gasunie new energy

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- About Gasunie New Energy
- The role of (bio)methane in the future energy system
- Market growth of biomethane
- Technology and Infrastructure developments
- Conclusions

Strategy

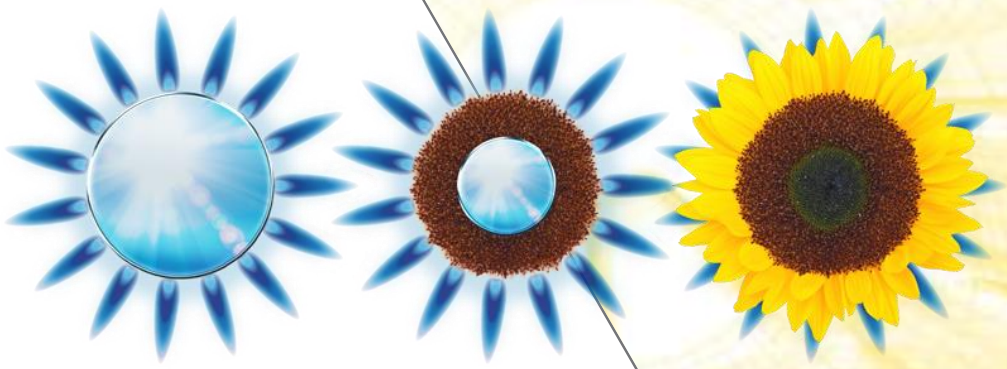
Ensure a secure, reliable, affordable and sustainable gas infrastructure in our key area

Contribute to efficient gas infrastructure & services for a well-functioning European gas and LNG market

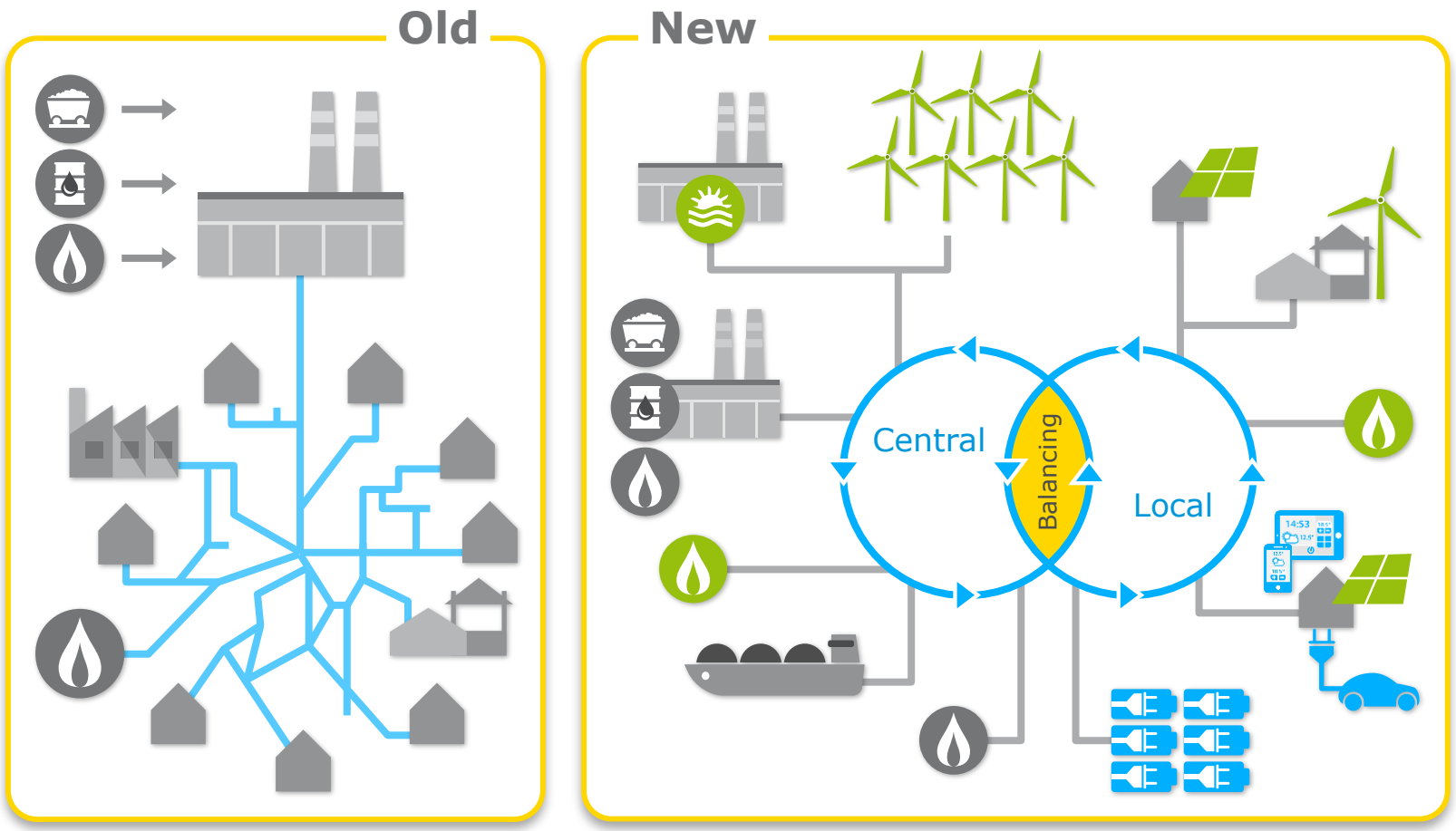
Accelerate the transition to a CO2-neutral energy supply

gasunie new energy

- We develop business opportunities in sustainable energy
- We create new business models in cooperation with partners, needed to bring new concepts and technologies to maturity



