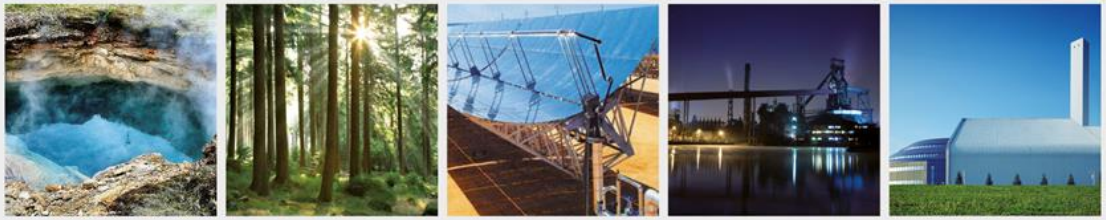

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Turboden Biomass solutions

LLOYD'S REGISTER · LRQA
ISO 9001

Doc.: 12-COM.P-18-rev.17
Update: 29/05/2015

ORC Applications - Biomass

Biomass | Heat Recovery | Waste to energy | Geothermal | Solar Thermal Power

Biomass

Cogeneration plants with Turboden ORC can produce heat and electrical power from biomass with high efficiency and user friendly operation. The generated power usually ranges between 200 kW and 15 MW electric.

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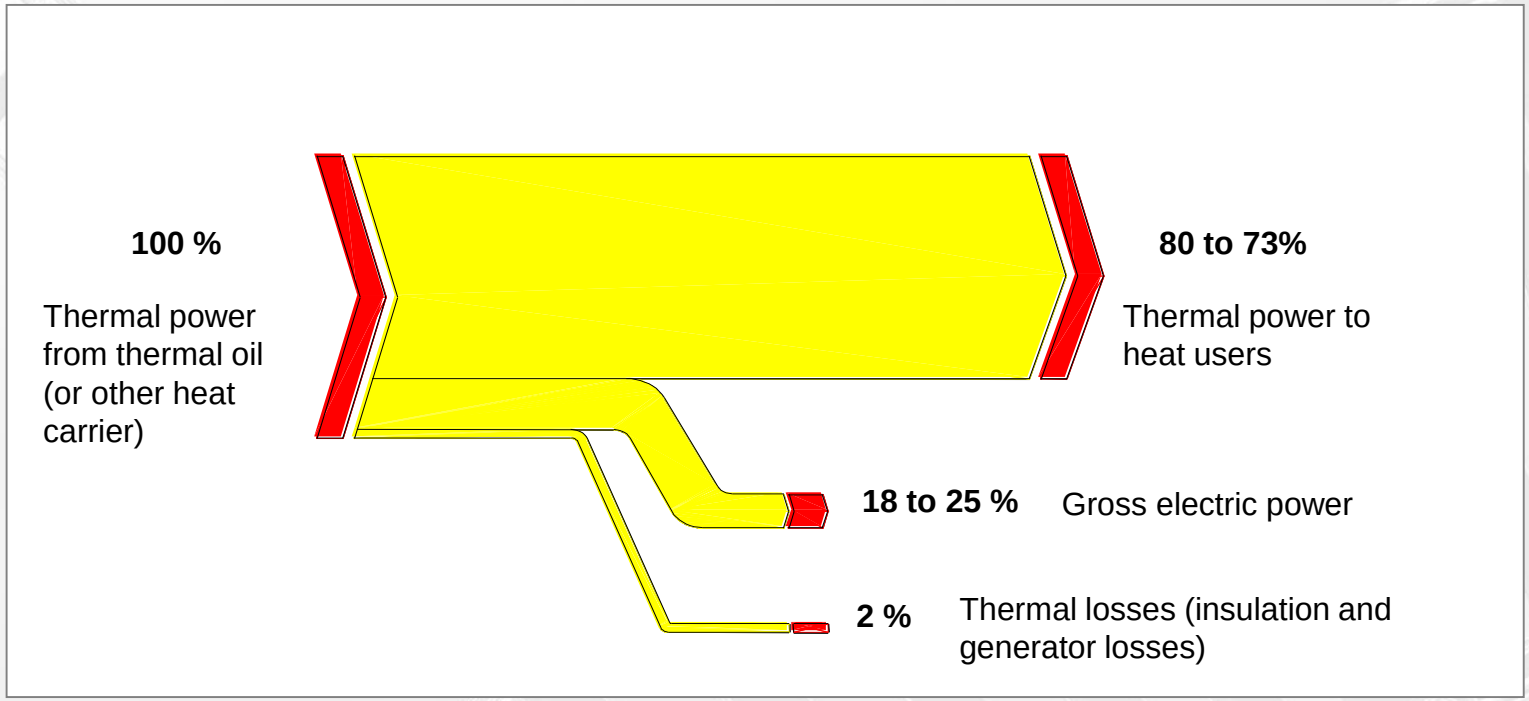
ORC Plant – Performances



