Digital Heat

CIRCE

Research Center for Energy Resources and Consumption

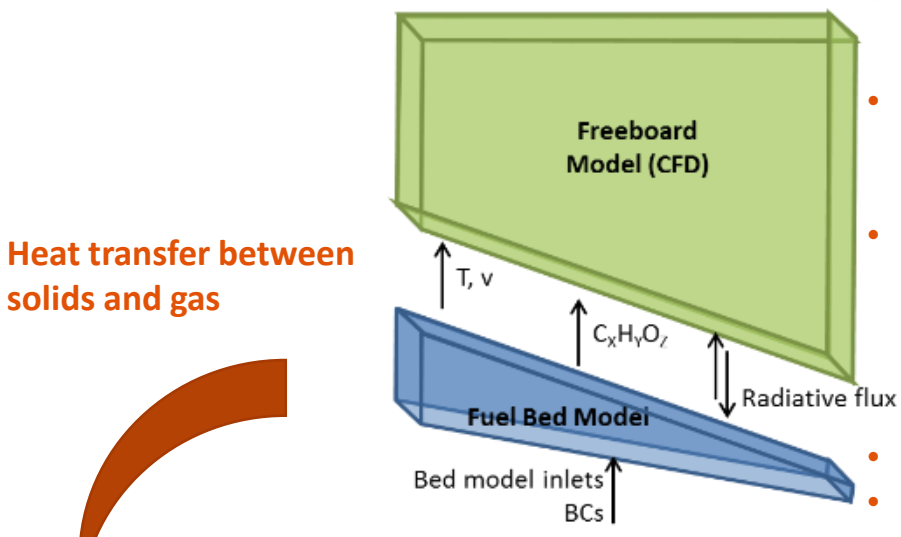
Zaragoza
20/05/2020

1. CFD Simulation
2. Digitalization Through Simulation
3. Current Projects
4. Application to DHC

CFD simulation for the energy industry

- Optimising equipment design
  - Economic savings
  - Efficiency of operation
  - Emissions reduction
- Optimising operation
  - Decarbonization by using
  - biomass based fuels
  - Use of waste fuels
  - Exploitation of waste heat

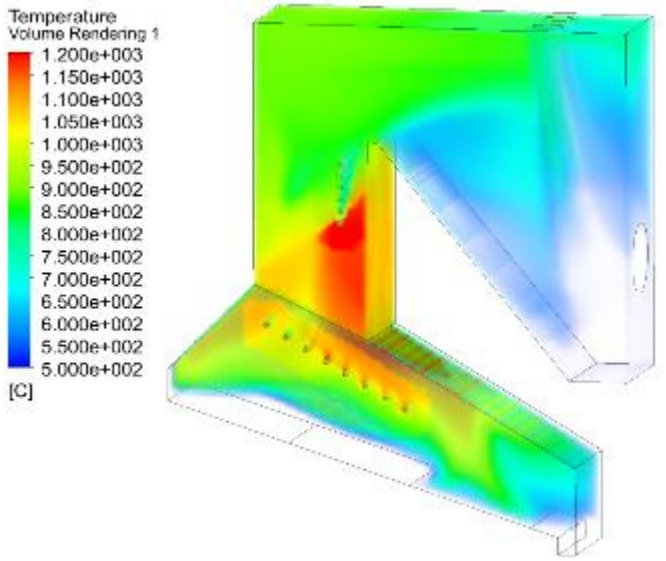
Biomass grate boiler simulation



- **Models for combustion, turbulence, radiation**
- **Changes in fuels**

Heat transfer between solids and gas

- **Models for beds**
- **Changes in fuels**



- **Estimation of emissions: NOx, CO_2, SO_2…**
- **Changes in design and improvement proposals**
- **Selecting monitoring points**