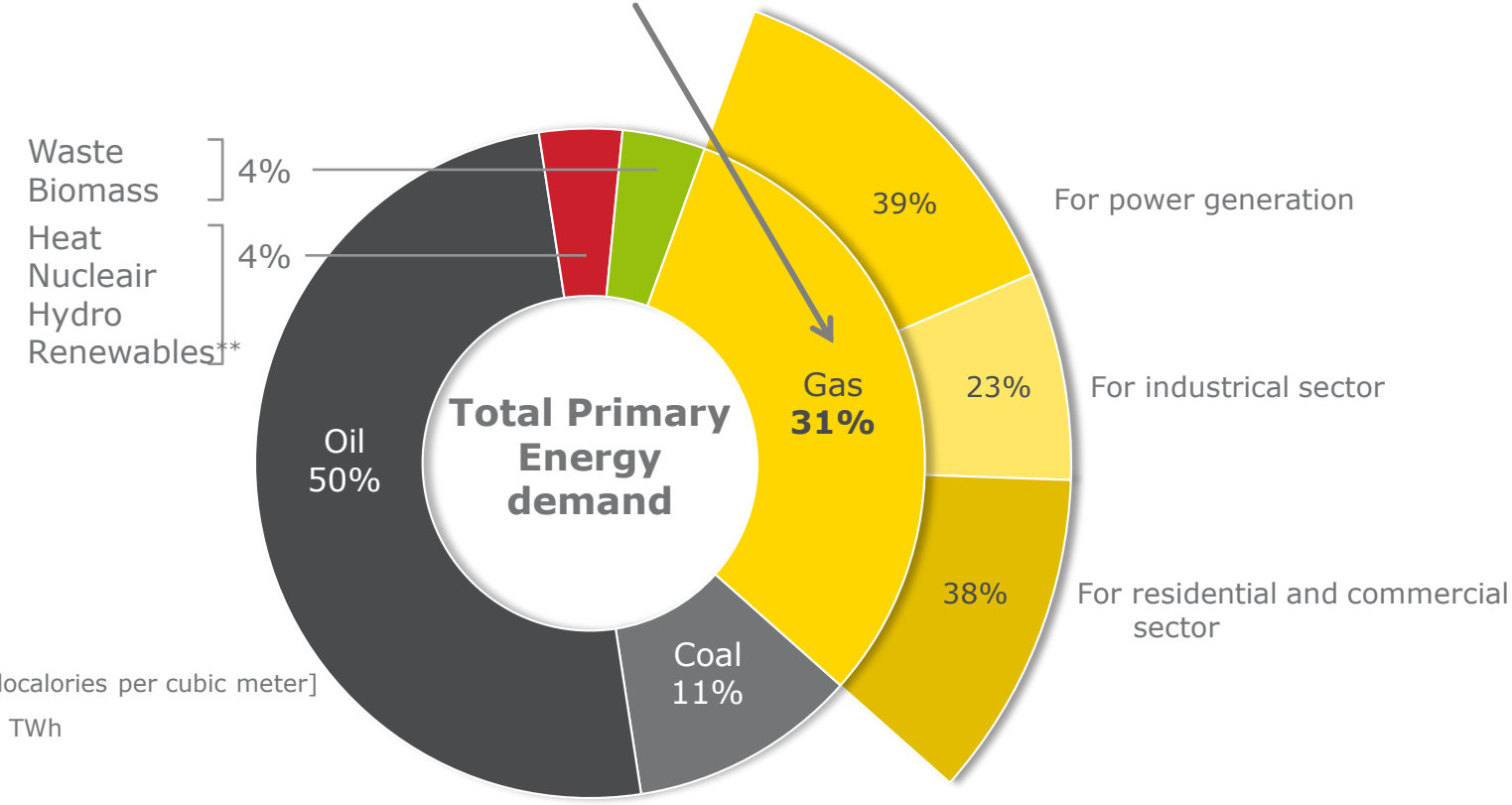
The changing energy system



The Netherlands: Natural gas country

(2015)

Total gas demand (~34 bcm = 373 TWh*)



* [at 9,500 kilocalories per cubic meter]

