

Gas fired CHP: Efficiency, Flexibility or Mothballing

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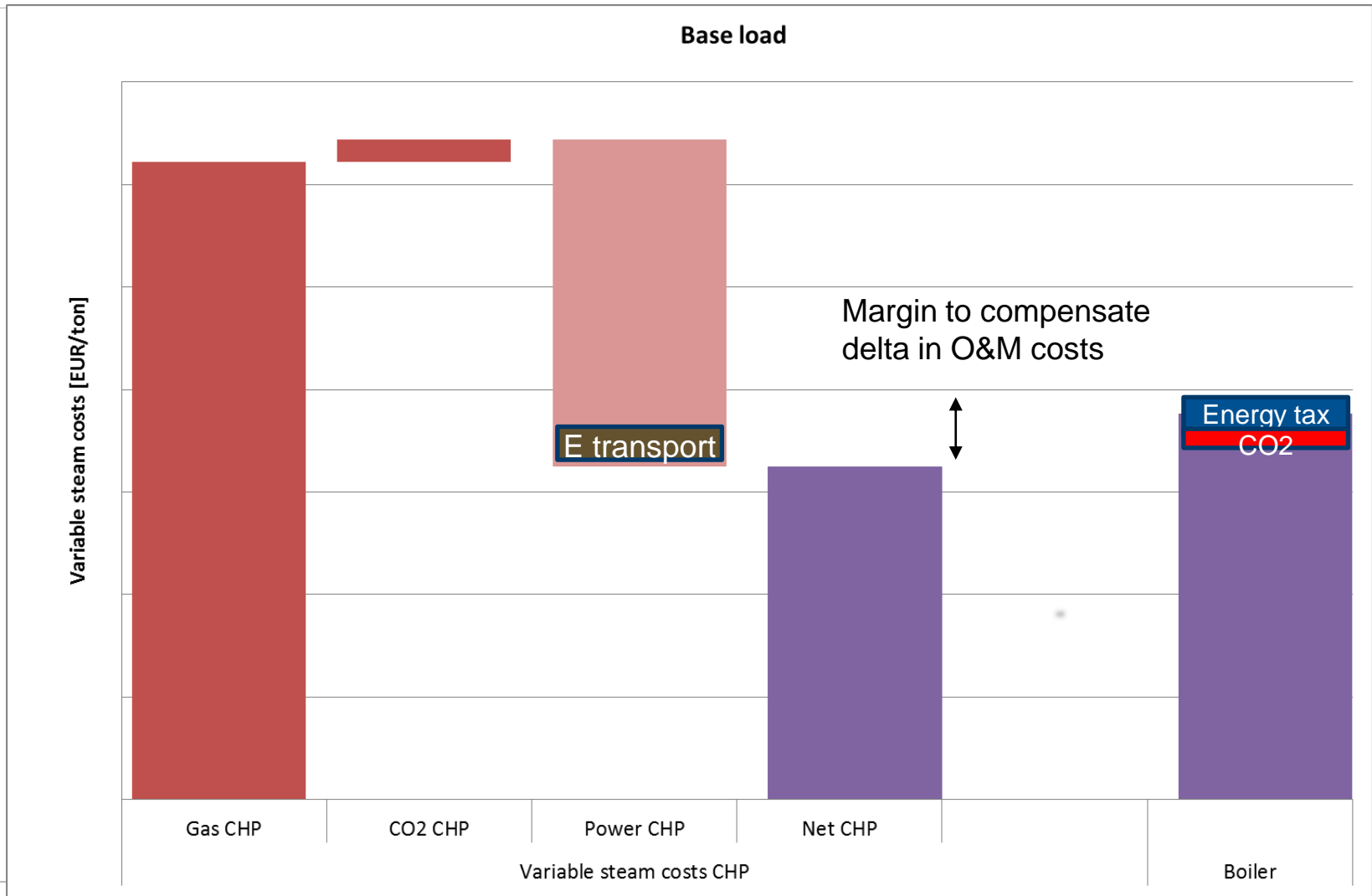


