TECHNISCHE UNIVERSITÄT WIEN

Energy Economics Group

The costs of bioenergy use from forests in Austria – Scenarios up to 2050 – BIOSTRAT

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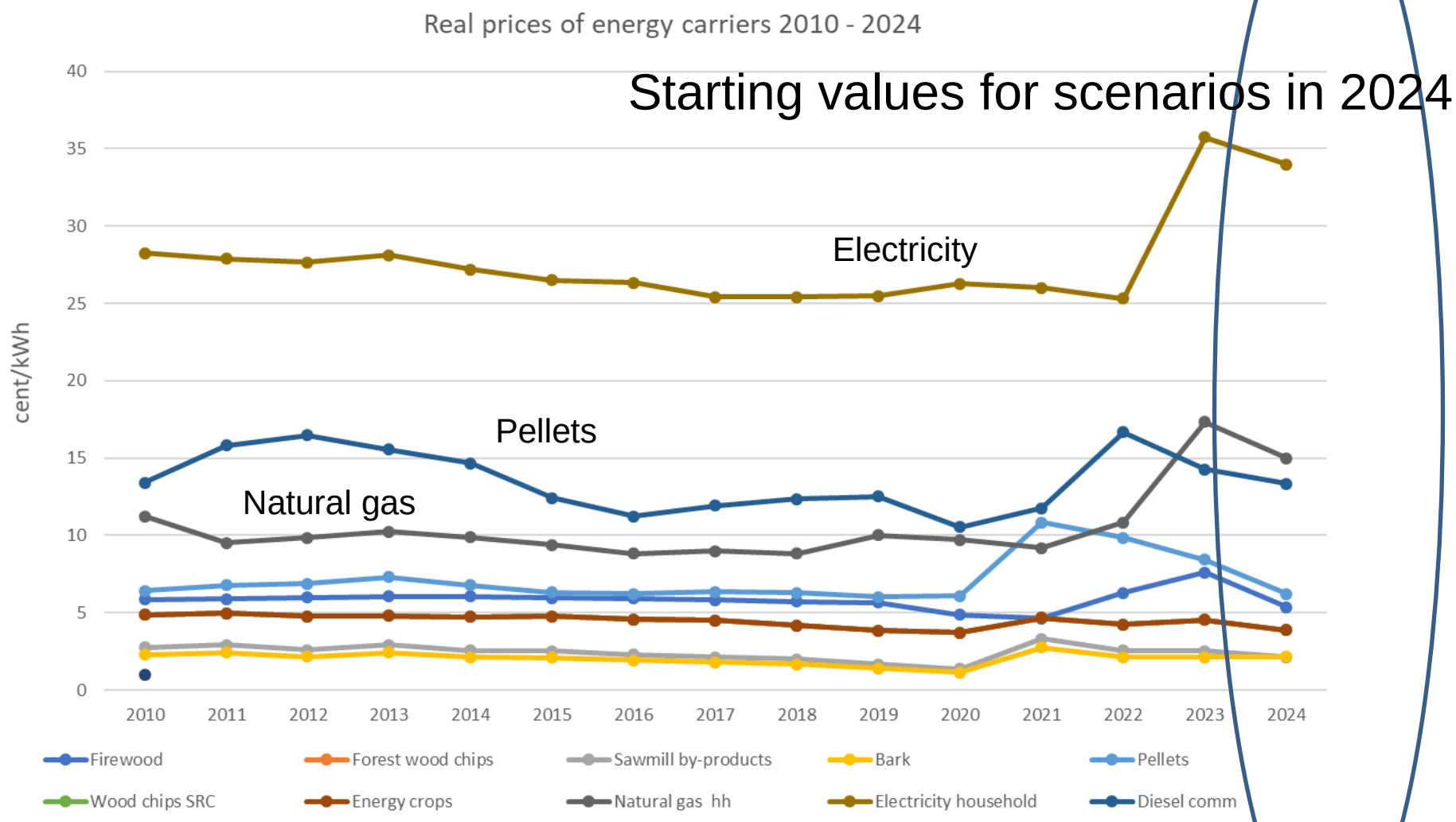
Introduction

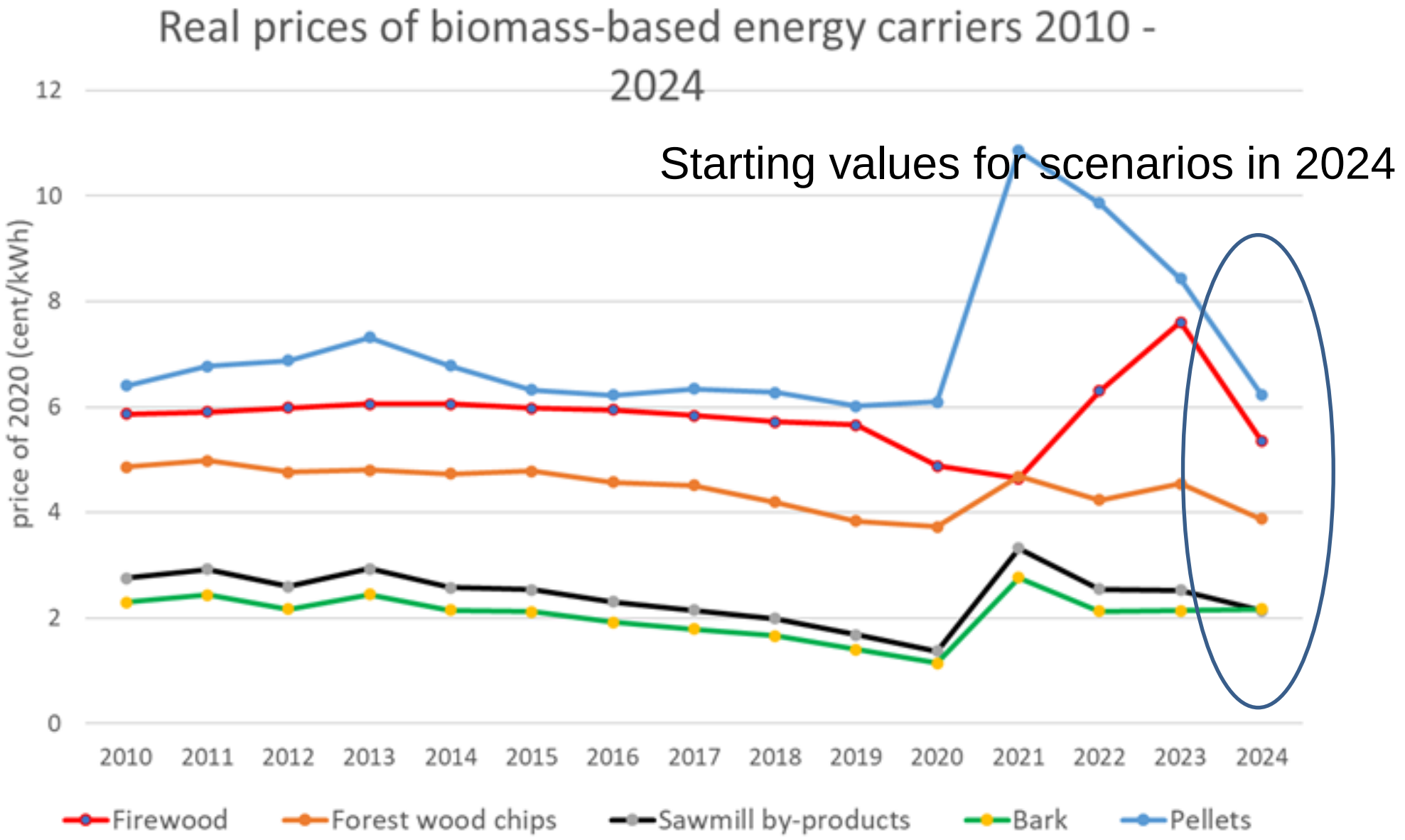
- Biomass may play an important role for the energy transition
- Analysis of the economics of different feedstocks for various end uses
- Assessment of the carbon emissions of biomass vs fossil fuels
- Estimation of static and dynamic sustainable potentials
- Analysis of prioritary end uses for biomass use
- Scenarios for developments up to 2050

