Biogas and syngas
New technologies for valorizaiton

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Agenda

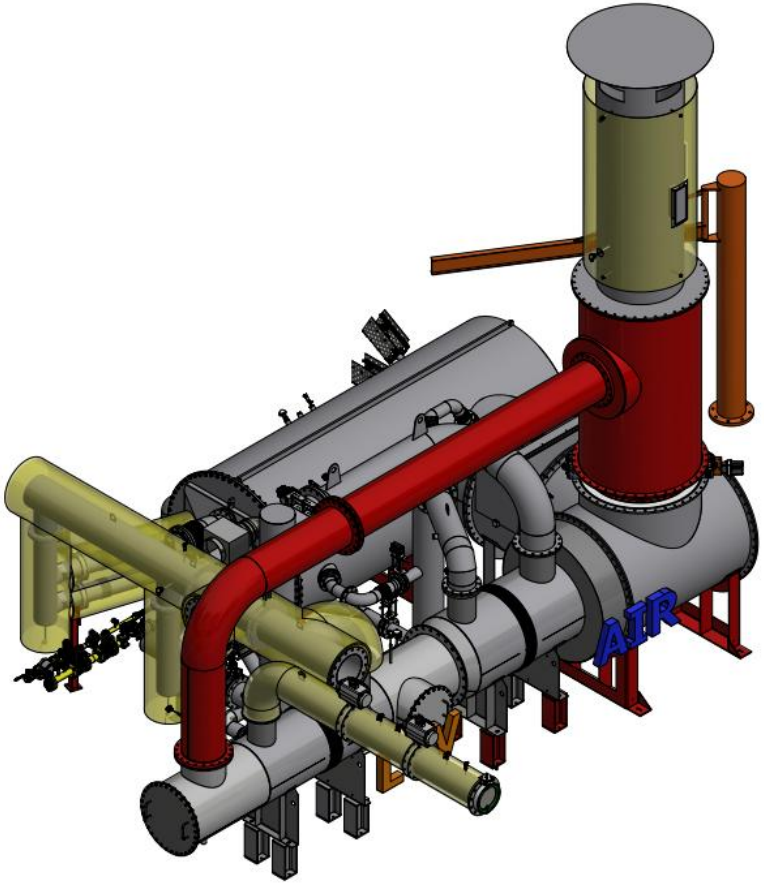
- LCV combustion for gas upgrading
- LCV combusiton for landfill gas
- Pyrolyis gas combustion
- Hydrogen reformer for decentralized H_2 production

1: Burning purge gas from biogas upgrading

Biogas upgrading

- Each gas upgrading process produces a purge gas:
  - Landfill gas: 6-10% CH4
  - Fermenter biogas: 1-5 % CH4
- E-flox is the leading expert to process this purge gas:
  - No methane slip
  - Optimum heat recovery

Example: LCV combustor for Brazil



- Purge gas of landfill gas upgrading
- 3500 Nm^3/h of LCV gas
- 5-9% CH_4 in LCV gas, 2-3 MW total
- Preheated LCV gas for regeneration processes
- Complient with landfill guidelines