Summary

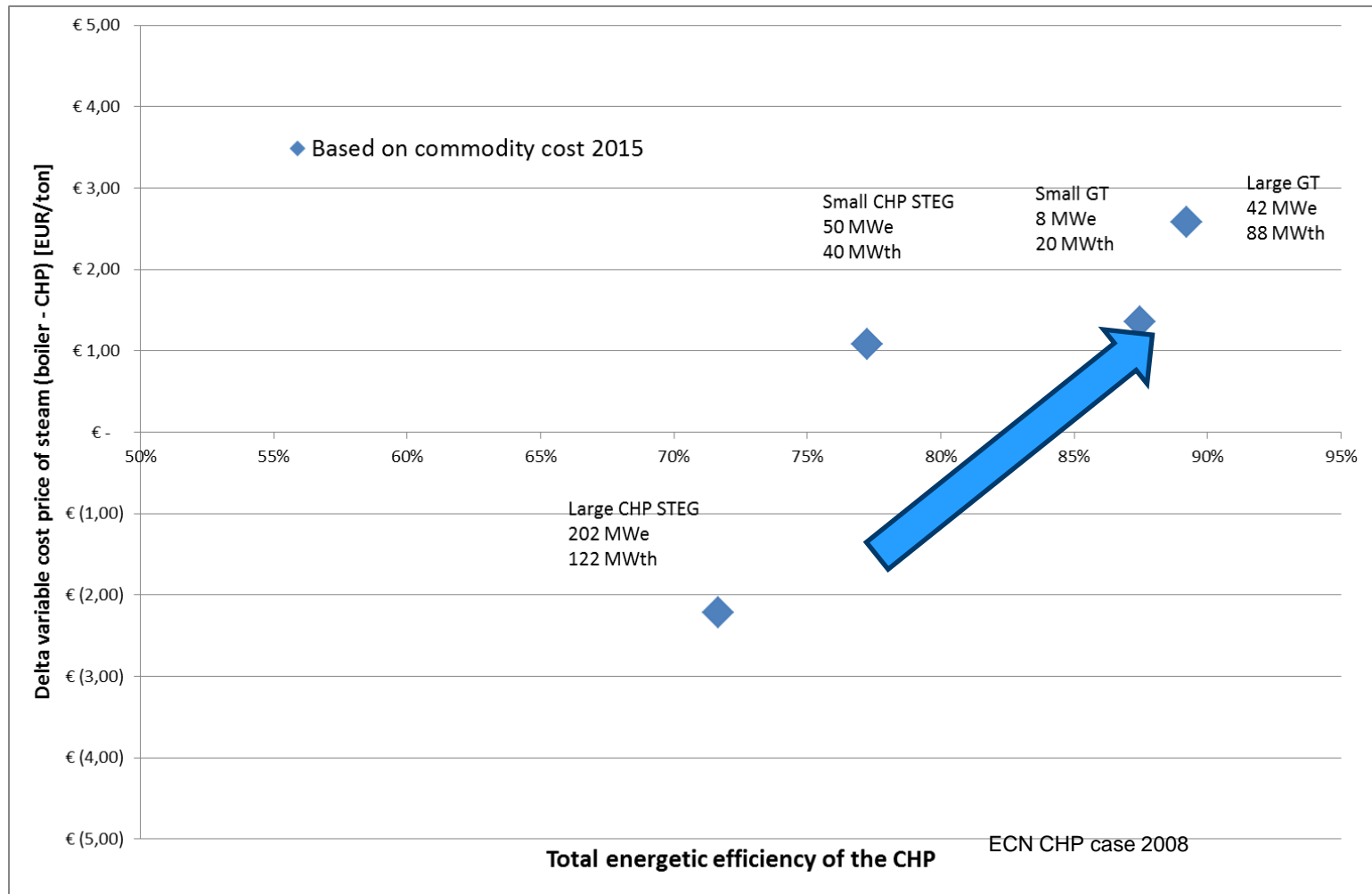
- Industry is looking for **competitive steam**
- Gas fired CHP provided competitive steam in the Netherlands (in the past)
- Only **high total energetic efficiency gas fired CHP** can be competitive to gas fired boilers under current market conditions, with some support from savings on energy tax and grid transportation fee
- **Flex operation** of a gas fired CHP can improve the business case for a gas fired CHP, especially in combination with power2heat. However loss of savings on energy taxes and/or grid transportation fee will probably make this business case marginal
- **QUESTION:** Does this result in an overall **competitive** steam price for the industry?

