

# Digitalisation and future hybrid energy systems in industry

Digital Energy Twin

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# The DIGITAL ENERGY TWIN

Optimised Operation and Design of Industrial Energy Systems

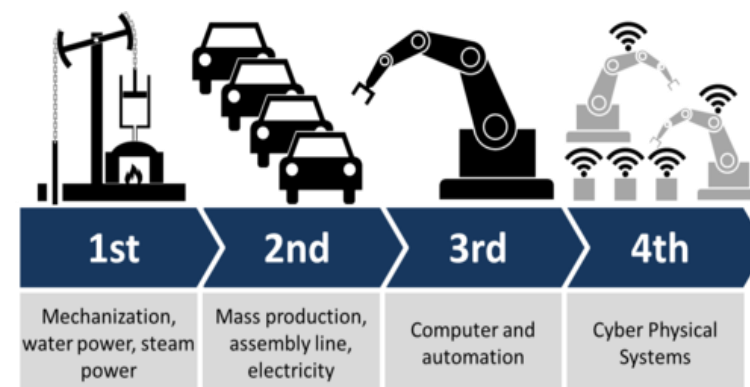


The project is funded by the Austrian Climate- and Energy Fund within the programme „Energieforschung“.



# Megatrends

## Industry 4.0



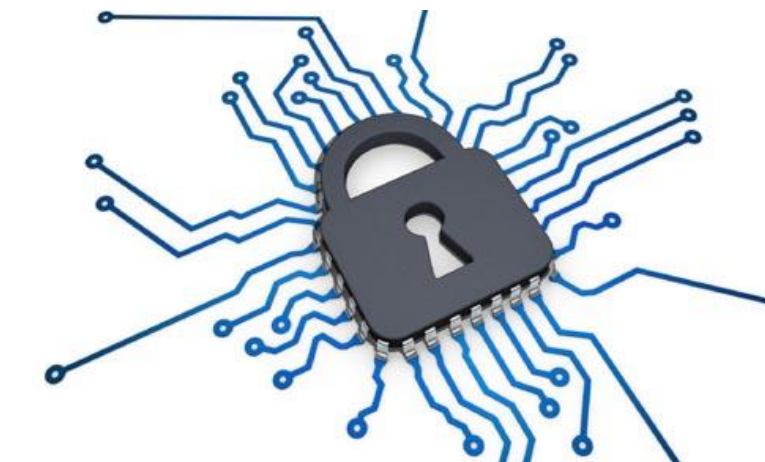
## Digitalization



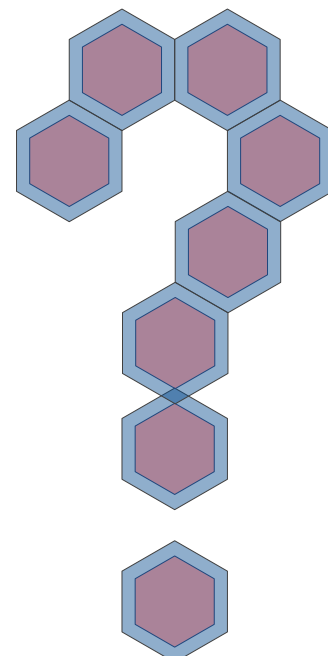
## Big Data Clouds



## Data security



- Productivity increases by up to 25%<sup>1,2,3</sup>
- 50% of the world's largest companies use digital twins
- Guiding principles of Austria's digital roadmap



**Sustainable and efficient energy supply with maximum product quality**

1...IDC Futurescape 2018, 2...Marktforschungsunternehmen Gartner, 3...WECC Global PCB Production Report for 2015



# Potential

**60%** of industrial process heating demand can be covered by energy efficiency measures and renewable energy technologies (SotA).

