

Natural gas and biomethane are complementary fuels – developments in Sweden

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ELFORSK



Why biomethane in transports?

Only fully oil dependent sector in Sweden! (92 %)*

- **Full utilization of energy with solutions available now**
 - Inevitable heat losses in CHP utilization, wind & sun better alternatives
 - Commercially available solutions for oil dependent transports of all types (LDV, MDV, HDV, short, medium and long-distant), with performance on par with diesel soon to come!
 - Natural gas and biomethane: freely intermixed and interchangeable
 - Evident co-distribution and backup synergies (backup for market fluctuations, process failure) allow for 100 % utilization of your biomethane and earlier market buildup
- **Promotional value compensates for added costs**
 - Steadily increasing the renewable share gives true greening

* Industry – 25 % fossil fuels (oil, coal, natural gas)

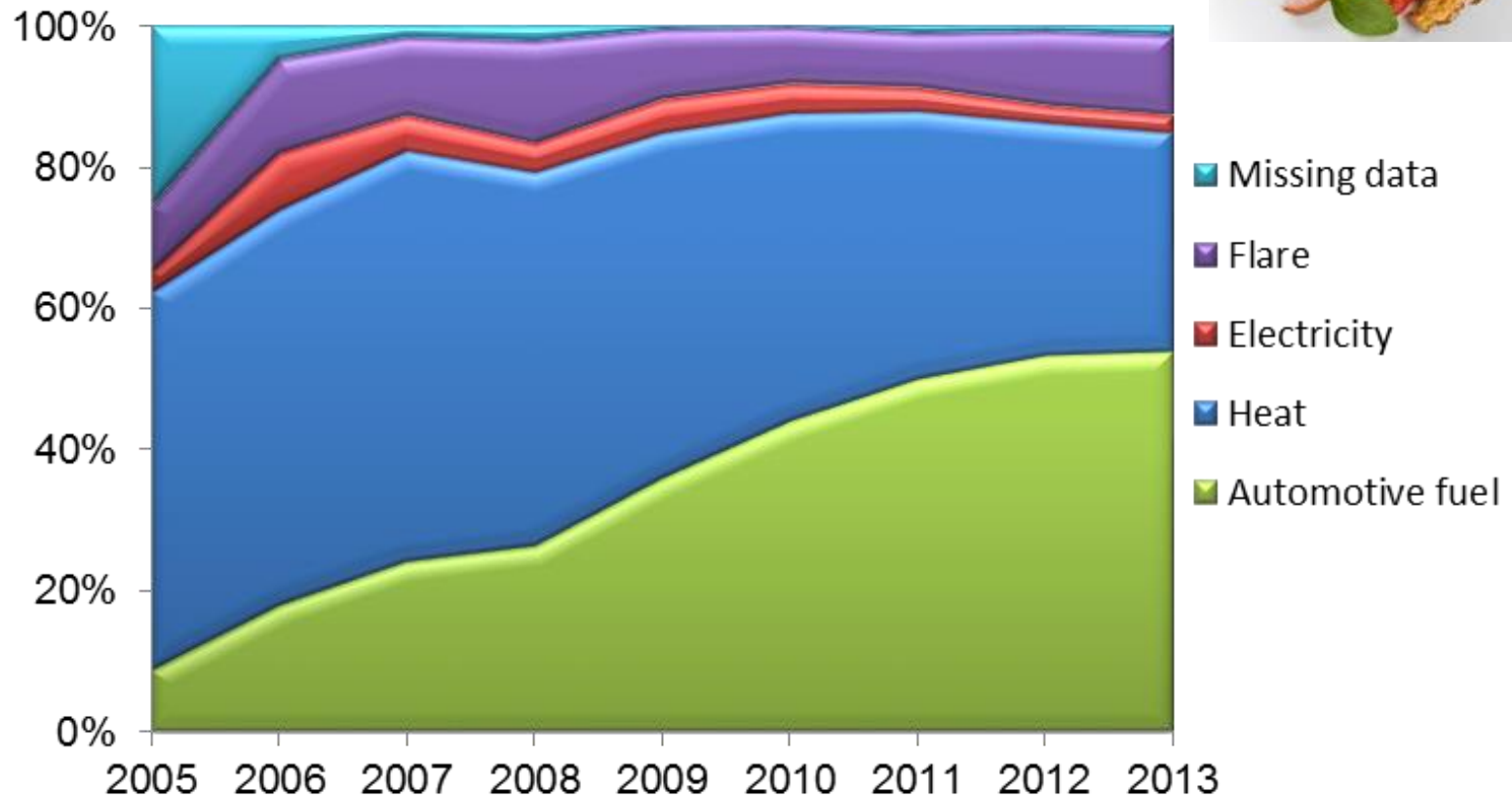
Households – 10 % fossil fuels (oil)

