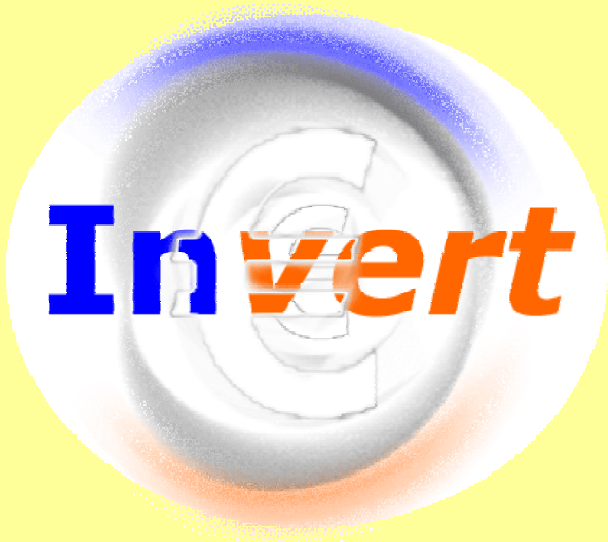
Case studies: applying the Invert simulation tool



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Regions investigated in the project Invert

- Crete (Greece)
- Baden-Württemberg (Germany)
- Jordanow (Poland)
- Vienna (Austria)
- Denmark
- Cornwall (UK)
- French illustration example

Sectors investigated within the project Invert

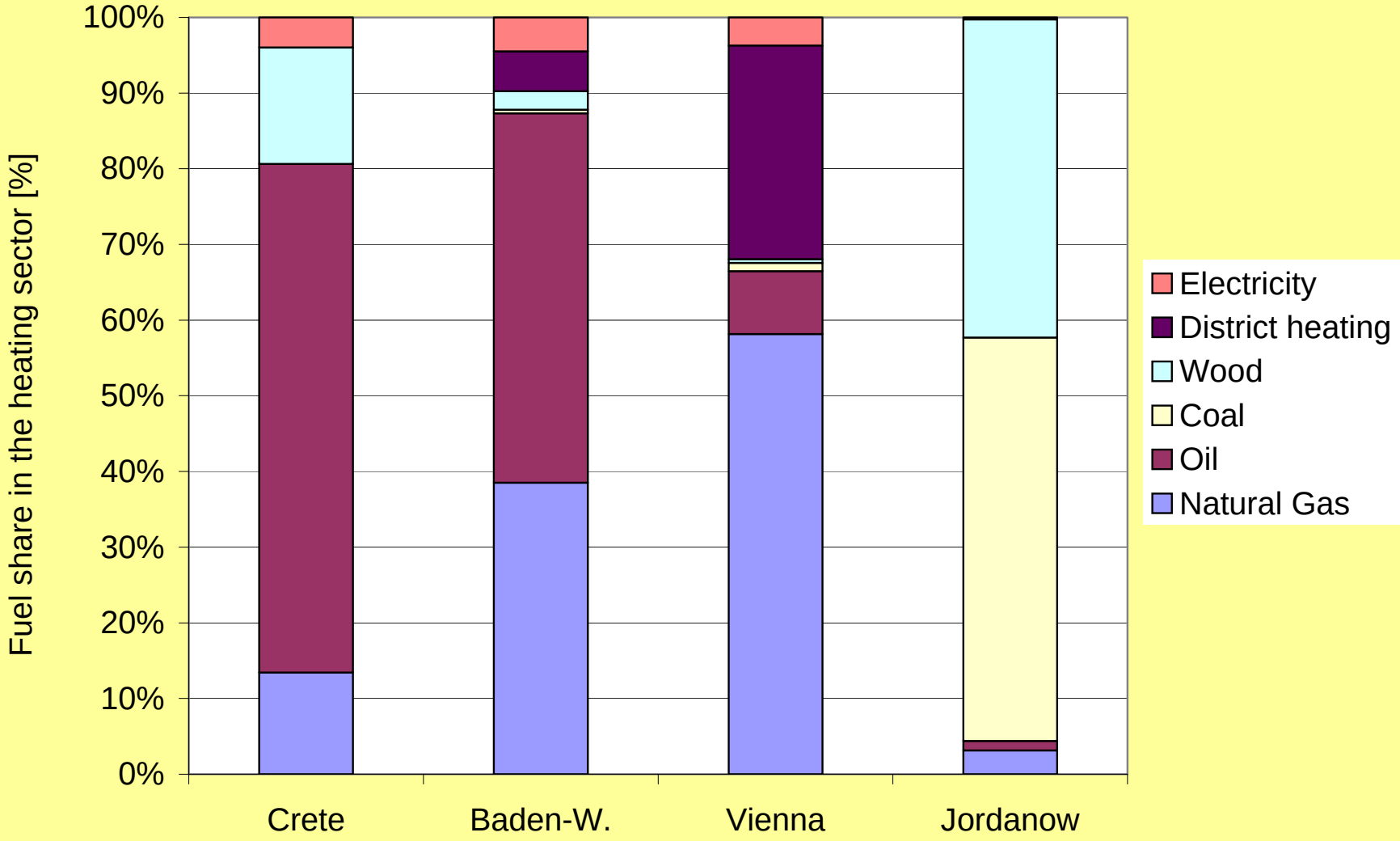
- Buildings
  - Heating
  - Domestic hot water (DHW)
  - Demand Side Management (DSM)
- Electricity
- Biofuels for transport

Detailed data base on existing building stock and heating systems necessary

Case study regions - overview

	Vienna	Crete	Baden-Württemberg	Jordanow	
Area	415	8,300	35,751	194	km²
Population	1,660,000	601,131	10,700,000	21,664	Inhabitants
Number of households	805,900	290,000	4,800,000	7,500	

Fuel share in the heating sector / regions are rather different



General features of the results obtained with Invert

- Analysis of the shift among energy carriers
- Analysis of the interplay between RES and RUE
- Assessment of the effect of different kind of support schemes on public budgets
- The CO_2 emission reduction efficiency can be assed in terms of the "budget relevant spending" in a specific period – policy makers perspective
- Willingness to pay can be considered by "soft barriers" / calibration of soft barriers with historic data possible
- Model should not be used as a "black box"