## Energy efficiency:

- About 8–10% savings with payback period of 5 or less years <sup>1</sup>

## Renewable energy:

- 50% of industrial process heating demand covered by technologies as solar thermal, heat pumps, biomass and biogas<sup>2</sup>

## 60% NON-FOSSIL

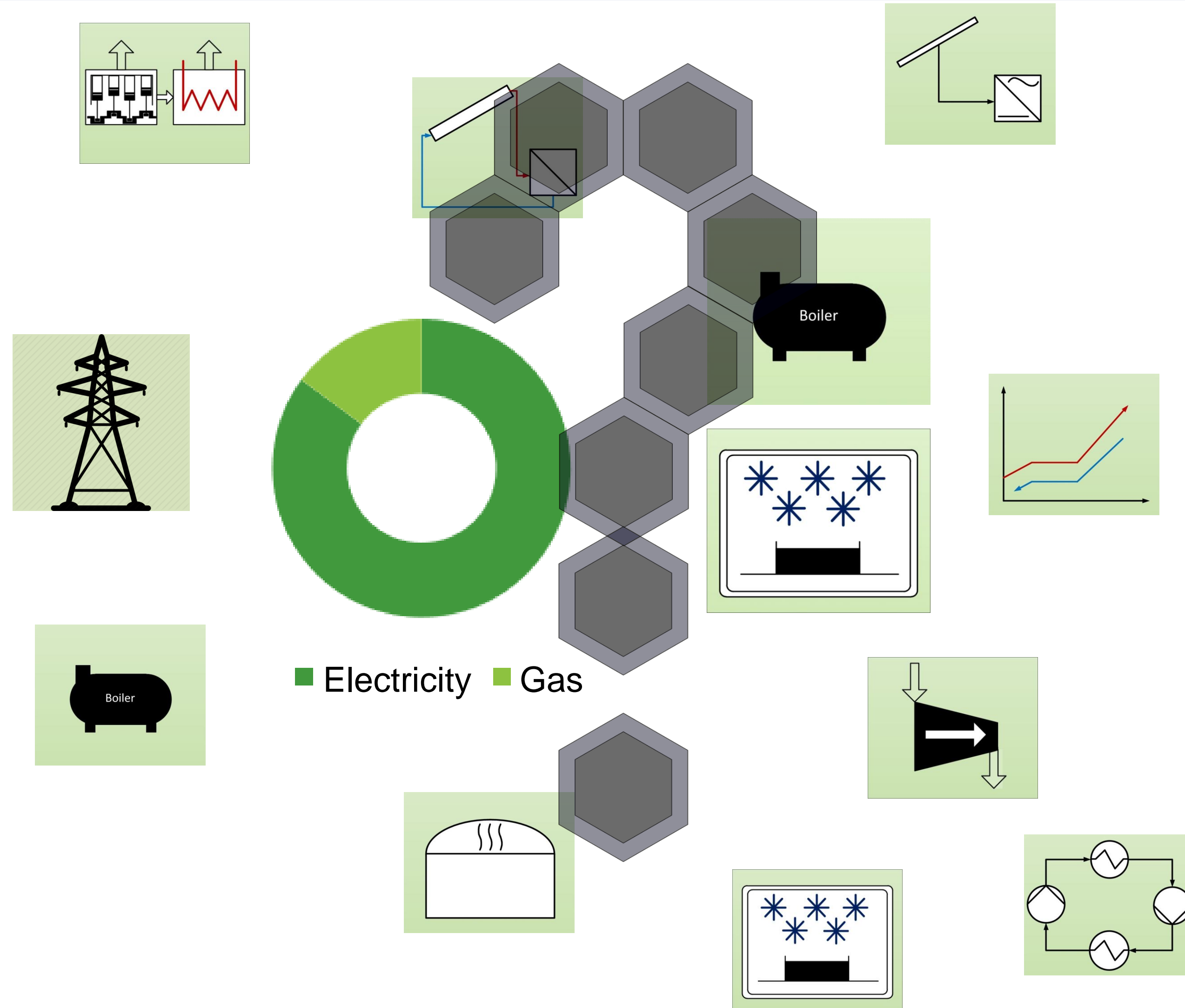


Grey = Fossil energy carrier;  
Green = Renewable energy;  
Transparent = Energy efficiency

