

Student Opportunities

Master Theses

Modelon offers master theses projects on selected subjects in physical systems modeling and cloud software development.

If you are interested in any of the topics listed below, please apply at: modelon.com/company/careers

- **Simulation & optimization of industry applications**
- **Thermo-fluid, chemical, electrical, & mechanical systems**
- **Machine learning & Artificial intelligence**
- **Cloud software & Web-native technologies**

The thesis proposals listed on the following slides are examples, if you have other ideas that you think would fit, please reach out to us.



AI/ML methods for models and model training

Explore, select & implement

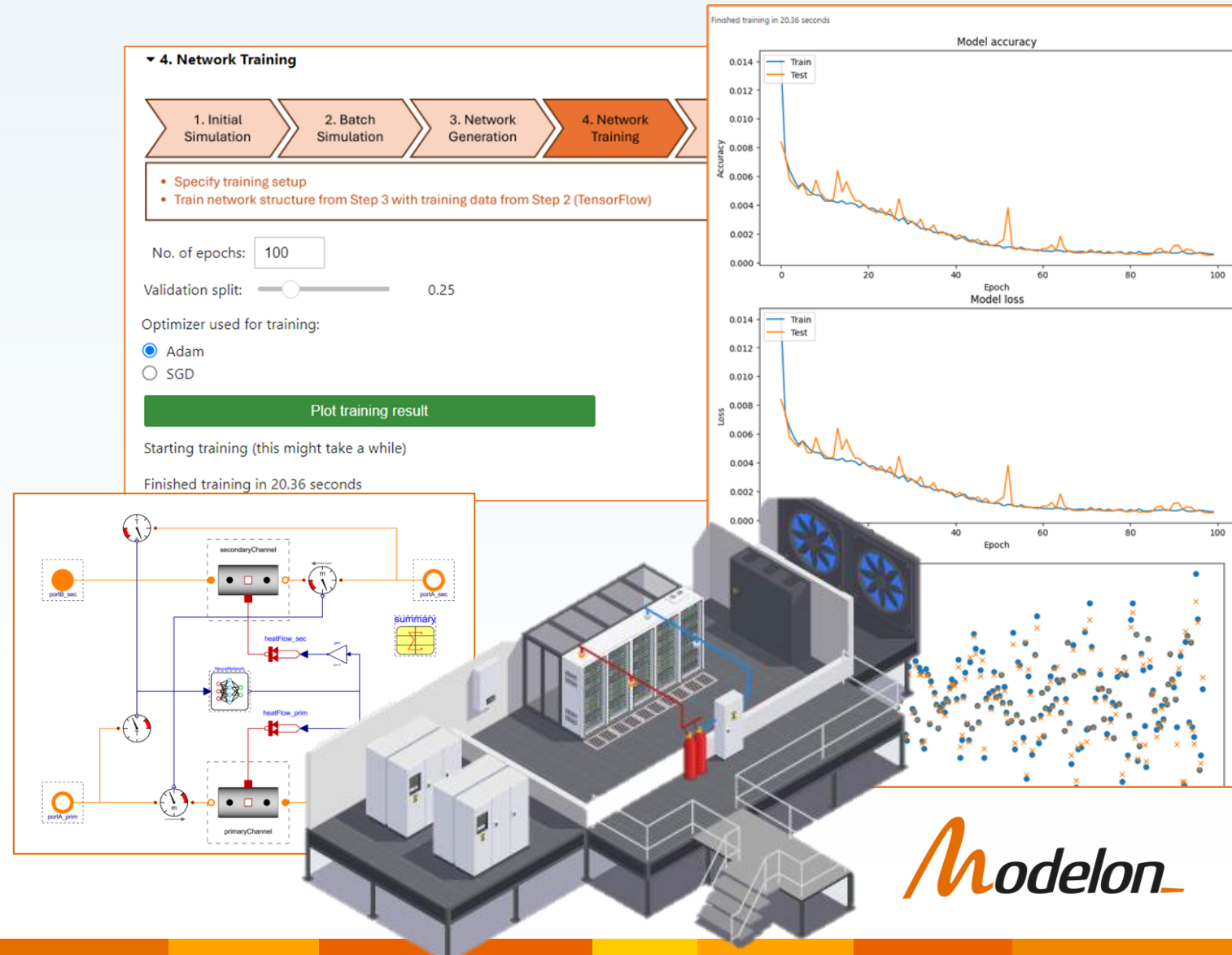
- Neural ODE, PINN, etc.