1 bcm = ~ 11 TWh

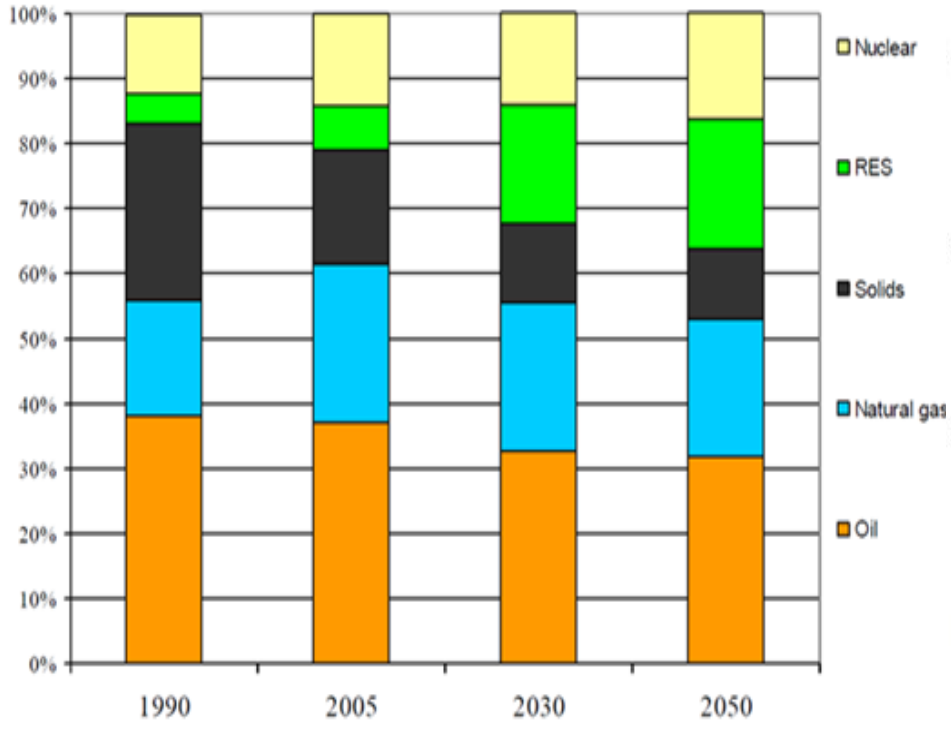
** Wind, sun

Source: IHS CERA 2016, Gasunie view

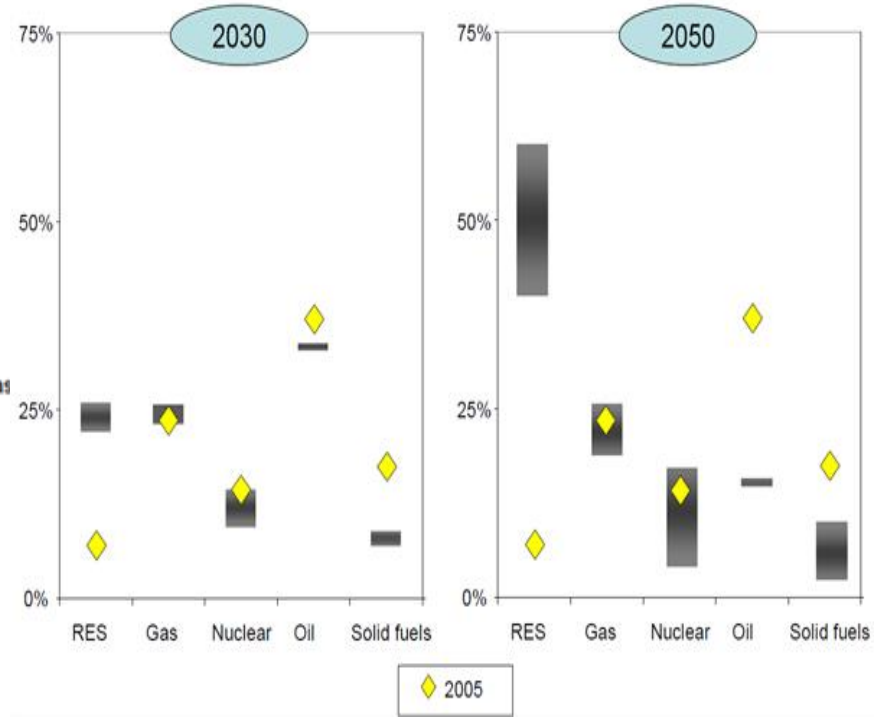
Consistent overall EU analyses for gas

- Ref. scenario: Stable share for gas in stable primary energy demand
- Clim scenario: Stable share for gas in declining primary energy demand