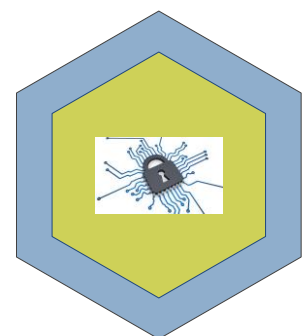
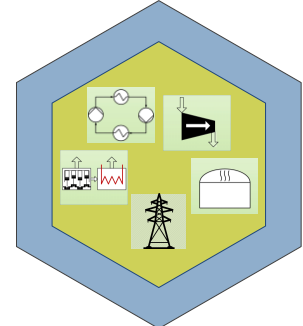
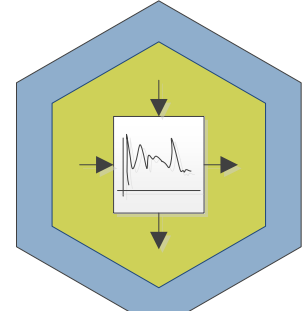
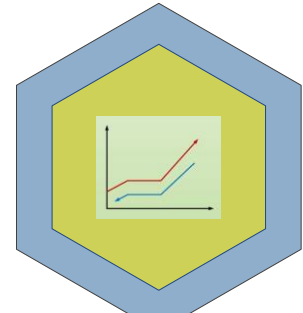
Quelle: 1. "Study on EE and Energy Savings Potential in Industry..." ICF International. 2015  
2. Estimate developed based on several sources: "Process heat collectors..." Horta P. 2016; "Process heat in Industry, Suitable Technologies". Fraunhofer ISE presentation. 2017. "Potential for Solar Heat in Ind. Processes." Vannoni C. et al. 2008;

# Energy supply challenges

## AT&S



# Portfolio Digital Energy Twin



- **Holistic optimization algorithm for industrial energy systems**

- DigitalEnergyTwin-Software for industrial energy systems
- Holistic and simplified energy modelling
- Simplification und multiplication through standardization of the DigitalEnergyTwin workflow