Evaluate for

- Predictability
- Accuracy
- Performance

Deploy on industry applications

- Data center cooling
- Heat pumps



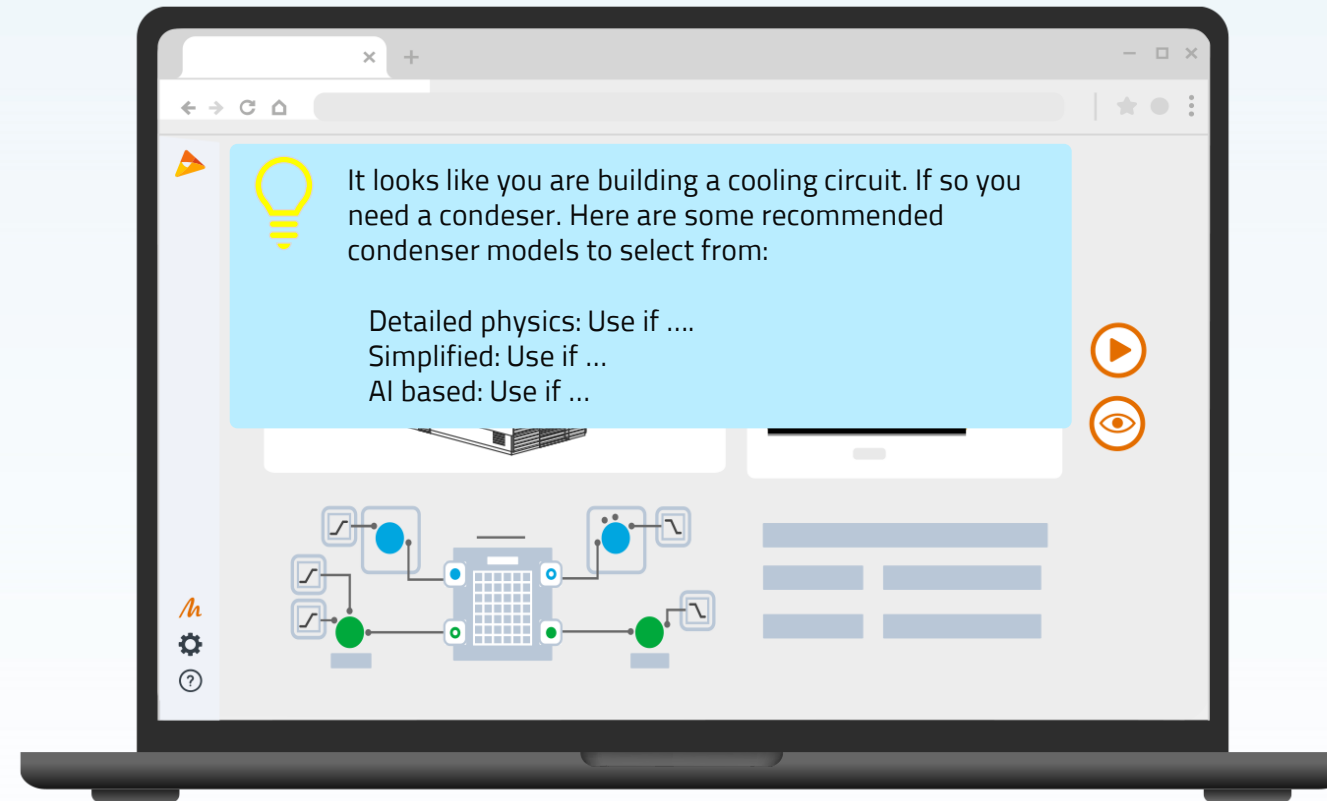
AI Companion – Model Build

Key use cases:

- Suggesting components
- Identifying missing user input

Main steps:

1. Identify possible algorithms
2. Select & Implement
3. Train and evaluate on Modelon library portfolio
4. Integration with Modelon Impact