Energy prices as of 2024

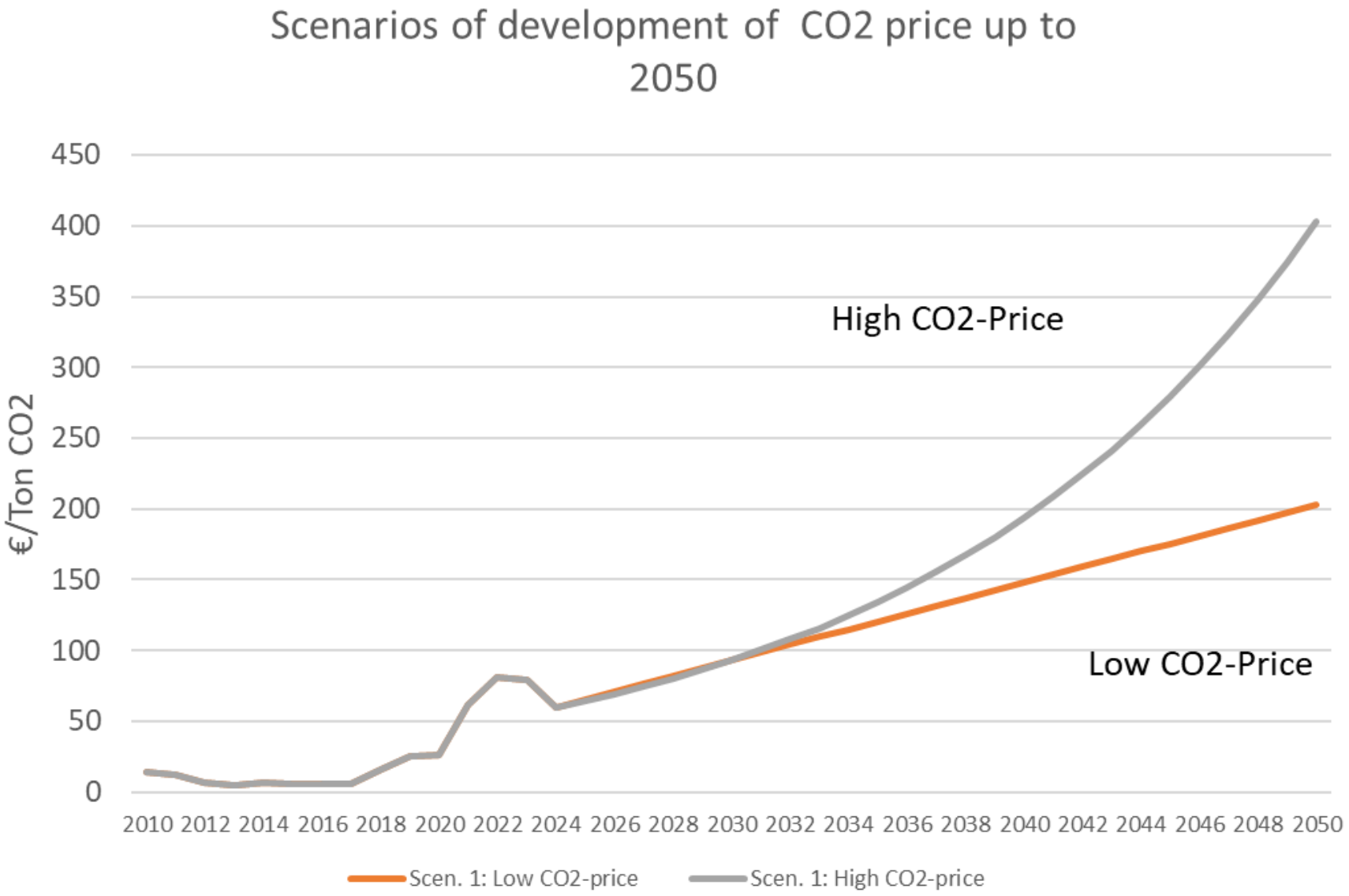


Starting values for scenarios in 2024

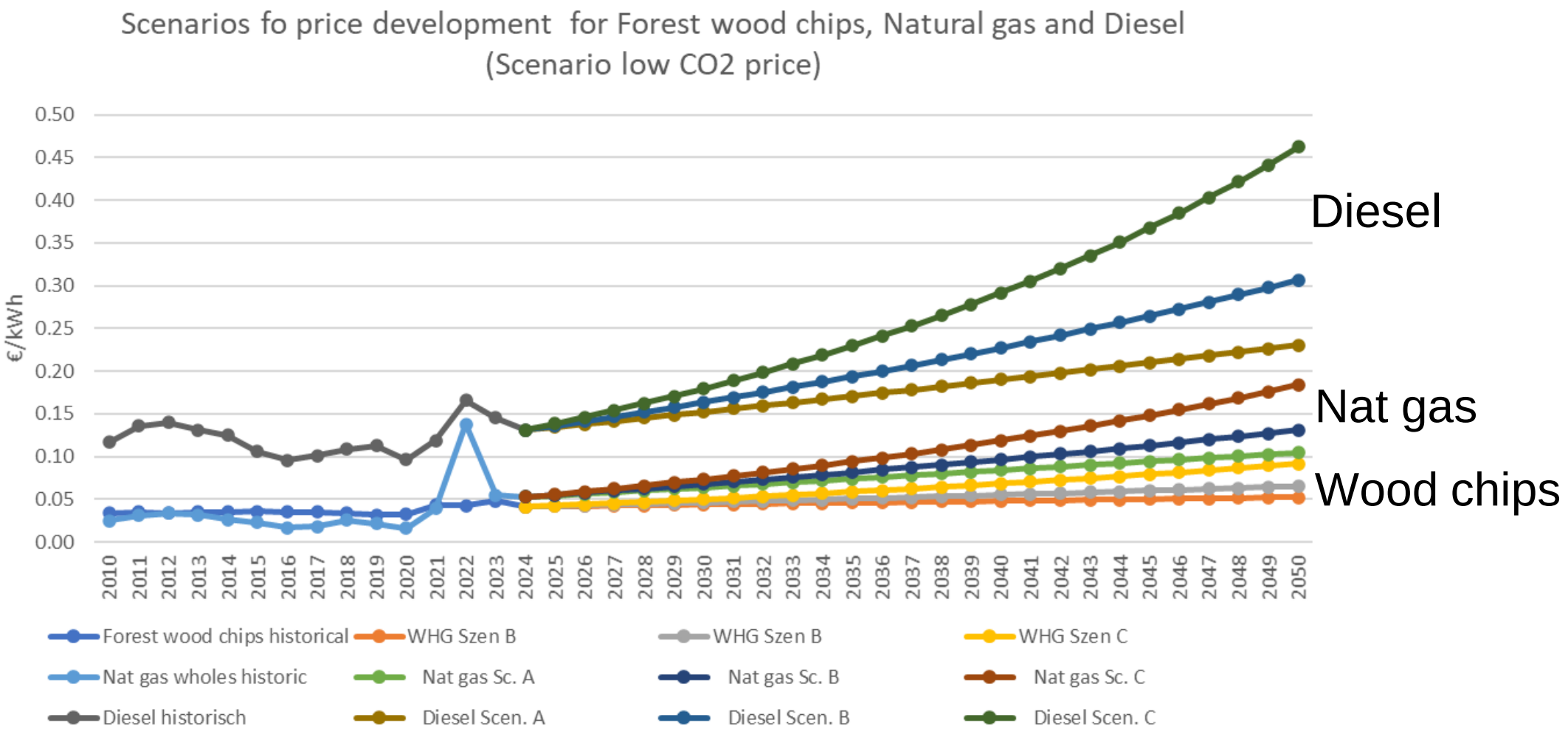
Energy prices as of 2024



CO2-price scenarios



Price scenarios



Sectors and end uses

- Residential SH& WH (incl. Agriculture)
- District heating
- Electricity generation (incl. CHP)
- Industry (high temp applications)
- Industry (low temp applications)
- Transport (FT-Diesel)

