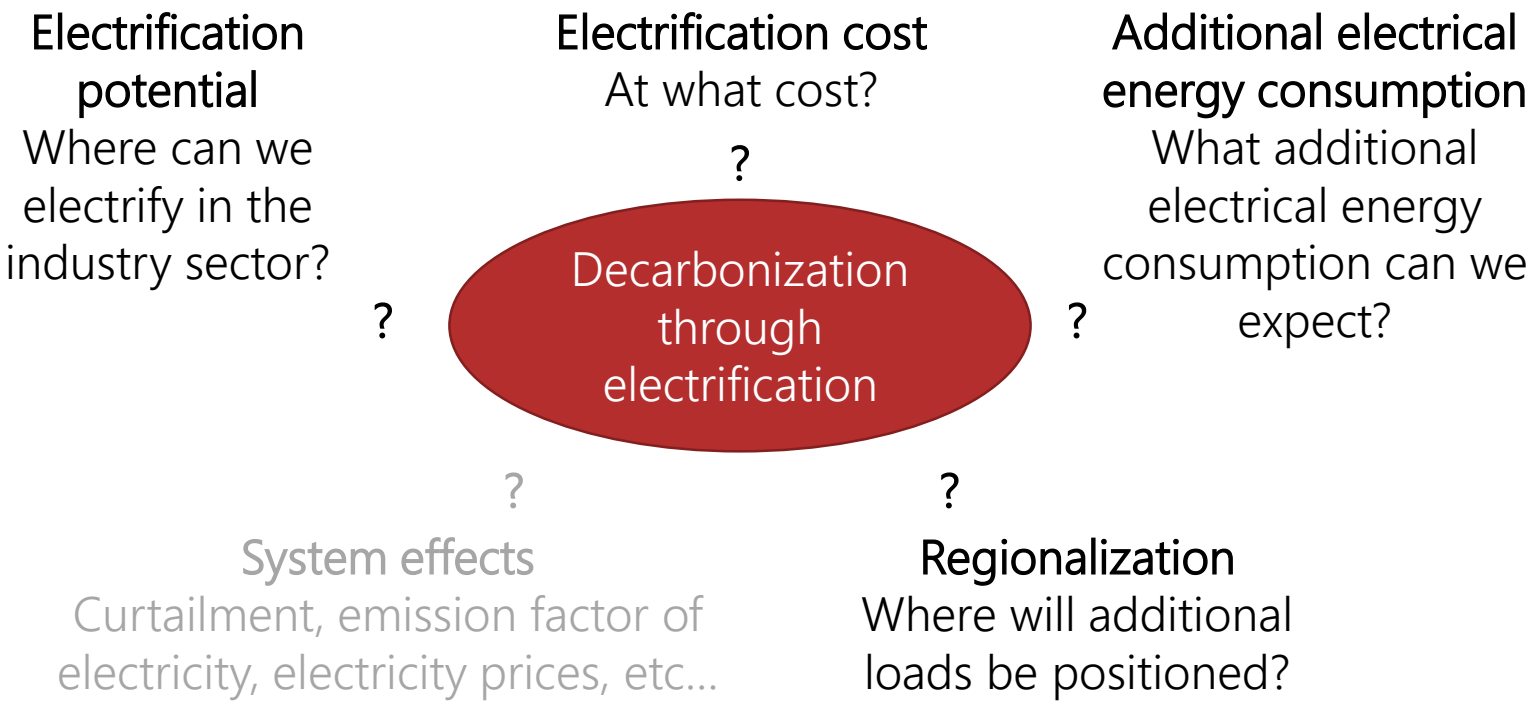
2019

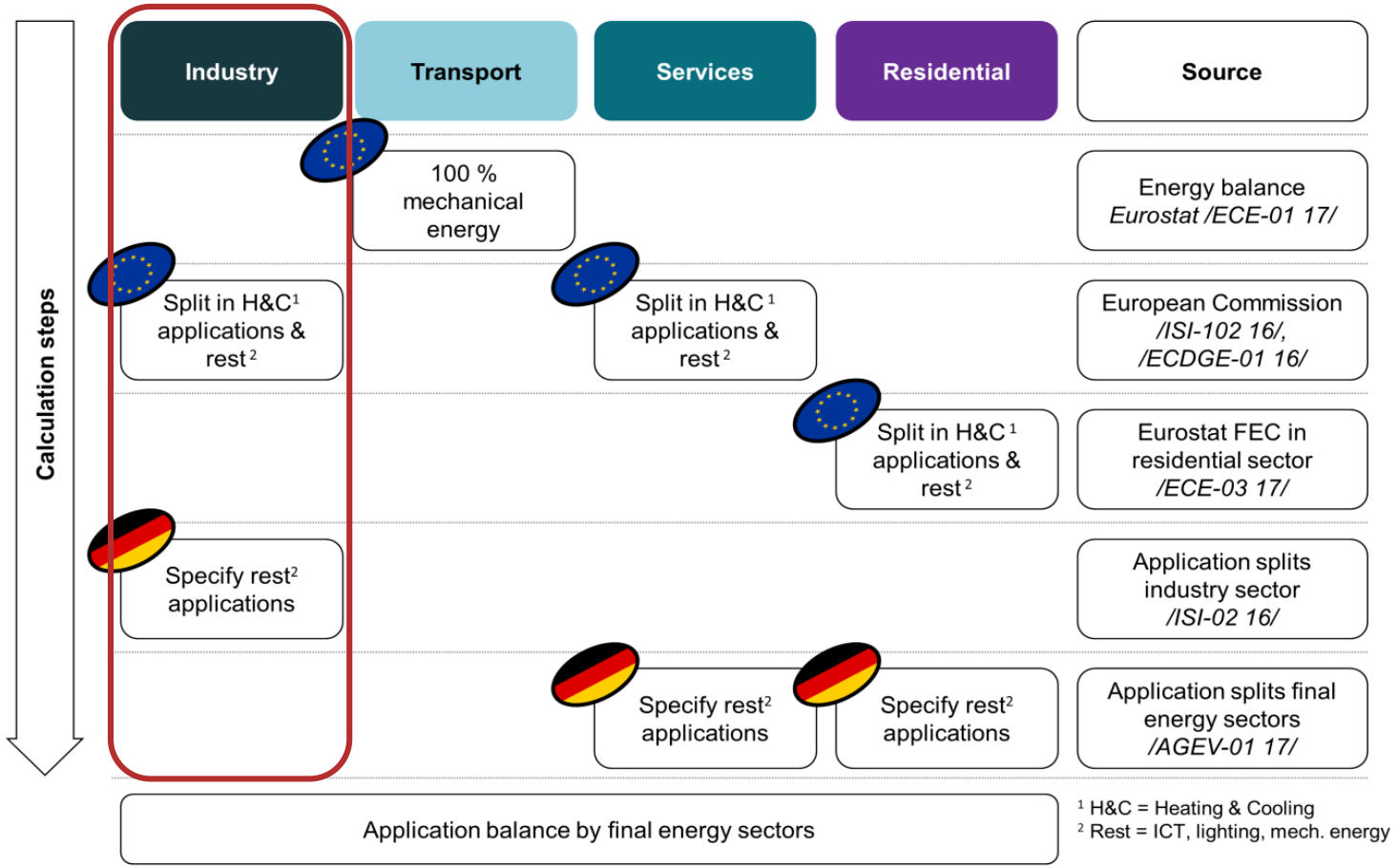
What it's all about…



The geographical scope is Germany plus ist electrical neighbours

Energy application balances build the basis for the development of demand-side scenarios

