Future and Present solutions for Coal Power Plants

ASSOCARBONI

Rome, 22 March 2013

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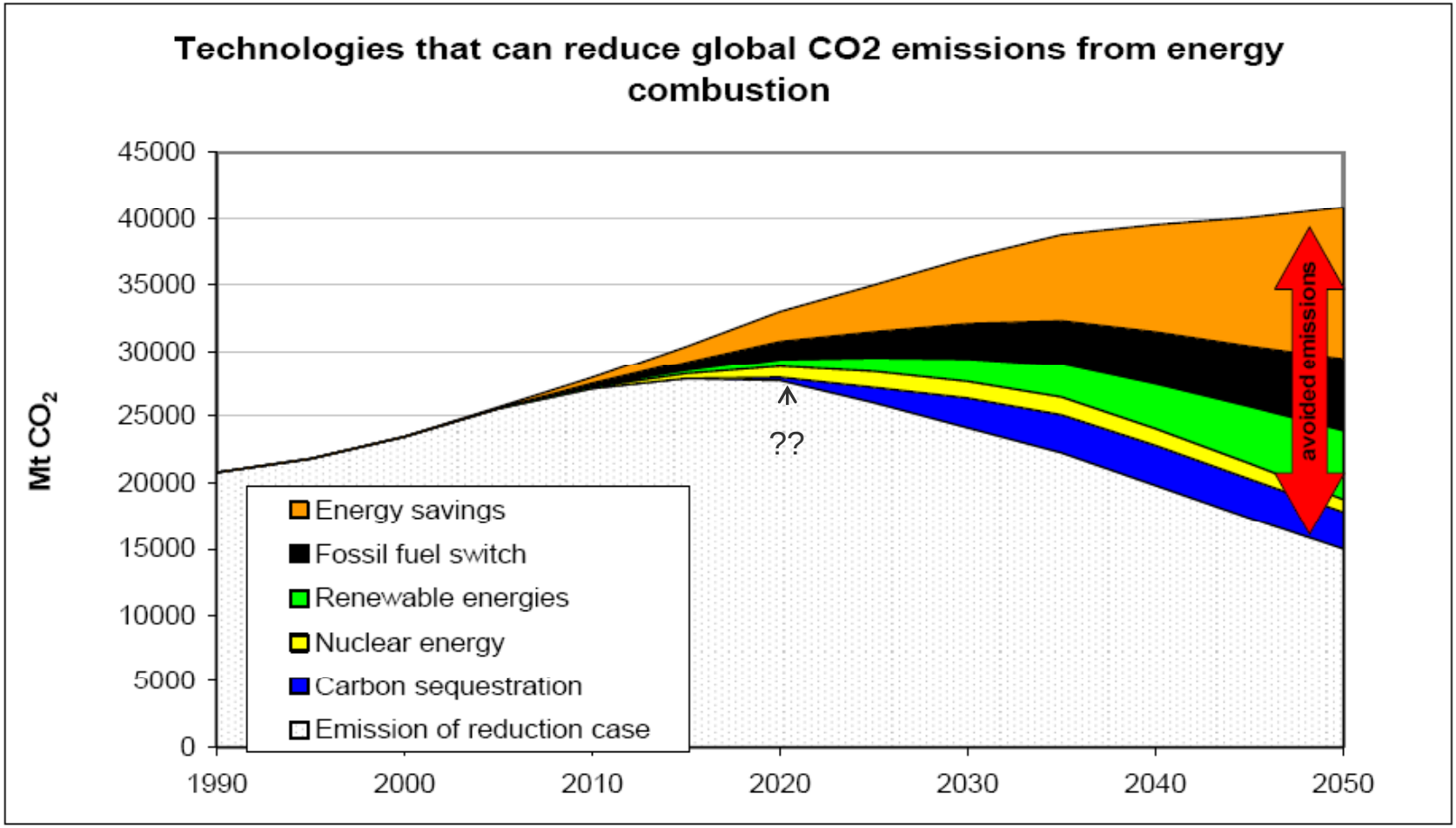
Emissions reduction is definitively necessary