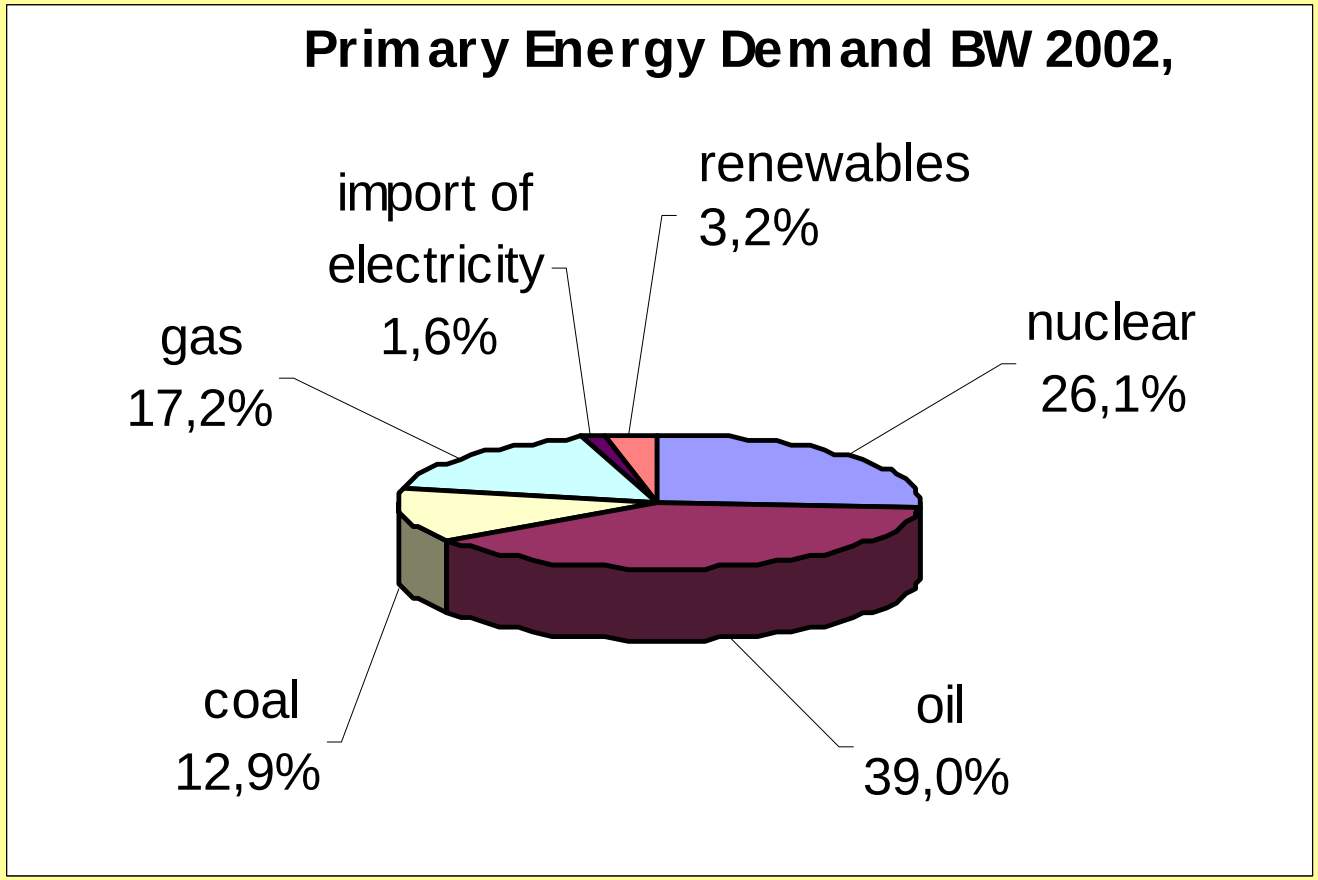
Correct definition of the reference case – the crucial basis for using Invert

Key inputs are:

- **Future evolution of fossil and biomass energy prices**
- **Interest rate determining the investment decision of households**
- **Full representation and extrapolation of the existing support measures**
- **Assumptions on CHP share in electricity generation**
- **Future development of building stock and insulation quality**

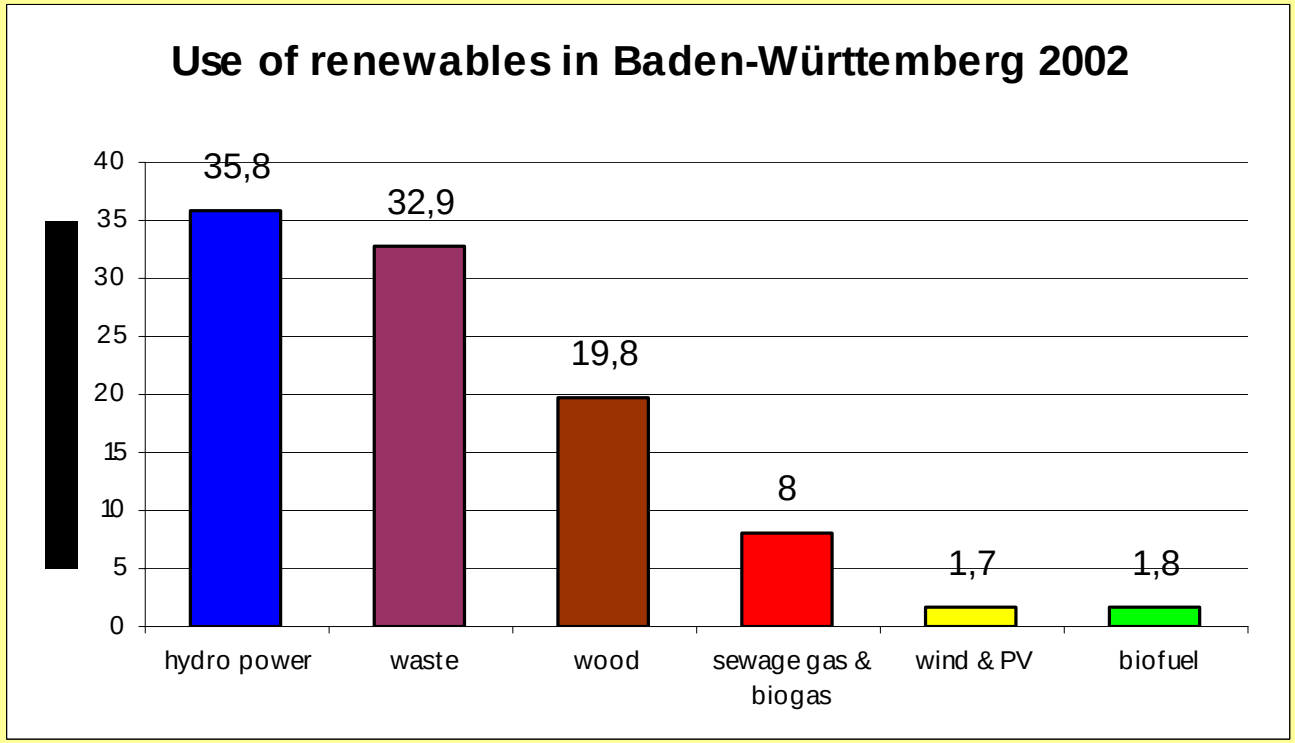
Baden-Württemberg – overview (1)

