

DanuP 2 Gas seminar, July 13th 2022

The Danish biogas and biomethane development

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Danish Biogas Association

The organisationen for all stakeholders in biogas

Mission

- Promote production and use
- Promote cirkular economy
- Capacity building
- Networking and knowledge sharing

Members

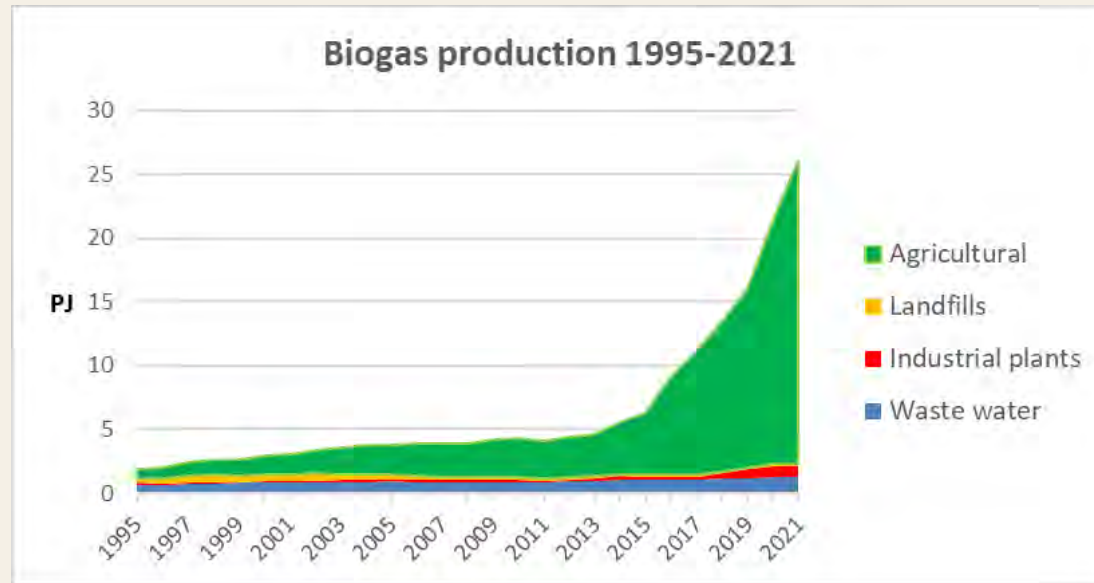
- Producers and users of biogas
- Biomass suppliers and users
- Technology and equipment suppliers
- Consultants and knowledge institutions
- Energy, waste and agriculture sectors
- Approximately 190 members



