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OF DENMARK
The Trade Council

ENERGY NETWORKS AUSTRALIA AND BIOENERGY AUSTRALIA

BIOGAS SYMPOSIUM

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Trade Commissioner of Denmark to Australia & New Zealand

Sydney, 6th June 2019

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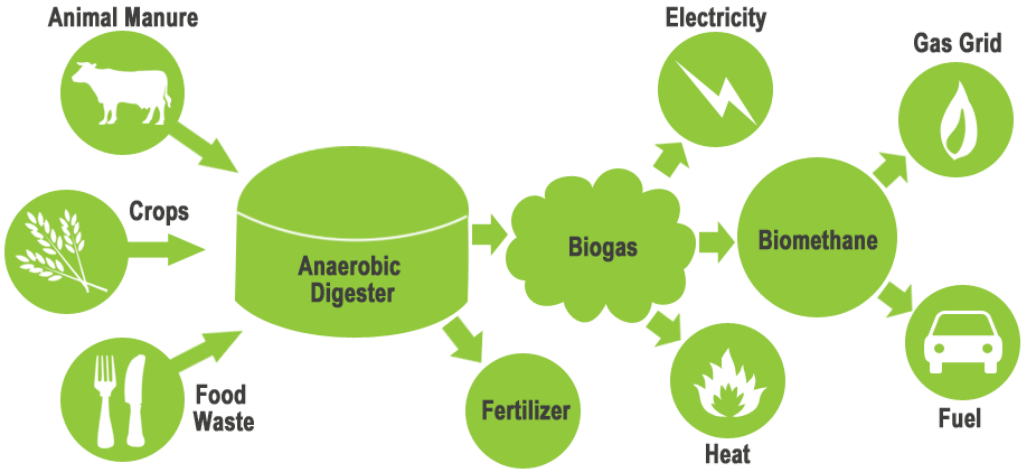
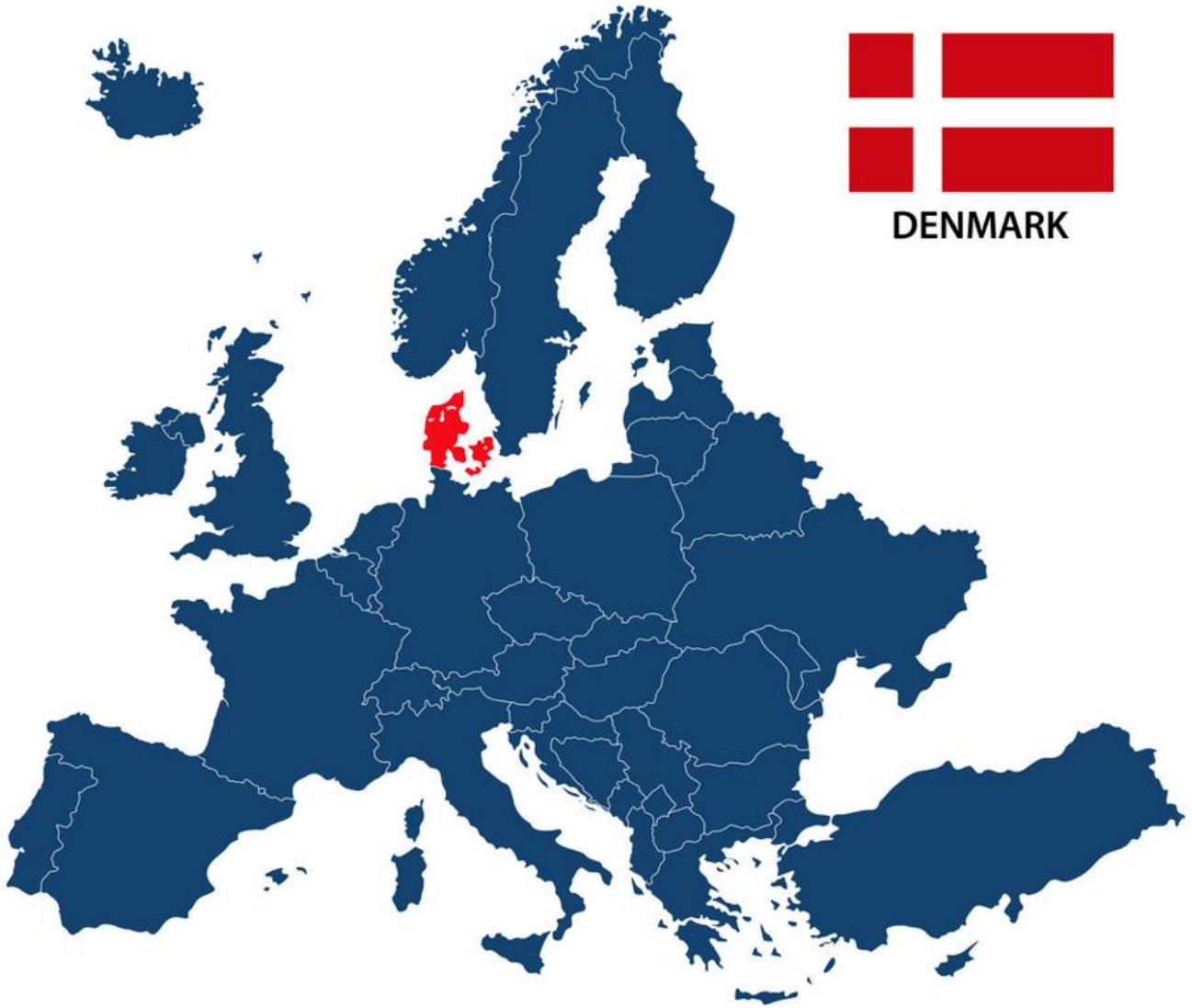
BACKGROUND