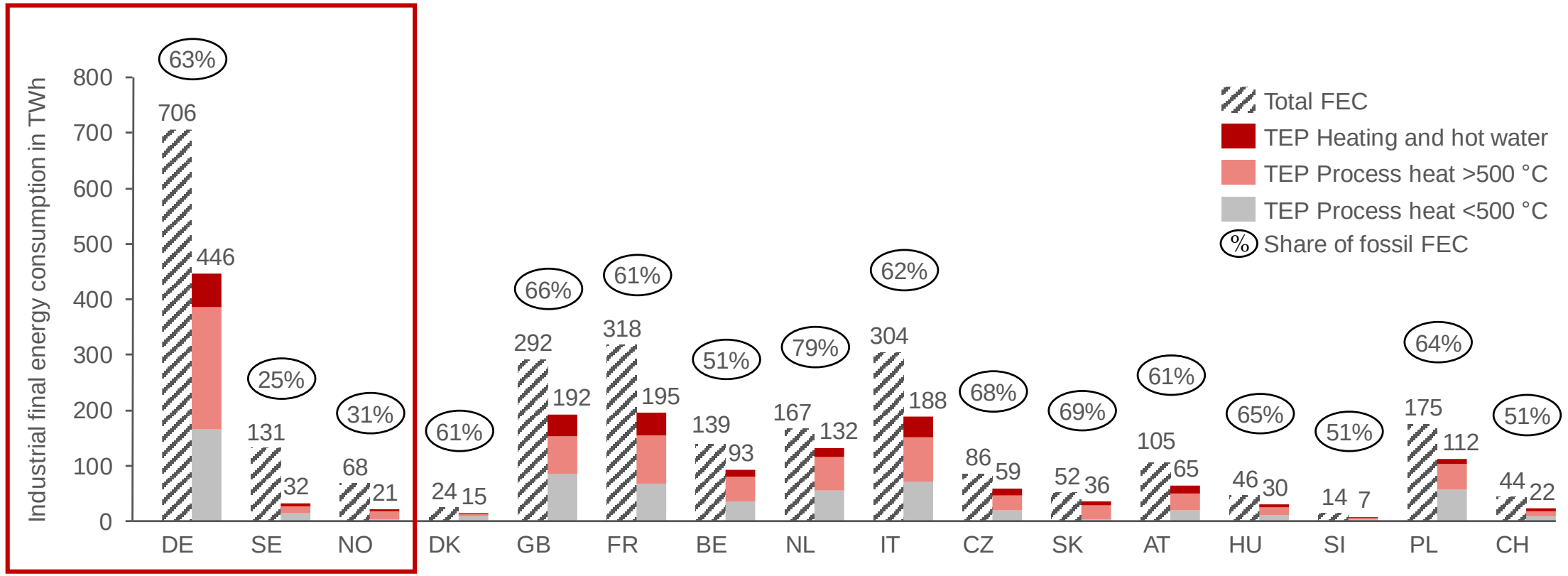
EU energy application balances → Electrification potential → Electrification costs → Decarbonization efficiency → Scenario regionalization



We calculated energy application shares for each industry branch and country

The share of renewable and electrical energy consumption varies between 21 % in the Netherlands and 75 % in Sweden (2014)

EU energy application balances | **Electrification potential** | Electrification costs | Decarbonization efficiency | Scenario regionalization



The focus of this presentation lies on low-temperature electrification <200 °C

Electrification costs are calculated based on high efficiency reference scenario

EU energy application balances | Electrification potential | **Electrification costs** | Decarbonization efficiency | Scenario regionalization

