

Natural gas and renewable gases

Sustainable energy for all

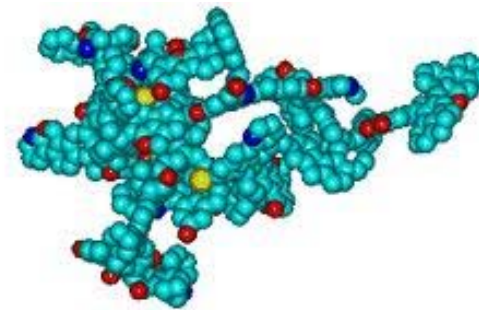
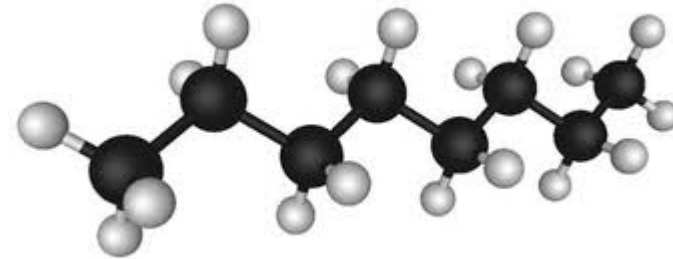
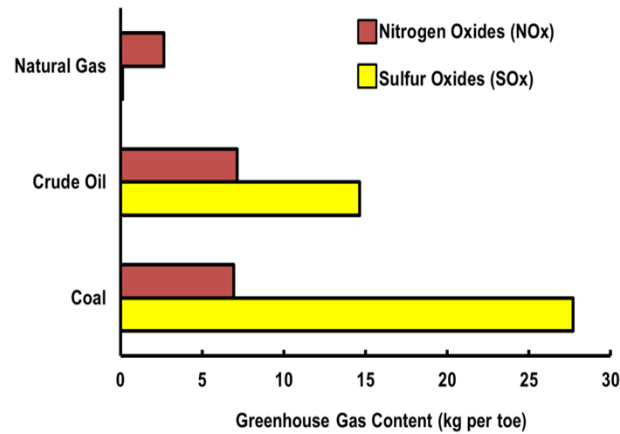
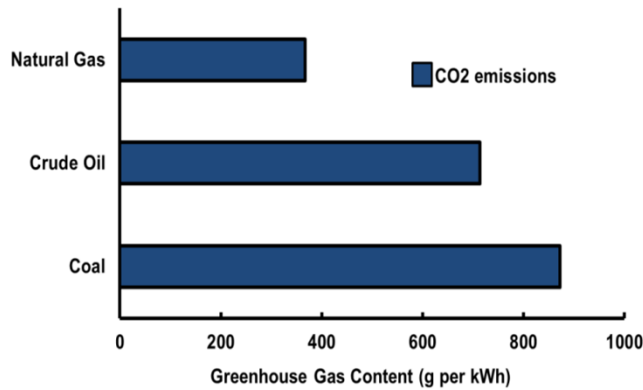
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Elbert Huijzer

