

German Strategy to increase RE: “Lead Study 2008“

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Issues covered in the Lead Study

A) Lead scenario 2008

- detailed structure of the 2020 (2050) targets of the use of renewable energy including the energy system
- approximation of the efficiency and combined heat and power targets 2020
- production costs of renewable electricity, heat and fuel
- electricity costs of fossil plants, additional costs and CO₂-costs of RES under 3 price scenarios
- structure of power plants in 2020 (2050): RES, CHP, condensation power station; sensitivity analysis regarding decommissioning; structure of new power plants; effects of a lifespan extension of nuclear plants
- structural development of the heat sector 2020 and 2050 including interactions of CHP –RES; development of district heating
- structural development of the transport sector (2020) 2050 with biofuels, RES-E and RES-Hydrogen

B) further scenarios (corridor)

• scenarios E (“efficiency“)

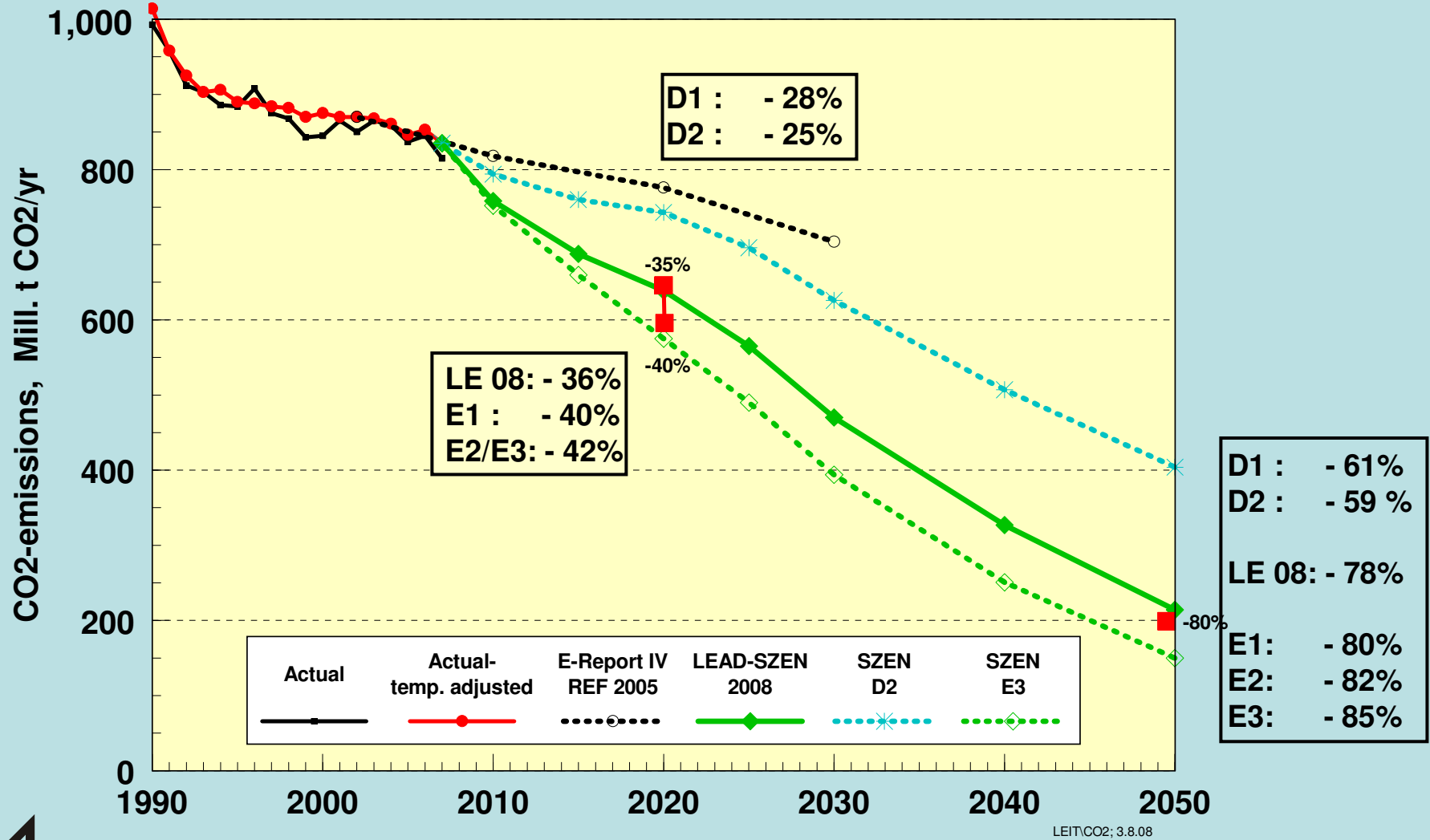
- E1: ideal fulfilment of efficiency targets 2020; RES such as Lead 2008
- E2: additionally very dynamic RES-expansion
- E3: after 2020 considerable expansion of RES in traffic (electricity, H₂)
- transformation of E3 towards full supply with RES after 2050.

• scenarios D (“deficit“)

- D1: efficiency and CHP targets are clearly missed, RES such as Lead 2008
- D2: additionally, strong expansion of coal fire plants; assessment of CCS-potential.