Perspective

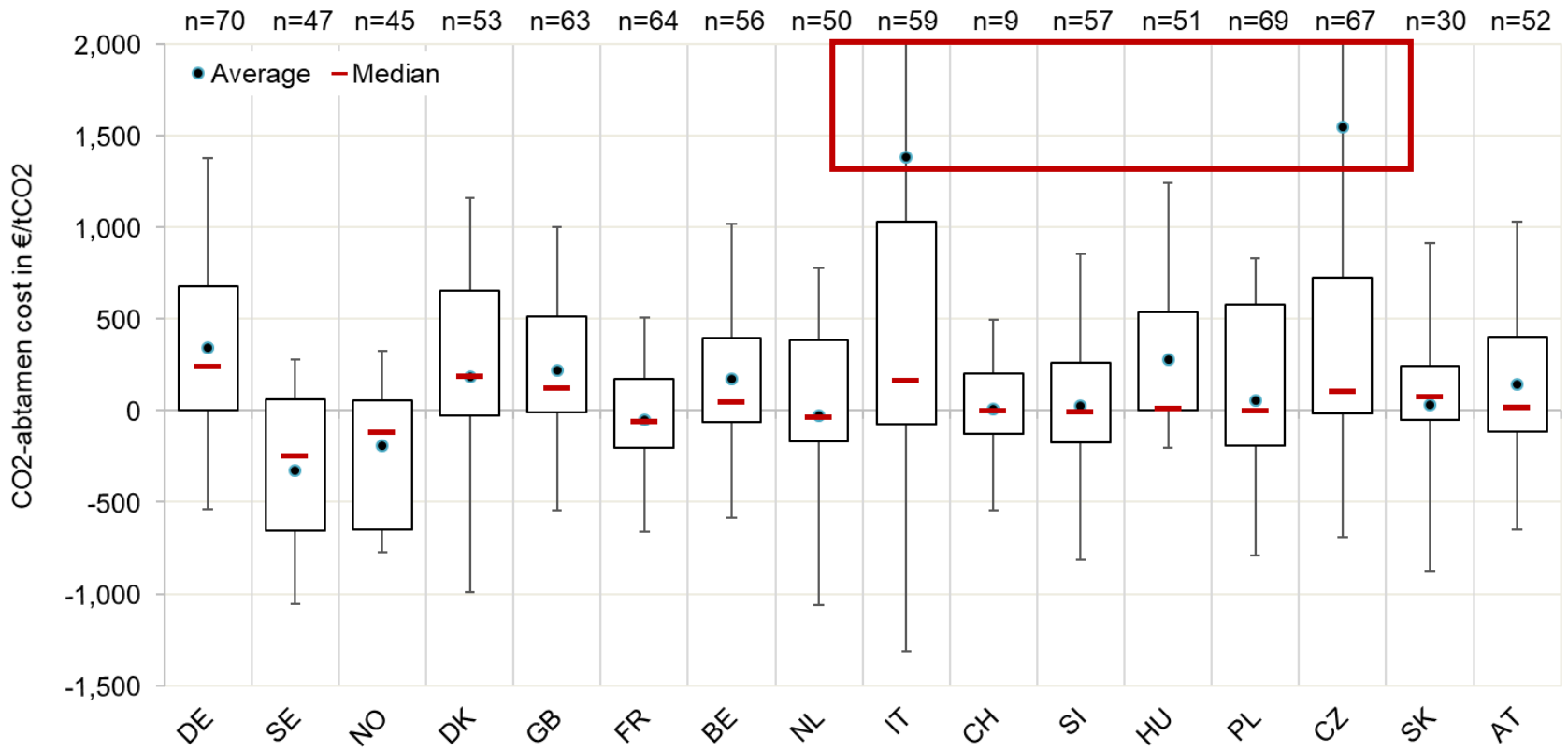
- Relevant costing approach
- Investor perspective: includes all cost components, which are visible to a company implementing the electrical end-use application
- CAPEX: industry branch specific discount rates (9 – 11 %)
- OPEX: country and industry branch specific energy carrier prices incl. taxes levies and surcharges as well as other operation and maintenance costs

Methodology

- Calculation of greenhouse gas abatement costs for electrification measures
- Basis for cost calculation is a high efficiency low sectorcoupling reference scenario
- Energy system reaction to electrification is not included in the costs calculation (idea for further research)
- Focus of the analysis is 2050; substitution rates are bound to the lifetime of existing applications

The costs perspective defines how results should be interpreted, the methodology shows the calculation methodology

