Danish Follow-up Programme for Solid Biomass CHP Plants

Small scale biomass co-generation Danish experience and perspective

IDA workshop October 7. 2010

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Danish Energy Agency

DK Follow-up programme

- Started 1993 continued to 2005 on full load.
- Process-, fuel-, energy-, environment-, waste water-, ash-, chemical- and economy analysis
- Monthly data collection
- Continues reporting.
- Task group

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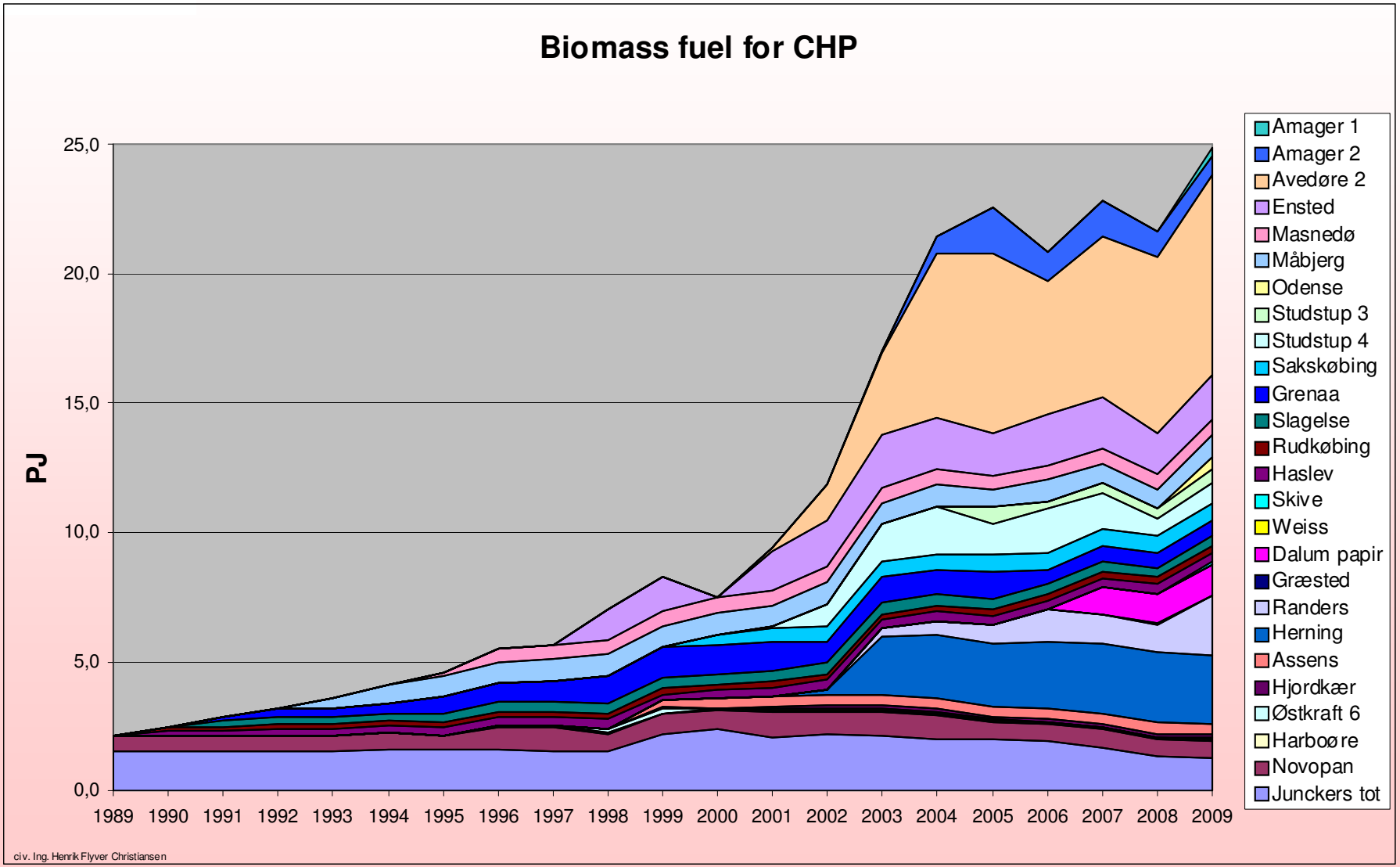

Fundamental consideration

- Saving – reduced consumption
- Efficiency – reduced consumption
- Renewable energy – reorganize production
- Long term - Biomass become only carbon resources.

Unique Danish position

Consumption <=> Production

- National power grid – partly storable
- National natural gas grid – partly storable
- Local district heating – storable
- Transport of fuel / product - storable
- Information transport – storable

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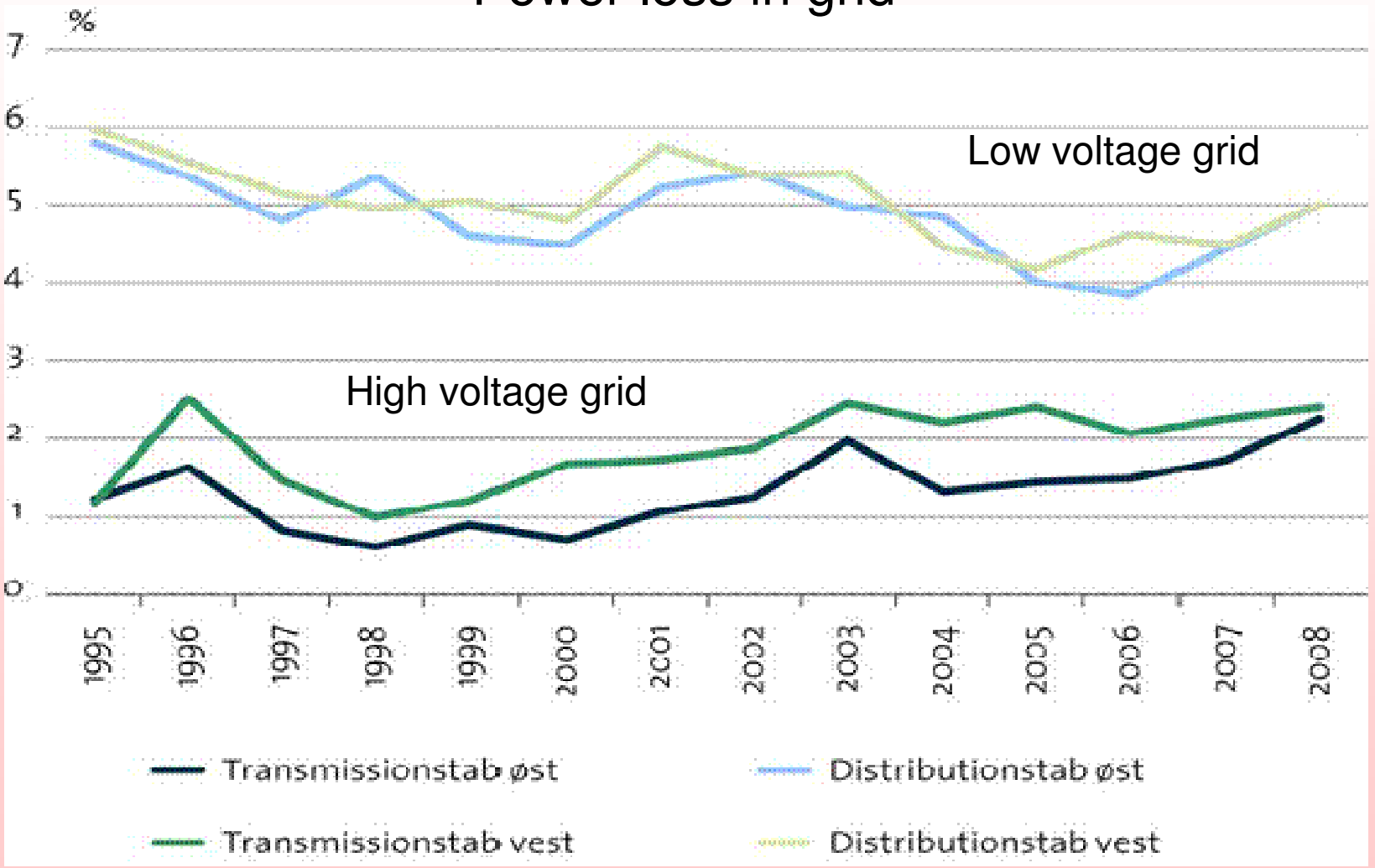
Power loss in grid