Total primary energy demand: 450 TWh/yr

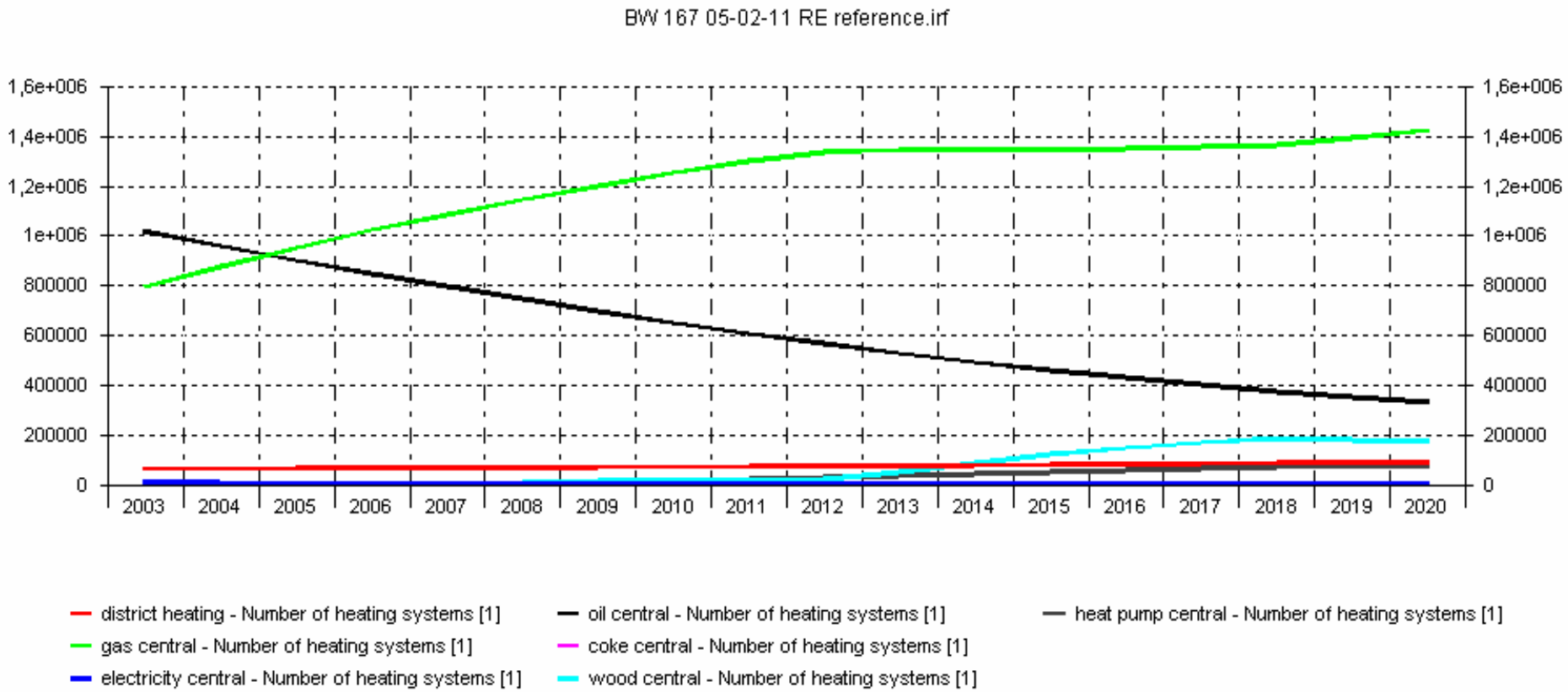


Baden-Württemberg – overview (2)

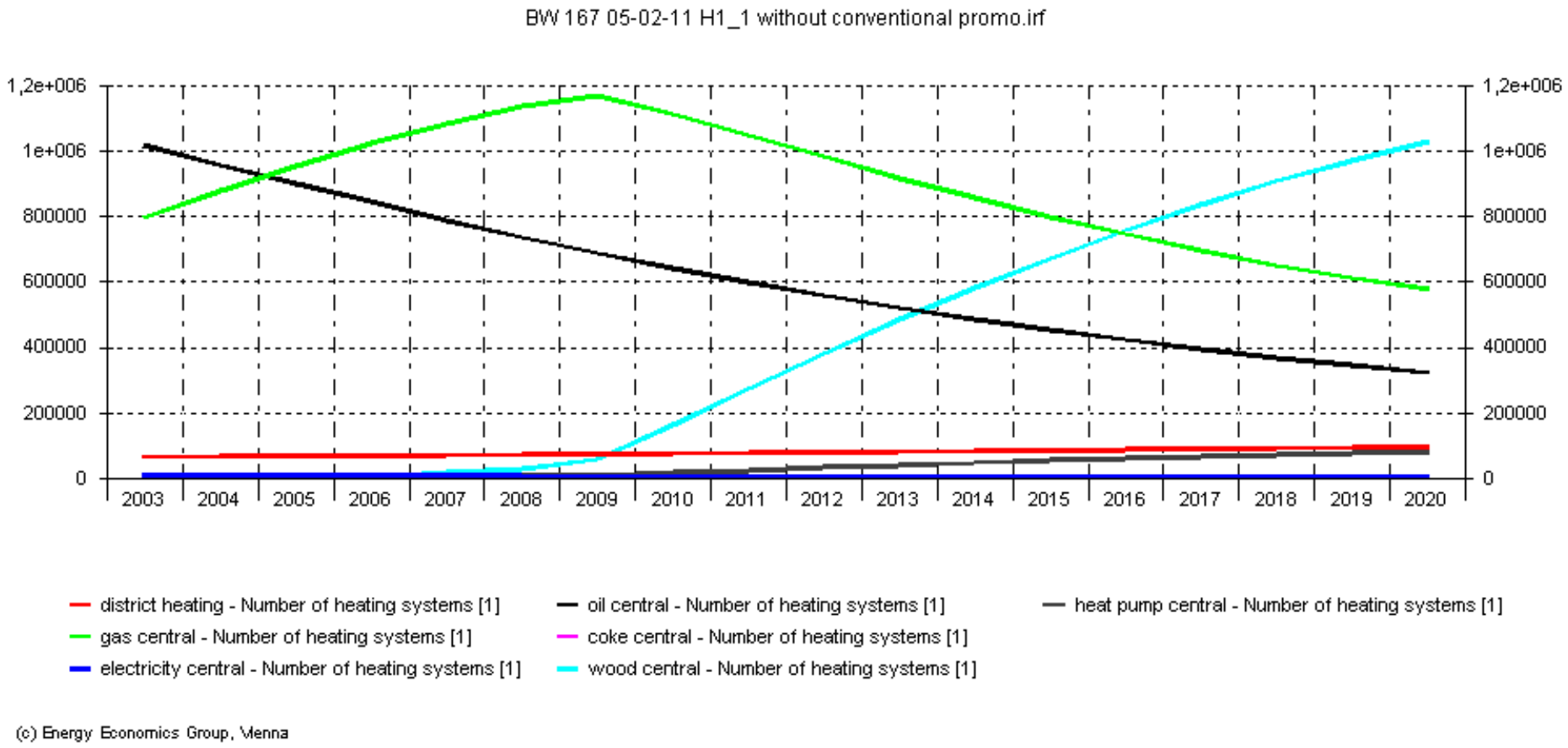
Total renewables: 14,3 TWh/yr (3%)



