# Bio-Natural Gas Plant Emmertsbühl

## Feeding biogas into the natural gas grid

Emmertsbühl, 27th April 2012

Bio-Natural Gas Plant Emmertsbühl
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EnBW
The Power Pioneers

# Agenda

- Political framework & climate
- Biogas and bio-natural gas
- Bio-natural gas in Germany

**Background**

- Cooperation model of EnBW
- Project Emmertsbühl
- Innovation

**Project**

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# Political framework & climate
## European and German energy policy


renewable energy by 2020:

30% electrical power

12% mobility

14% heating

# Political framework & climate
## Renewable Energy Sources Act (RESA)

RESA provides incentives for the production of electricity via renewable energies

- it obliges operators of power grids to give priority to purchasing electricity from renewable energies and to pay fixed prices for this energy
- incentives are paid for
  - solar power
  - geothermal power
  - hydro power
  - wind power
  - power from biomass and biogas

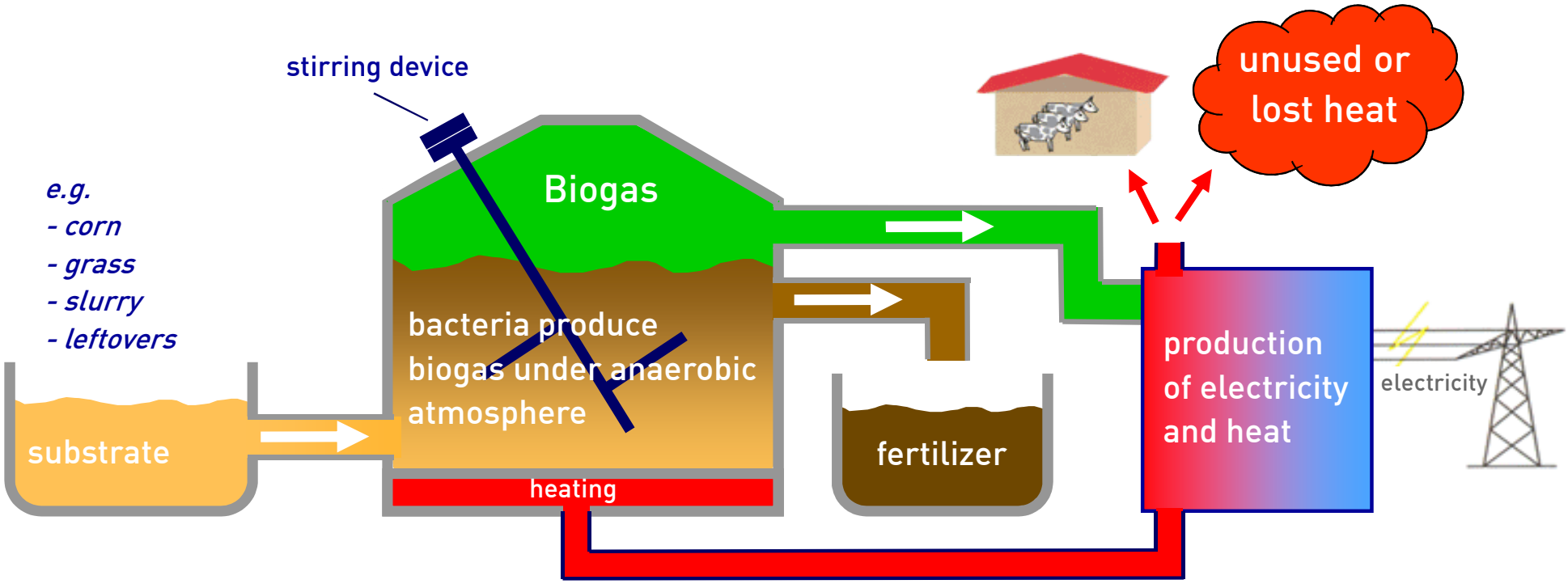
RESA made an important contribution to the development of the biogas market and renewable energies in general in Germany.