Source Miljørapport 2009, Baggrundsrapport, Energinet.dk

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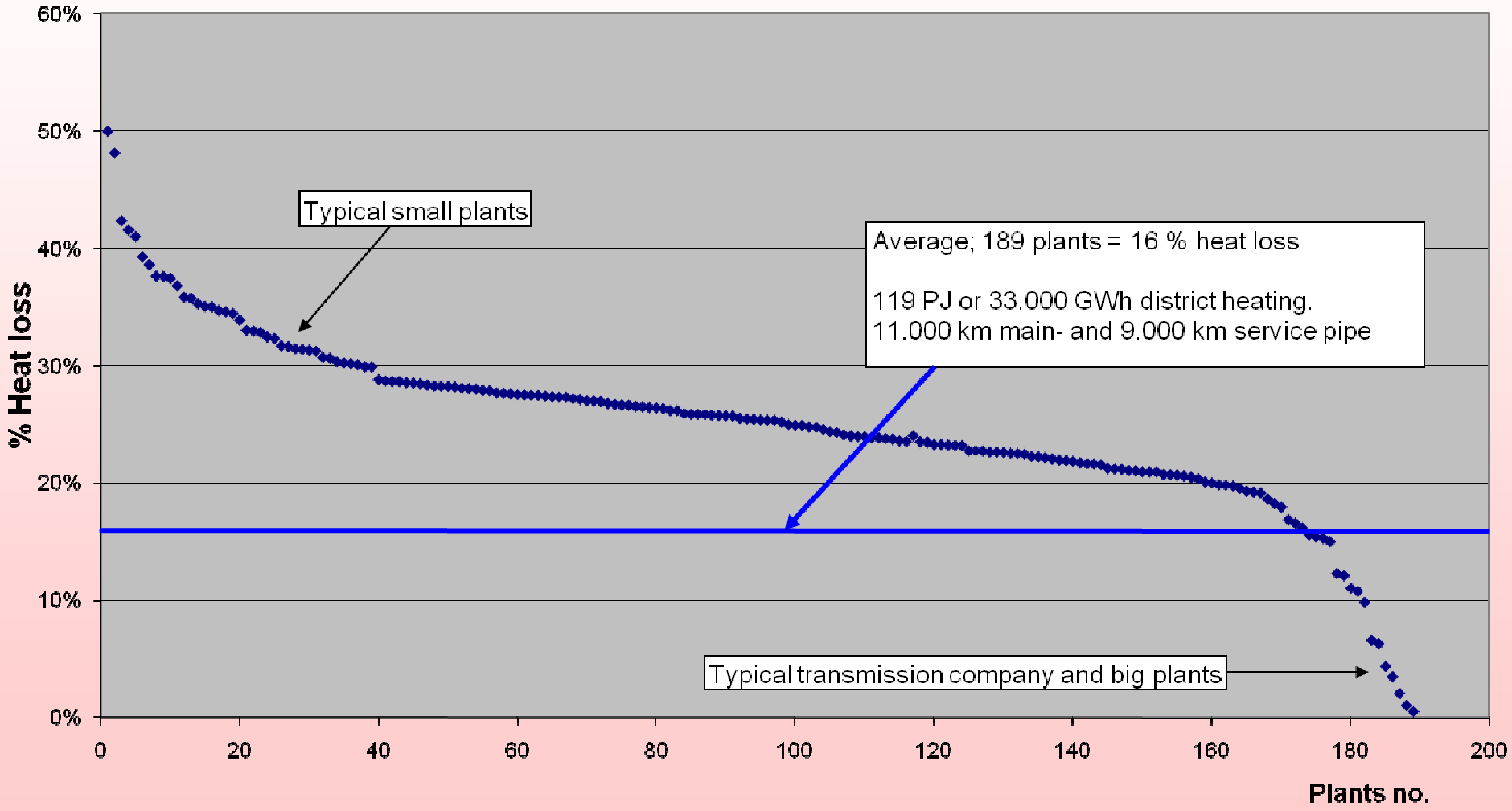
Heat loss in district heating