Further examples

400 kW from LFG upgrading
France

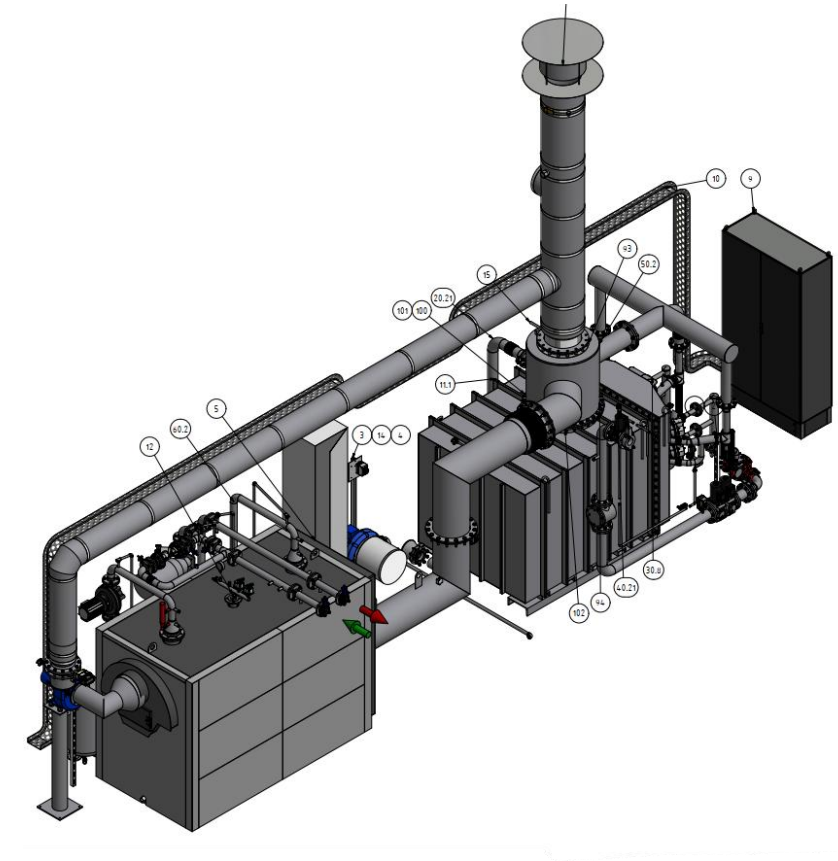
250 kW biogas upgrading
France

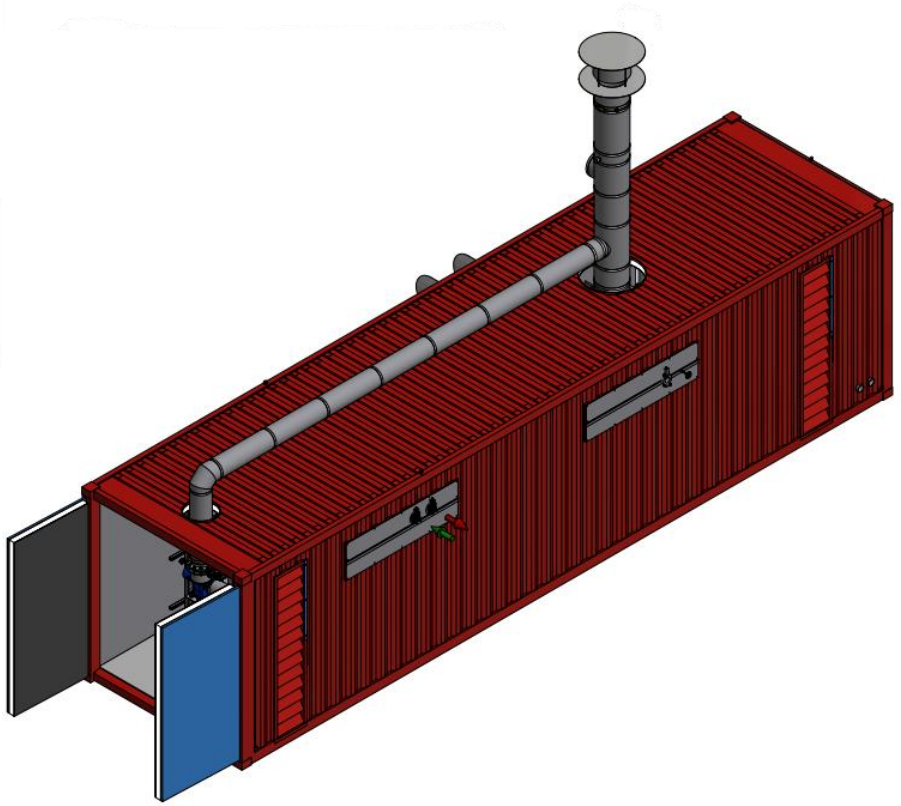
2: Landfill gas (LFG) from old landfills