# Biogas and bio-natural gas
## conventional use of biogas

agricultural products

fermenter

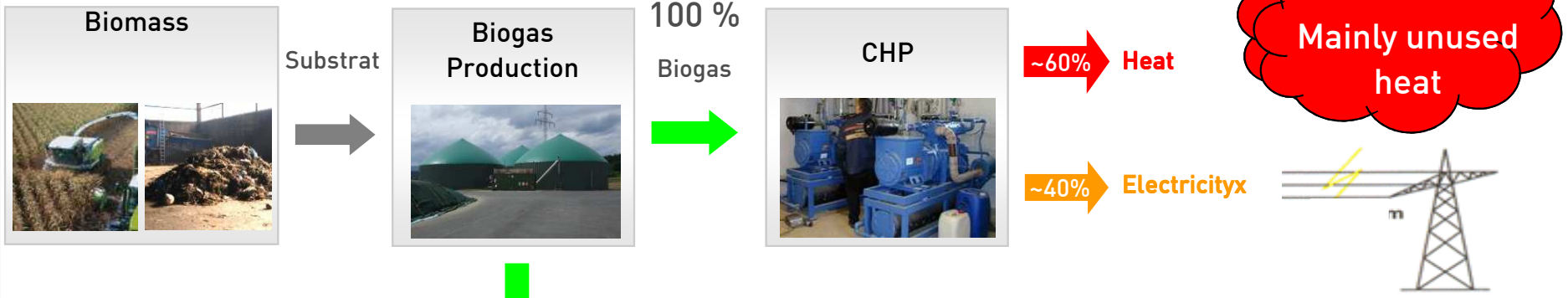
combined heat and power plant



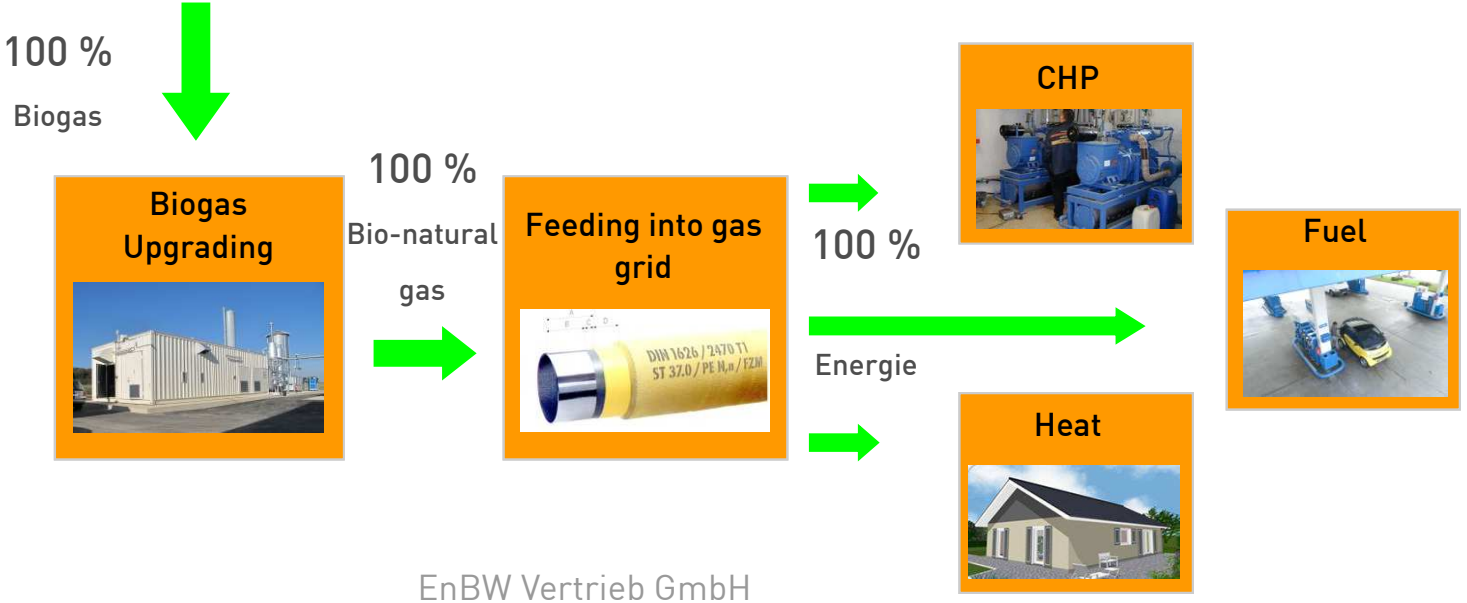
# Biogas and bio-natural gas
## processing and feeding into the gas grid