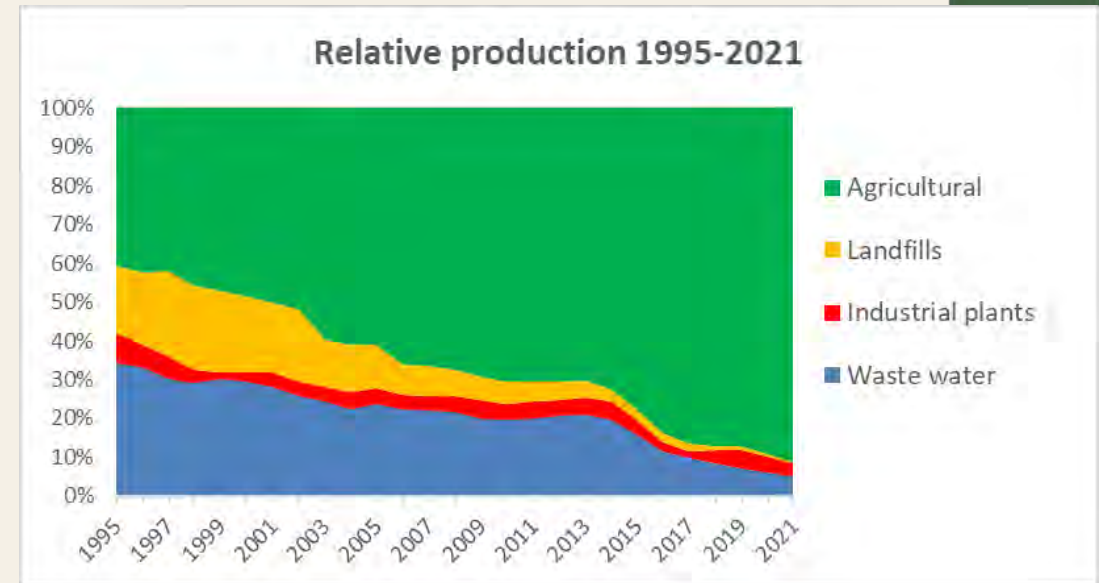
Danish biogas - a developing sector

From urban service to rural development

Expanding biogas production



Danish biogas is agricultural based

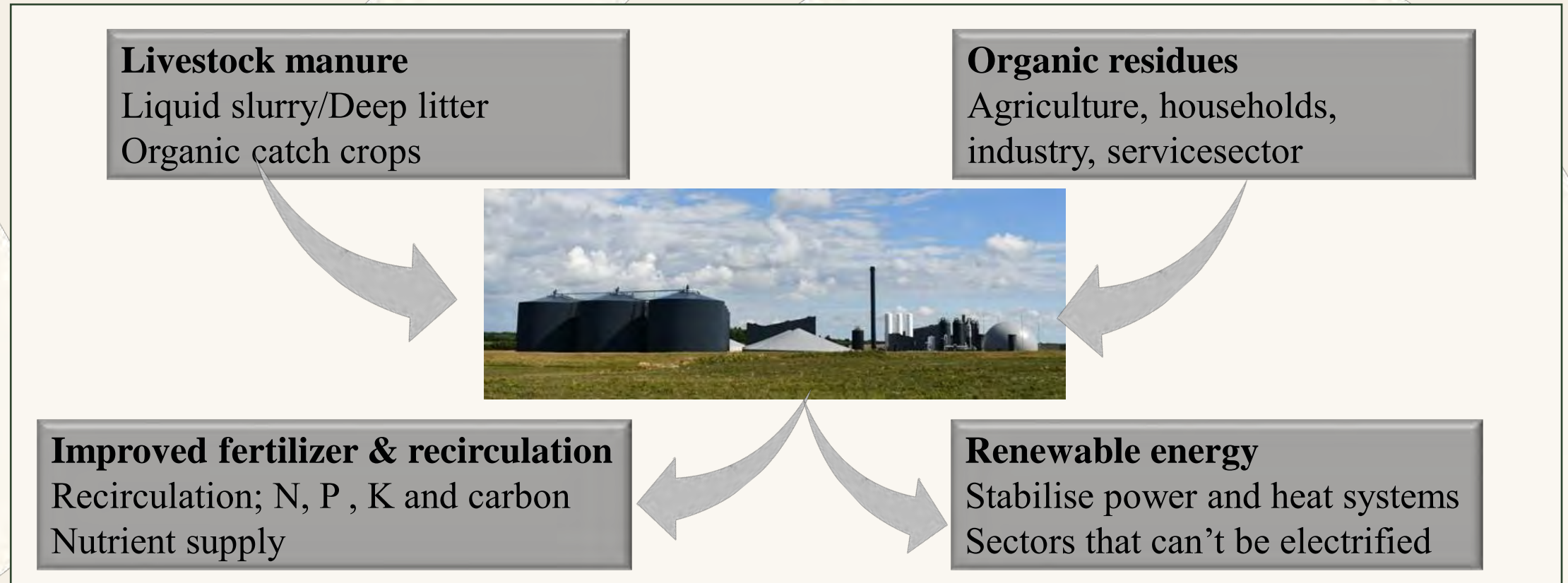


Fact:
In 2021 28 per cent of Danish manure was digested
Biogas substituted 25 per cent of gas consumption

Projection in 2018:
In 2020, 20 per cent of Danish livestock manure will be digested in biogas plants
Producing 20 PJ biogas which substitutes 20 per cent of natural gas

Danish Biogas Model

Sustainable agriculture and security of supply of renewable gas based on residues