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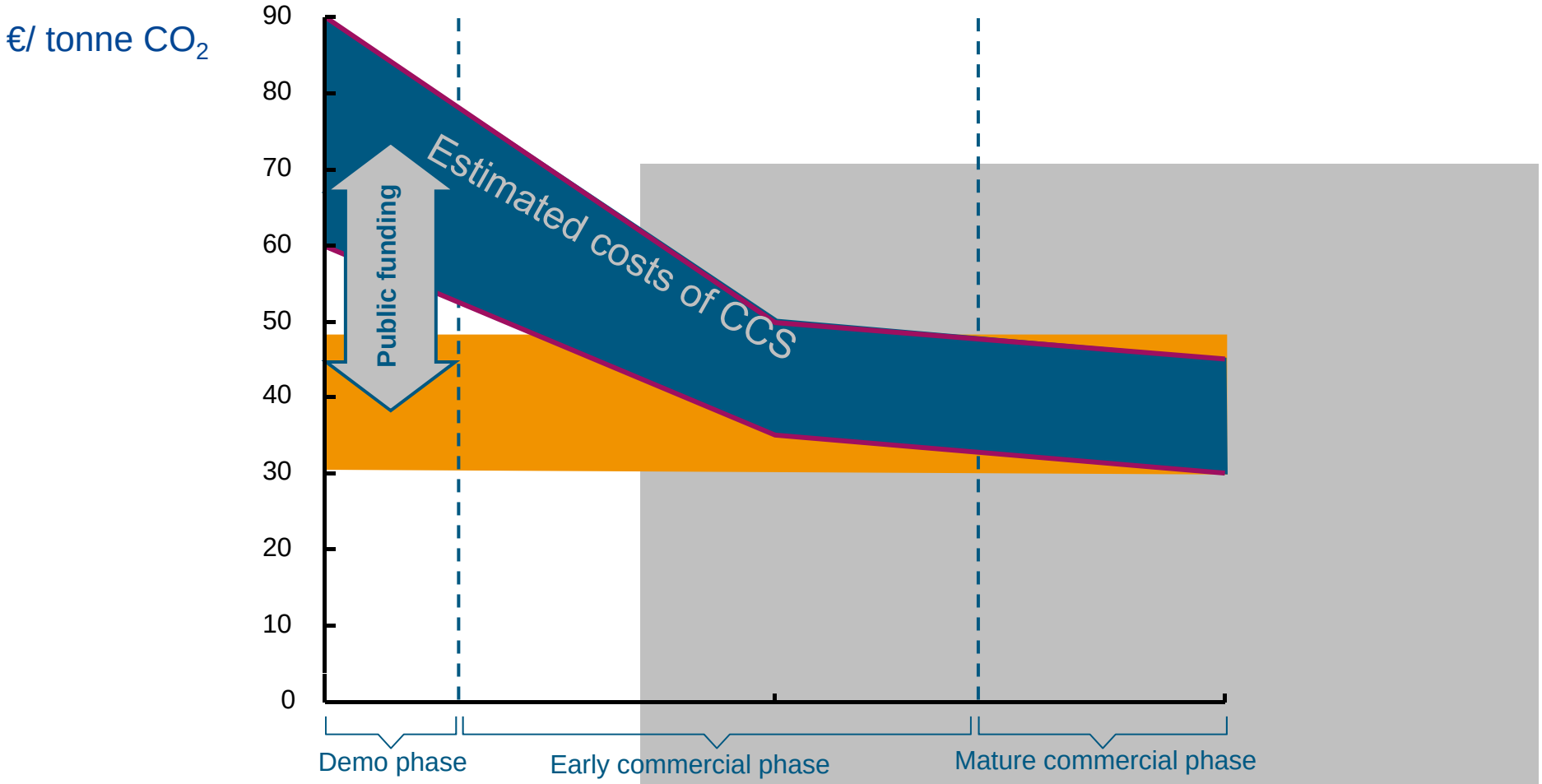
Economics of Carbon Capture and Storage



Source: **McKinsey & Company** "CCS – assessing the economics" for the cost numbers; policy implications drawn by ZEP