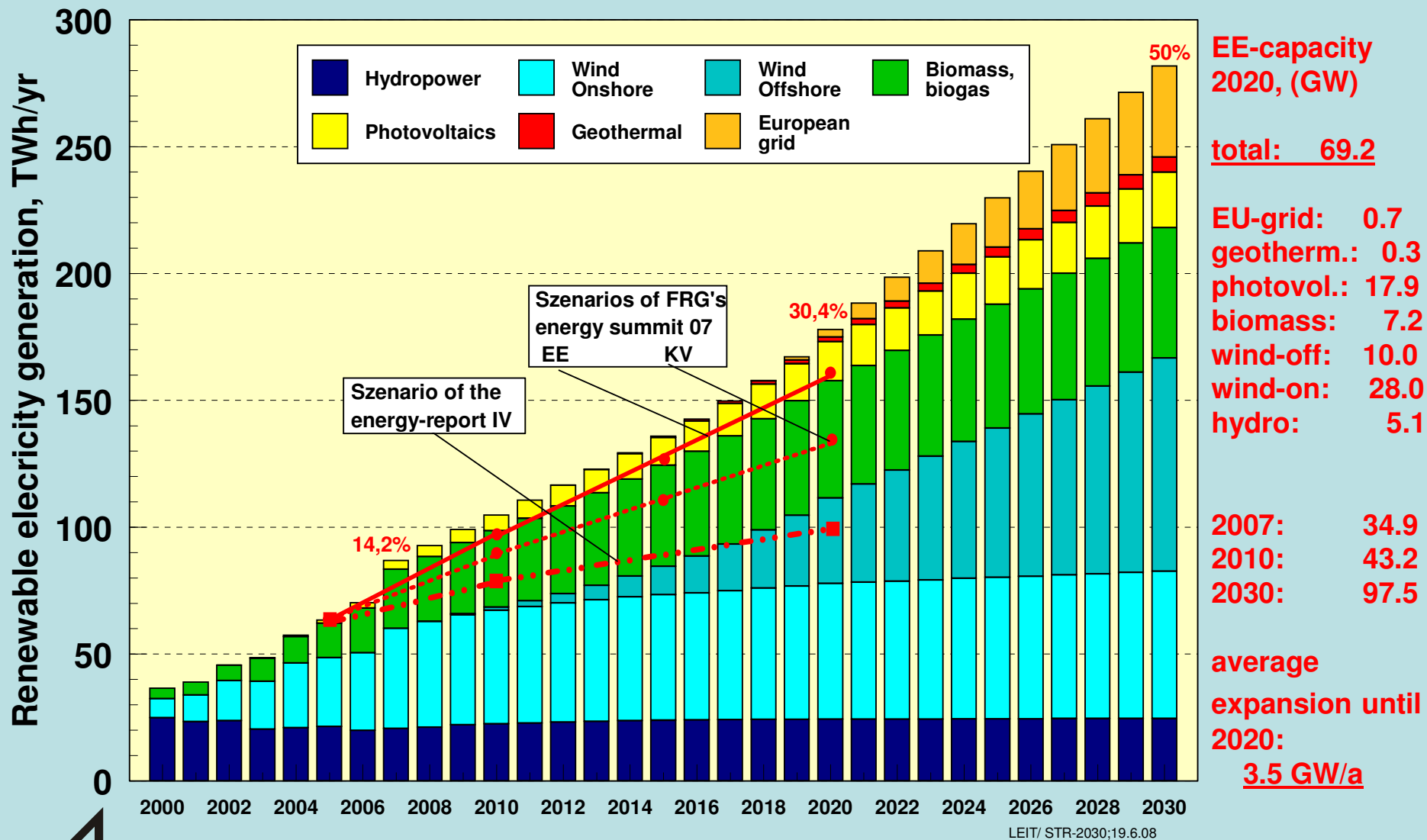


CO₂-reduction in the Lead scenario 2008 and in the scenario corridor



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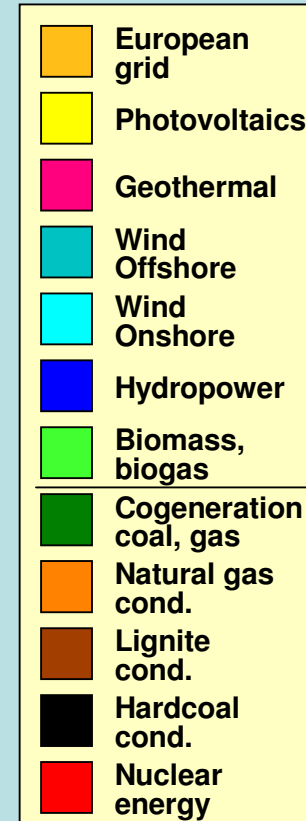
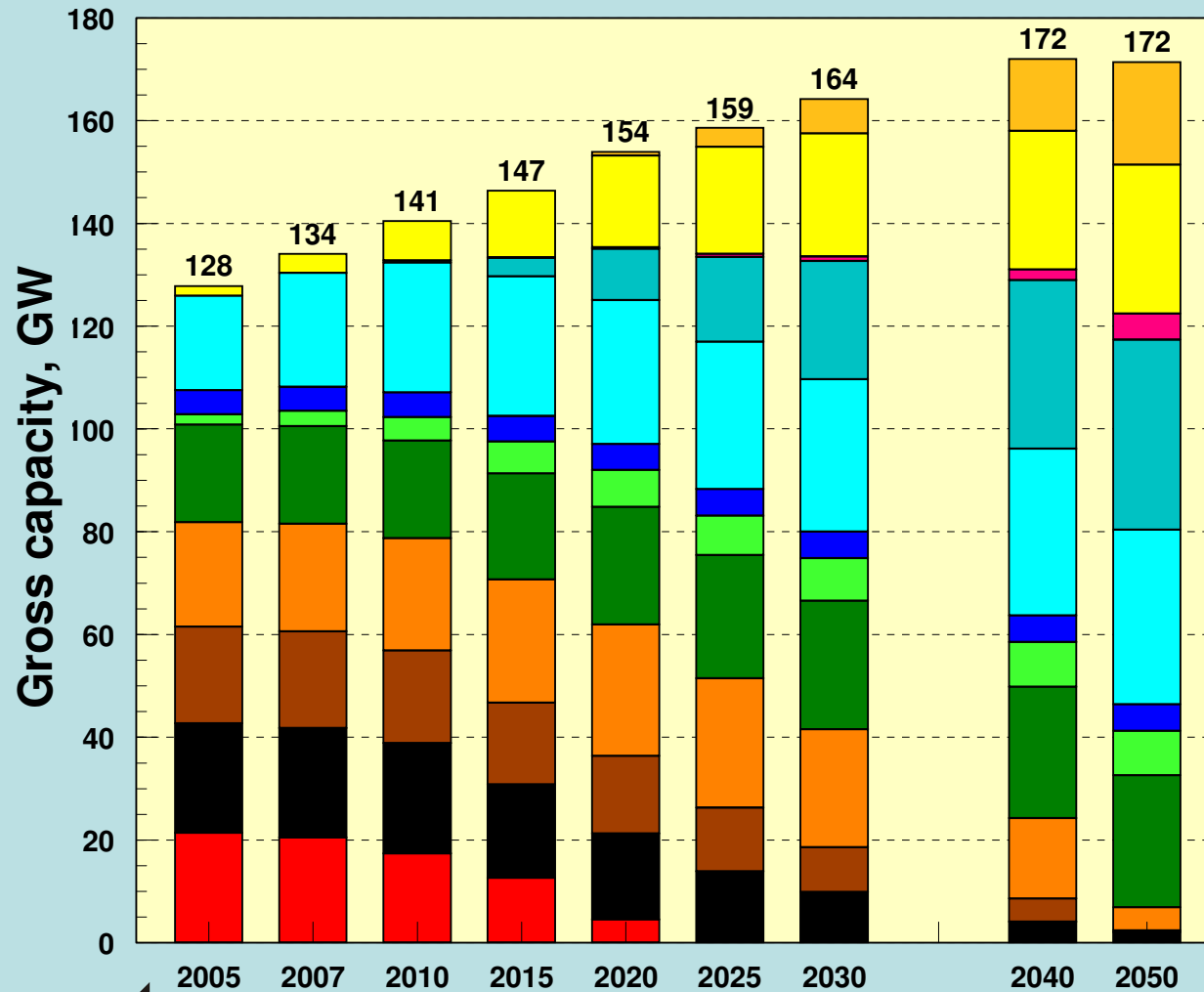
Development of RES-E generation until 2030 in the Lead scenario 2008



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Transformation of the electricity generation structure until 2050

- Leadszenario 2008 -



2050 (GW):

Fossil = 34

- CHP = 25

- COND = 9

RES total = 138

- fluct. ~ 90

- n. fluct. ~48

max. load:

77 → ~ 65

secured

capacity:

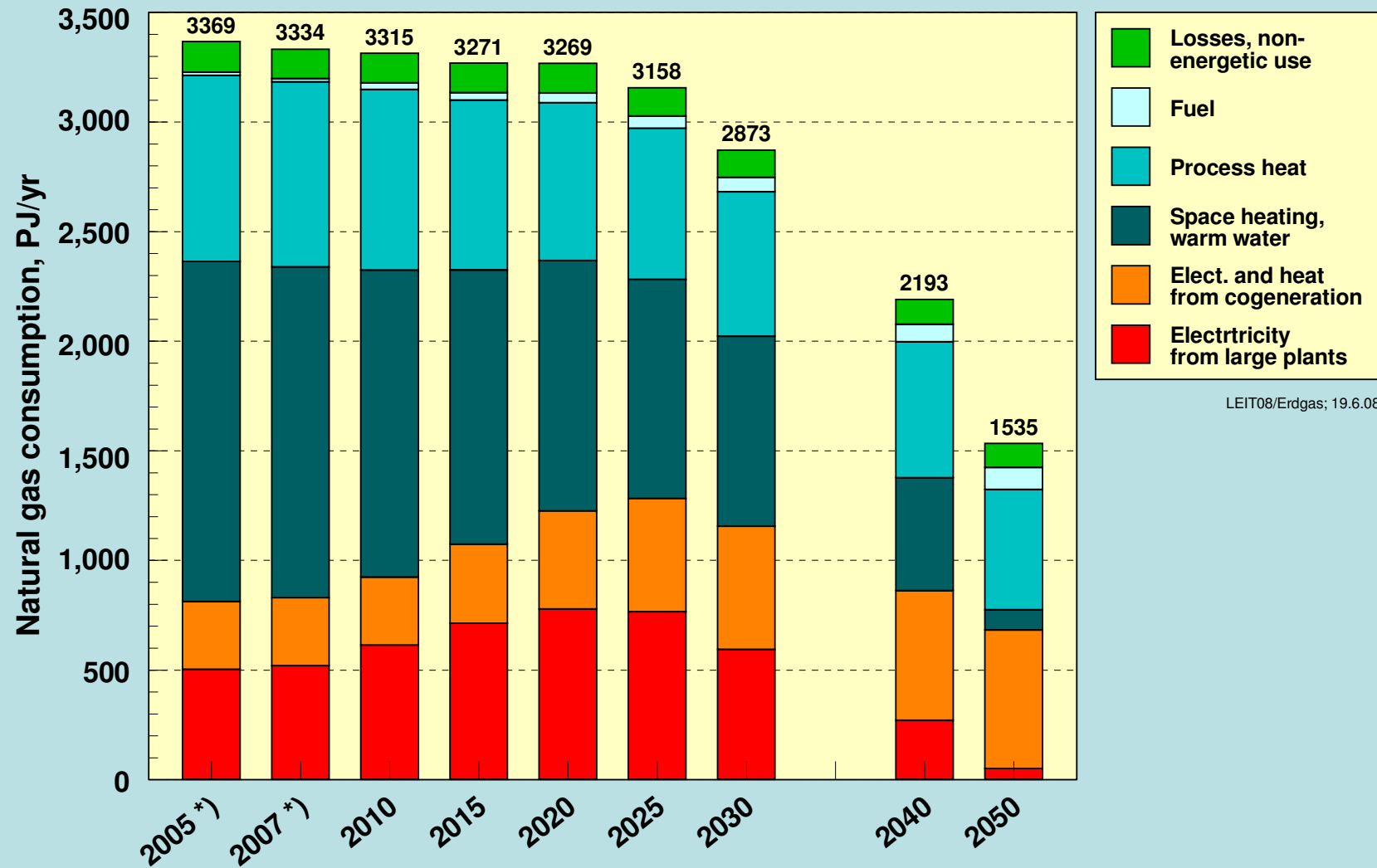
90 → ~ 72

LEIT08/ STRLEIS; 22.6.08



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Change of natural gas use in the Lead Scenario 2008



LEIT08/Erdgas; 19.6.08

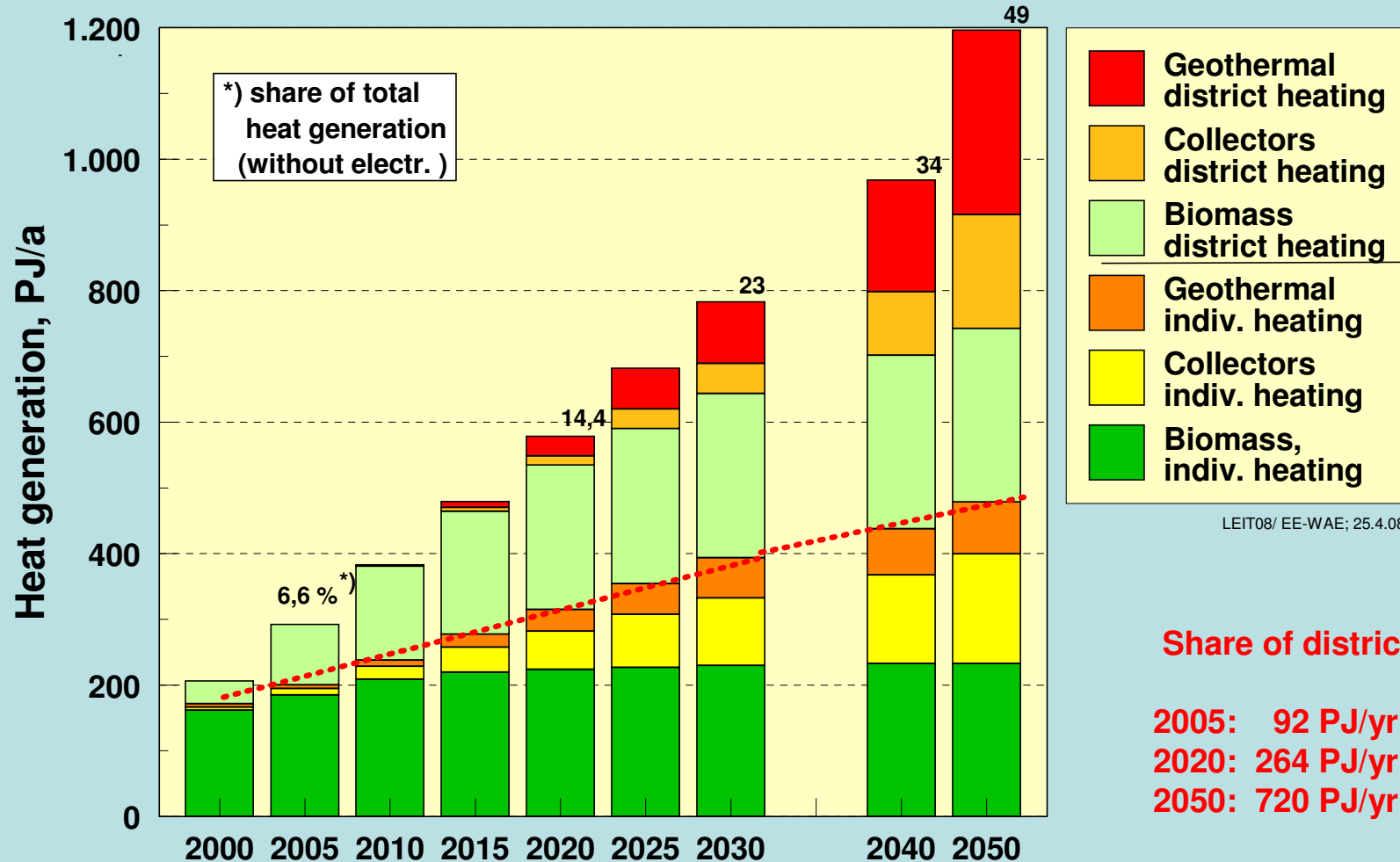
*) years 2005 and 2007 are temperatur adjusted



