

# The Flexigas Simulator

F L E X I G A S

## A decision support system for biogas chains

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Watch the movie!

### Background

- Co-digestion of biomass into biogas is important for future renewable energy mix.
- The optimal design, planning and use of a biogas production chain is very challenging:
  - What is the biomass availability in quantity, quality and location?
  - What is the energy demand in energy type, quantity and location?
  - What is the needed machinery and infrastructure to connect them?

### What do we offer?

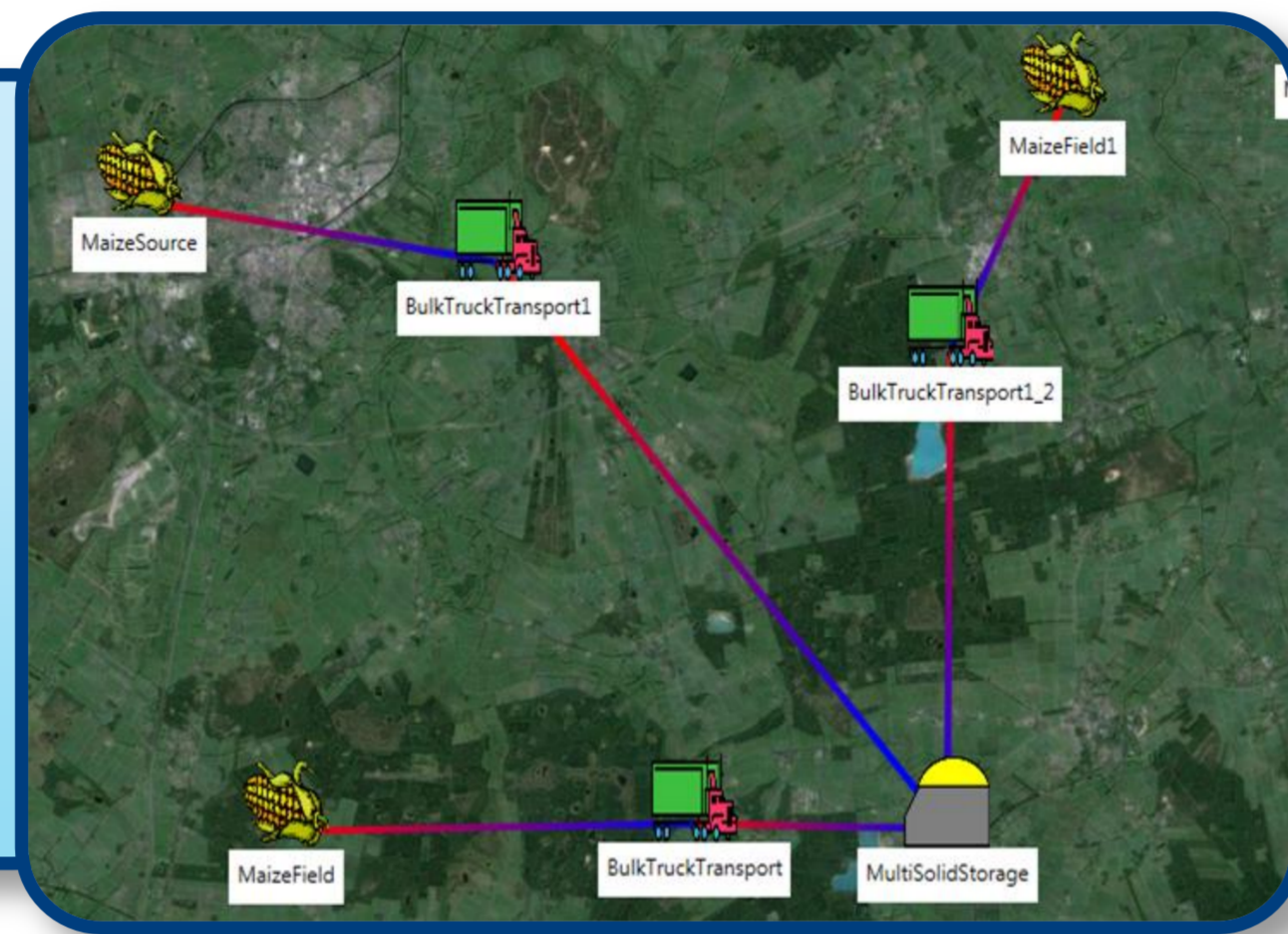
#### The Flexigas Simulator

- **Interactive** system with a **multi-touch** interface which facilitates the **decision making process** of various **stakeholders**.
- It uses a **geographical map interface** to visualize the locations of the concerned components
- Illustrates the **results graphically**, while keeping the underlying computations transparent to the users.
- It offers an **effective** and **efficient** way of running multiple **what-if scenarios** in order to optimize the processing chain.
- More ...

## Usage examples of the Flexigas Simulator

### Build your biogas chain

- ❖ Build a digester: Is it profitable? What is its **best location**?
- ❖ Burn biogas in CHP or upgrade it to natural gas quality: what is better?
- ❖ Is the **chain** as a whole **profitable**? Build the biogas chain yourself with our software, answer your questions and **try out alternatives!**



