

# LARGE-SCALE ORC PRESENT AND FUTURE: THE MARKET LEADERS' VISION



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Milan, 14 September 2017

# AGENDA



1

ORC SIZES

2

DIRECT HEAT EXCHANGE

3

WASTE HEAT RECOVERY FOR LARGE INDUSTRIAL USERS

4

HIGH TEMPERATURE ORC SYSTEMS

# ORC SIZES: MARKET INSIGHT AND RECENT TURBODEN DEVELOPMENT

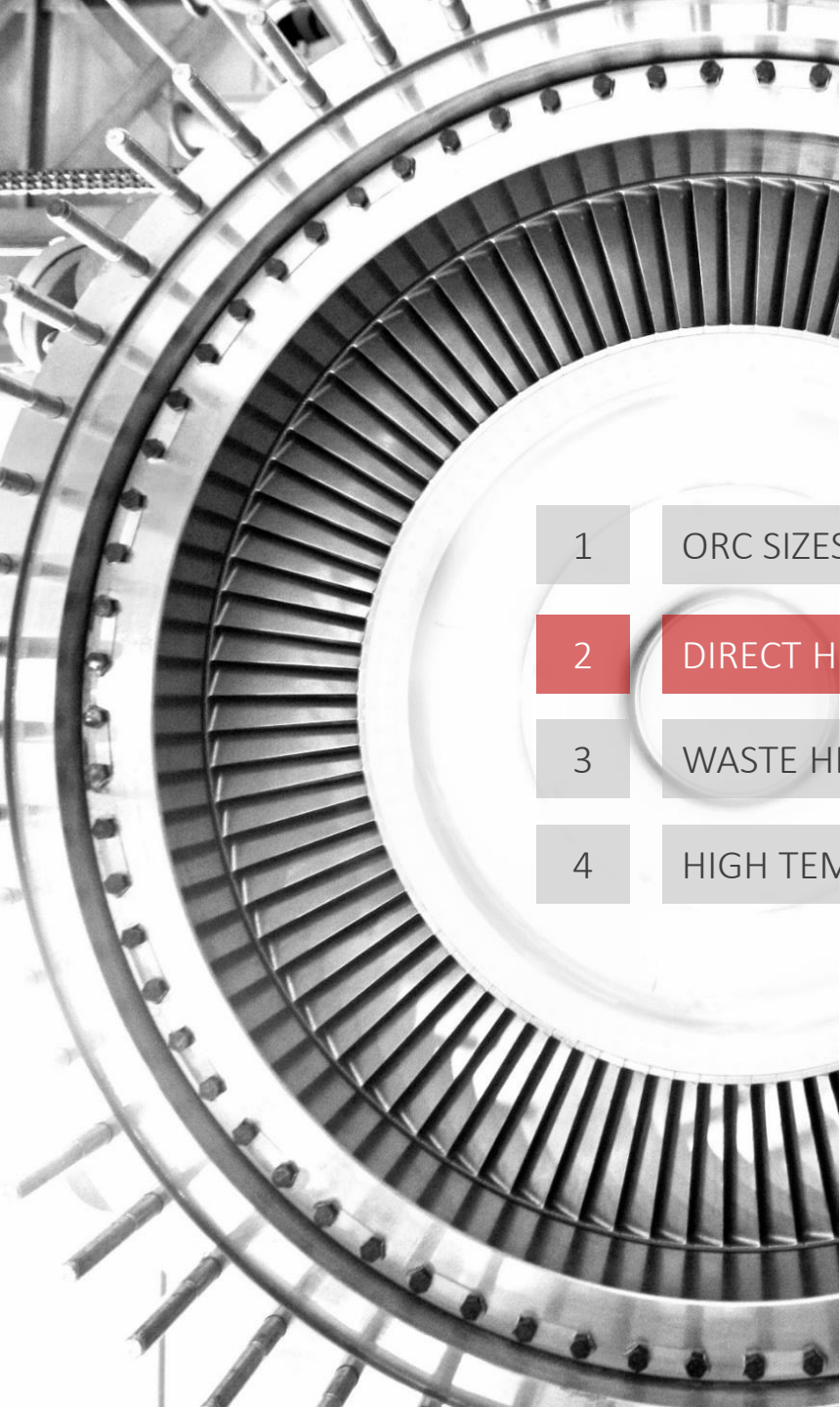
ORC sizes are increasing more and more.