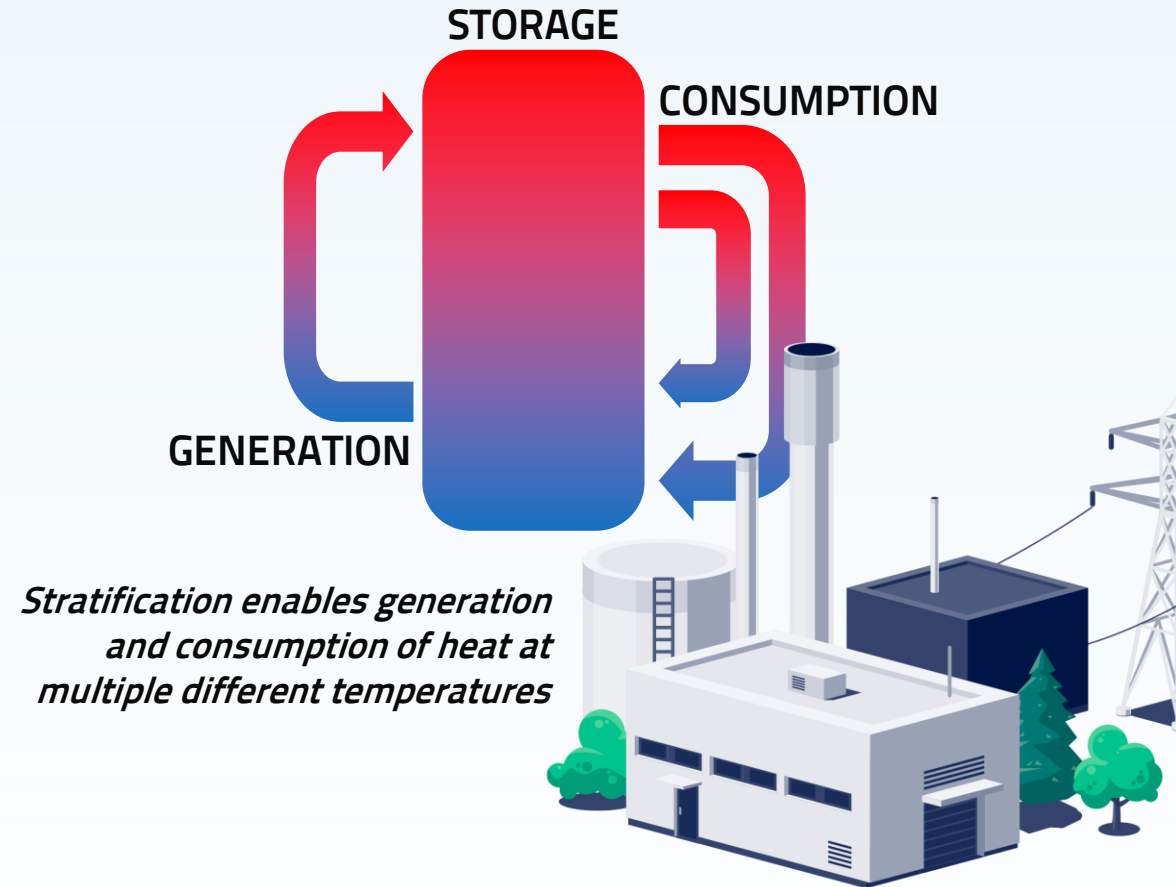
Stratified thermal energy storage

What

- Energy storage is a key challenge for the shift to renewable electricity
- Thermal storage helps to balance supply and demand
- A stratified hot water tank is a key enabler to electrify heat generation

Main tasks

1. Investigate modelling approaches
2. Build a component model using Modelica
3. Show energy saving potential in a case study



Battery model calibration app

A semi-automated workflow for parametrizing and validating a battery cell model from lab data



Modelon Impact

Battery model calibration app

Mock-up

Nominal (static)

Rate: C (2.75 A)
Temperature: degC
Charge: 2.75 Ah
Energy: 9.9 Wh
Voltage: 3.6 V

Limits

Max voltage: V
Min voltage: V

Maximum (pulse)

Duration: s
Max temp: degC
SoC (dch/ch): / %
Discharge: 10 A / 25 W
Charge: 10 A / 25 W

Model fidelity

Impedance time constants:

SOC invariant

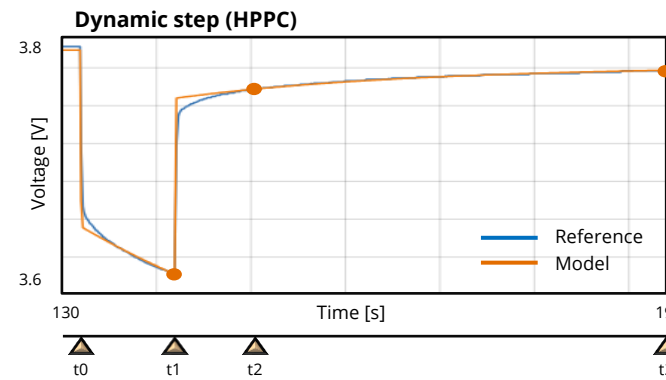
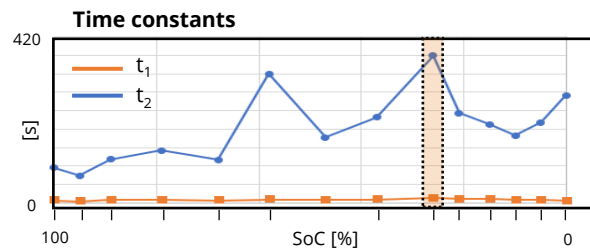
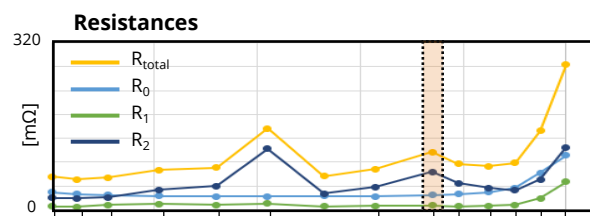
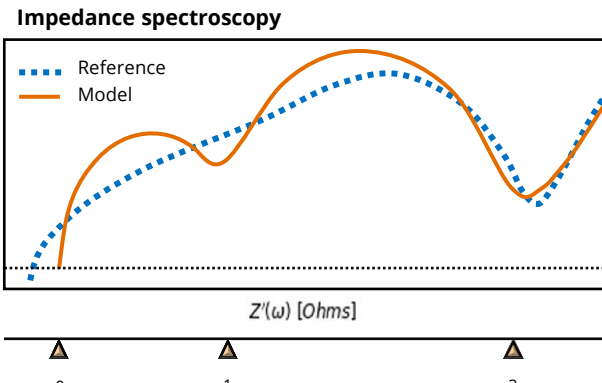
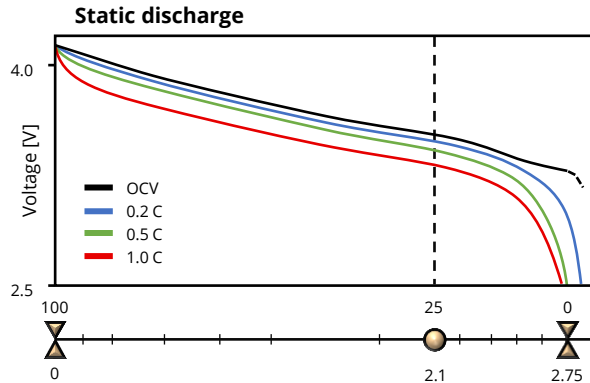
Temperature invariant

...

