Sustainable Bioenergy
Solutions for Tomorrow

BEST-program/TASK 3.2 Industrial concepts

Task 3.2.1 Conceptual design of BIGCC - Summary report

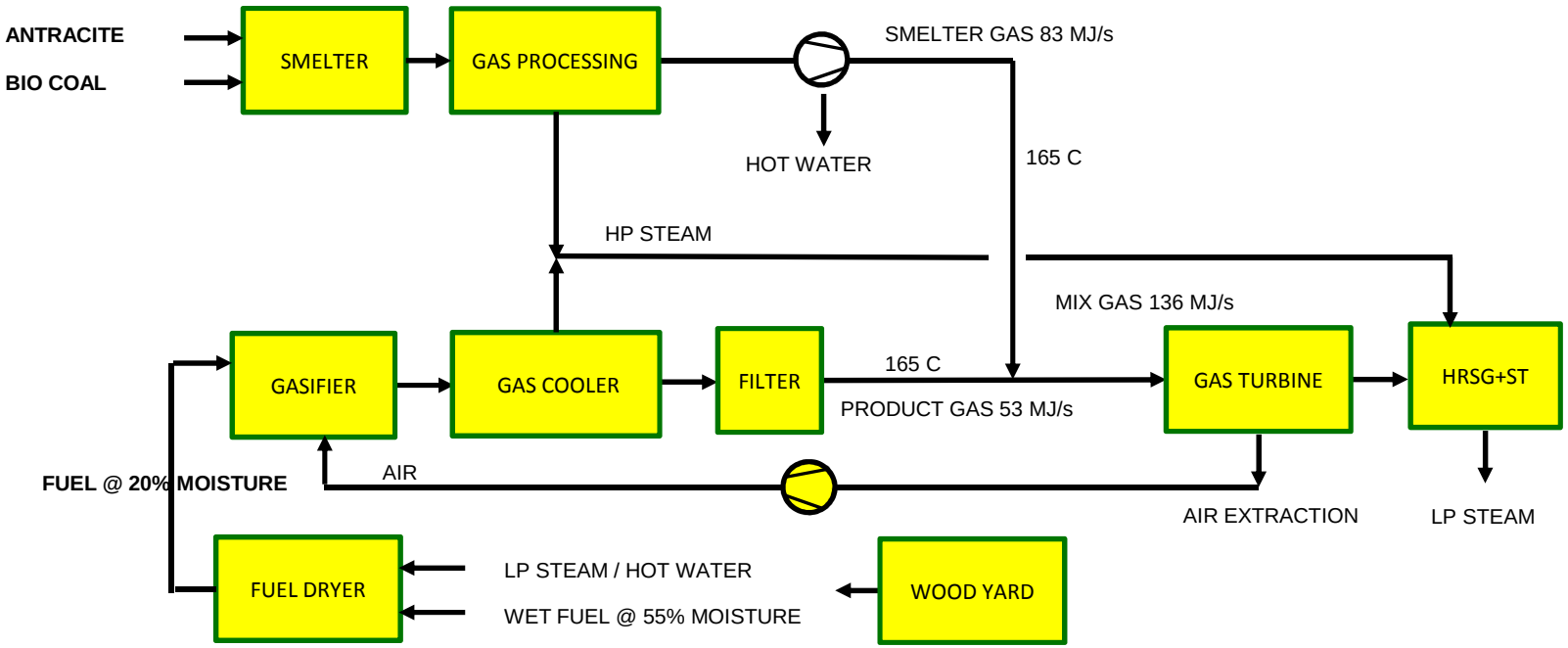
Industrial concept

Task 3.2.1 Conceptual design of BIGCC

- The overall concept is an industrial real case - Mustavaaran Kaivos Oy
    - Industrial energy company partner Pohjolan Voima Oy
- The concept integrates the mixture of CO-rich off-gas from metallurgical process and biomass based gasification gas as primary fuel for a gas turbine in power production
- Additional heat recovery is enhanced by integrated heat recovery steam generator with steam turbine to achieve high electricity efficiency
- Gas turbine is dimensioned and designed for the gas mixture above
- Gasification concept is based on a gasification plant utilizing pressurized air from gas turbine compressor part
- In the study the total investment costs and power generation costs were estimated and the feasibility of the new industrial concept was assessed
- This designed concept is the first of this kind and the potential to multiply the concept for the global markets is under process