Source: Energiläget 2014, Swedish Energy Agency

Biogas utilisation 2005-2013

264 biogas plants  1.7 TWh biogas (2013)

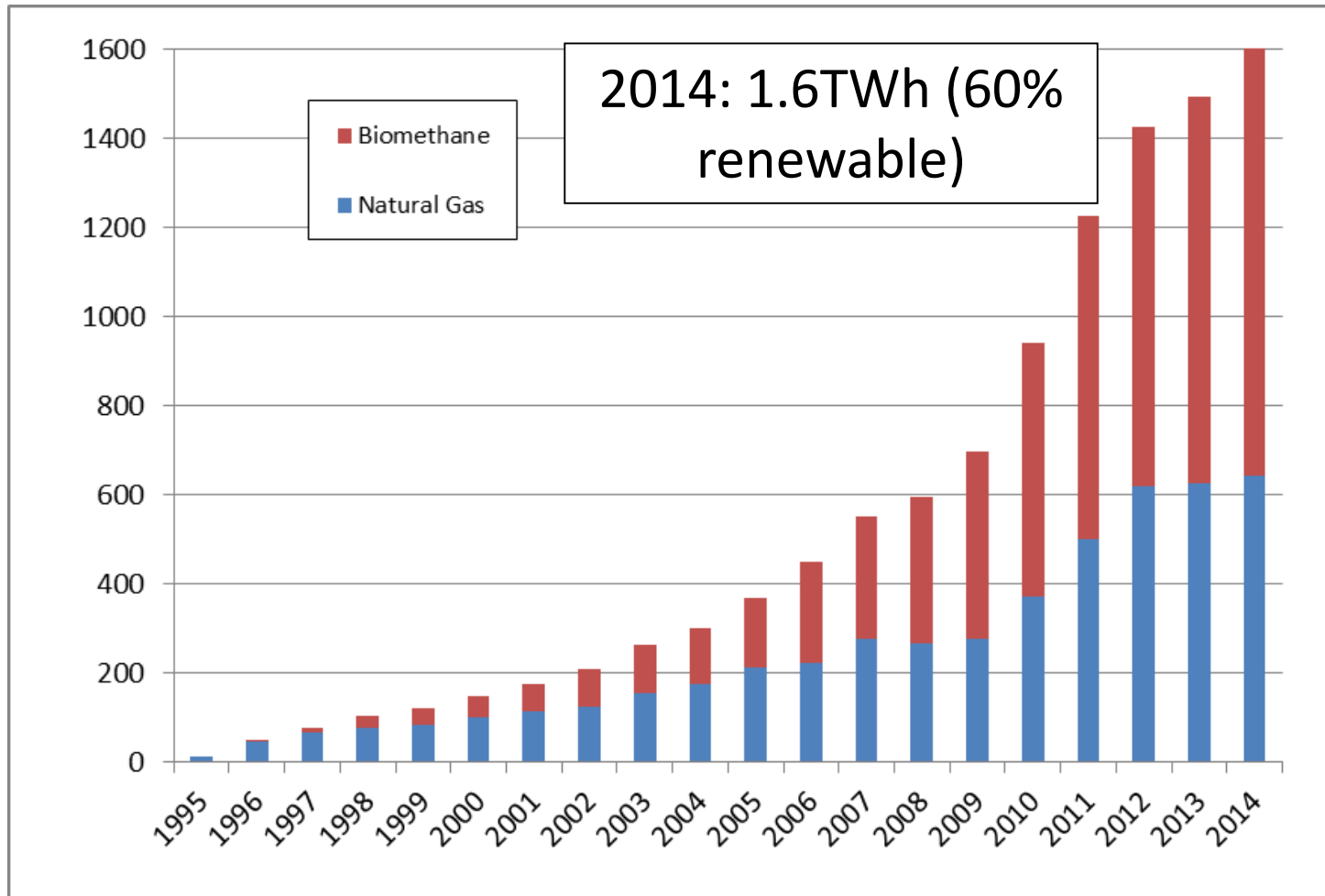
Food waste collection in 190 of Sweden's 290 municipalities
30,000 ton 2005 → 307,000 ton 2013 (1/3 of potential)