Upload reference data

Generate model

Save parameter file



References

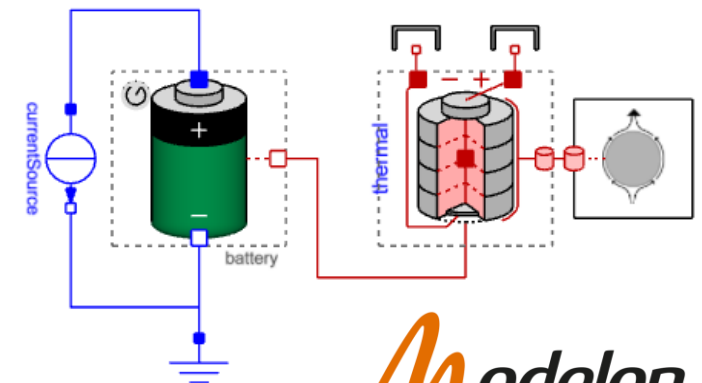
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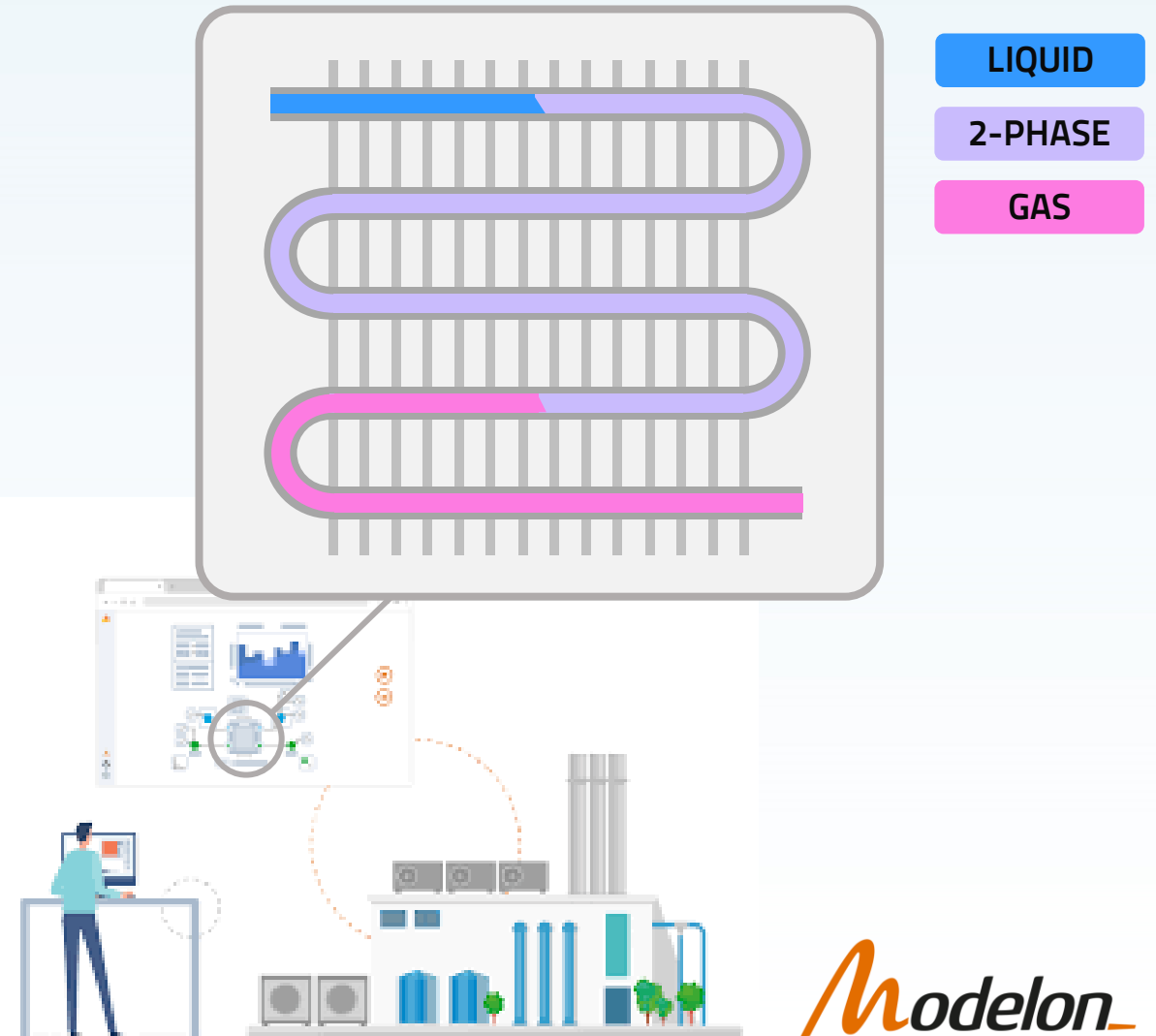
Moving boundary model of a heat exchanger

What

- Heat exchangers are key components in any thermal energy system
- Their design have huge impact on the over-all system efficiency and the ability to reduce energy consumption
- Moving boundary is a technique to combine high accuracy with low computational effort to enable better system level performance predictions early in the design process