Efficiency & the overall business case for gas fired CHP

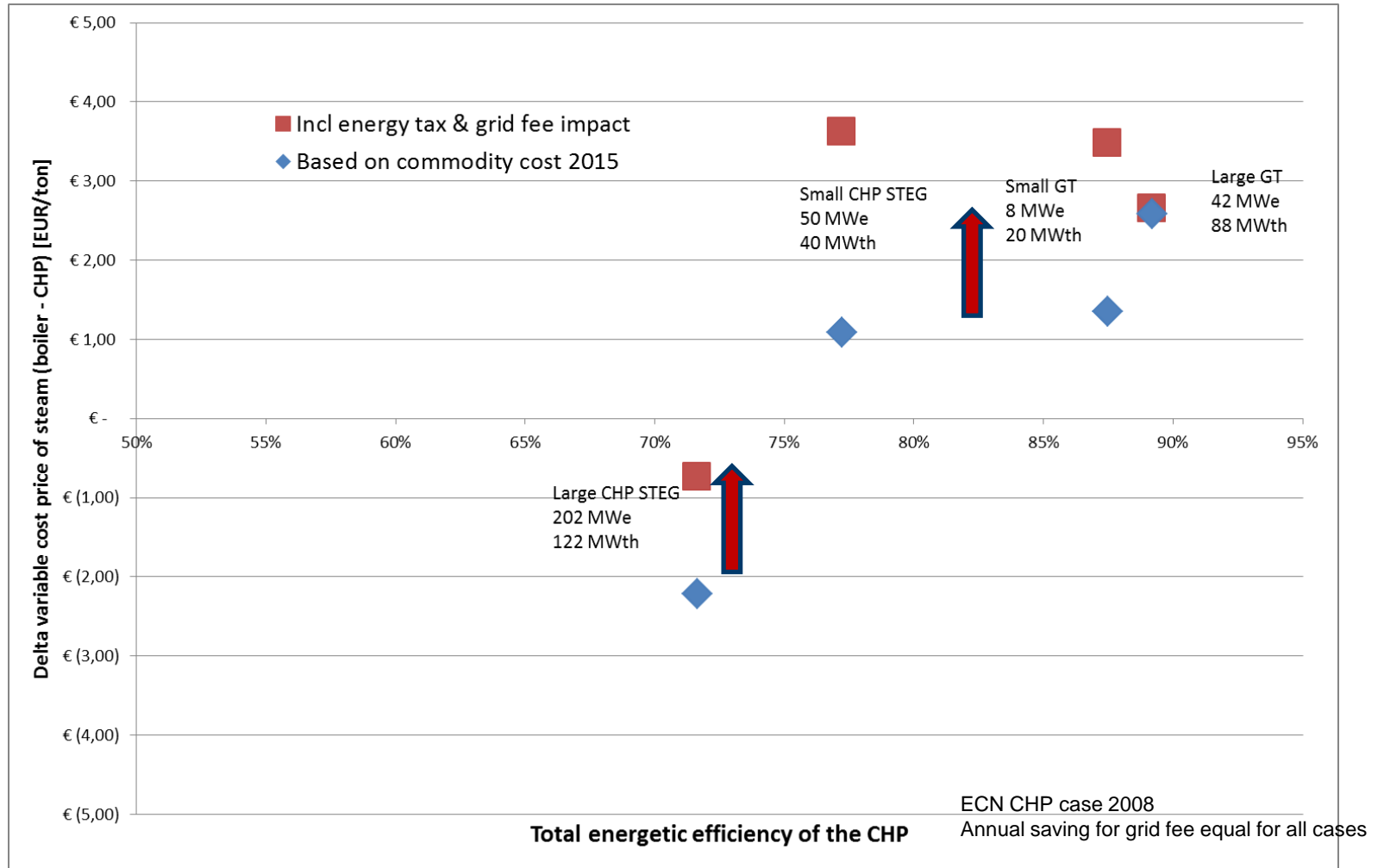
Net variable steam costs of a gas fired CHP versus a gas fired boiler