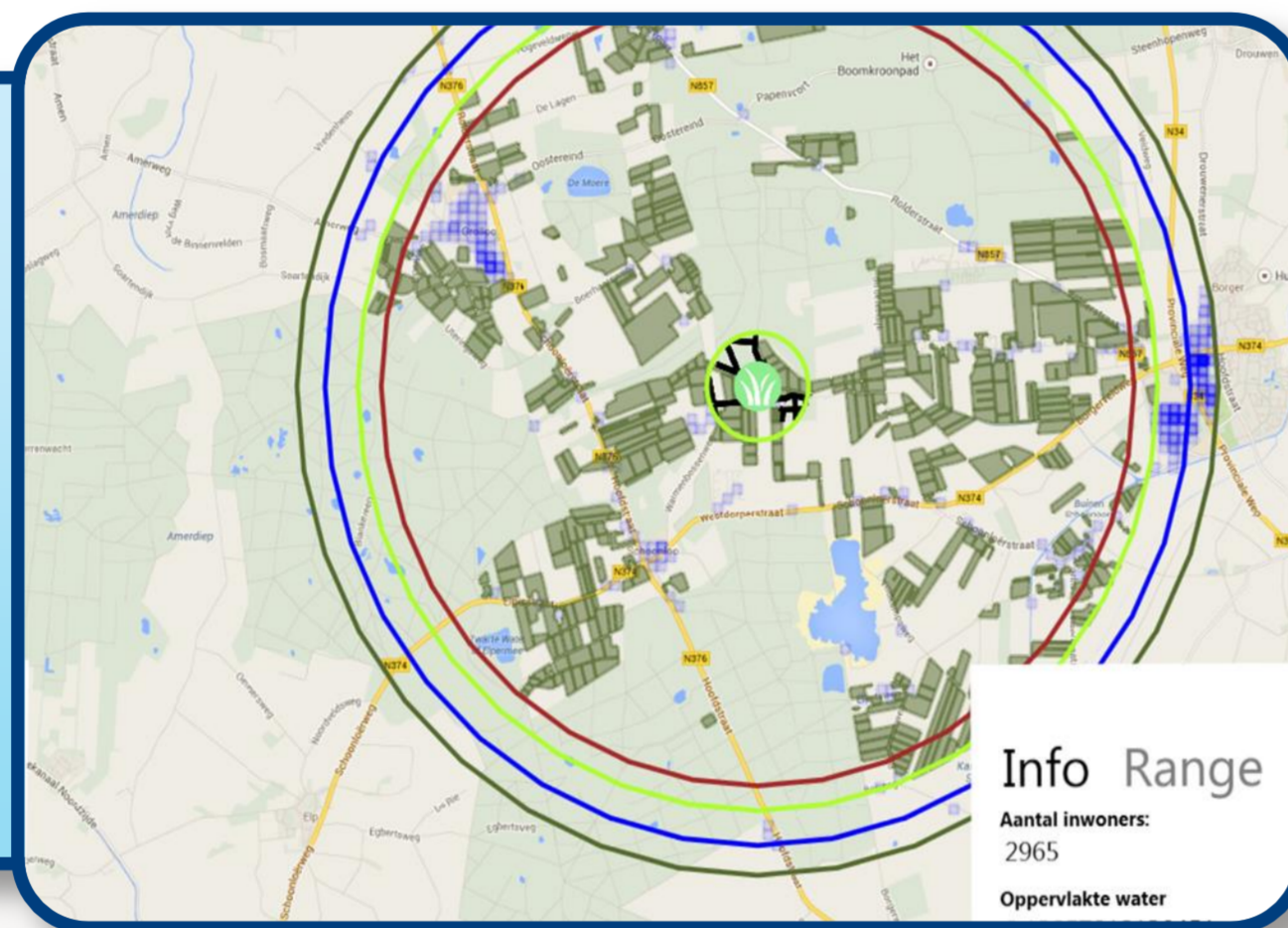
### Collaborate with stakeholders

- ❖ The user interface can be used on multi-touchscreen, **allowing** a group of people to **design** the biogas chain **together**.
- ❖ The user interface is **easy** to understand, so **every stakeholder** can join the decision making process.



### Integrate external information

- ❖ What is the biomass potential in the area?
  - ❖ How much roadside grass can we collect?
  - ❖ Is there demand for heat in the area?
  - ❖ How many people live in the area?
- By connecting the tool to existing GIS databases this **information** can be made **visible** during the design process.



### Dynamic models

- ❖ The model is **configurable**
- ❖ The model is based on Dynamic Flow Analysis and Life Cycle Analysis and it is capable of **calculating** the Energy Returned on Invested, Carbon footprint, sustainable impact and economical cost.



