



## Smart Green Gas Grid – SG3

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# Index

- *Stedin*
- *Problem*
- *Pilot*
- *Results*
- *Conclusion*

# Stedin in numbers (2015)

## Electricity

- 2,040,205 connections
- 45,358 km electricity grid
- 20,013 GWh transported



## Gas

- 1,915,595 connections
- 23,508 km gas grid
- 4,436 million m3 transported



# Stedin

## Biomethane developments

- Amount of biomethane feed-in projects increases gradually
- Present moment four biomethane feed-in projects
- Produced 6,255,669 m<sup>3</sup>(n) in 2015



# Problem

## Changing regulation

“feed-in projects are entitled to transport capacity, to be able to feed into the gas grid up to the amount that is equal to the instantaneous gas consumption of the local network”

An DSO has to coordinate the feed-in capacity when two feed-in projects are located on one local network.



# Problem

Literature\* describes that the feed-in capacity can be regulated by two methods:

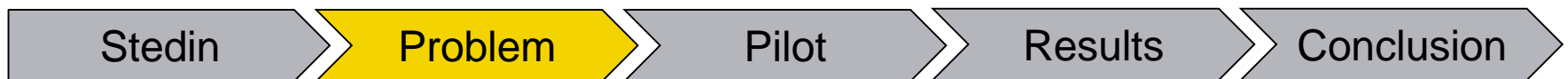
- **Last in / first out**

The first method is based on a pressure allocation in the grid. Each feed-in project is allowed to operate between a certain pressure bandwidth.

- **Allocation framework**

The second method is a flow regulated method directed by the DSO.

\* Kiwa report; GT-130004



# Pilot

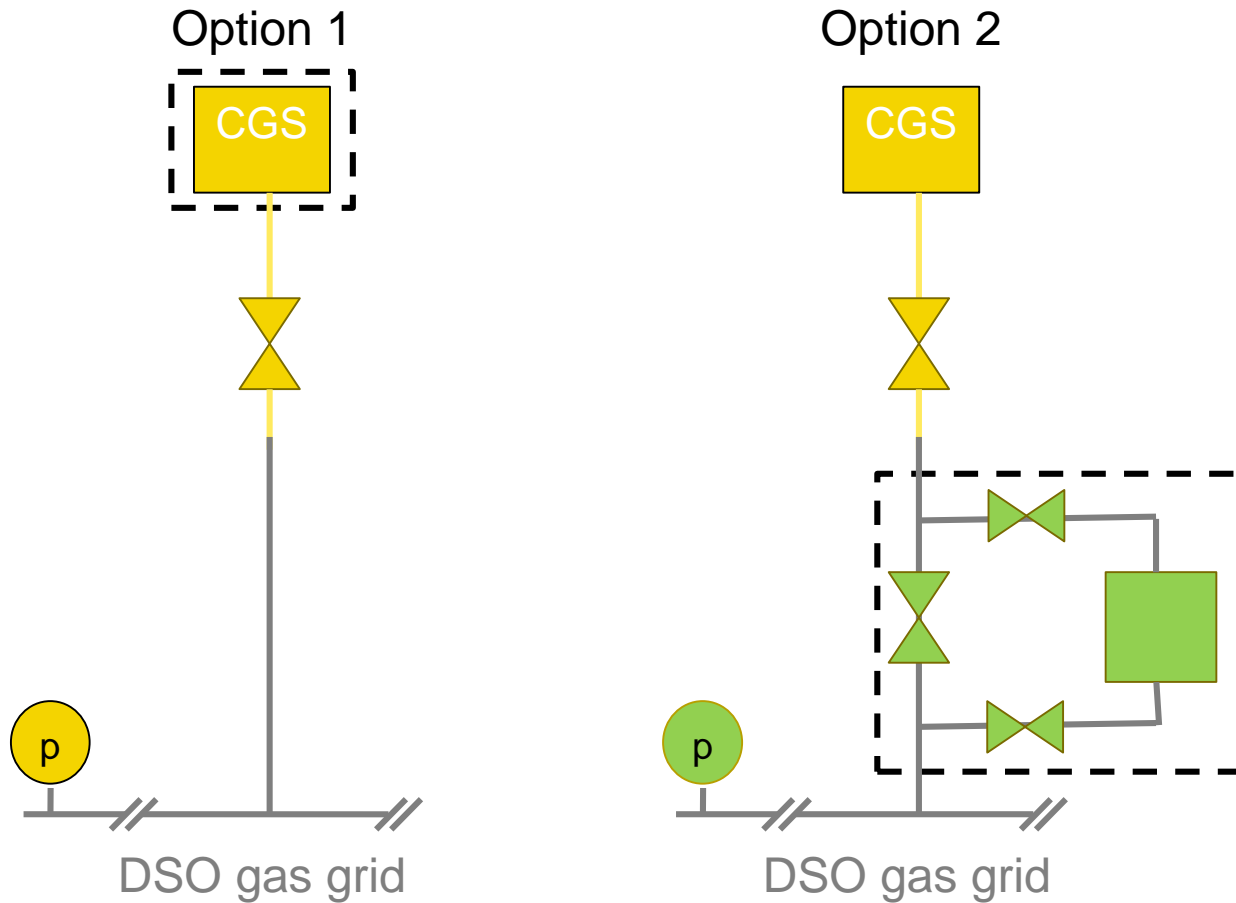
*How should a DSO coordinate the feed-in capacity with multiple feed-in projects on one local gas grid?*

