ECN

Energy research Centre of the Netherlands

SNG: A NEW BIOMASS-BASED ENERGY CARRIER

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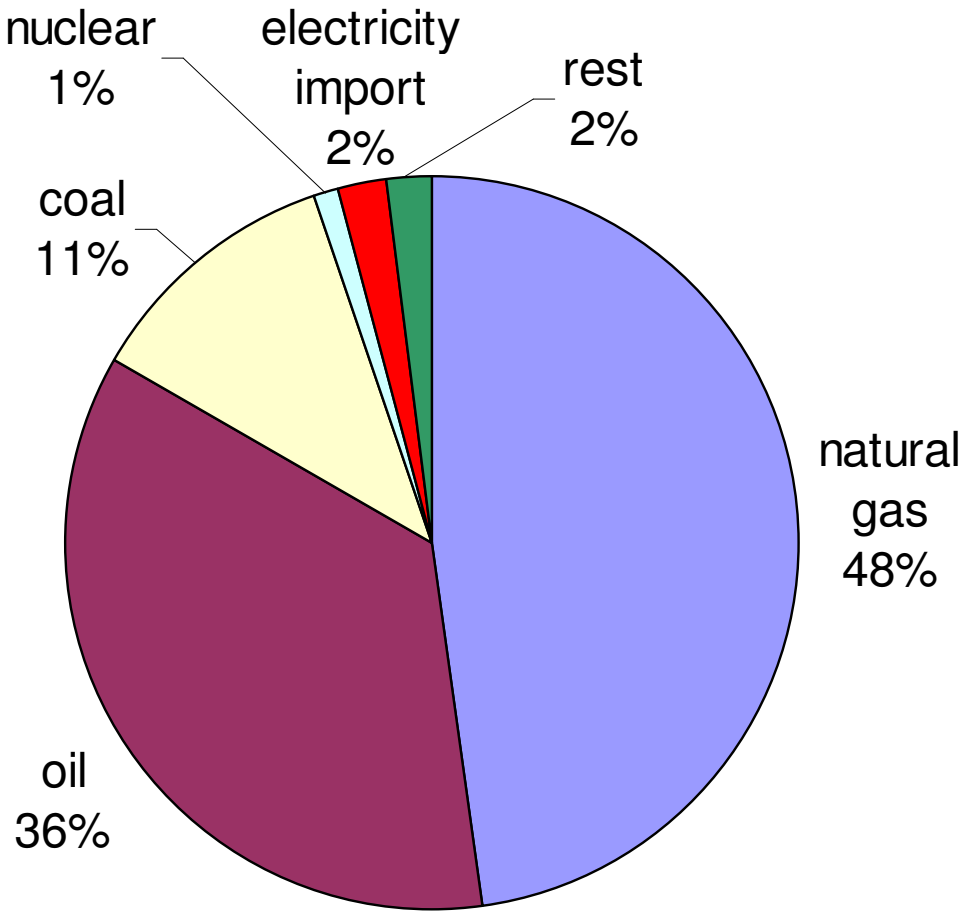
