Presentation by Wolfgang H. Stachowitz

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# Global CO2 Consideration, LFG and Carbon Credits: a European Perspective

## Emission (Carbon) Trade

**Stratford-upon-Avon, England 28 – 30 September 2004**

**WASTE 2004 CONFERENCE**

**Learn CO2e – Trading …**

**… and get into the pole position.**

**Background photo:**

**„The day after tomorrow“**

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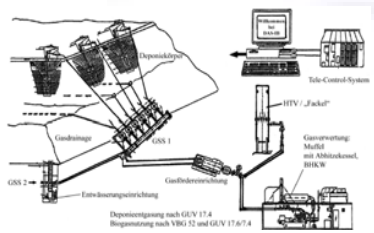
Biogas-, Sludge gas and Landfill gas technology:

- Consulting, planning & design, project management
- Familiarisation and training of system operators
- Independent Expert & Specialist
- Export in ATEX – Zoning according to 99/92/EG and 94/9/EG



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10.IX. 04

**Green house effect**

**FACTS and Background**

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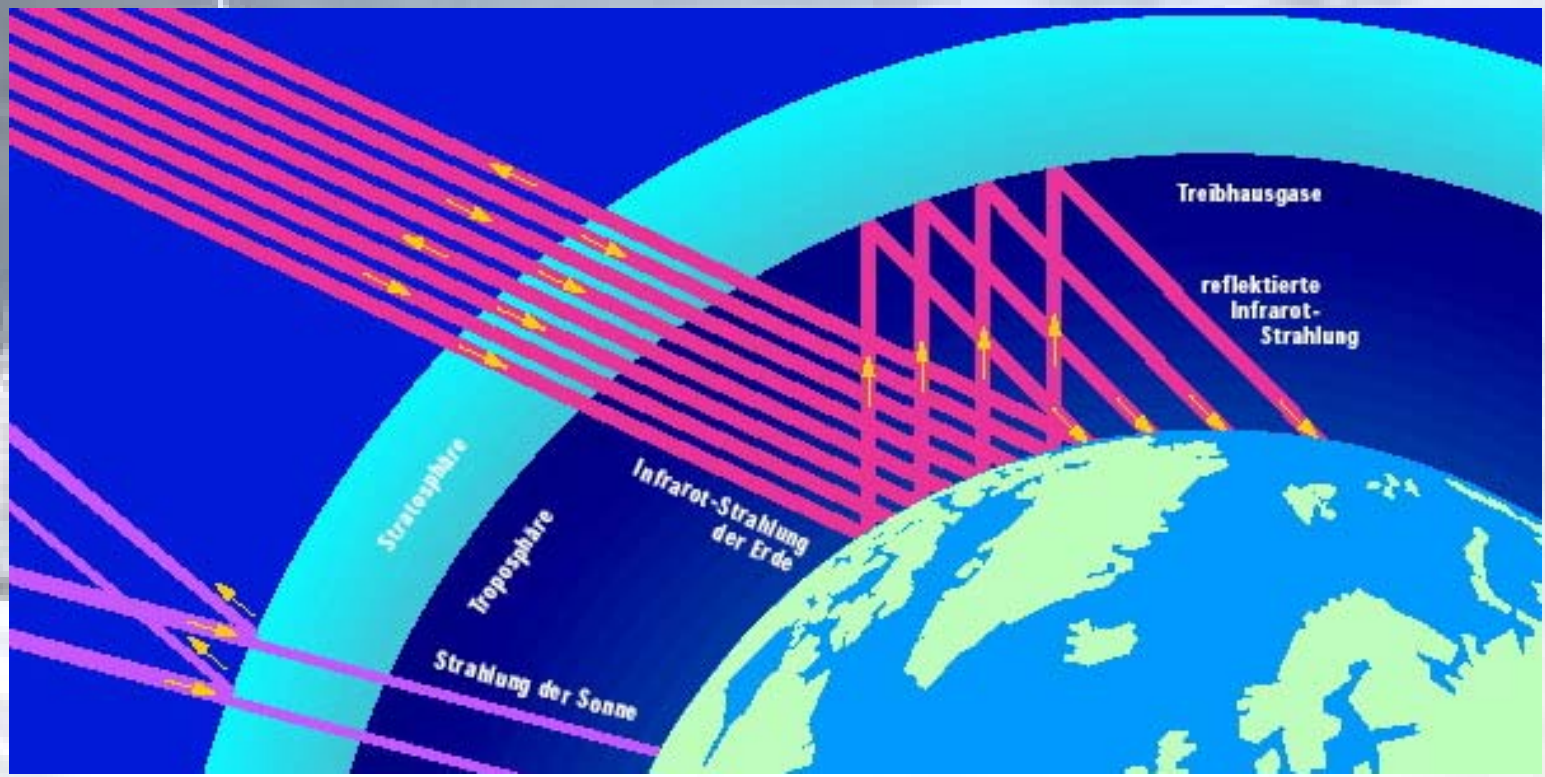