How to use landfill gas

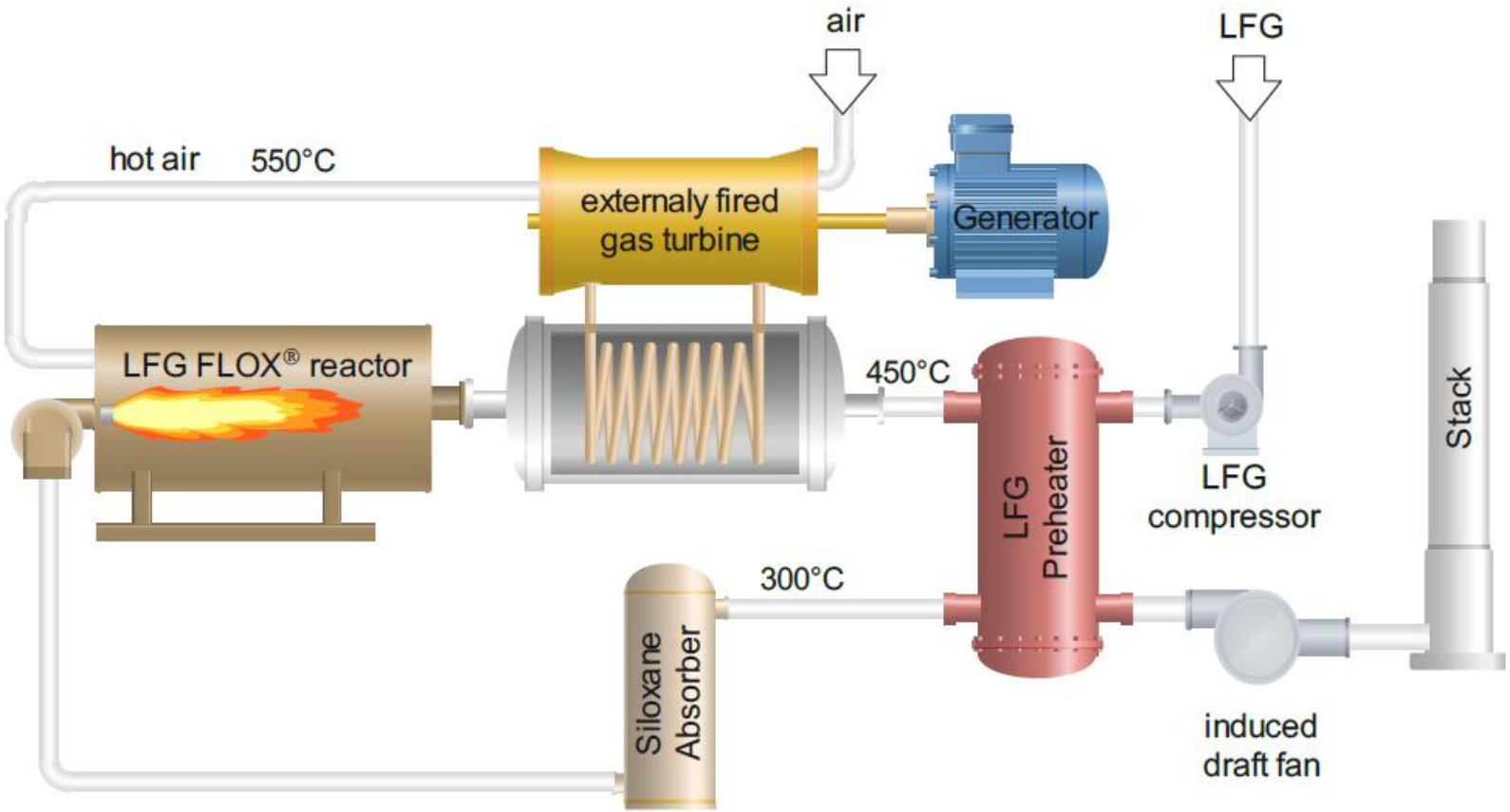
- If the landfill is open or recently closed:
  - Good quality biogas
  - Gen sets for electricity production
  - Gas upgrading for RNG
- If the landfill is closed for more than 10 years
  - Landfill gas quality declines substantially
  - Gen sets and flares do not work anymore
  - Gas collection is tuned down and a substantial amount of methane is lost
- Turn the problem into a revenue –> e-flox
  - Use all available syngas, increase the methane yield typically by the factor 2
  - LCV combustor combined with a boiler
  - LCV combustor combined with electricity generator (>= 800 kW_{th})