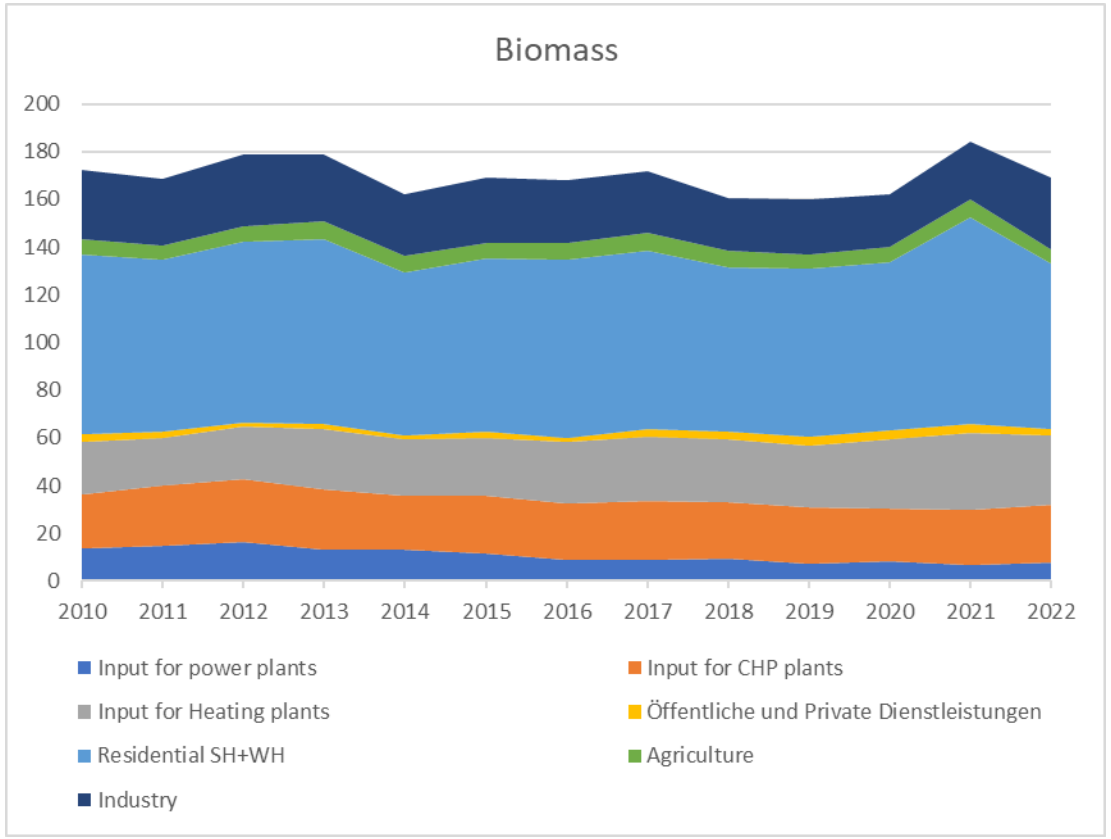


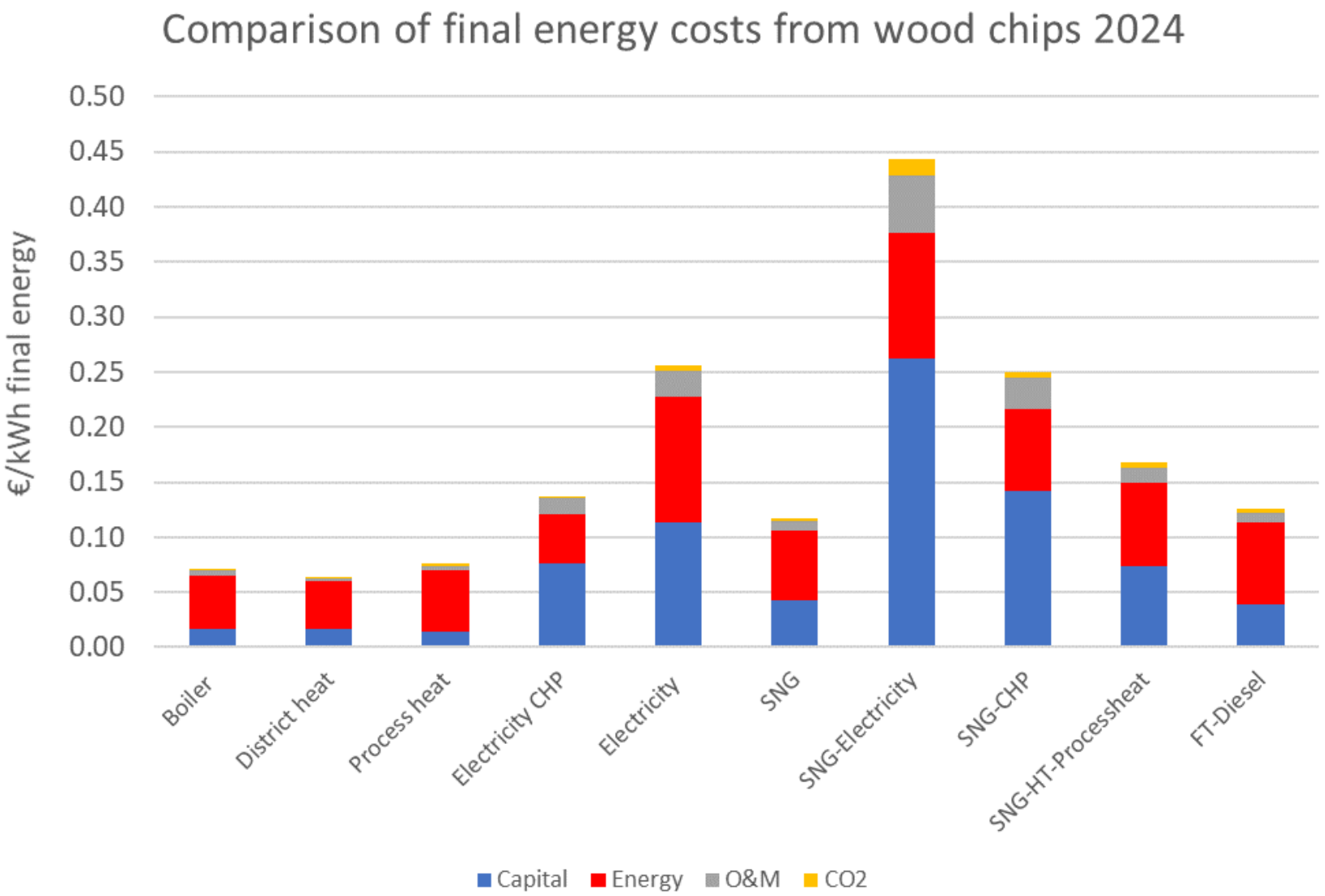
Table CO2-factors

kg CO2-eq/kWh														
	Strom	Strom + Wärme	Fernwärme	Prozesswärme (aus Produktgas)	Raumwärme	SNG	SNG Strom	SNG Strom + Wärme	SNG Hochtemperatur Prozesswärme	FT Produkt	Biogas Strom	Biogas Biomethan	Biomethan - Strom	Biomethan - Strom + Wärme
Brennholz					0.0201									
Waldhackgut	0.0650	0.0223	0.0246	0.0634	0.0381	0.0631	0.1881	0.0823	0.0796	0.0718				
SNP	0.0415	0.0135	0.0158	0.0407		0.0474	0.1422	0.0622	0.0611					
Rinde	0.0344	0.0109	0.0132	0.0368		0.0442	0.1343	0.0587	0.0579	0.0496				
Pellets	0.0784	0.0273	0.0296		0.0581									
Hackgut KUP	0.0690	0.0238	0.0261	0.0673		0.0659	0.1961	0.0858	0.0895					
Miscanthus	0.0749	0.0260		0.0736										
Wirtschaftsdünger											0.1892	0.0616	0.1839	0.0804
Bioabfälle											0.1640	0.0540	0.1622	0.0710
Altholz	0.0420	0.0137	0.0160	0.0424		0.0482	0.1457	0.0637	0.0628	0.0543				

