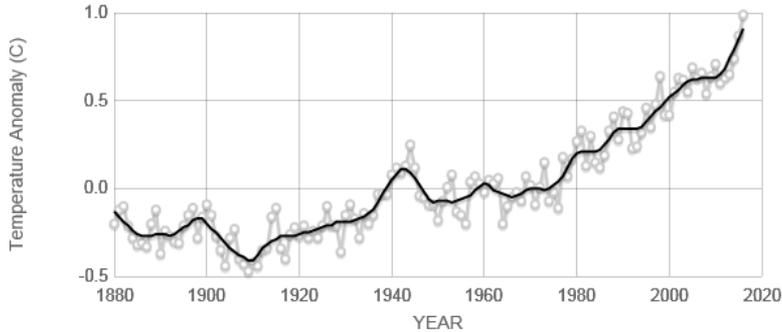
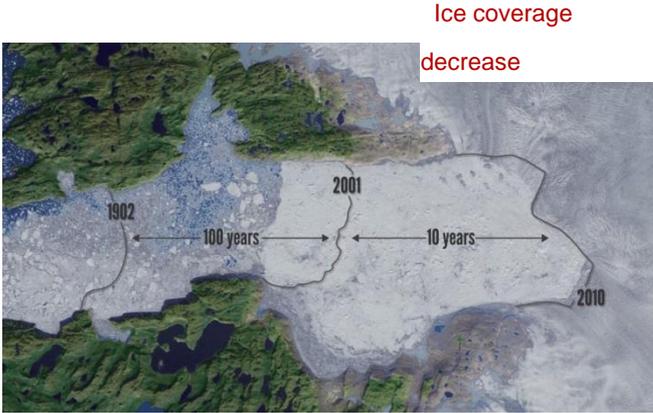


Renewable gas

- An important piece of the puzzle in the global warming mitigation strategy

e.on

Any doubt on why?



Global mean
temperature
variation

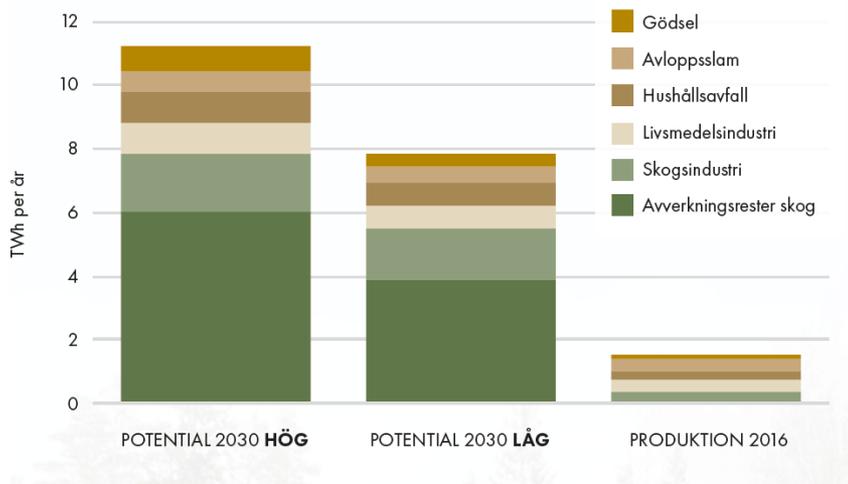
Source: climate.nasa.gov



- Increasing amount of signs of the severeness of global warming
- Slow process to reverse the trend
- Conclusion: no time to waste

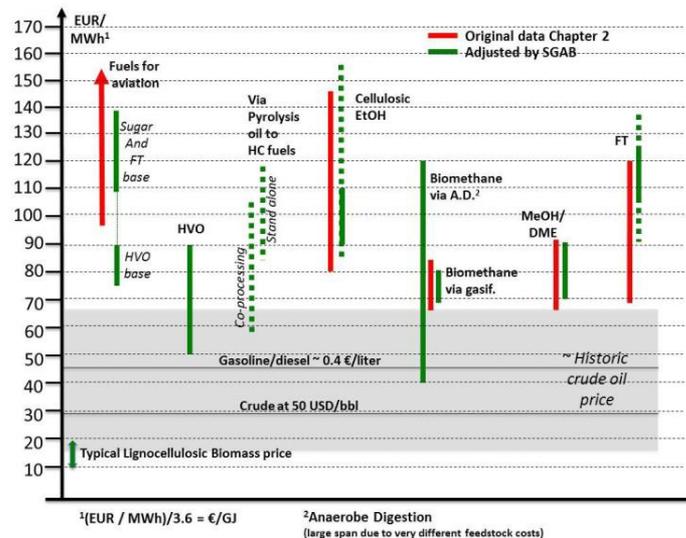
Pathways for renewable gas – substrate and technology

Potential – in Sweden a quarter of the fuel needed by 2030 could be supplied as methane



Source: Biodrivmedel och markanvändning i Sverige, Ahlgren et al. SLU och LU 2017, f3 projekt 40584-1