## Approach

- Desk research: Simulating feed-in through constant gas flow control
- Strategy 1: Last-in-first-out (LIFO)
- Strategy 2: Limiting all feed-in projects on a flow regulating method
- Strategy 3: Pressure regulation “Biomethane facilitator”
- Strategy 4: Pressure regulation as a function of temperature

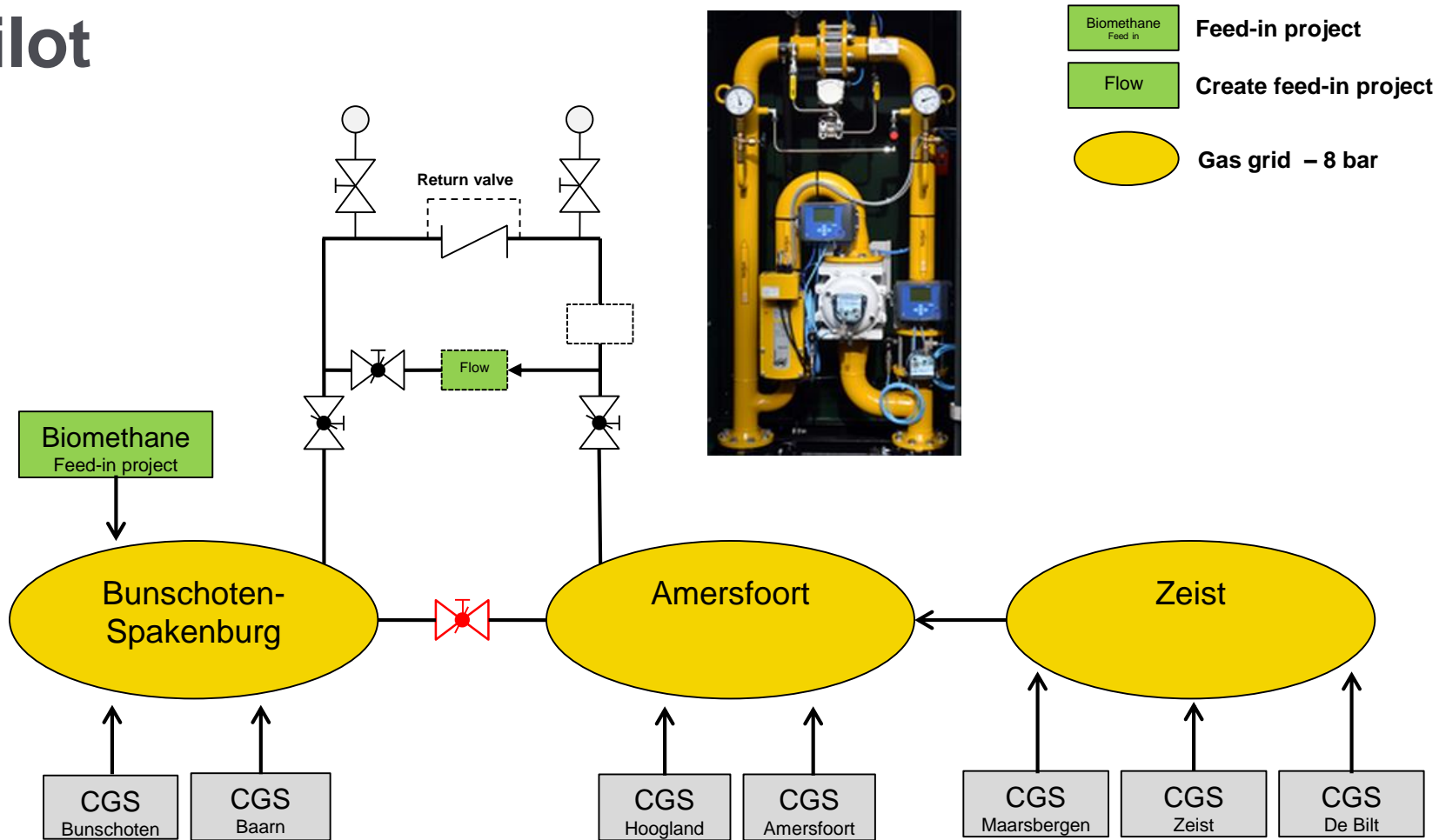


# “Biomethane facilitator”



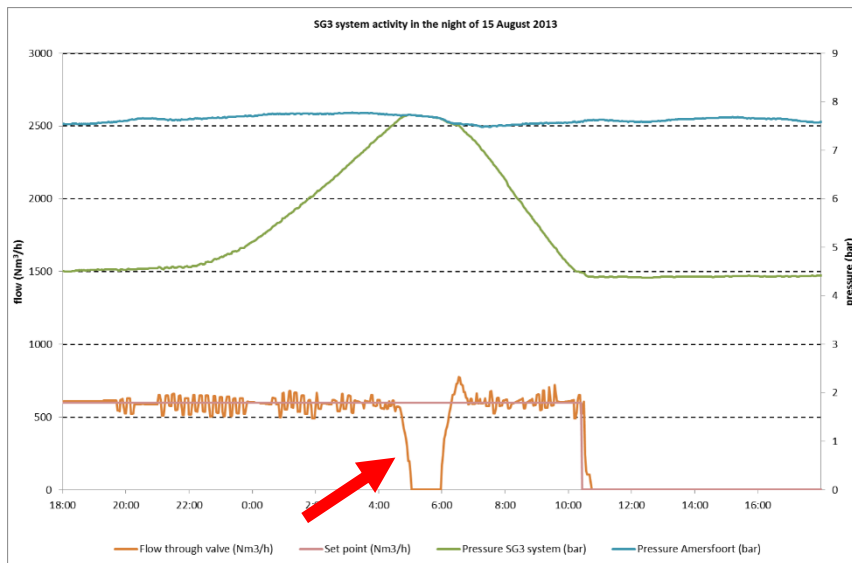