E.g. SNG production 0.044 - 0.066 kg CO2/kWh

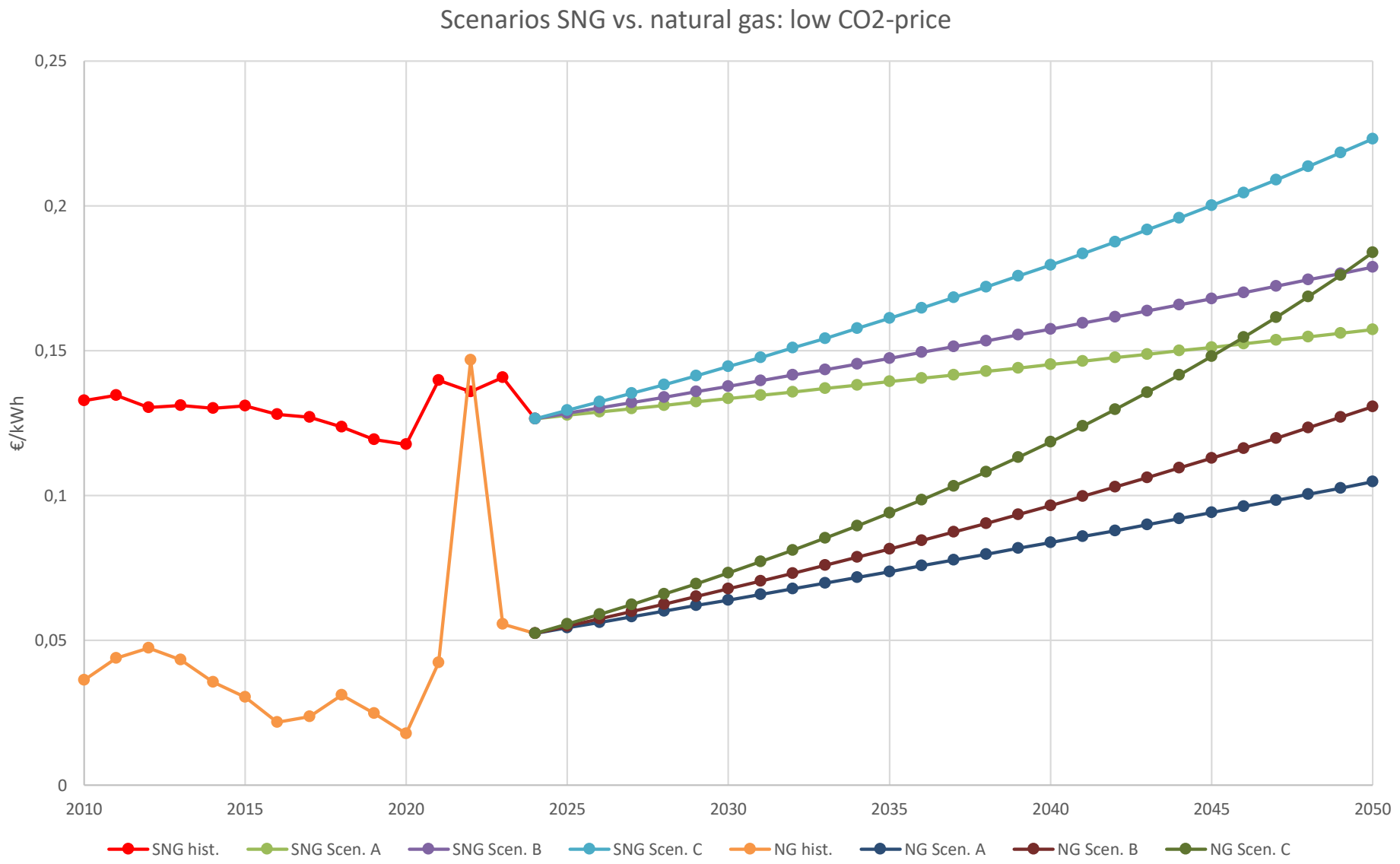
Natural gas: 0.249 kg CO2/kWh

Cost structures Final energy from wood chips 2024