EnBW

### Model A Common: Biogas ist used to operate CHPs

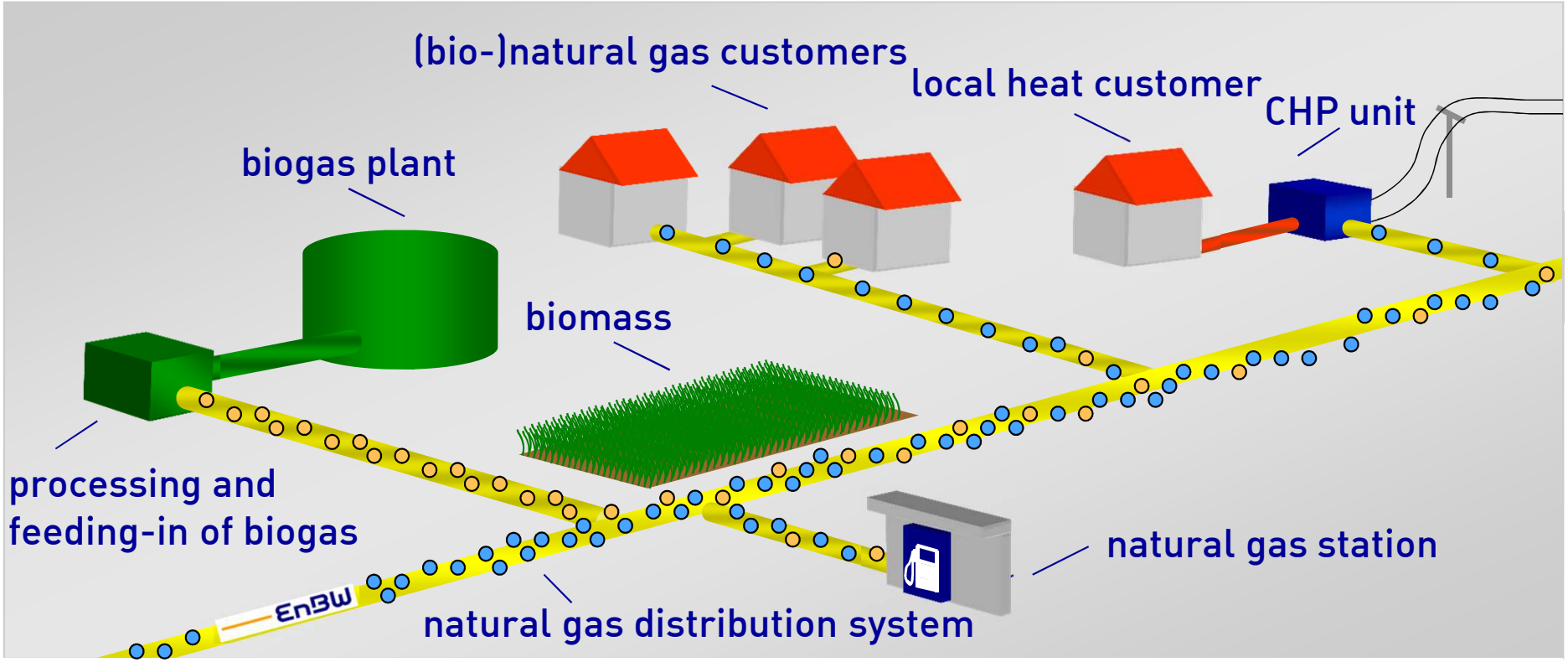



### Model B Upgrading of Biogas and feeding into the public natural gas grid



# Biogas and bio-natural gas
## processing and feeding into the gas grid

by feeding-in, bio-natural gas is physically mixed up with fossil natural gas




the supply of customers with bio-natural gas is carried out virtually (similar to renewable electricity)

# Biogas and bio-natural gas
## processing and feeding into the gas grid

**natural gas and bio-natural gas mainly differ in their methane content**

| Criteria | unit | natural gas | biogas | | bio-natural gas |
|---|---|---|---|---|---|
| Methane | Vol-% | 80 – 96 | 40 - 65 | | > 96 |
| $CO_2$ | Vol-% | < 6,0 | 55 - 25 | | < 0,5 |
| $H_2o$ | Vol-% | n. V. | 2 – 7 | processing | n. V. |
| Hydrogen sulfide | mg/Nm³ | < 5,0 | 10-30.000 | | < 5,0 |
| Calorific value ($H_{s,n}$) | kWh/Nm³ | 11,15 | 4-7,5 | | 10,85 |

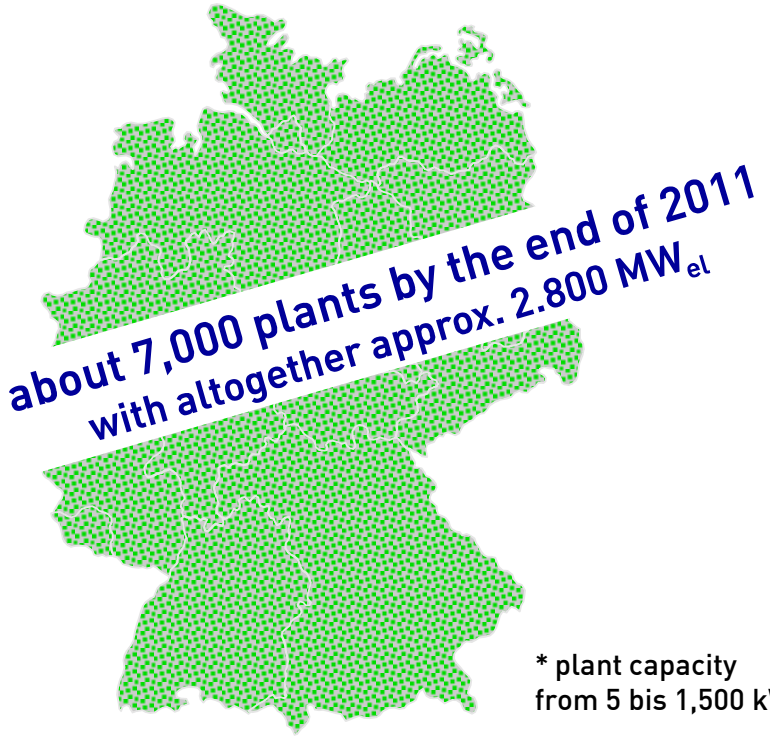
**after processing the physical and chemical characteristics of bio-natural gas correspond with those of fossil natural gas**