Volumes of CNG/biomethane in Sweden

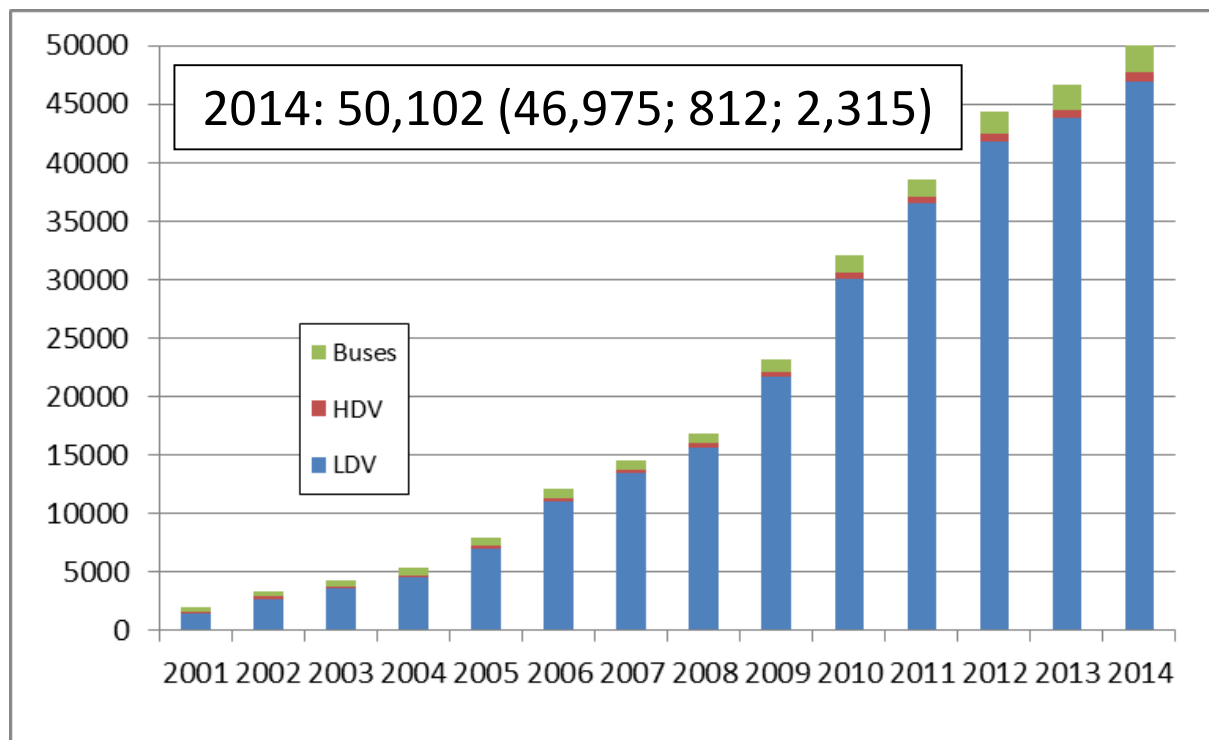
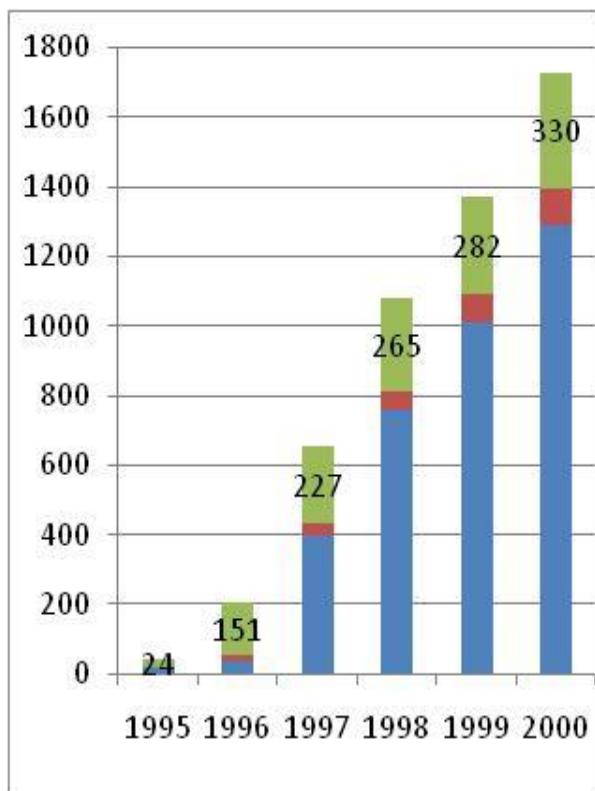
Evidence of a fruitful interplay between the use of natural gas and biomethane