Baden-Württemberg – reference scenario heating

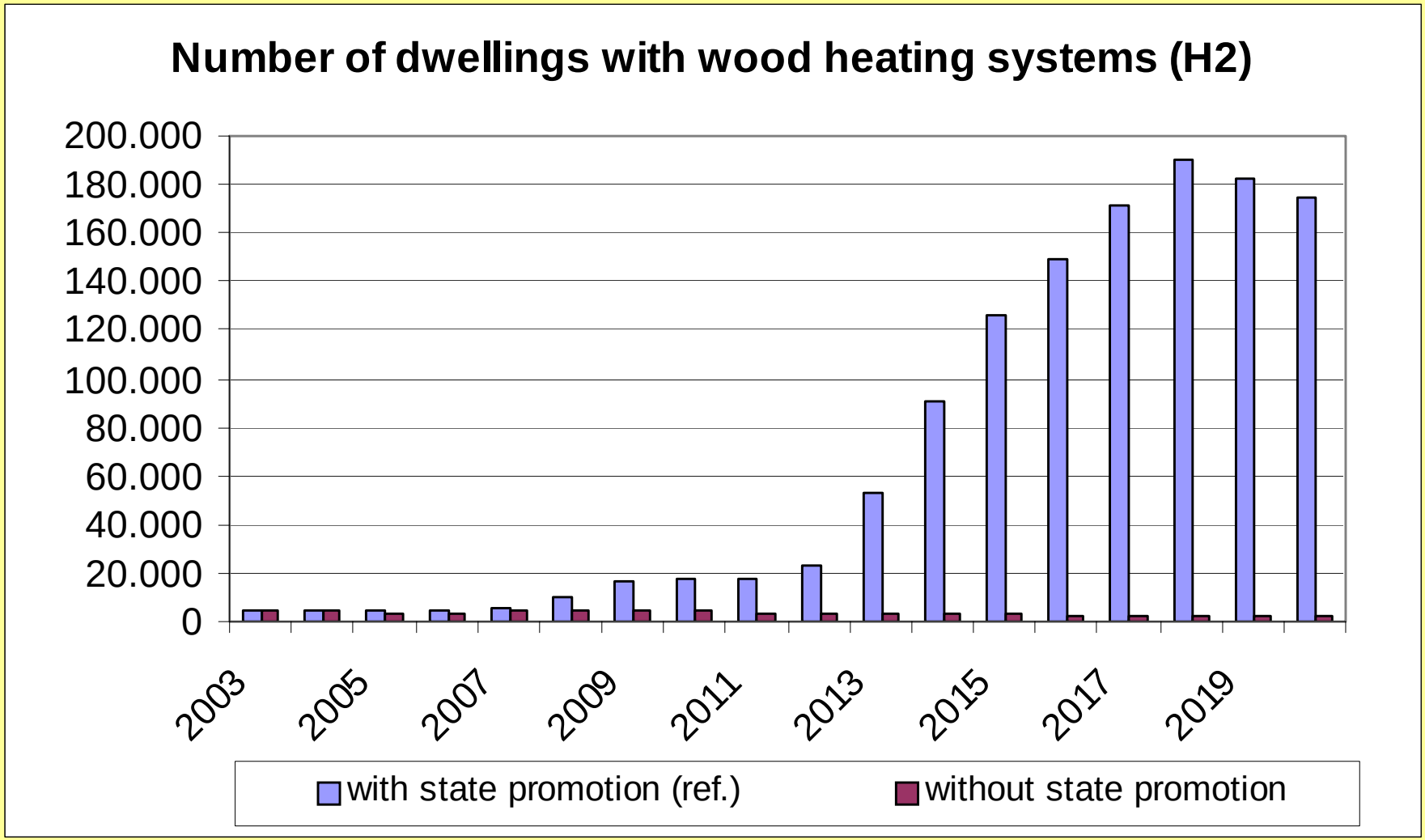


Baden-Württemberg – removal of support for conventional heating systems (soft loans)

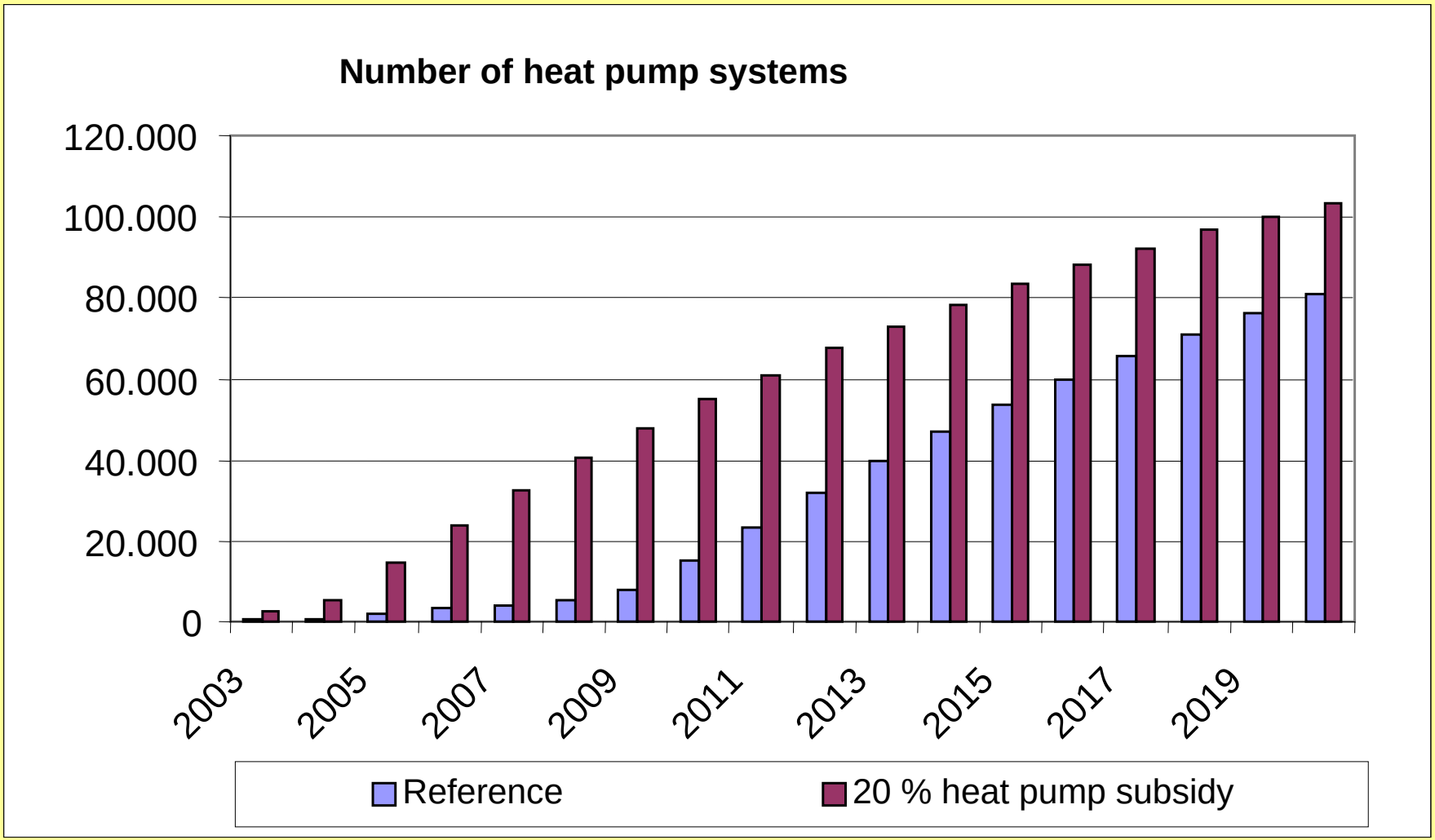


Import options for wood fuels assumed

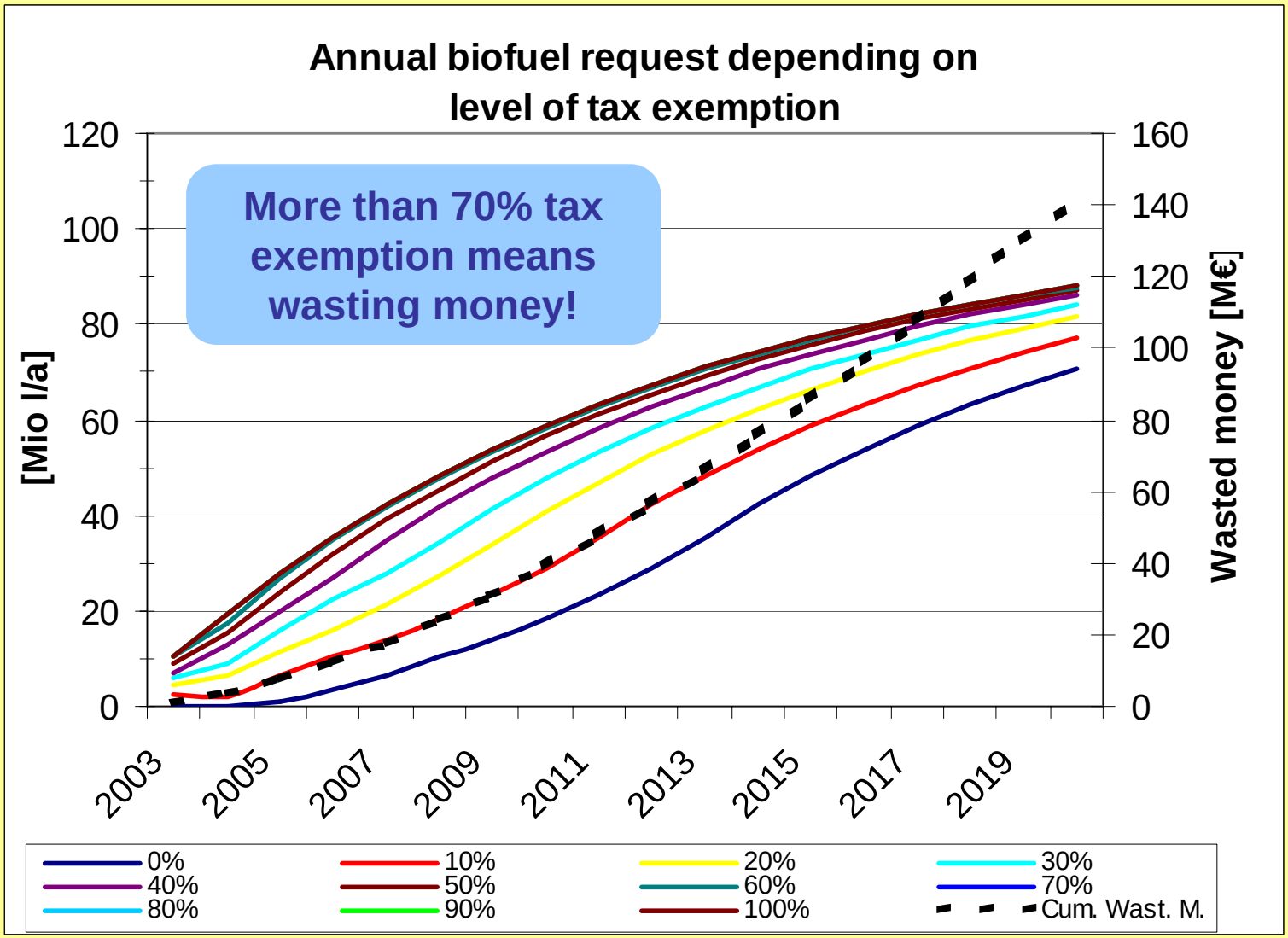
Baden-Württemberg – effect of 10% extra investment incentive from the state (30% instead of 20%)



