EEM22

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Green hydrogen – Future production opportunities from biogas plants in Germany

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Framework

Green hydrogen

- Green gas of the future
- Climate neutrality
- Gas grid is expected to distribute hydrogen in the future

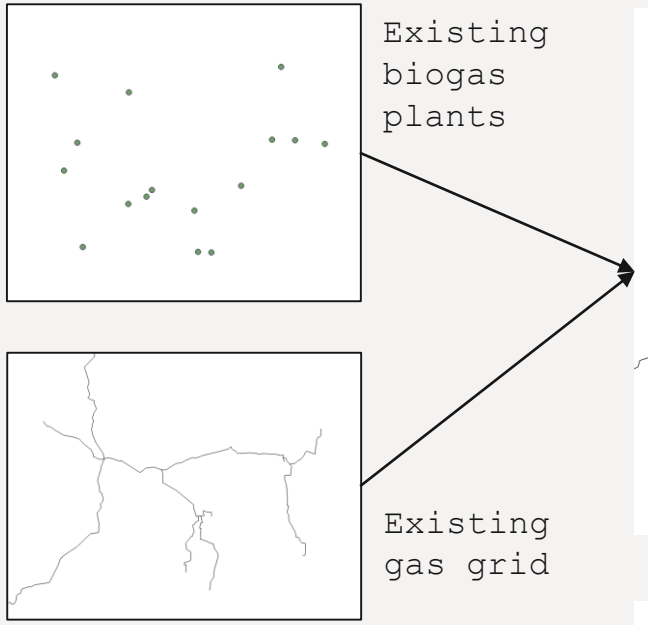
Biogas plants

- Changes in regulation
- New business models required
- Cost degression in investment costs for steam reforming

Approach: joint biogas steam reforming and injection into the gas grid

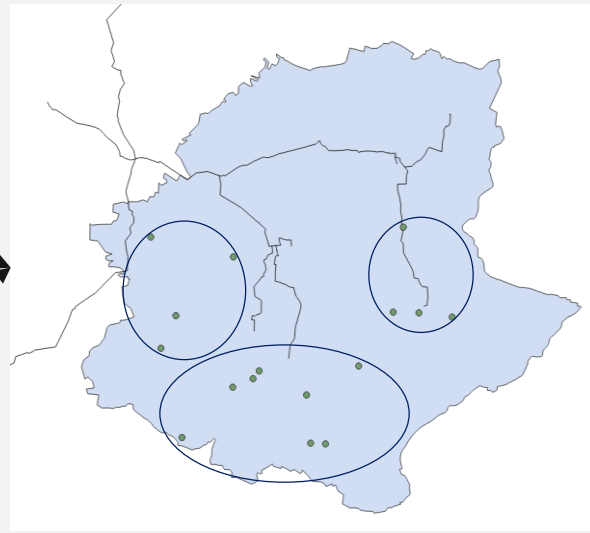
Modelling

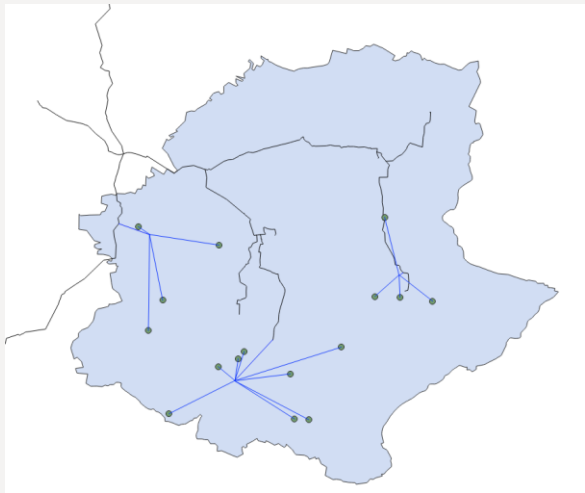
- Cooperation to exploit cost degression
- Objective function of minimum system cost
- Annual cost components:
  - Gas pipelines
  - Steam reformer