Liander



The cleanest fossil fuel



Power generation efficiencies assumed:
 Natural gas 55%, crude oil 37%, coal 39%

The 5 A's of natural gas

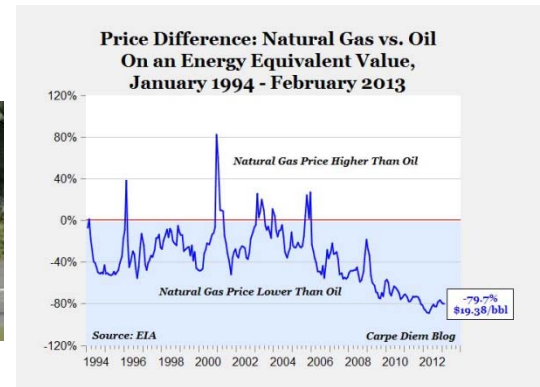
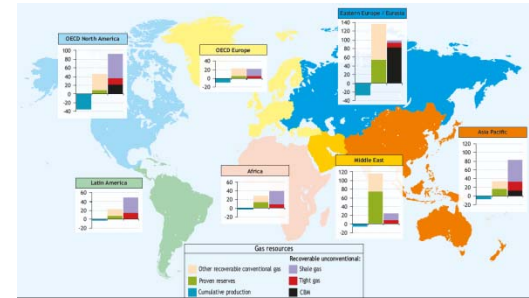
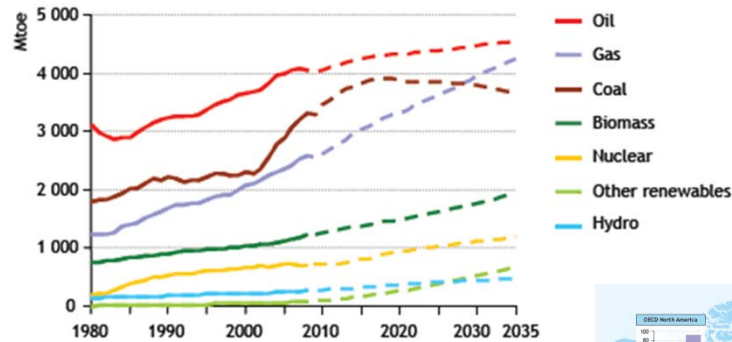
Available