# Bio-natural gas in Germany
## current situation

EnBW

## A direct power generation

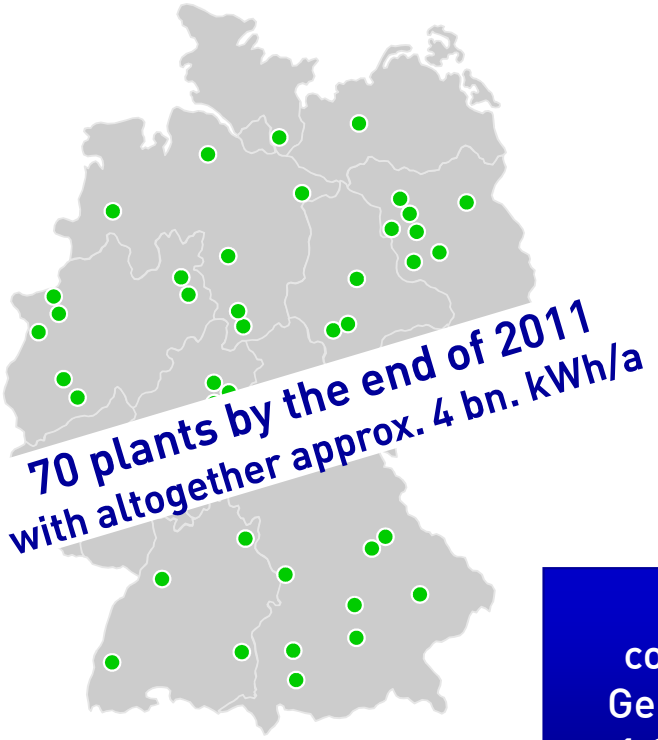
biomass → biogas → CHP → ~40% electicity + ~60% heat




* plant capacity
from 5 bis 1,500 $kW_{el}$

## B feeding into the gas grid

biomass → biogas → processing → gas grid
- CHP
- heating
- fuel




natural gas consumption in Germany approx. 1.000 bn. kWh/a

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# Cooperation model of EnBW
## hand-in-hand with regional farmers and communities

## State of Baden-Wurttemberg

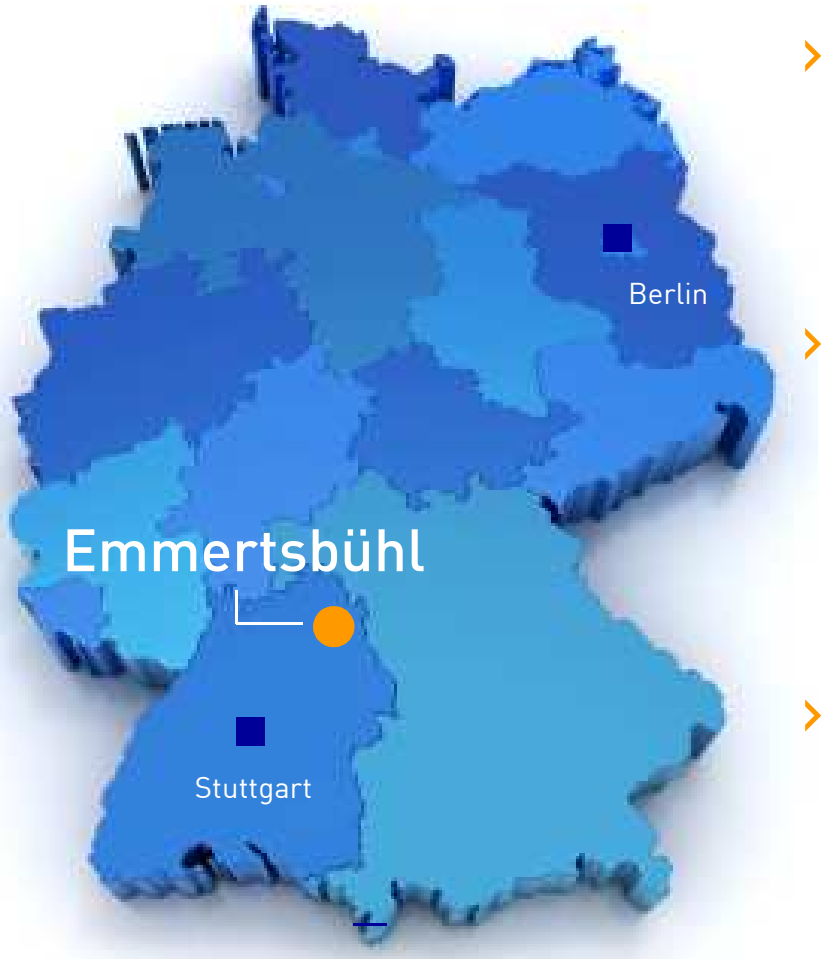
Germany

| cultivation of substrate | biogas plant | processing & feeding | transportation | marketing |
|---|---|---|---|---|
|  |  |  |  |  |

