Tebodin

WE MAKE IDEAS WORK
Introduction Tebodin

Bio-energiecluster Oost Nederland
Cogas | 7 mei 2014

Key figures

Long-term experience
- Founded in 1945, The Hague, the Netherlands
- Part of the engineering and services company Bilfinger

Ample resources
- 4,900 consultants and engineers worldwide

In-market presence throughout the world
- 50 offices in 25 countries
- local staff

Long term relationships with clients
- 75 % of turnover = repetitive business

Our international network

Services

Services we provide
- Design & Engineering
- Project Management
- Procurement
- Construction Management
- Consultancy

Our markets


Industrial


Health & Nutrition


Energy & Environment


Chemicals


Oil & Gas


Property


Infrastructure

Our markets







Industrial
- Automotive
- Construction Materials
- Consumer Products & Electronics
- Metals
- Pulp & Paper

Health & Nutrition
- Agro-Industry
- Food & Beverage
- Life Sciences

Energy & Environment
- Biofuels
- Power & Heat
- Soil, Air & Noise
- Waste
- Water

Chemicals
- Polymers, Plastics & Fibers
- Resins & Coatings
- Specialty Chemicals
- Base Chemicals

Oil & Gas
- Upstream
- Midstream
- Downstream

Property
- Data Centers
- Hotels
- Logistic Centers
- Offices
- Residential
- Retail
- Sports & Leisure

Infrastructure
- Airports
- Networks
- Pipelines
- Port & Terminals
- Rail
- Roads
- Sewerage

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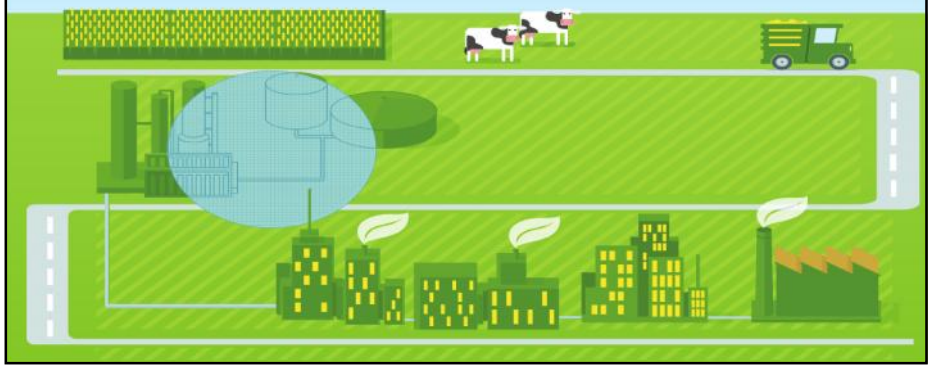
DESIGNING THE BIOMETHANE SUPPLY CHAIN THROUGH AUTOMATED SYNTHESIS

Taede Weidenaar, PhD research

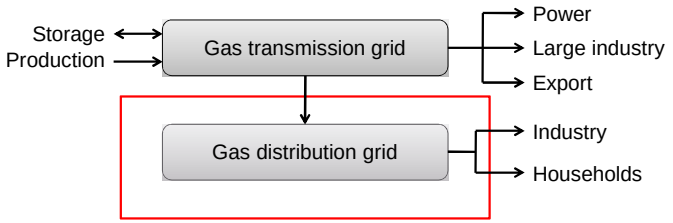
7 May 2014, Bio-energiecluster Oost Nederland, Almelo



Agenda

- Background of research
- Design options for the biomethane supply chain
- How can the DST aid the design process?
- Sensitivity analysis on the biomethane supply chain