Natural greenhouse effect (Troposphere solar energy) approx. 1,35 kW / m2

In the absence of this effect we have approx. 15°C instead of approx. - 18°C

And most life on earth is capable of existence

**Total Greenhouse effect**

**FACTS**

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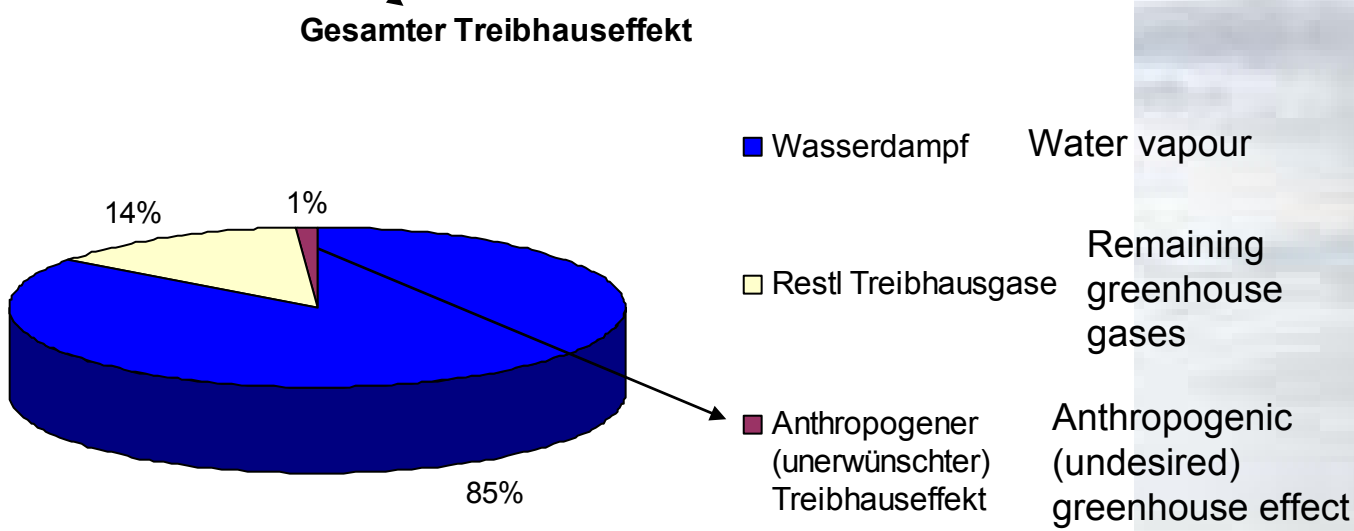
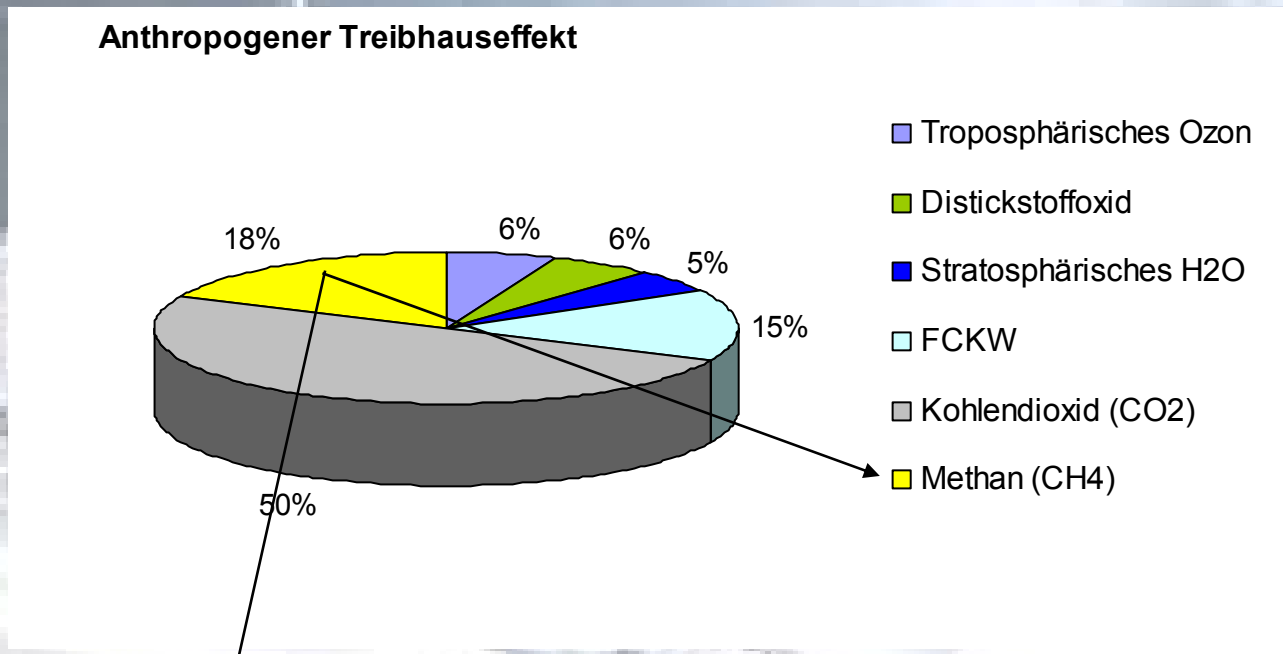