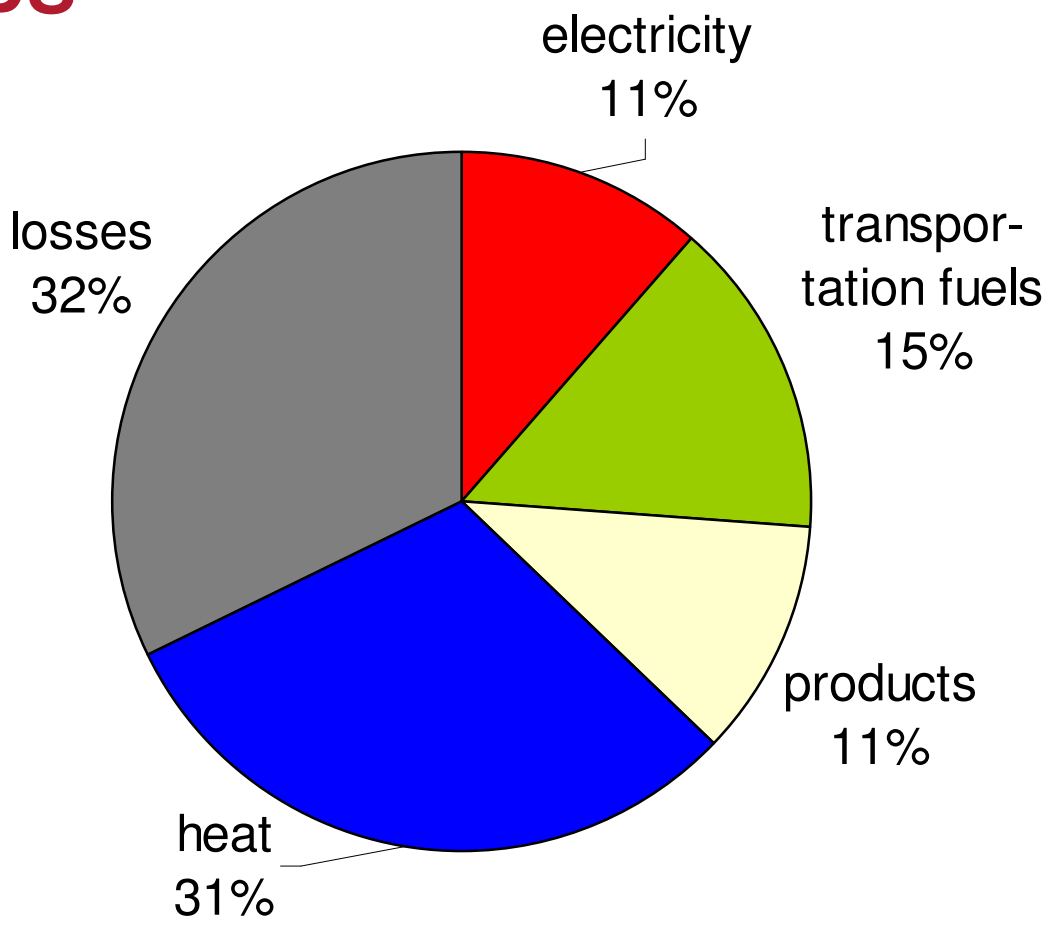
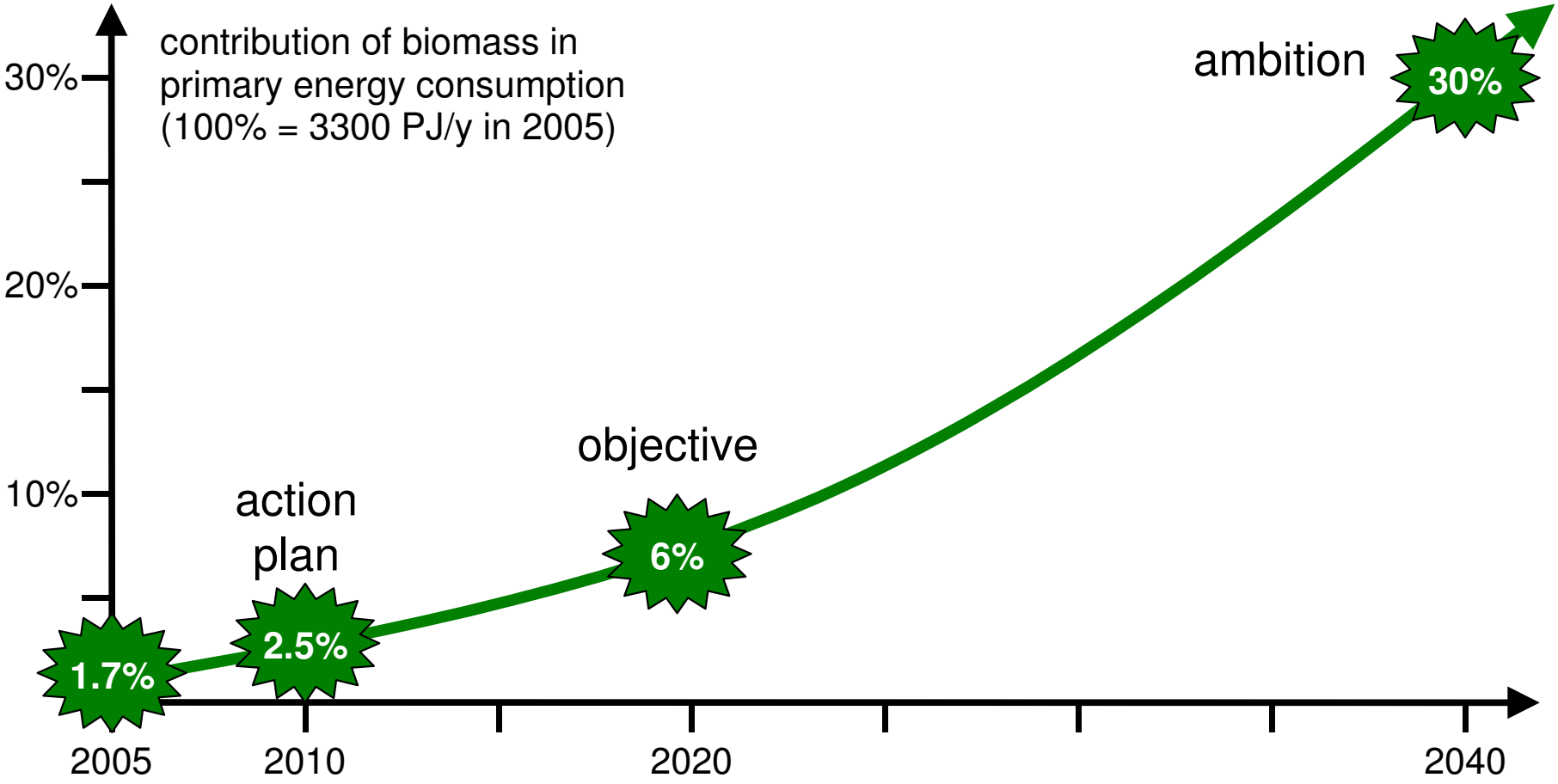
PRIMARY ENERGY IN THE NETHERLANDS