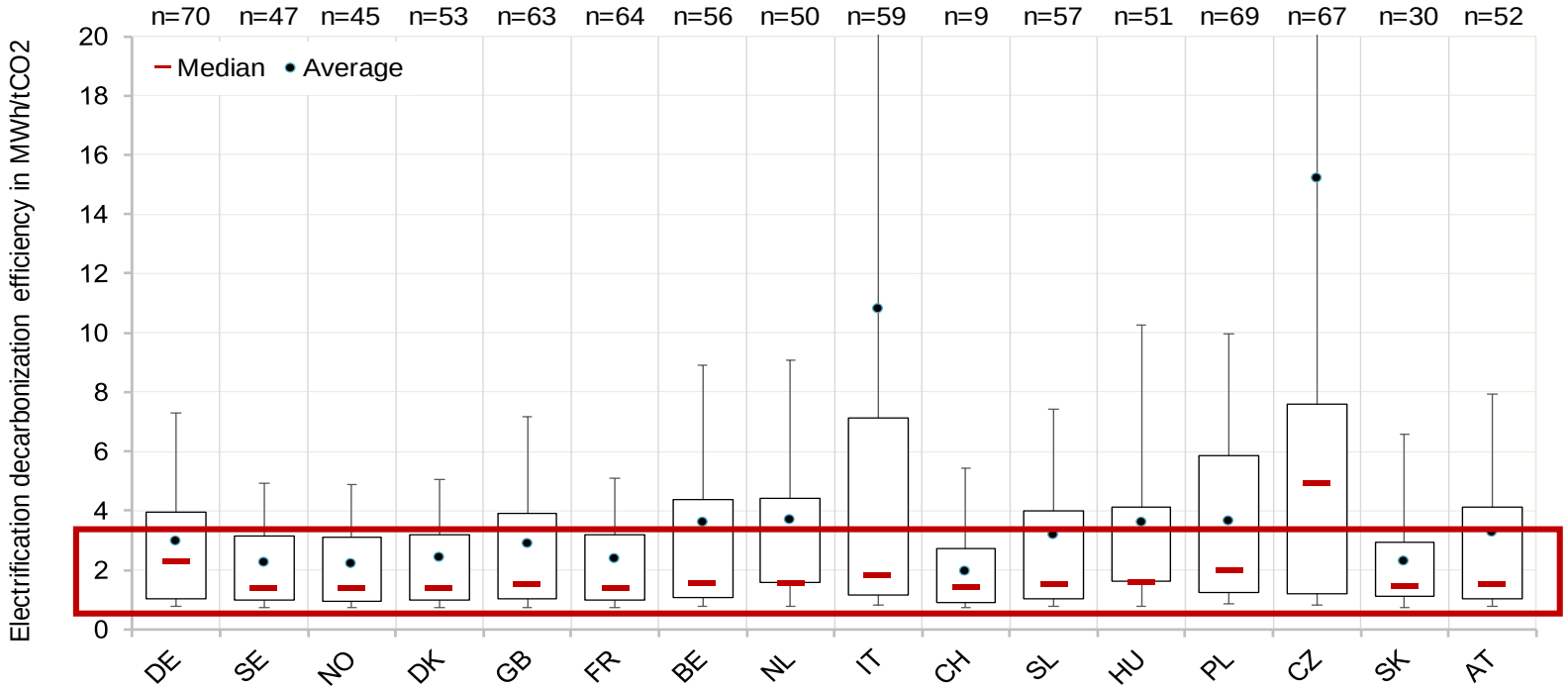
Extreme abatement cost values result from low emission reduction in combination with high energy carrier price differences (2050)



All values greater than 210 €/t_{CO2} appear only in the temperature band between 100 °C and 200 °C,

