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Dynamic pressure control in gas grids for better integration of green gases – a potential analysis in the North of Germany

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Agenda

- Motivation and technical approach
- Considered cases and aims
- Methodology
- Results
- Conclusion

Need for adaptions in order to accommodate green gases (g-gases)

- Increasing injection of g-gases (also taking over load from power grids)
- Smart solutions are needed (not only new grids)

Regulatory Challenges

- Need for reduction of costs and
- Increased infrastructure efficiency

Is dynamic pressure control (DPC) an effective smart solution?

DPC-approach

- Using the technical available pressure swing of gas grids as a buffer to
  - Increase the accommodation capacity for g-gases
  - Reduce the compression energy for redirecting gas to higher pressure tiers
  - Optimise the gas procurement

Considered cases and aims

Case: „rural area“ - aiming at:

- Improving g-gas accommodation capacity in a medium pressure grid
- Reduction of compression energy (necessary if gas is redirected to higher pressure tiers
- Considered operational situations (min., max. and medium gas consumption)

Case: „urban area“ - aiming at:

- Smoothing the daily load curve by using the DPC as buffering option
- Reduction of costs for internal gas procurement by reduction of the peak load
- Considering the max. load situation is sufficient as this is relevant for the internal procurements

Methodology

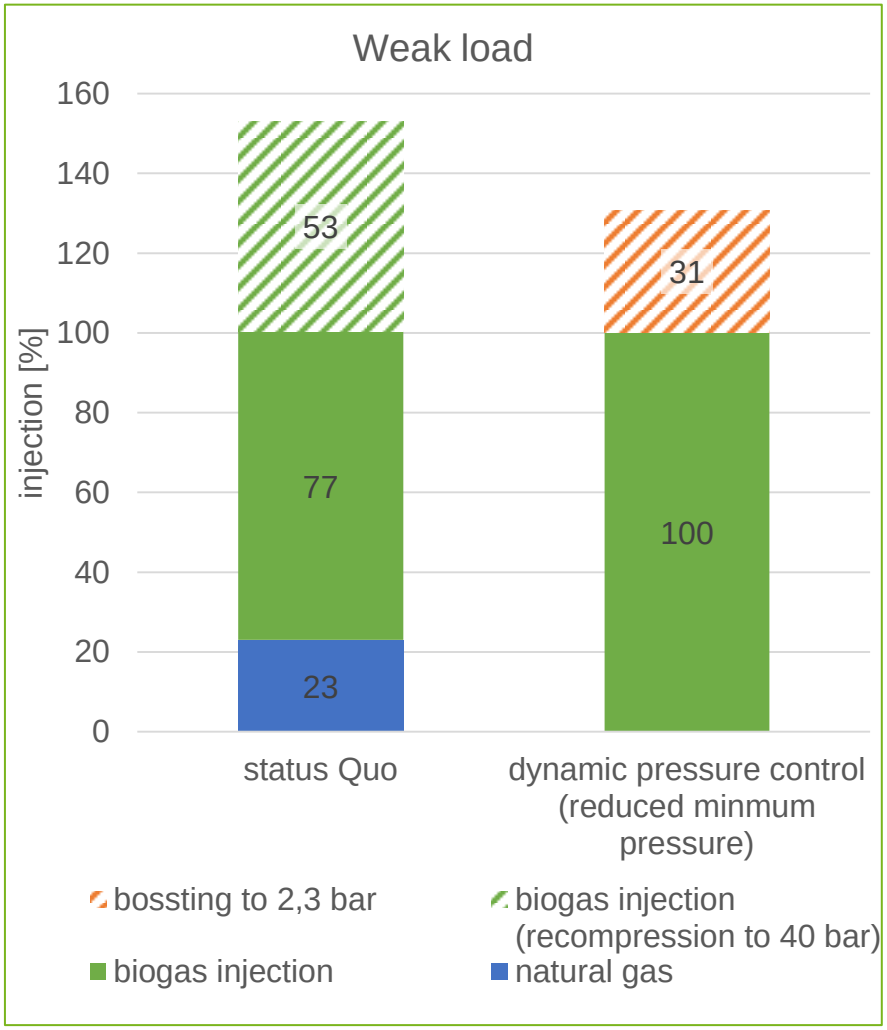
- Simulation the flows in the selected gas grid with a pertinent Software (Stanet) for the selected operational modes (heavy, medium and weak load)
- Concluding the accommodation potential for g-gases as well as the share in comparison to conventional natural gas
- Determining the allowable pressure swing limits and verifying by modelling that all customer are provided with sufficient pressure
- Changing the injection activity of the pressure regulations stations in order to give priority for g-gas injection and using the grid as a buffer
- Determination of the g-gas share after applying the DPC
- Concluding the effect on saving compression energy and peak loads