- **Gross electric efficiency: up to 25%**
- **Overall energy efficiency: 98%**

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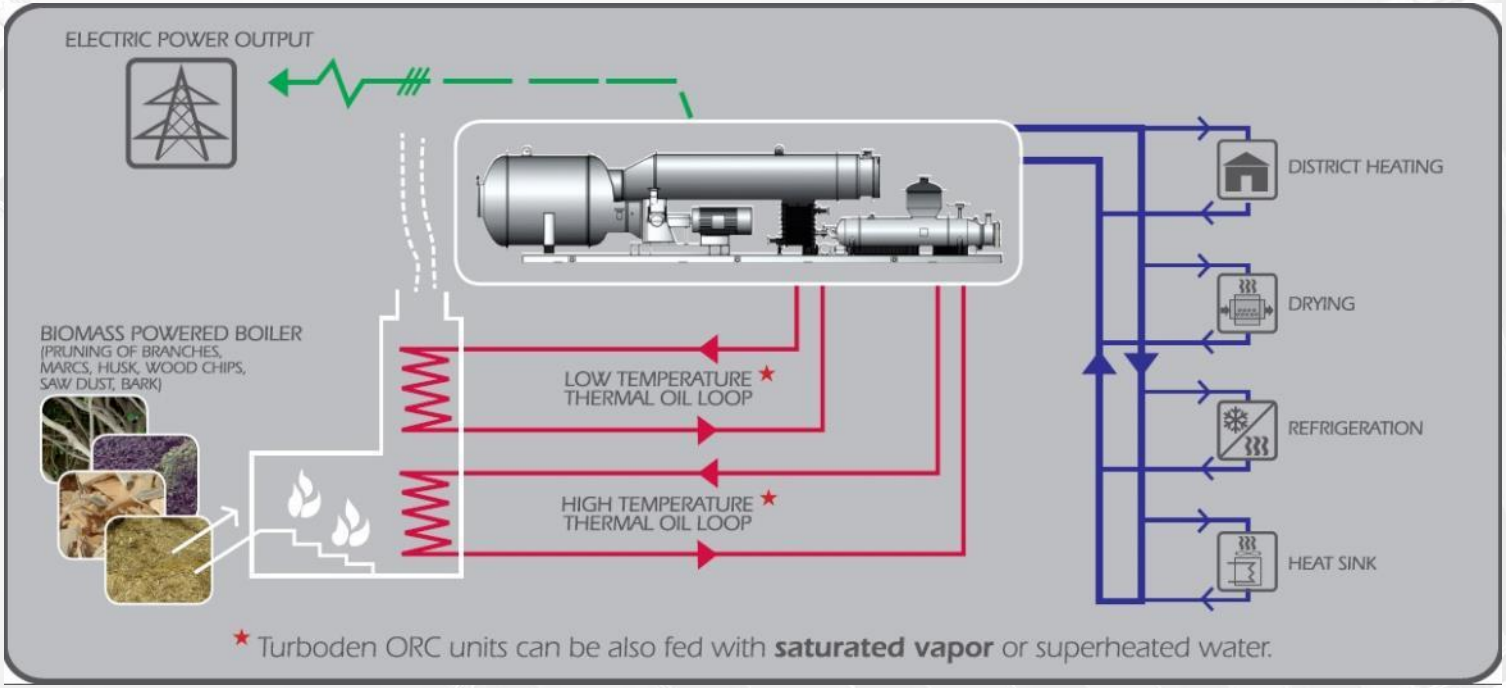
ORC Plant in a Process of Cogeneration from Biomass



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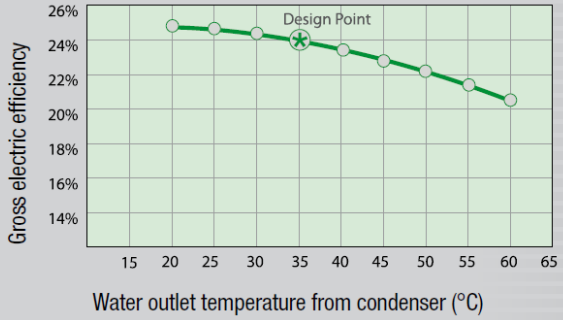
HRS – High Electrical Efficiency Units

HRS for electricity generation and cogeneration from biomass

Gross Performance of the Turboden HRS Modules at Various Condensation Water Temperatures

(*) Value of gross electrical efficiency calculated as the ratio of electric power output at generator terminals to the thermalpower input to the ORC at the design point



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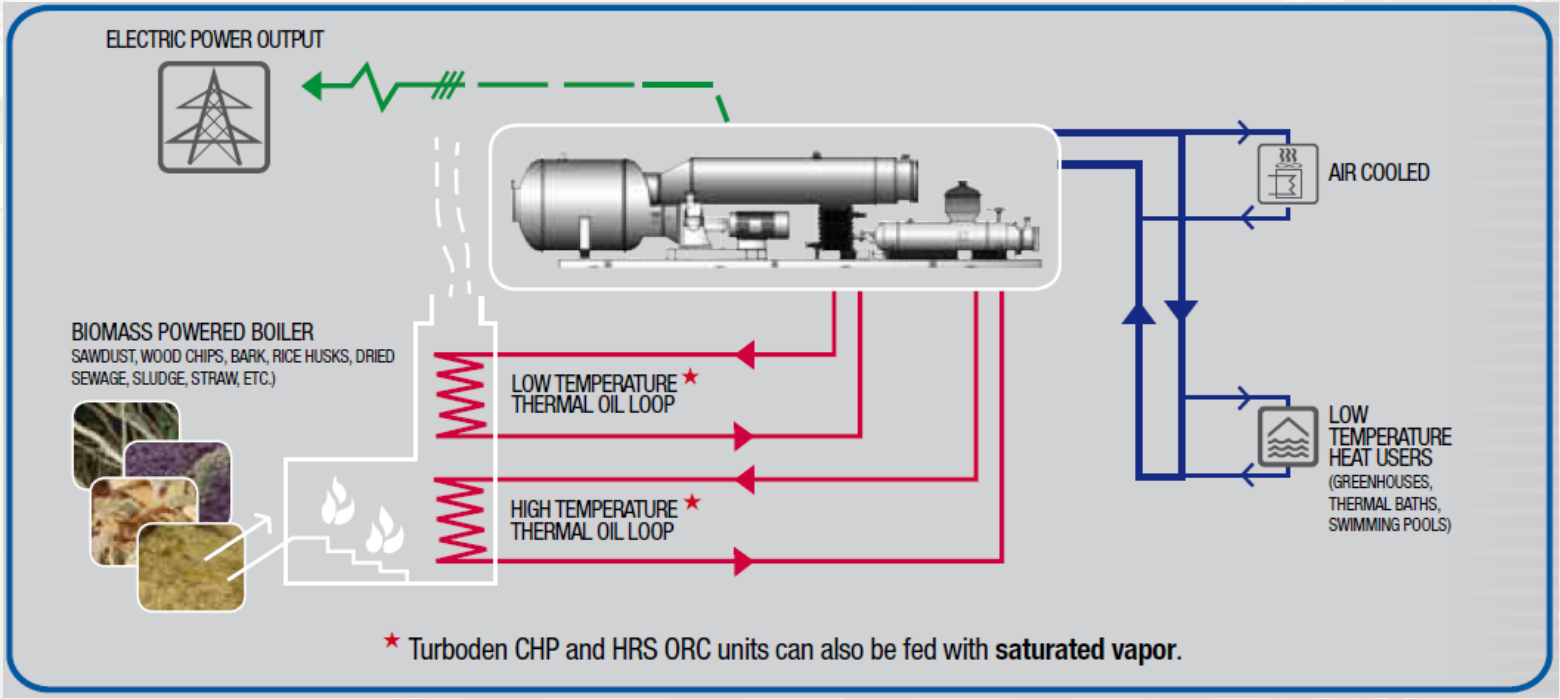
HRS – High Electrical Efficiency Units