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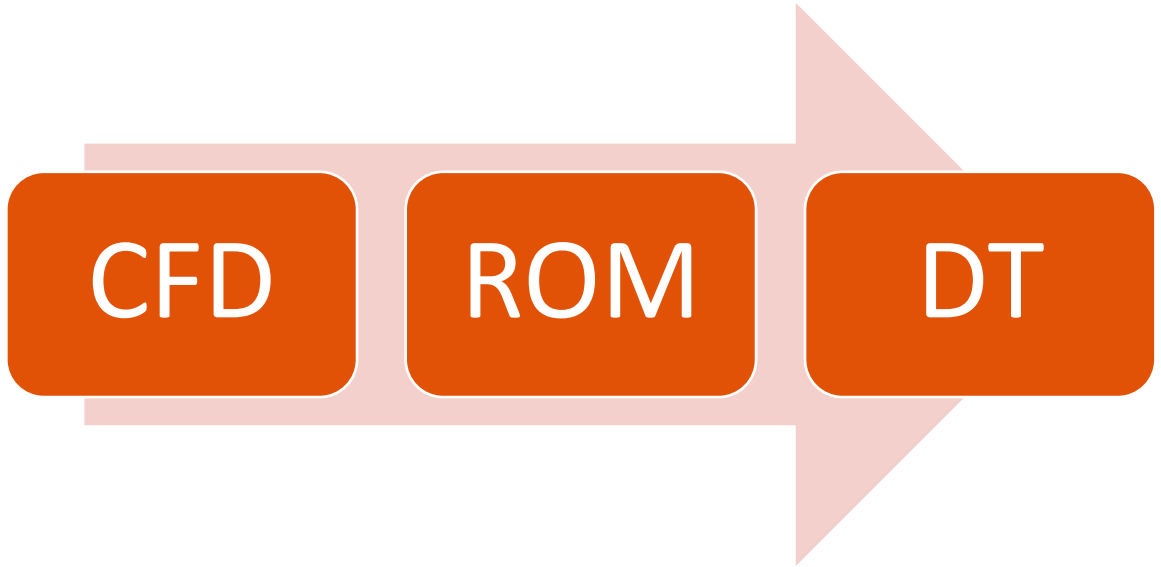
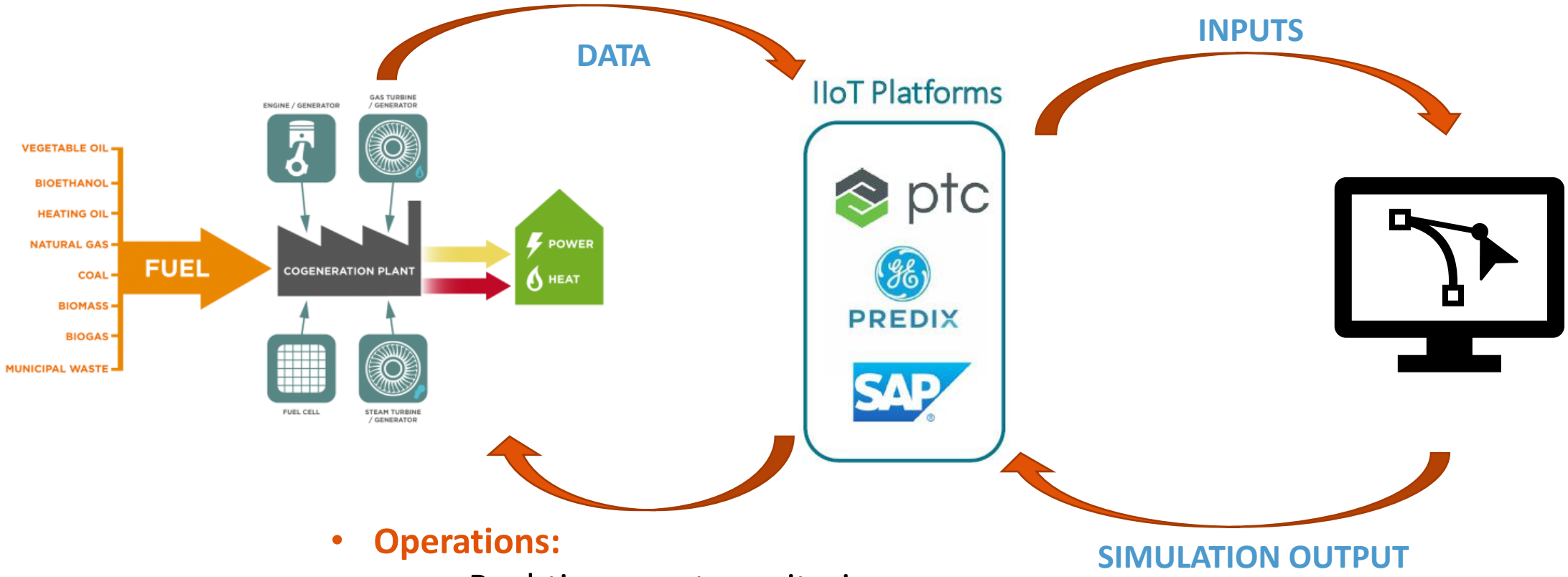
Digitalization through CFD simulation



- **CFD:** Computational model of an asset
- **ROM:** Reduced Order Model. Reduces the number of degrees of freedom of CFD model, thus allowing Real-Time simulation.
- **DT:** Digital Twin. ROM consumption using standard control libraries. Integration in control systems.