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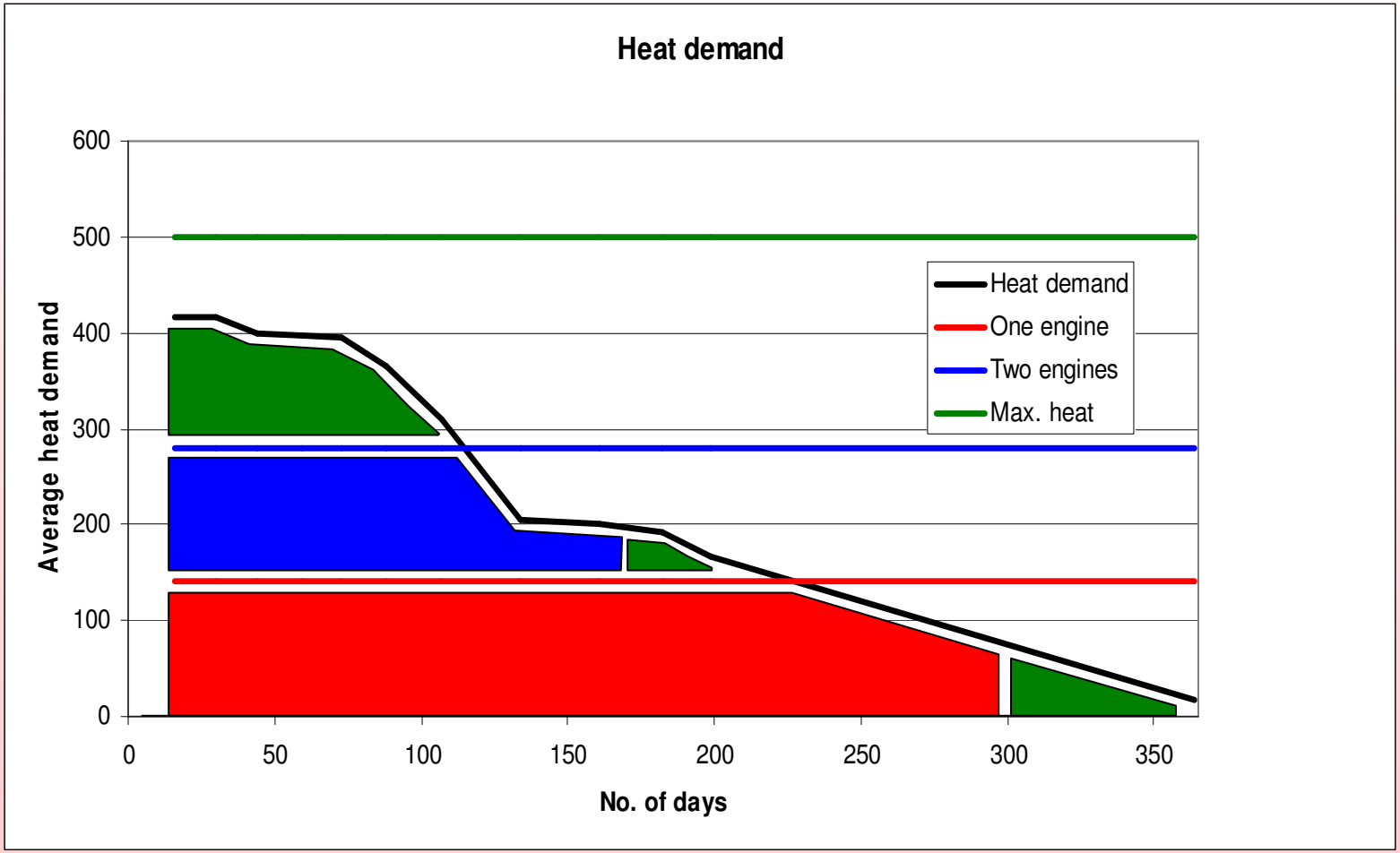

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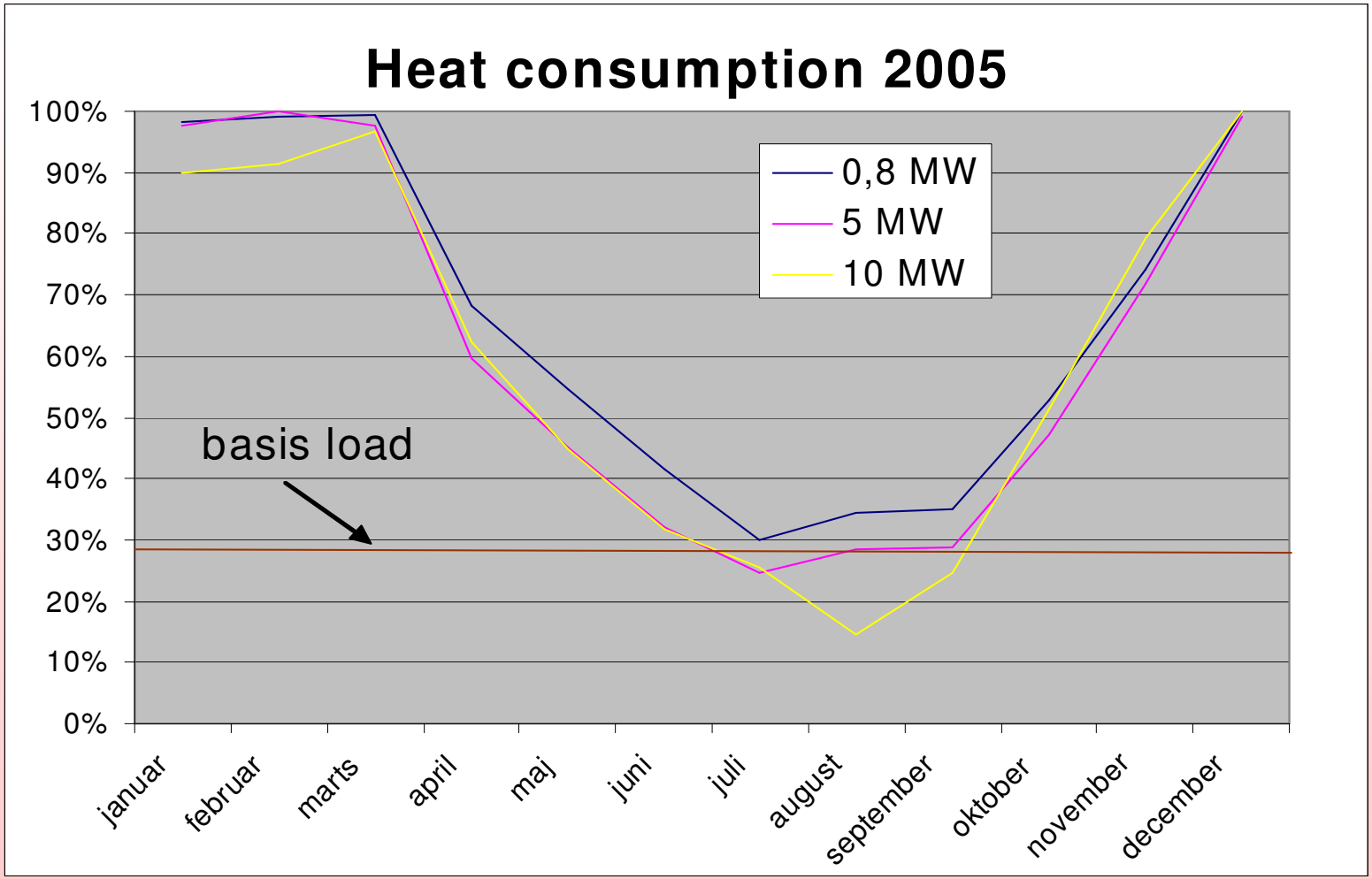