Turboden recent projects:

- ▶ 8 MW biomass ORC plant in USA, in operation since October 2016
- ▶ 10 MW waste heat recovery plant in Italy for a steel industry
- ▶ Numerous business proposals for ORC plants with sizes ranging from 10 up to 20 MW



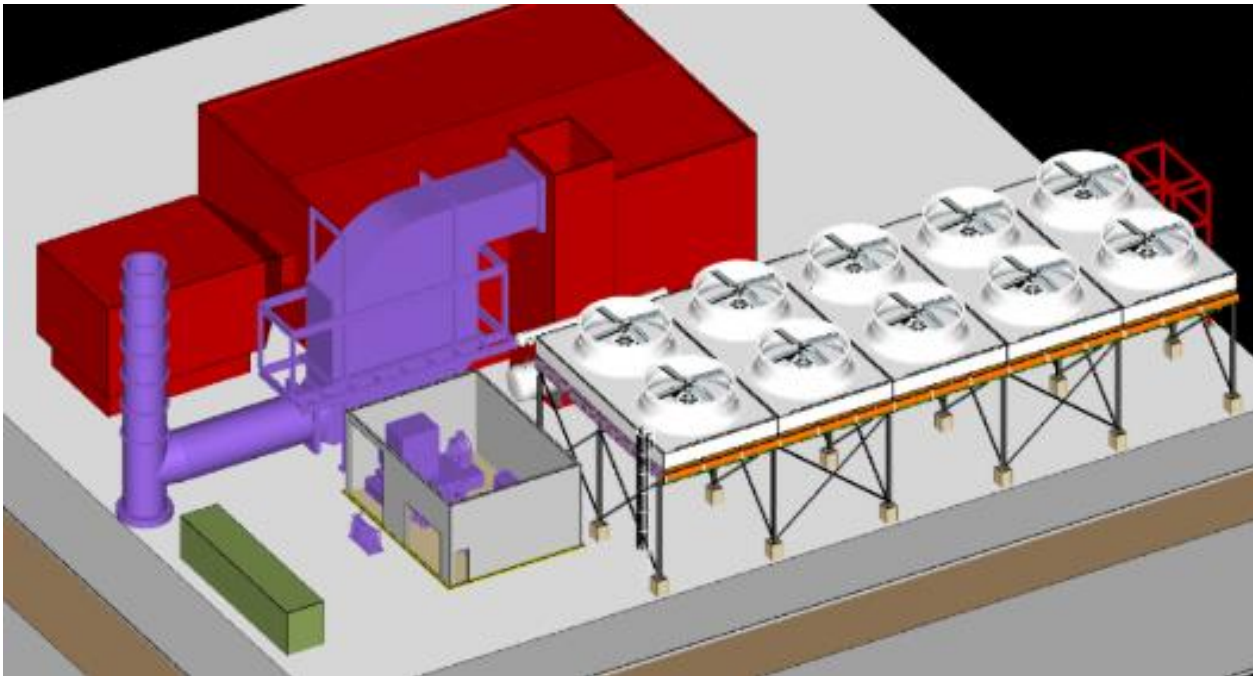
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# DIRECT HEAT EXCHANGE

Recently Turboden put into commercial operation its first Direct Exchange ORC plant for biomass application (700 kW unit).

- ▶ Commissioning operations provide have provided a positive feedback, now the the unit must work properly for months/years to prove its reliability
- ▶ Complexity of the system is greater than expected



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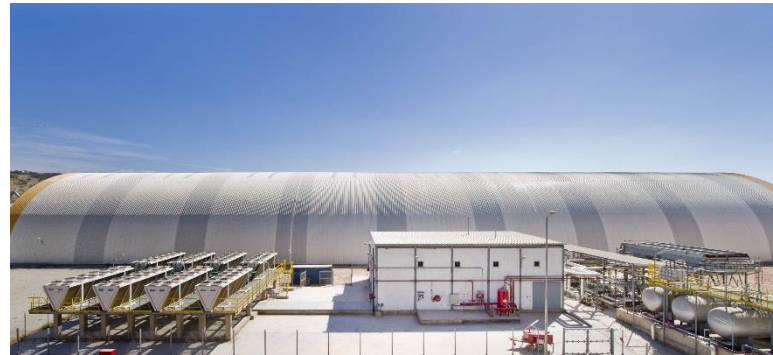
3 WASTE HEAT RECOVERY FOR LARGE INDUSTRIAL USERS

