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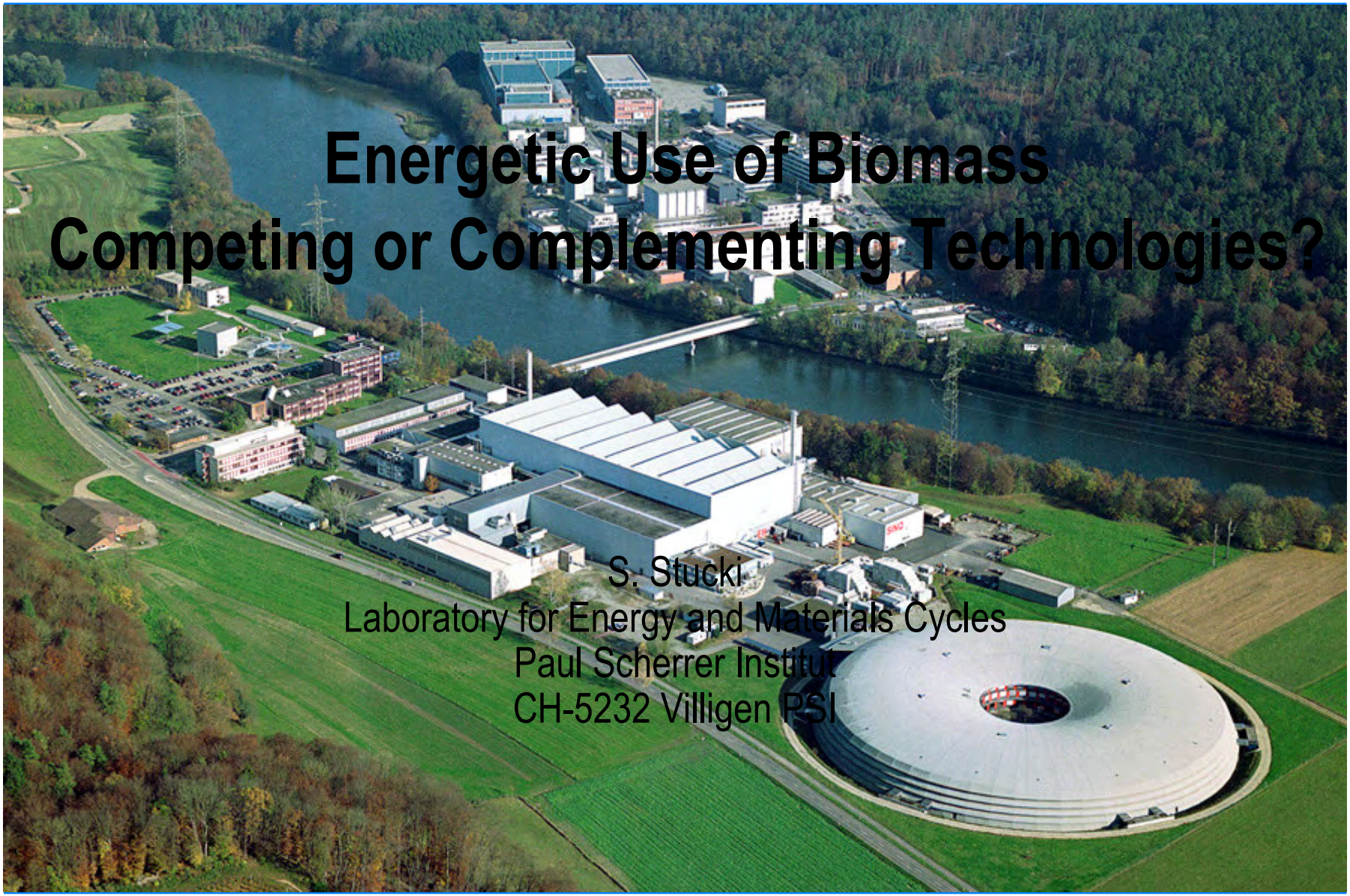

Energetic Use of Biomass
Competing or Complementing Technologies?