ENERGY "INTERMEDIATES" IN THE NETHERLANDS



BIOMASS ENERGY IN THE NETHERLANDS



CONCLUSIONS

- NL is large natural gas consumer (~1500 PJ/y)
- much heat required (1100 PJ/y)
- ambitious biomass objectives (80, 200, 1000 PJ/y)

- SNG: a new biomass-based energy carrier?!

CONTENTS

- what is SNG?
- SNG why?
- how SNG?
- SNG potential
- SNG price
- conclusions

WHAT IS SNG?

- SNG: Substitute Natural Gas (or Synthetic Natural Gas or Green Gas), similar to natural gas but made from coal, biomass, waste, …

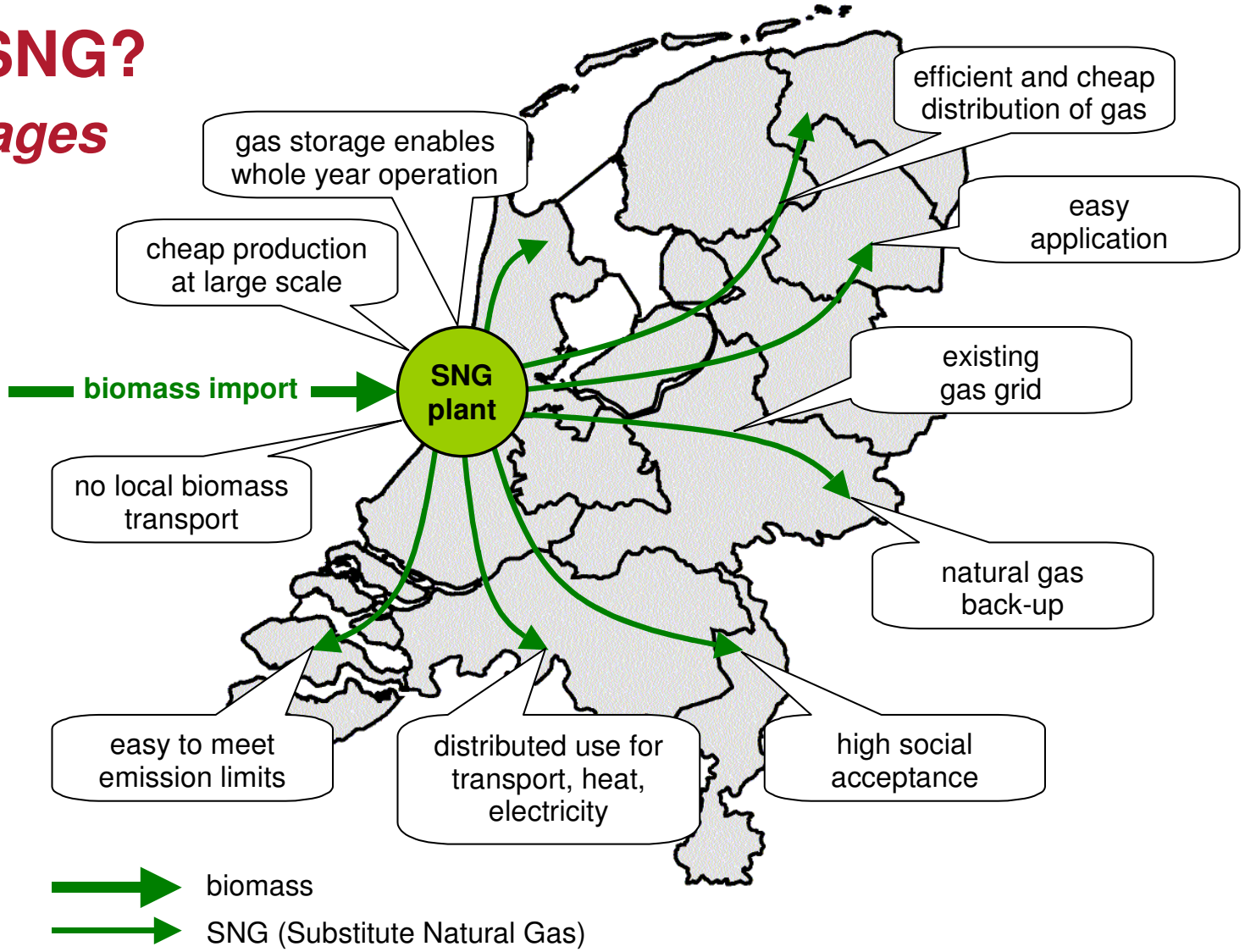
WHY SNG?
considerations

- natural gas is the fuel of choice worldwide
- but supplies are finite, SNG is one option (see USA)
- SNG from biomass also avoids CO_2 emissions

- *ECN focuses on **large-scale** production of **SNG** for **heat**:*
- ~50% of NL energy comes from natural gas
- most of this is used for heating (of which ~0% renewable)
- in NL: biomass not available in large quantities, import necessary
- in NL: biomass fuel will clean (wood), expensive and concentrated in large harbors

WHY SNG?