- **The Trade Council** consist of two handfuls of commercial consultants set out to drive business growth between Denmark, Australia and New Zealand
- **CR**
- Our purpose is to ensure knowledge sharing between sector specialised Danish companies and Australian businesses - in other words:
- **We analyse Australian challenges and match these with Danish competencies**

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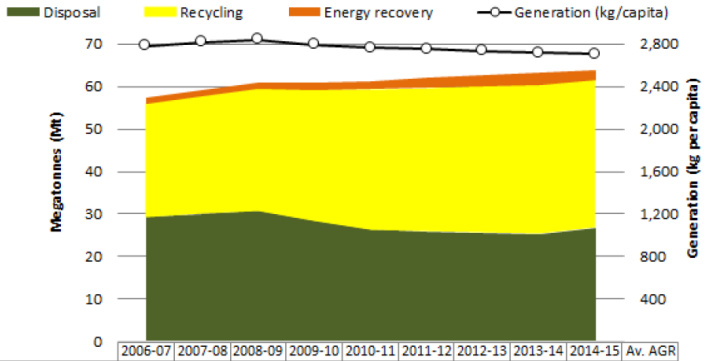
PROBLEM: AUSTRALIA'S TRADITION FOR LANDFILL AND WASTE MANAGEMENT

- **40% of the Australian waste is disposed to landfill,** caused by poor traditions involving access to massive landmasses, and many abandoned open-pit mines that were traditionally converted into landfill
- The generation of waste in Australia increases on average by 1.2% per year
- The **64Mt waste** generated 2014-15 comprise of **13Mt organics** (20.3%)

Figure 7 Trends in waste generation and fate, Australia 2006-07 to 2014-15



	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	Av. AGR
Generation (kg/cap)	2,783	2,815	2,837	2,790	2,765	2,751	2,732	2,718	2,705	-0.3%
Generation (Mt)	57	59	61	61	61	62	63	63	64	1.2%
Energy recovery (Mt)	1.4	1.4	1.5	1.7	2.0	2.3	2.6	2.9	2.3	6.0%
Recycling (Mt)	27	28	29	31	33	34	34	35	35	3.0%
Disposal (Mt)	29	30	31	29	26	26	26	25	27	-1.0%
Recovery rate	49%	49%	50%	53%	57%	58%	59%	60%	58%	1.9%

Relies on interpolation for 2007-08, 2011-12, 2012-13 for all states and territories. 'Av. AGR' means average annual growth rate.