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Expansion of RES in the heating sector

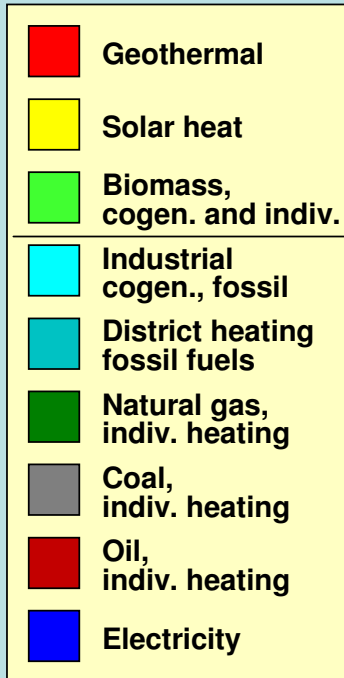
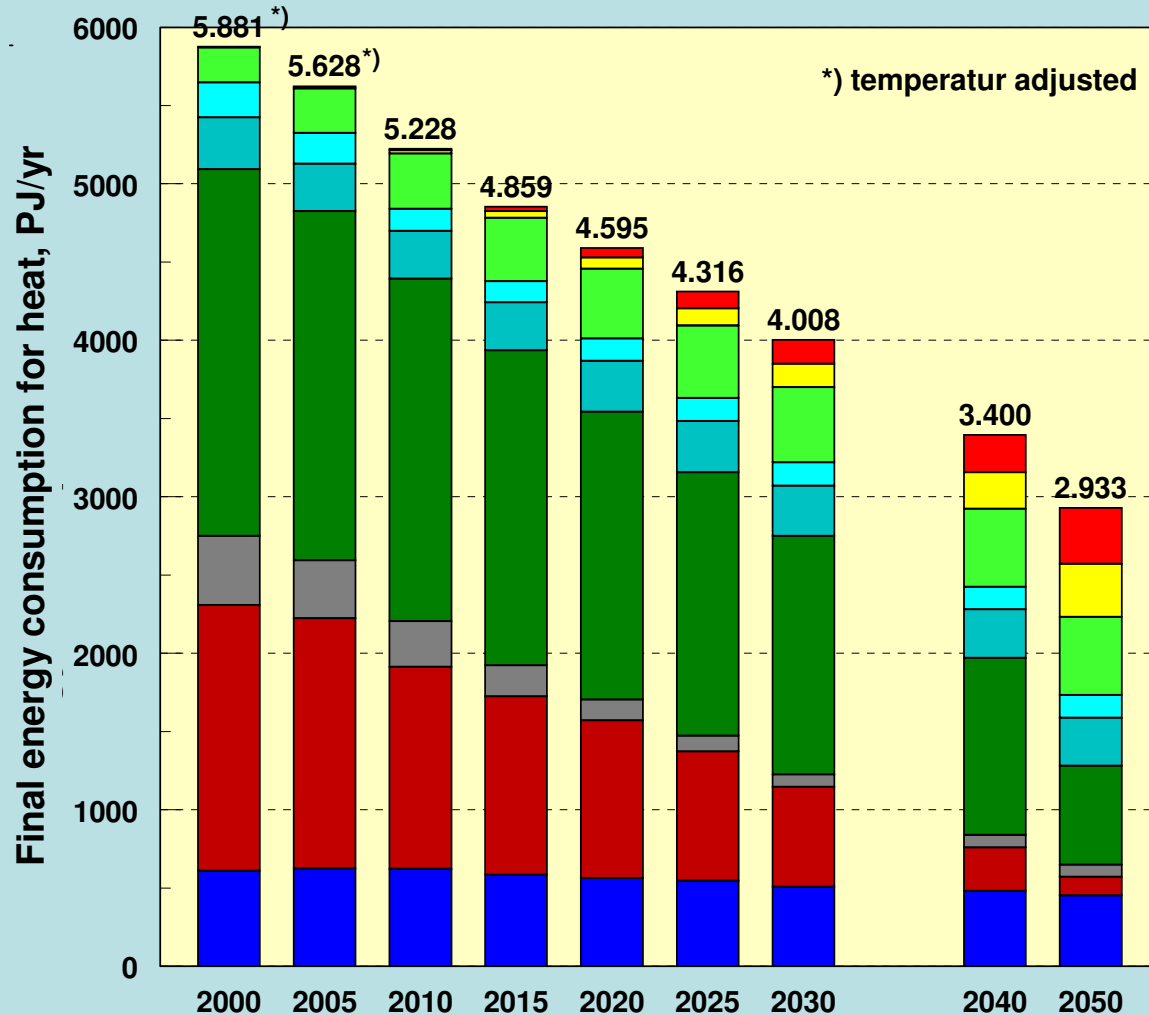
- LEADSCENARIO 2008 -



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Structural changes in the heating sector according to the Lead Scenario 2008

- LEADSCENARIO 2008 -



Spec. space heating demand:

2005: 162 kWh/m²yr
 2020 = 74 %
 2050 = 42 %

LEIT08/WAERM; 25.6.08

Heat via district heating respectively from CHP:

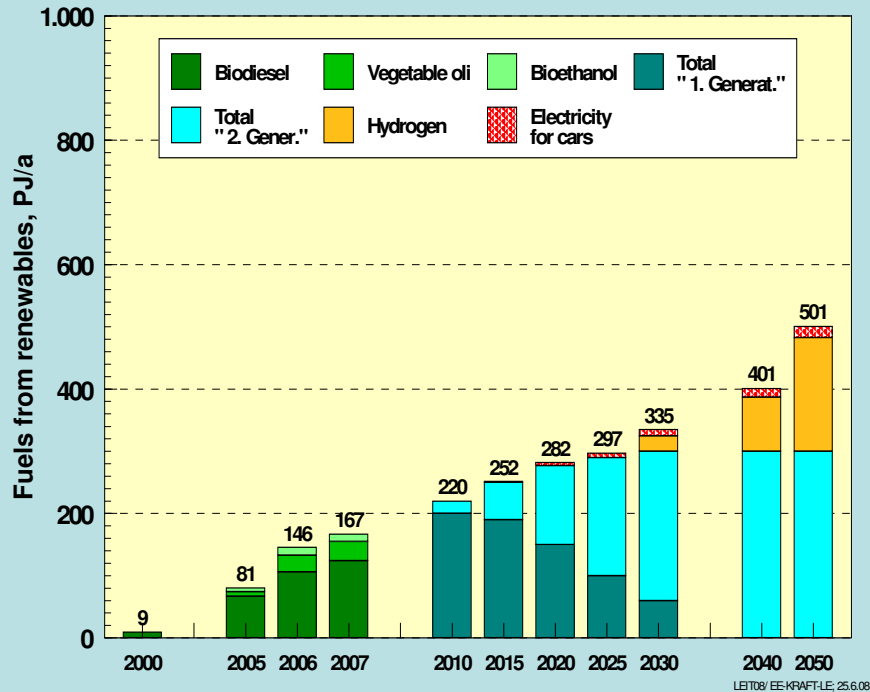
	total	SP + HW
2005 =	12%	10%
2020 =	18%	20%
2050 =	47%	65%