farmer ⟷ energy supplier

farmer ⟷ energy supplier

# Bio natural gas plant Emmertsbühl
## information

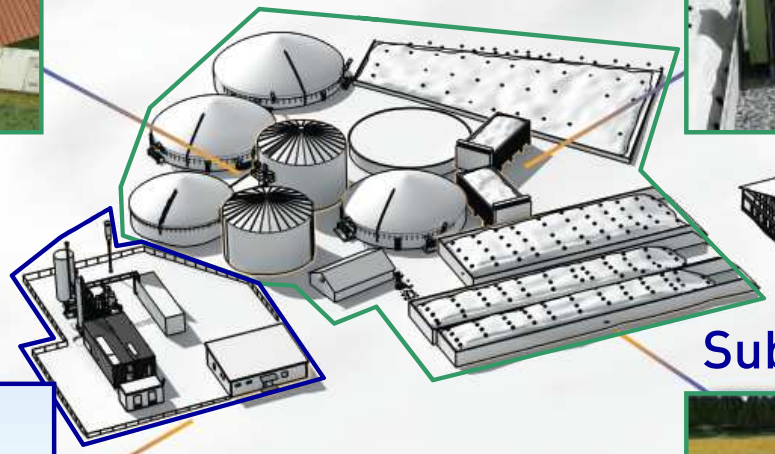



- **background**
  - biogas plant is operated by a farmer since the year 2005 (power generation in CHP´s)
- **cooperation partners**
  - farmer owns and operates biogas plant
  - EnBW operates upgrading and feeding facilities
- **biogas capacity (bio natural gas)**
  - enough to supply 1,500 private customers
  - 23,5 $GWh_{gas}/a$

# Bio-natural gas plant Emmertsbühl
## Plant at a glance

### Fermenter

### Feeding units




### Processing and feeding-in of biogas

### Substrate storage

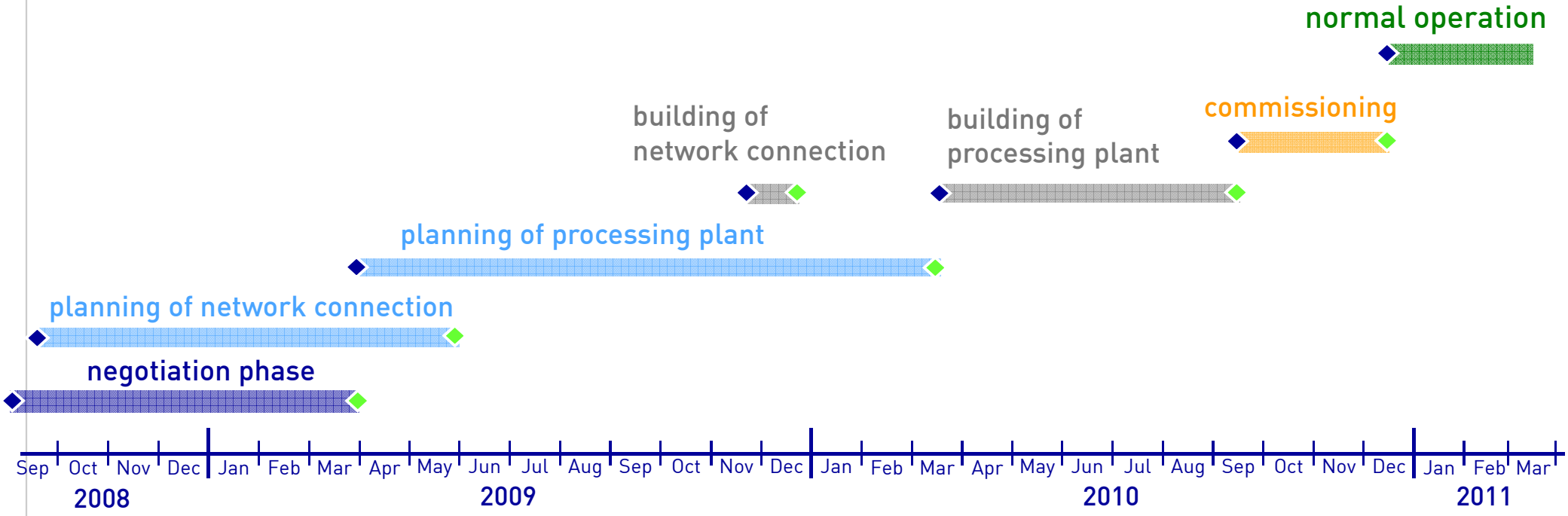
# Bio-natural gas plant Emmertsbühl
## time flow