- **Data security and data management**

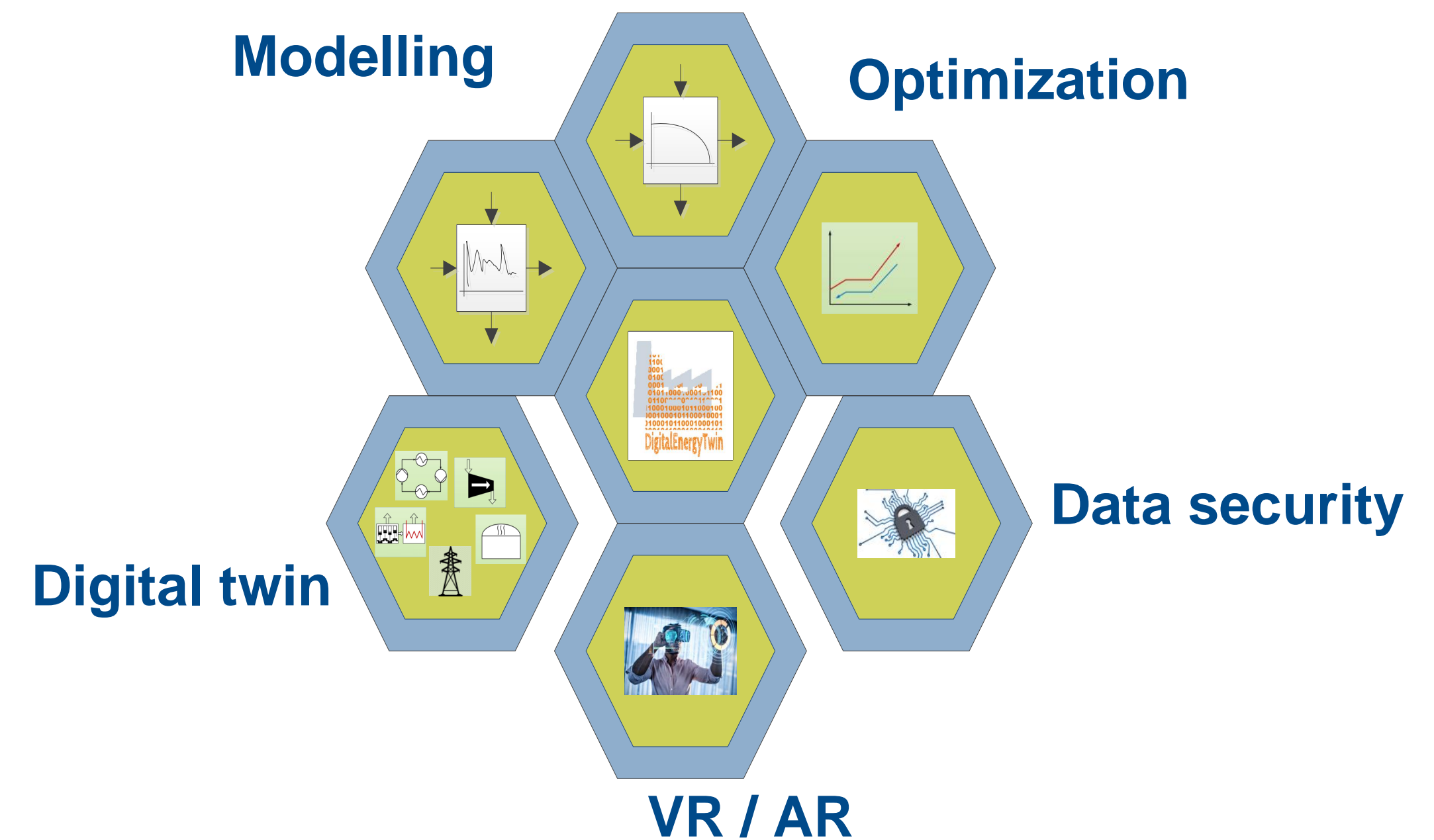
- Validation and standardized procedure