Water vapour: 60 – 95 %, Remaining greenhouse gases: 5 – 40 %

**Anthropogenic (undesired) greenhouse effect: 0.5 – 1.5 %**

**Anthropogenic (undesired) greenhouse effect**




Tropospheric ozone

N2O: Nitrous oxide

Stratospheric H2O

CFC

Tropospheric ozone: 2 - 10 %, N2O: Nitrous oxide: 2 – 10 %,

Stratospheric H2O: 0 – 10 %, CFC: 5 – 25 %, CO2: 35 – 65 %

**Methane: 10 – 25 %**

**Anthropogenic (undesired) greenhouse effect of methane emissions**

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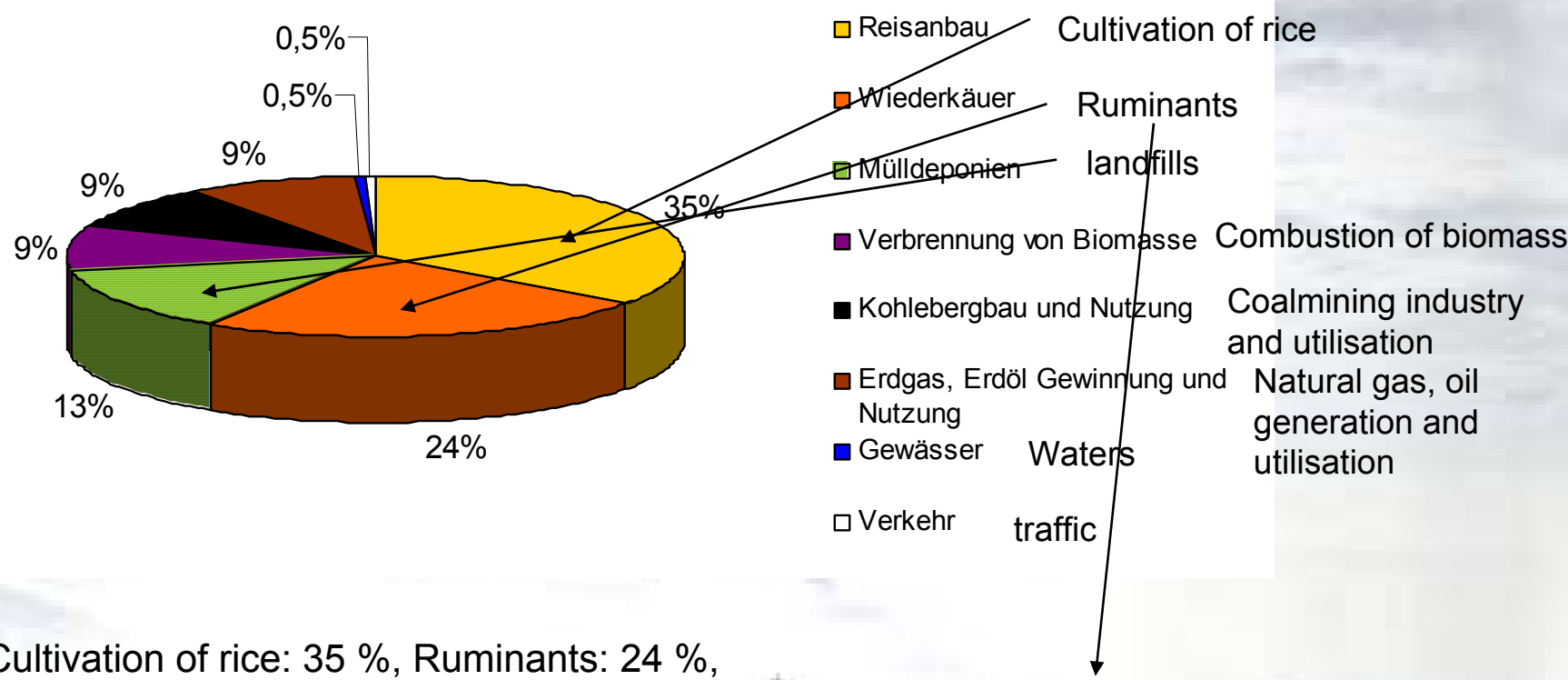
**Zusammensetzung der anthropogenen Methanemissionen (D : 380 Mt/a)**




Cultivation of rice: 35 %, Ruminants: 24 %,

**landfills: 13 %**

**New Zealand is planning a „flatulence tax“, dpa dated of July 16th 2003**

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Rise in temperature of the ground-level atmosphere by 0.3 to 0.6 °C since the late 19th century, according to: Assessment Report IPCC dated 1994.

The "US Global Change Research Information Office (GCRIO)" ascertains a rise in temperature of 1 °C since 1860

According to the "US Global Change Research Information office – GCRIO", it is due to this temperature rise, that the ocean level has risen by 10 to 25 cm (reduced by the expansion of the water, meaning in addition to the latter).

The "United Nations Framework Convention on Climate Change" expects a temperature rise of 1 to 3.5 K by the year 2100.

**Examples:**

* In the Sahara, a rise in temperature of 0.1 to 0.2 K at constant rainfall will result in an expansion of the desert by approx. 100 km.
* In England, a temperature rise of 0.5 K will prolong the vegetation period by approx. 14 days.

**Death of 15 – 37 % of animals and plants until 2050** (Nature and taz 8.I.04)

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| Greenhouse gas | Estimated lifetime (years) | 20 a GWP | 100 a GWP | 500 a GWP |
|---|---|---|---|---|
| CO2 (reference) | variable | 1 | 1 | 1 |
| CH4 | 12 | 62 | 23 | 7 |
| N2O | 114 | 275 | 296 | 156 |

Extract of: Intergovernmental Panel on Climate Change, Third Assessment Report, 2001 UK and others

In 1997, after a long period of negotiation, the foundations for worldwide climate protection were laid with the passing of the Kyoto protocol. The target of this agreement is the global reduction of greenhouse gas emissions.