Digitalization through CFD simulation



- **Operations:**
  Real-time asset monitoring
- **Support:**
  Predictive maintenance
  Connected field-service
- **Development:**
  Usage-based requirements

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Current projects

EU H2020

BAMBOO

BOOSTING NEW APPROACHES FOR FLEXIBILITY MANAGEMENT BY OPTIMIZING PROCESS OFF-GAS AND WASTE USE

Retrofeed

smart retrofitting in process industry

EU H2020

- Fossil fuel substitution by biomass
- Replacement of NG by process gas
- Waste heat recovery:
  - Combustion air pre-heating
  - Drying operations

Decision Support System

- Smart Control
- Fuel flexibility
- Energy flexibility
- Production adjusted to current needs

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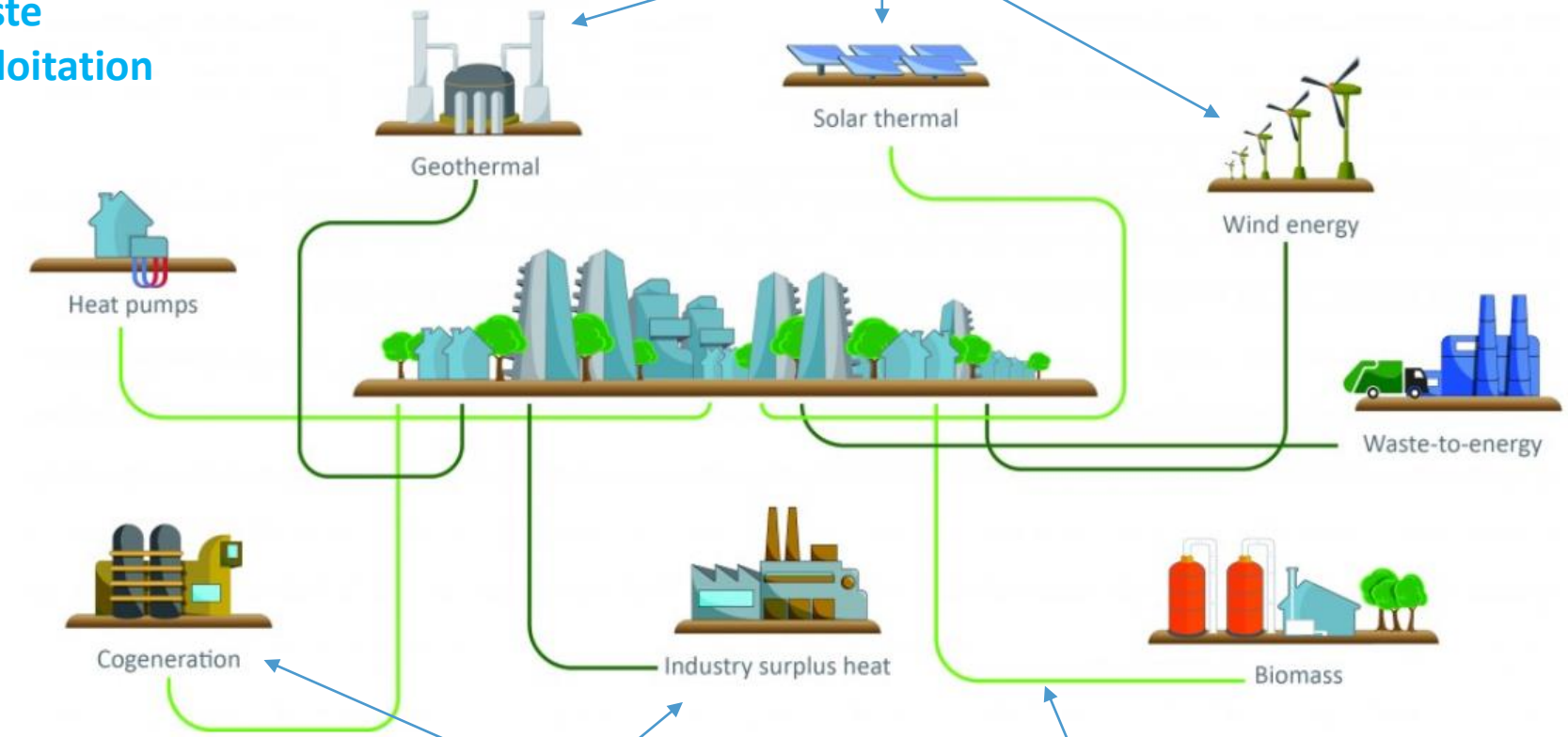
Application to DHC