[GWh]



No. of NGV's in Sweden

The NGV market base: Captive bus fleets (1 bus \approx 20-30 LDV's)



NGV market dynamics of Sweden

Local pollution problems + no grid access = biomethane buses

- **Converting to NG buses to solve local pollution problems**
 - Grid connected cities of Malmö and Gothenburg
 - NG companies searching for a new market segment

The future: 24 m biomethane powered hybrid bus in Malmö from 140601 – most frequent commuter line, BRT concept



NGV market dynamics of Sweden

Local pollution problems + no grid access = biomethane buses

- **Environmental state funding to municipals decisive (1998-2010)**

- Non-grid cities upgraded to biomethane to fuel their buses – grid cities followed
- Captive bus fleets shown* providing the essential niche of the emerging NGV market in Sweden

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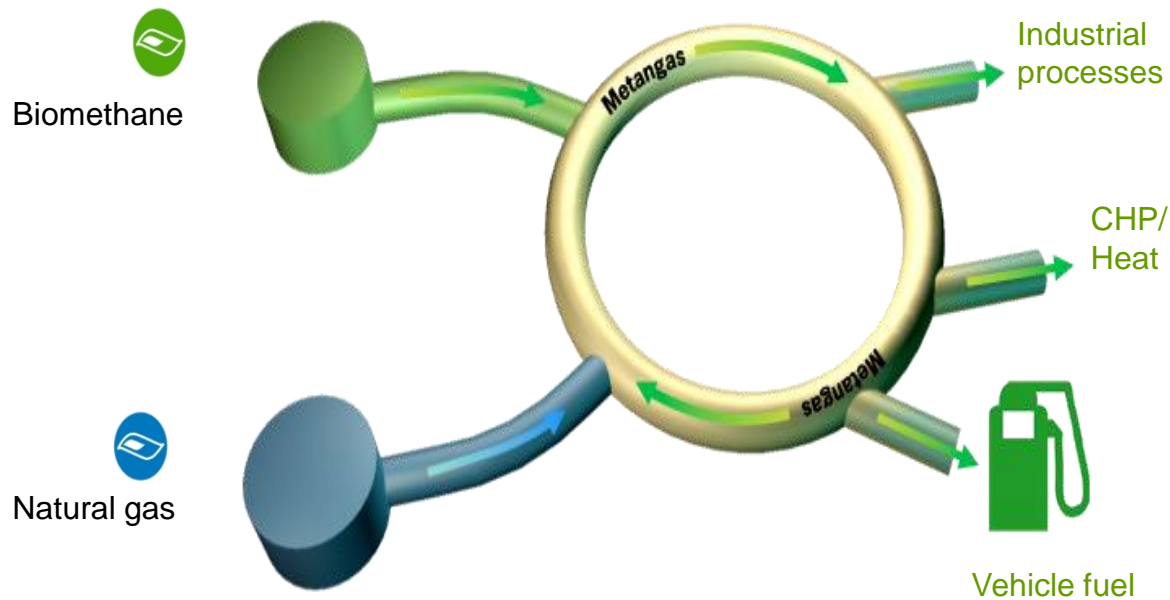
The intercity bus sector is also under "gasification" in Sweden