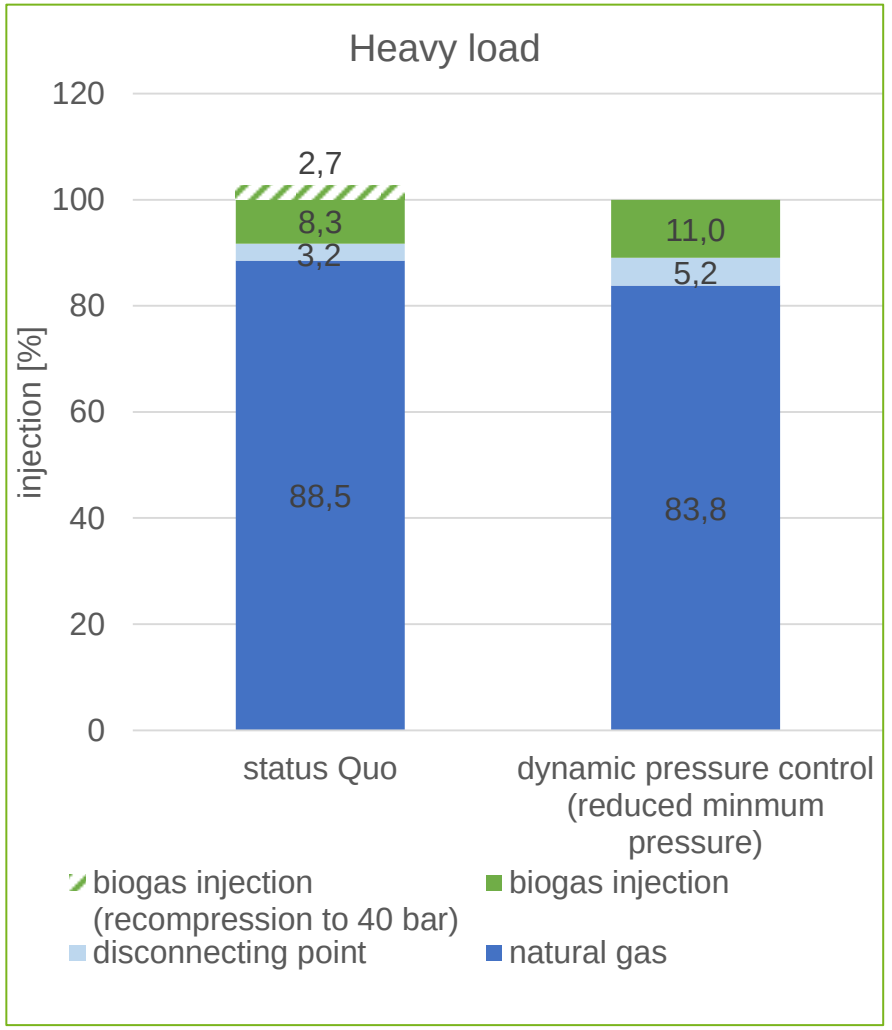
Results Case: „Rural Area“

G-gas accommodation capacity

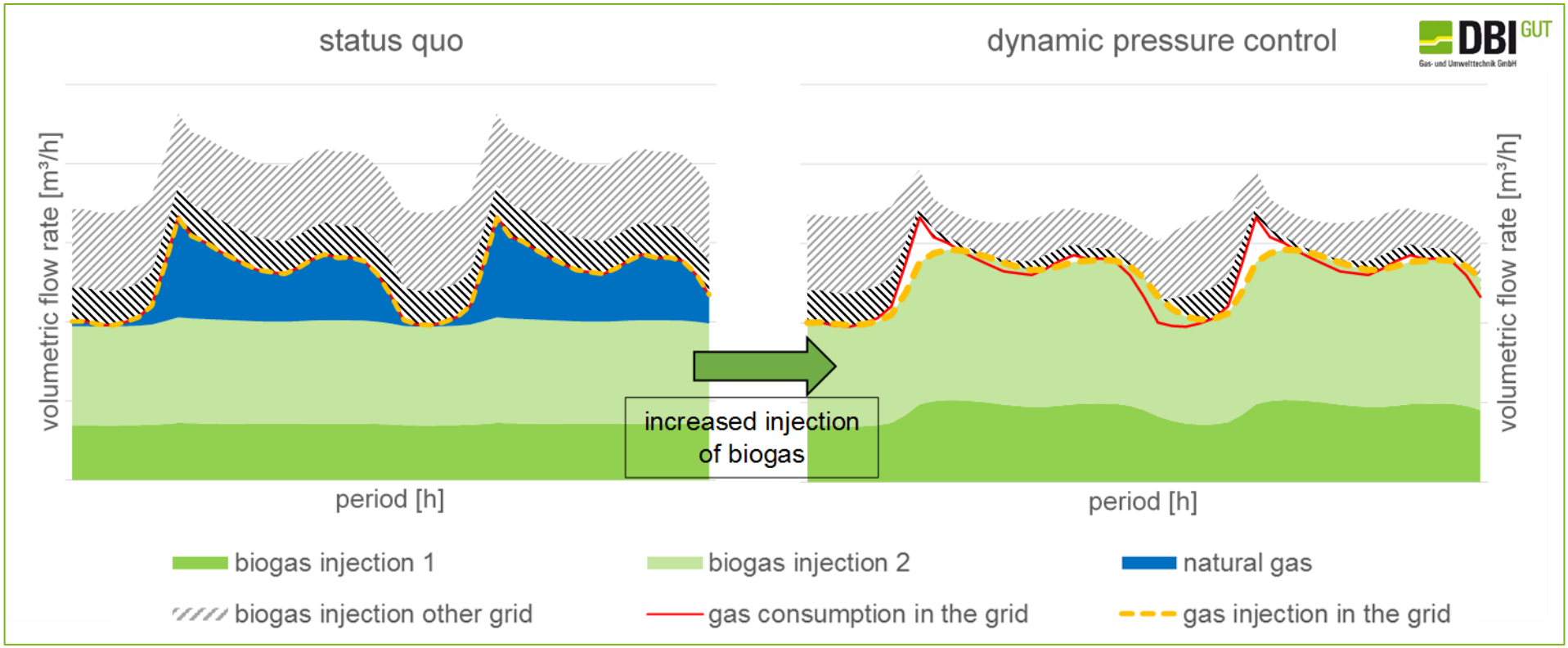
Energy for recompression

Results – rural area
effect on g-gas accommodation





Results – rural area
effect on g-gas accommodation



Results – rural area
effect on g-gas accommodation

Increase of g-gas injection

- 100% accommodation in the medium pressure grid has been achieved
- In the weak load situation a gas redirection to an nearby industrial area is mandatory but recompression to about 3 instead of 40 bar.

Necessary action to achieve the results

- Seasonal adoption of gas pressure regulation injection pressures
- Reduction of minimum pressure to 0.3 bar