advantages



HOW TO MAKE SNG

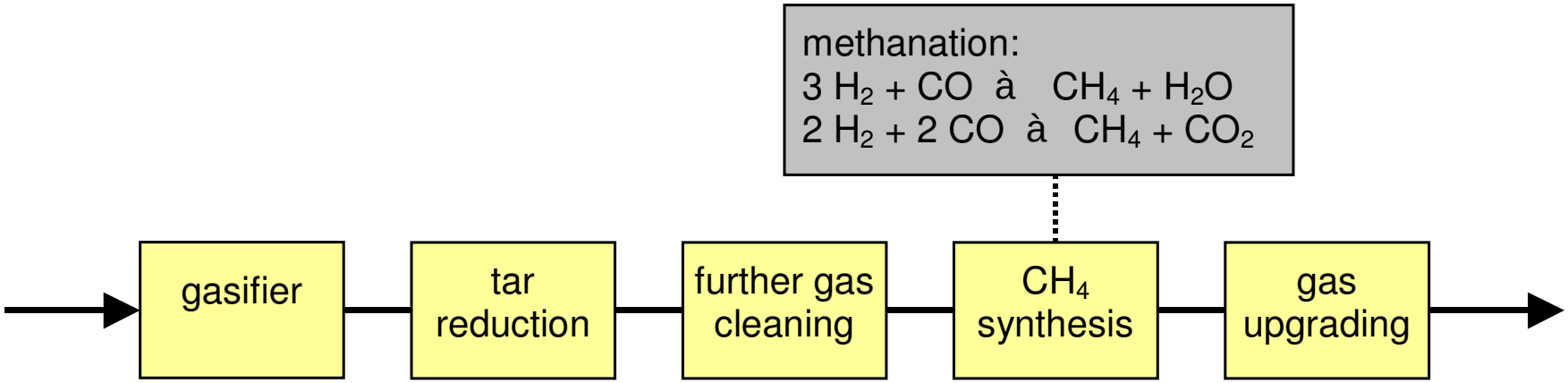
two options

	upgraded biogas	Substitute Natural Gas (SNG)
technology:	digestion / landfill	gasification & methanation
status:	commercially available	in development (for biomass)
implementation:	today	> 2010
production scale:	small *(~300 kW)*	large *(~1,000 MW)*
feedstock:	wet biomass *(available)*	dry biomass *(import required in NL)*
potential:	limited *(< 60 PJ in NL)*	unlimited *(> 240 PJ in NL)*