Existing biogas plants

Existing gas grid

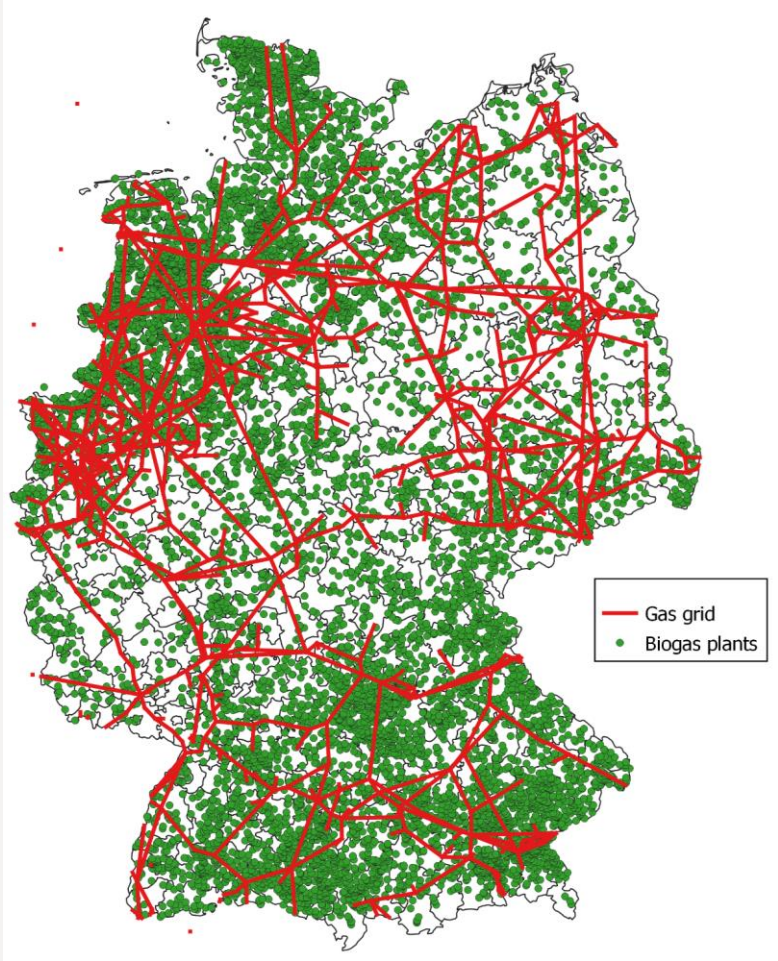




Solution:
- Pipeline
- Steam reformer

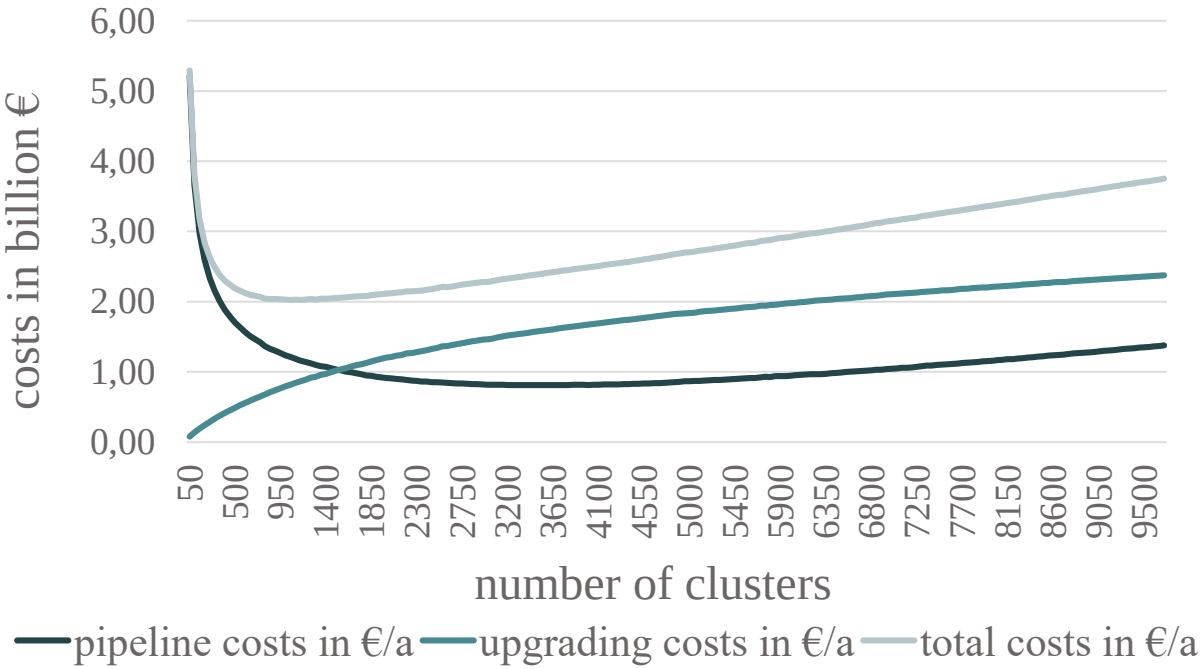
Case study

- Reference region: Germany
- 9,700 biogas plants, installed capacity of 5,666 MW
- Steam reforming of biogas only performed in pilot plants