# Pilot



# Desk research

*How can it be assured that the flow of gas from the constant flow rate controller remains equal to the set point under all circumstances?*



Problem definition



Utrecht University



**Simulating local Green Gas feed-in through constant gas flow control**

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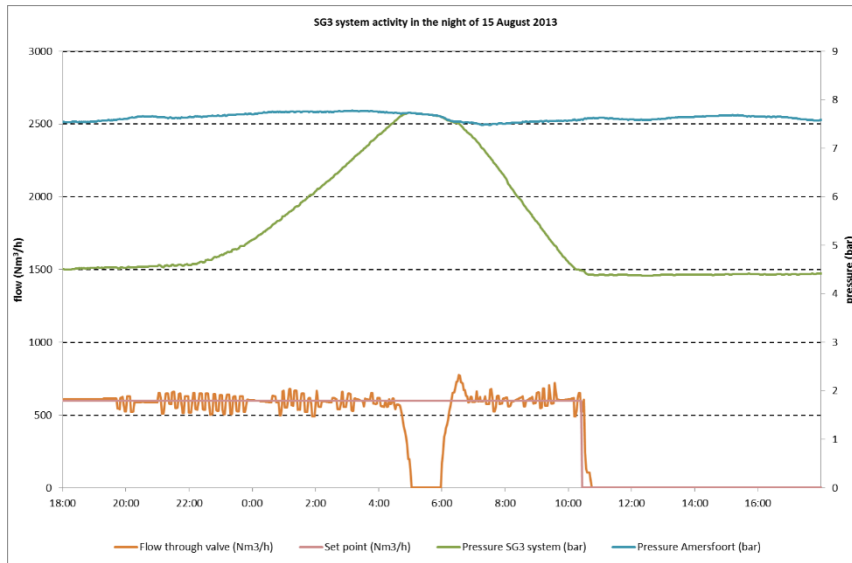
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Report