Background



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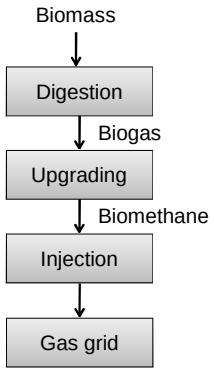
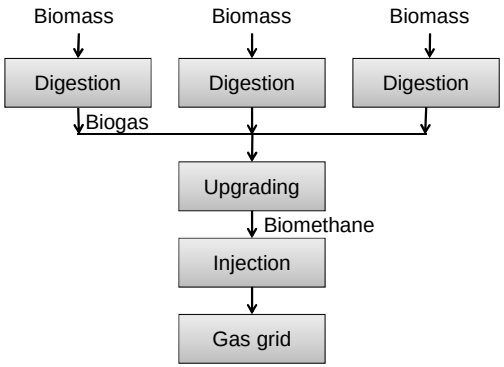
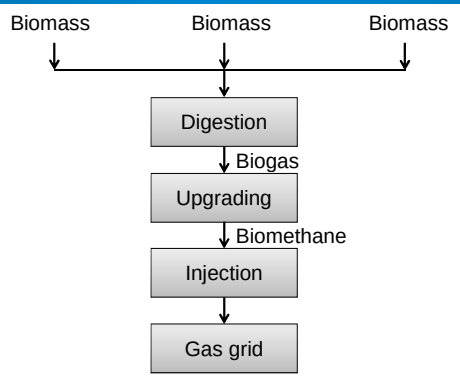
The co-digestion process



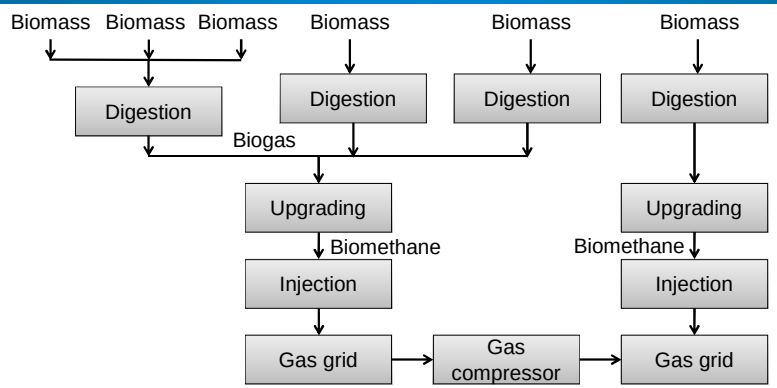
Design configuration 1



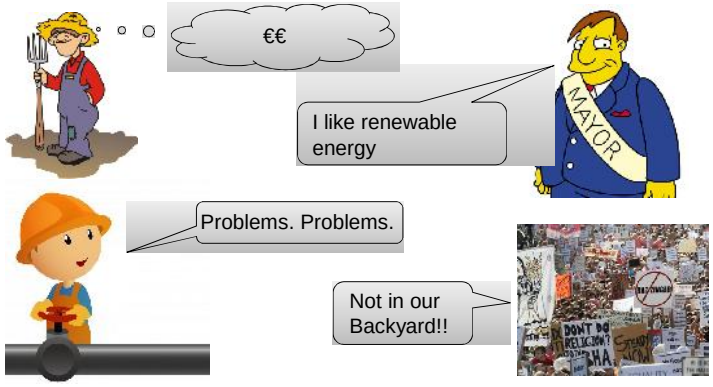
Design configuration 2



Different design options



Stakeholders



Challenges

Decision Support Tool (DST)