Integration of RES in the network

Efficient waste streams exploitation



Efficient control of available heat

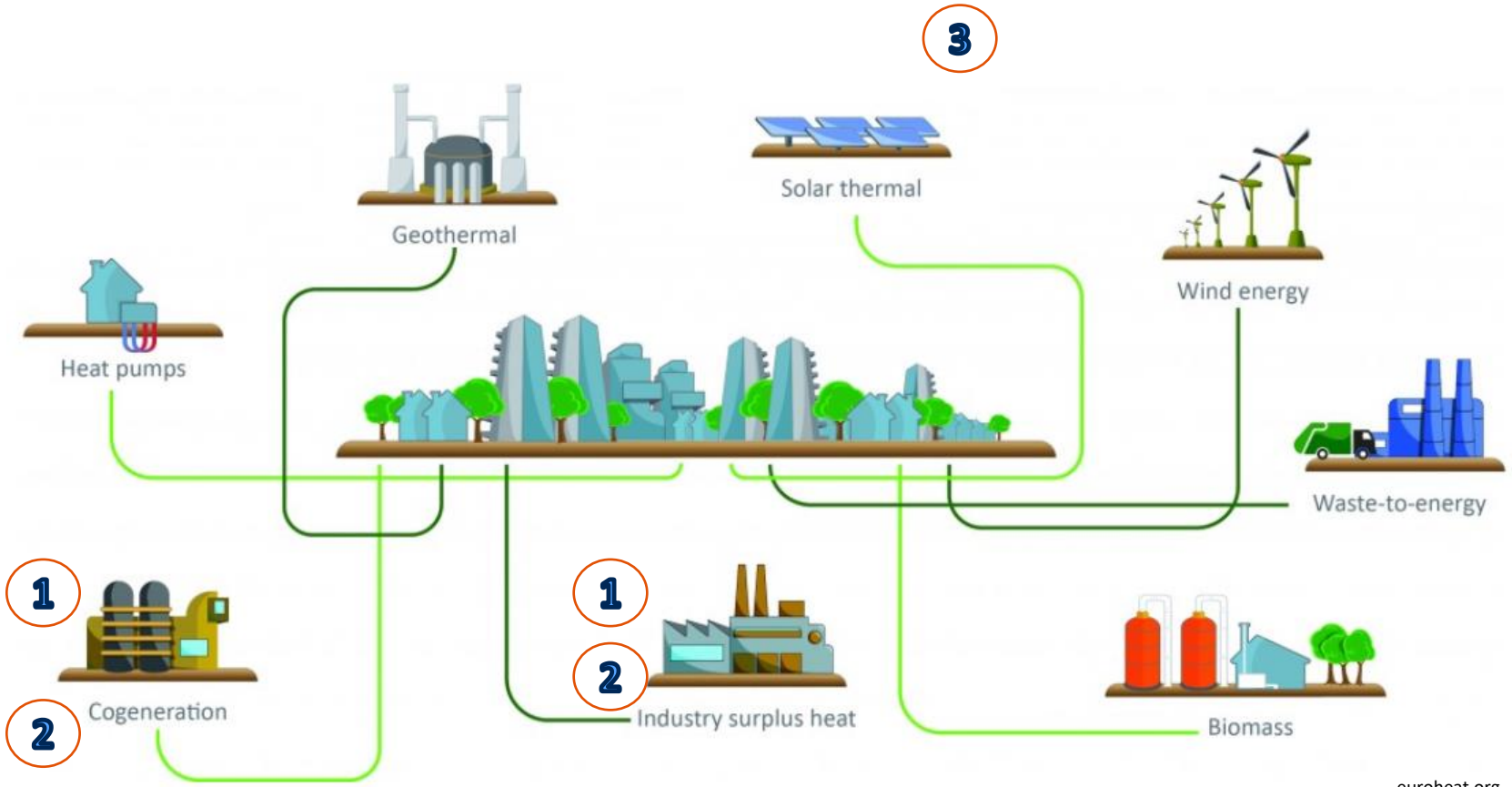
Efficient substitution of fossil fuels

ASSET DIGITAL TWIN

Point of use of waste heat streams

Application to DHC

1. **Asset Digital Twin**
2. **Efficient substitution of fossil fuel**
3. **Integration of RES in the network**
4. **Efficient control of available heat**
5. **Efficient waste stream exploitation**
6. **Point of use of waste streams**



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THANK YOU VERY MUCH FOR YOUR ATTENTION

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