In Denmark waste to landfill equals
5% of the waste stream

Source: Australian National Waste Report 2016

DRIVER: BIOGAS INDUSTRY

Multiple factors are driving the industry to handle organic waste more efficiently

OVERALL

- **Demand for $C0_2$ neutral energy production**
- **Increasing electricity & gas prices**

URBAN WASTE INDUSTRY

- A combination of **rising landfill levys** and
- **High feed in tariffs**

AGRICULTURE

- Anaerobic digestion of livestock manure in biogas plants
  - improves the value as fertilizer: 5-8 kg more N available per LU*
  - Reduces leaching of nitrate with 2 – 4 kg per LU*
- Hence, we see a demand for utilising digestate as soil fertilisation instead of/or supplementing artificial fertilisers

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DRIVER: LOCAL GOVERNMENT WASTE STRATEGIES

New South Wales

- Increasing recycling rates to:
  - 70% MSW
  - 70% for C&I
  - 80% for C&D
- **Increase waste diverted from landfill to 75%**
- Managing problem wastes better, establishing 86 drop-off facilities and services across NSW

Queensland

- Queensland State Government commitment to zero avoidable waste to landfill by 2050
- Local Government Association of Queensland (LGAQ) **zero waste to landfill by 2028 target**
- Introduction of levy on landfill waste in 2019 with investment of funds to waste management initiatives

Western Australia

- **Landfill diversion:**
- **MSW metro 50% by 2015 and 65% by 2020**
- MSW regional centres 30% by 2015 and 50% by 2020
- C&D 60% across the state by 2015 and 75% by 2020
- C&I 55% across the state by 2015 and 70% by 2020.

South Australia

- **35% reduction in landfill by 2020**
- 5% reduction in waste generation per capita by 2020 For metropolitan Adelaide:
- **MSW landfill diversion of 70% by 2020**
- C&I diversion of 80% by 2020
- C&D diversion of 90% by 2020

Australia Capital Territory

- Waste generation grows less than population
- Expand reuse of goods
- Waste sector is carbon neutral by 2020
- Double energy generated from waste
- Recovery rate increases to over:
  - 85% by 2020
  - 90% by 2025

NT, TAS & VIC: *No numerical targets in their strategy*

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DRIVER: BIGGEST FOOD WASTERS IN THE WORLD

RANK/REGION	POUNDS OF FOOD WASTE PER PERSON /PER YEAR	TYPES OF FOOD MOST WASTED
7 South/Southeast Asia	227 pounds	Grains
6 Sub-Saharan Africa	350 pounds	Roots/tubers
5 North Africa & West/Central Asia	460 pounds	Grains
4 Latin America	495 pounds	Fruits/vegetables
3 East Asia	530 pounds	Roots/tubers
2 Europe	610 pounds	Roots/tubers
1 North America Oceania	640 pounds	Roots/tubers

SOURCE: The Food and Agriculture Organization of the

TECH INSIDER

- Australia is **among the biggest food wasters in the world**
- Food waste is estimated to cost the Australian economy around **$20 billion** each year

THE GREEN TRANSITION IN DENMARK

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DENMARK'S GREEN TRANSITION

1970'S TO TODAY

- It was the oil crisis in 1973 that triggered the **Green Transition**
- As many other nations, Denmark was once entirely dependent on imported oil and other fossil fuels
- We began to invest in renewable energy and focus on energy efficient solutions to become independent

SINCE THEN

- Since the mid 1980's Danish GDP has increased by +70 percent, while **energy consumption has remained** unchanged and our **water consumption has decreased by 40 percent**
- Based on a need for energy security, today, more than **30% of our energy needs are from renewables**
- Our degree of self-sufficiency is 90%. This is not just a matter of security and supply, but a long term driver for green growth

HOW?