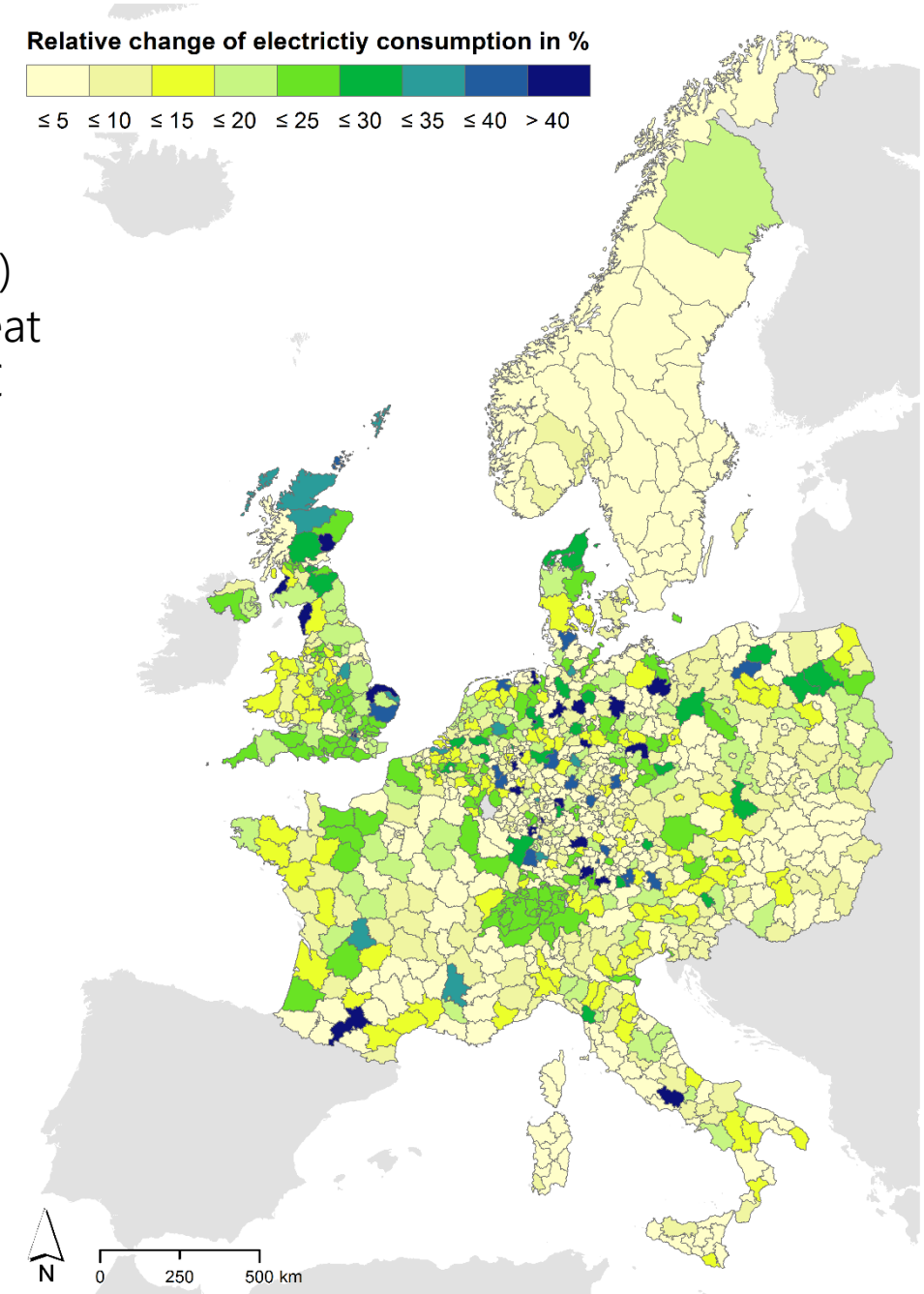
Electrification decarbonization efficiency: additional electrical energy demand per avoided ton of CO_2

$$Decarbonization\ efficiency = \frac{Additional\ electrical\ final\ energy\ consumption\ (MWh)}{Avoided\ emissions\ (t_{CO2})}$$



Maximum values result from electrification through electrode boilers and low differences between electricity and gasemission factors