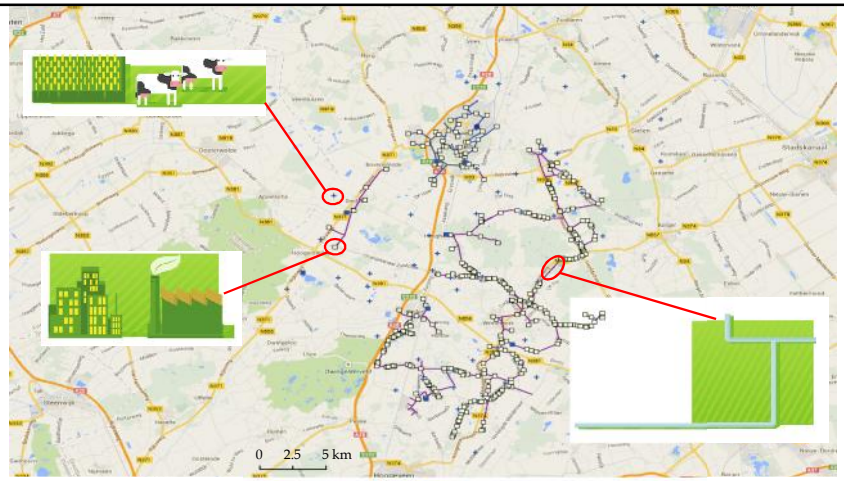
Decision Support Tool

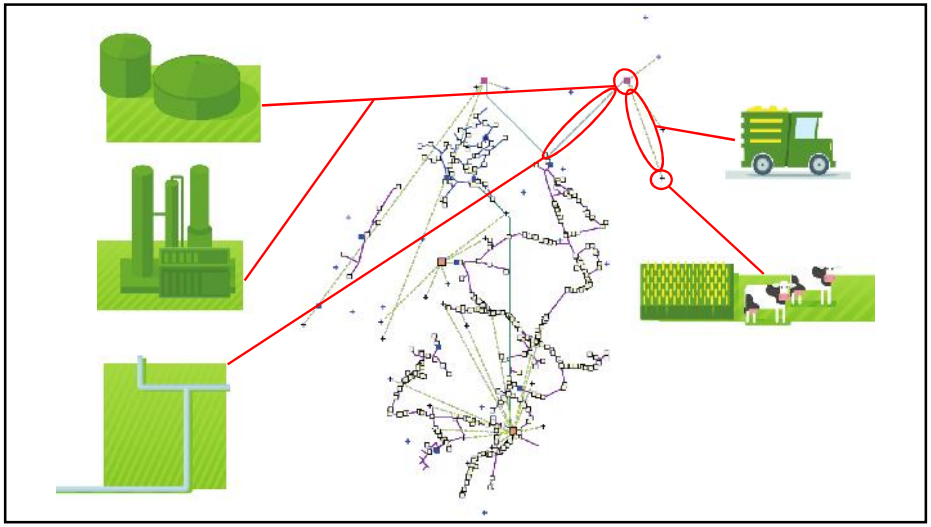
- Gas grid and consumers
- Biomass locations

DST

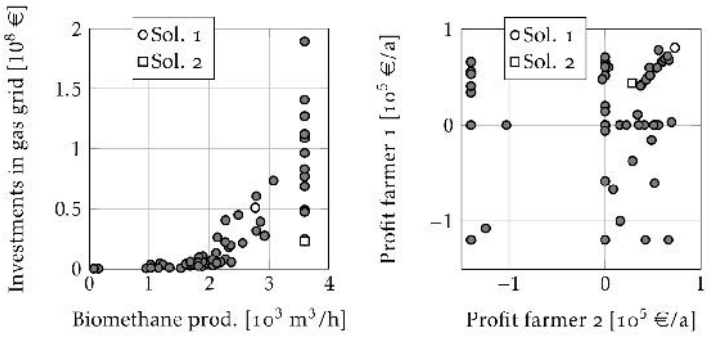
- Candidate designs
- Performance indicators

- Digesters
- Upgraders
- Pipelines
- etcetera

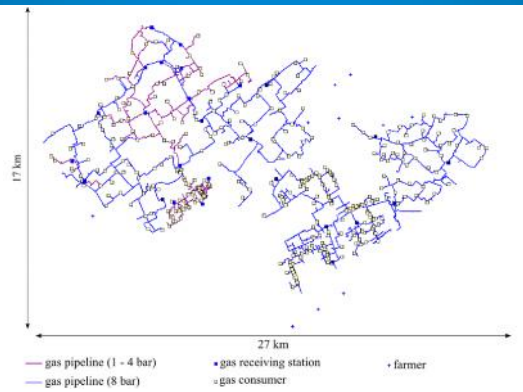




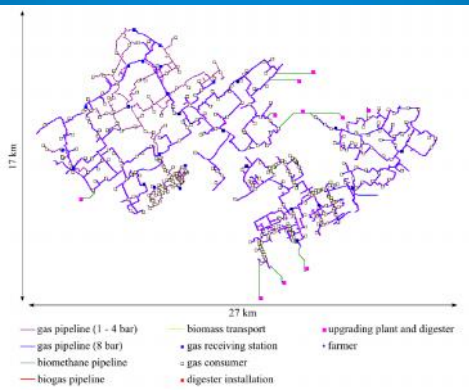
Designing the biomethane supply chain together