- **Energy Manager 4.0**

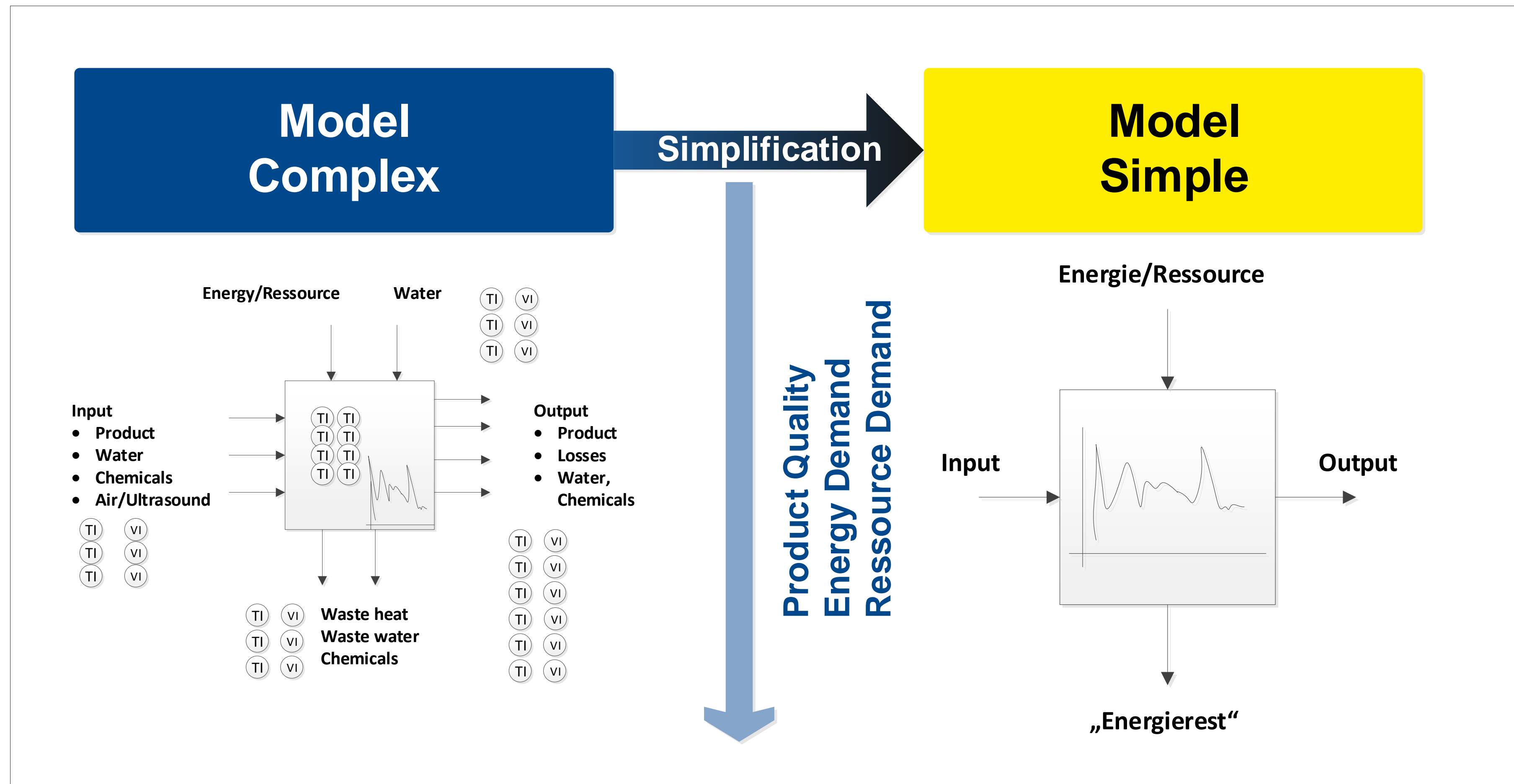
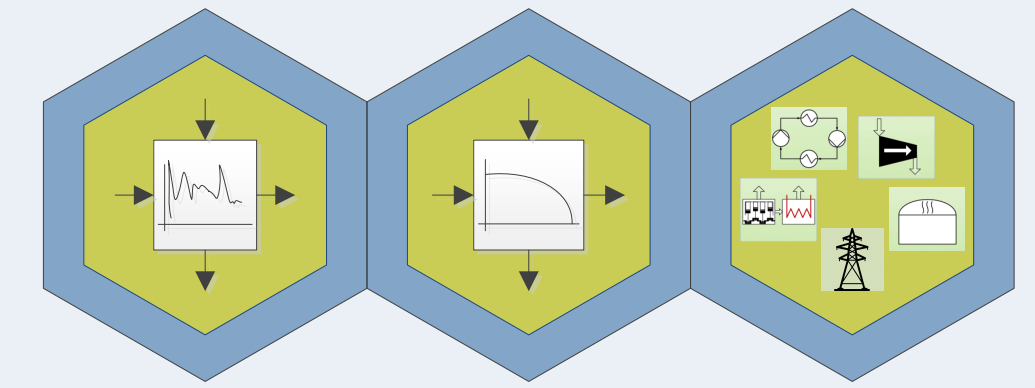
- Augmented and Virtual Reality (AR/VR)