Map (left)
Process heat
< 200 °C



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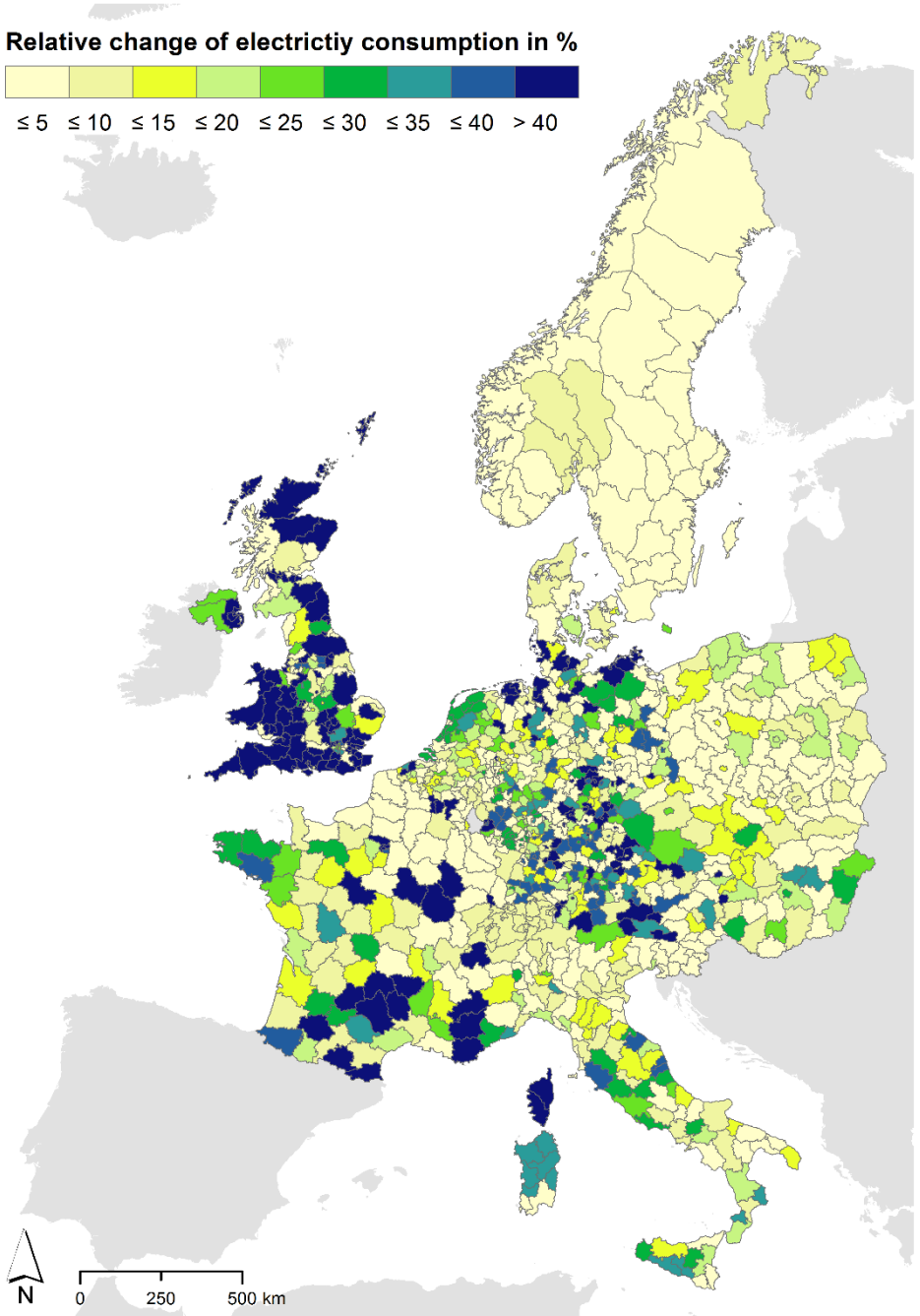

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Map (right)
Heating and
hot water

Any questions?
Contact me: aguminski@ffe.de