S. Stucki
Laboratory for Energy and Materials Cycles
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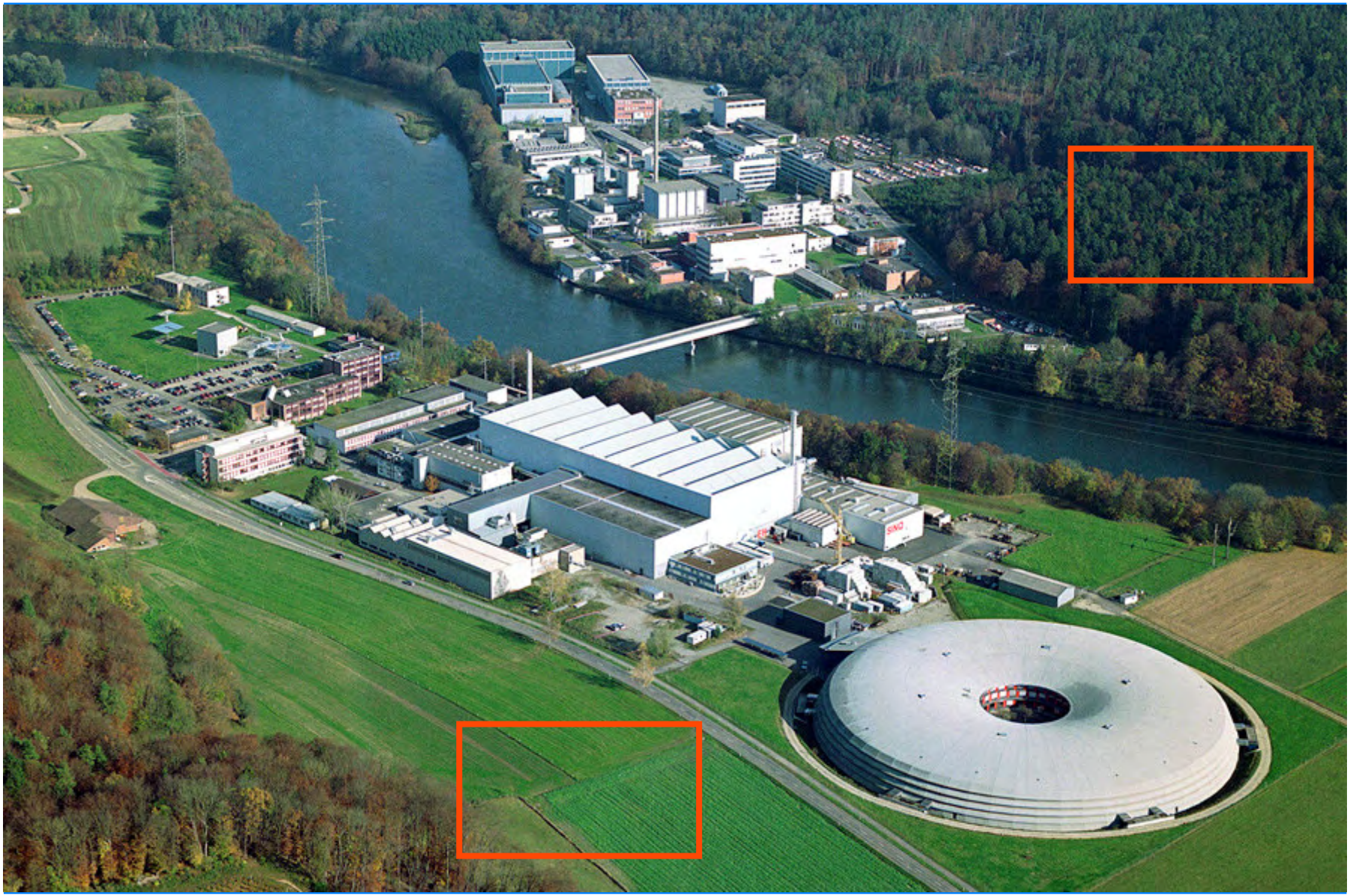