# Digital Energy Twin (Modelling approach)

- **Modelling paradigms**
  - Physics-based
  - Data-driven based
- **Validating and simplifying models using**
  - Near-real-time data
  - Historic data
- **Integrating optimizer applied for operation and integration of**
  - energy efficiency measures
  - and renewable technologies





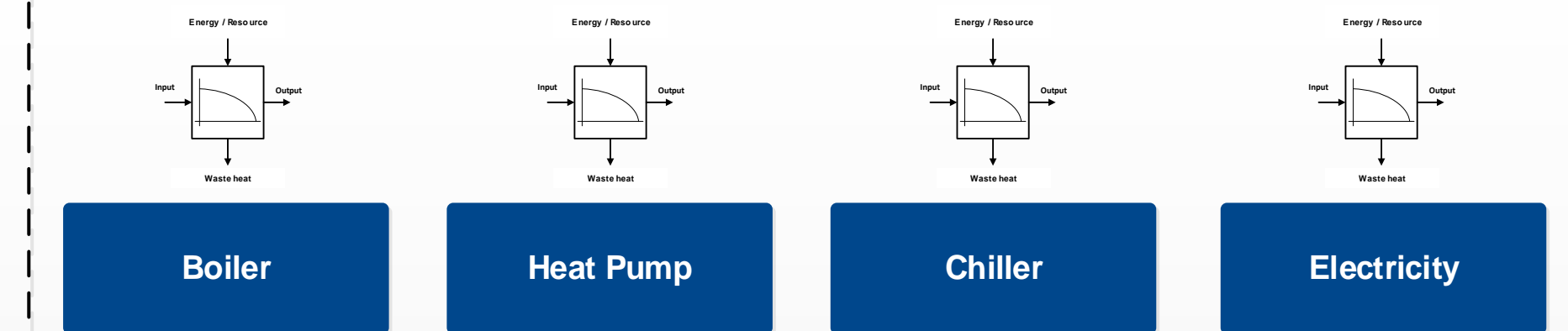




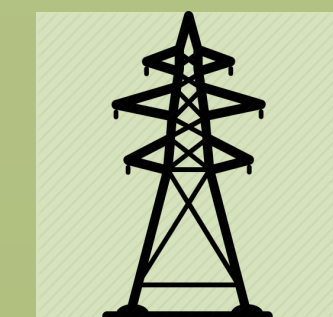
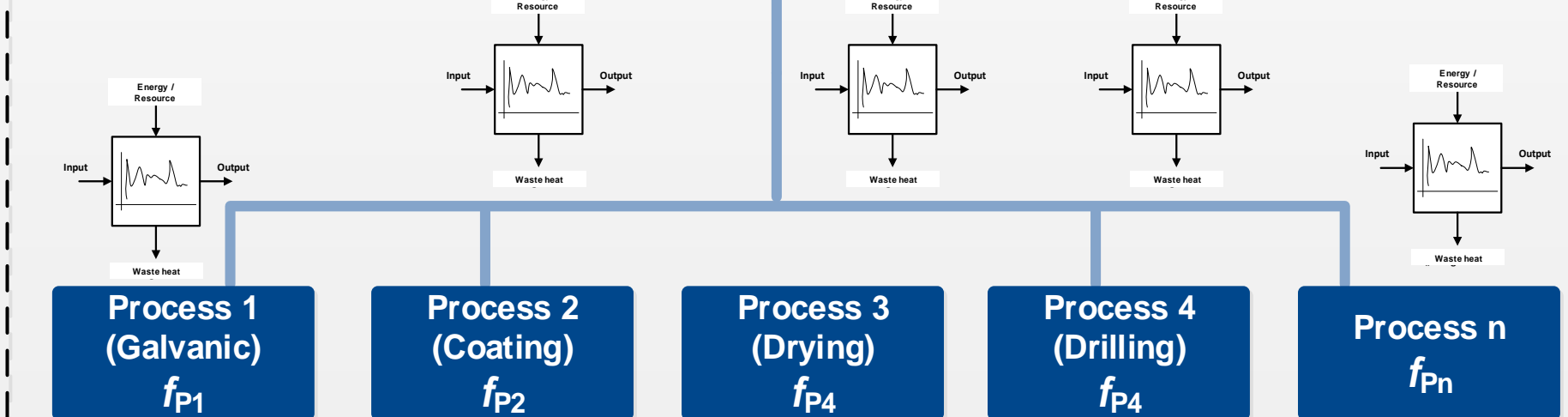
## Optimisation