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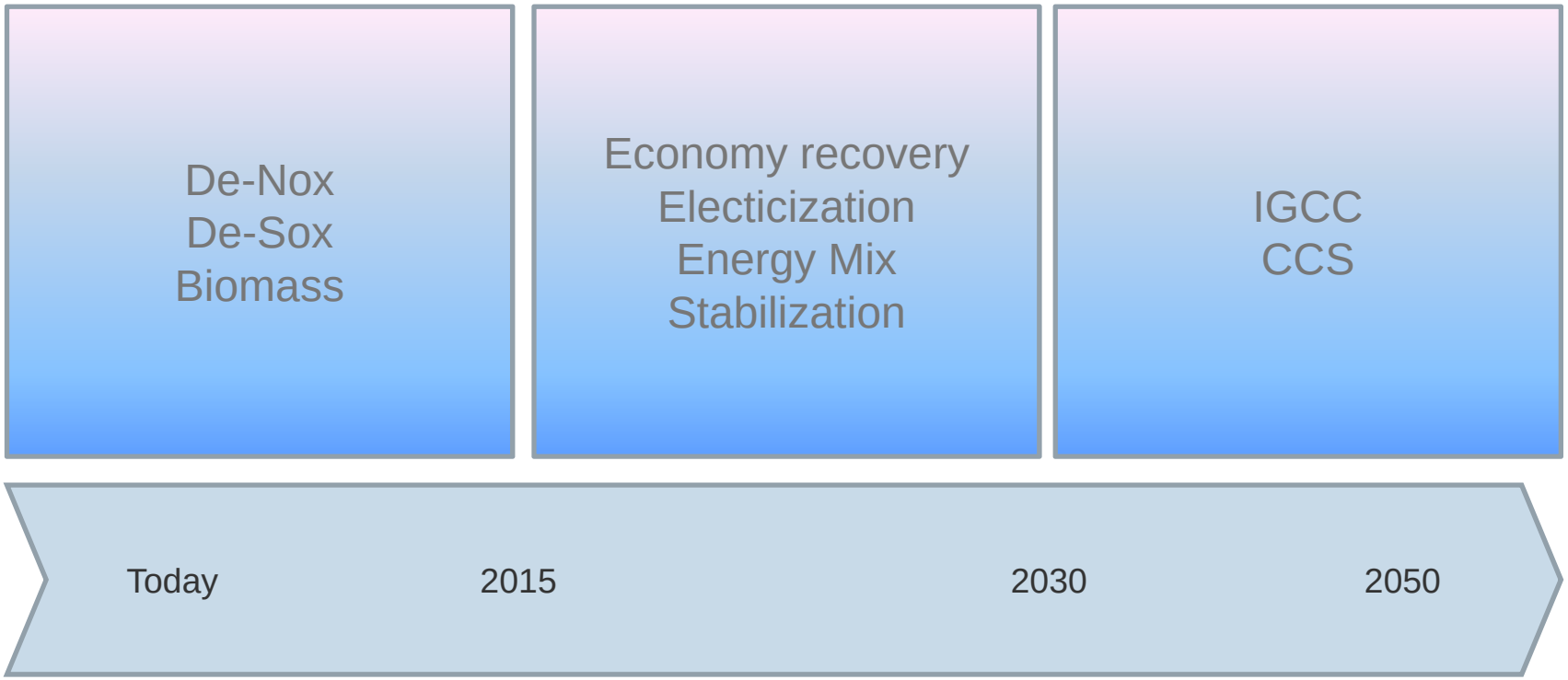
Present and future



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Production Efficiency: New Plants