HOW TO MAKE SNG

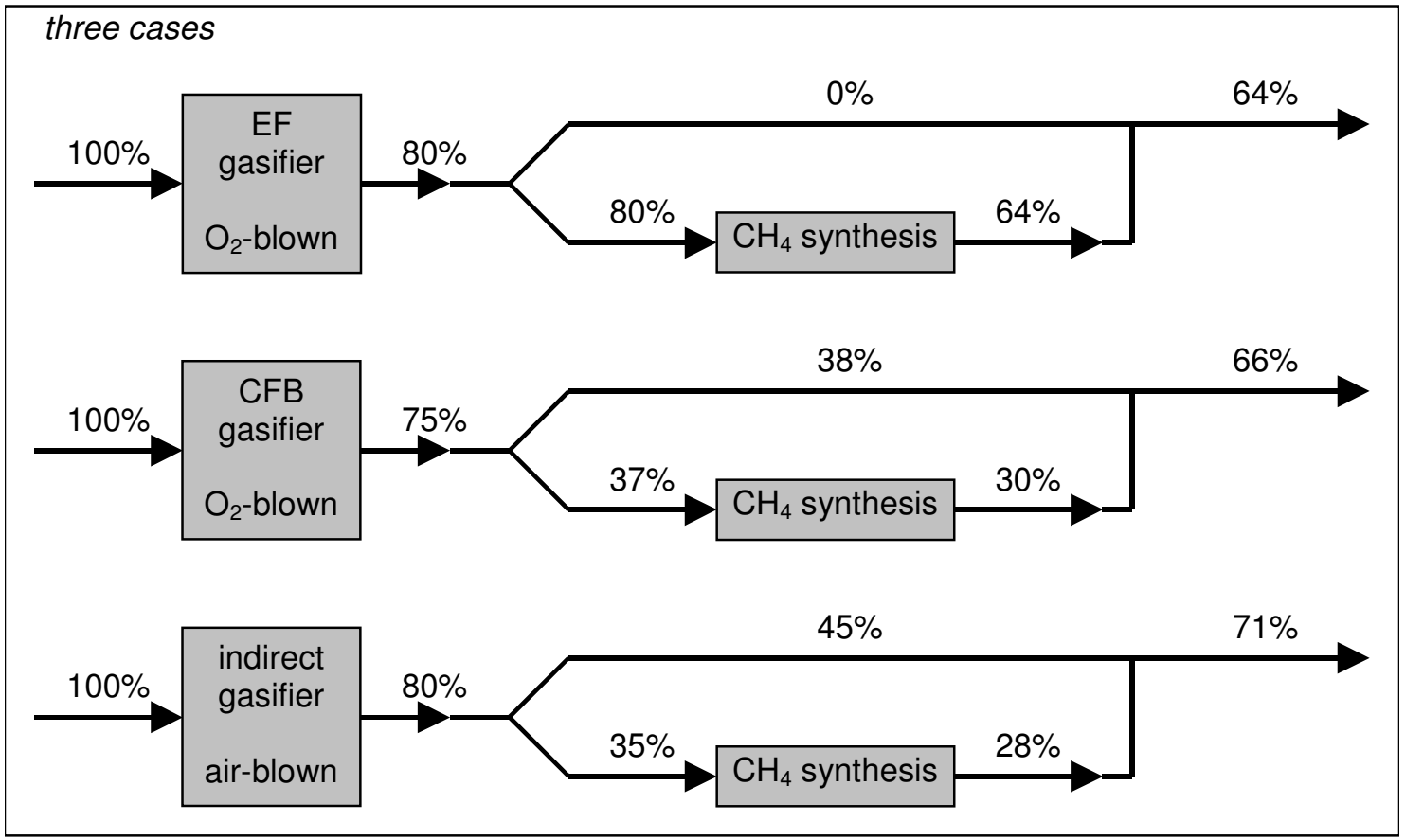
gasification system

Substitute Natural Gas (SNG)