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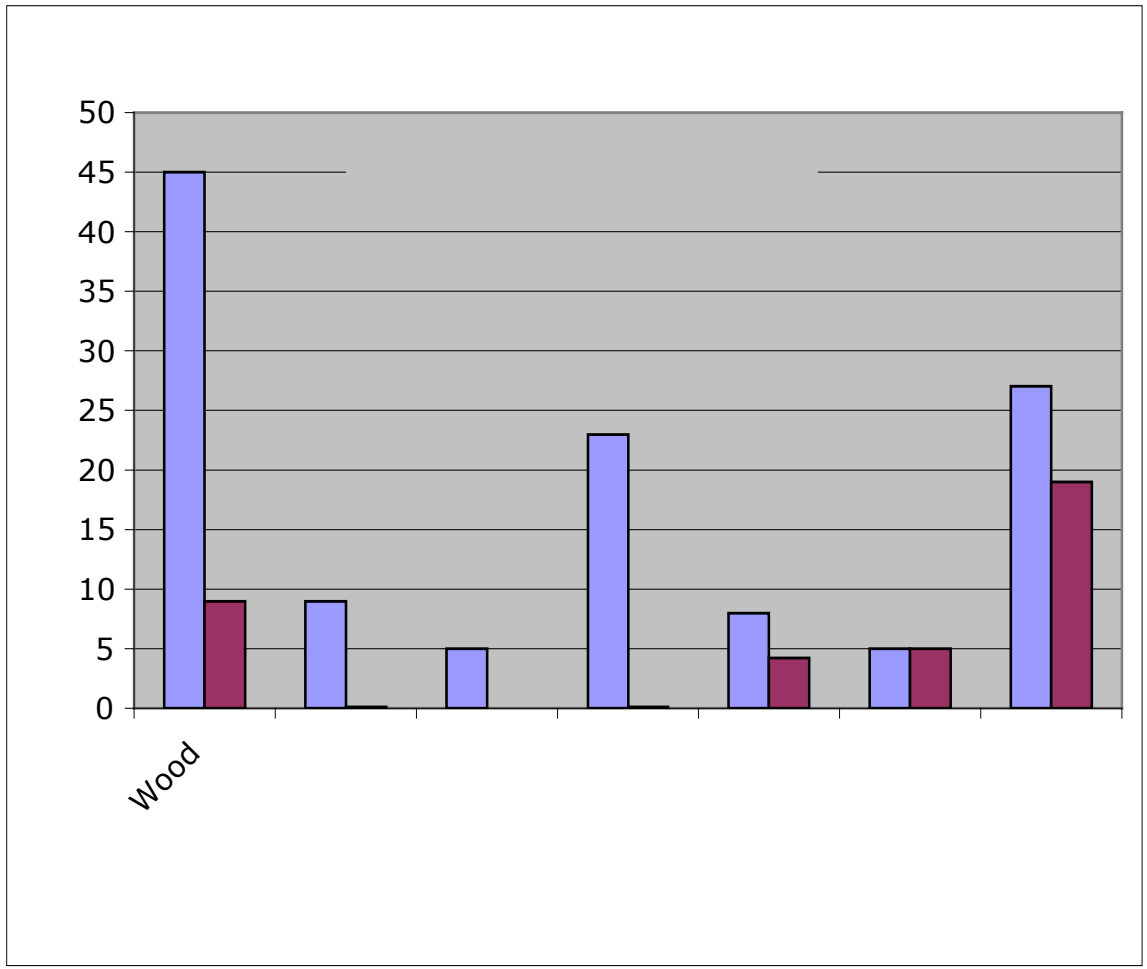
Switzerland and Kyoto

Electricity production is CO_2-free

Transportation sector keeps growing. CO_2 targets will be missed.

What happens, when nuclear capacity needs to be replaced?

Biomass Potentials in Switzerland



Referece: Bundesamt für Energie 2004: Potentiale zur energetischen Nutzung von Biomasse in der Schweiz