	Coal	Gas
↗ Efficiency	30% to 50%	40% to 60%
↘ CO_2 emissions	40%	33%

60% of the 2030 installed base still to be built

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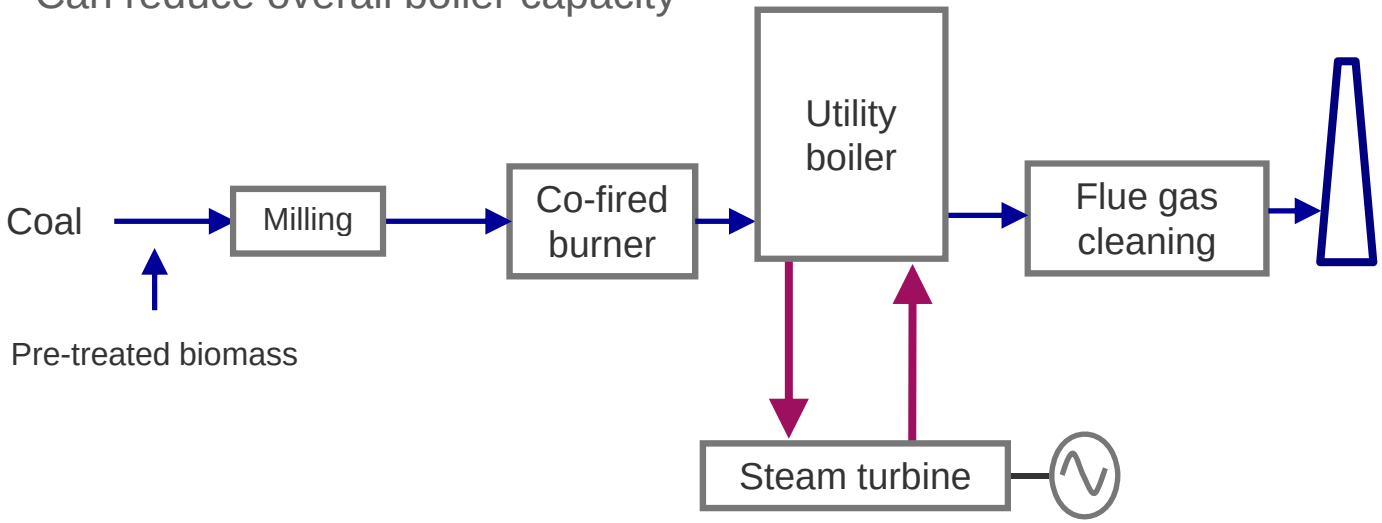
Biomass Co-milling

Blending with Coal and Co-milling – typically fire up to 5-8% mass

- Lowest cost
- Blend with coal before milling
- Use existing mills
- Output limitation
- Stringy material can be problematic
- Can reduce overall boiler capacity



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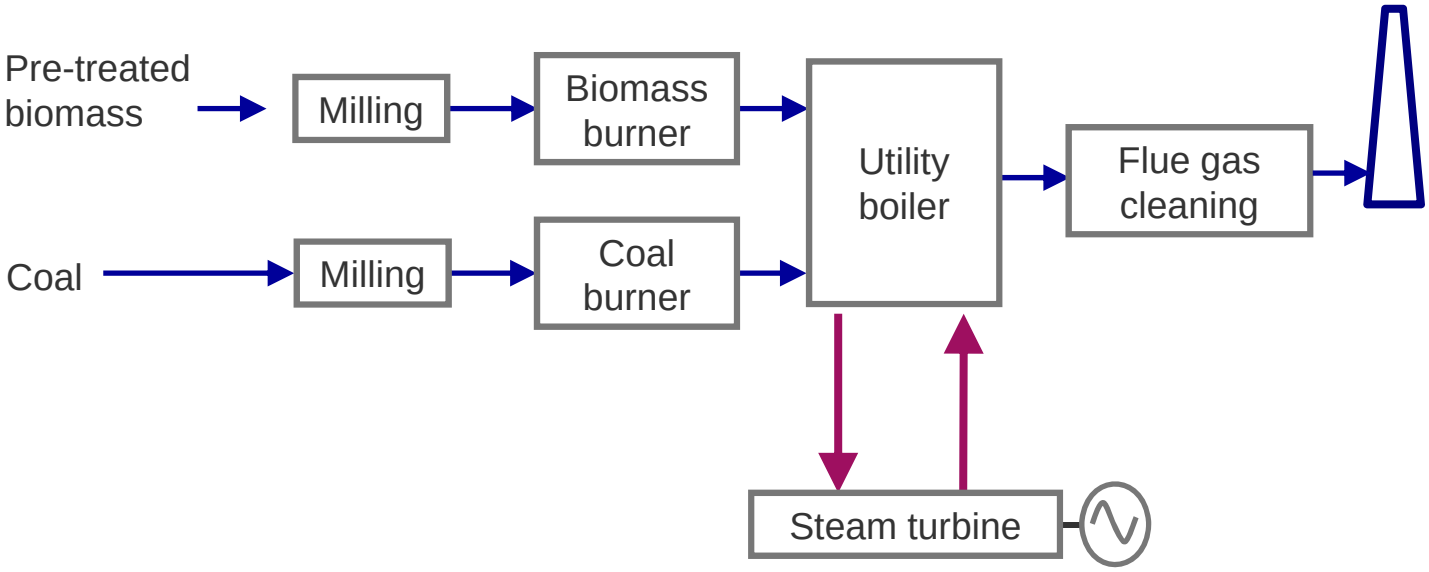
Dedicated Biomass Co-firing