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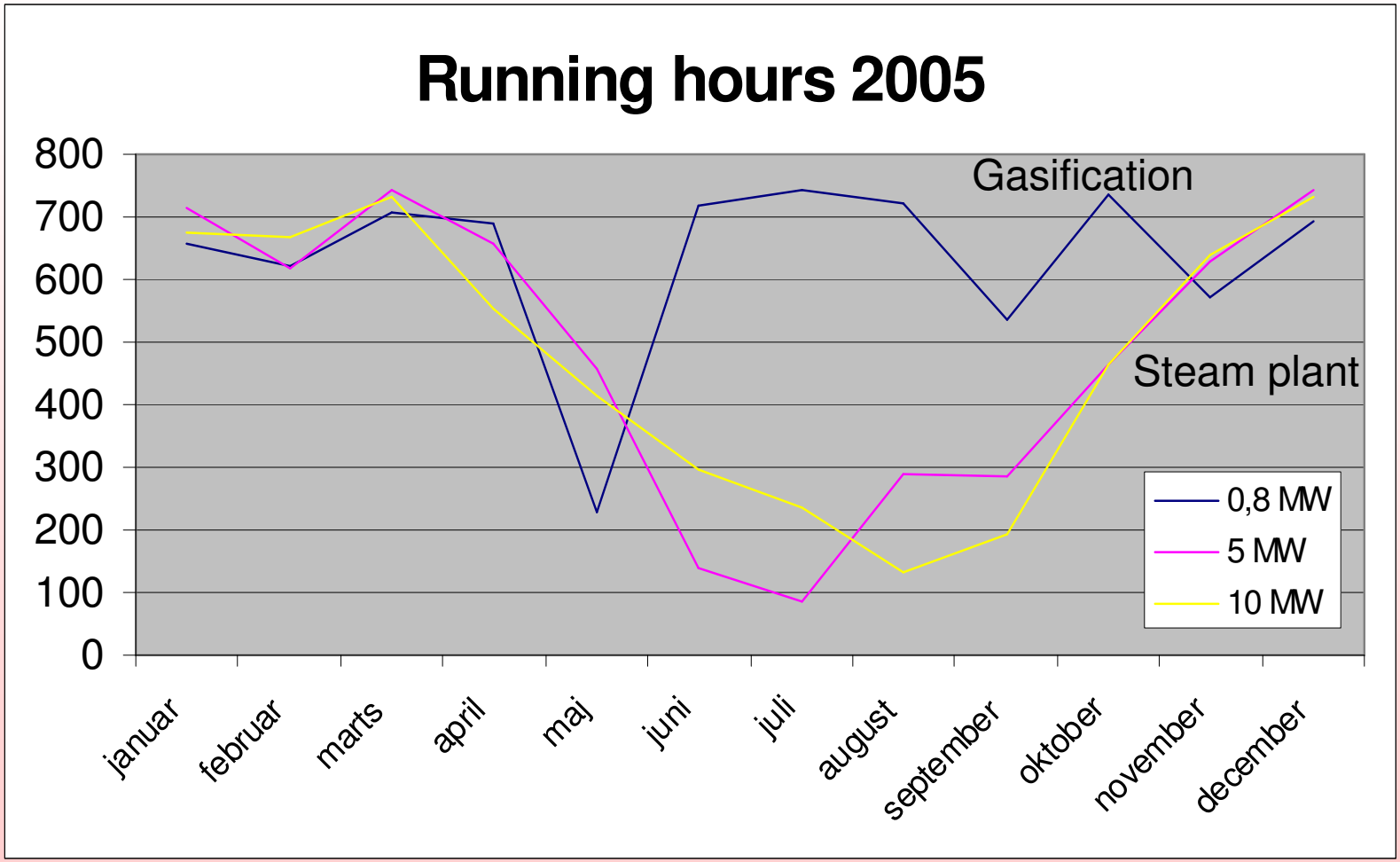

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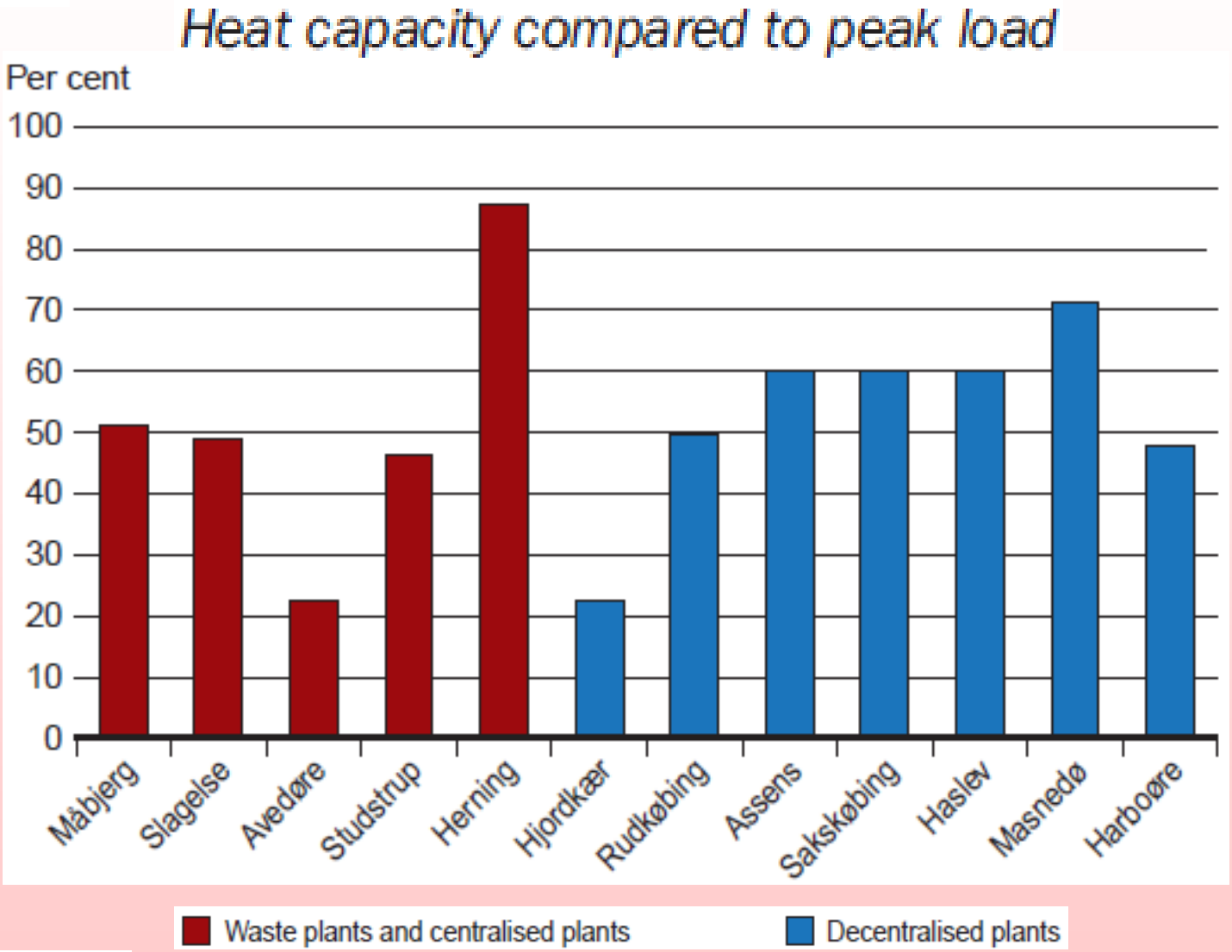