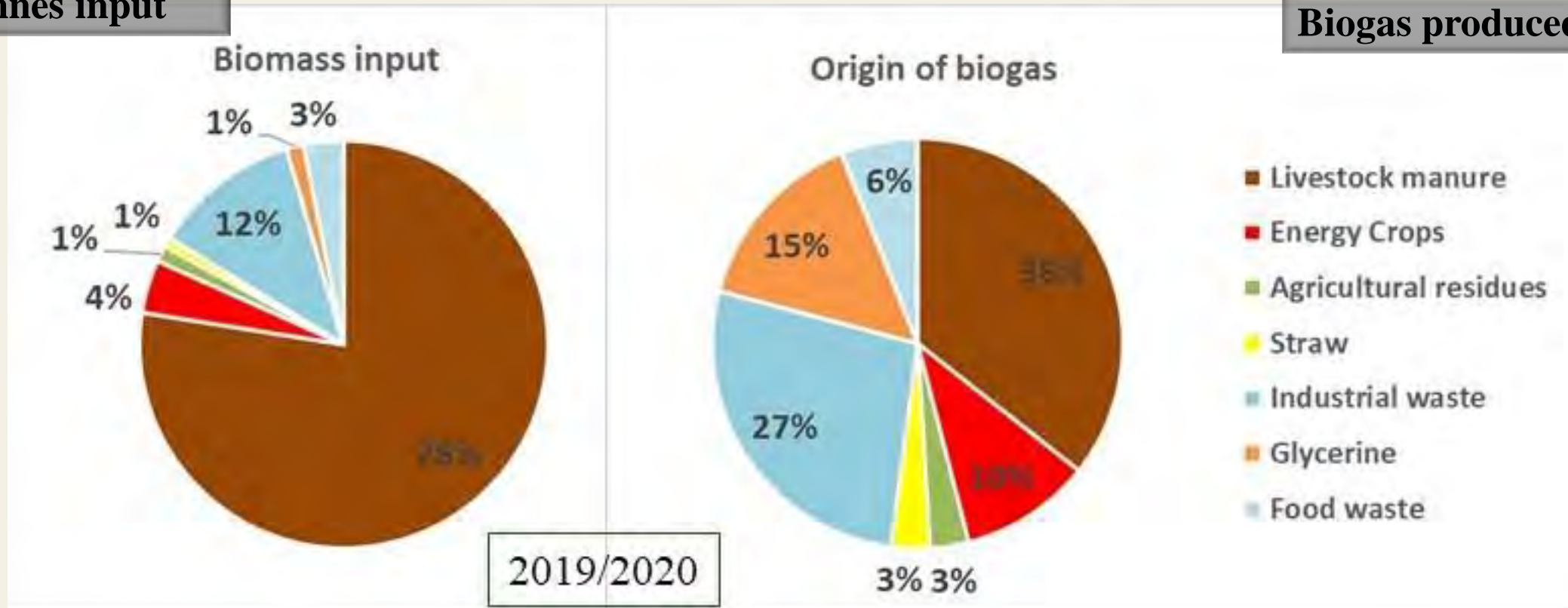


Based on residues

From agriculture, industry and households

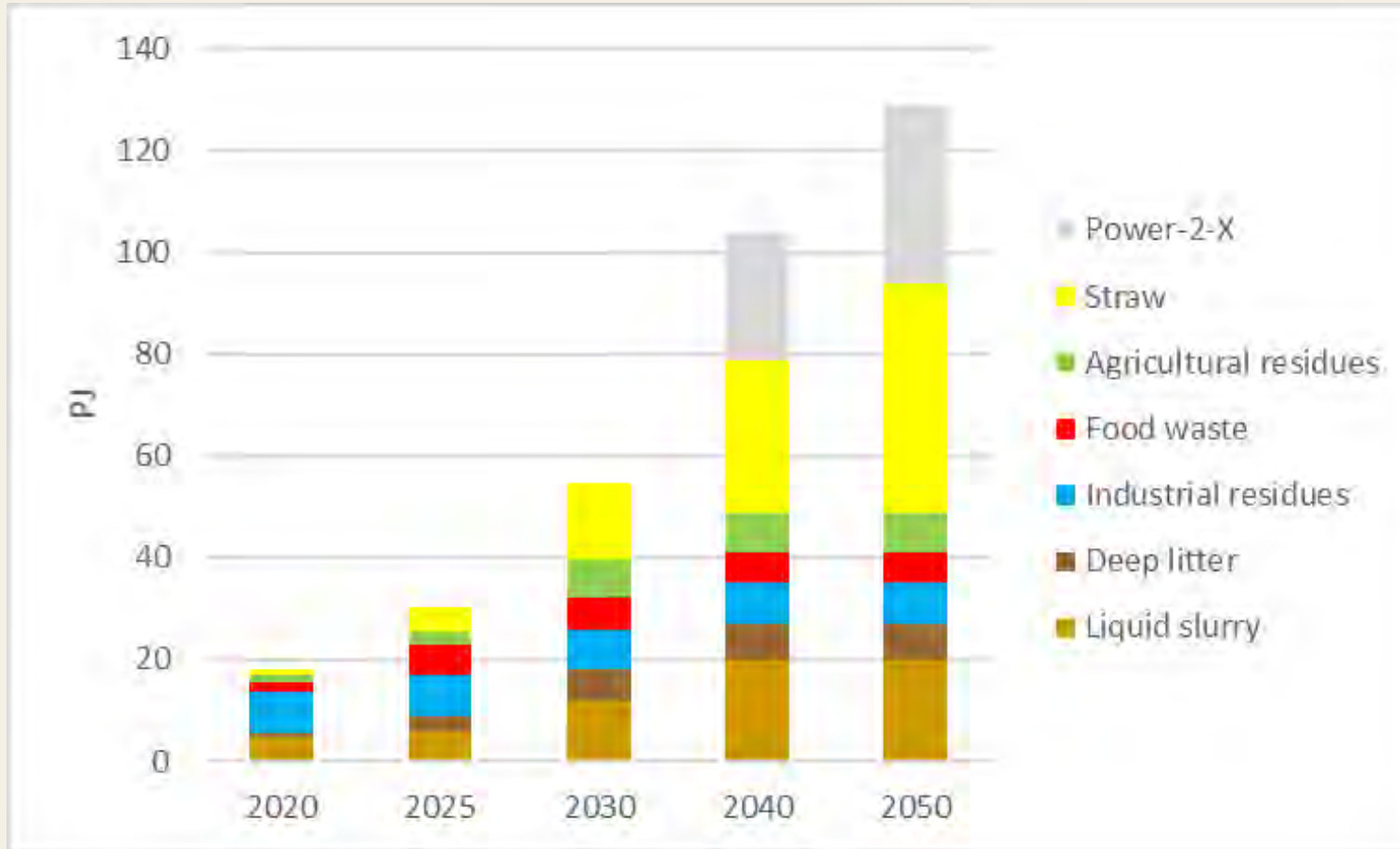
Tonnes input

Biogas produced



Resources are key

Biogas potential 2020 – 2050*