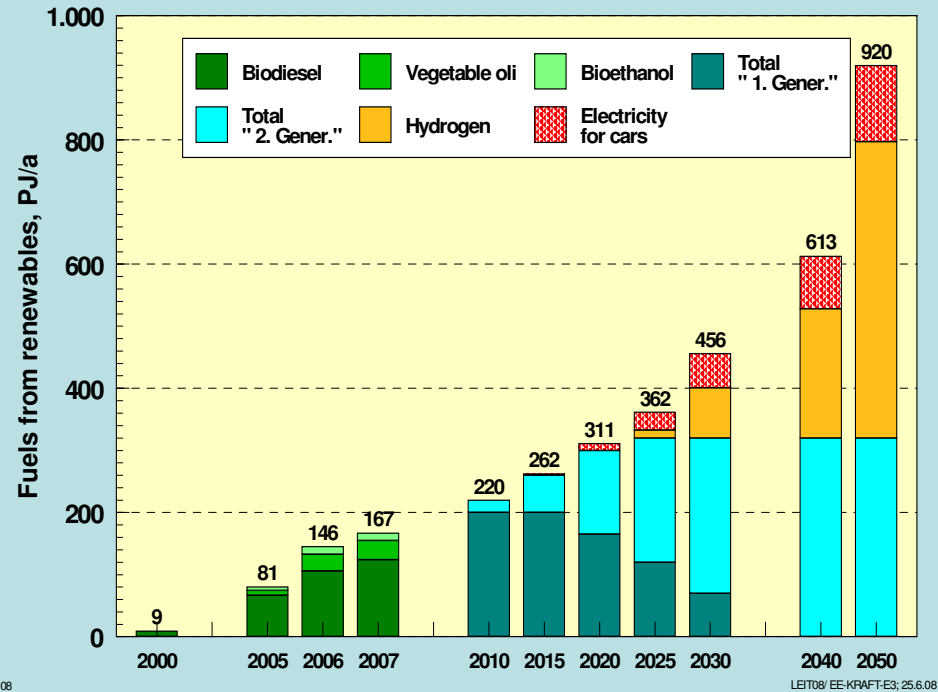
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Contribution of RES in transport: Lead Scenario and Scenario E3

- LEADSCENARIO 2008 -



- Scenario E3 -



RES-fuels share in the total fuel consumption (%):

6.4 12.0 26.9 13.6 51.4

Total RES*) share in the total final energy (%):

6.6 12.7 29.7 14.5 56.2

Additional RES-E for electric vehicles and H₂ (TWh/yr):

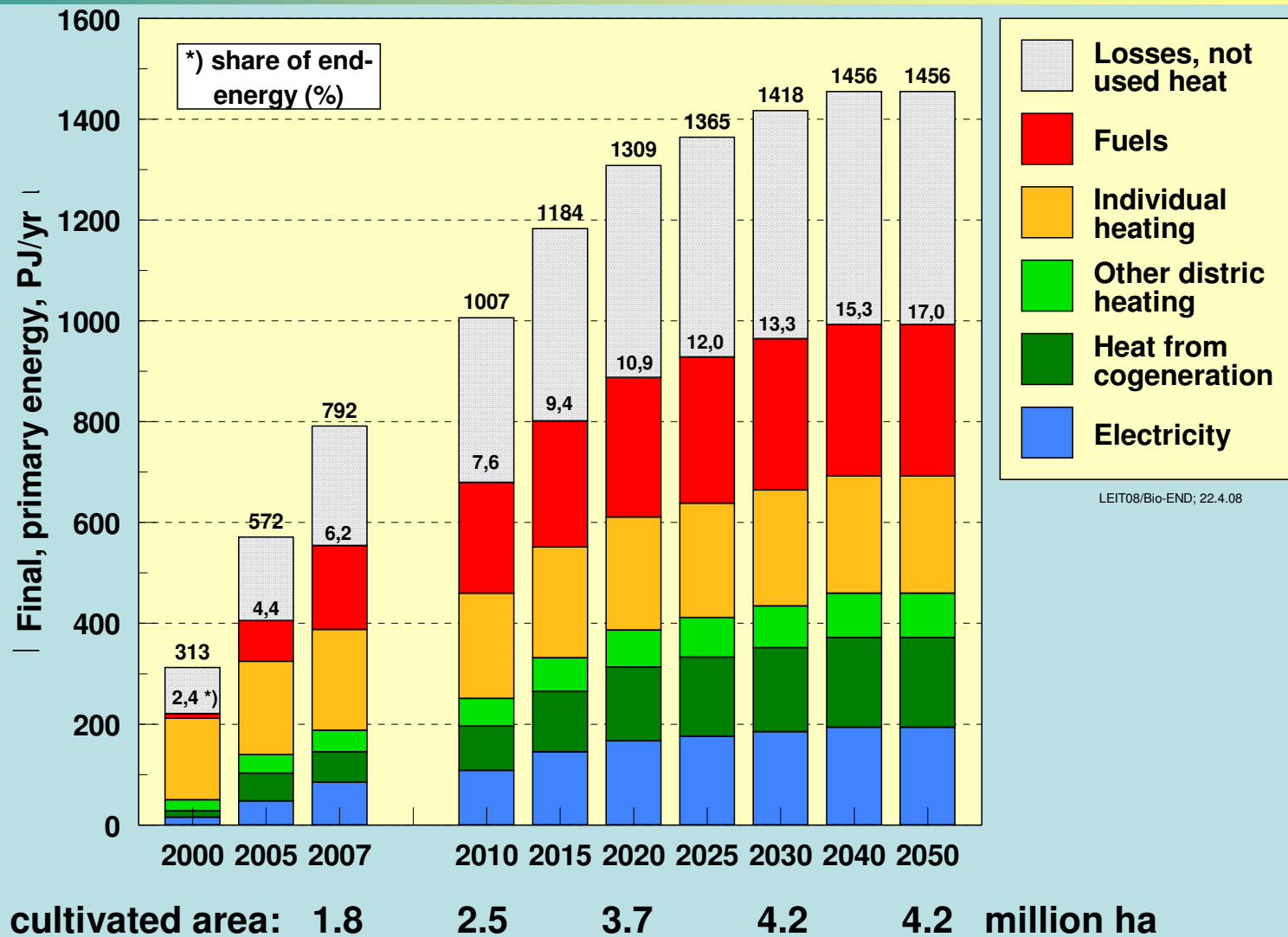
1.5 72 (12%) 3.0 205 (30%)