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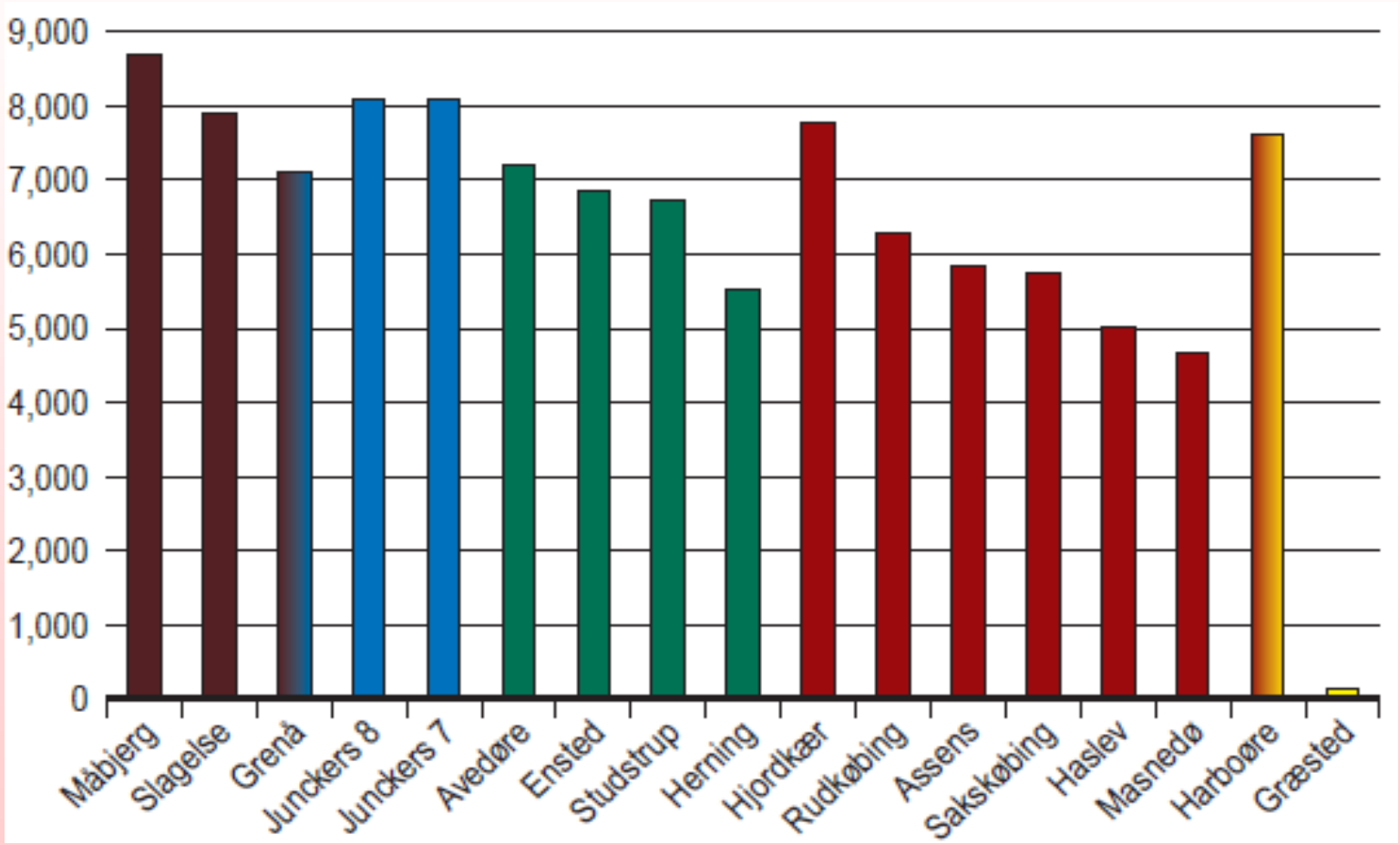
Operation hours in 2005



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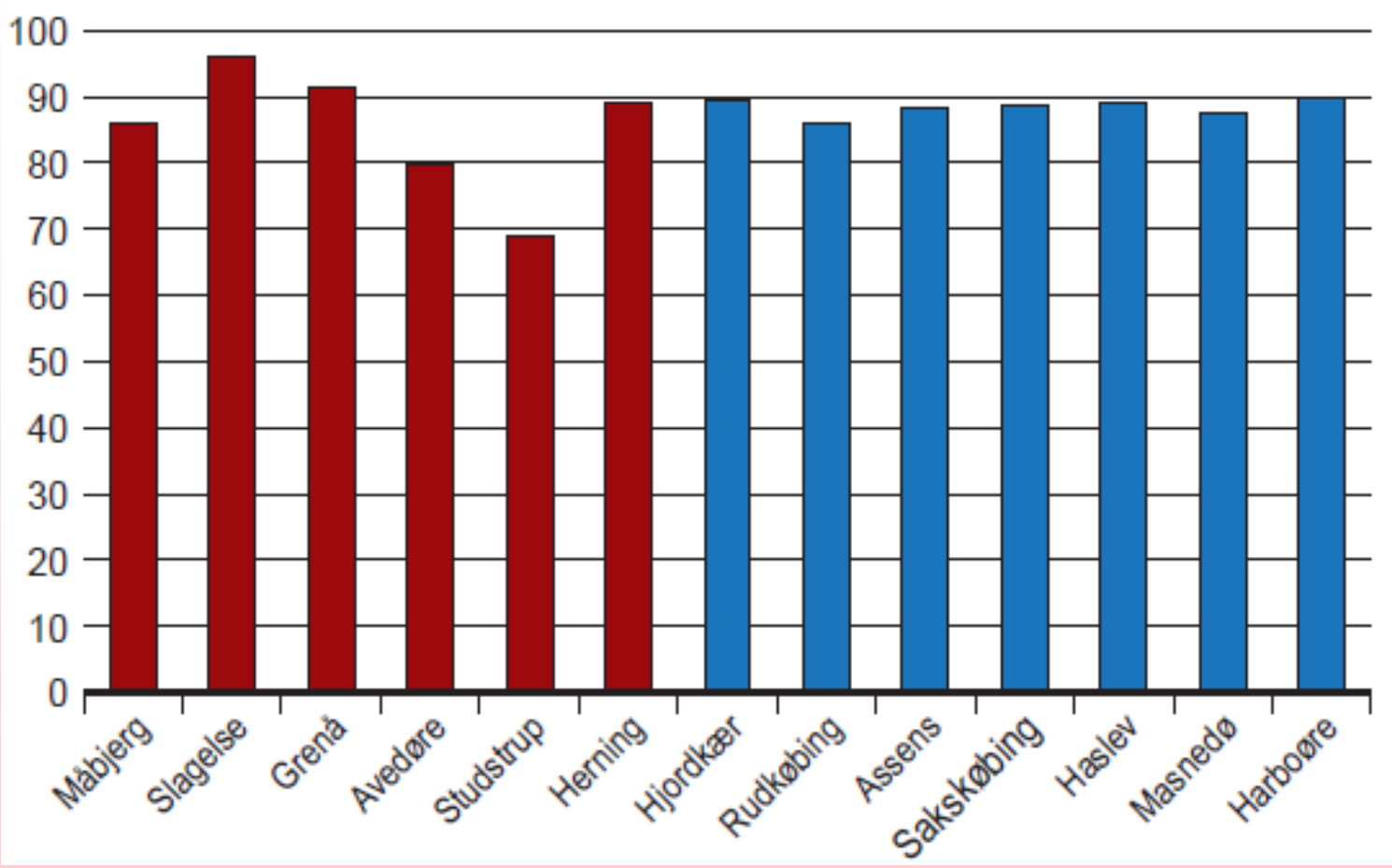
The average total efficiency for the plants in 2005.