4 HIGH TEMPERATURE ORC SYSTEMS

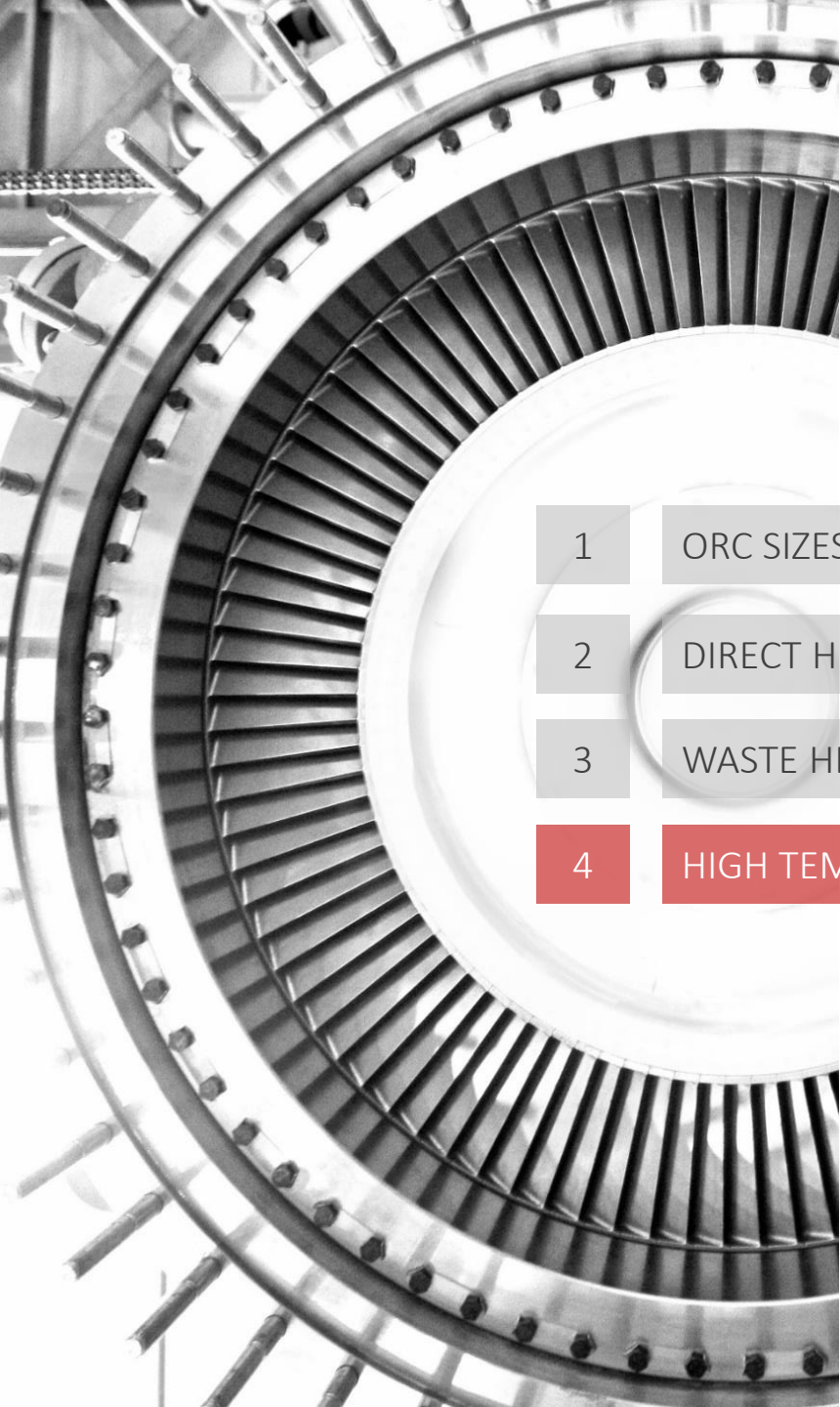
# WASTE HEAT RECOVERY FOR LARGE INDUSTRIAL USERS

Large industrial users are more and more interested in ORC technology, with a consequent increasing of ORC sizes (up to 20 MW).