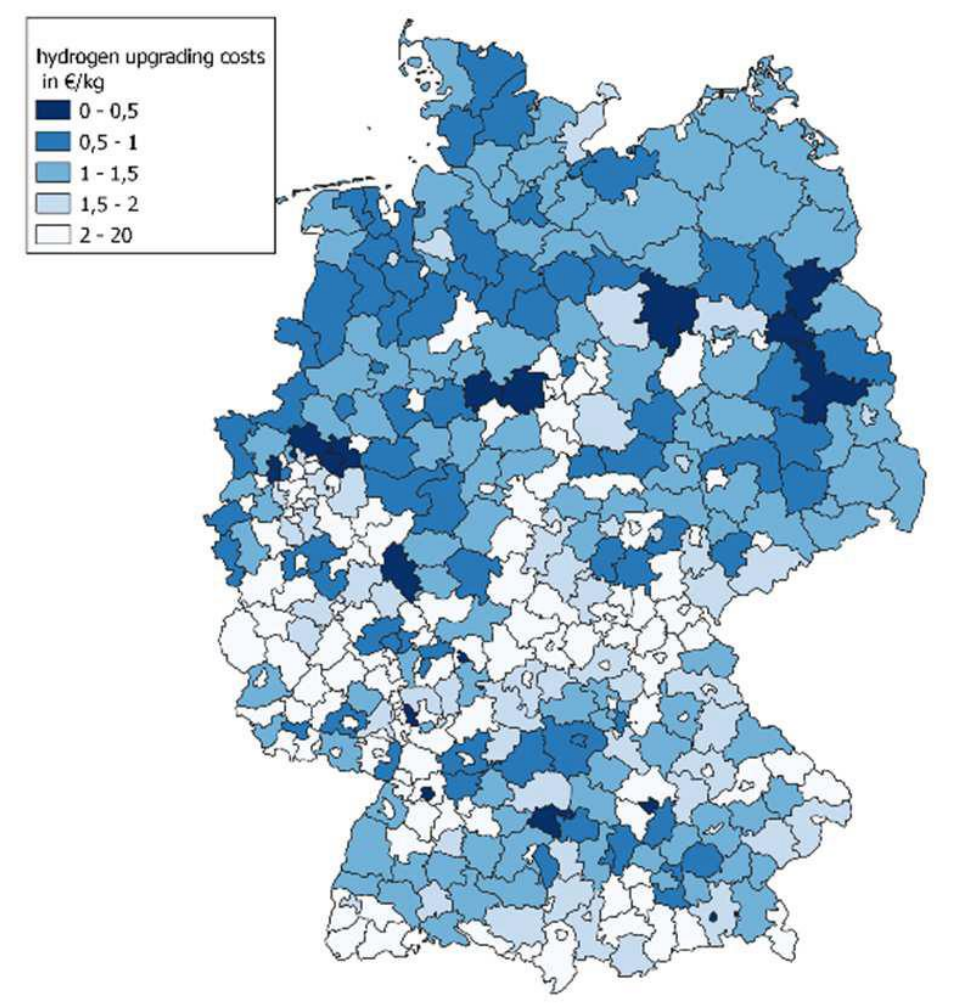
Results

- Individual hydrogen production
  - Annual system costs: 3.75 billion €
  - Even smallest steam reformers are overdimensioned
- Joint operation
  - 1,042 clusters (ø 9 biogas plants)
  - Annual system costs: 2.04 billion €
  - Costs savings: 46 %
- Two opposing effects:
  - High purification costs in individual facilities
  - High pipeline costs for fewer clusters



Results

- Regional different potential for biogenic hydrogen production
- Leads to big differences in hydrogen upgrading costs
- Regions can be identified where steam reforming of biogas is comparatively cheap



Conclusion

- Large Potential for joint steam reforming of biogas
- Regions with high potential for green hydrogen production and low production costs are well suited as pilot regions
- Next steps:
  - Examination of the hydrogen production costs and economic efficiency in detail
  - Identify potential from other renewables to confirm pilot regions

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THANK YOU.

Questions?