- Political stability has been important in securing long-term investment and establishing ambitious, long-term targets
- To finance the green transition, we **encourage public and private partnerships (PPP)**
- These partnerships are allowing governments to enact regulations and programs with the support of the industry and it lets citizens invest through shared ownership - example later

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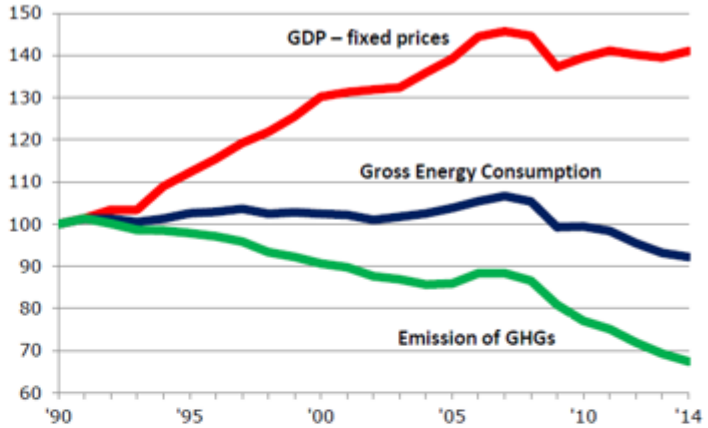
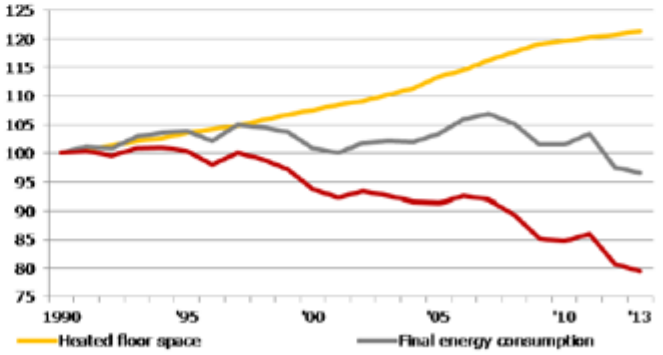
DENMARK'S GREEN TRANSITION

DECOUPLING ECONOMIC GROWTH FROM ENERGY CONSUMPTION

- The world's highest share of new renewables (non-hydro) in electricity generation – 56 % in 2015.
- 43 % share of wind power in electricity generation (2017).
- Very high degree of energy security (99,996% for electricity).
- Energy consumption per GDP-unit is lower than in any other EU-country.
- … while maintaining economic growth and reducing GHG emissions

