WP2 – Energy Production, Transmission, Storage & Conversion
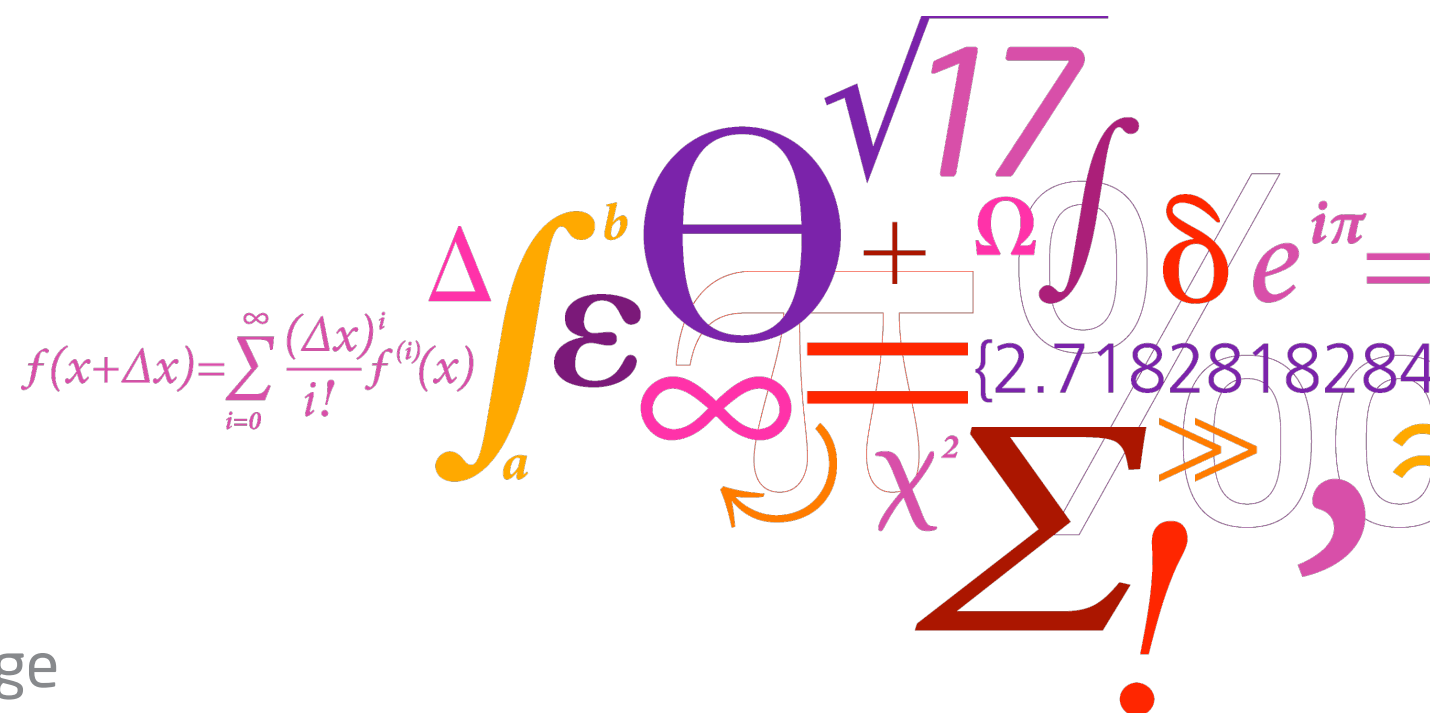## CITIES PhD and Postdoc meeting, 22.10.2014

Daði Þ. Sveinbjörnsson

DTU Energy Conversion
Department of Energy Conversion and Storage

CITIES Work Package 2

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- WP leader: Allan Schrøder Pedersen
    - 1 Postdoc (myself, started Aug. 2014)
    - 1 PhD student (starts in early 2015)
    - 1 MSc student (Alessia Elia, started Oct. 2014)

    ▌ **DTU Energy Conversion**

- Close collaboration with WP1 is planned. ▌ **DTU Management Engineering**

- We are actively collaborating with Energinet.dk
  (the Danish electricity and gas transmission grid operator).