Acceptable

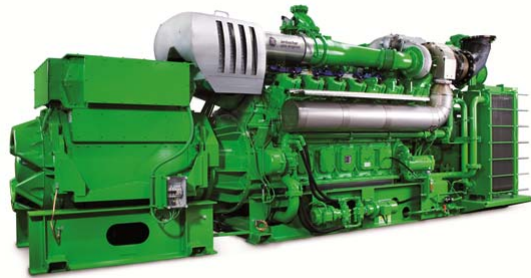
Accessible

Adaptable

Affordable



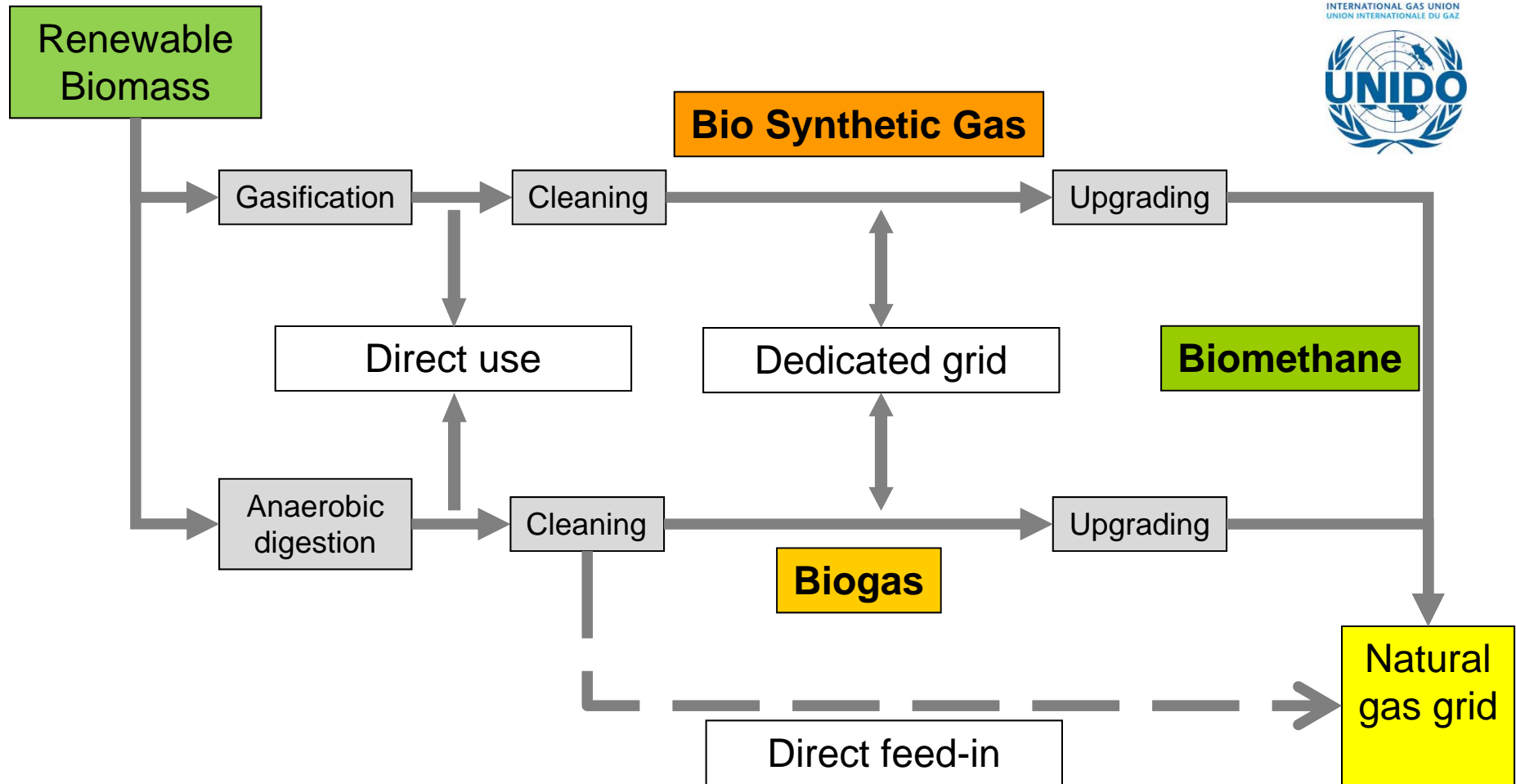
Gas to power



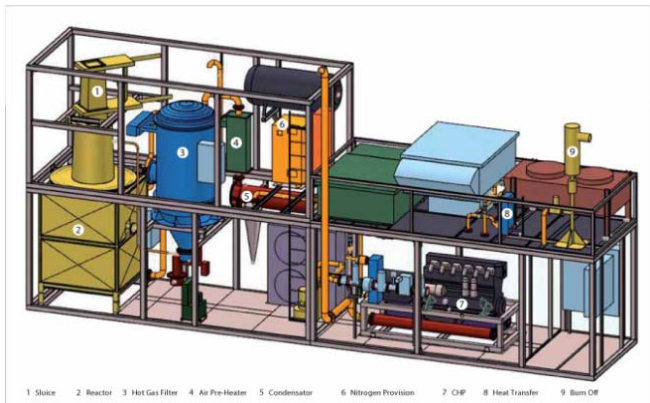
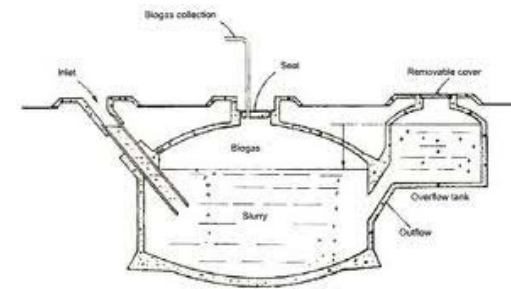
Type	Power output (kW)	Electrical efficiency	Thermal efficiency
Gas turbine, combined cycle	> 250.000	60 %	-
Gas-turbine, single cycle	100.000	40 %	-
Industrial cogeneration plant	10.000 – 50.000	35 %	40 %
Gas engine	10 – 5.000	45 %	-
Small CHP	5 – 300	35 – 45 %	35 – 45 %
Micro CHP	1 – 10	20 – 50 %	40 – 50 %