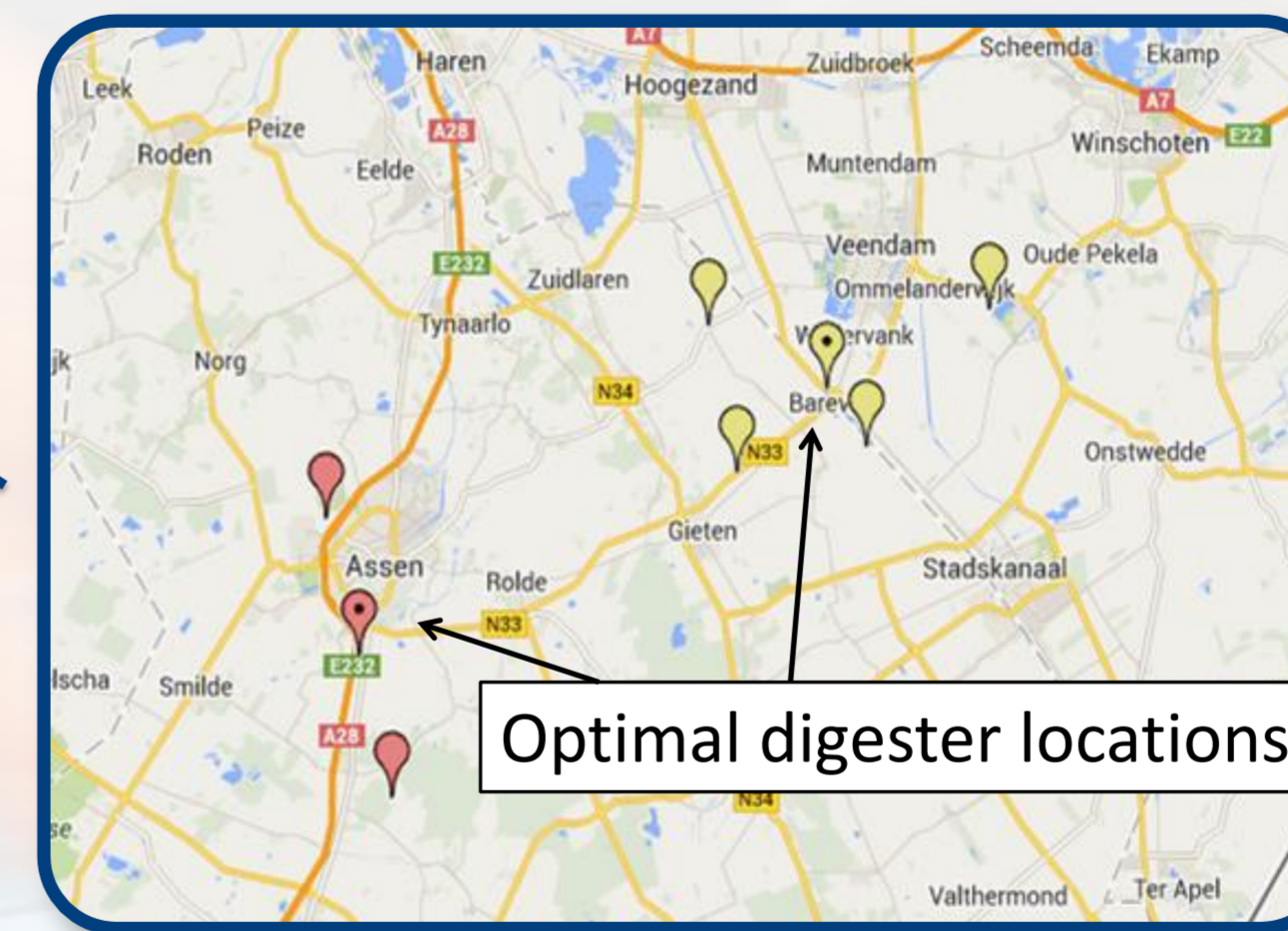
### View the results

- ❖ After simulating the biogas chain, users get a quick **overview** of the **key variables**.
- ❖ Using the touchscreen, they can easily visualize **any variable** in the model.
- ❖ All values can be **downloaded** as a CSV file for further analysis.