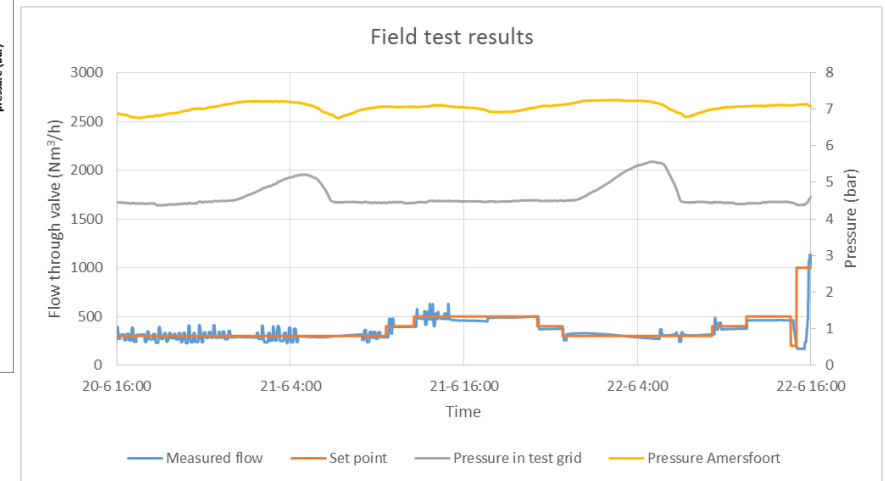


# Desk research

*How can it be assured that the flow of gas from the constant flow rate controller remains equal to the set point under all circumstances?*



Problem definition



Field results

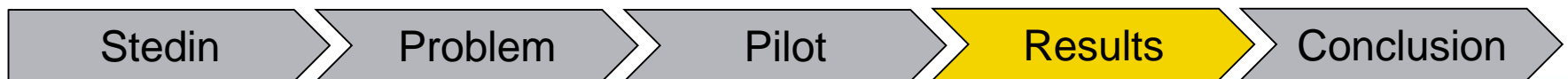


# Strategy 1

Last-in-first-out (LIFO)

## *Pilot results*

- Strategy has been tested for 11 days.
- When the pressure exceeds the predefined set point, the feed-in process is stopped. This interruption is intense for feed-in process of biomethane.
- The grid pressure oscillates during deployment of the strategy.



# Strategy 2

Limiting all feed-in projects on a flow regulating method

## *Pilot results*

- Strategy has been tested for 38 days
- With gradual pressure variations, allocation of capacity also changes gradually. This makes this strategy 2 far more practical than Strategy 1.
- A partnership (DSO and feed-in project) is needed in order for this strategy to work



# Strategy 3

Pressure regulation “Biomethane facilitator”

## Description

By applying pressure regulation to the gas grid a optimum between facilitating a buffer space (lowering system pressure) and reliability (highest pressure) can be made.

*Pilot results:*

- Strategy has been tested for 11 days
- Point of pressure measurement was to close to the installation.
- Strategy control worked well



# Strategy 4

Pressure regulation as a function of temperature

*Pilot results:*

Pressure regulation, based on outside temperature, could not be tested during the pilot due to the minimal temperature changes and insufficient pressure variation.



# Conclusion

The SG3 installation responds quick to the commands, while an feed-in project responds slow or are not at all (not equipped to respond to outside signals).

Some consumers and feed-in projects design and construct near to the operating pressure of the DSO instead of the guaranteed pressure of the network.

It is likely that feed-in project are not arranged to cope with the periodization strategies, so a proper preparation will be necessary.

Strategy 2 more practical than Strategy 1





# Questions?

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