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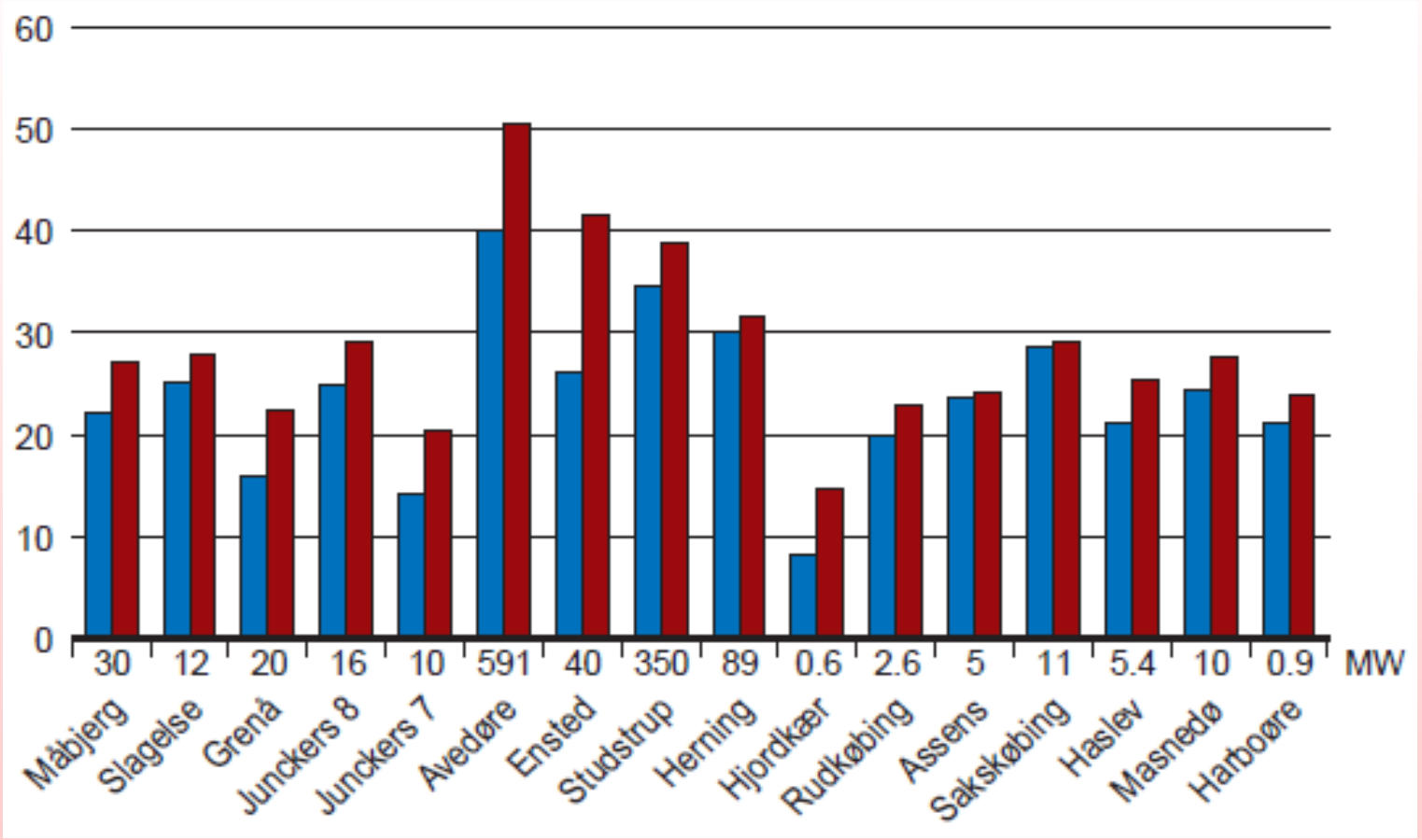
Power efficiency in 2005