Baden-Württemberg – 20% investment incentive for heat pumps compared to reference case

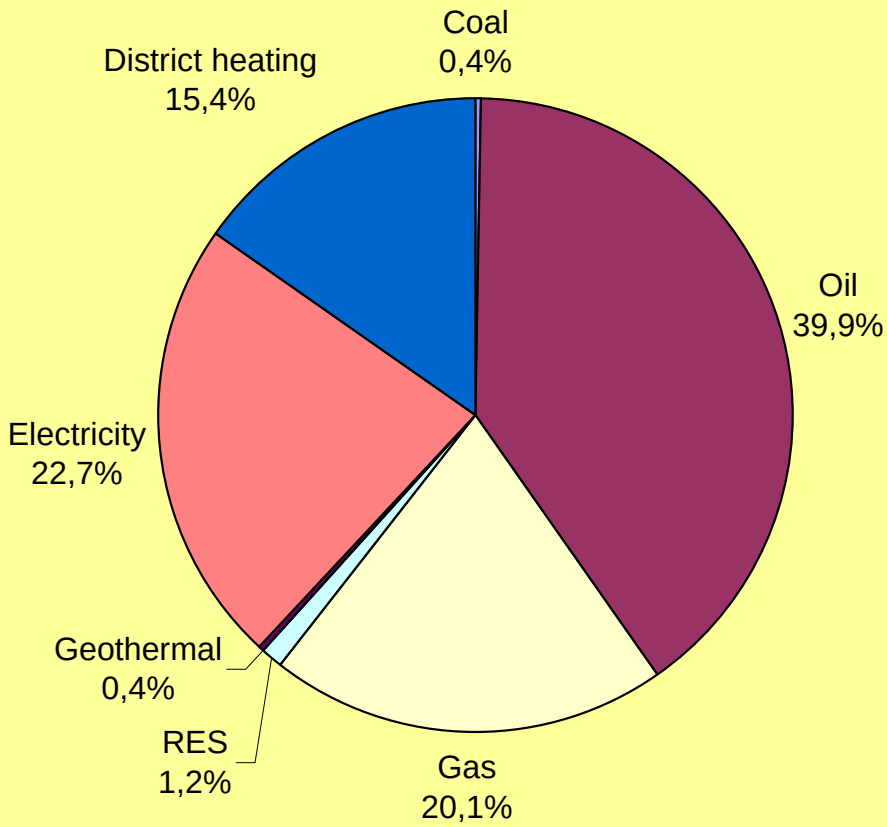


Baden-Württemberg – tax exemption for biofuels



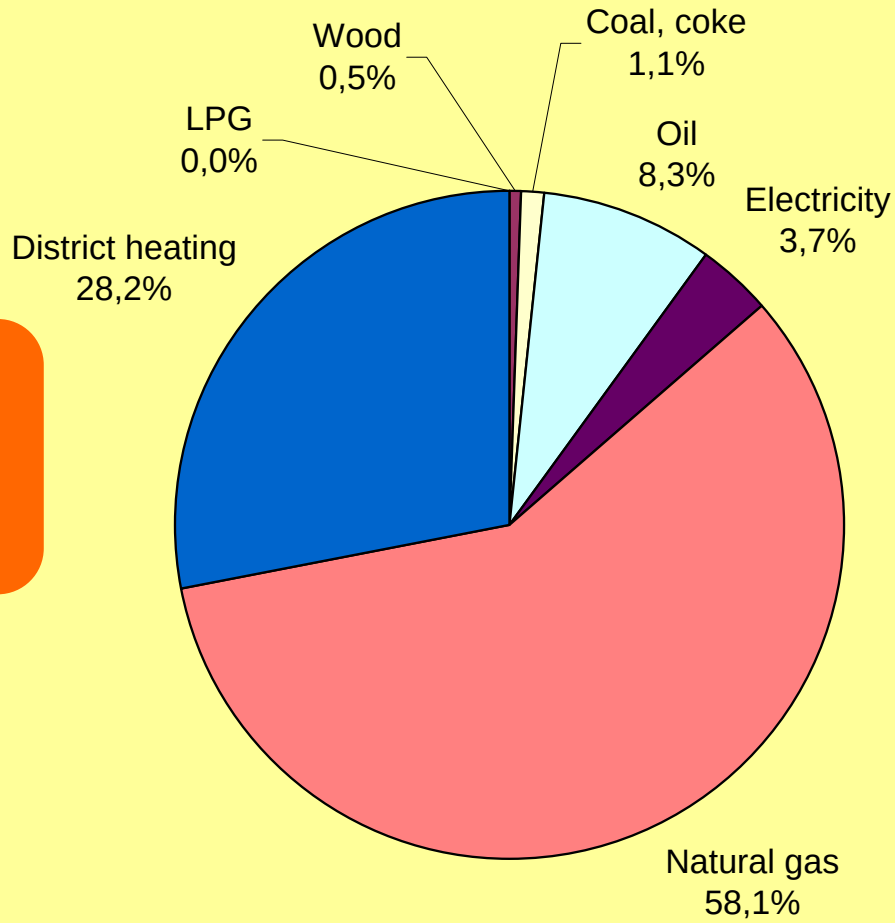
Vienna – overview (1)