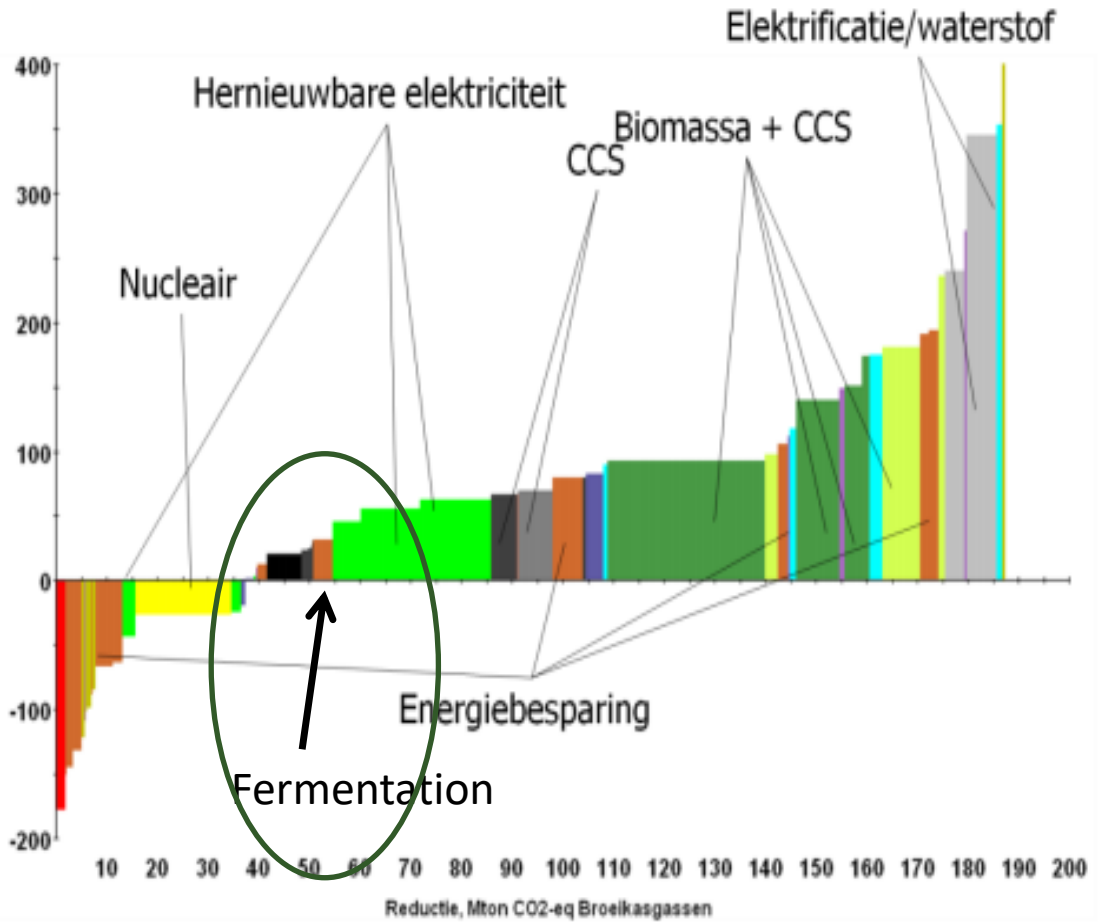
EU Reference scenario: shares of primary energy carriers 1990-2050. Total energy demand: stable



EU Climate scenarios: shares of various energy carriers in 2030 and 2005. Total energy demand decreases by 11-16% (2030) and 30-38% (2050)



MAC curve NL 2030



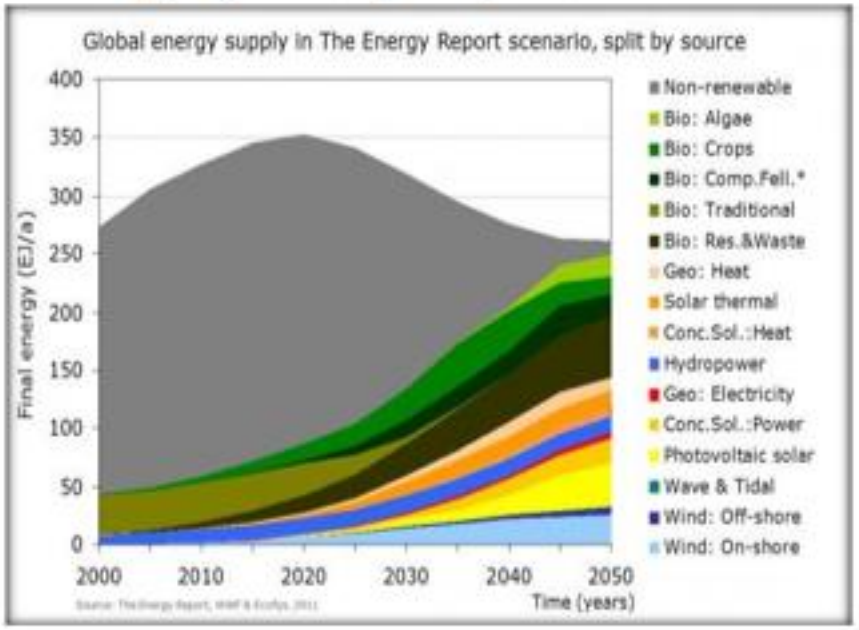
Over 2023 targets en biomassa

Biomassa (BM) is en blijft van belang in duurzame mix, hernieuwbare gassen volgen dan vanzelf