Renewable gases



Production technologies

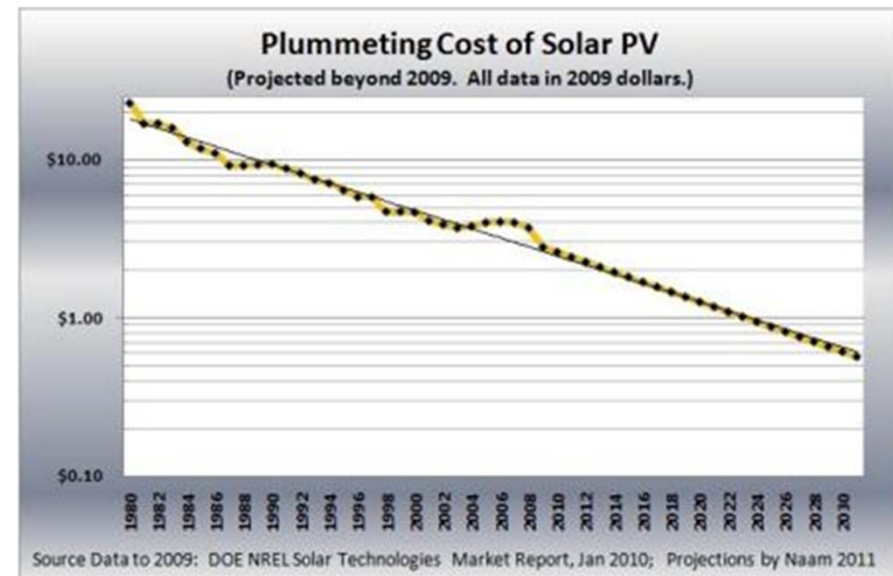


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Strengthening communities



Solar energy



Sustainability

CRAMER CRITERIA:

The **greenhouse gas balance** of the production chain and application of the biomass must be positive;

Biomass production must not be at the expense of important **carbon sinks** in the vegetation and in the soil;

The production of biomass for energy must not endanger the **food supply and local biomass applications** (energy supply, medicines and building materials);

Biomass production must not affect protected or vulnerable **biodiversity** and will, where possible, have to strengthen biodiversity;

In the production and processing of biomass the soil and the **soil quality** are retained or improved;

In the production and processing of biomass **ground and surface water** must not be depleted and the water quality must be maintained or improved;

In the production and processing of biomass the **air quality** must be maintained or improved;

The production of biomass must contribute towards **local prosperity**;

The production of biomass must contribute towards the **social well-being** of the employees and the local population.

Standard ISO 13065 is expected in 2015 (ISO/PC 248)



Sustainability



THEMES		
Environmental	Social	Economic
INDICATORS		
1. Lifecycle GHG emissions	9. Allocation and tenure of land for new bioenergy production	17. Productivity
2. Soil quality	10. Price and supply of a national food basket	18. Net energy balance
3. Harvest levels of wood resources	11. Change in income	19. Gross value added
4. Emissions of non-GHG air pollutants, including air toxics	12. Jobs in the bioenergy sector	20. Change in consumption of fossil fuels and traditional use of biomass
5. Water use and efficiency	13. Change in unpaid time spent by women and children collecting biomass	21. Training and requalification of the workforce
6. Water quality	14. Bioenergy used to expand access to modern energy services	22. Energy diversity
7. Biological diversity in the landscape	15. Change in mortality and burden of disease attributable to indoor smoke	23. Infrastructure and logistics for distribution of bioenergy
8. Land use and land use change related to bioenergy feedstock production	16. Incidence of occupational injury, illness and fatalities	24. Capacity and flexibility of use of bioenergy

Source: Global Bioenergy Partnership (GBEP)

Position of the gas industry



The people need work, income and energy;

Local, renewable energy is a good means to help fulfilling these needs;

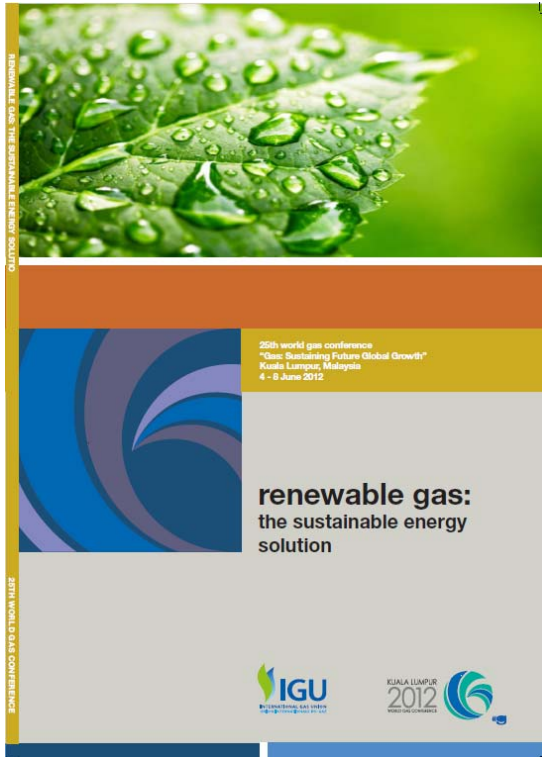
To increase economic development, more energy is needed than can be delivered by local, renewable energy;

Natural gas can be the bridge between:

Local, national and global energy supply;
Electricity, heating, cooling and transportation;
Large, medium and small producers or consumers;
Cleanest fossil resources and renewable energy.