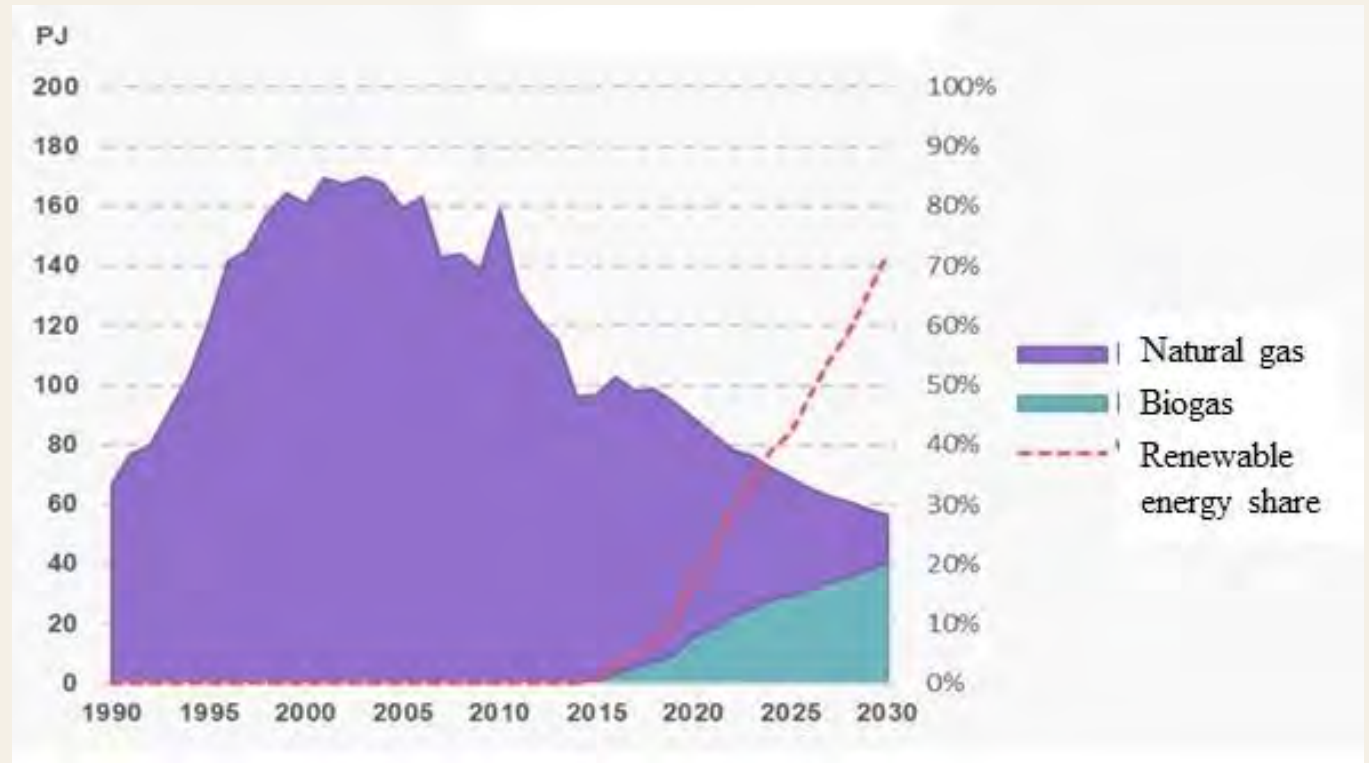


Green gas transition

From fossil natural gas to renewable biogas in grid



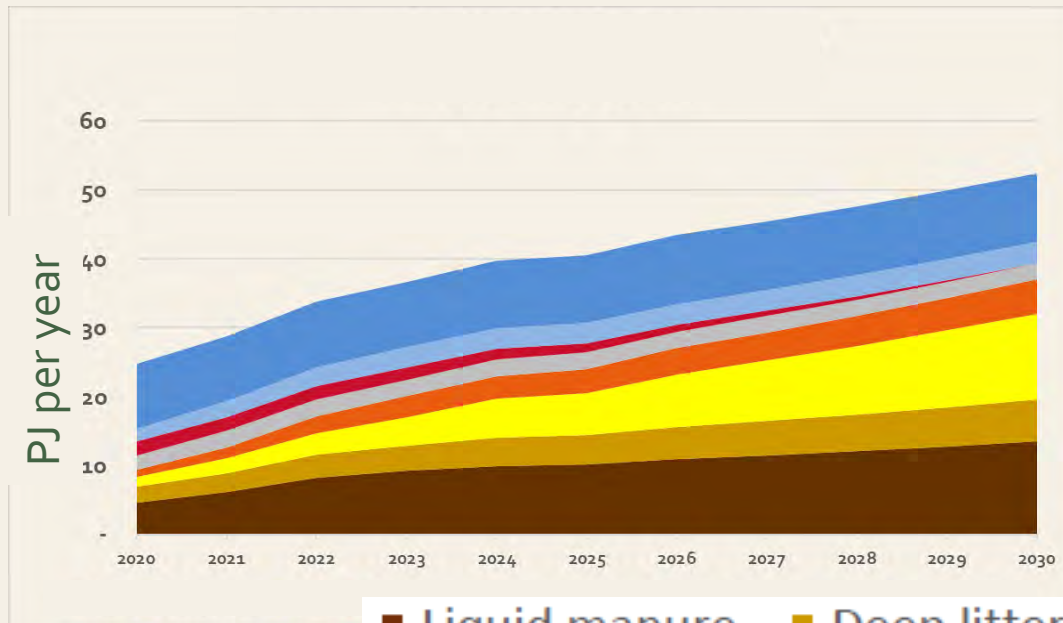
70 per cent of gas in grid biogas in 2030*