Direct Injection with dedicated systems - > 10% by mass

- More flexible,
- Higher output
- Equipment's can be specifically sized for biomass
- Minimal outage requirements



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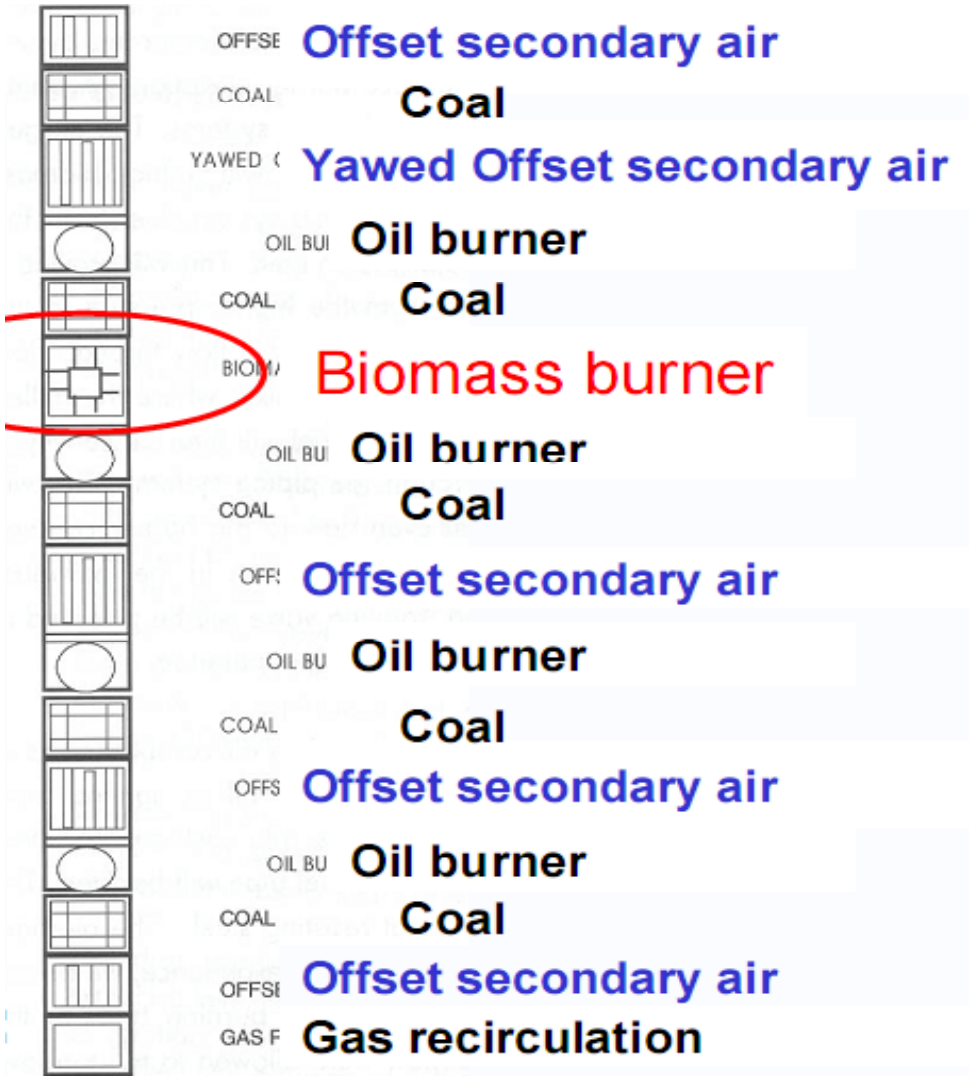
Burners (3)