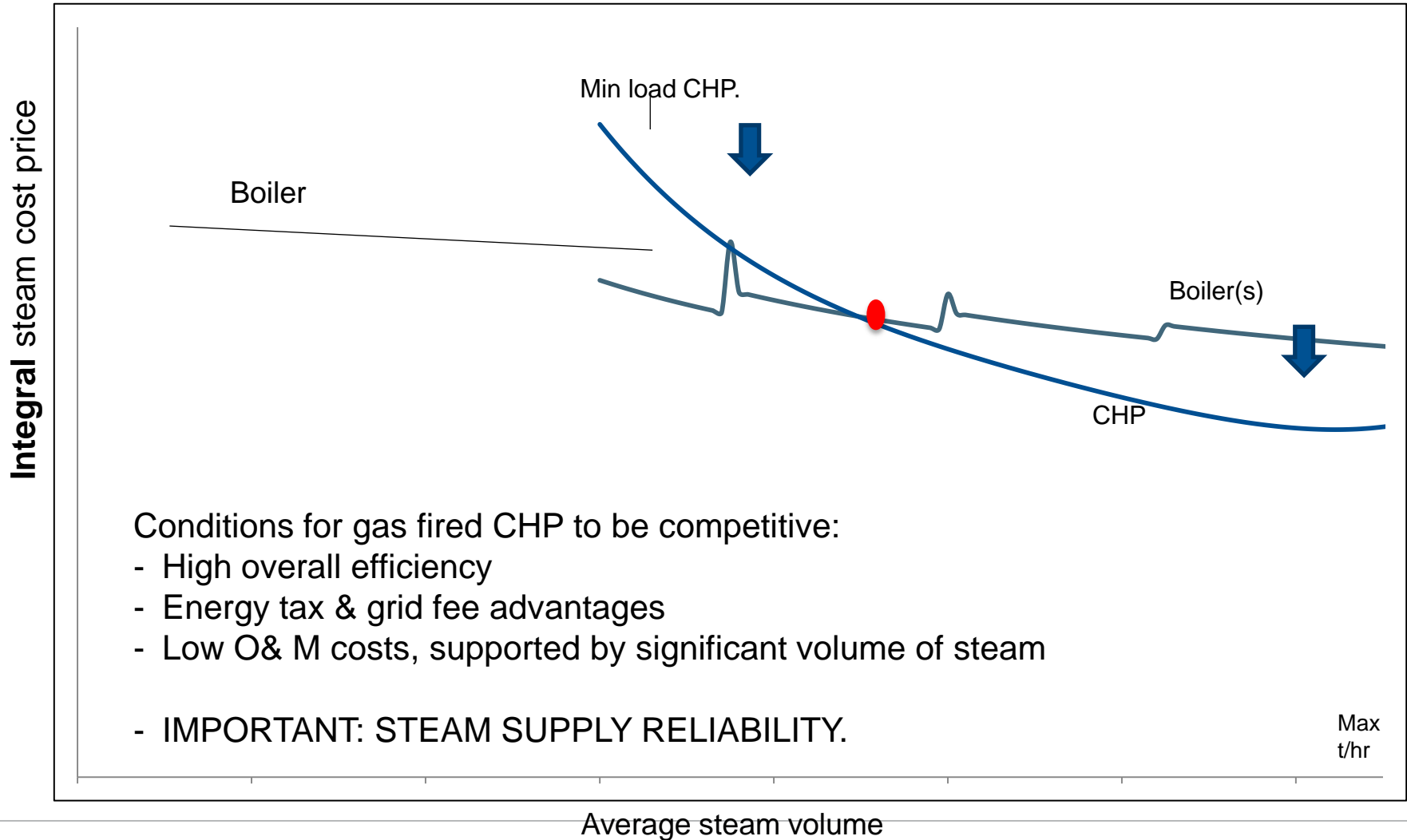
High total efficiency leads to a better business case for gas fired CHP.



Savings on grid fee & energy tax (electrical efficiency > 30%) support this.



The analysis of integral (variable + fixed) costs show that a gas fired CHP can still be competitive to a gas fired boiler