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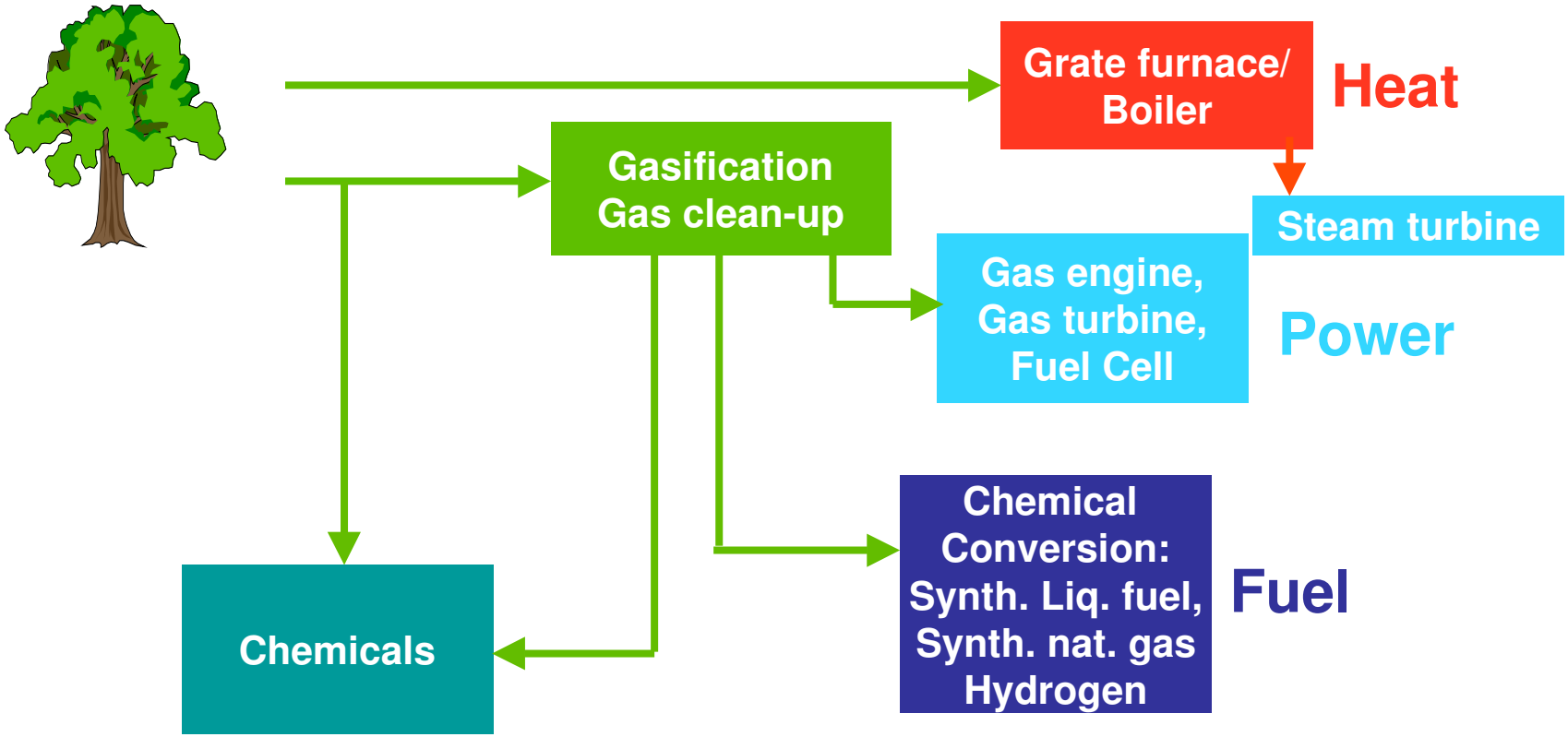
Wood: Which technology for which product



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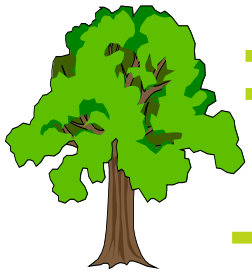
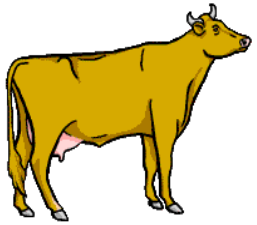
ECOGAS: Integrating Biomass into existing grids





Gasification-Methaniation

Biogas

Hydrothermal Gasification

Biogas

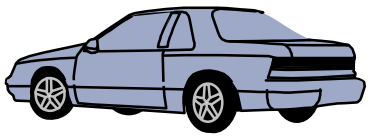
Gas grid

CHP

Distr. heating

Power

CHP



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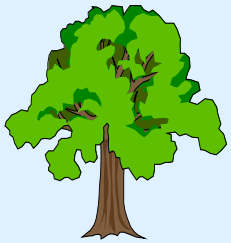
Linking biomass energy & the European Natural Gas Network

Variety of biomasses for a dense distribution network (NG grid at 25 … 70 bar)