- Energieakkoord 2023 **16%** (350 PJ) is hernieuwbaar; in 2030 **27%**
- Lange termijn ambitie Rijksoverheid/Regering: in 2050 80-95% co2 reductie
- In elk scenario (WNF/Ecofys, Urgenda, IRENA) zal biomassa van belang zijn, ook in NL
- Doorgroei 80 PJ Biomassa naar 350 PJ Biomassa levert scenario 80% emissiereductie op in 2050 (PBL)
- Hernieuwbare gassen zal in veel biomassa ketens een logische rol spelen

NL vandaag: 5,8% hernieuwbaar, >70% BM (incl BMS)

Energy Report 2050 (WWF): > 45 % BM



Gasunie sustainable business development

1 Reducing emissions by smart use of gas

2 Increasing share of green gas in the energy mix

3 Facilitating system integration

Main focus of Gasunie New Energy

Gasunie sustainable business development

2 Increasing share of green gas in the energy mix

- Power-to-gas projects
- Gasification projects
- Fermentation projects

Green Goods farm

The Green Goods Farm of focusses on building an end-to-end biomass conversion value-chain

Green goods Texel

Seeding

- Usage of non-food grass
- Due to controlled (product and process) seeding steady and predictable quality and quantity of biomass can be realized

Harvesting & transport

- Optimized speed of delivery maximizes conversion potential
- Participating farmers are rewarded on measured quality of biomass providing a incentive for good farming

Conversion

- Conversion of biomass into:
  - Animal feed
  - Fertilizer
  - Biogas
- Upgrading and/or liquefaction into:
  - CO2
  - Bio-LNG
  - Bio-CNG

Market

- Selling sustainable materials for the following sectors:
  - Livestock
  - Agriculture
  - Transport (fuel, coolant)
  - Households
  - Industry

End Delivery

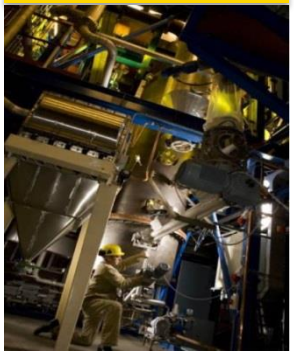
- End delivery of products to customers

New Energy is focusing on the biogas to bioLNG conversion

Ambigo

A gasification technology that can convert waste and dry feedstock into synthetic gas

Gasification



Cleaning
(tar removal)

Methanation and gas upgrading

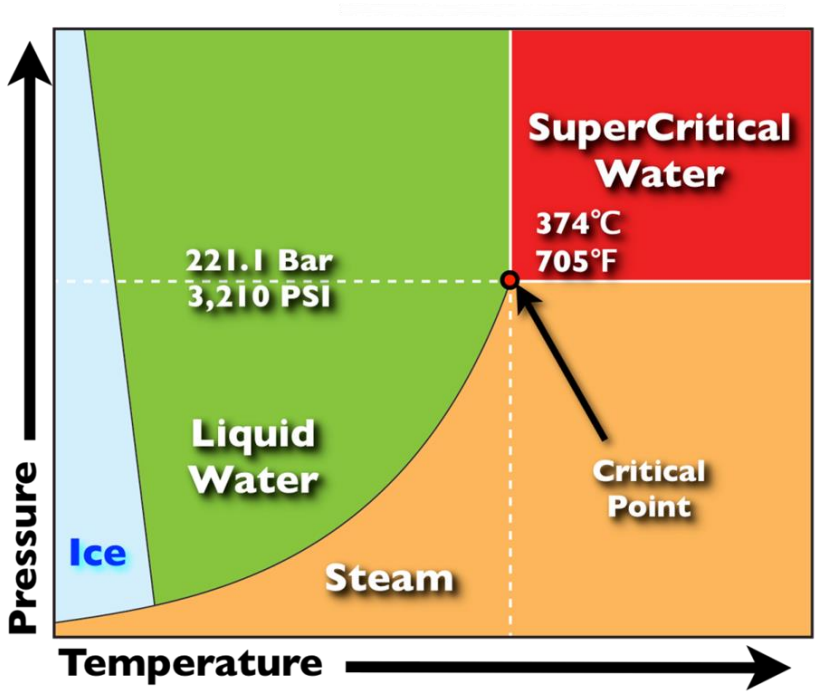
	MILENA	OLGA	ESME
Development phase	0,8 MW demo in Petten India under construction	Ca. 4 MW in Portugal India under construction	