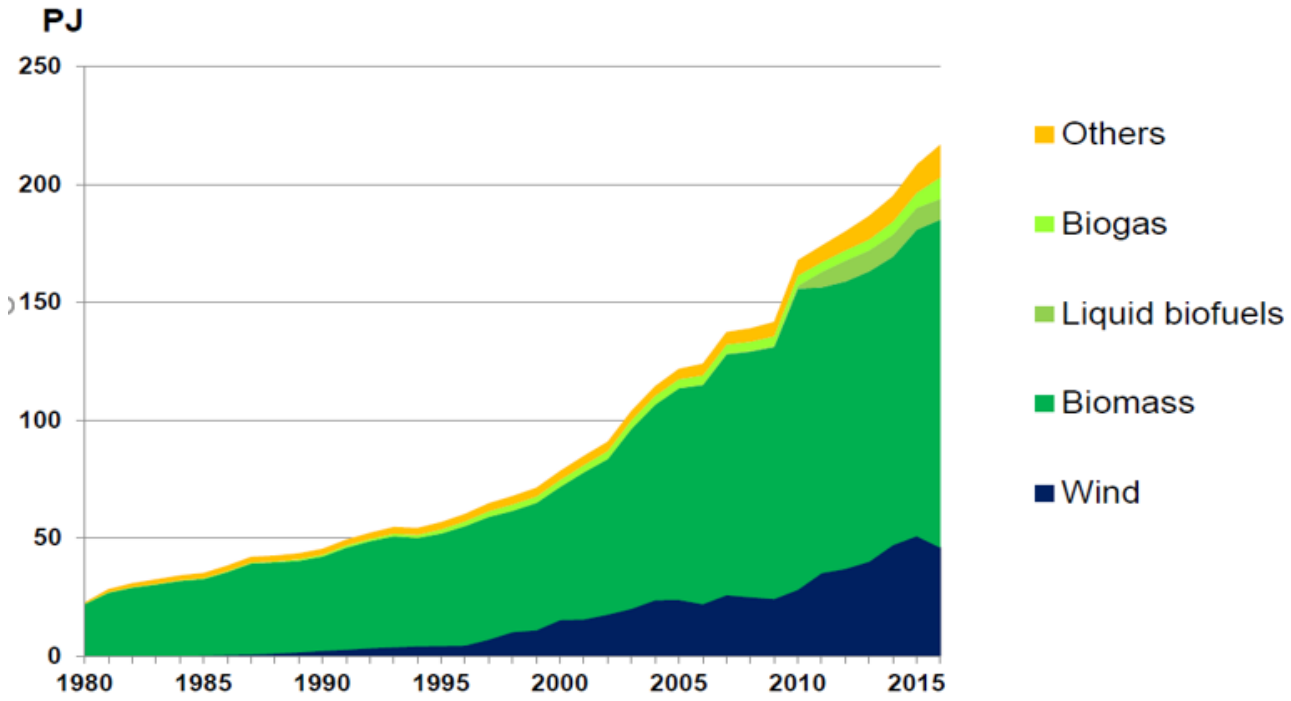




Danish Energy Agency

Source: Danish Energy Agency

CONSUMPTION OF RENEWABLES BY FUEL



BIOGAS

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KEY ELEMENTS OF DANISH BIOENERGY POLICY

2009-2017 A CONTINUOUS DEVELOPMENT

Green growth agreement 2009 (Agricultural policy)

- 50% manure in biogas in 2020
- 20% investment grant (increased to 30% in 2012)

Energy agreement in March 2012: Feed in tariffs (Energy)

- Improved: electricity from 79 – 115 DKK/GJ **(17 – 25 AUD)**
- New: Bio methane in grid: DKK 115/GJ (25 AUD)
- New: Transport and Industry DKK 75/GJ (16 AUD)

Resource strategy 2013 (Environmental / Circular Economy)

- 50% of household waste for reuse in 2023
- Including substantial biogas generation from municipal waste

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KEY ELEMENTS OF DANISH BIOENERGY POLICY

2018-2024

- In June 2018, the Danish government signed an energy agreement with the **unanimous support** of all parties in the Danish parliament
- EUR 564 million is allocated to a tender process (starting in 2020), where **different technologies can compete on delivering green electricity at the lowest price**
- More than **EUR 537 million (AUD 865) is allocated to expand the production of green biogas**
- A modernisation of the heating sector for energy efficiency
- EUR 67 million is allocated to green transportation in 2020-2024
- **Phase-out of coal in the Danish electricity production by 2030**
- This new agreement also ensures obligations towards the UN Sustainable Development Goals are fulfilled
- Restricted use of fertiliser/ manure on fields
- **Ban on organic waste to land fill**
- Fees for waste treatment co-digestion