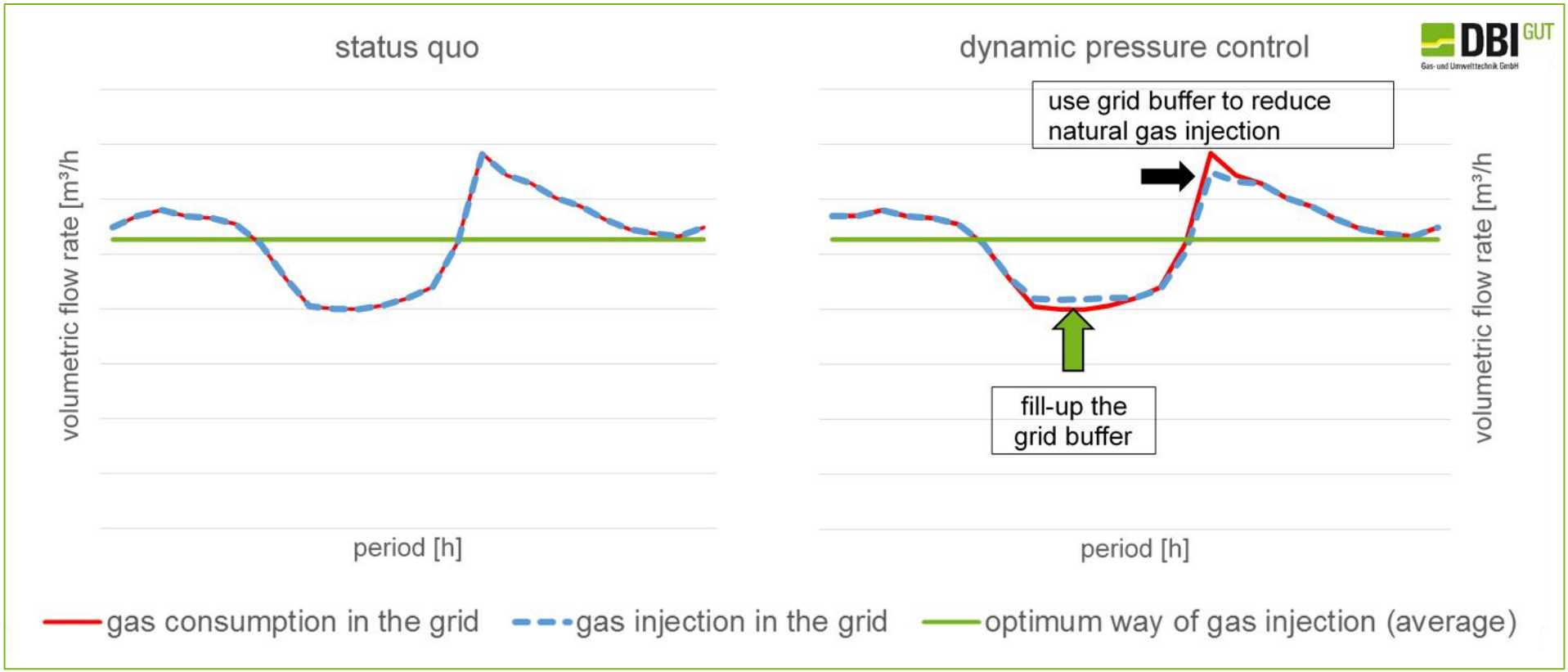
Results – rural area
effect on compression energy

- Weak load situation (18,4°C): The needed compression energy can be reduced by about 90% due to the DPC and the redirection of excess gas into the industrial area
- In the heavy load situation (-3,5°C) the whole g-gas can be injected into the medium pressure grid if DPC is applied. The compression energy is therefore reduced by 100%

Results Case: „Urban Area“

Smoothing daily load curve/optimisation of gas purchase

Results – urban area
optimisation of gas purchase



Potential for optimisation of gas purchase

- Depends on the buffer opportunities of the gas grid (volume and pressure limits)
- In the considered case a peak load reduction of 5% have been achieved – the internal orders could be reduces in the same amount

Necessary action to achieve the results

- Daily adoption of gas pressure regulation injection pressures is needed
- Net pressure limits need adoption (Min.: 0.3 bar, max.: 1.8 bar)

CONCLUSION

Conclusion

Dynamic Pressure Control can contribute positively to the injection of G-Gases into the existing natural gas grid.

Main effects

- Significant increase oft the injection capacity in rural areas
- Reduction of compression costs (up to 90%)
- Optimisation of the gas purchase and internal orders by reduction of the peak load

Needed precondition/action

- Seasonal adoption of the pressure limits of regulations stations in rural and daily adoption in urban areas

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Thank you for your attention!

Ihre Ansprechpartner

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