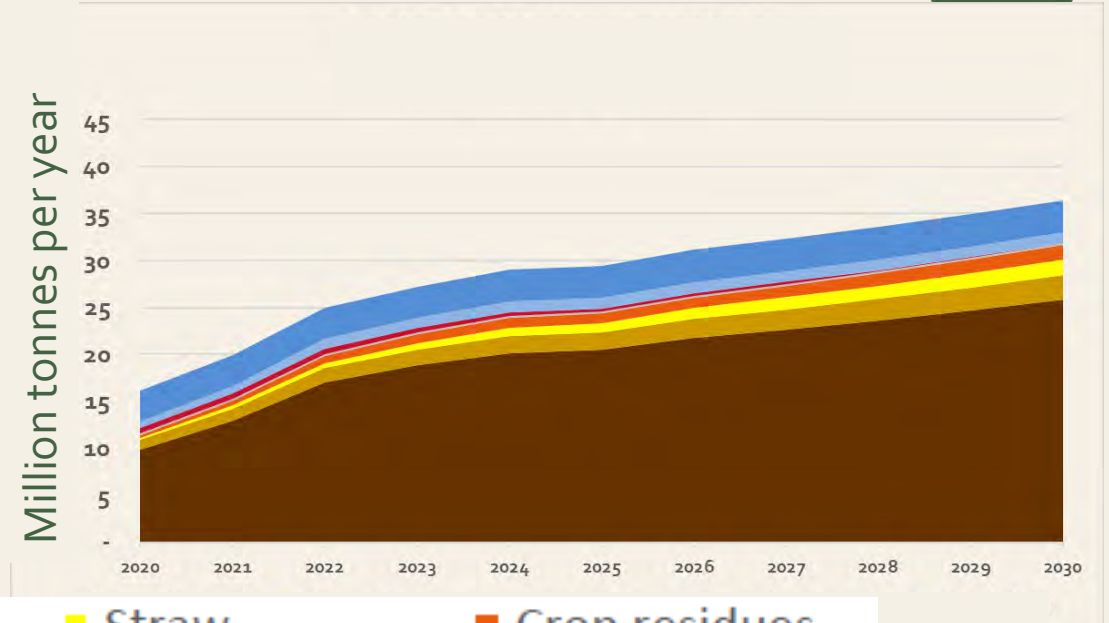
Agricultural residues the prime source

Two thirds of energy - manure number one, straw the next big

Origin of biogas, PetaJoule



Biomass input, Tonnes



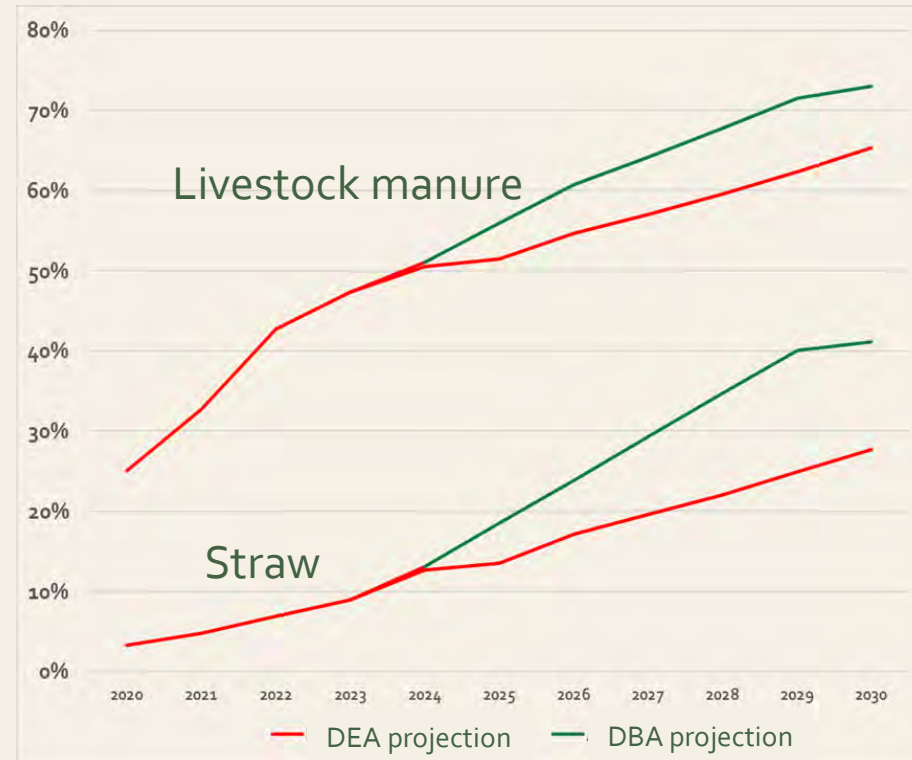
- Liquid manure
- Deep litter
- Straw
- Crop residues
- Sewage
- Energy crops
- Food waste
- Industrial waste

Future development

Utilisation of the potential in manure and straw



Percentage of manure and straw*



Framework conditions*

Biogas - a tool in many policies

| Agricultural policy | Energy policy | Circular economy | Climate |
|--|---|---|---|
| Green growth 2009 <ul style="list-style-type: none">• Investment grants• Target: In 2020 50 % of livestock manure into biogas plants | Energy agreement 2012 <ul style="list-style-type: none">• Improved FiT (power)• New FiT upgrading, transportation, process and heat | Ressource strategy 2013 <ul style="list-style-type: none">• In 2023 reuse 50 % of household waste• Organic fraction from incineration to biogas | Climate law 2019 <ul style="list-style-type: none">• 70 % reduction of greenhouse gas emissions by 2030• Climate partnerships |