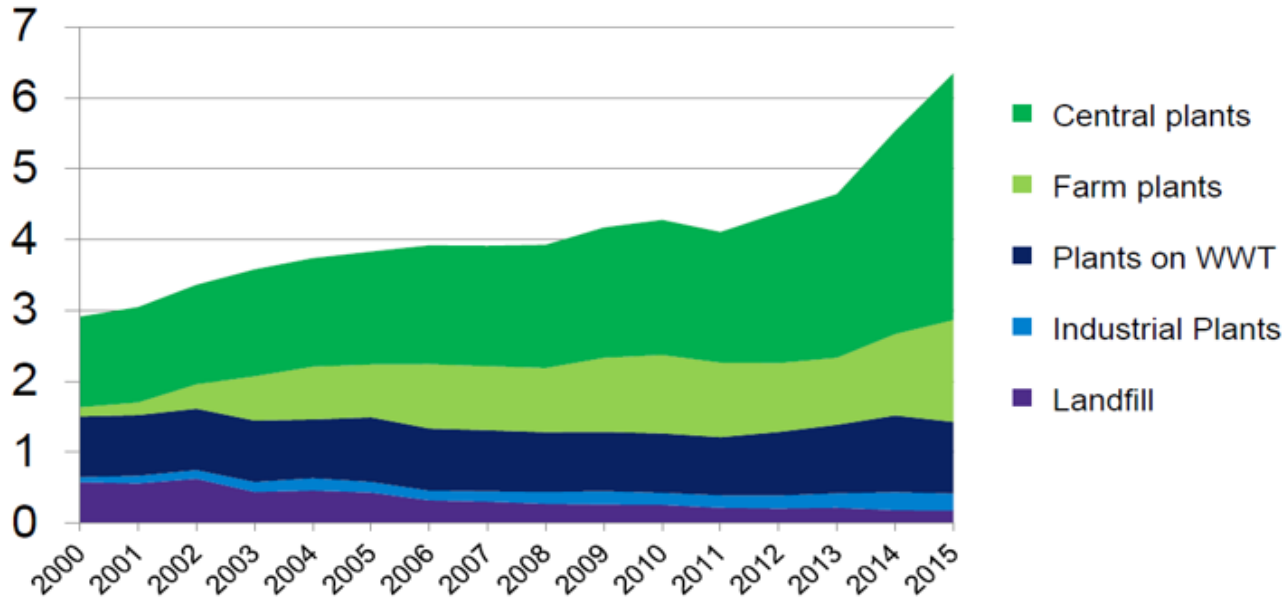
TODAY: 160 BIOGAS PLANTS ON 44,000 SQ KM

- Denmark is 5% the size of New South Wales. Perhaps a small area but a 100% scalable business model
- Biogas plants were traditionally owned by farmers or municipalities
- Today, the trend is that **investors are entering the market** (energy companies for example) - in co-ownership with farmers or industries
- **A few noticeable trends**
  - Upgrading to Biomethane (grid)
  - Industrial Waste (13% of waste generates 53% of the gas)
  - Centralized larger facilities

BIOGAS PRODUCTION

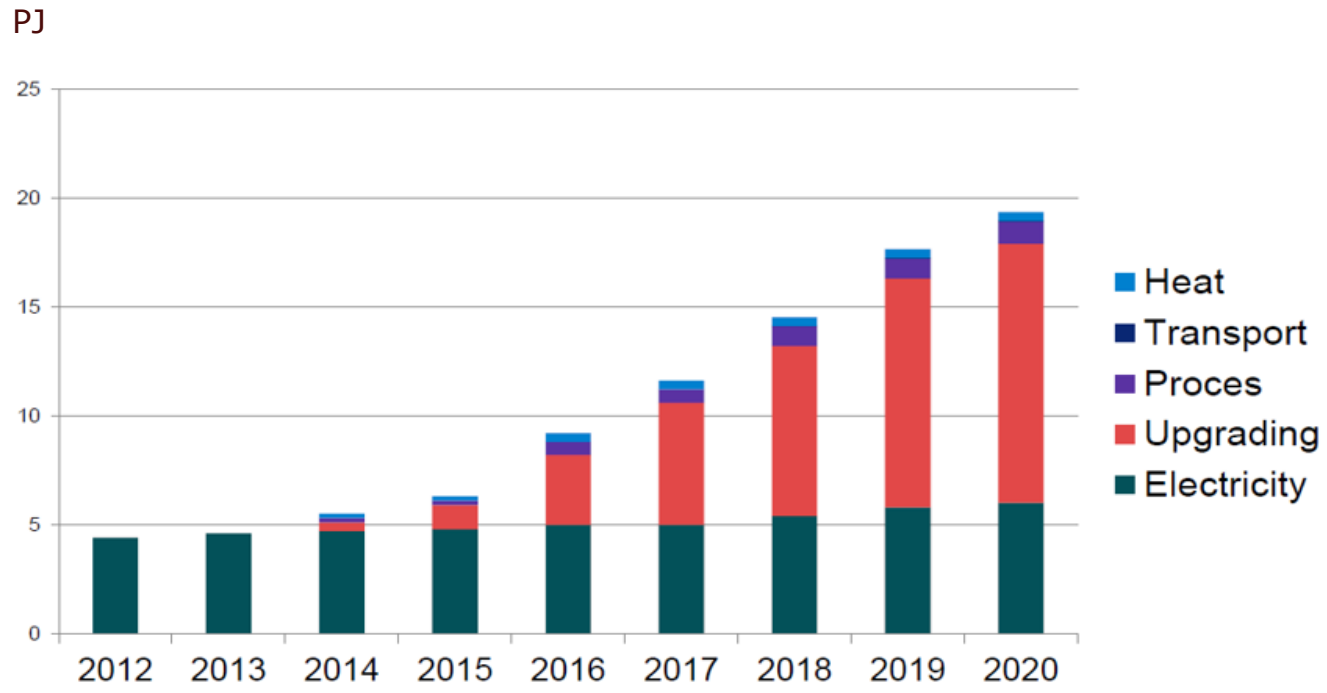
2000 – 2015 PRODUCTION DEVELOPMENT VARIOUS SOURCES