- Wood
- Straw
- Energy crops
- Black liquor
- …

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Güssing CHP Plant

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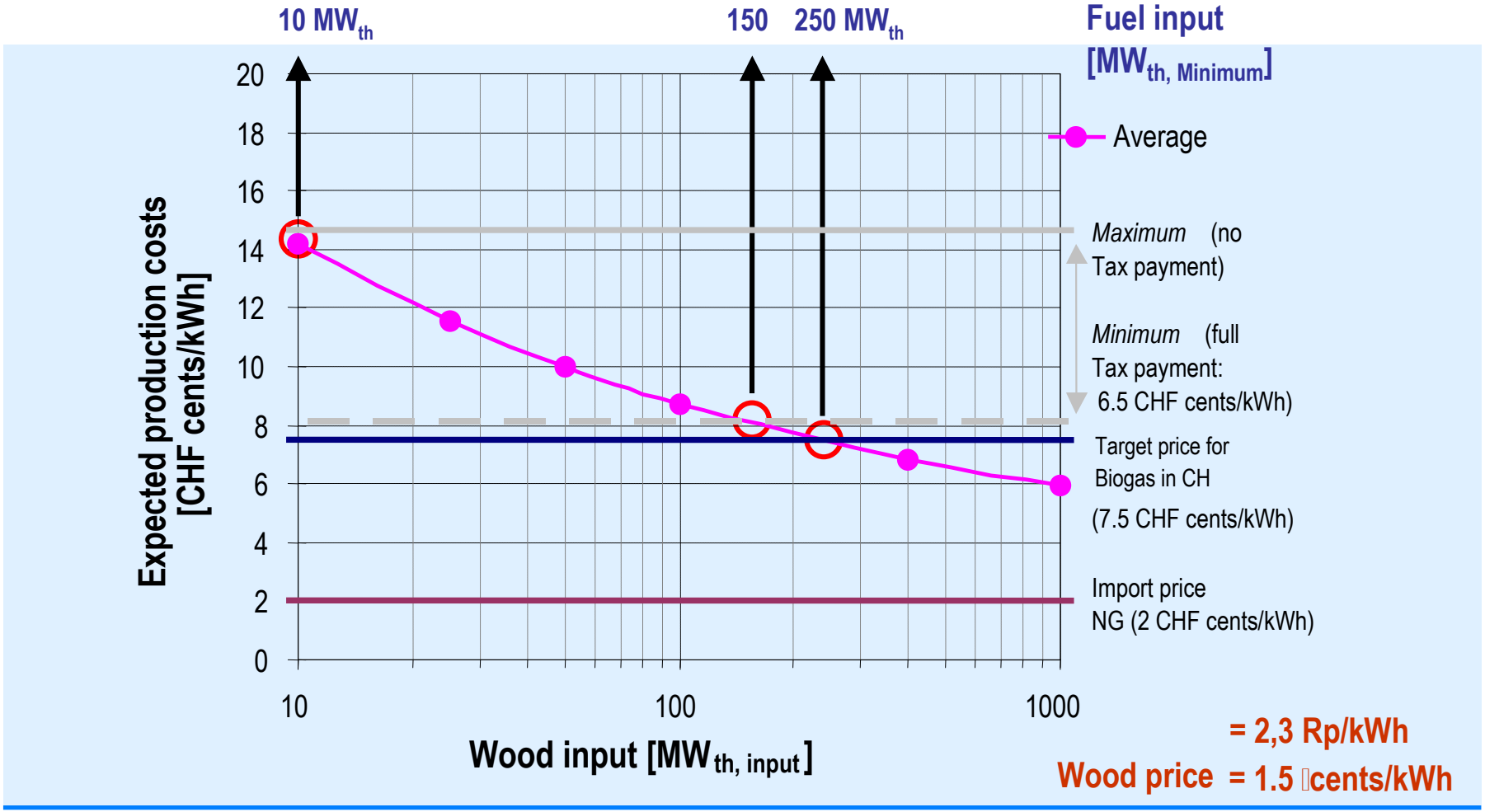
PSI's Methanation Reactor at Güssing

Catalytic conversion of producer gas (including tars, alkenes with 85% efficiency

Wood to methane: 60% efficiency

Technology ready for scale-up to 1 MW (2006)

Cost analysis for SNG production from wood



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Economic Modelling (Markal Model)

Economic model of Swiss Energy System

Introducing new technologies into the system; varying exogenous parameters, such as oil price development, etc.