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**With respect to the following objectives, the trade in emissions (emission rights) will be set up as tool for effective climatic protection:**

*** EU – liability of Kyoto: Reduction of the greenhouse gas discharge by 8% by the year 2012, taking the year 1990 as a starting point and**

*** The resolution of the federal cabinet of Germany dated November 1990: To achieve the reduction of the most important greenhouse gas CO2 by 25 % until 2005 (basis also 1990)**

*** UK: minus 60 % C02 until 2050 (Energy White Paper; www.dti.gov.uk ).**

**According to the Council of Ministers of the EU (agreement dated Oct 2003, directive 2003/87/EU describes the so-called "CO2 trading certificates" as "authorizations to trade with greenhouse gas emissions". The NAP`s are made in summer 2004. The EU commission: "The British NAP is best!".** (taz 08.VII.04)

**According to addendum II, the greenhouse gases:** CO2 (1. Phase), **CH4 (2008)**, N2O, SF6 and fluorocarbons as well as perfluorinated hydrocarbons **fall within the scope of this directive.**

**The Kyoto protocol only governs the emission trade between states.**

**CO2e – Trading**
**Time schedule**

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2004 2005 2006

**30. Sept.:**

**Application and allocation to the plants (NAP)**

**28. Febr.:**

**First expense / issuing of certificates for 2005**

**30. April:**

**1. Clearing / account**

**(= First check)**

**Prices high?**

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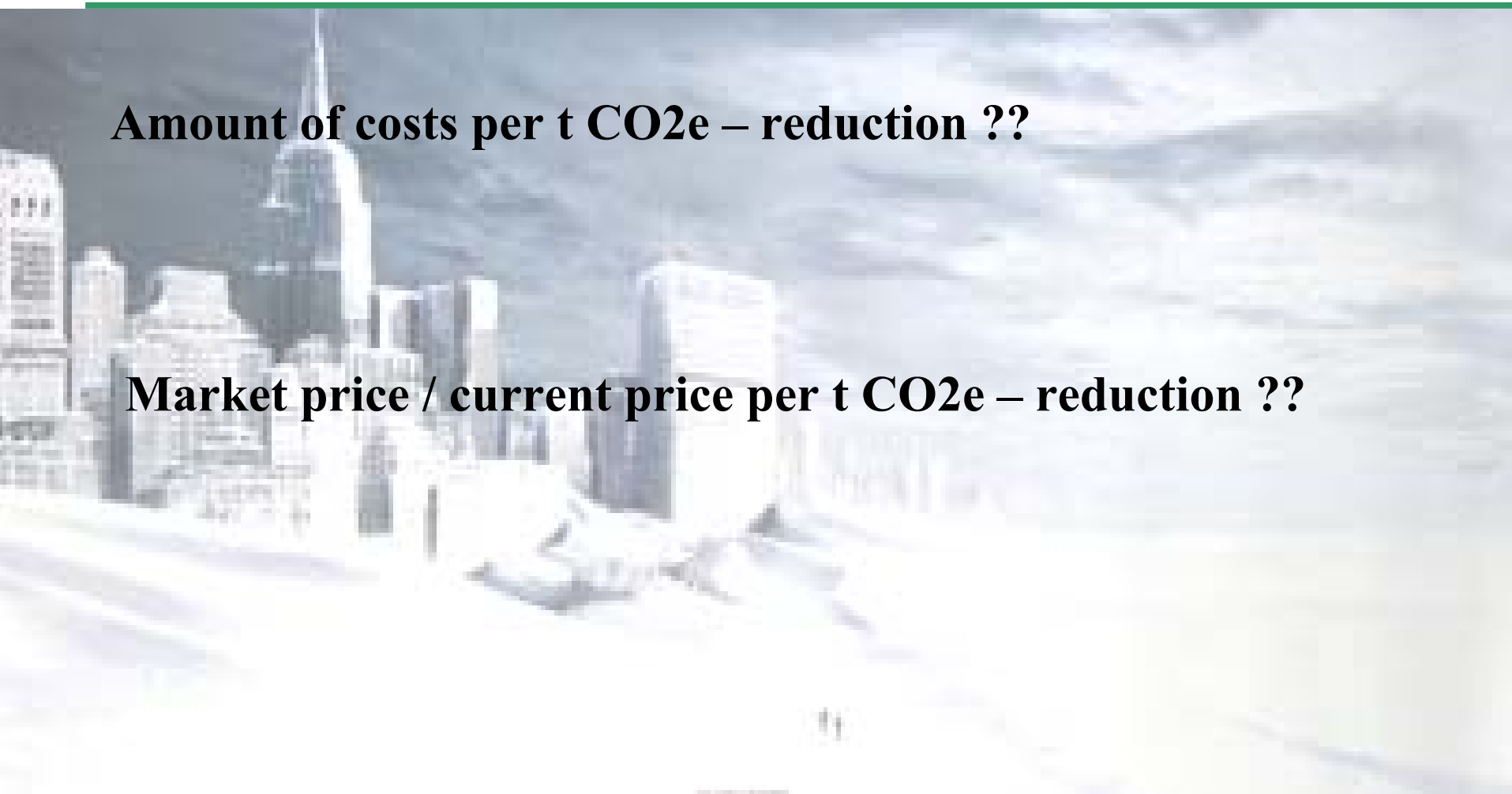