### Simulation

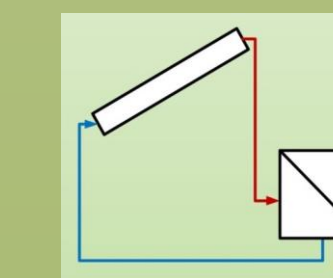
#### Supply level model



#### Process level model



Thermal and  
electricity grid

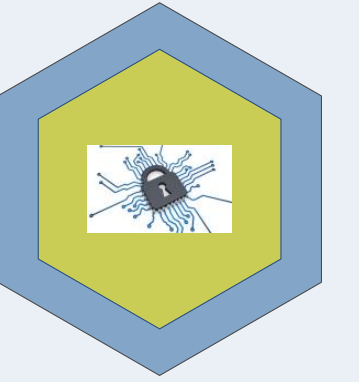


Renewable energy  
sources

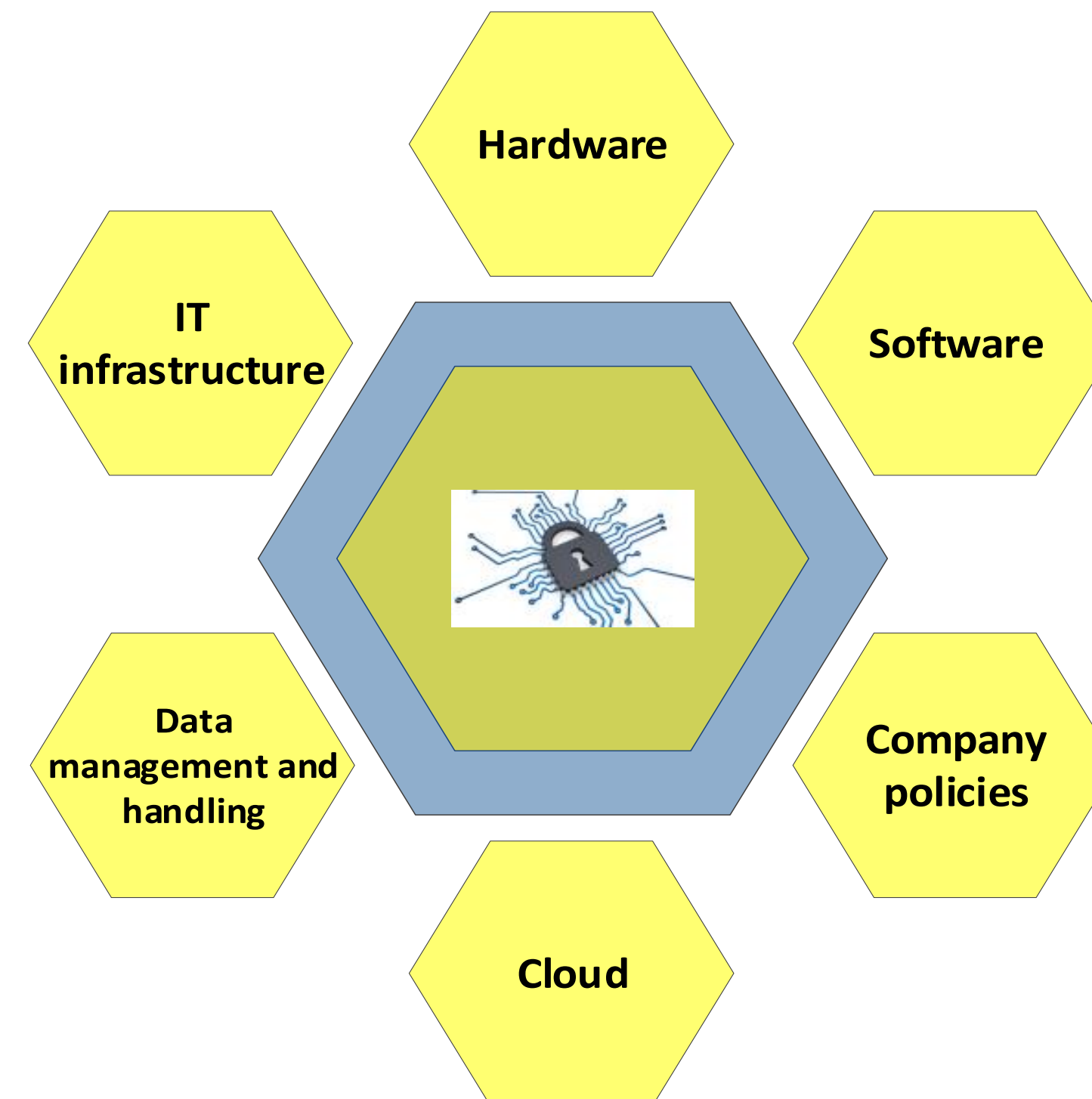


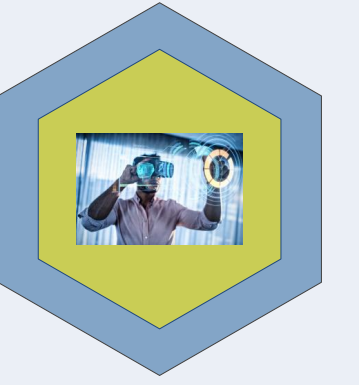
Optimisation  
methods





- **Highly important within digitalization**
- **To obtain reliable data**
- **To ensure a smooth data exchange between DT and industrial process**
- **To fulfil high-level confidentiality requirements of the industry**





## Content Management System\*



## Energy manager 4.0

**\*Organization and archiving of activities, processes and tools of digital information in their lifecycle**

# Outlook

- **Development of an operating twin for energy relevant processes (demand) and necessary supply utilities**
- **Optimization as basis for decarbonizing the industry including real investments and multiplication within the company**
- **The methods and tools developed in this project are expected to be transferrable and adaptable to other industries**





**AEE INTEC**

**IDEA TO ACTION**

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