ORC plants are becoming a competitive solution compared to tradition steam solutions, especially in dry environments where water is not available.



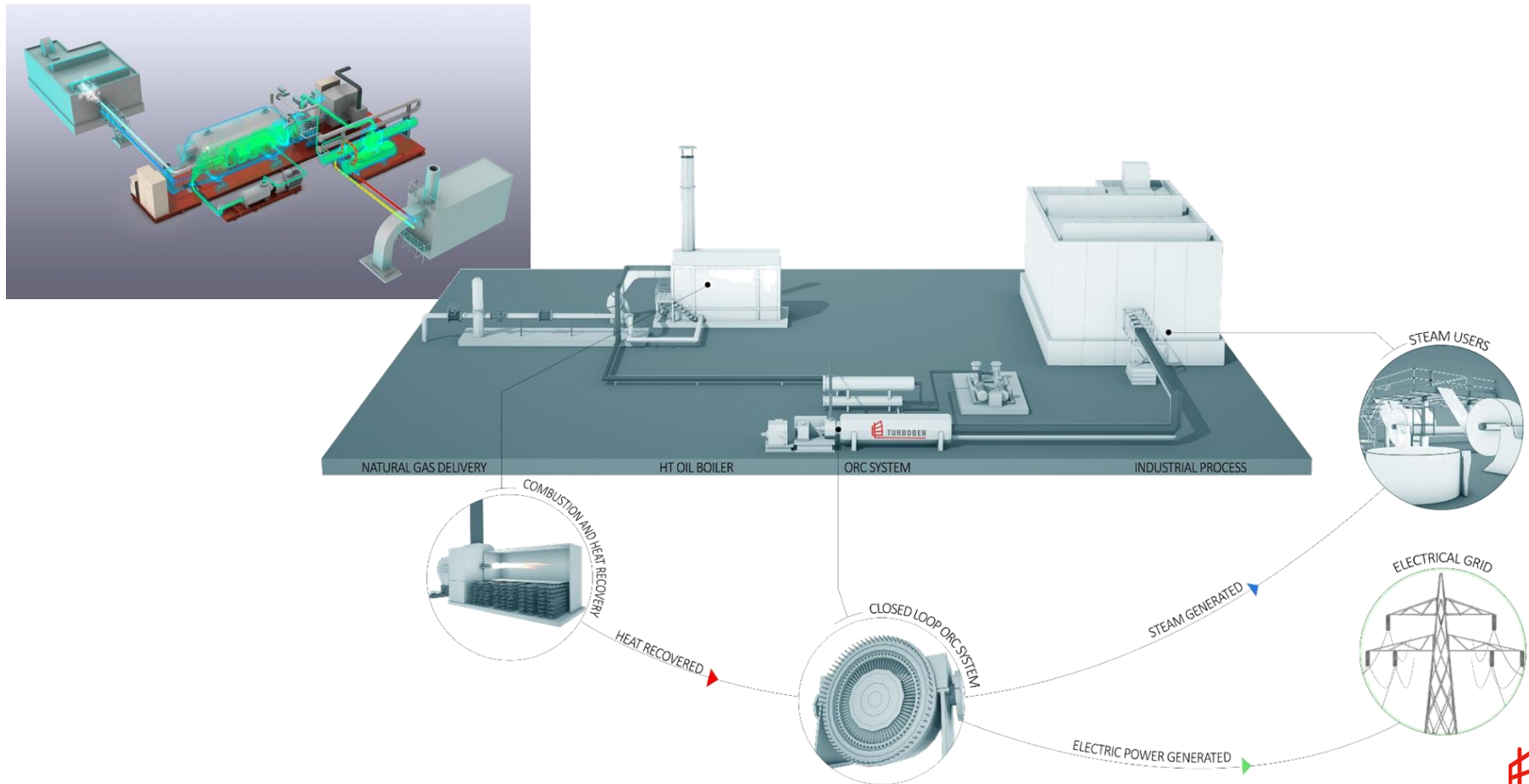
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# HIGH TEMPERATURE ORC SYSTEMS

New ORC solutions with new working fluids, such as the Turboden Steam&Power one, allow to work at temperature up to 400°C and to achieve higher efficiency and new CHP schemes.





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