Total final energy demand: 34 TWh/yr

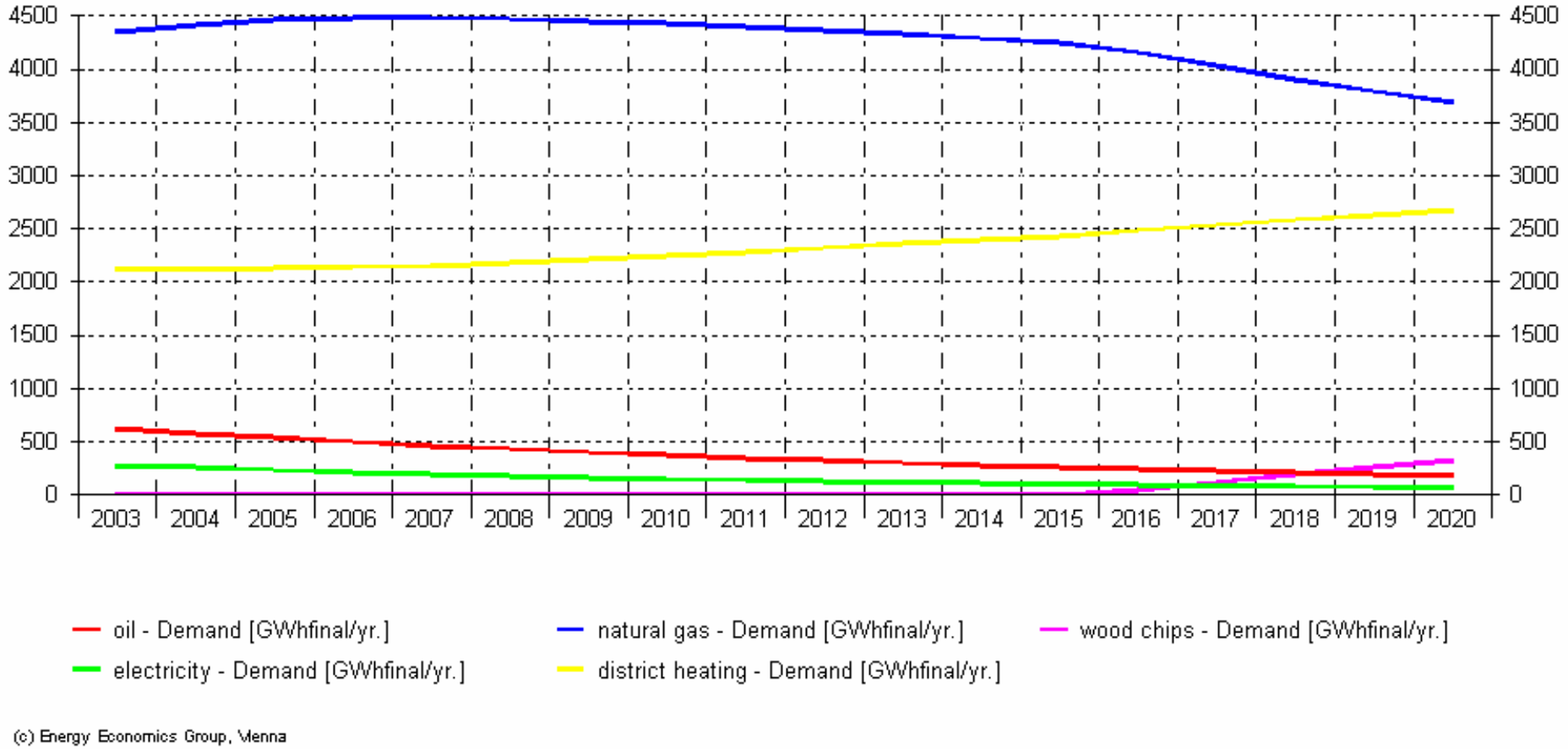


Vienna – energy mix heating sector

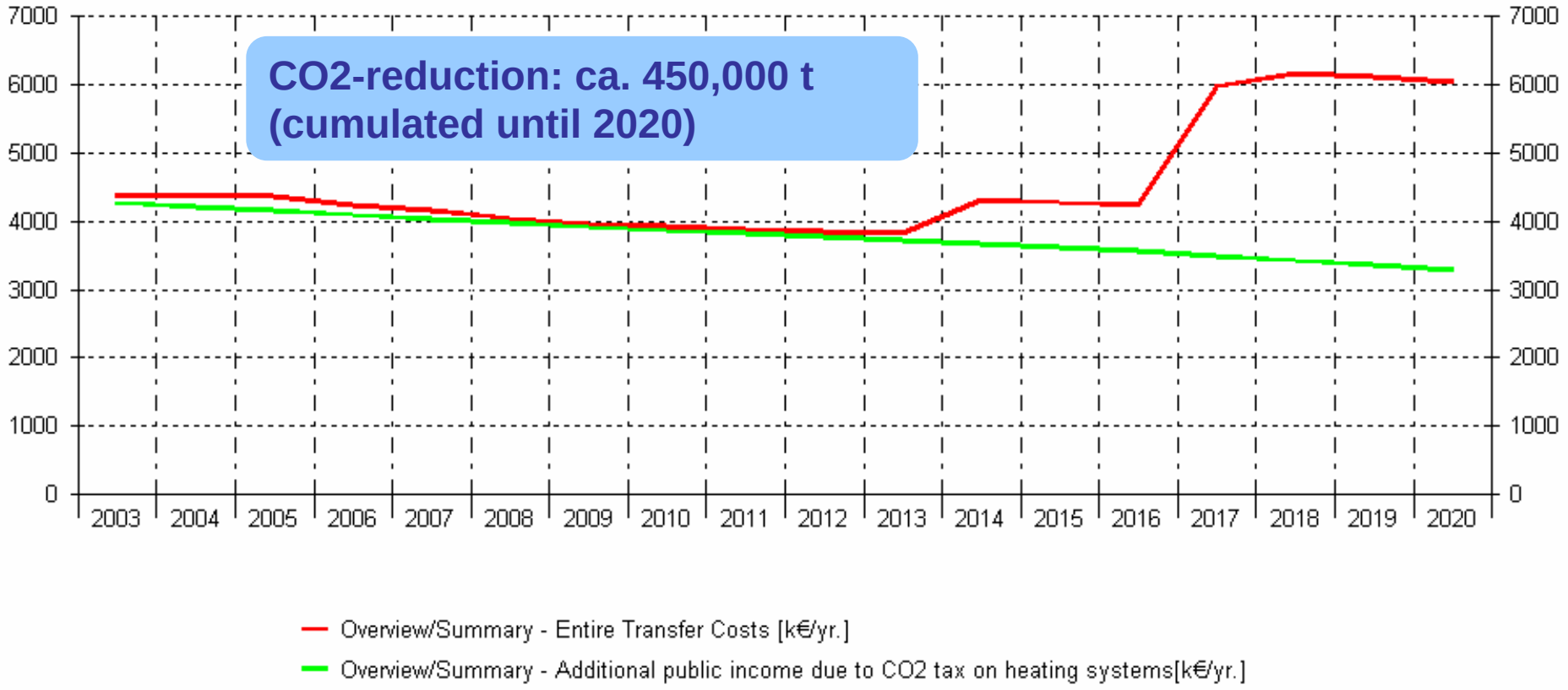
Total final energy demand for heating: 7 TWh/yr