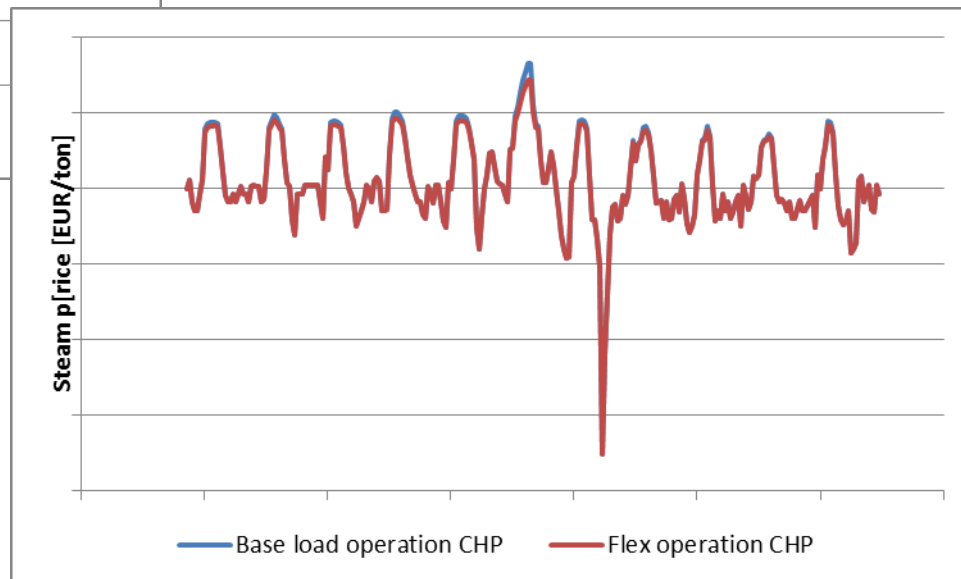
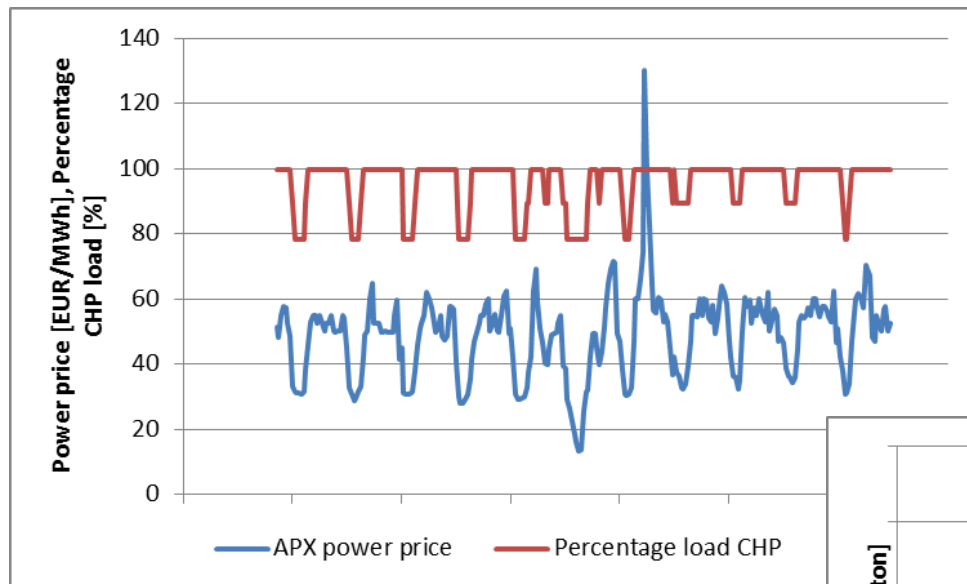