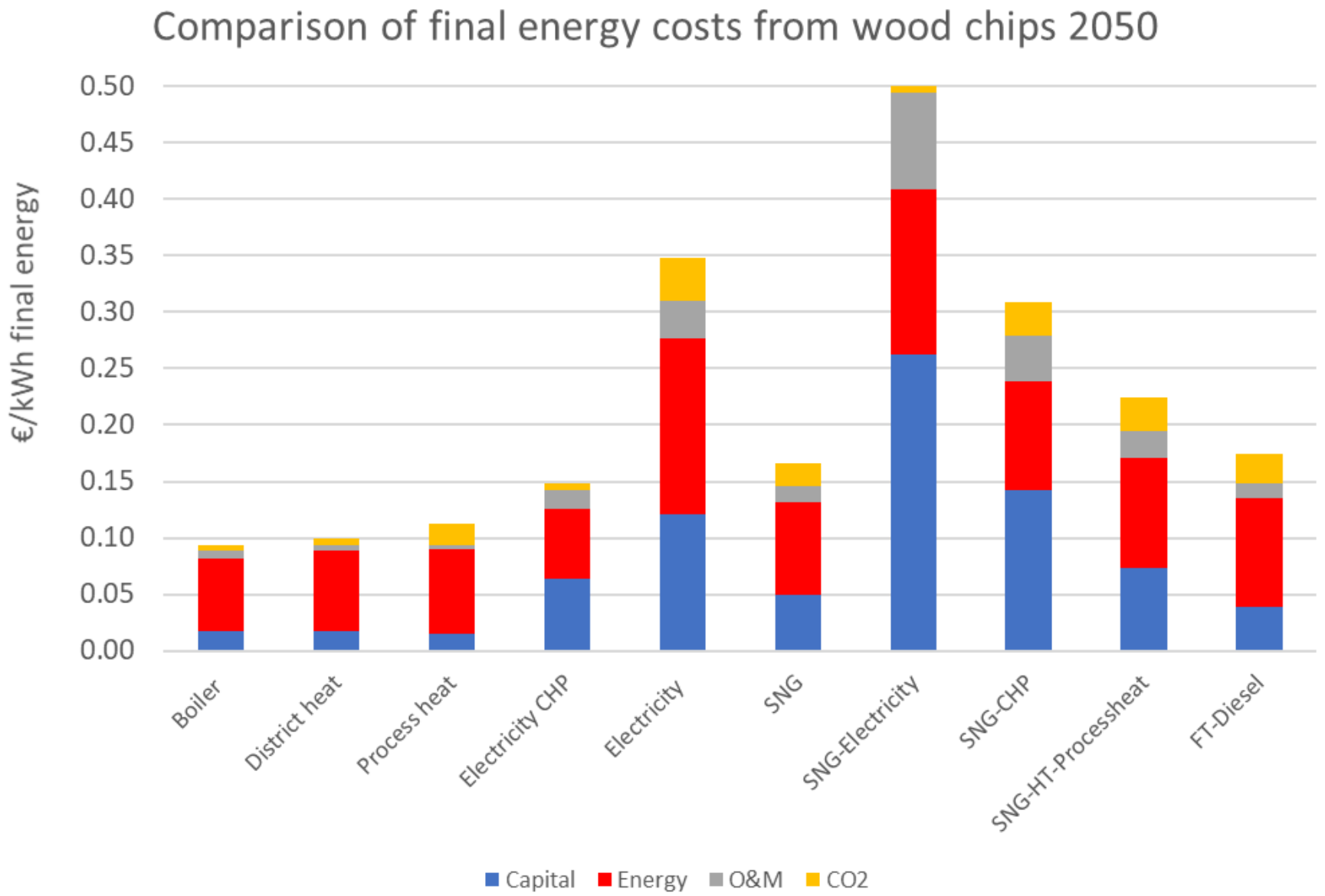


Comparison of total costs from wood chips vs natural gas/diesel 2024

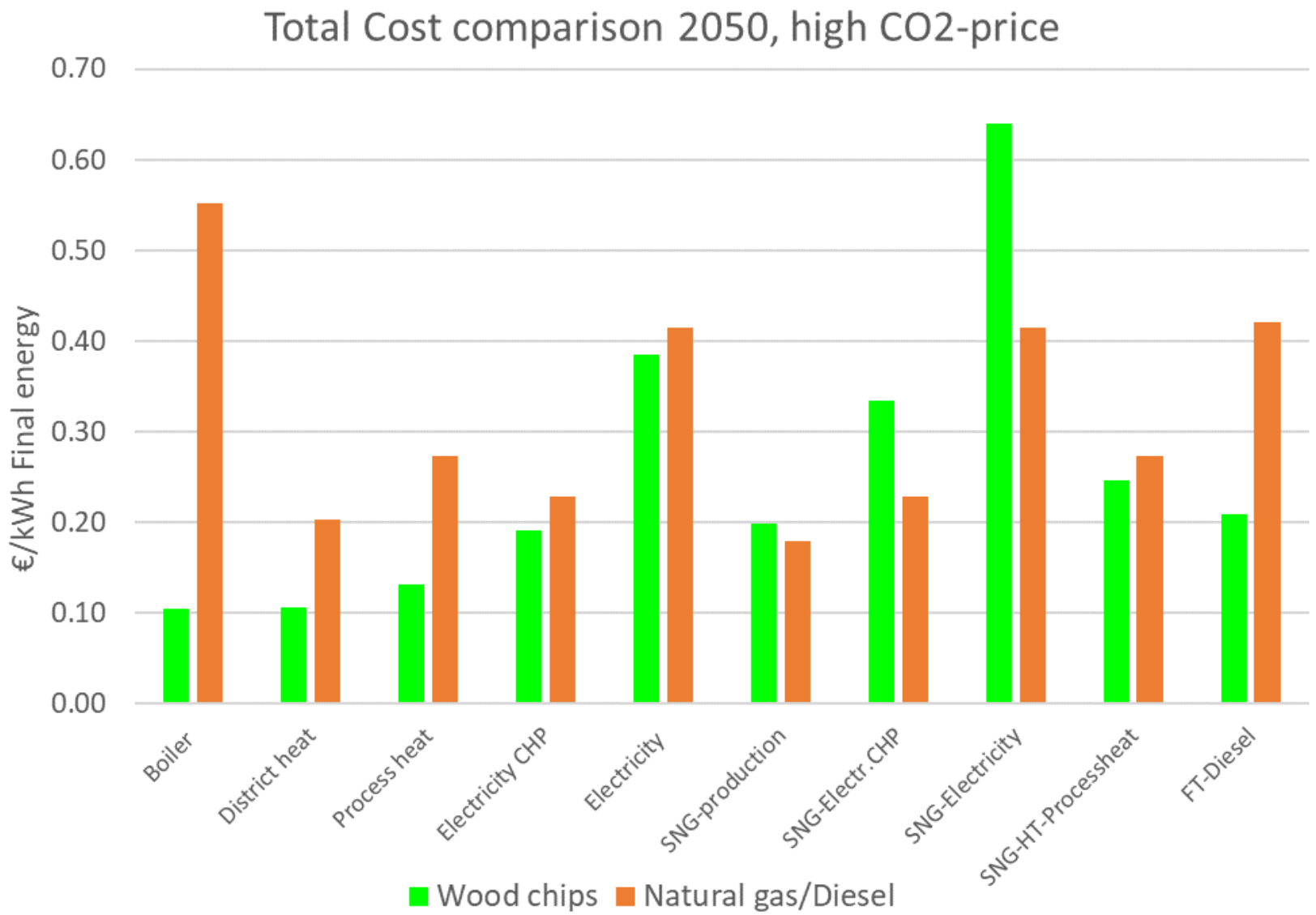
Scenario SNG from forest wood chips vs natural gas