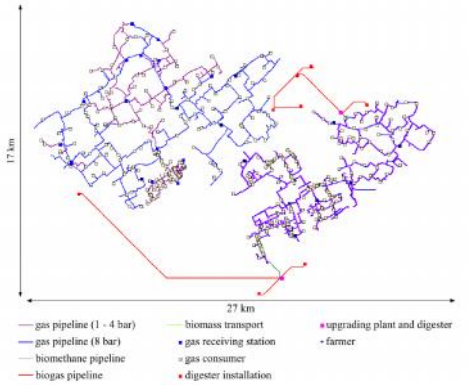
Sensitivity analysis – Start configuration



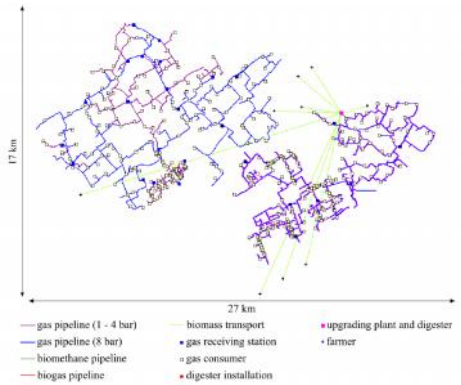
Sensitivity analysis – Local for local layout



Sensitivity analysis – Biogas hub layout



Sensitivity analysis – Biomass transport layout



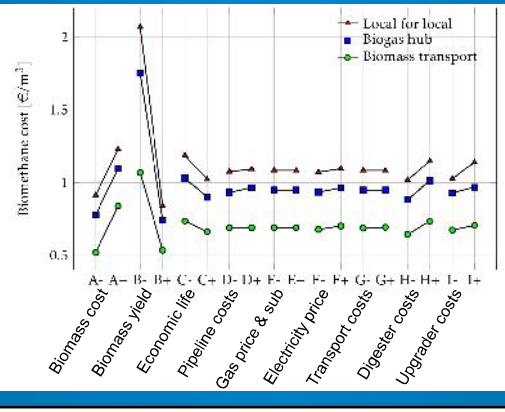
Sensitivity analysis – Nominal situation

	Local for local	Biogas hub	Biomass transport
Biomethane cost [€/m^3]	1,08	0,95	0,69
NPV [10^7 €]	-1,17	-0,73	0,10

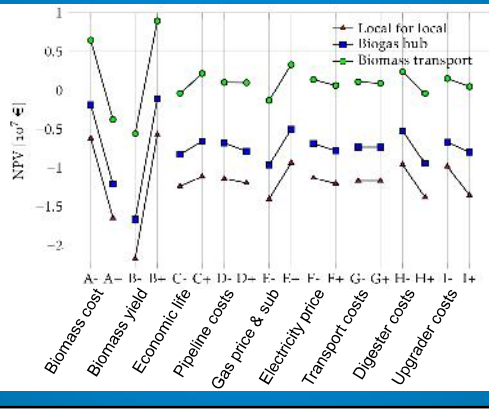
Sensitivity analysis – Factors

	Nominal value	Low value	High value
Biomass cost [€/tonne]	31	15	45
Biogas yield [m^3/kg]	0,16	0,08	0,24
Economic life [years]	12	9	15
Pipeline costs	1	0,8	1,2
Natural gas price + subsidy [€ct/m^3]	72	64,8	79,2
Electricity price [€ct/kWh]	7	5	9
Biomass transport costs	1	0,8	1,2
Digester installation costs	1	0,8	1,2
Upgrading plant costs	1	0,8	1,2

Sensitivity analysis – Biomethane cost



Sensitivity analysis – NPV



Conclusions

Sensitivity analysis

- Biomass transport > Biogas hub > Local for local
- Scale is important
- Biomass cost and yield strongly affects NPV and biomethane cost

DST

- Enables stakeholders to jointly design the biomethane supply chain
- Increase consensus among stakeholders through transparancy in design process
- Results in better solutions for society (no only optimal for biomass owner)

always close