The potential added value of Flexibility

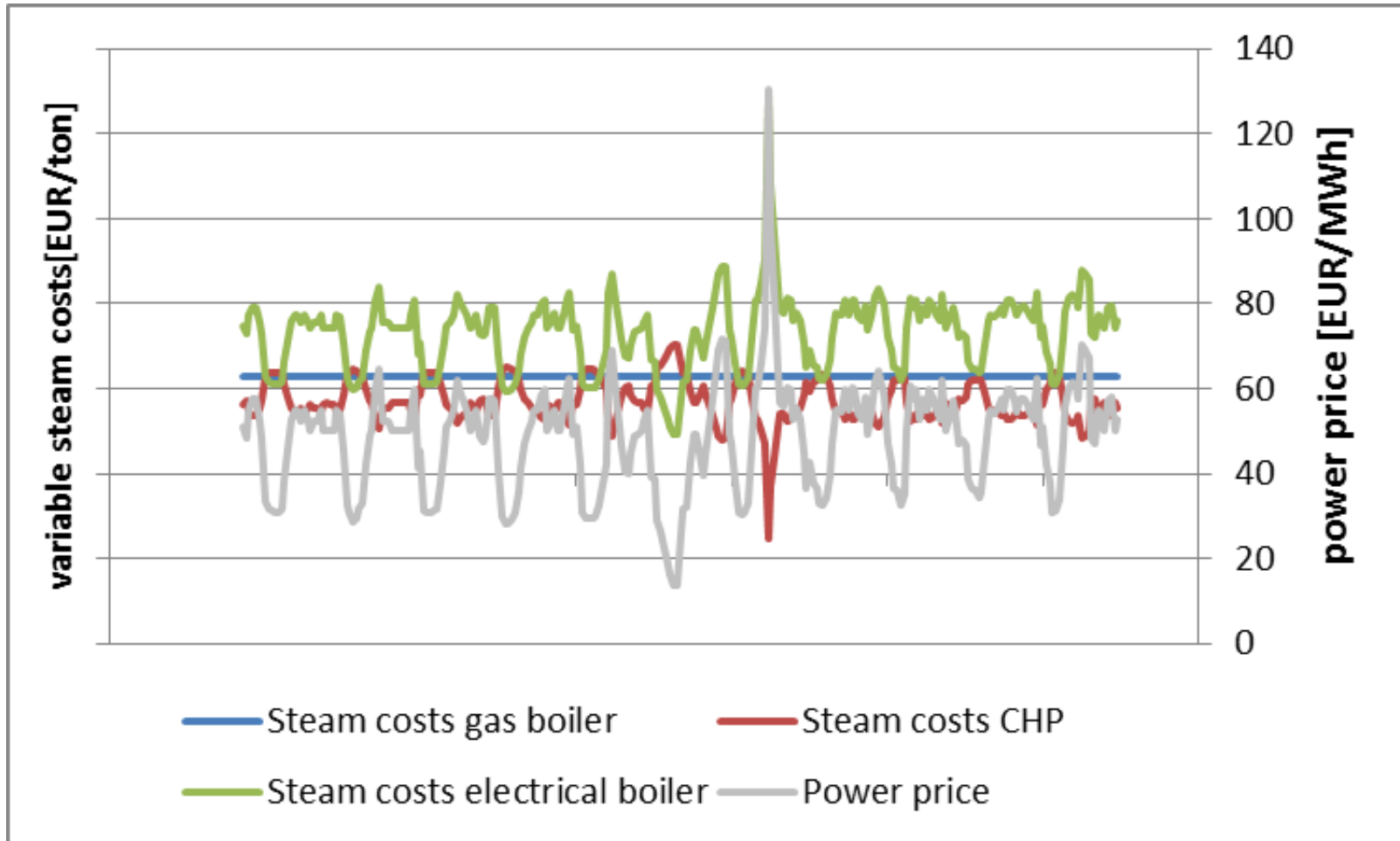
Realistic flexibility level from industrial gas fired CHP while keeping the steam production stable

	Flex power range	Time constant	Remarks
combination of condensing turbine & supplementary firing	50-100%	< 15 min	In operation ??
gas turbine (+ steam turbine) & supplementary firing	75%-100%	< 15 min	Limited flex
start/stop gas turbine with a gas fired boiler	0-100%	> 4-8? Hr	Boiler available ??
start/stop gas turbine with an electrical boiler	-100% - 100%	> 4-8? hr	Investments? Grid costs?

Flex value for a gas fired GT based CHP without start/stop operation limited due to limited power range and low(er) part load efficiency



Start stop operation of a gas fired CHP in combination with a gas fired or electrical boiler potentially yields higher revenues



Potential important savings in steam costs with CHP in start/stop mode.

	Max reduction in steam cost	Max running hours	Realistic reduction in var steam costs (incl time constant)	Realistic running hours	Realistic # starts
CHP flex	~1%	8760	<1%	8760	na
CHP – gas boiler	2%	1600	1%	800	45
CHP – electrical boiler	6%	1500	3%	700	40

Potential reduction in variable steam costs (up to 3%).

Loss of benefits from energy taxes and grid fees: 2-5% => net savings?

Calculation based on 2013/14 hourly APX&Monthly TTF prices

Observations on the business case for a gas fired CHP

- Difference between the variable steam price from a gas based CHP and a gas based boiler is minimal to negative under the current market conditions
- Important aspects in the economic value of a gas fired CHP versus a gas fired boiler are the total energetic efficiency, the O&M costs, the steam volume, energy taxes and savings on grid fee
- Flexibility in power generation can add value for a gas based CHP especially in the case of start stop operation. However flexibility may ruin the exemption for energy tax on gas (electrical efficiency > 30%) and or savings on electrical transportation fees

QUESTION: Is the gas boiler the relevant reference for industrial competitive steam?