4 MW installation demonstrating the biomass to SNG process in Alkmaar is planned to go on stream in 2017 / 2018

SCW Energy

Producing green gas with an innovative technology

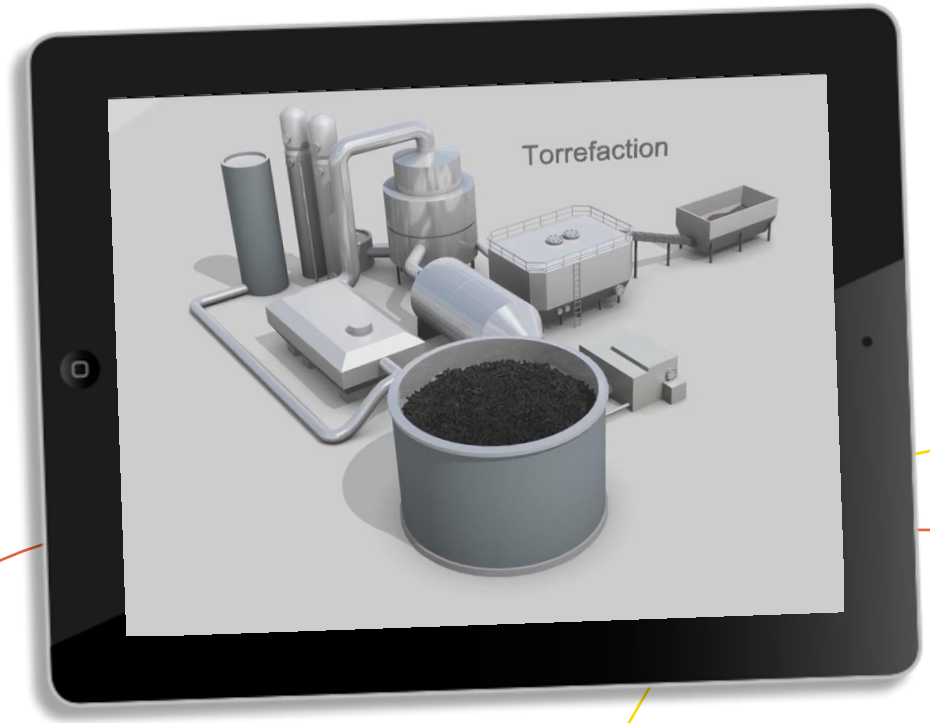
- Demonstration facility for super critical water gasification
- Converting wett biomass into sustainable energy
- Based in Alkmaar, Energy Innovation Parc
- 10 units x 1,000 lts/hr @ 30% dry biomass ≈ 13,500,000 Nm^3 methane



Torrgas

A demonstration facility producing syngas from torrefied biomass

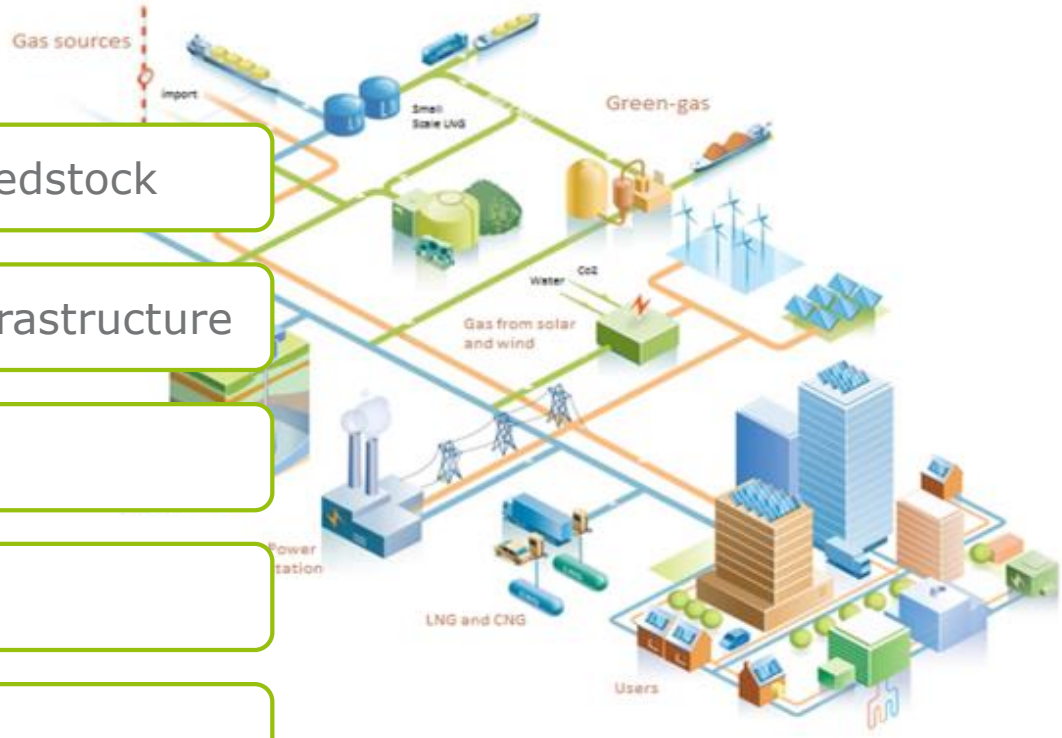
- Torrefaction
- Proven on laboratory scale
- Pilot scale in progress
- Next step: 20 MW facility