Landfill gas combusiton with hot water boiler





ELMS power, Gen set for low quality LFG



3: Process heat from pyrolysis process

Syngas sources

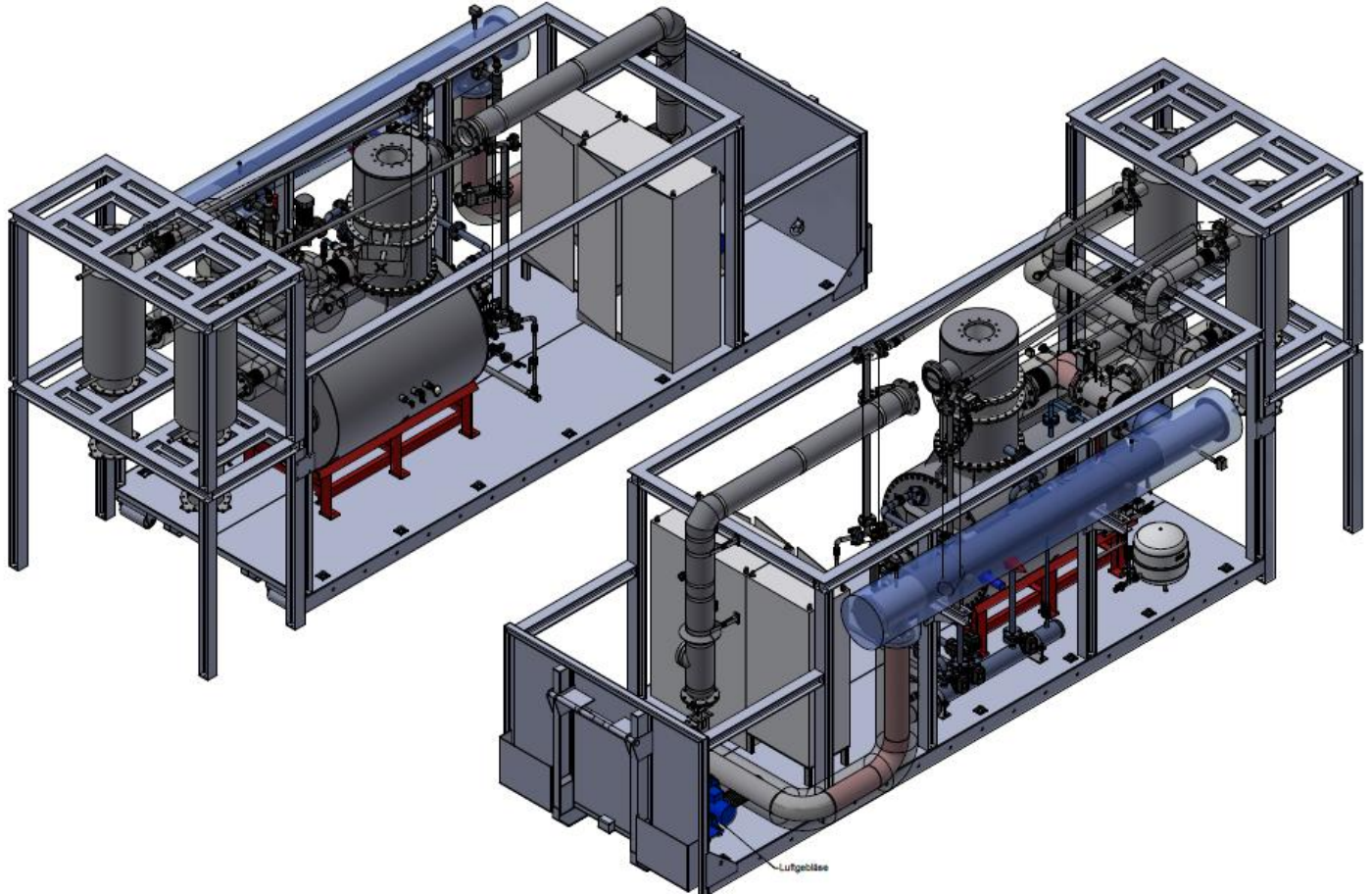
- Pyrolysis of waste streams
  - Plastics or old tyres as feedstock
  - Turn your waste into energy and valuable products

- Biochar production
  - New product by turning biomass into biochar
  - Utilize the syngas for process heat
  - Generate CO_2 credits

- Some of our Customers:
  - Pyreg: Biochar and sewage sludge pyrolysis
  - Pyrum: car tyres
  - VOW: Waste biomass and sewagesludge