  ENERGINET.DK

Modeling the Danish Energy System

The aim is to optimize the future usage of resources, while delivering the required energy services in a sustainable and reliable way.
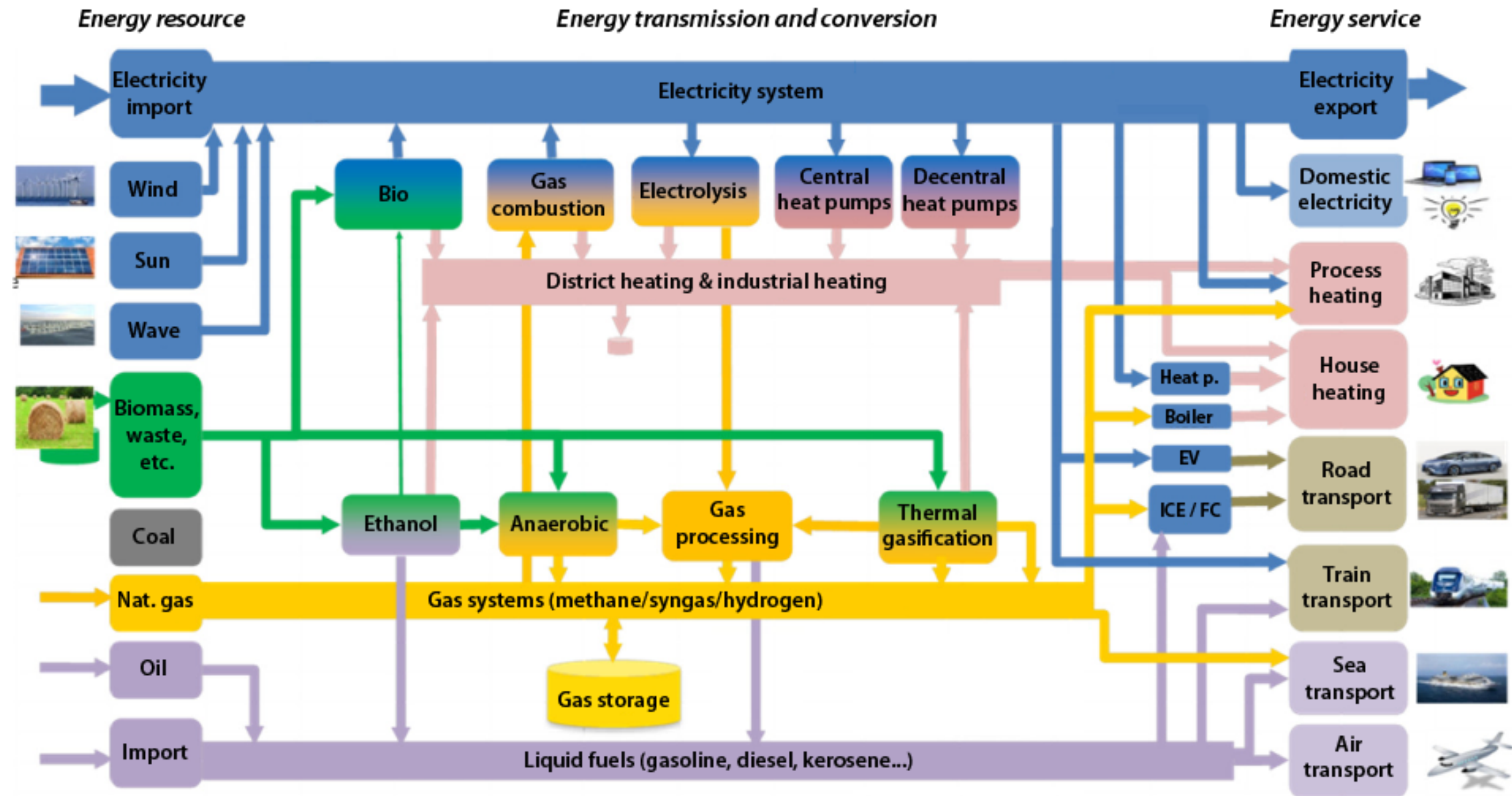
Figure from Energinet.dk

The focus of our modeling work

- *We will start by focusing on gas and liquid fuels:*

  - Production of (bio)gas from biomass and electrolysis.
  - Conversion of (bio)gas to liquid fuels.
  - Integration with other energy sectors.

- *Later, we plan to focus on heating:*

  - Heat pumps (individual and utility size).
  - District heating.
  - Integration with other energy sectors.

- *Energinet.dk focuses on the electricity system:*

  - E.g. modeling of fluctuating generation from wind.
  - They already have extensive knowledge on this.