Production – cost for biofuels using different technologies

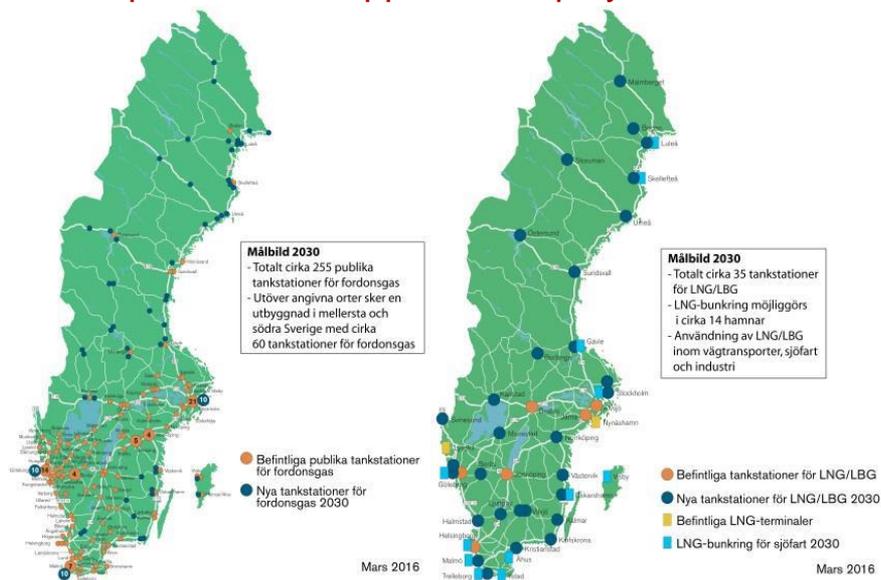


Source: European Commission 2017, SGAB Building up the future – Cost of biofuels, Landälv & Waldheim et al.

Pathways for renewable gas – infrastructure and vehicles

Infrastructure – European Directive for Alternative Fuel Infrastructure (DAFI) provide the support for deployment

Vehicles – Buses, small trucks, cars and now increasingly also heavy trucks available



VEHICLE CATALOGUE
 JUNE 2017

Source: <https://www.ngva.eu/ng-vehicle-catalogue>

Source: Scenarier för gasanvändning i transportsektorn till 2030, Sweco 2016, Wallmark & Larsson

Current use of renewable gas - Sweden & Global

Nationally:

- 50 000 CNG cars and small CNG trucks (~1% of fleet)
- More than 800 CNG trucks (~1% of fleet)
- About 2400 CNG buses (~20% of fleet)
- 2/3 of all biogas is upgraded, and used in transport

Trends:

- Increasing electrification of cars
- Inner city bus traffic going from renewable to electric
- Increased interest from countryside buses and heavy trucks – favorable for LNG

Trends globally:

- LNG for shipping, driven by excellent emission performance. Renewable gas so far not on the agenda.
- Standardized fuel injection system from major OEM's for cars – increasing number of car models
- Increasing interest for heavy trucks – LNG, but also CNG
- Continued deployment of buses – all over the world, exemplified by Qatar's decision to use CNG buses for FIFA World Cup™ 2022 transport need.

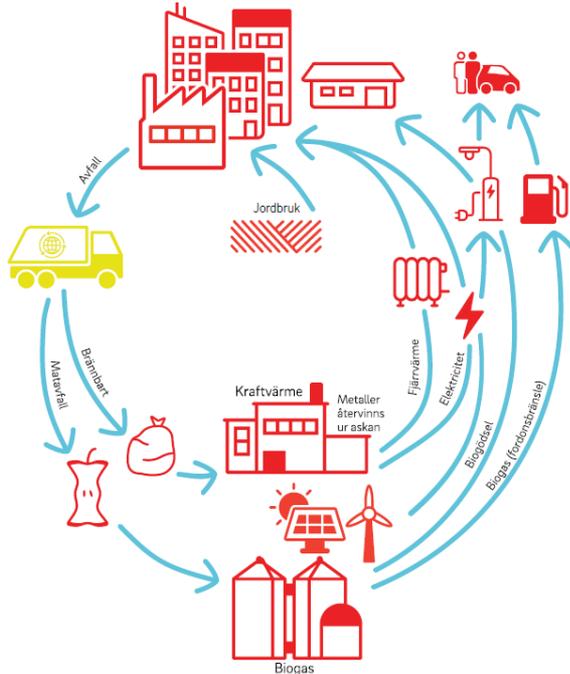
Technology, policy or market to decide which fuel to use where?

European policy making has been helping renewable gases in transport through both RED (fuels) and DAFI (infrastructure), but now CVD (vehicles) risk part of the success by adopting old standards for CO₂ measures.

Example: Electricity (renewable or not) used in cars counts as zero emissions, hydrogen (renewable or not) used in cars counts as zero emissions, whereas renewable gas used in cars counts as fossil . Thus no incentive for car manufacturers to make CNG cars, even if the gas is renewable (100% in Iceland, 75% in Sweden, 55% in Netherlands, 50% in Finland, or providing renewable gas like Audi).

Volume is key to cost effective distribution – if policy limits the use of a fuel to certain vehicles the path to deployment becomes longer. And trust in policies erodes.

Our piece of the puzzle to sustainable transports



Circular economy explained

Even a sustainable society creates waste and residues.

Existing technologies can convert waste and residues to a sustainable fuel – renewable gas

Vehicles for all categories of transport exist and are comparable in cost to fossil alternatives

Together with renewable electricity they are an important building block for the necessary transports in the society.

- So simple that it is easy to forget



Thanks - Act Now!