2012 Energy Agreement

New support schemes – new markets

**Support given to the USE
- Not the production of biogas**



Biomethane in gas grid

Combined power/heat

Process in industry

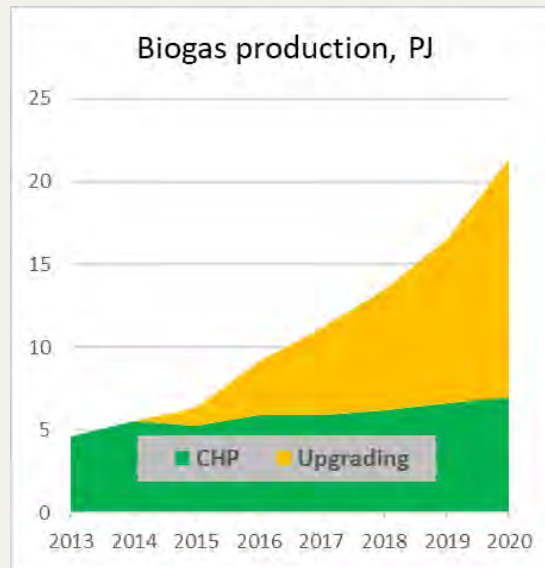
Transportation fuel

Heat production

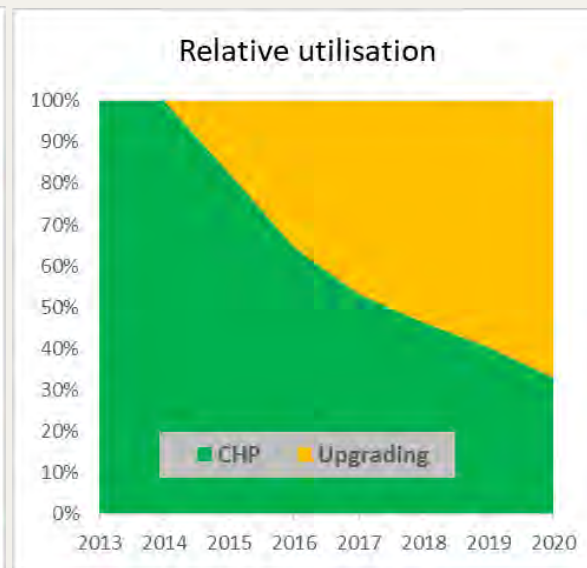
Biogas – the storable Renewable Energy

Fast turnaround from CHP to upgrading

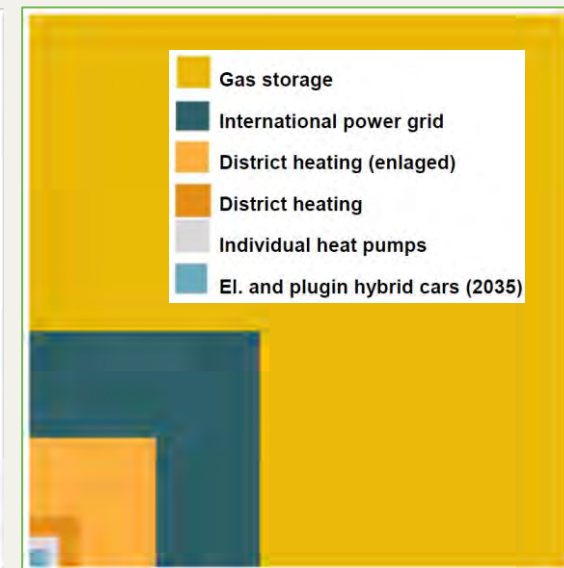
Rapid growth



Growth is in upgrading



Gas grid: the big battery*

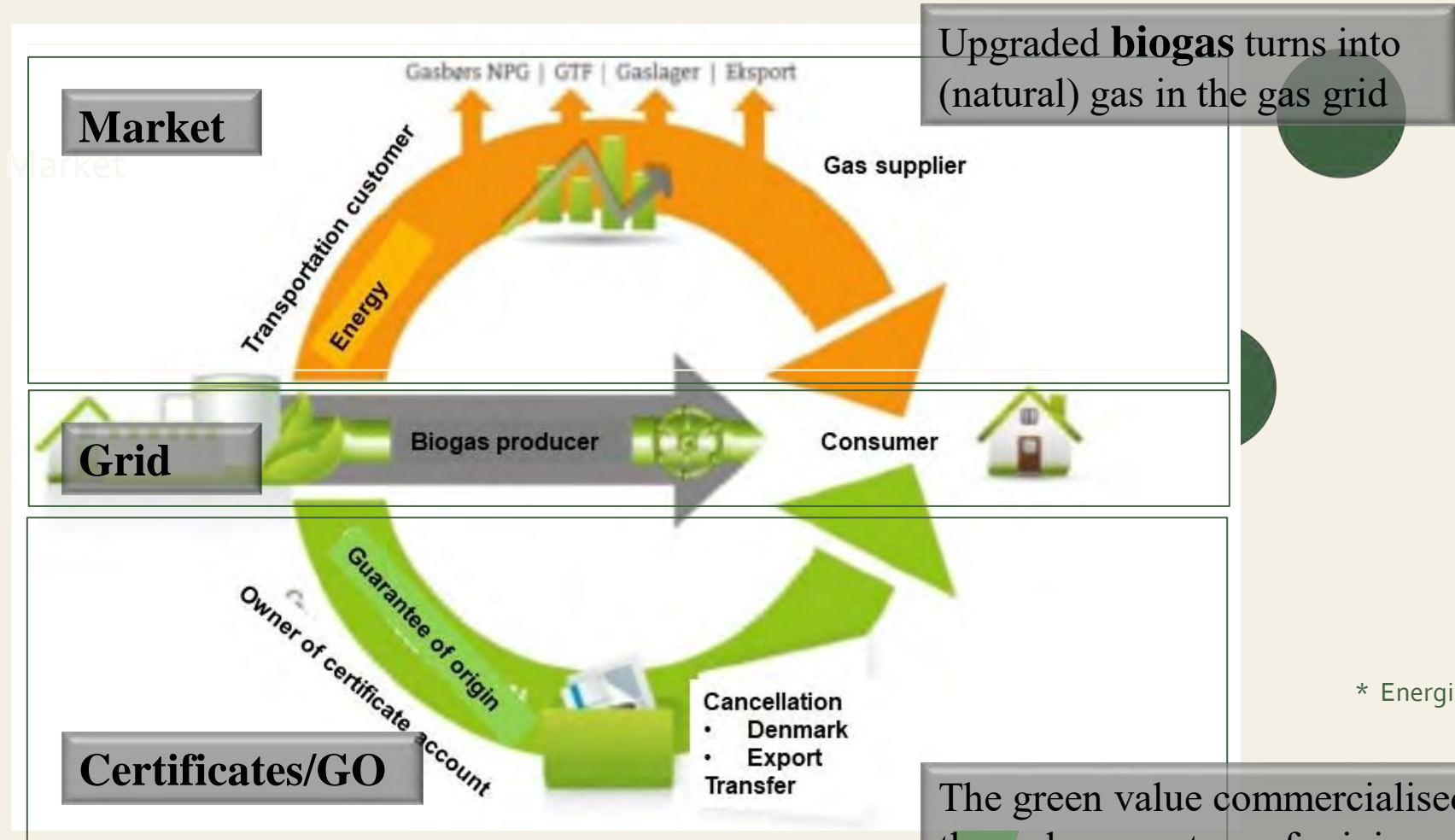


* The Danish gas grid can store energy in biomethane equal to the electricity to power all Teslas on a parking lot 13 times around the Earth



Market model for biomethane*

Market initially Danish model – now RED II



* Energinet

Energy agreement 2018

No access for new projects – guarantees to plants in operation*

Are in 2012 support scheme if

Either

- Irreversible investments by 8 February 2019
- Necessary permits by July 1 2019
- In operation by end of 2022

Or

- In operation by end of 2019

Guarantee for investors

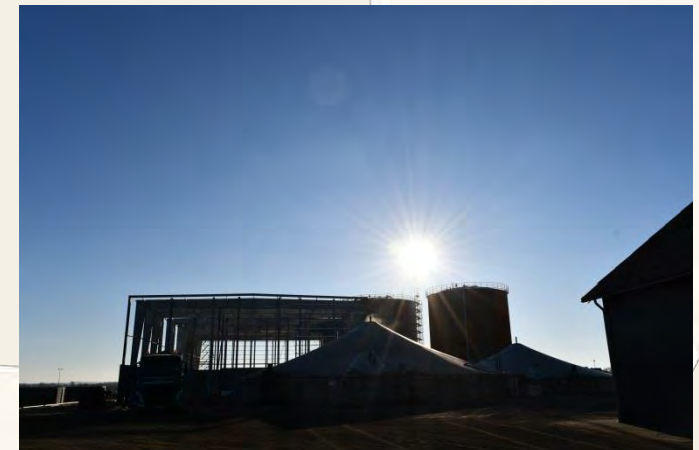
Written guarantee from government

- FiT for 20 years (minimum until 2032)*
- For fixed volume per year

Assessment of overcompensation

- Due to state-aid-approval
- Regulation if over-compensation

* DEA guarantee FiT for 42 PJ biogas per year



Climate agreement 2020

Tenders for 92 million € in 2020 climate agreement for industry and energy***

Adopted by Parliament*

Tenders for new biogas production *

| | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | Total |
|------------|------|------|------|------|------|------|------|-------|
| DKK | 200 | 0 | 150 | 75 | 75 | 90 | 88 | 678 |
| EUR | 27 | 0 | 20 | 10 | 10 | 12 | 12 | 92 |

* Climate agreement for energy and industry June 22 2020

Should be speeded up

Proposal to push tenders forward **

| | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | Total |
|------------|------|------|------|------|------|------|------|-------|
| DKK | 350 | 328 | | | | | | 678 |
| EUR | 47 | 44 | | | | | | 92 |

** Proposed by DBA, liberal and socialist parties in Parliament April 2022

*** DEA expects 10 PJ biogas per year

A shift in framework conditions

From specified Feed-In-Tariffs to targeted Tenders

2012 Energy Agreement

Specific FiT for different purposes

- CHP, Gas grid, Industry, Transport., heat
- Originally without limit (volume, time)
- Guaranteed for 20 years for fixed volume
- Up to 42 PJ per year