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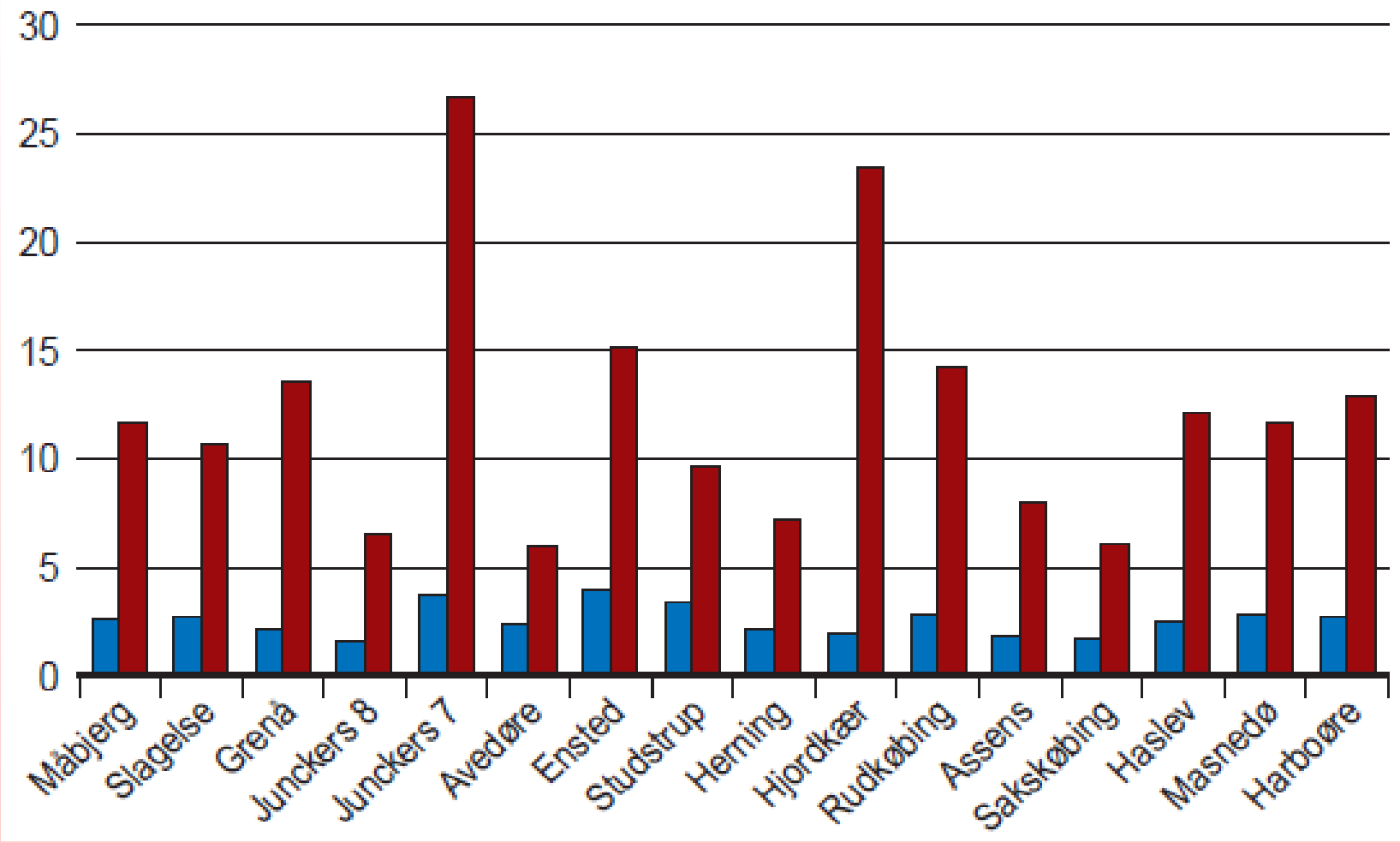
Power consumption in 2005



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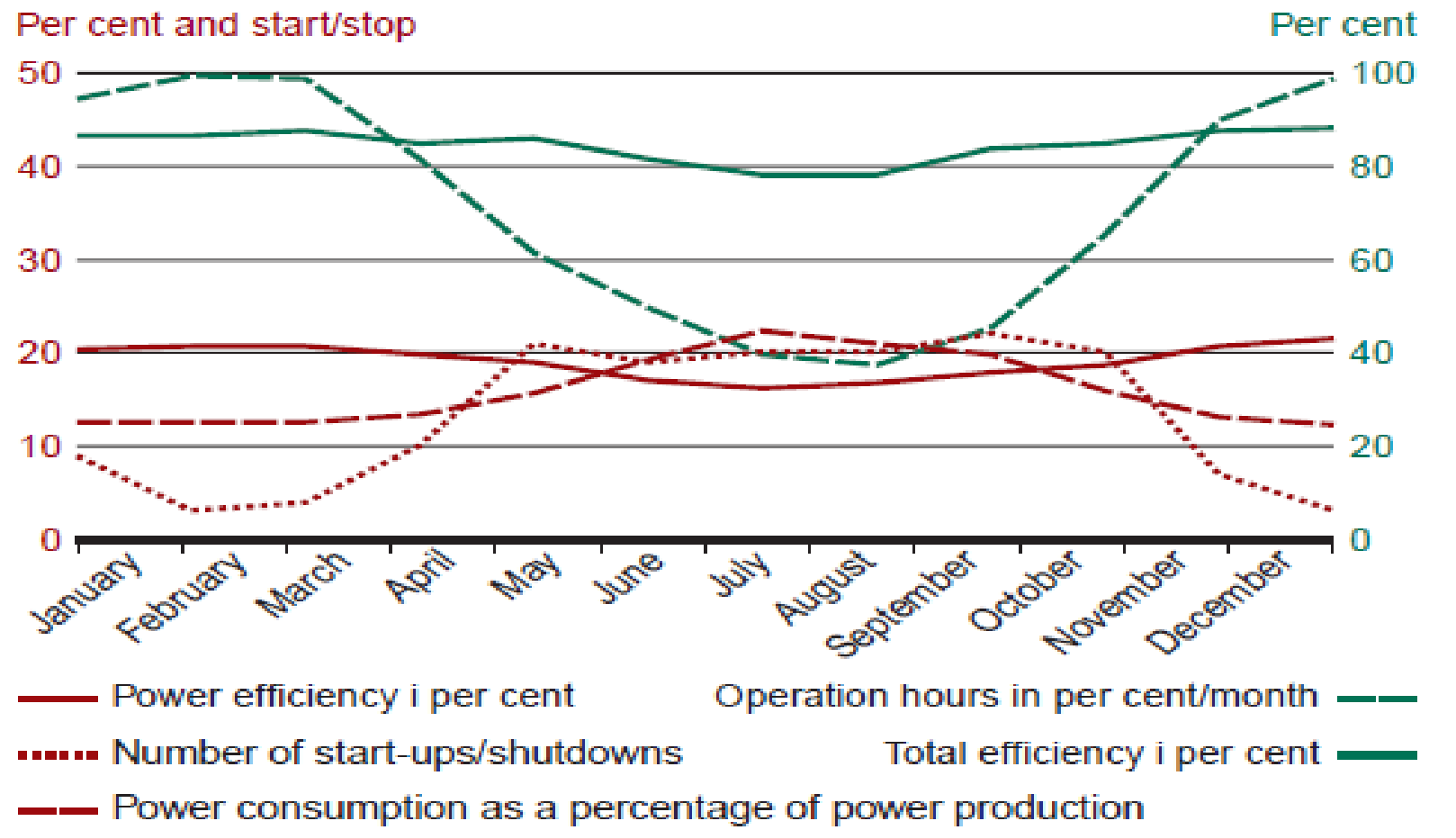
Rudkøbing 2,3 MW steam in 2005