Example: 2 x 6 MW syngas lines for the US

250 kW integrated System



4 : Biogas to Hydrogen

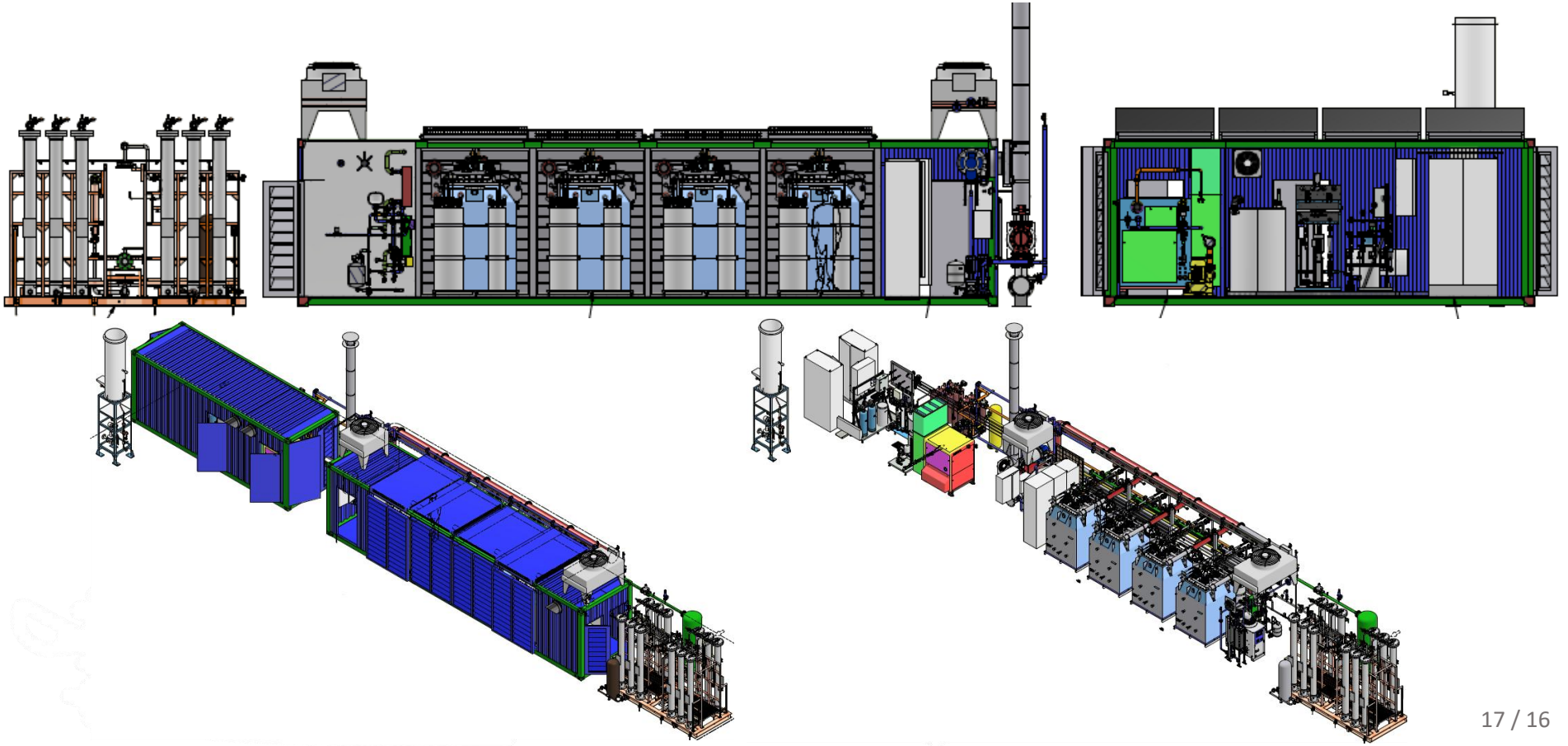
BTH 400 -> 400 kg H_2/day

Business modell BTH

- Farmer:
  - RED2 certified fuel allows to sell H_2 + CO_2 credits
  - Supply of industry with H_2 container
  - Supply of local transportationcompanies

- Municipal H_2 Projects:
  - Produce H_2 fromorganic wasts
  - Fuel your waste colleciton trucks
  - Fuel local bus fleet

BTH400 turn key system for H_2 5.0



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