2020 Climate Agreement

Tenders for 2024 – 2030

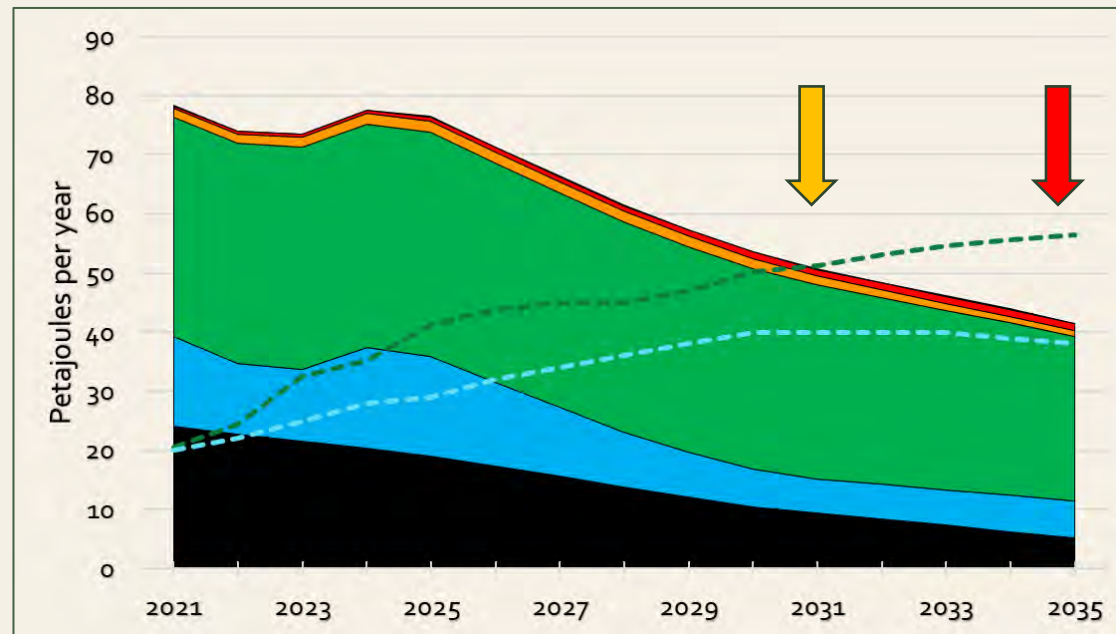
- Biogas and other green gases
- Only for biomethane
- Guaranteed for 20 years
- Up to 10 PJ per year

**The necessary support schemes are adopted
How fast will it be implemented? 2030/2035 or faster?**

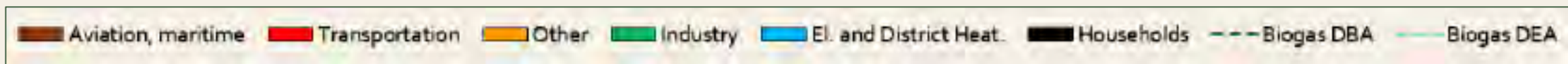
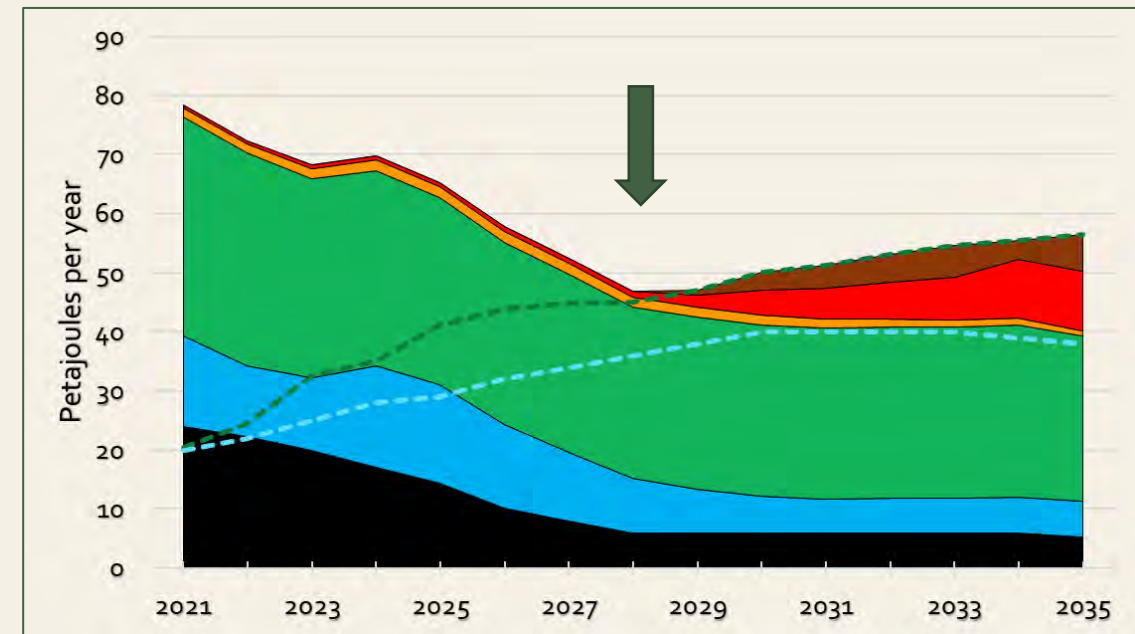
100 per cent biogas* in grid

Russian invasion of Ukraine enforces phasing out of fossil gas

Projection 2021



Projection 2022



Solutions to multiple challenges

Production and use of biogas has several positive effects

Advantages of biogas

- Reduced leaching of nitrates
- Recirculation of nutrients
- Reduced greenhouse gas emission from agriculture and energy sectors
- Fossil fuel substitution
- Jobs in construction phase, management and maintenance

Biogas – a key in many sectors

- Sustainable agriculture and food
- Circular economy
- Climate
- Sector integration, PtX, CCS, CCU
- Fossil independence



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