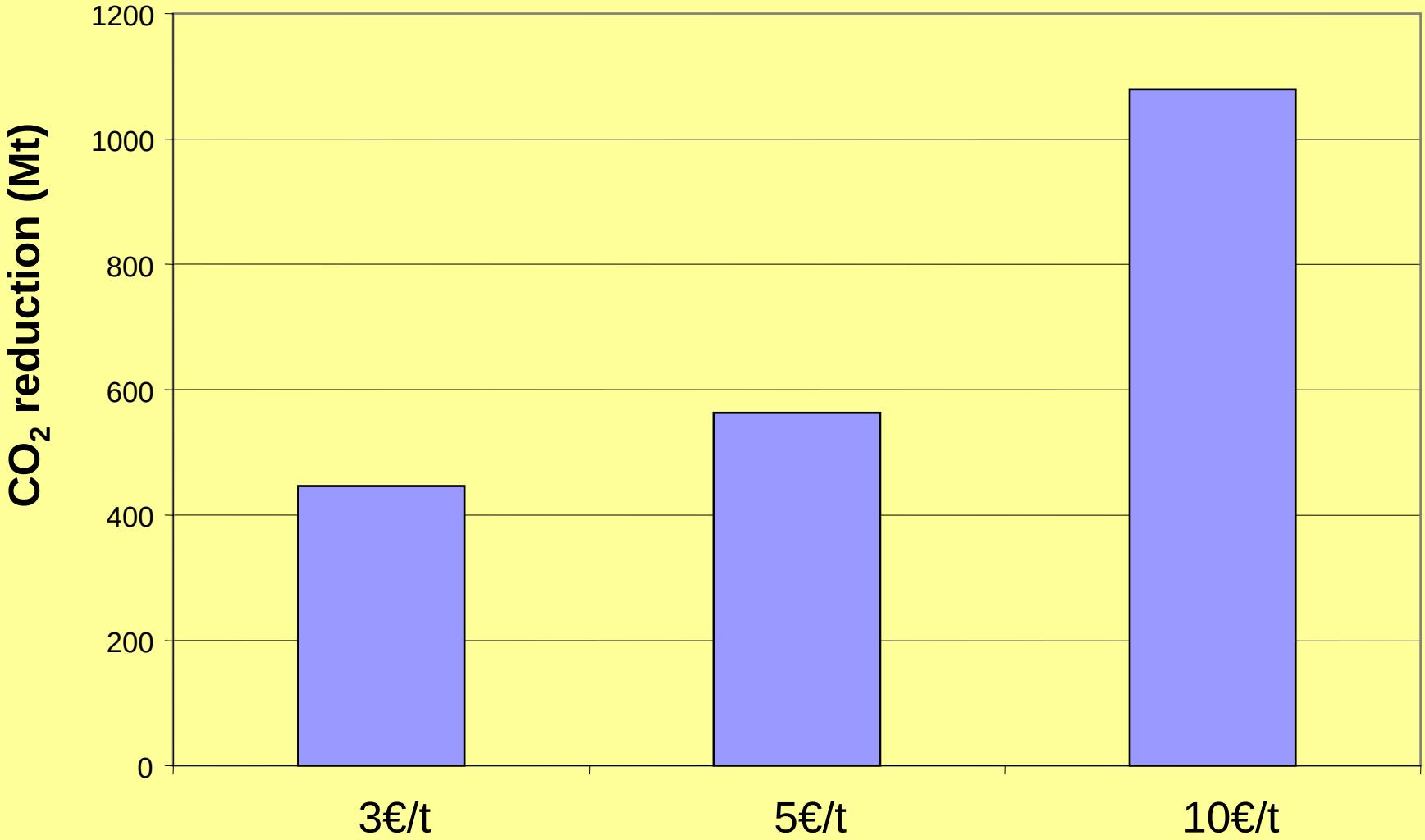
Vienna – reference scenario heating



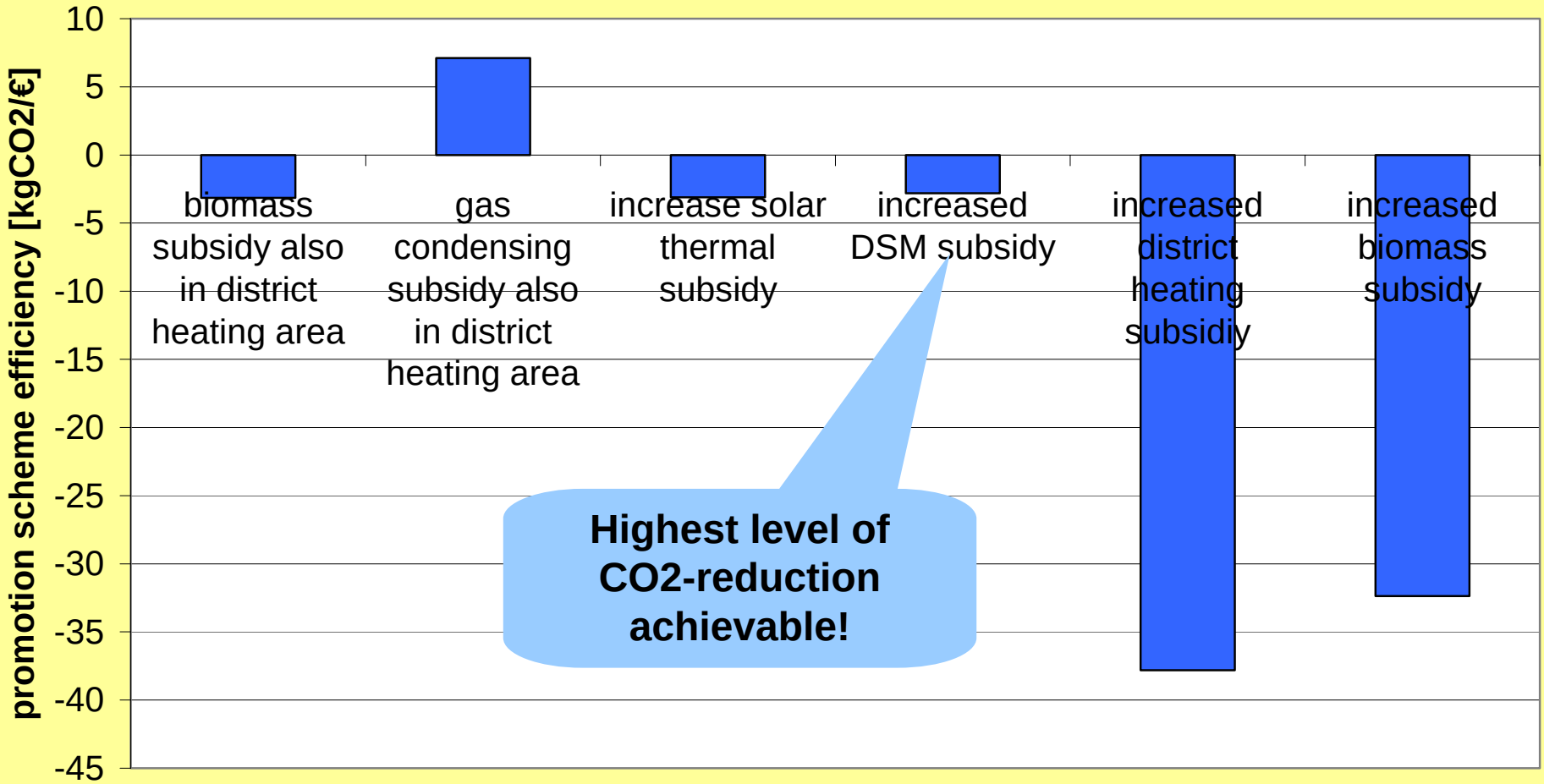
Vienna – CO2-tax (3€/t)



Vienna – effect of different levels of CO_2-tax (3-10€/t)