**Amount of costs per t CO2e – reduction ??**

**Market price / current price per t CO2e – reduction ??**

**Potential buyers – potential salers**
source: BMfUNR, Herr F. Schafhausen

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| EU-member state | | CO2-Emission 1990 | CO2-Emission 2000 | aim | difference in Mio. t $CO_2$-Äquivalenten |
|---|---|---|---|---|---|
| Belgien | B | 143,1 | 151,9 | 132,4 | - 19,5 |
| Dänemark | DK | 69,4 | 68,5 | 54,8 | - 13,7 |
| Deutschland | D | 1222,8 | 991,4 | 966,0 | - 25,4 / - 17 Industrie |
| Finnland | FIN | 77,1 | 74,0 | 77,1 | + 3,1 |
| Frankreich | F | 551,8 | 542,3 | 551,8 | + 9,5 |
| Griechenland | GR | 104,8 | 129,7 | 131,0 | + 1,3 |
| Irland | IR | 53,4 | 66,3 | 60,4 | - 5,9 |
| Italien | I | 522,1 | 543,5 | 488,2 | - 55,3 |
| Luxemburg | L | 10,8 | 5,9 | 7,8 | + 1,9 |
| Österreich | A | 77,4 | 79,8 | 67,3 | - 12,5 |
| Portugal | P | 65,1 | 84,7 | 82,7 | - 2,0 |
| Schweden | SWE | 70,6 | 69,4 | 73,4 | + 4,0 |
| Spanien | ESP | 286,4 | 386,0 | 329,4 | - 56,6 |
| United Kingdom | UK | 742,5 | 649,1 | 649,7 | + 0,6 |
| Niederlande | NL | 210,3 | 216,9 | 197,7 | -19,2 |

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National: Certificates / Allowances

**Plant „A“ in „D“**

**Has to reduce CO2 – Emissions**

„A“ make the financing or realised projects to reduce CO2 – emissions

**Home country**

**Forign countries**

**Emission trade**

**Reduce intern CO2 Em.**

**J**oint **I**mplementation

**C**lean **D**evelopment **M**echanism

Certificate = National Allowances based on NAP (histories emissions)

Certificate = Emission credit out of Emissions reductions (JI - > ERU / CDM - > CER)