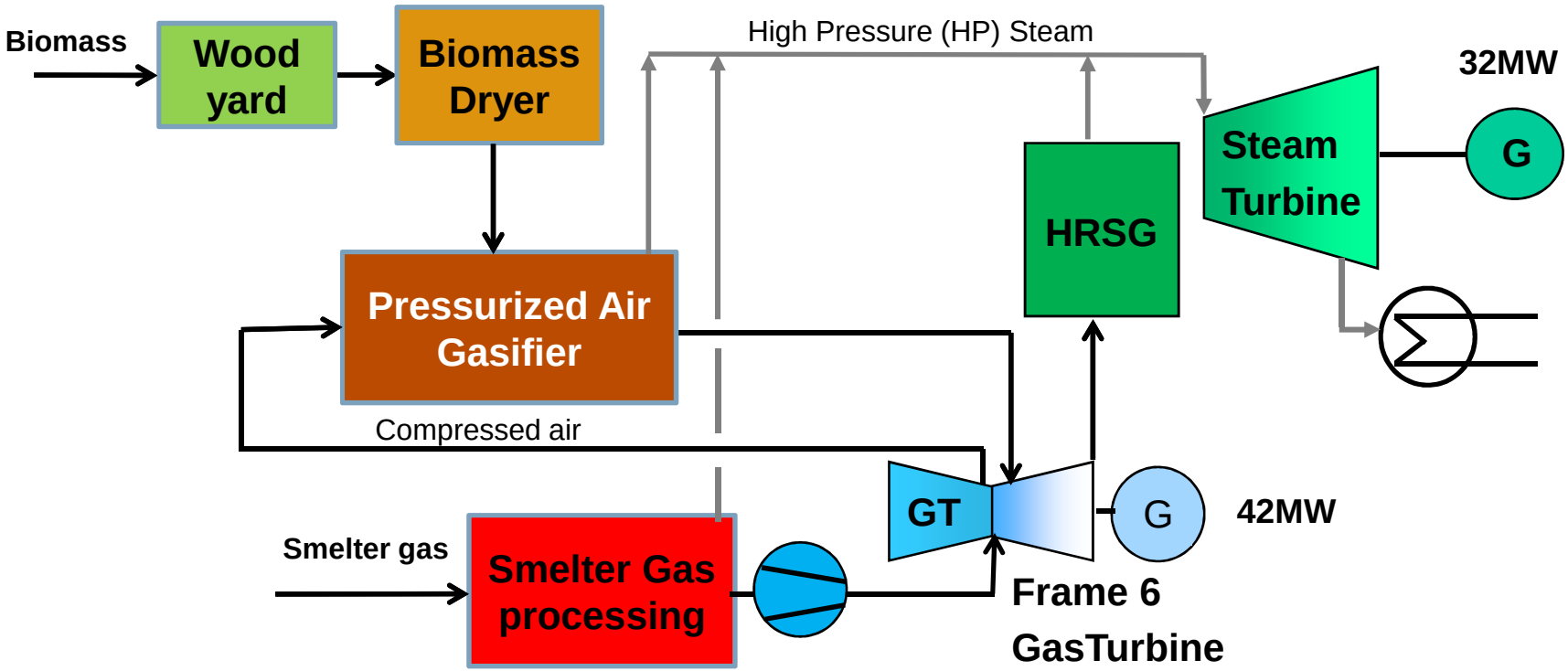
Conceptual design of BIGCC

Block diagram



Conceptual design of BIGCC

Power generation



Total investment 121M€

Conceptual design of BIGCC

Process Performance

- Gasification Plant
  - Fuel as received 55% moisture, 55 MW_{th}
  - Product gas heat to GasTurbine (GT) 63 MW_{th}
  - HP steam from gas cooler to HRSG
- Smelter gas
  - Gas from Smelter 1200^{o}C, 93.7 MW_{th}
  - Smelter gas to GT 83 MW_{th}
  - HP steam from gas cooling to HRSG
- Gross power 73.3 MW, gross efficiency 49.3%
- Net power 64.2 MW, net efficiency 43.2%

Conceptual design of BIGCC

Economical calculations

- Fixed costs estimated to16 M€/a
  - 30 years period with 5% interest
  - Operation, maintenance and administration etc costs are separately assessed
- Variable costs 9 M€/a
  - Off-gas from smelter is assumed to be free of charge
  - Gasifier biomass feed costs based on 20 €/MWh_{fuel}
- Net power production 64 MWe giving annual power production of 500 GWh
- **Electricity price of 50.0 €/MWh is achievable**

ACKNOWLEDGEMENT

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