*Sandén, B., Jonasson, K. Variety Creation, Growth and Selection Dynamics in the Early Phases of a Technological Transition: The Development of Alternative Transport Fuels in Sweden 1974-2004. pp. 76, 2005.

<http://publications.lib.chalmers.se/cpl/record/index.xsql?pubid=12635>

Swedish visions and goals

- **The Swedish Gas Industry's visions are:**
 - 100 % biomethane in the vehicle gas in 2030
 - 100 % biomethane in the gas grid in 2050

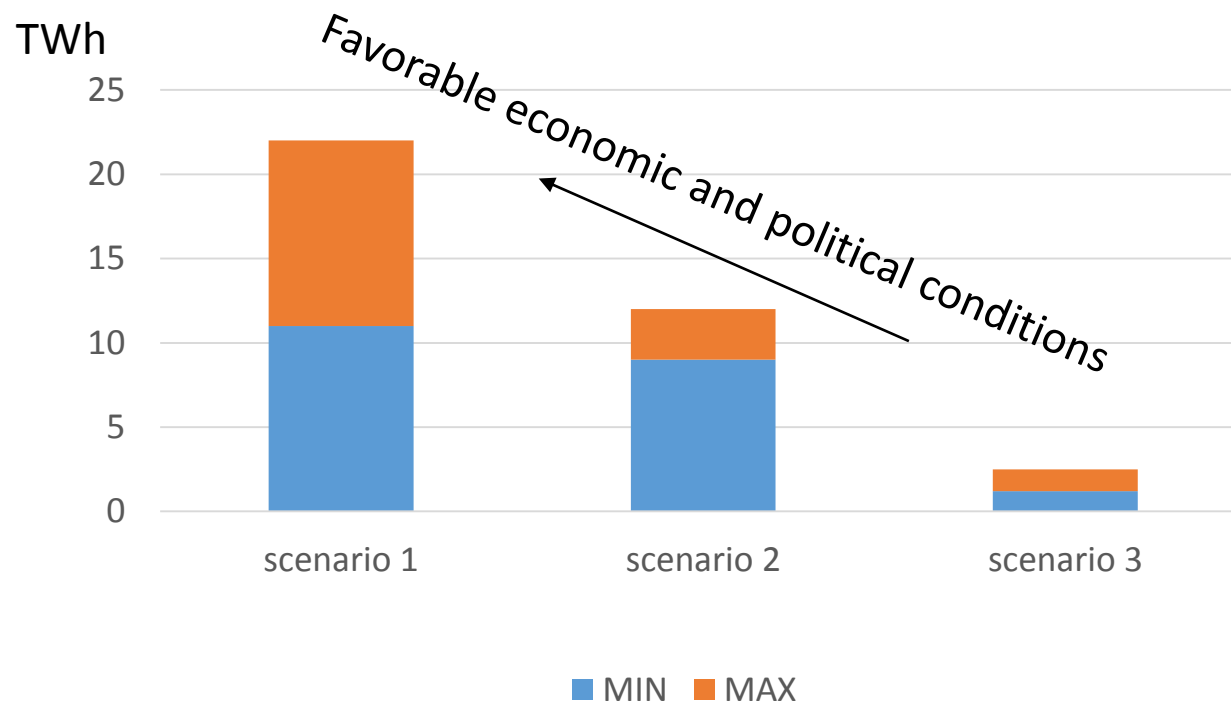


Swedish visions and goals

- **Fossil free vehicle fleet in 2050, through the following measures:**
 - ↓ Needs for transports
 - ↑ Energy efficient vehicles
 - ↑ Proportion of electricity and bio-fuels



The realizable biomethane potential for the vehicle fleet in Sweden 2030



Biomethane in Sweden today

Capital intensive business with still small profit margins need additional drivers and good framework conditions

- **Tax exemption + high fossil fuel taxes most important driver**
 - Retail at approx. 2 EUR/kg (9SEK/€)
 - Fringe benefit tax reduction on company cars 40 %
- **Long-term high-volume contracts securing the market**
 - Waste management + procurement of public transport
- **Challenges ahead**
 - Missing: Extension of existing policies, no new ones to facilitate production growth (tax exemption ruled unlawful by the EU, 2016 → ?? certificate system, continued exemption for biomethane only?)
 - Competition in the bus segment (HVO, electrification, diesel hybrids)
 - Low oil prices

Biomethane trade in Sweden

National trade

- Similar to certificate trading but without third party control.

International trade

- The Swedish Energy Agency claims that imported biomethane has to fulfil traceability on mass balance level. Not possible through the European gas grid. Decision is appealed.
- However: One company (Mody) is certified through REDcert, recognized by the European Commission, and is allowed to import biomethane to Sweden

Conclusions

The driving forces that co-create NGV markets

- Oil-dependent transport identified as a major challenge
- Corporative: Gas companies looking for new markets, clients wanting renewable transport products
- National, regional and local interest and policy making
 - National policies, regional public procurement and long-term commitments to fulfill environmental goals
- → Public-private partnerships and supportive national policies are key in building a biomethane powered NGV market!
 - Long-term policy commitment, preferably % market size!
 - The whole value-chain need to be involved from the beginning!

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Thank you for your attention!

Any questions?

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www.gasification.se
October 2016