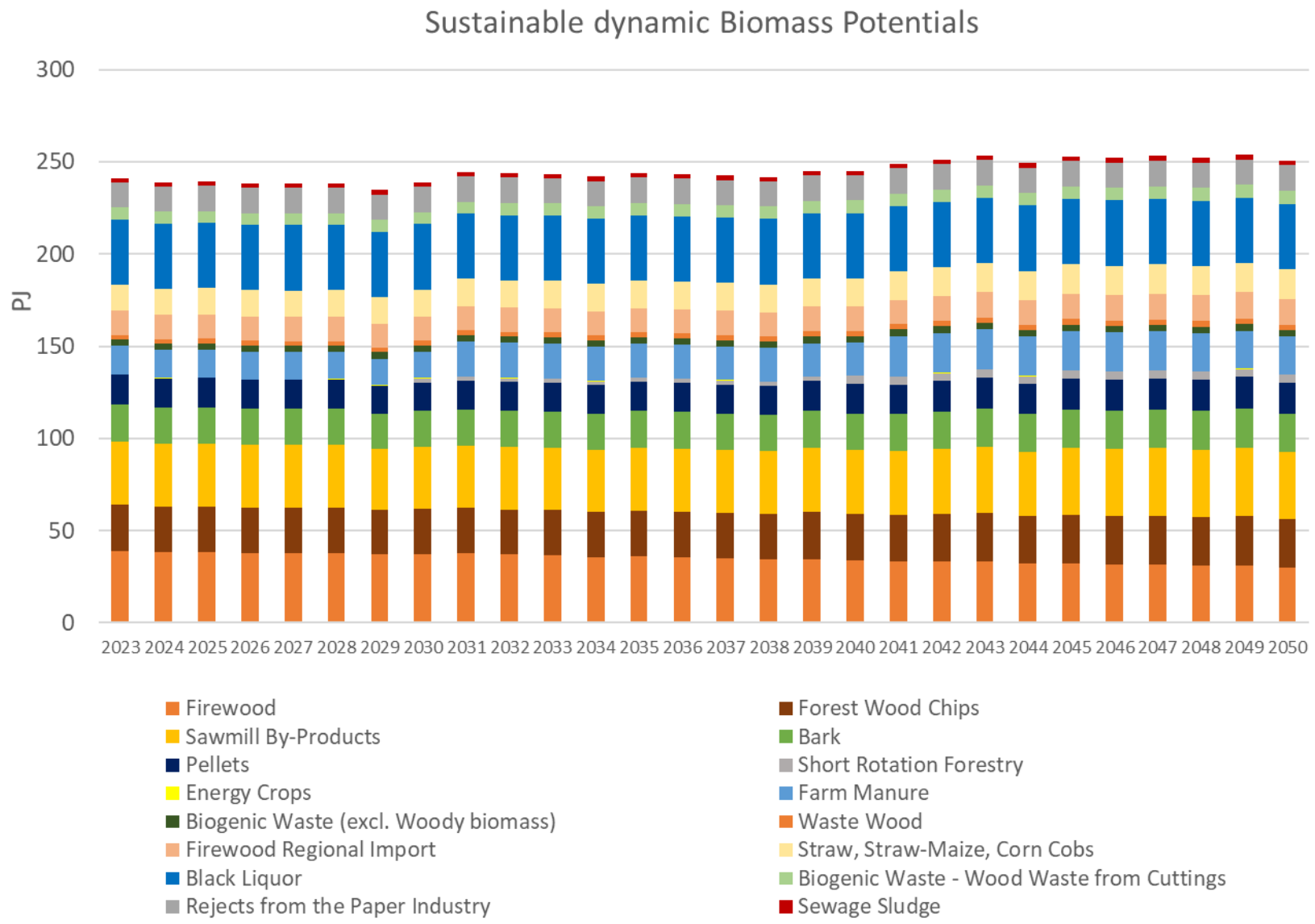
Cost structures Final energy from wood chips 2050