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Biomass – Fuels & Applications

Fuels

- Wood biomass: sawdust, woodchips, bark, treated wood
- Other biomass: dried sewage sludge, green cuttings, rice husk, vinasse and vine cuttings, wood industry waste material etc …
- Waste material

Heat Consumers

- District Heating networks
- Timber drying in sawmills
- Sawdust drying in wood pellet factories
- MDF/PB Producers
- Refrigeration
- Greenhouses
- Wine industry

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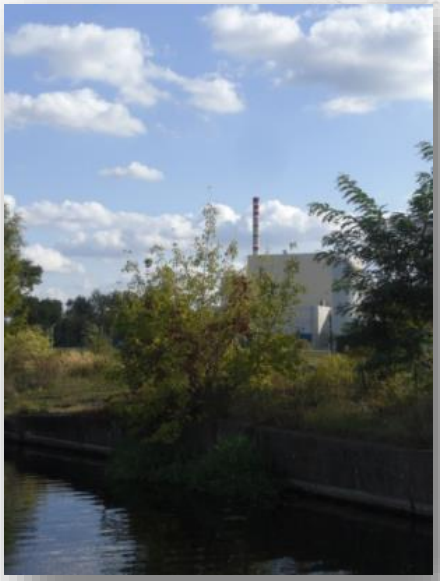
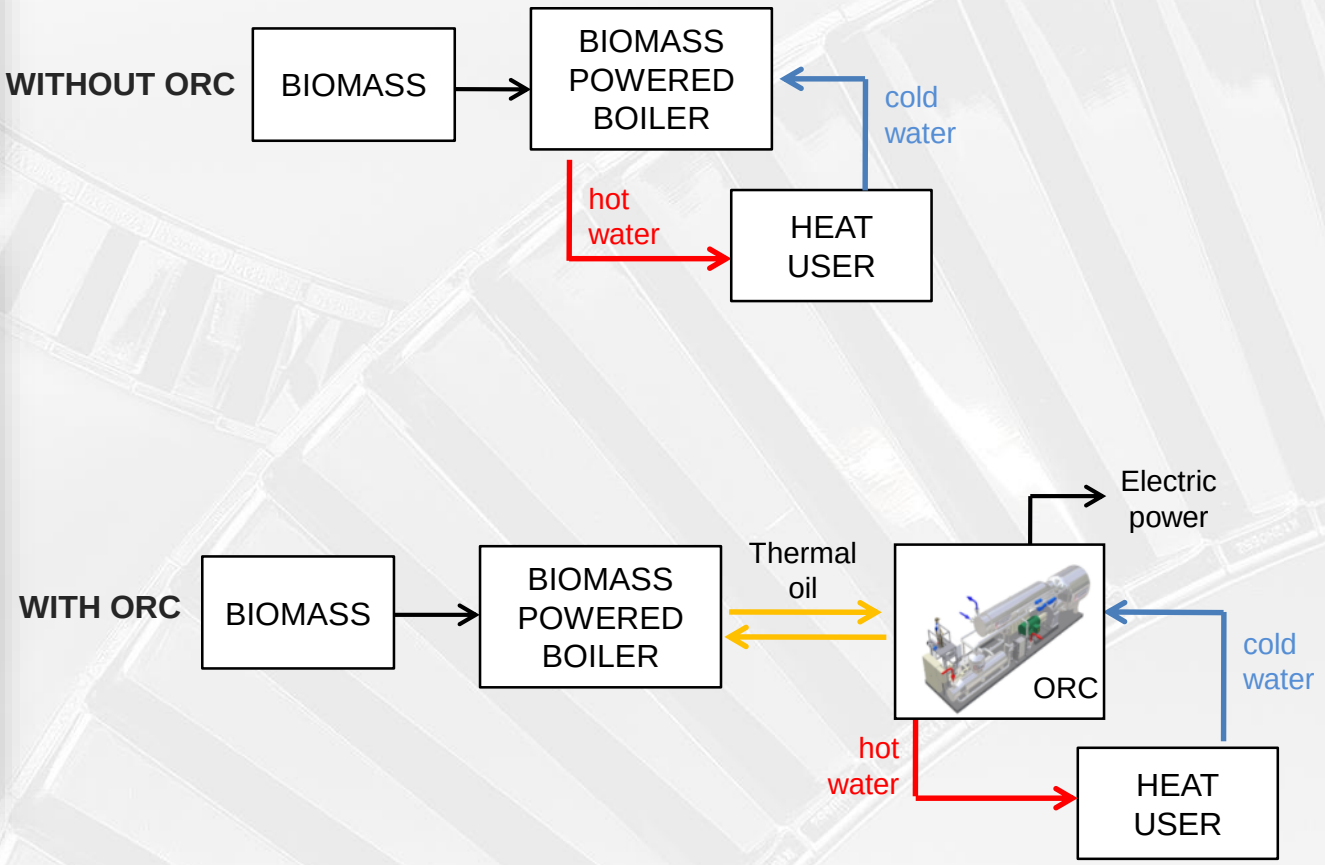
District Heating Networks