Thank you for your attention



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IGU Events

Gas Knowhow

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Combined cycle animation

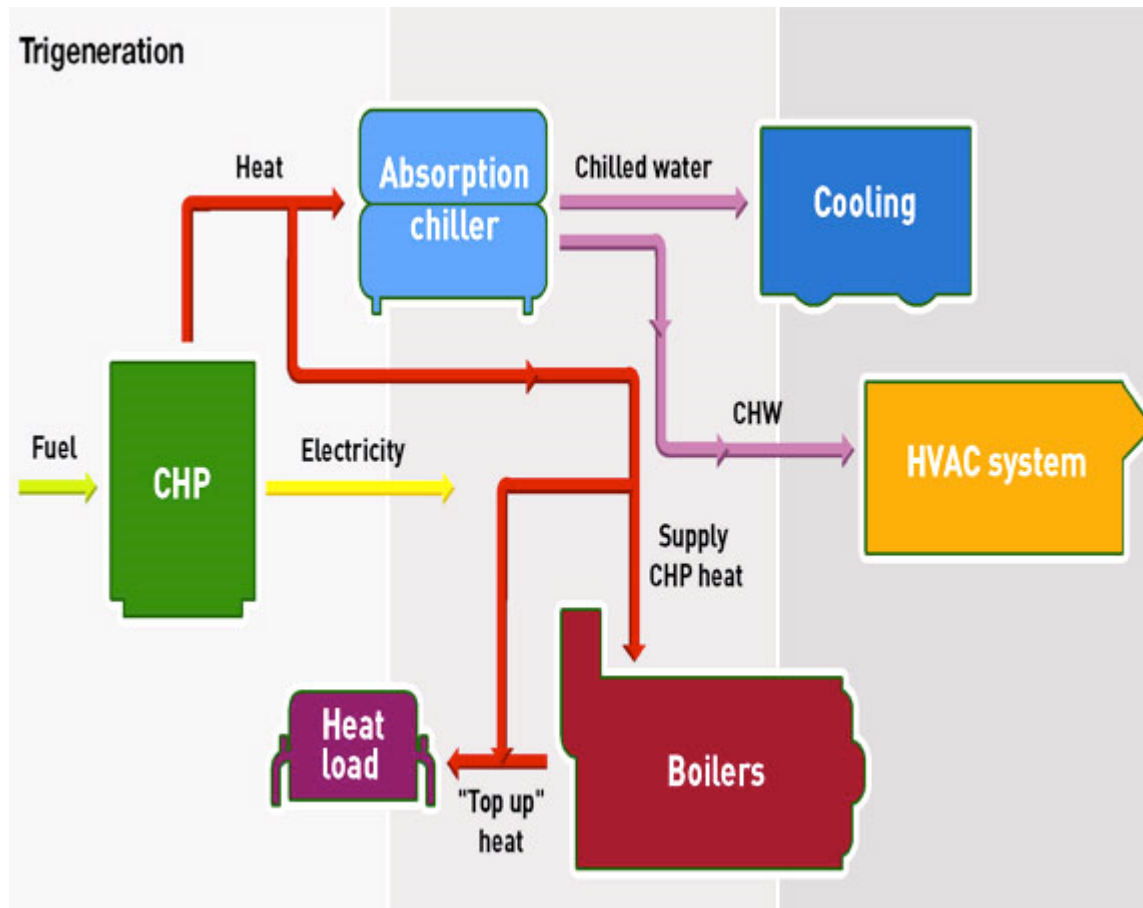


Animation by Panda Power Funds



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Trigeneration



Biogrid



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