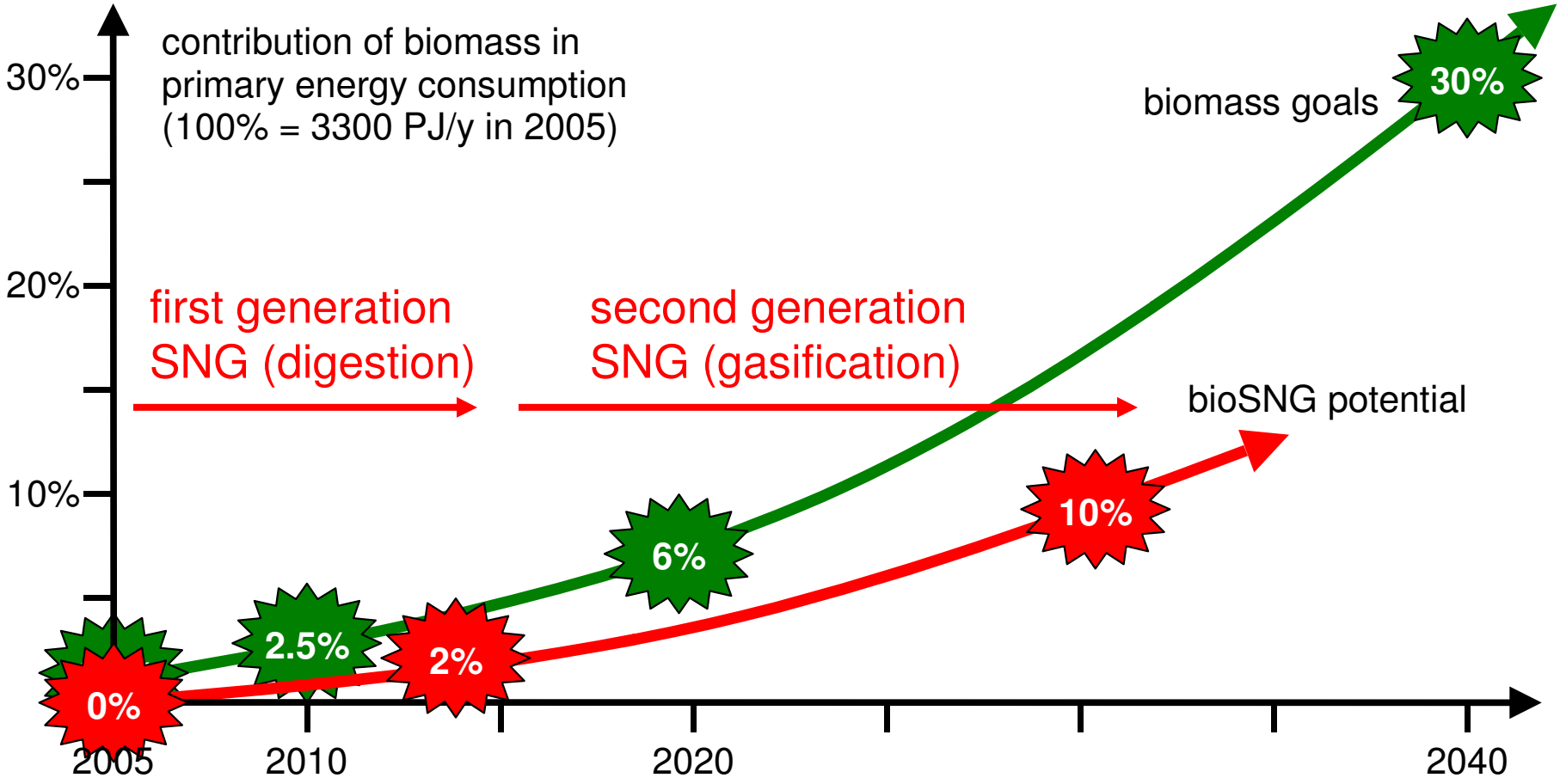
HOW TO MAKE SNG

efficiency



EF: entrained flow, CFB: circulating fluidised bed

SNG POTENTIAL

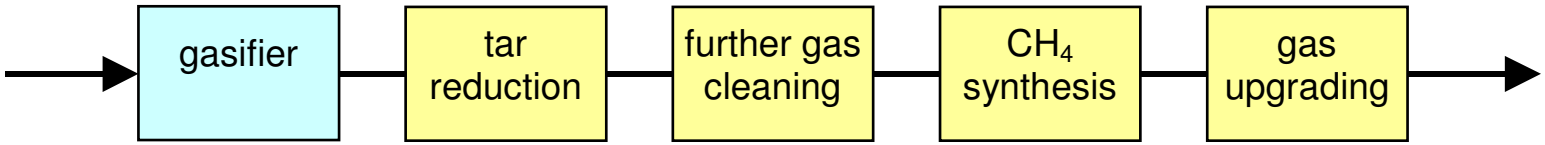


FUTURE PRICE OF SNG

- biomass 4 €/GJ
- depreciation: 14% of investment yearly
- operation and maintenance: 8% of investment yearly
- 8000 h/y
- 70% biomass-to-SNG efficiency
- investment costs based on GtL

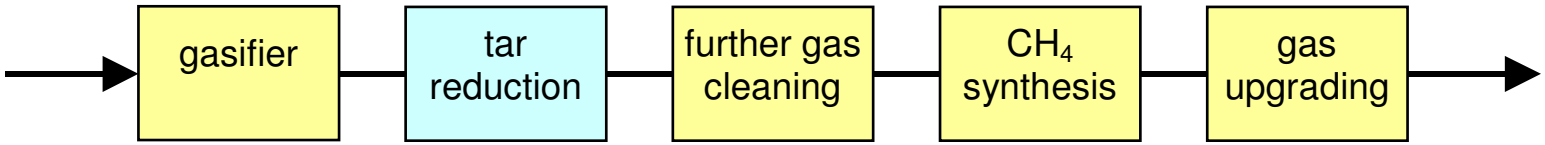
- 1000 MW_{th}: 10-11 €/GJ SNG production costs
- for comparison: 7 €/GJ natural gas price (today!)
- difference corresponds to 50-75 €/ton CO_2