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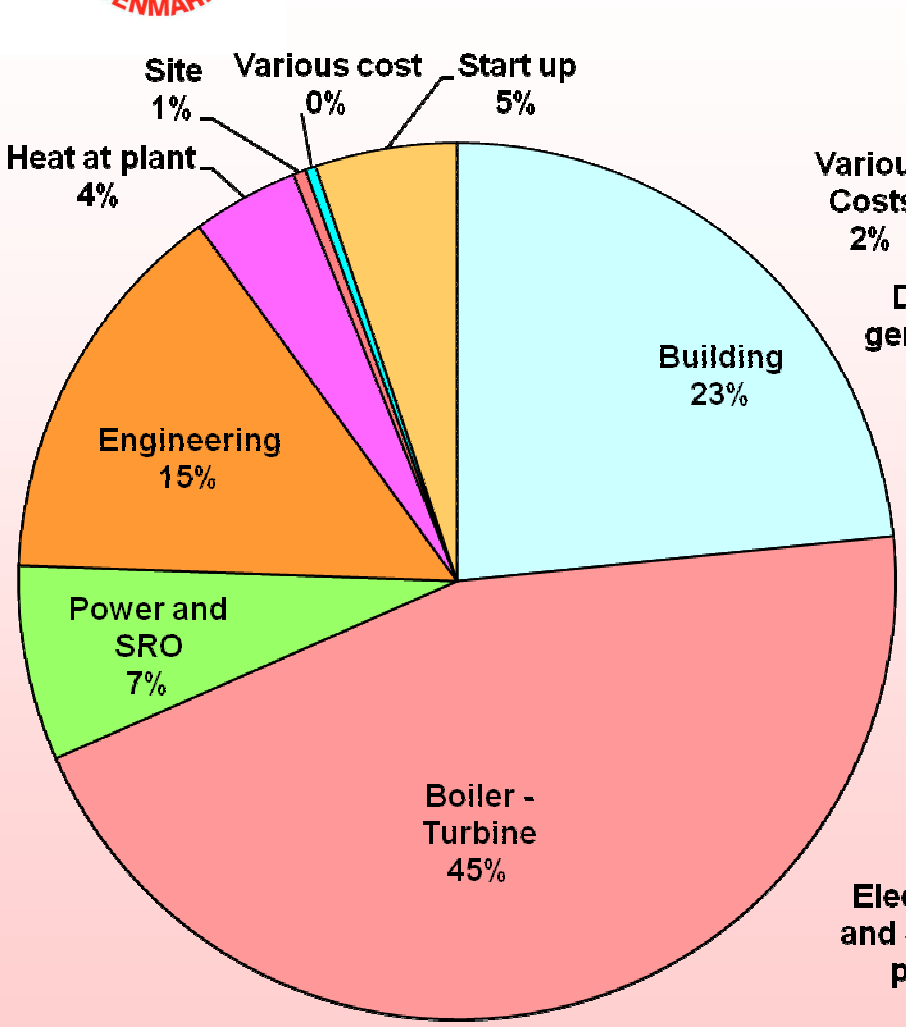
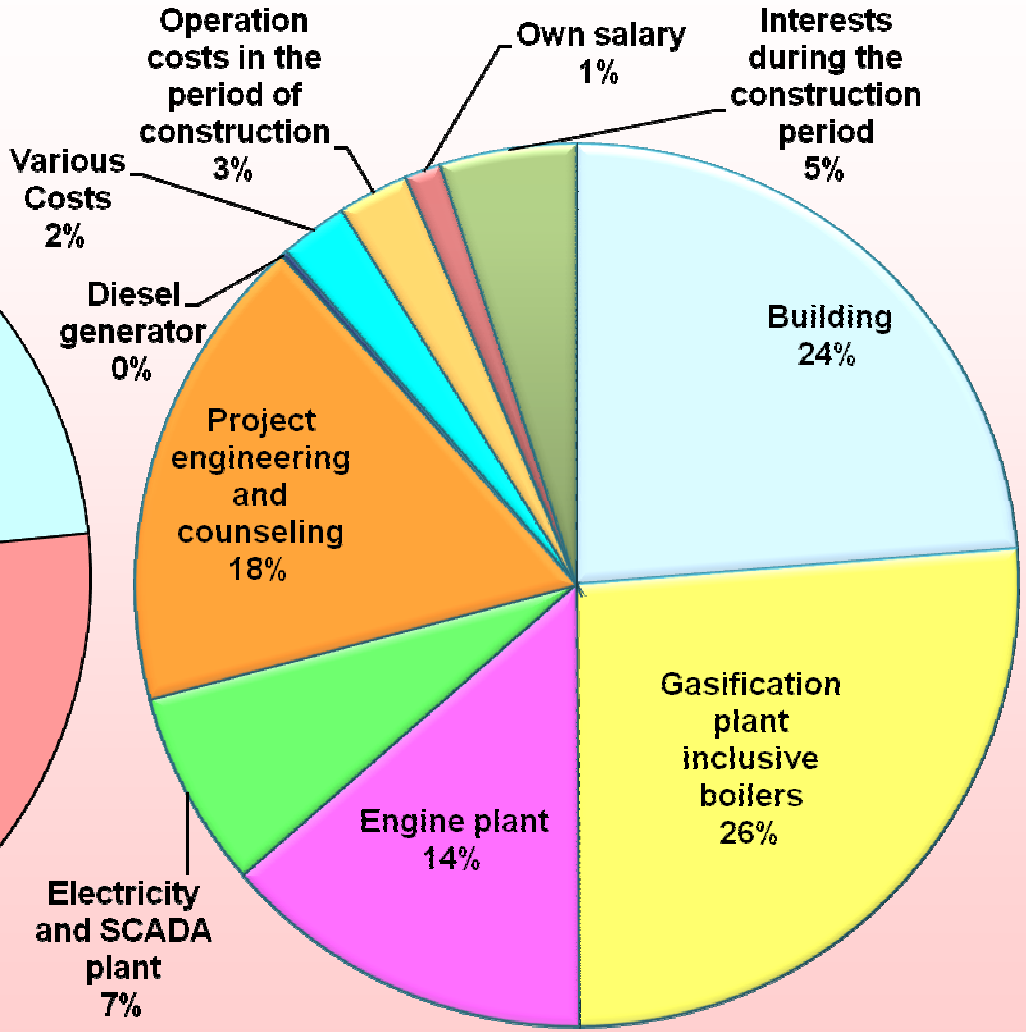


Steam Plant. Straw



Gasification Plant. Wood

Plant Investment

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Key no. and Plant Investment

	Fuel	Electricity	Heat	Liquid	Costs	Rate
	MW	MW	MW	MW	Mio. DKK	Mio. DKK/MW
Skive project	18	6	10	0	250	42
Skive optimised	28	9	16	0	288	32
Skive 2 + fuel	28	10	15		262	26
Skive 2 + liquid	28	10	15	18	302	30
Skive 2 pressurized + oxygen	98	43	43		608	14
Straw combustion, 2002 costs; Sakskøbing	39	11	23		252	22

DK Follow-up programme

Some results:

- **Combustion**: fuel- and ash handling. Plant guarantee. Plant consumption – cut down.
- **Gasification**: Tar- and dust measurement. Guarantee for engine. Basis research.
- **Common**: Standard for fuel. Standard for preforment test.

How to make success

- Secure delivery of homogeneous fuel
- Step by step – don't do every thing at same time
- Development takes time – often more than 10 years for new technology
- National network of developer and supplier
- New plant don't work
- The staff at the plant
- Long term program and a lot of money

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Development of Straw Fired CHP Plants