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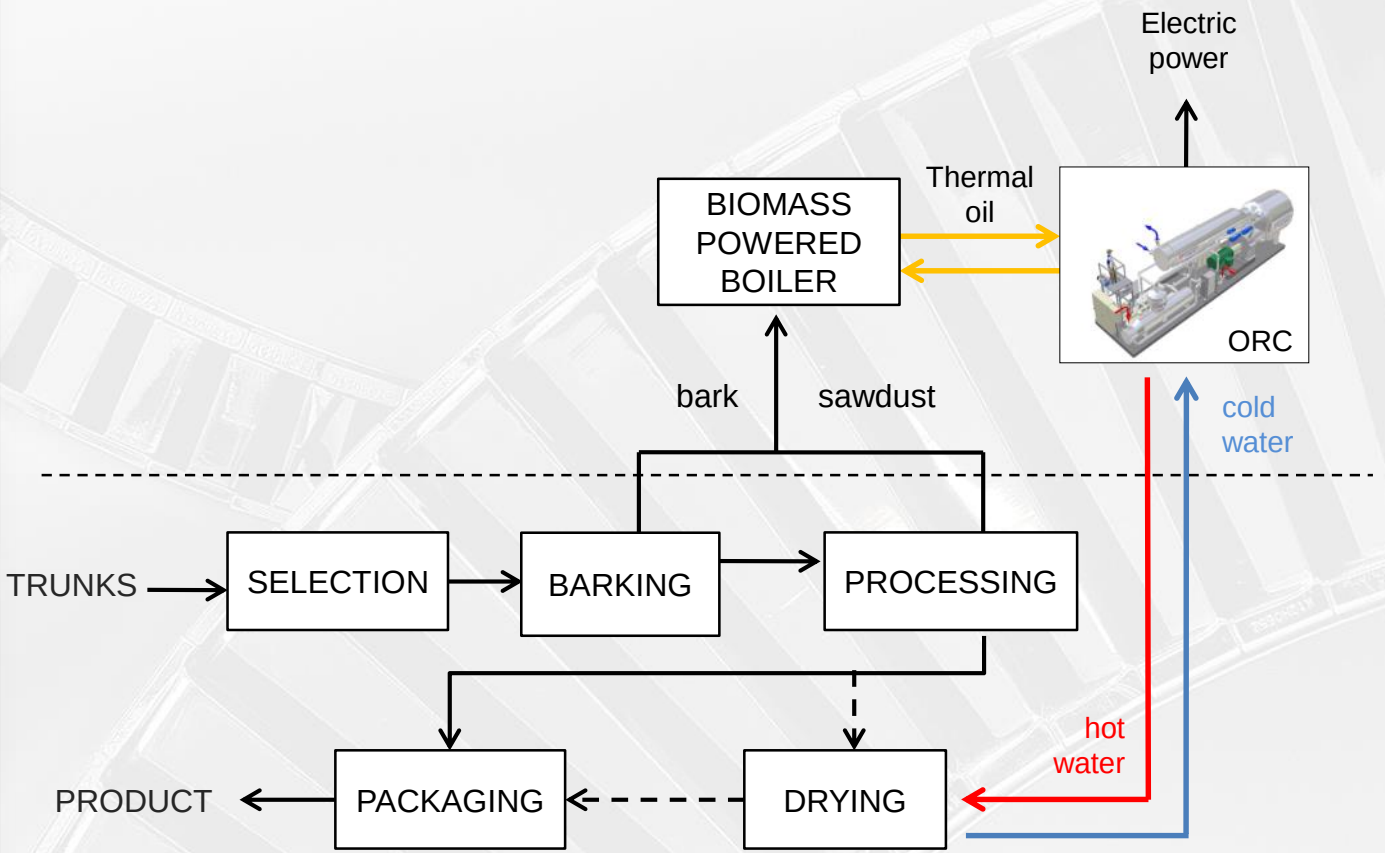
Sawmills



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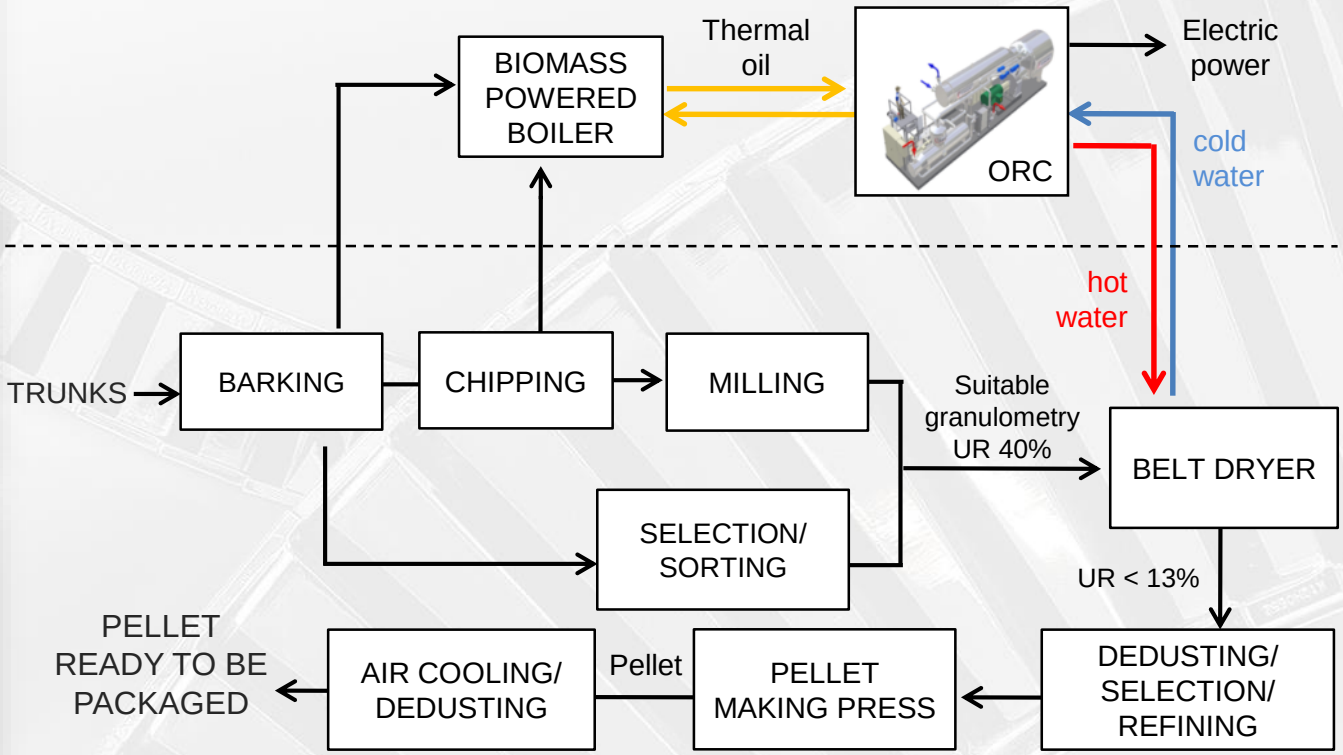
Wood Pellet Production