PJ



BIOGAS PRODUCTION

2012-2020 WHAT HAPPENS TO THE GAS



Who is State of Green?
State of Green is a not-for-profit, **public-private partnership from Denmark**. State of Green foster relations with international stakeholders interested in discussing their challenges and bring into play relevant **Danish competencies** and technologies that enable the **green transition.**

2035
According to a memorandum published by Green Gas Denmark, **Denmark's gas grid could be running entirely on green gas in 2035**. When so, Denmark will be the first European country to become independent of natural gas and cover the consumption entirely through gas produced from **food waste, industrial waste and agricultural by-products**.

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DANISH & AUSTRALIAN SYNERGIES

THERE ARE PARALLELS

- **Denmark** is a food and agriculture nation producing enough food for **3 times** its population. Similarly **Australia** is producing food for > 60 million people.
- The Danish proportion of waste to landfill **has fallen from 39% in 1985 to 5% today**
- As **Australia is at 40%** to landfill today, Danish expertise might contribute and support with important elements of the Danish experience in Australia
- This includes recycling, Biomass and Biogas
- The nexus of the waste and energy crisis in the Australia creates the right time for biogas, initially to meet industrial demand and later supplying green gas to the grid.
- To utilise the opportunities and share expertise – we have created the **Danish Biogas Alliance**
- Let us help boost Australia's **GREEN TRANSITION**

DANISH BIOGAS ALLIANCE IN AUSTRALIA

Combigas®
Complete biogas solutions

COMBIGAS stands for engineering, developing, deploying and support of biogas plants. By transforming an environmental passive (waste) into a sustainable asset (green energy as bio/nature gas, electricity, heat and a rich fertilizer) we contribute to circular economy being complementary to wind power and solar.

GEMIDAN ECOGI

GEMIDAN ECOGI develops, supplies and operates pre-treatment technology for the treating and recycling of food waste from households, businesses and industry. The resulting superior quality biopulp substrate allows for faster, more efficient digestion.

BIO GASCLEAN

BIOGASCLEAN is specialised in biological desulfurization of biogas without the use of chemicals. The removal process is 100% biological and operating costs are 70-80% lower than chemical gas cleaning systems.

NIRAS

NIRAS provides full cycle consultancy that ensures environmentally and financially sustainable solutions for our customers. We have in depth knowledge of the framework conditions of biogas development. We create innovative results with our customers and suppliers drawing on our multi – disciplinary teams worldwide.

THANK YOU