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Modeling the gas and biofuel part of the Energy system

Optimizing the usage of biomass and electrolysis to produce gas and liquid fuels
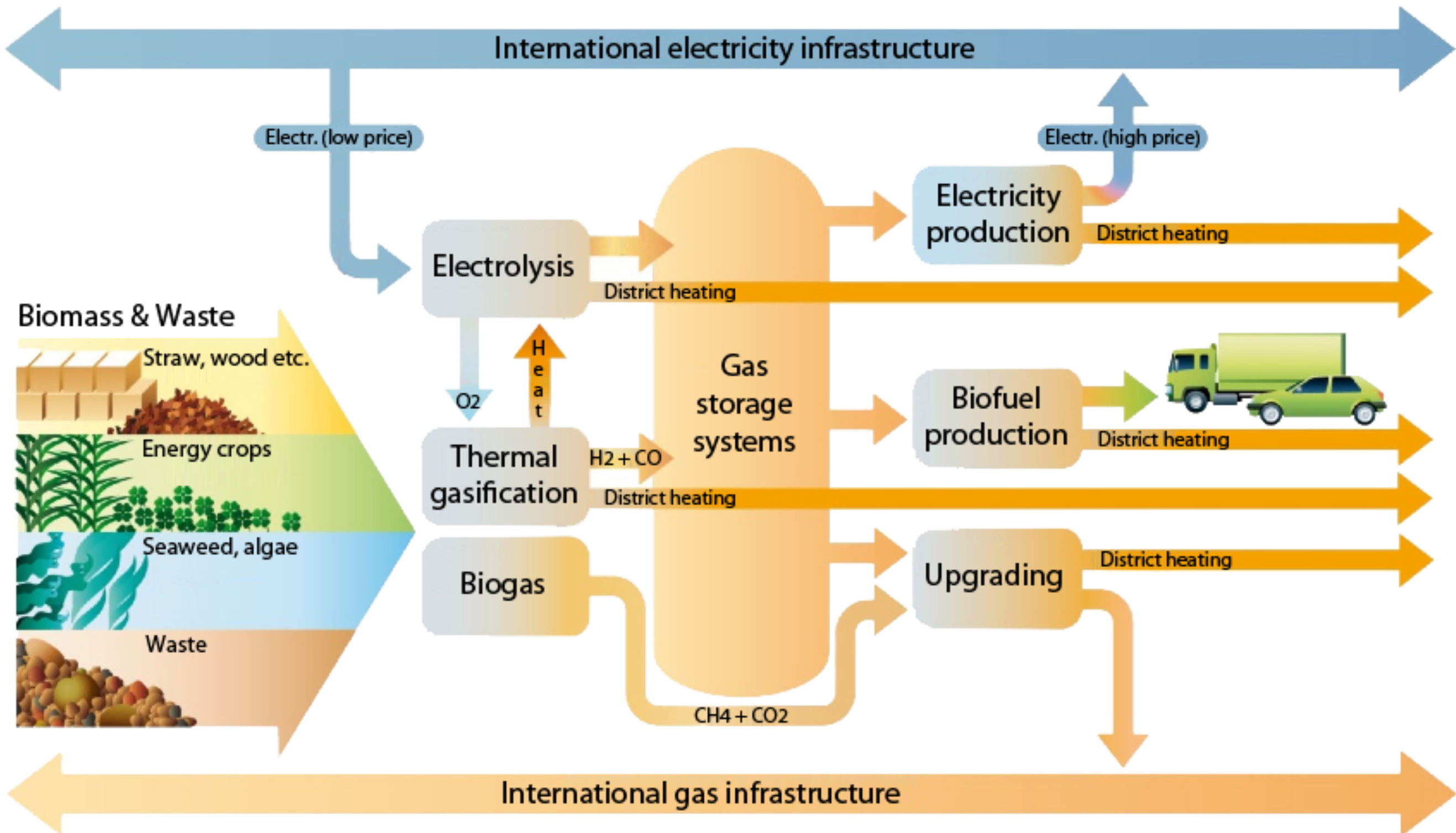
An example of parameters and outputs in a simple model

Parameters:

- *Biomass & waste*
    - Availability
    - Price
- *Conversion*
    - Conversion techniques
    - Conversion efficiency
    - Conversion cost
- *Demand*
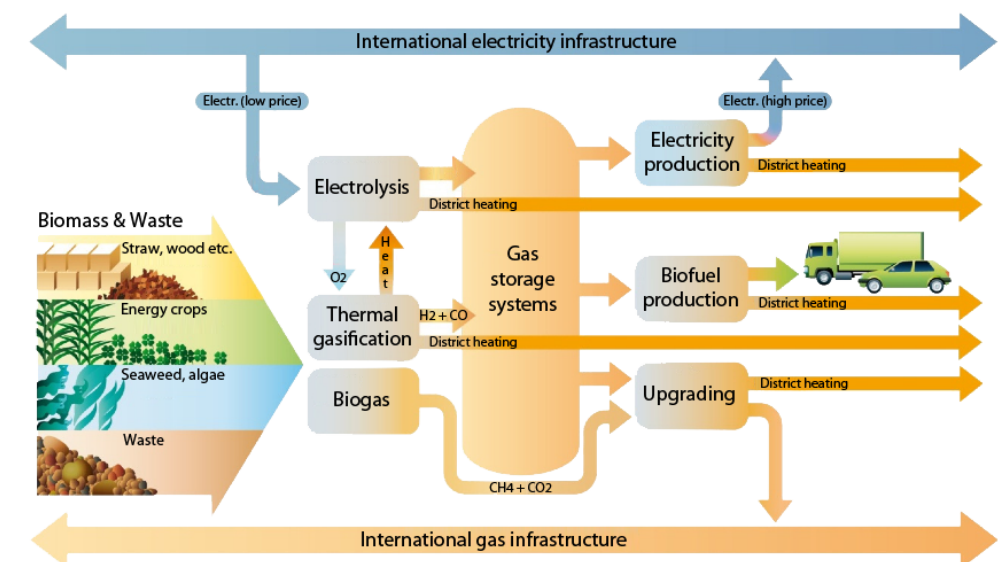   - Gas and liquid fuel demand