March 2009
signing of cooperation contract

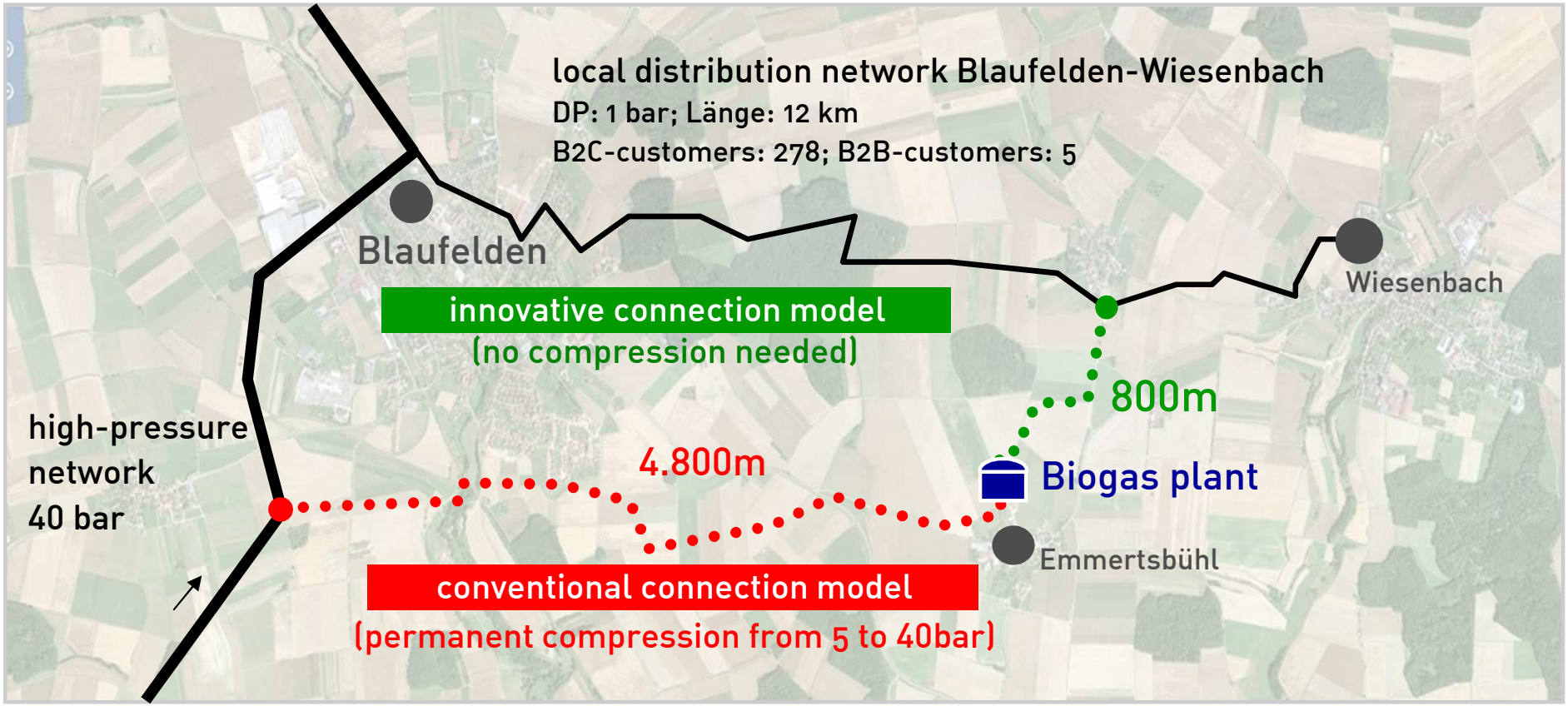
April 2009
planning of processing plant

28th April 2010
ground breaking

**26th October 2010**
**official commissioning**

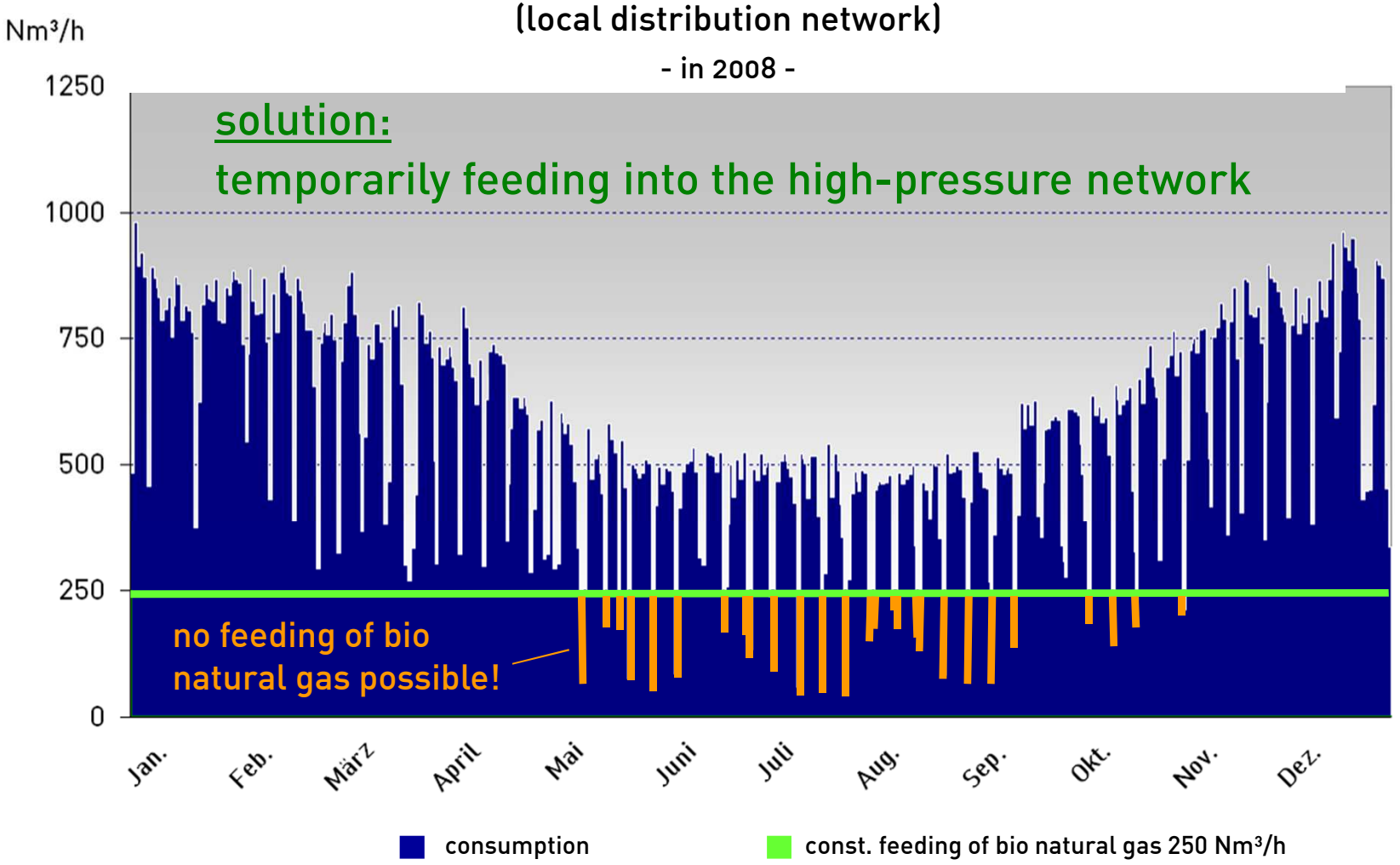


# Innovation
## network connection model



# Innovation
## fluctuating consumption of the gas grid

Consumption of natural gas in Blaufelden – Wiesenbach
(local distribution network)
- in 2008 -