Vienna – Promotion scheme efficiency



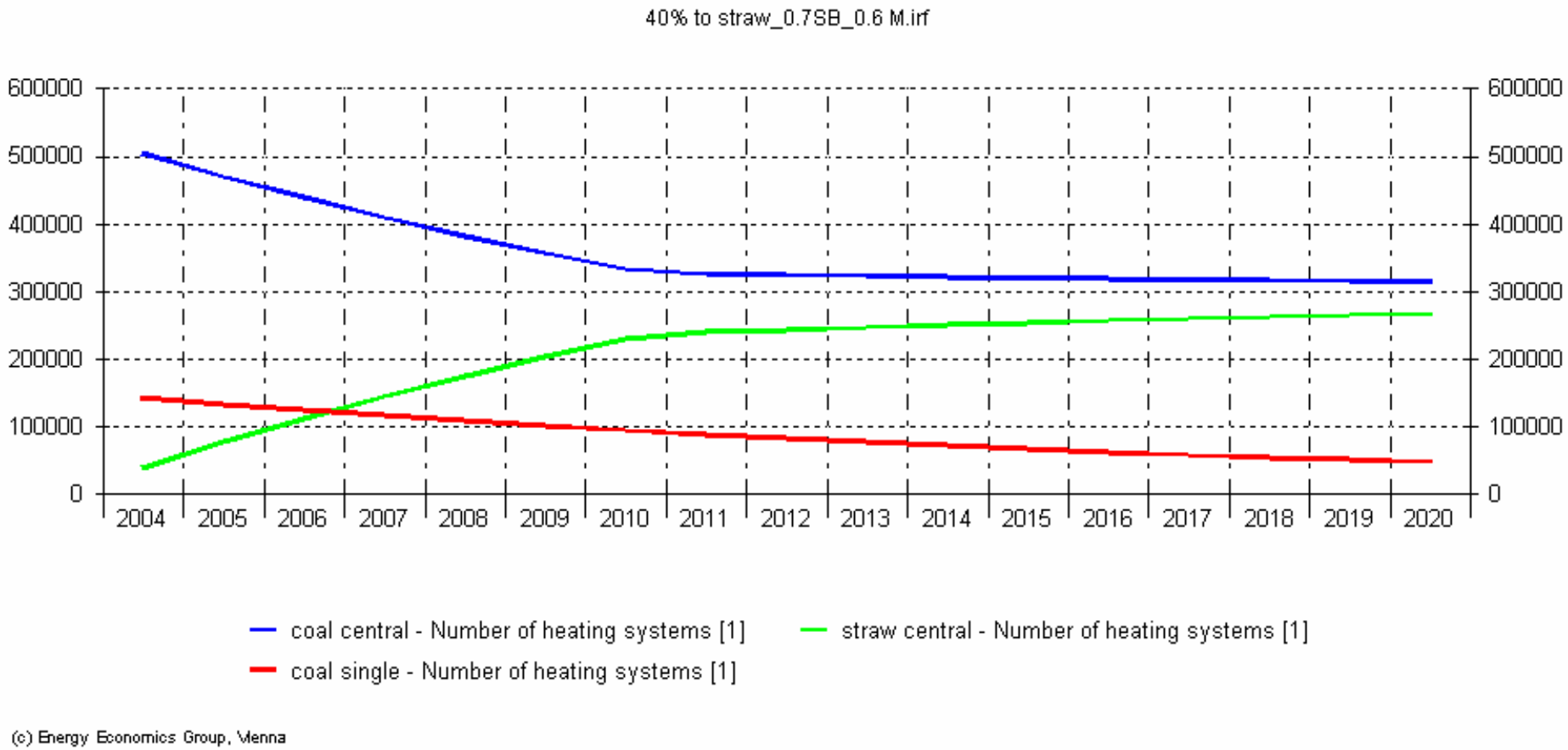
Main conclusions for Baden-Württemberg

- Simultaneous promotion of natural gas and wood heating leads to significant inefficiencies
- Additional state support (cumulating federal and state promotion) is the main driver for wood heating development
- Additional investment incentive for heat pumps would lead to an earlier take-off of the market (about 5 years) but only to moderate differences in 2020
- Additional promotion of DSM (e.g. by 20% investment incentives) might lead to inefficiencies, since the current promotion by soft loans seems to be a very efficient situation
- Full tax exemption for biofuels appears to be an over-promotion partial tax exemption is sufficient

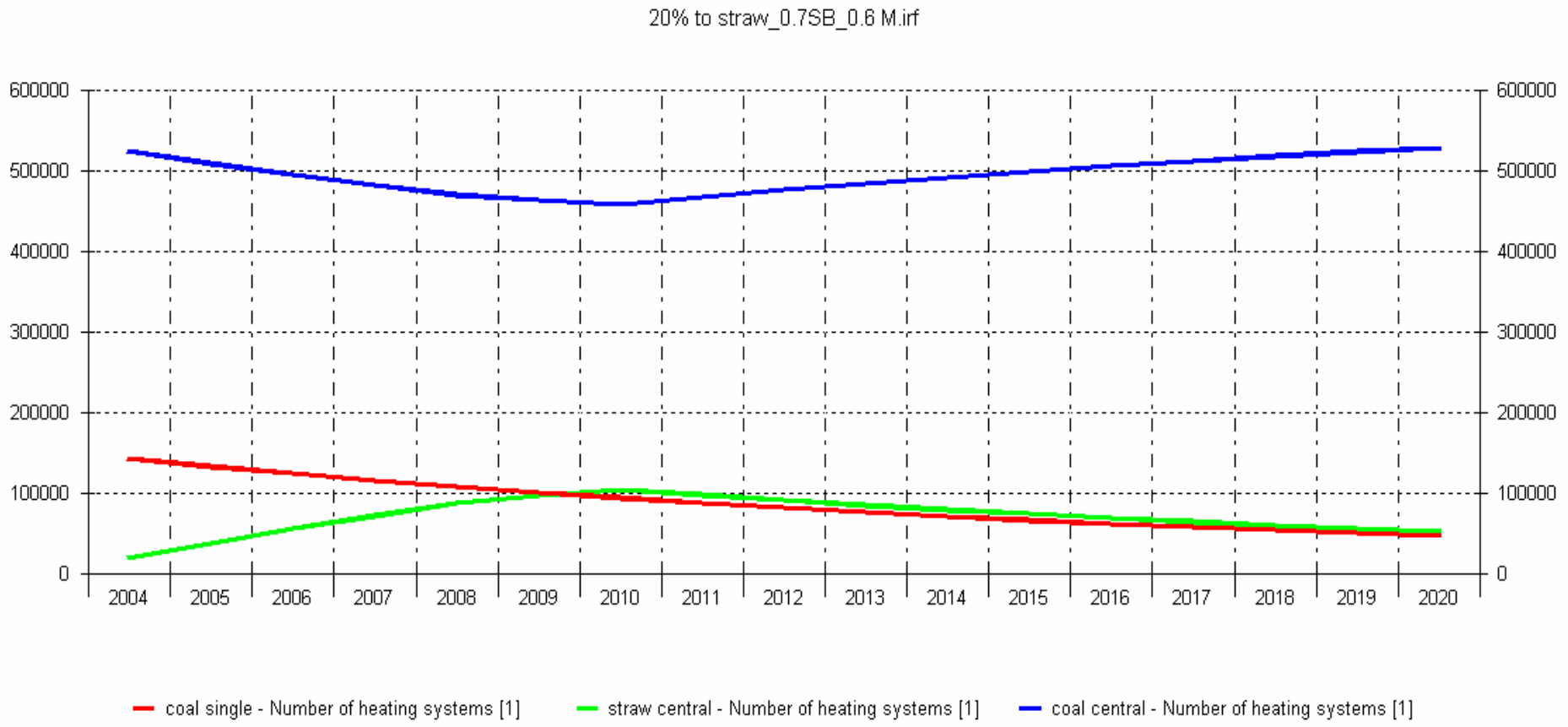
Main conclusions for Vienna

- Highest promotion efficiency occurs for increasing incentives for biomass and DH (biomass is mainly an option for suburbs) …
- … but highest CO_2 reduction would be reached for increasing DSM measures / but not as cost efficient as biomass and DH investment incentives
- Current promotion scheme for DSM is rather efficient (investment incentives for insulation depending on the degree of demand reduction – stepped system), by increasing the overall level of promotion additional CO_2 reductions can be reached
- Promotion of gas condensing boilers has a positive effect on CO_2 reductions, but shows competition with biomass
- Decreasing the flat rate for DH and increasing the variable costs of DH would stimulate DSM

Poland – straw boilers (40% subsidy)



Poland – straw boilers (20% subsidy)



Poland – comparison wind vs. straw