Gasunie sustainable business development

3 Facilitating system integration

- Sustainable feedstock
- Biogas, H2 Infrastructure
- Geothermal
- Data Services
- (Micro-) CHPs

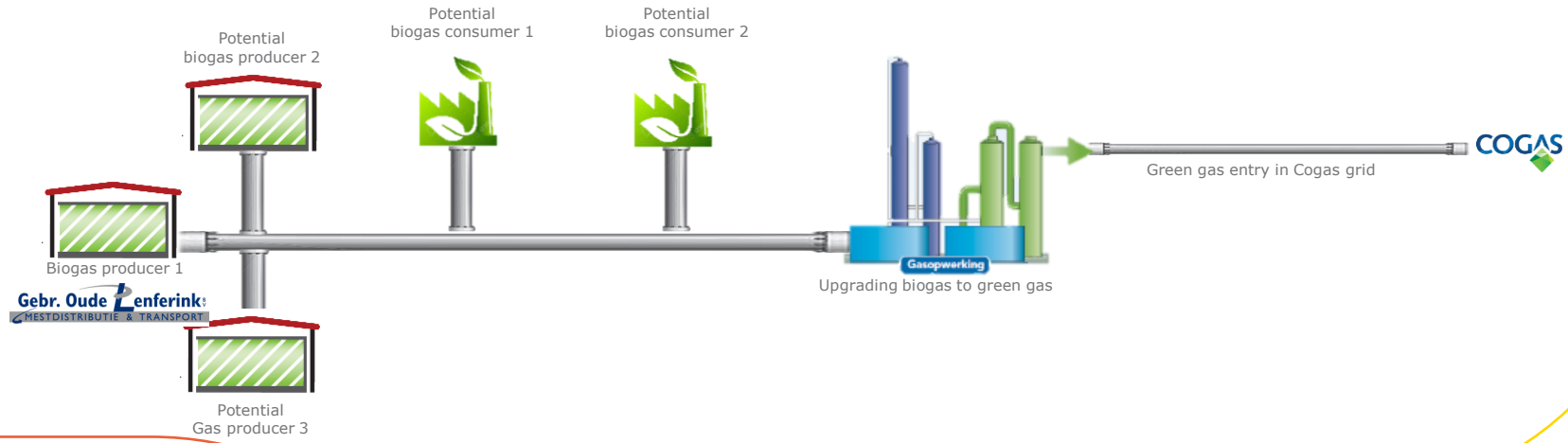


Biogasnetwerk Twente

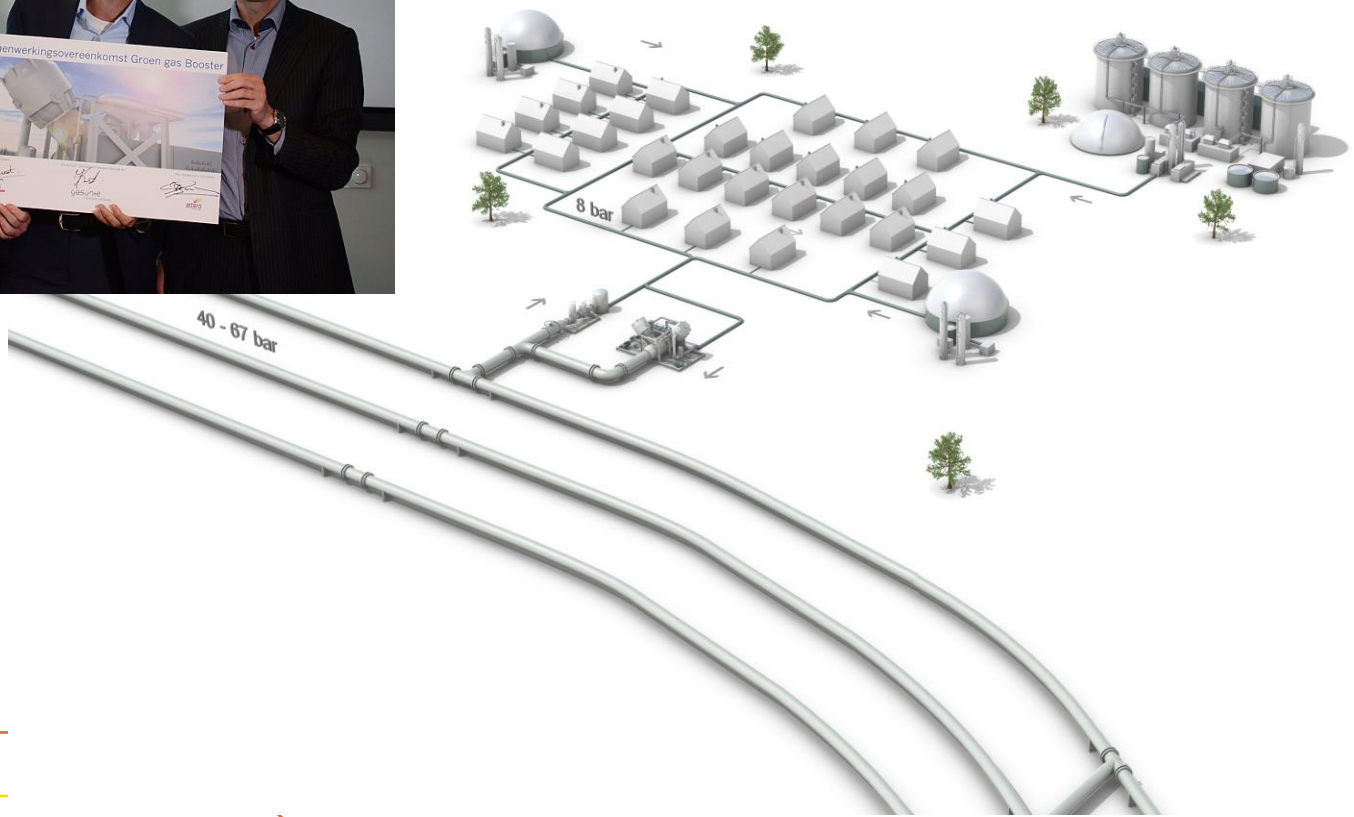
Development of a biogas network in Twente region with multiple biogas producers