Model optimizes energy system economically, taking into account time constants for market introduction of investment goods.

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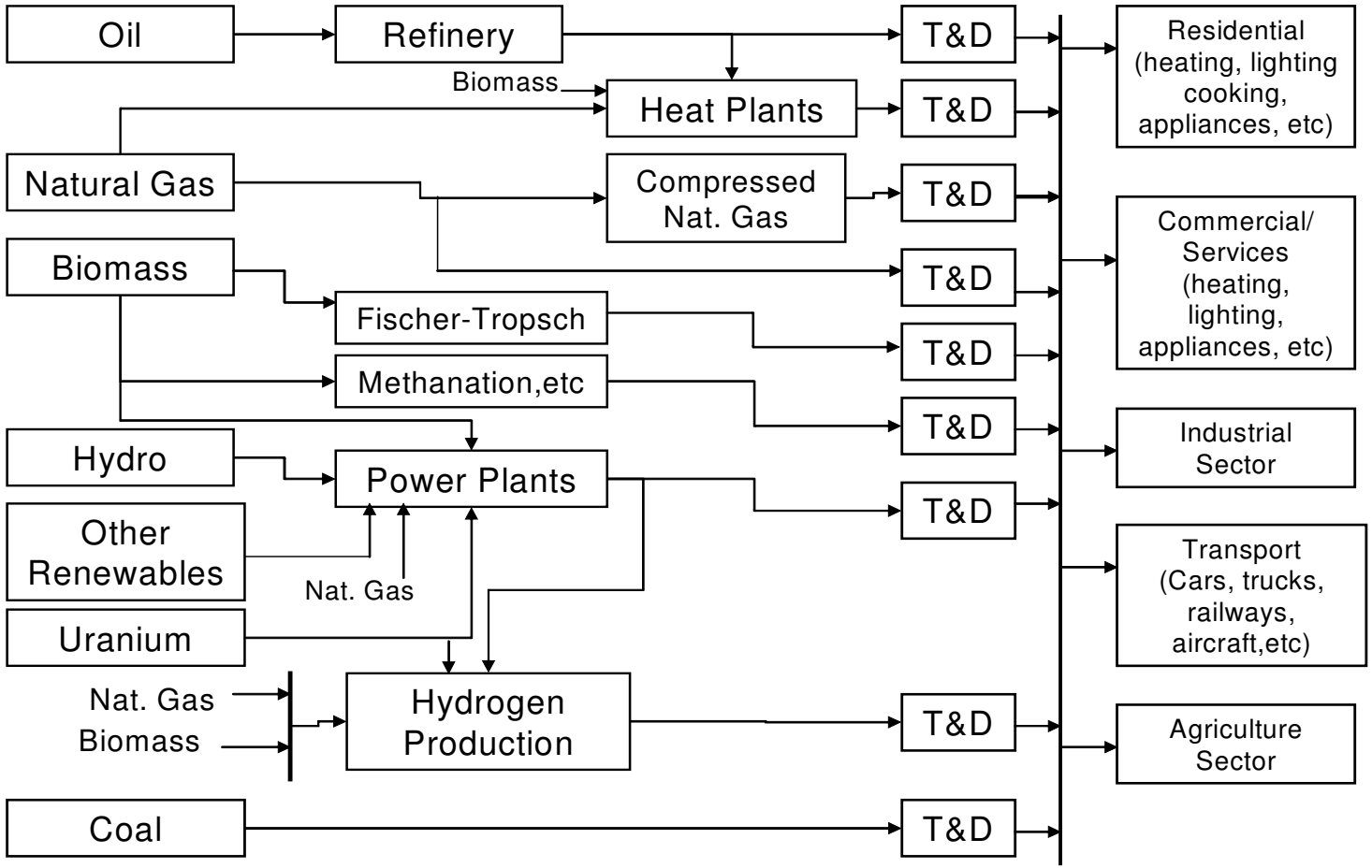
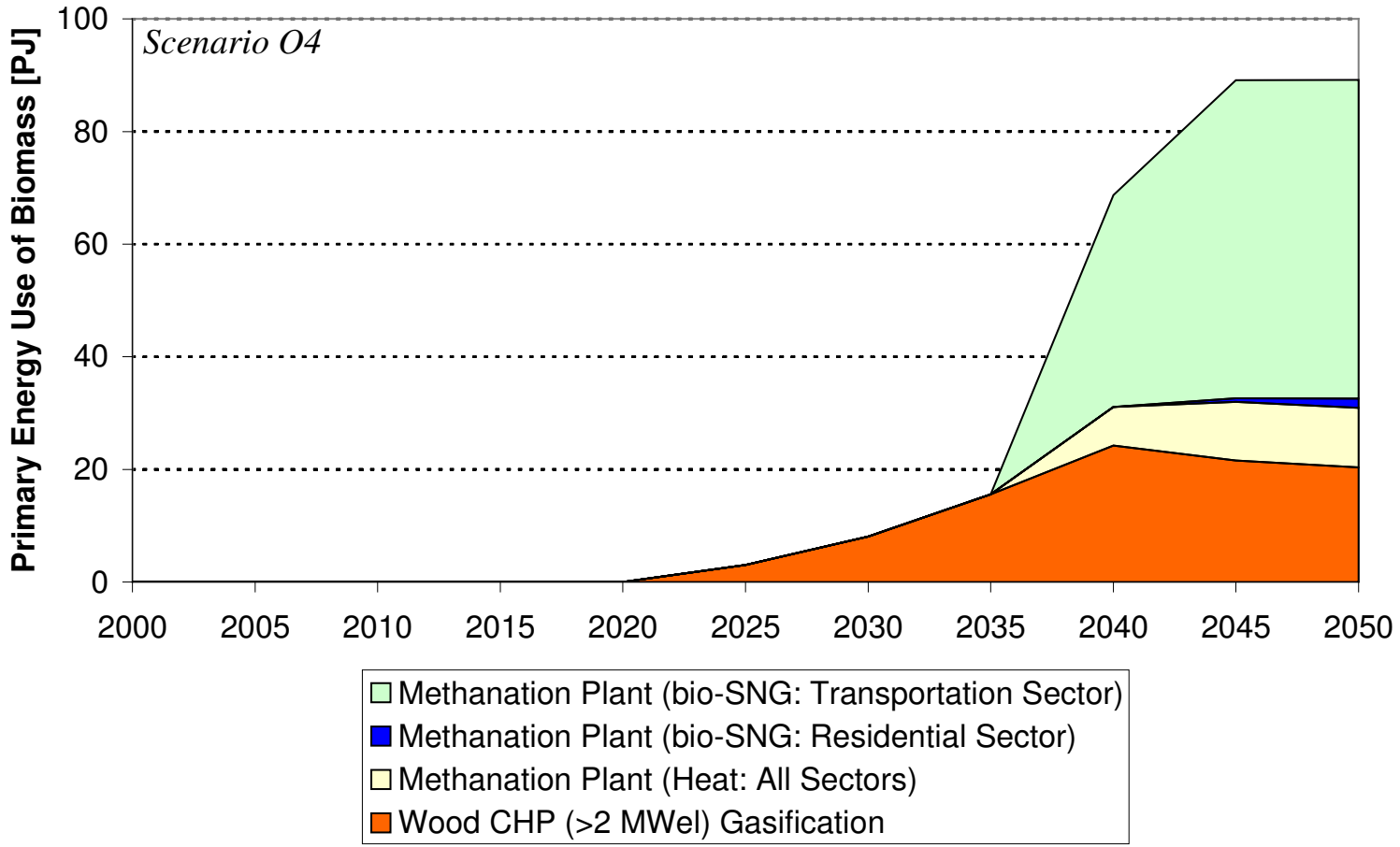
Reference system