Comparison of total costs from wood chips vs natural gas/diesel 2050



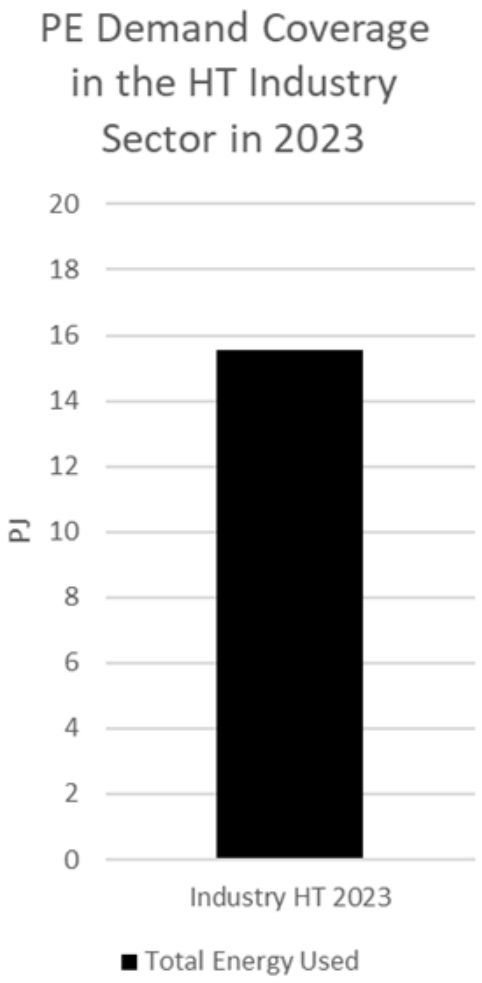
Sustainable dynamic biomass potentials

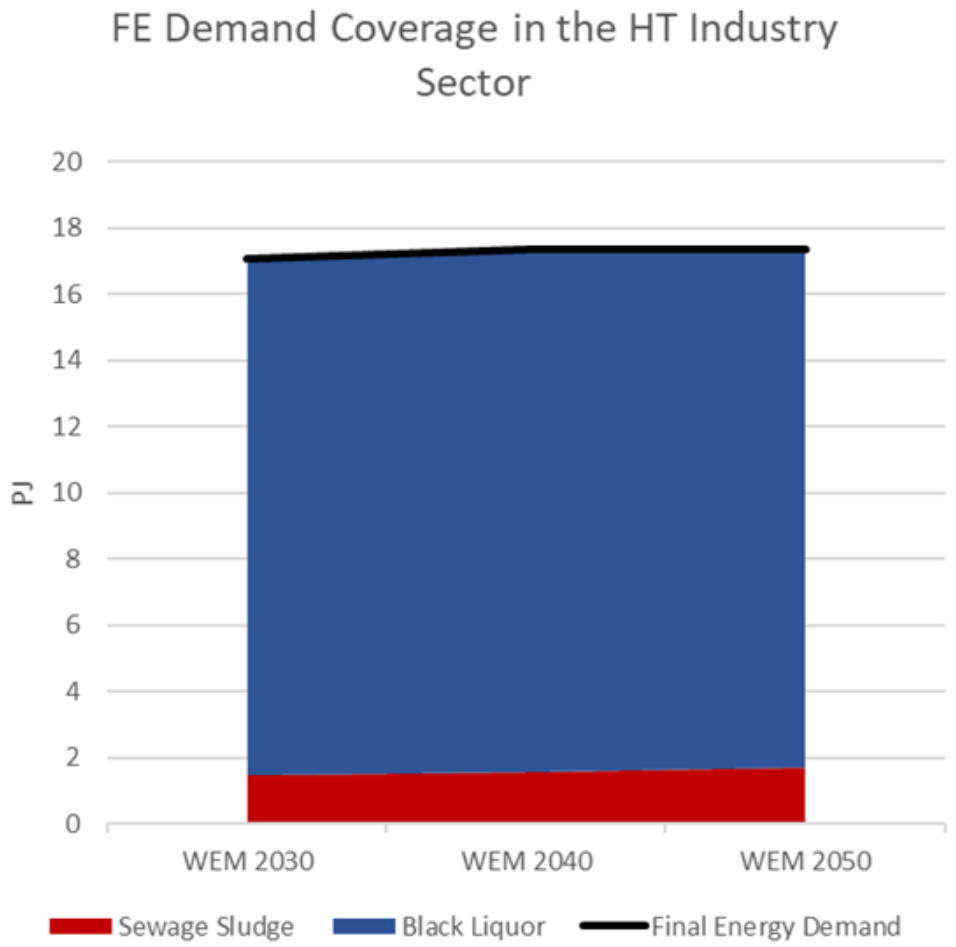


Method

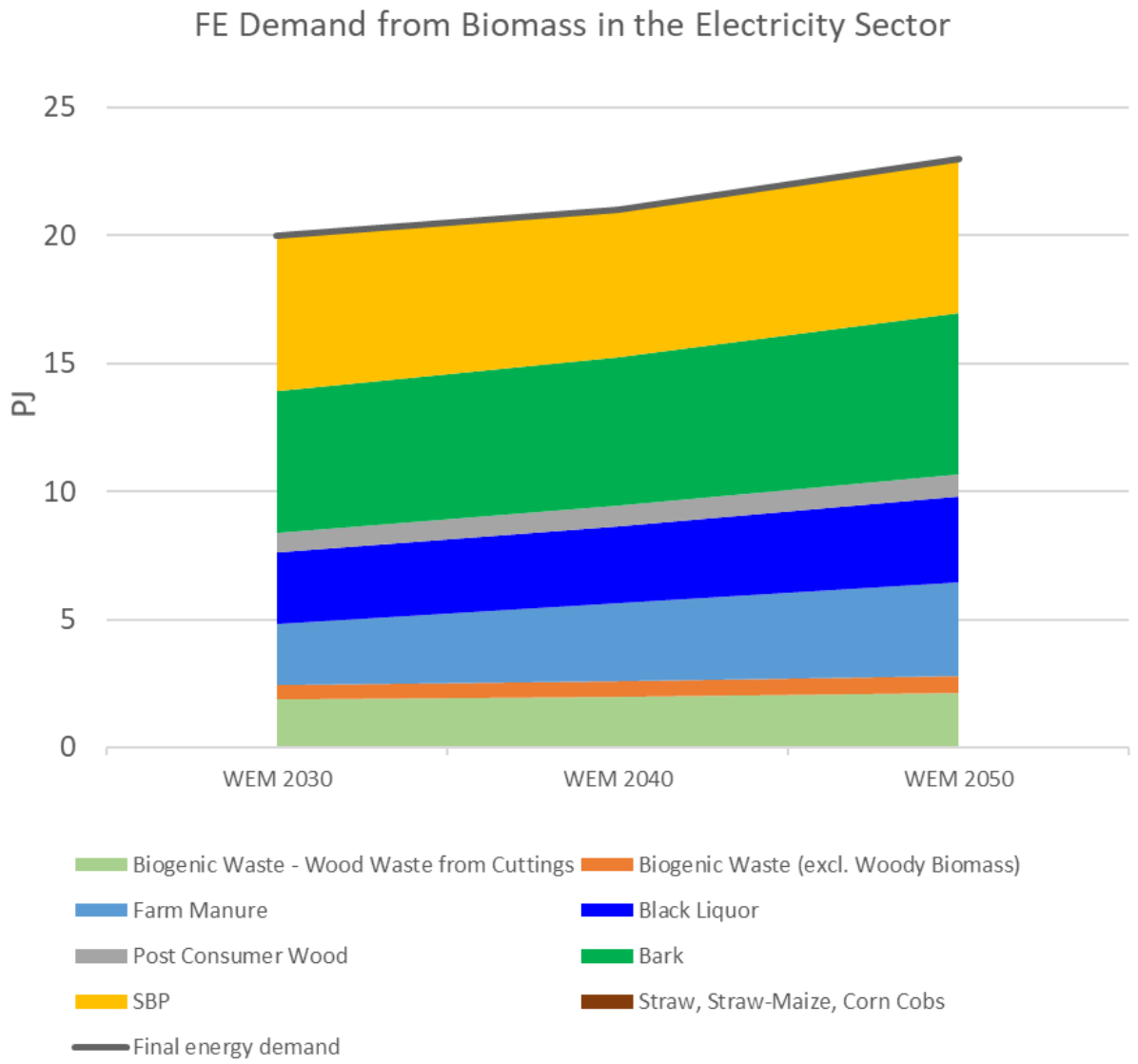
- Setting a prioritization order for the sectors
  1. Industry HT (28% of whole Industry sector)
  2. Electricity (CHP)
  3. District Heat
  4. Industry LT (remaining 72%)
  5. Buildings
  6. Transport