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MDF Production

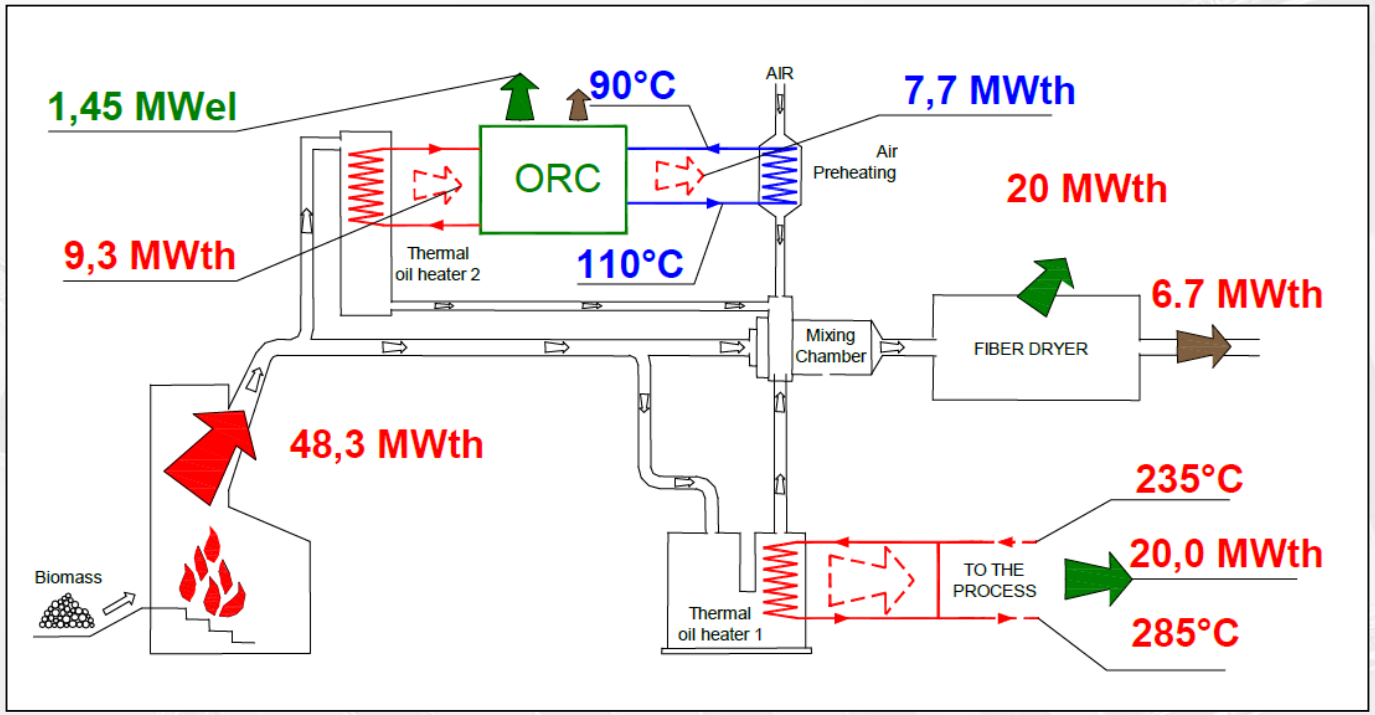

Figure: Proposed scheme for MDF plant with ORC cogeneration unit

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CCHP – Combined Cooling Heating Power

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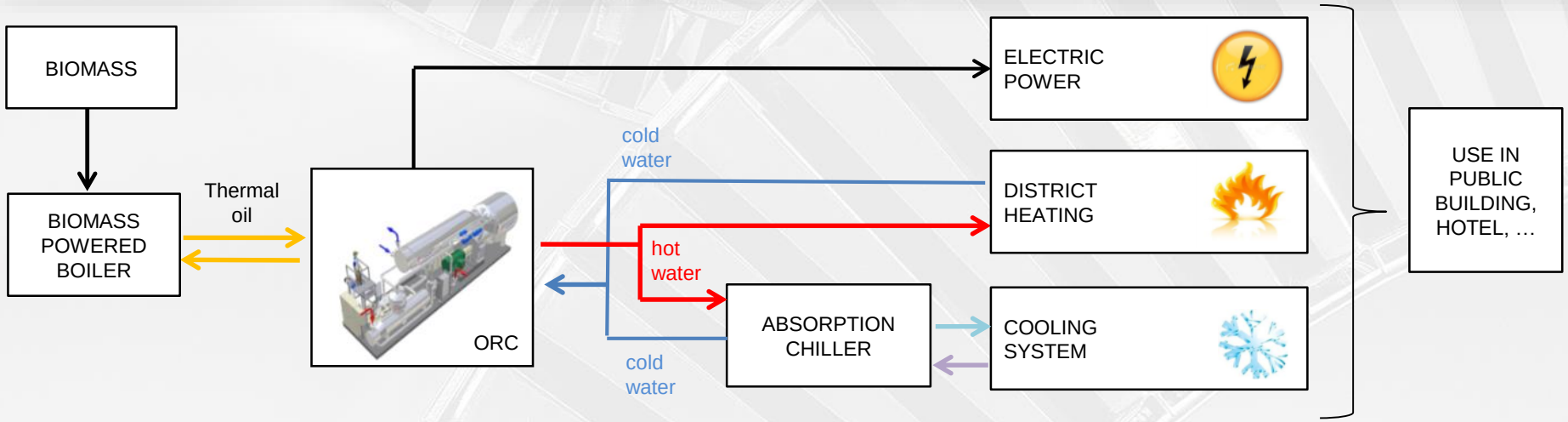