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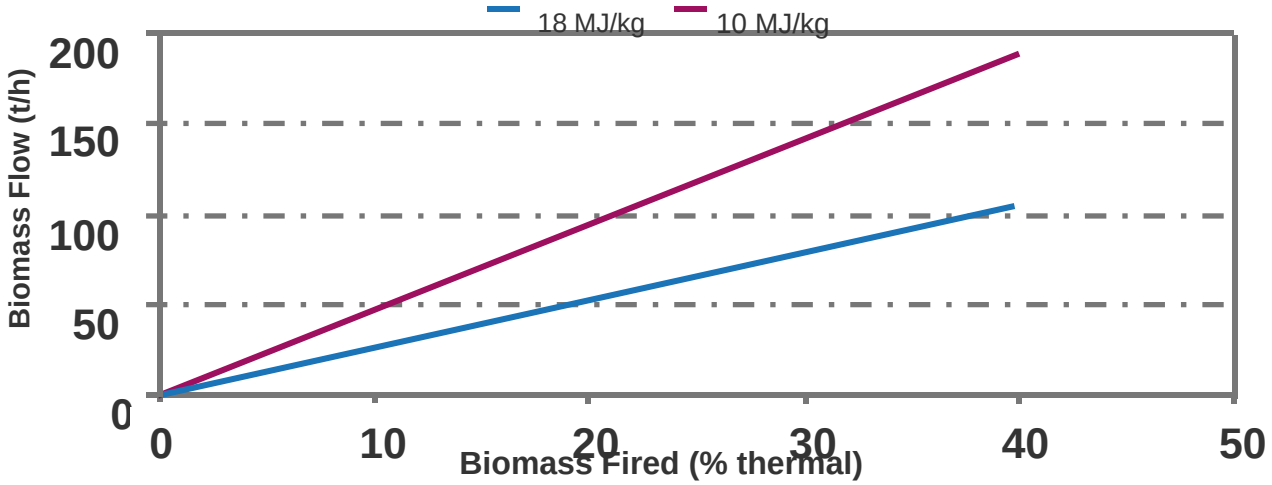
Effect of Biomass Thermal Input on Firing Rate

The figure below considers a 500 MWe boiler having 200 t/h coal feed at maximum load.

Comparison:
Heating values 50-70% with respect to coal
Bulk density of biomass fuels 20% of coal
overall fuel density of biomass in MJ/m3 approx 10% of coal.

Considering a replacement of 5% thermal energy, 15 t/h biomass flow is necessary requiring a **2000 m3** bulk storage area.



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Available tech. and R&D to boost biomass co-firing

Area of concerns:		Solutions:
• Burners may suffer from accelerated wear and corrosion	⇒	• Advanced burner design to reduce maintenance time. Define maintenance intervals.
• Mills rotating parts may suffer from erosion/corrosion	⇒	Patented materials having high resistance for wear and corrosion applied to mills, burners and fan impellers
• Water Walls and High Temperature pressure part materials may suffer from Chloride attack and accelerated corrosion	⇒	• Patented weld over-lay material for pressure parts

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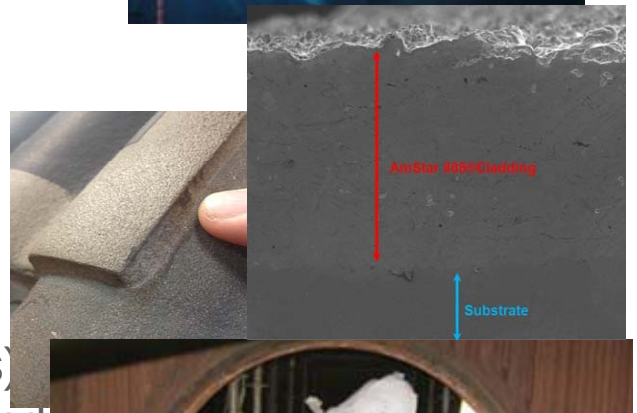
Boiler Service
Addressing Erosion / Corrosion

- Alstom patented technology AmStar 888® thermal spray cladding
- Dependable and predictable waterwall protection against corrosion and erosion (incl. CO corrosion following LowNO implementation)
- Scalable in thickness, maintainable and repairable
- Field designed for easy application with 10 years of field experience
- Successfully applied in PC (62 units), CFB (40 units) WTE (21 units) boiler types, improving availability and significantly decreasing the total cost of ownership
- Alstom is validating this technology with Enel in Fusina and Sulcis



