Assessing the geographical potential of biogas methanation in Denmark based on the existing biogas sources

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Introduction and aim

POWER-TO-X TECHNOLOGIES ARE ONE OF THE KEY TECHNOLOGIES IN REACHING 100% RENEWABLE ENERGY TARGETS IN ALL ENERGY SECTORS IN THE LONG TERM.

ASSESS THE POTENTIAL FOR BIOGAS METHANATION PLANTS IN A LARGER GEOGRAPHIC AREA

THE FOCUS IN THIS PRESENTATION IS THE AVAILABILITY OF EXISTING CARBON SOURCES (CO₂) FROM BIOGAS PRODUCERS.
Delimitations:

• Only existing biogas plants
• Does not consider economic feasibility or operation of plants
Methodology

- Biogas plants
  - Plant capacity estimation
  - Distance to infrastructure estimation
  - P2G
  - Evaluation/scanning
    - Potential scenario [a, b, c & d]

Primary Criteria:
- Electric network
- Gas network
- Wind turbines
- Wind resources
- Land restriction

Secondary Criteria:
- DH network
- CNG stations
- Gas injection

Legend:
- Input
- Process
- Decision
- Output
Biogas producers
Existing Infrastructure
Wind potentials
Selection criteria (base scenario)

Scenario b, c, d:
- 2 km distance to electricity and gas networks

Scenario c:
- 3 km distance to existing wind turbines
- 3 ratio between biogas methanation capacity and required new wind capacity

Scenario d:
- 3 km distance for new wind potential
- 4 MWh/m² for new wind potential
### Sensitivities

#### Distance to existing wind turbines

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<th>Distance (km)</th>
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#### Distance for new wind potential

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The model

- Simplified distance (ordinary straight line)
- Neglecting capacities of existing infrastructure
- Only capacity of existing wind turbines are used (not production or ownership)
- New wind turbines is simplified and restricted

Further investigations

- Economic assessment of feasibility
- Potential from new biogas producers
Conclusion

Total maximum theoretical production potential of 6,666 GWh/year

- 104 biogas sources in category [a] - too far from gas and electricity infrastructure
- 53 sources are in category [b] - only fulfilling the distance to gas and electricity infrastructure requirement
- 16 are in category [c] - existing wind turbines available
- 2 in category [d] - potential new wind locations available

Currently, around half of the biogas sources are relevant for biogas methanation

36 of the plants already has gas injection

114 plants are within 2 km of district heating

These numbers are very sensitive to the distance criteria used