HT- Industry biomass energy demand scenario

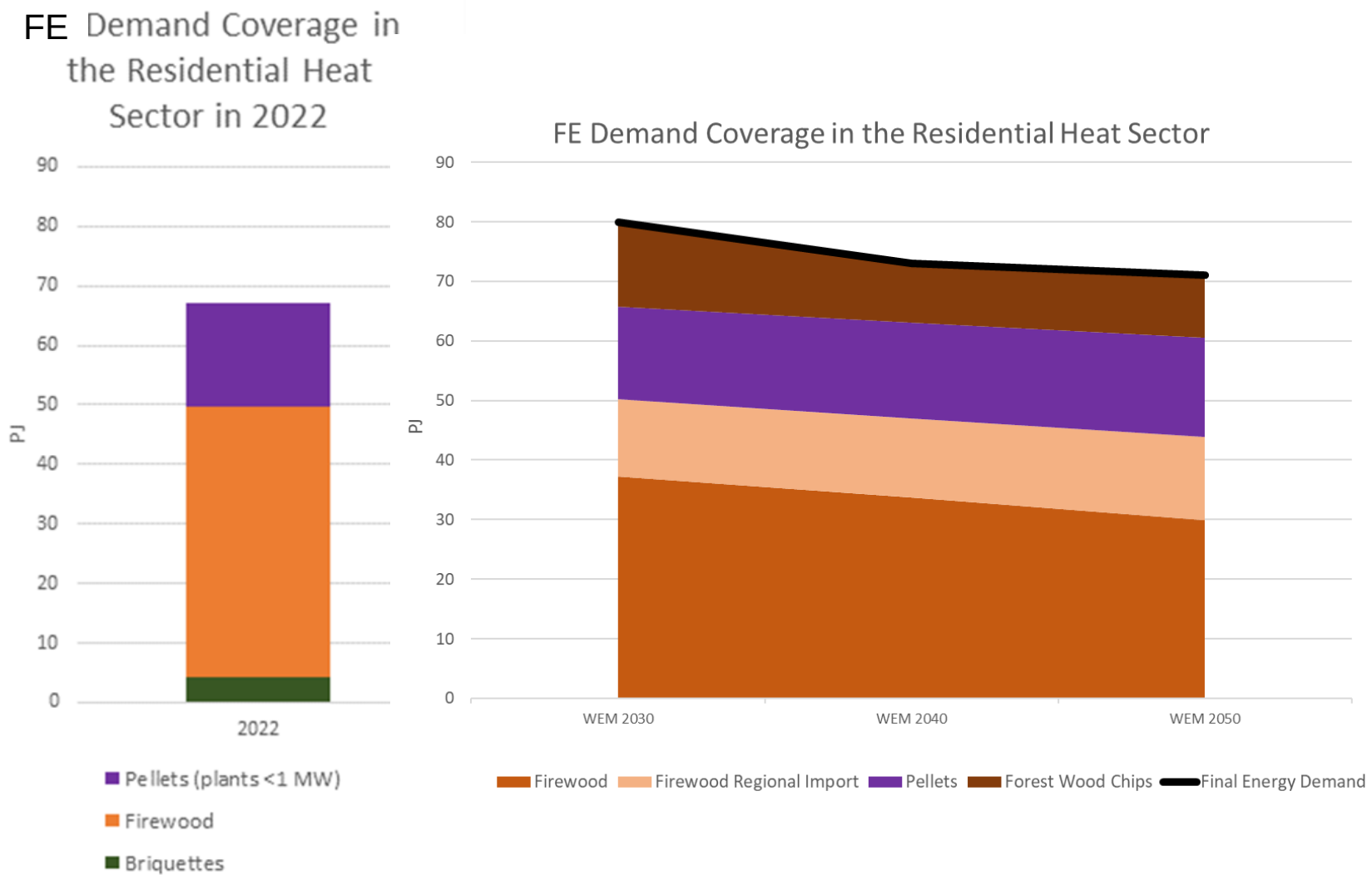




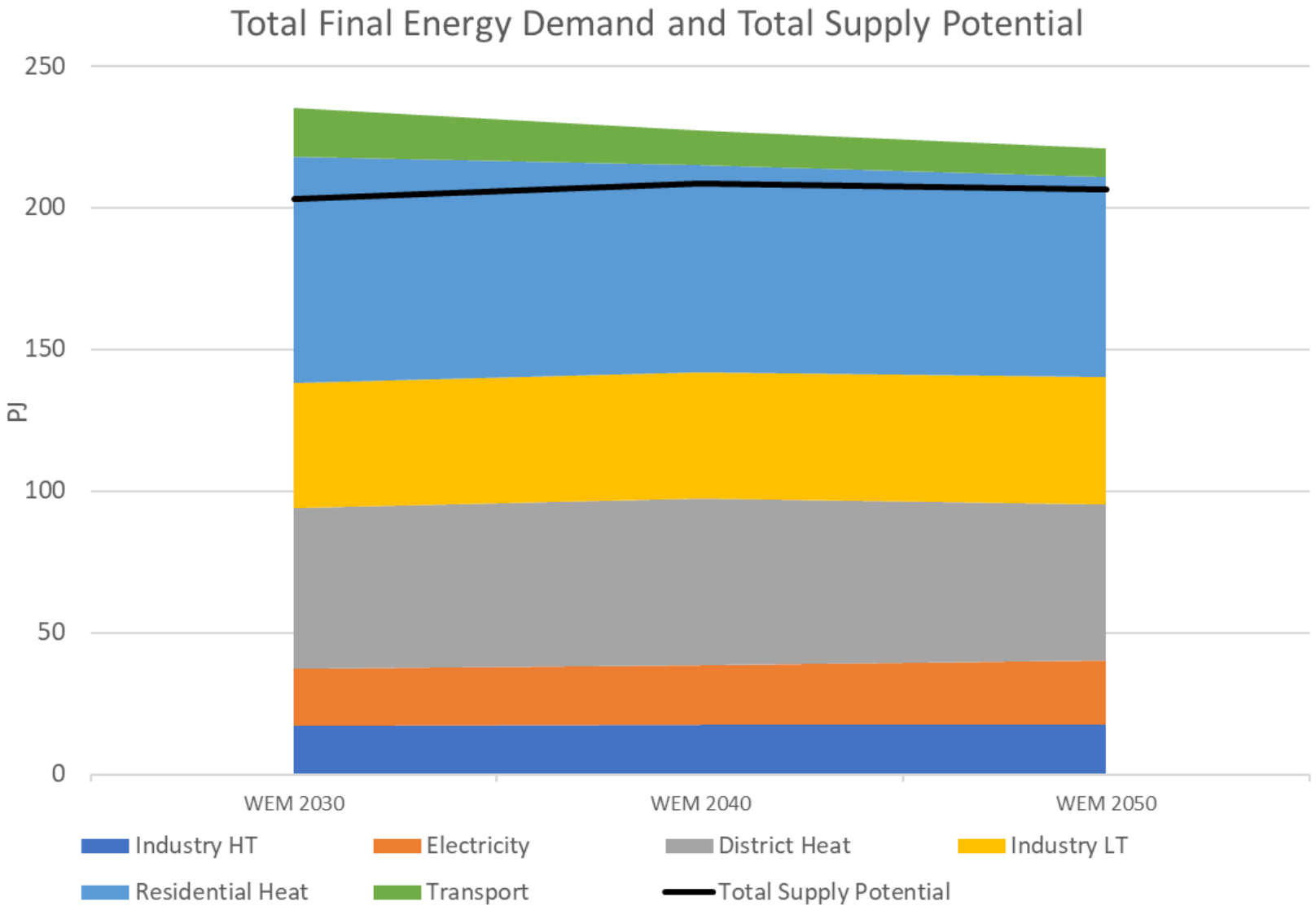
Elecricity biomass energy demand scenario



Residential heat biomass energy scenarios



Total biomass energy demand scenarios



Recommendations for priority use of biomass :

1. If there is a binding Zero carbon target in Austria then there is a priority set by policy for biomass (mainly based on black liqueur as cheapest) in the high temp industry
2. Next priority is for CHP electricity to cover demand in winter time (mainly from Saw by-products and bark)

3. In the local district heating sector (Nahwärme) biomass will be used mainly as currently (without regulation) from forest wood chips

4. The biomass left will be used in a B-Up approach competitively in the following sectors: new DH, boiler, low temp industry

5. Transport sector: What will change for biofuels? 1st gen biofuels up to 2040 → no need for FT diesel from biomass

Results and Conclusions

1. Heat economic preferable

   Cost differences between biomass heat and natural gas will inrease in future (in favour of biomass)

2. Electricity generation from wood chips in CHP

   Almost competitive, some subsidies necessary

3. Electr generation w/o heat use

   Not at all recommended, Only in extreme situations

4. SNG for Electricity generation

   Not at all recommended, to expensive and inefficient

5. SNG for industry high-temp heat

   Recommended, maybe to be subsidized