SGC International Seminar on Gasification

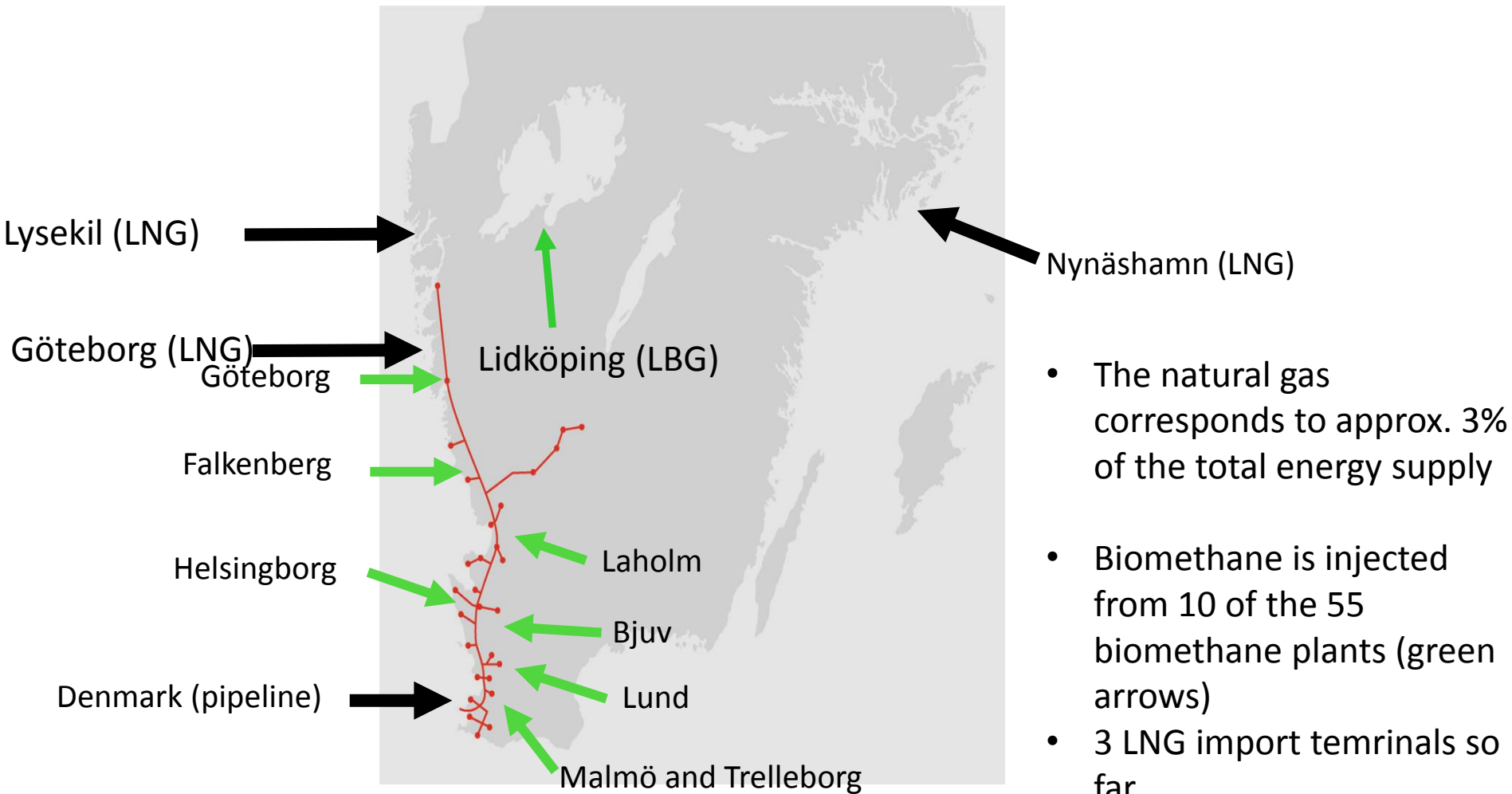
– An annual venue since 2007

www.nordicbiogas.com
Finland (Sthlm-Turku LNG
ferry!) 7-10 Sep 2016

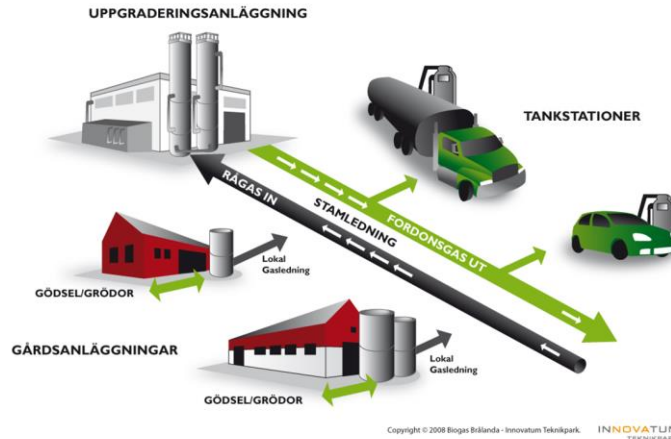
Nordic Biogas Conference



Limited national gas grid in Sweden



Sweden is world leading in transporting gas off-grid



Read more in case story from IEA Bioenergy Task 37:
Non-grid biomethane transportation in Sweden

The future: Regional grids

- The idea is to connect production units, refuelling stations and customers to an LNG terminal



Drivers spelled out: Biomethane positive externalities

- Considering the wider picture is important in order for biomethane production to be worthwhile