distribution network
Blaufelden-Wiesenbach

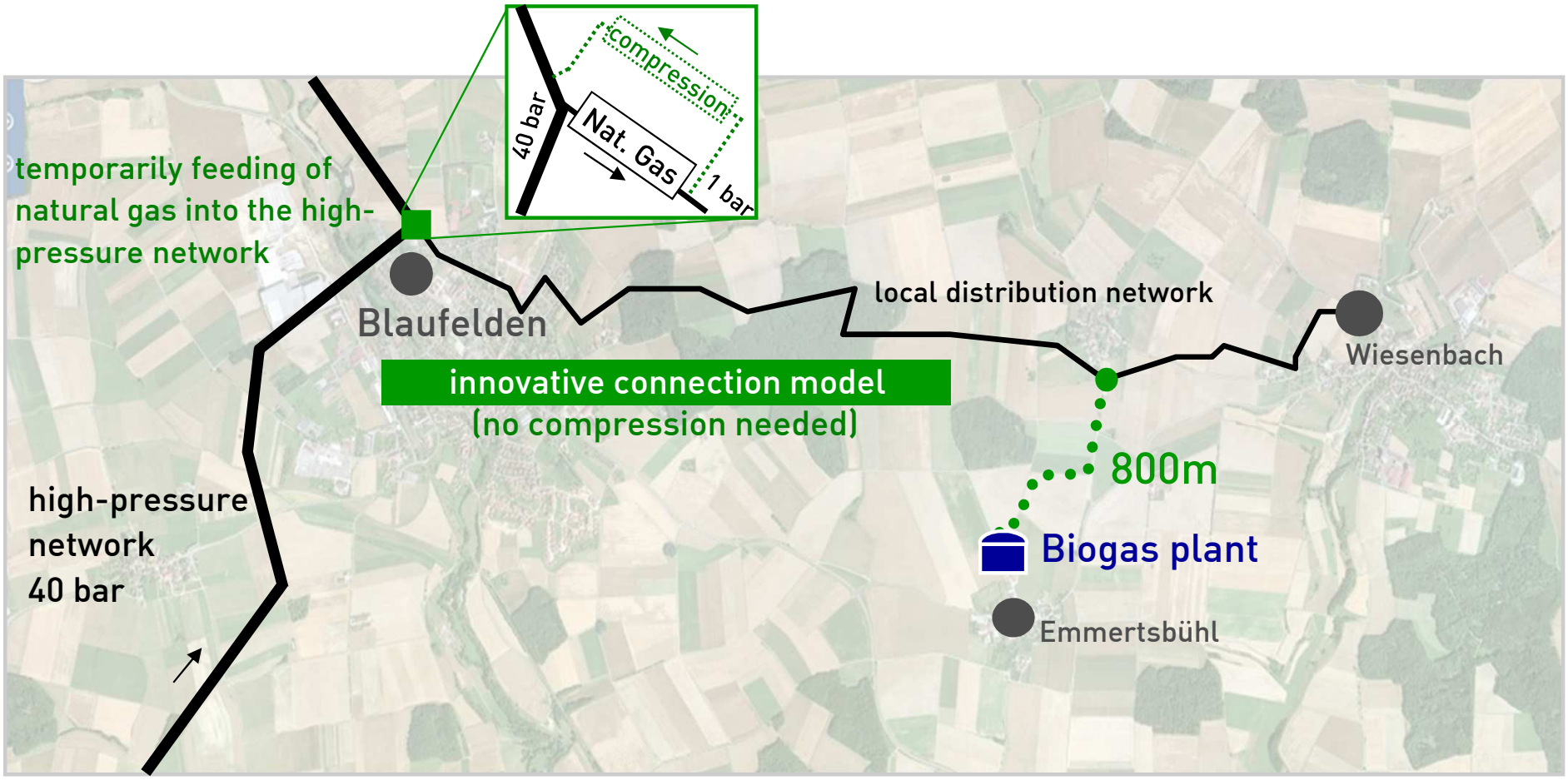
DP: 1 bar

Lenght: 12 km

private customers: 278

industrial customers: 5

# Innovation
## network connection model



# Bio natural gas plant Emmertsbühl
## solution of feeding

adaptation of calorific value with LPG

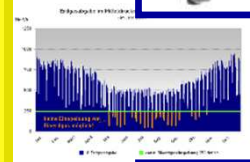

**calorific values:**

bio natural gas: max. 10,65 kWh/Nm³
natural gas: const. 11,10 kWh/Nm³

creation of a district with the same calorific value (10,65 kWh/Nm³)

high-pressure network (40 bar)