The goal is to predict and optimize the future energy system, e.g. in 2035 or 2050.

Such a model therefore requires projections of future prices, technologies and demand.

Optimization

Outputs:

- Biogas/biofuel cost
- Required conversion capacity
- System cost
- System efficiency

Summary

- WP2 focuses on the production, transmission, storage and conversion of energy.

- We will start by modeling the production of gas and liquid fuels using biomass and electrolysis.

- We are collaborating with Energinet.dk, who models the electricity system.
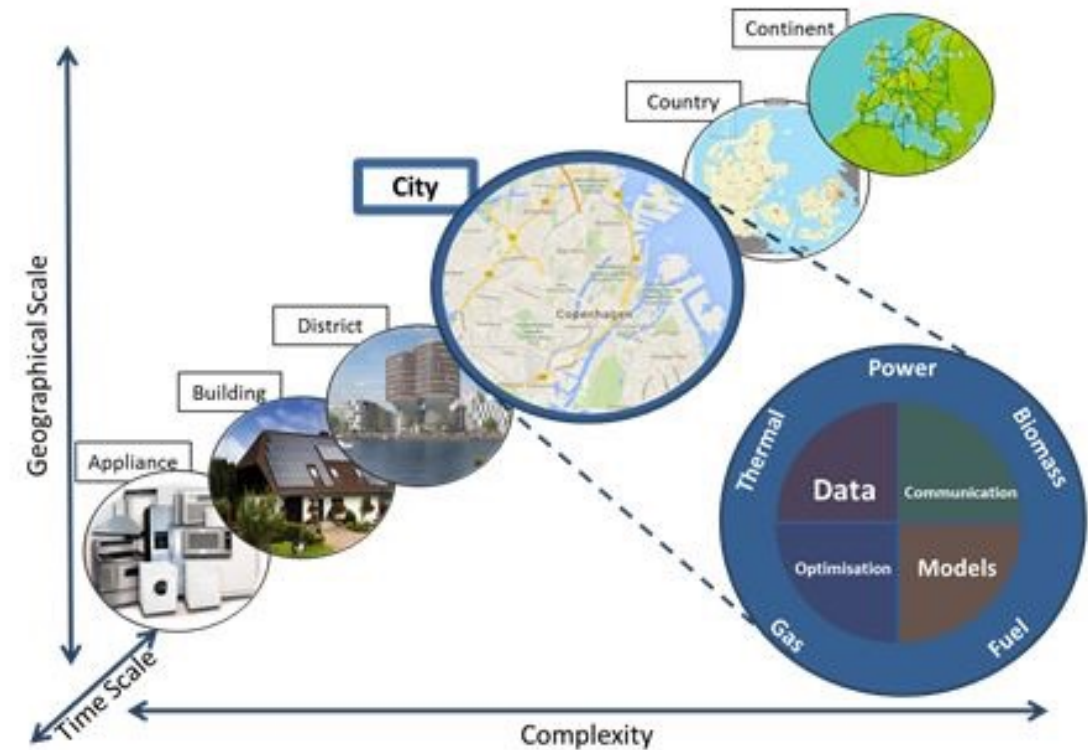
Next steps

- To gather more data on the relevant energy technologies.

- To use this data in optimization models for production and conversion in the energy system.

- To test such a model on a "model city".

Thanks for your attention!

Questions?

$$f(x+\Delta x)=\sum_{i=0}^{\infty}\frac{(\Delta x)^i}{i!}f^{(i)}(x)$$

Δ $\int_a^b$ ε Θ $\sqrt{17}$ $\int$ δ $e^{i\pi}$ Ω $+$ ∞ $\{2.7182818284$ χ^2 $\sum$ $!$

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