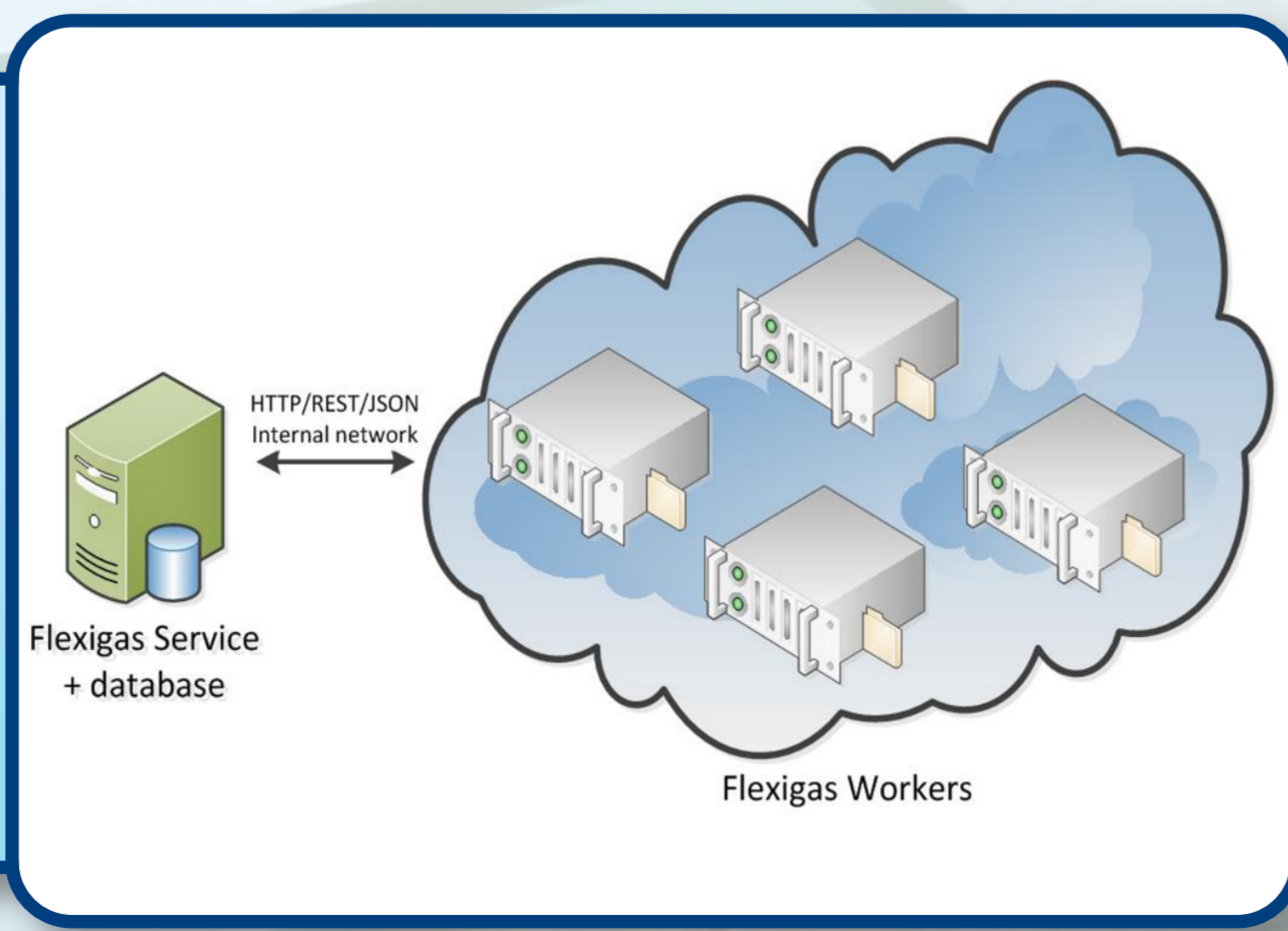
### Chain optimization tools

- ❖ Transport of biomass is both **expensive** and energy consuming
- ❖ What is the **best place** to build a digester?
- ❖ Is it better to build one big digester or several smaller ones?
- ❖ What is the **optimal size** for digester?



### Fast parallel execution

- Detailed models for a large biogas chain can get quite complex.
- ❖ Trying out the different alternatives in parallel is an easy **highly interactive process** for users.
  - ❖ Users **immediately** know the **impact** of their choices and can choose the best solution quickly.



### Upload your own models

- Everything we know about bio gas is written down in **Modelica** models.
- ❖ Modelica is a language for describing the models.
  - ❖ Users can **modify** the models or **create new** ones and upload them.
  - ❖ Any value chain can be simulated and optimized using the tool, if you make a model for it.

```

end SubstrateSource;

model Stable
parameter Integer numberOfCows;
SubstrateConnector out1;
CostConnector costs;
equation
out1.substrate.organicDryMass = 0.07;
out1.substrate.gasPotential = 300;
out1.substrate.methanePotential = 180;
out1.substrate.nContent = 0.00532;
out1.substrate.pContent = 0.0017;
out1.substrate.kContent = 0.00713;
out1.rate = numberOfCows * 18.12 / 8750;
costs.financial = out1.rate * 1.84; // TODO: verify v
costs.energy = out1.rate * 18.21 / 3.6;
out1.rate = 0.87;
end Stable;
end Substrate;
    
```

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