compression from 1 to 40 bar



switch-over depending on the consumption

decompression from 40 to 1 bar

adaptation of calorific value with air

*Blaufelden*

**bio** natural gas in the distribution network Blaufelden-Wiesenbach

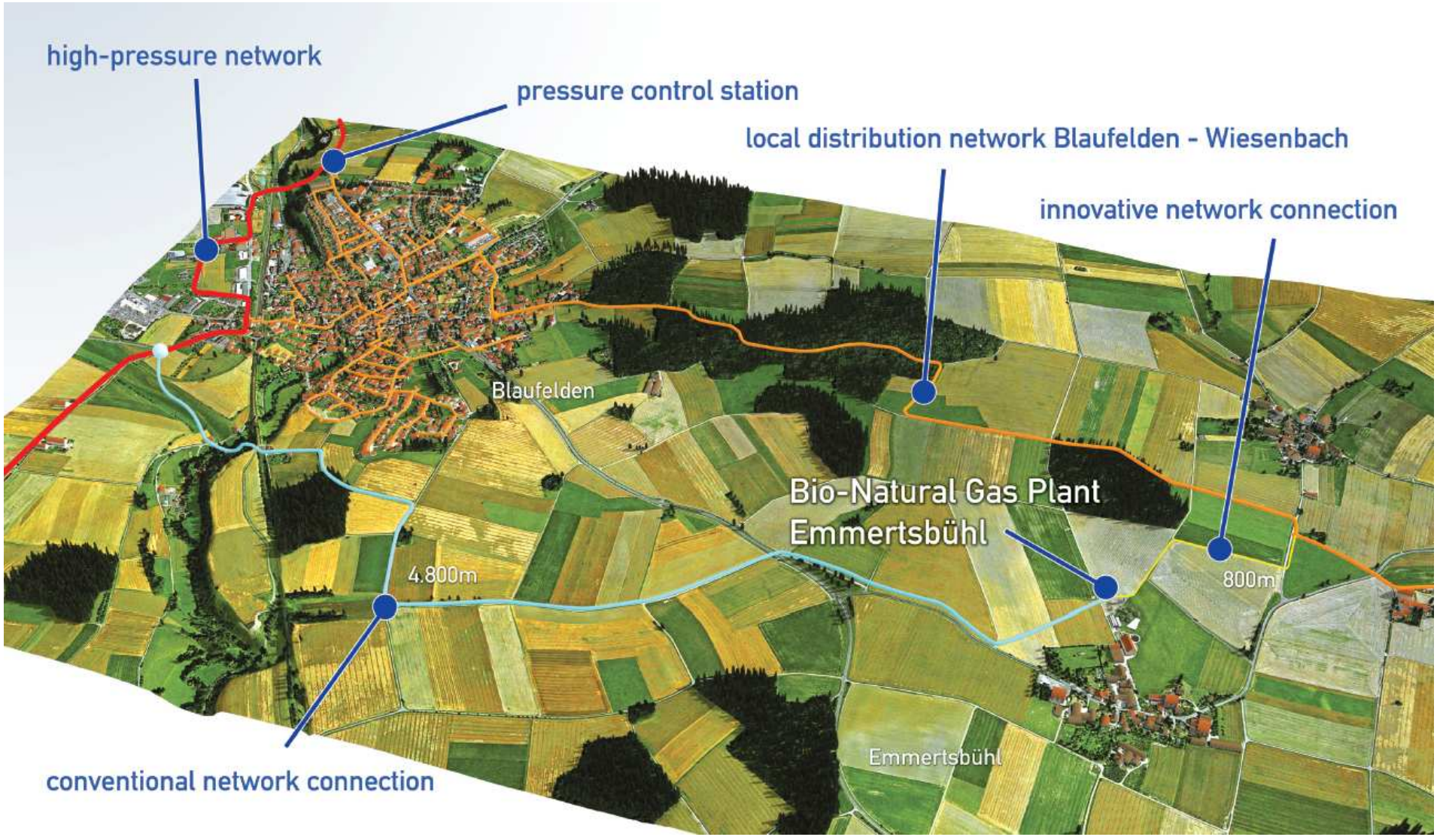
*Wiesenbach*

decompression from 5 to 1 bar

biogas processing

biogas production

# Bio-natural gas plant Emmertsbühl
## network connection



# Thank you for your attention!

## Your questions?

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