*) including RES-share of electricity for trains



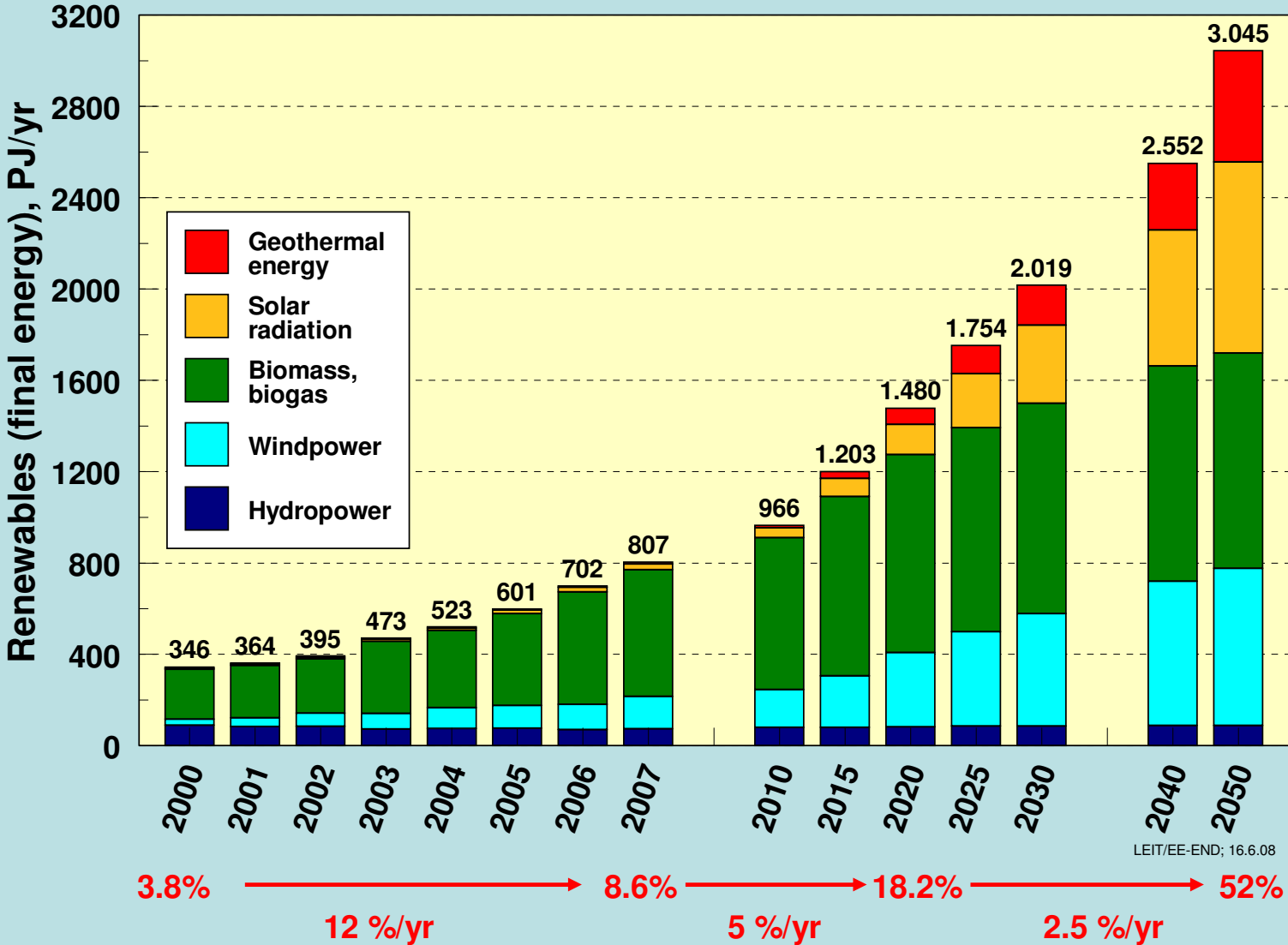
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Use of biomass (residues, biogenous waste, energy crops)