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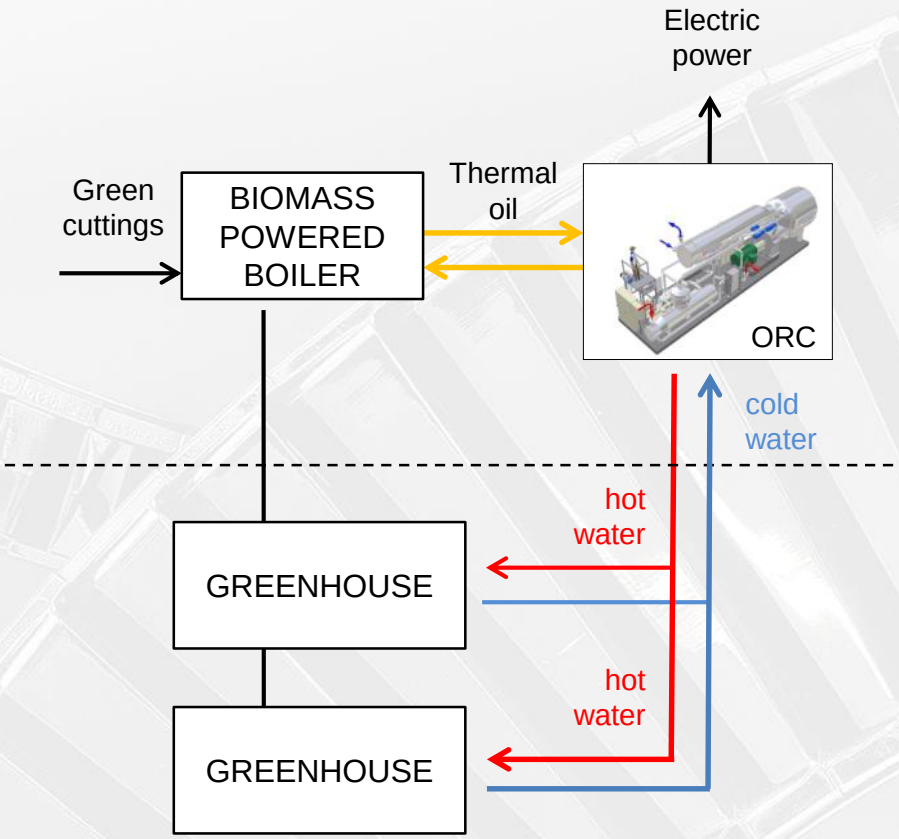
Greenhouses



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Wine Production

Land yearly upkeeping → cutting

Grappa and Alcohol

Skins Vinasse

Sweet Vinasse

Fermented Vinasse

DISTILLING

Exhaust Vinasse

Grape juice

Vine Growing

Pressing

Fermentation

WHITE

Grape production

Rasping

Grape stalks

RED

Pressing

Fermentation

BIOMASS TO ENERGY PRODUCTION

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Turboden at a Glance

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Turboden strong points

R&D

- Participation in national & EU research programs
- Cooperation with EU Universities and Research Centres
- Thermodynamic cycle optimization
- Working fluid selection & testing
- Thermo-fluid-dynamic design and validation
- Implementation & testing of control/supervision software
- Many patents obtained

Sales/marketing

- Pre-feasibility studies: evaluation of technical & economical feasibility of ORC power plants
- Customized proposals to maximize economic & environmental targets

Design

- Complete in-house mechanical design
- Proprietary design and own manufacturing of ORC optimized turbine
- Tools
  - Thermo-fluid-dynamic programs
  - FEA
  - 3D CAD-CAM
  - Vibration analysis

Operations & manufacturing

- Outsourced components from highly qualified suppliers
- Quality assurance & project management
- In-house skid mounting to minimize site activities

Aftermarket service

- Start-up and commissioning
- Maintenance, technical assistance to operation and spare parts service
- Remote monitoring & optimization of plant operation

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Turboden – a Group Company of MHI

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Energy & Environment

the largest segment of MHI

over $12 billion (in fiscal 2013)

Energy & Environment

Providing optimal solutions in the energy-related fields of thermal power, nuclear energy and renewable energy in different environmental areas and for Chemical plants & other industrial infrastructures elements.

Machinery, Equipment & Infrastructure

Providing a wide range of products that form the foundation of industrial development, such as machine tools, material handling, construction machinery, air-conditioning and refrigeration systems.

MITSUBISHI HEAVY INDUSTRIES, LTD.

Mitsubishi Heavy Industries is one of the world's leading heavy machinery manufacturers, with consolidated sales of over $32 billion (in fiscal 2013).

Foundation July 7, 1884

Commercial Aviation & Transport Systems

Delivering advanced land, sea and air transportation systems, including civilian aircraft, commercial ships and transit networks.