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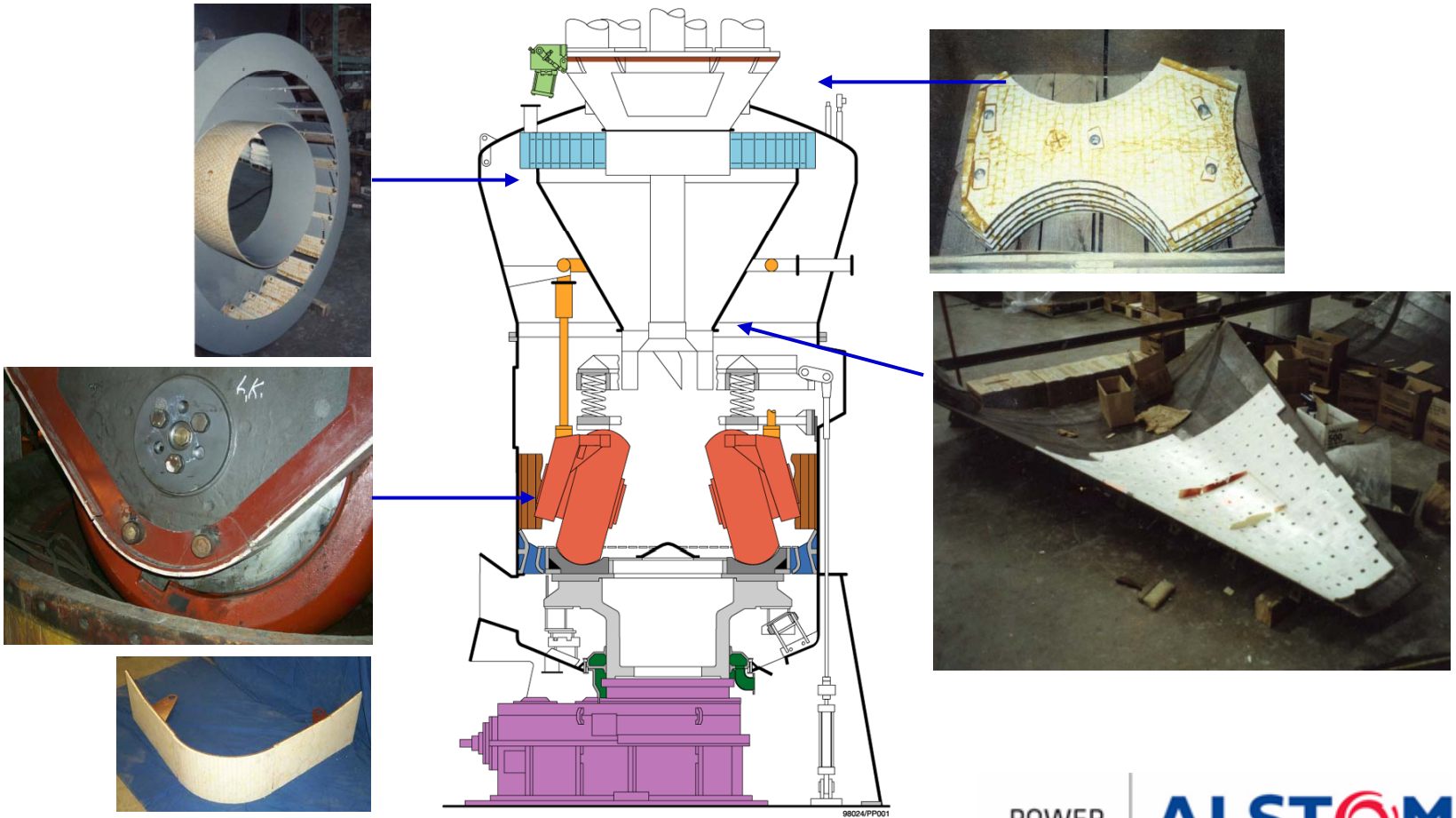
PSDE – Ceramic Wear Protection

Use of ceramic materials to lenghten lifetime and availablity of components



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