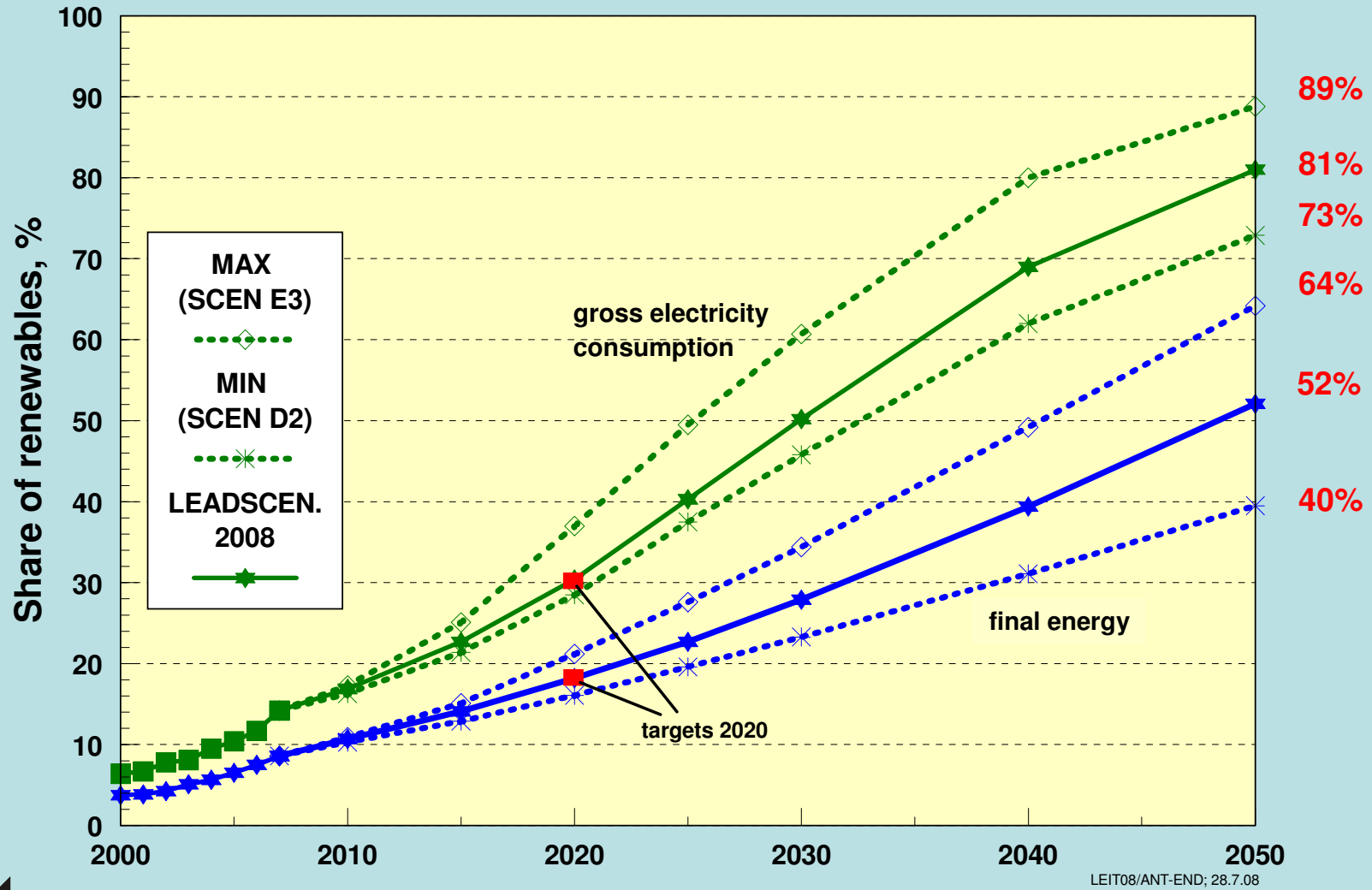


Total contribution of RES in the Lead Scenario

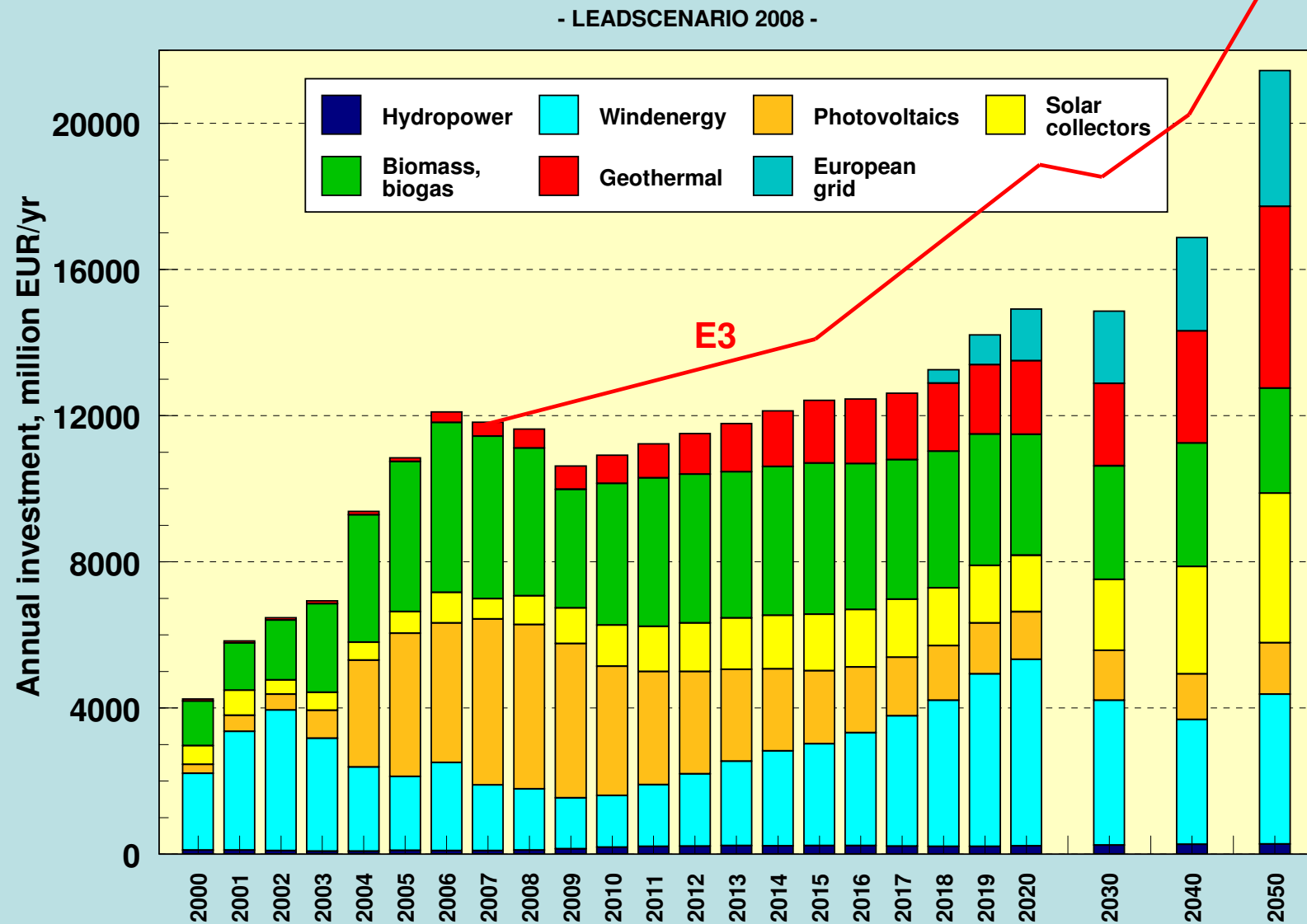
- LEADSCENARIO 2008 -



Corridor of RES-shares in electricity and final energy in the scenario analysis



Investment in RES facilities (electricity & heat) in the Lead Scenario



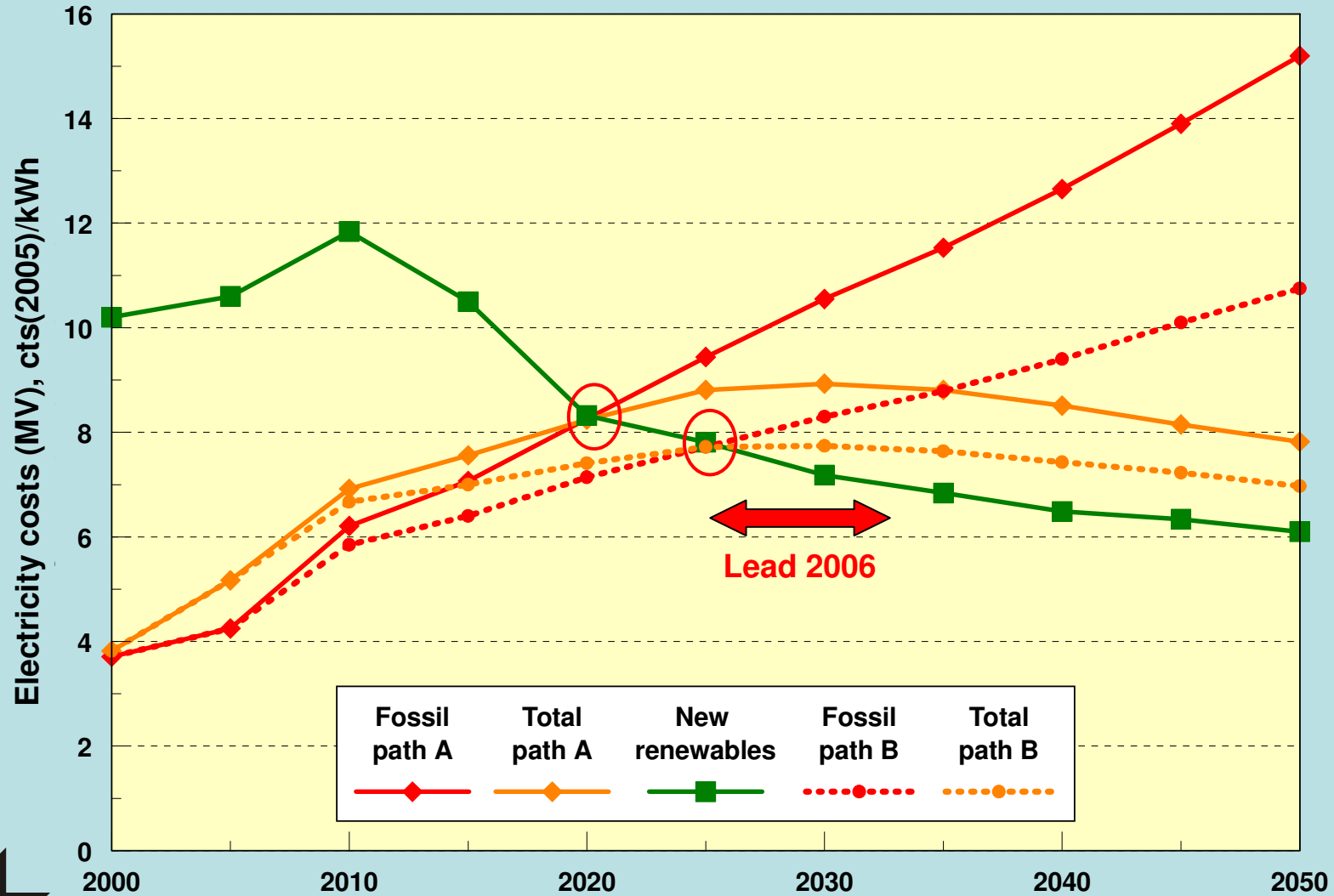
Leit-B/INV-EE; 25.6.08



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Development of electricity production costs in the Lead Scenario 2008

- Lead Scenario 2008; Price paths including CO₂-surcharge -

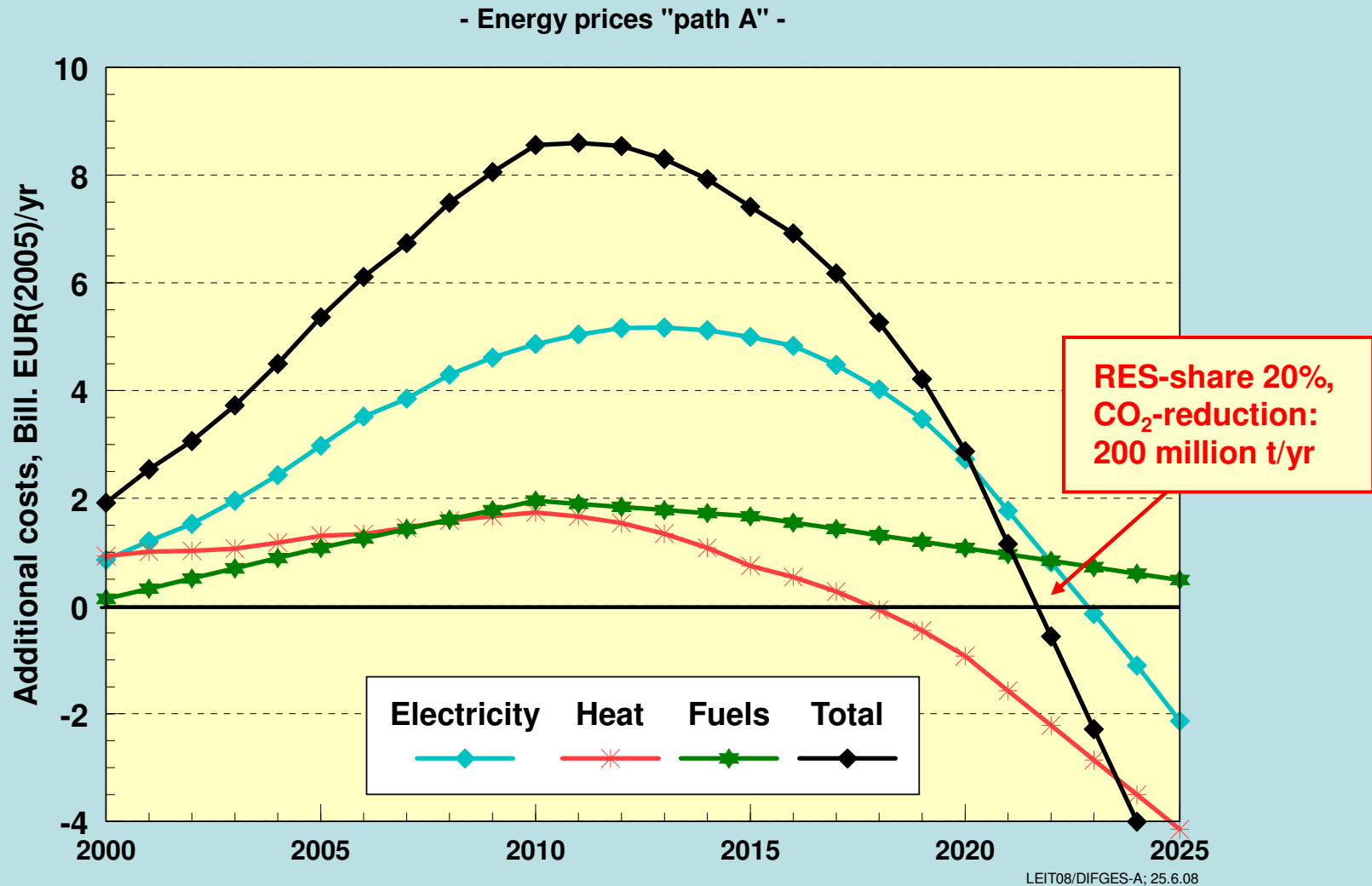


LEIT08/KOS-A-B; 26.4.08



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Course of the annual additional costs of the total RES expansion



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Some conclusions of the scenario analysis

- The Lead Scenario 2008 is a relatively robust development path to reach the climate protection targets 2020 and 2050.
- Structurally even more can be achieved under favourable framework conditions (E2/E3).
- The largest CO₂ reduction potentials until 2020 of 70-80 million t/yr are to be found in the expansion of renewable electricity and efficiency in the heating sector, followed by the expansion of combined heat and power in connection with the expansion of efficiency in electricity (approx. 60 million t/yr); RES expansion in the heating sector, RES-fuels as well as the expansion of efficiency in transport each account for approx. 20-25 million t/yr.
- The existing dynamic to expand the use of renewable energies should be kept up (LEIT 2008); a stronger expansion (E2) would even have greater positive economic effects.
- To backup this development, a European master plan for the use of RES in the framework of a joint energy and climate protection strategy should be developed in the near future (especially regarding a European grid).
- Only renewable electricity has a very large potential. After 2030 at the latest, intelligent utilisation concepts are needed beyond the conventional use of electricity (RES-electricity > 50%).
- The target achievement for the expansion of CHP and electricity efficiency is critical; permanent monitoring and possibly readjustment may be required; also the dynamic of the expansion of RES in the heating sector needs to be observed carefully.