Integrated Defense & Space Systems

Providing advanced land, sea and air defense systems, including naval ships, defense aircraft, launch vehicles and special vehicles, as well as space-related services.

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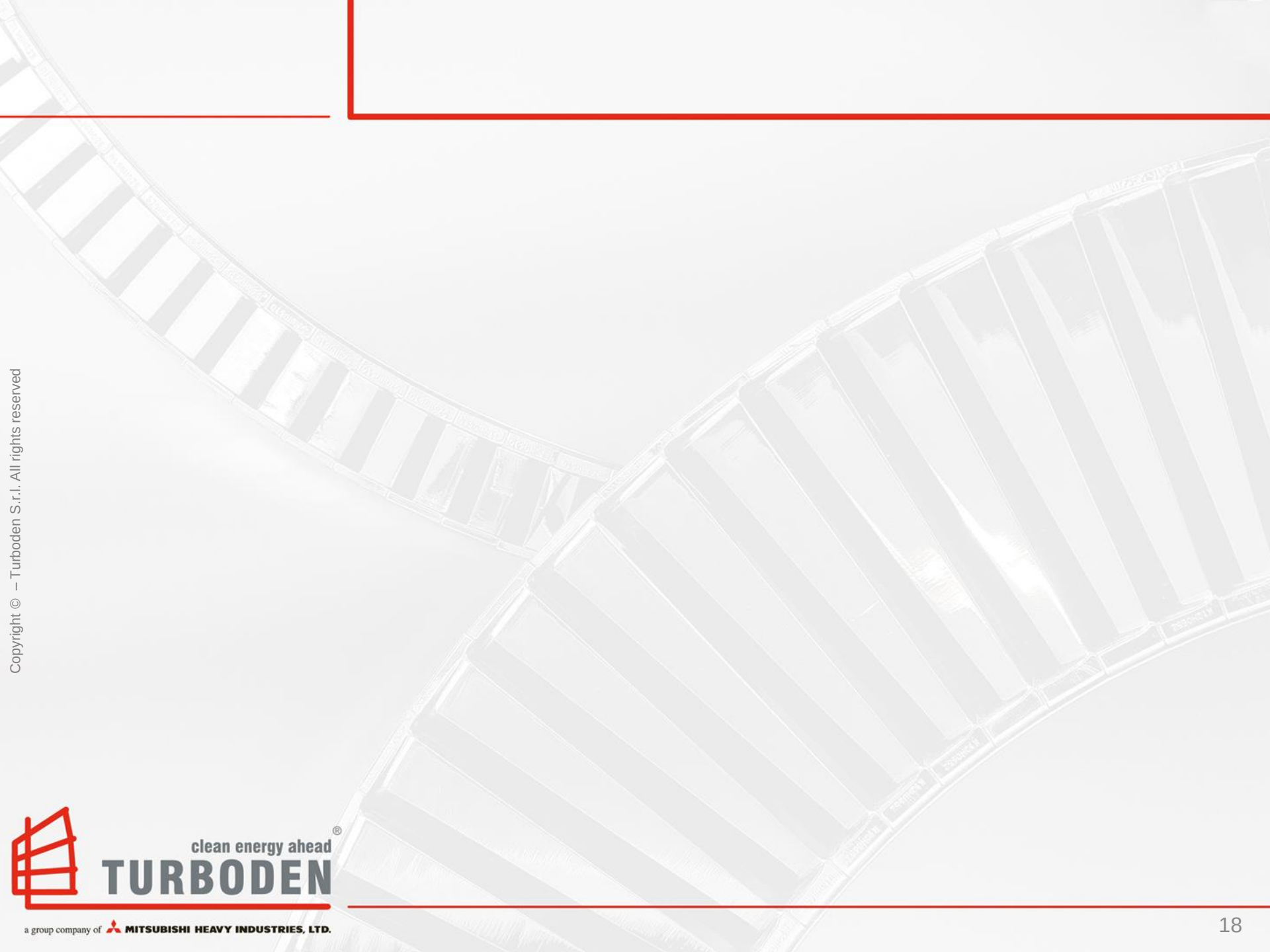