Current

Future

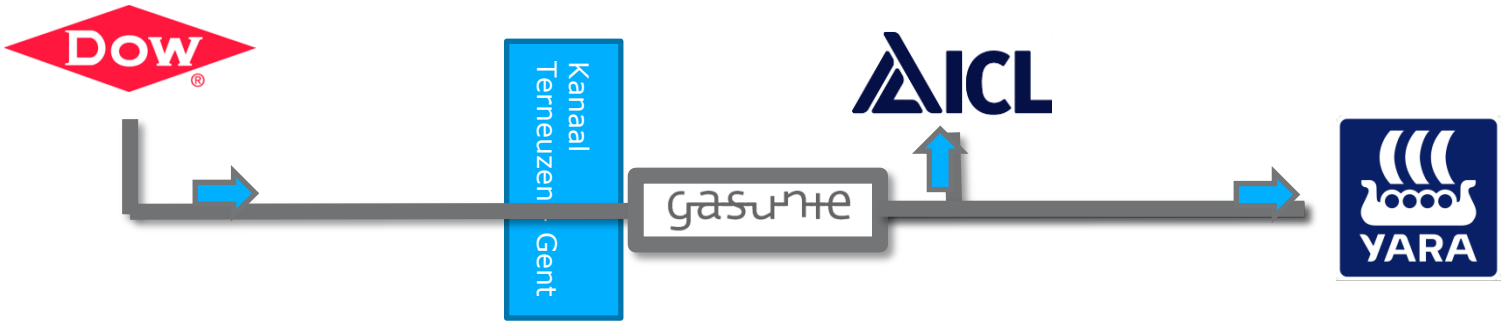


Green gas booster (GasTransportServices)



Hydrogen symbiosis Zeeuws Vlaanderen

- Smart Delta Resources (SDR) want to decarbonize by using residual hydrogen from DOW Benelux (byproduct of ethylene production) as feedstock for Yara (fertilzers) and ICL-IP (bromine processing)
  -> Potential CO2 reduction of 20-40 kTon.
- SDR requested GTS to transport the hydrogen from DOW to Yara and ICL-IP via an existing (but redundant) pipeline.
- Benefits for GTS are:
  - to optimize utiisation of exisiting assets
  - gain experience about hydrogen transport!



SDR is an initiative of 11 energy intensive industries in the Delta region, in the Southwest of the Netherlands.

= Existing pipeline

Name:	A-530-11
Route:	MR Axel – DOW Terneuzen
Age:	1996
Length:	11,7 km
Diameter:	DN400 (16”)
Design pressure:	66,2 bar(e)

Name:	Z-555-11
Route:	MR Axel – Terneuzen
Age:	1966
Length:	700 m
Diameter:	DN300 (12”)
Design pressure:	40 bar(e)

Can GTS transport hydrogen?

- Legal requirements for GTS activities:
  1. Gas to be transported should comply with defintition in the Gas law
  2. Gas quality should be defined in the injection- and delivery specification (MR gaskwaliteit)

- Currently, hydrogen does <u>not yet</u> meet these requirements

- **Green Deal: Ministry of Economic Affairs will eliminate the legel contraints of this initiative!**

- -> H2 transport through this specific pipeline will be added to the MR (approval pending).

Conclusions

- Gas will play an important role in the changing future energy system
- Renewable gas is a cost effective way to reduce greenhouse gas emissions
- Innovation needed to produce the required amounts
- Infrastructure is required to facilitate future use of renewable gas


thanks
for
your
attention
arigato
gracias
merci
spasiba
danke
grazie
cheers
mèsi
nkosi
wado
danki
vinaka
mahalo
talofa
shukran
saha
zikomo
sobodi
matondi
gràcies
buznyg
dėkoju
misaotra
dziekuje
stuutiyi
bayarlalaa
spas
tenki
obrigada
tanmirt
shakkran
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