Oil price 2050: 130 US$/bbl



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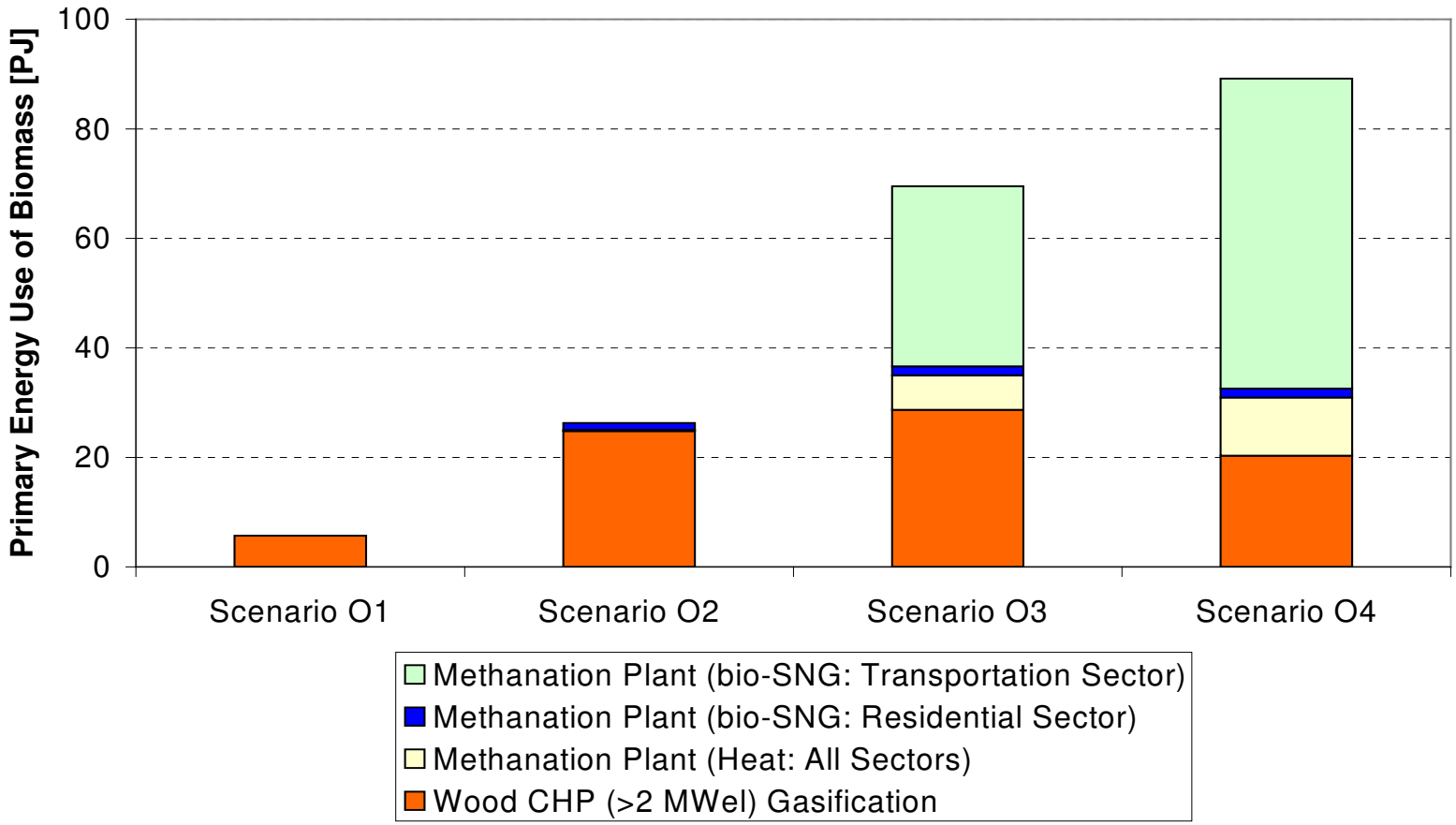
Oil price 2050: 100-130 US$/bbl



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Dry Biomass to Energy - some Qualitative Statements

	Environmental	Economic	Future trends
Distributed heating (traditional)	CO2 Pollutants	Dependence on performance and convenience Seasonal demand	Pellets Demand for heating energy diminishes
Large scale heat Residential	CO2 Flue gas control	Expensive heat distribution limits economy of scale Seasonal demand	Further "dilution" of heat demand
Large scale heat Processes	CO2 Flue gas control	High load factors Limited number of sites	
Combined heat and power	CO2 Flue gas control	Heat distribution limits economy of scale Load factor	High electric efficiency
Power generation	CO2 in power sector dependent on electric efficiency Flue gas control	Explore economy of scale	Combine cycles
Transportation Fuels	CO2 in transportation dependent on efficiency	Explore economy of scale	Chemicals, bio-refineries

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Vision: Linked Networks