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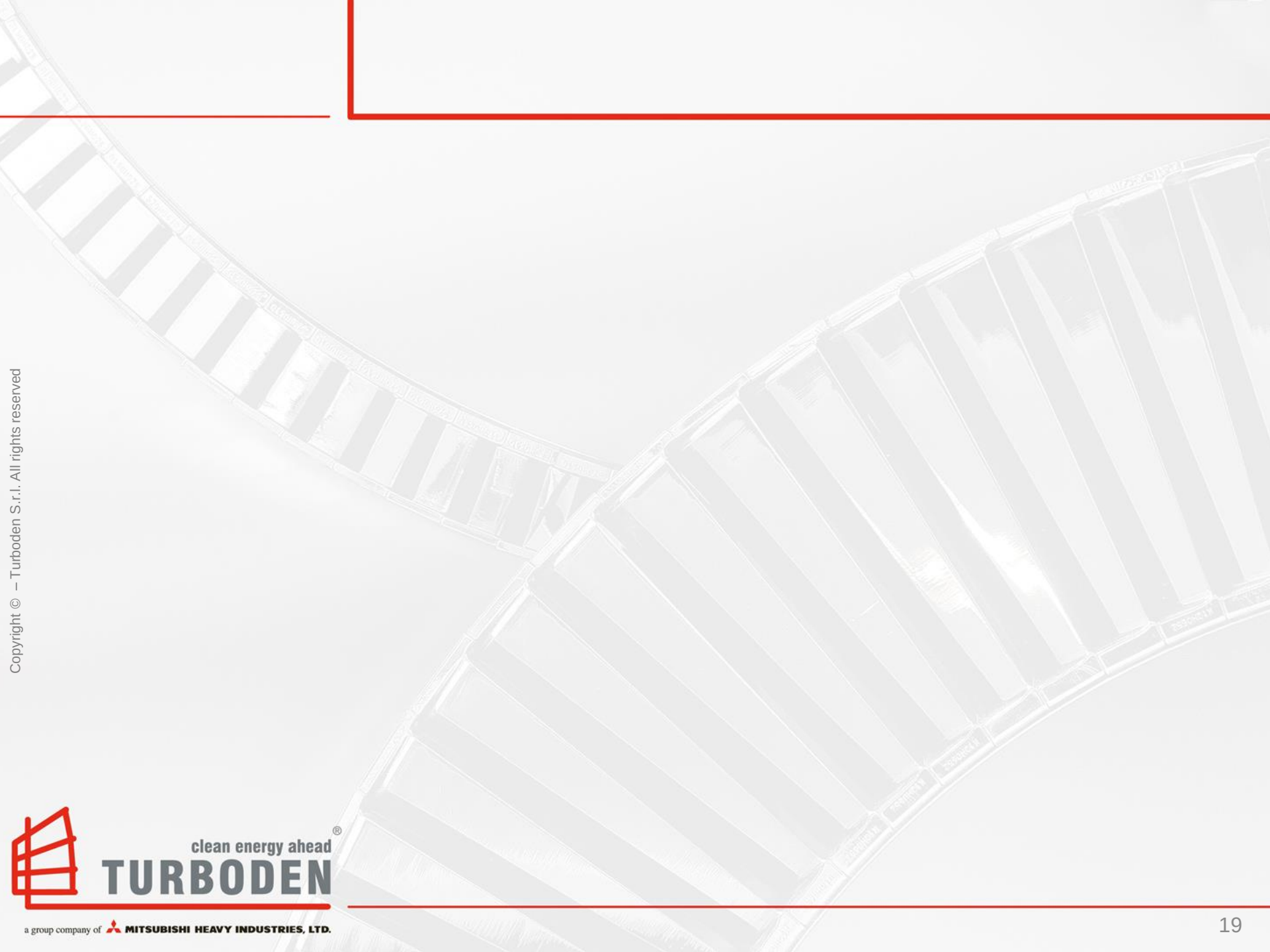

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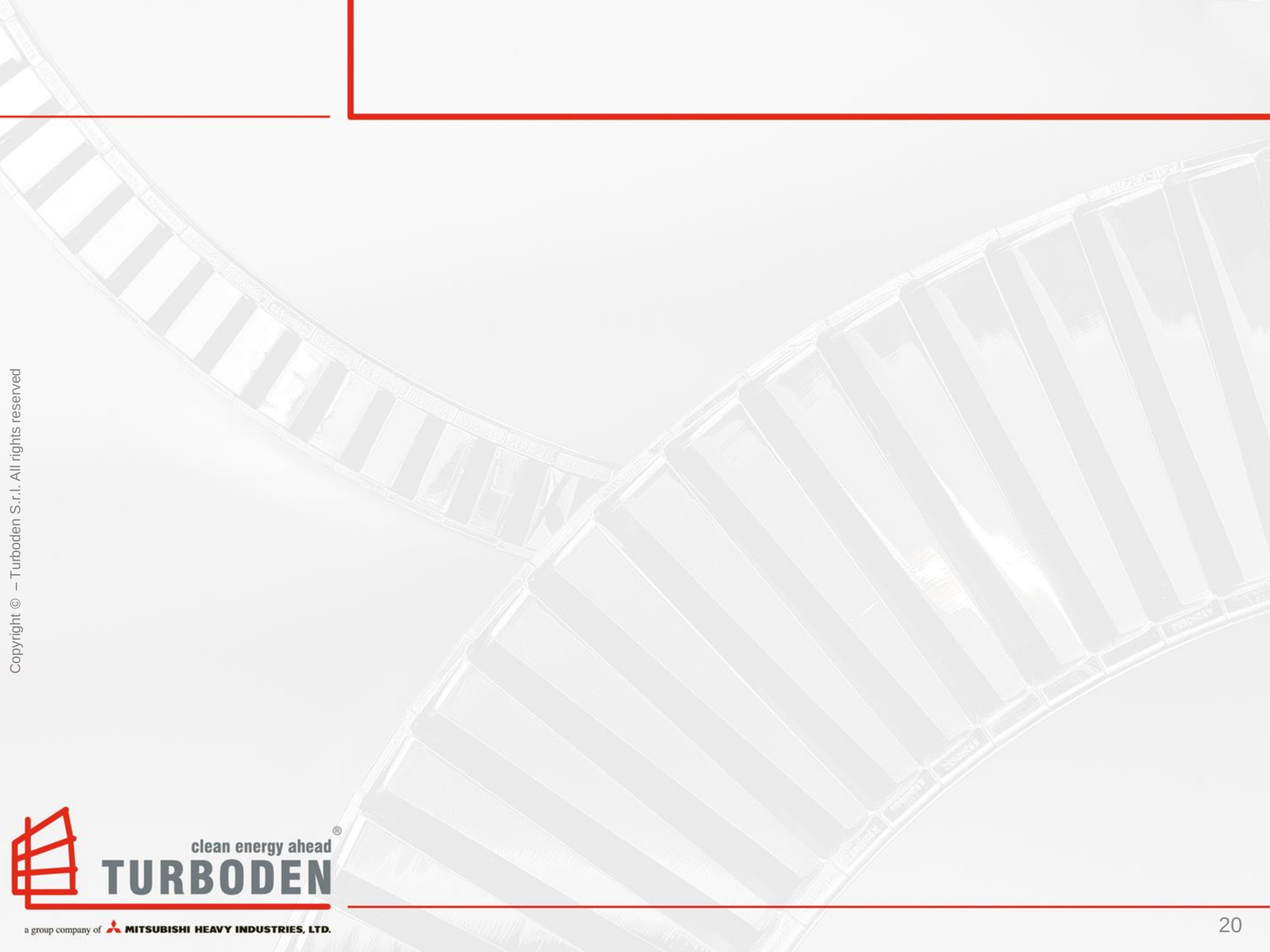

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