Main tasks

1. Learn the moving boundary approach
2. Build a component model using Modelica
3. Show accuracy and computational speed in a case study



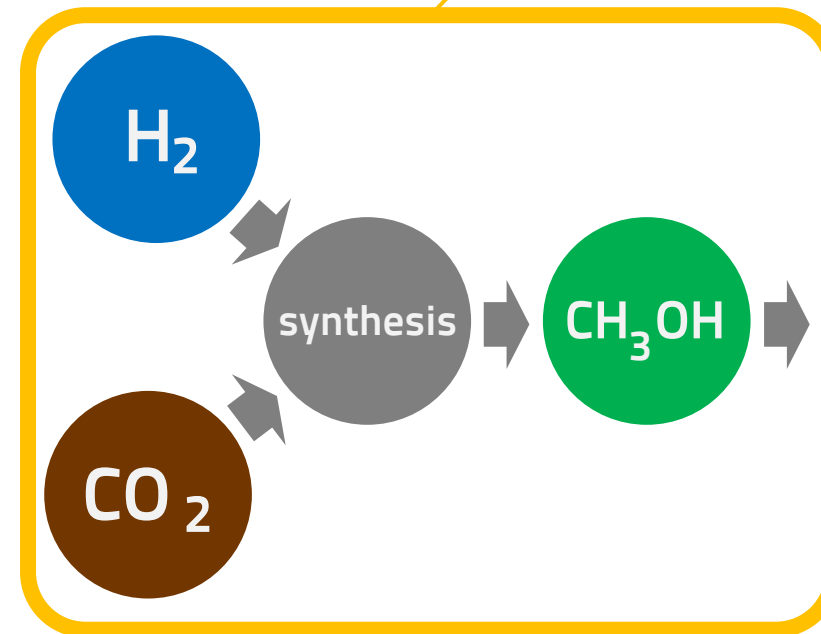
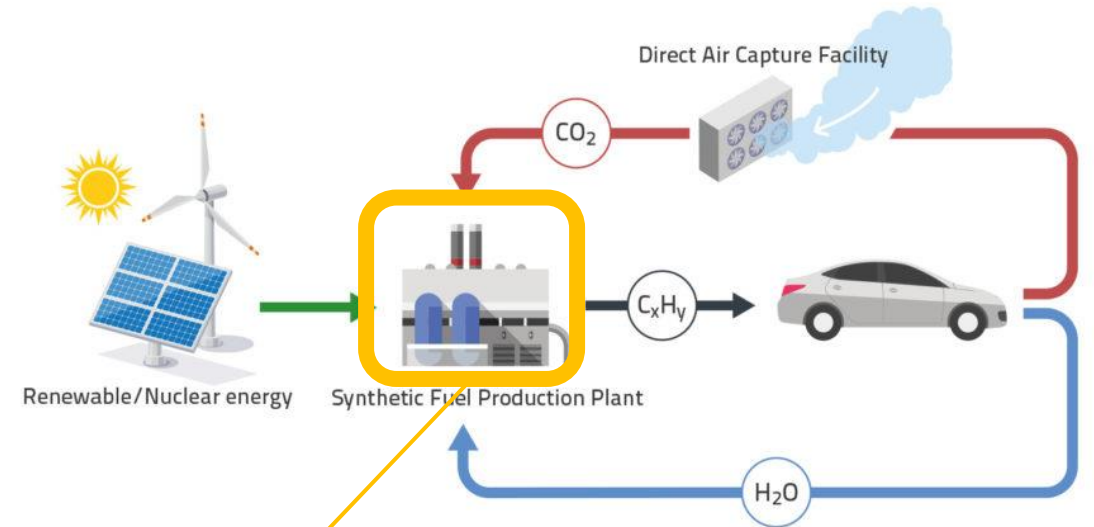
Green fuel production

What

- Synthesizing hydrogen and carbon-dioxide into methanol is a key step to produce green fuels.

Main tasks

1. Implement synthesis of H₂ and CO₂ into CH₃OH in Modelica
2. Integrate with existing models for carbon capture and hydrogen generation
3. Case study to evaluate electricity-to-fuel efficiency
4. Expand the process to further fuels, e.g. SAF, gasoline





Modelon Impact

Meet Modelon Impact – a cloud platform for virtually designing, simulating, and analyzing industrial systems.