ECN RESEARCH PROGRAMME



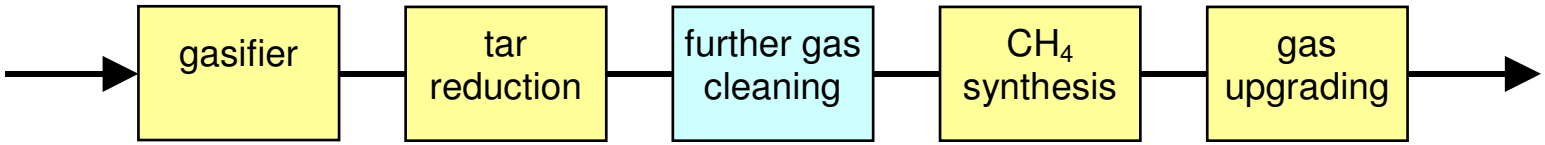
- MILENA indirect gasifier
- can be operated as:
  - SilvaGas
  - FICFB
  - BFB
- 5 kg/h biomass
- since 2004
- 150 kg/h in preparation

ECN RESEARCH PROGRAMME



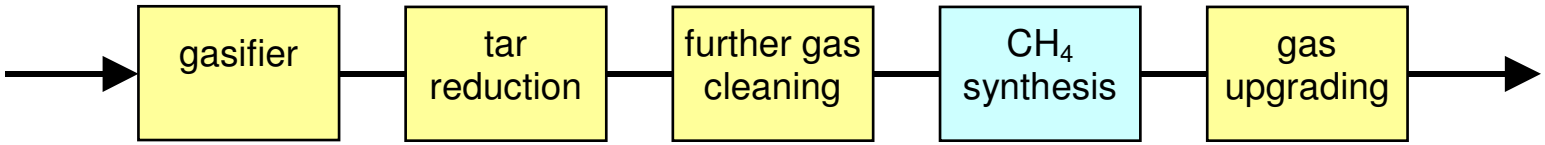
- OLGA tar removal
- removes tars efficiently
- tar dew point < 0 ℃
- www.dahlman.nl
- 2 and 200 nm^3/h unit available
- 1500 nm^3/h constructed

ECN RESEARCH PROGRAMME



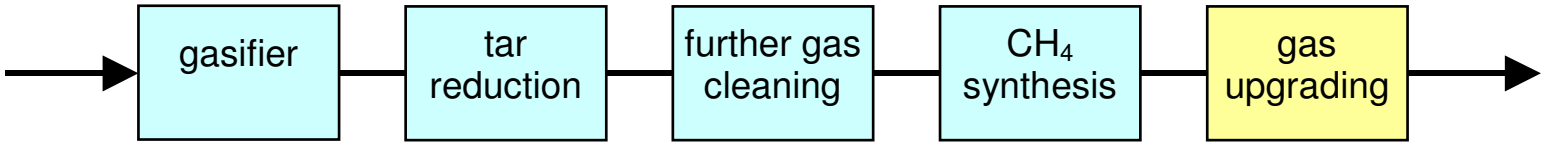
- SACHA dry gas cleaning
- H_2S, COS, HCl removal

ECN RESEARCH PROGRAMME



- methanation catalysts selection
- no ECN catalyst development (yet)

ECN RESEARCH PROGRAMME



first integrated test scheduled mid 2006
on lab-scale (2-8 nm^3/h)

CONCLUSIONS

- ECN vision: SNG from biomass will become important
- SNG production should be large-scale (typically 1000 MW) plus gas storage
- high production efficiency required: gasification <1000°C
- indirect gasification preferred technology
- ECN research on all major parts (with partners):
  - gasification
  - gas cleaning
  - methanation
- SNG: the new biomass-based energy carrier !!!

MORE INFORMATION

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