**1 ERU = 1 CER = 1 Allowance**

# Operation ranges of gas plants

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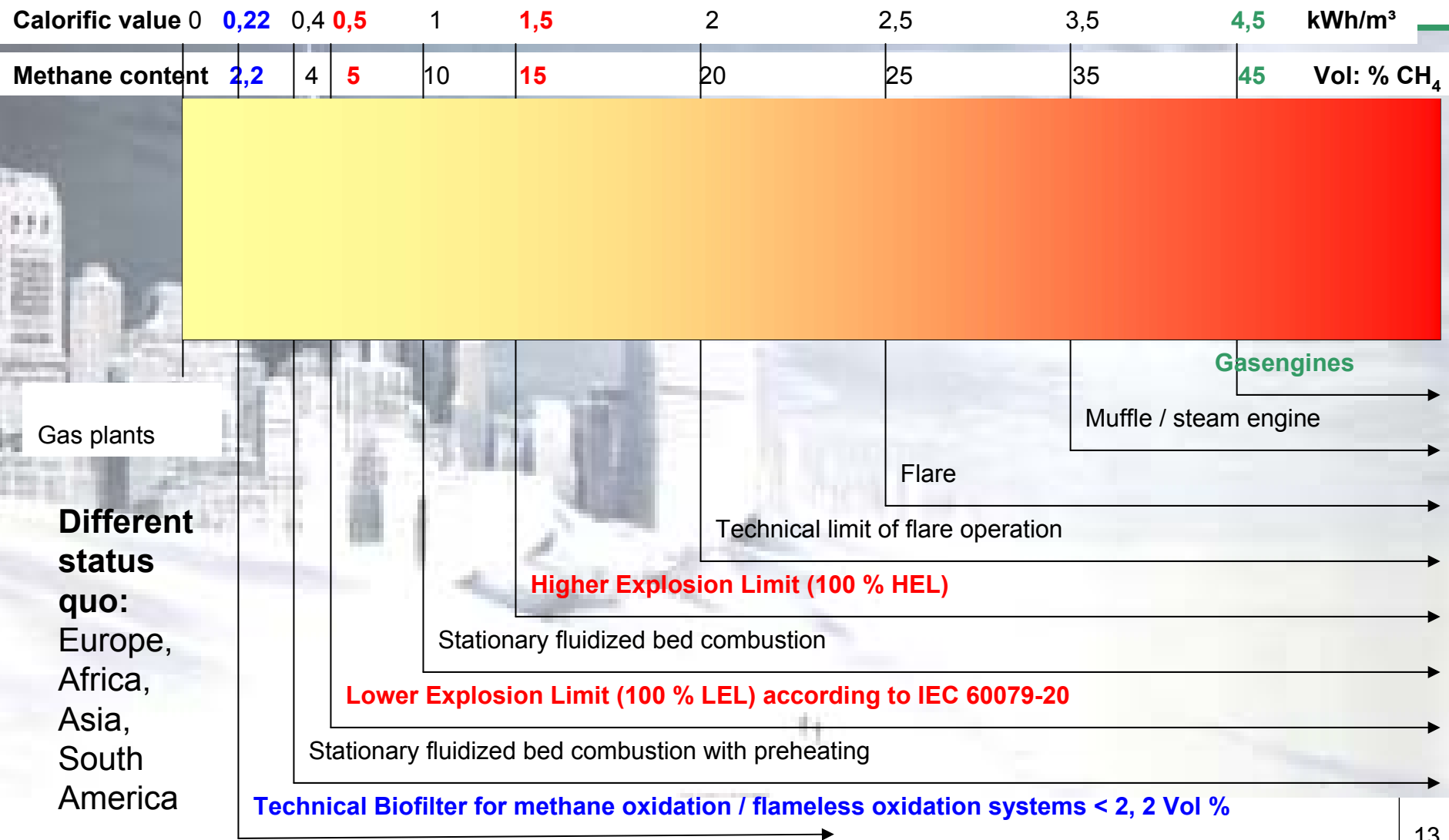

**Real technical solutions for poor gas quality**

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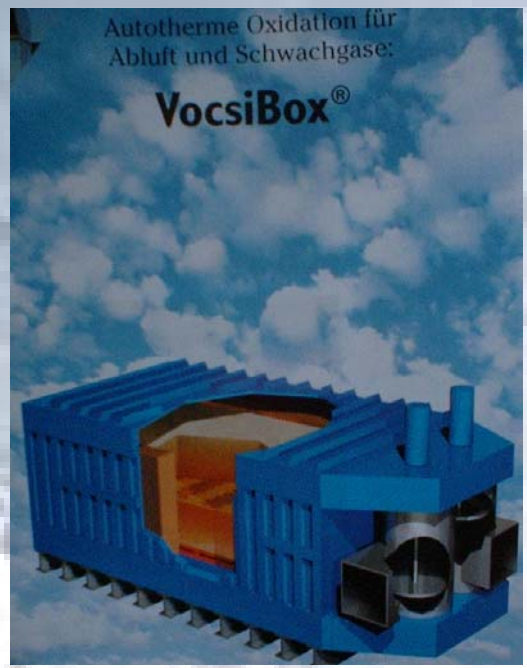


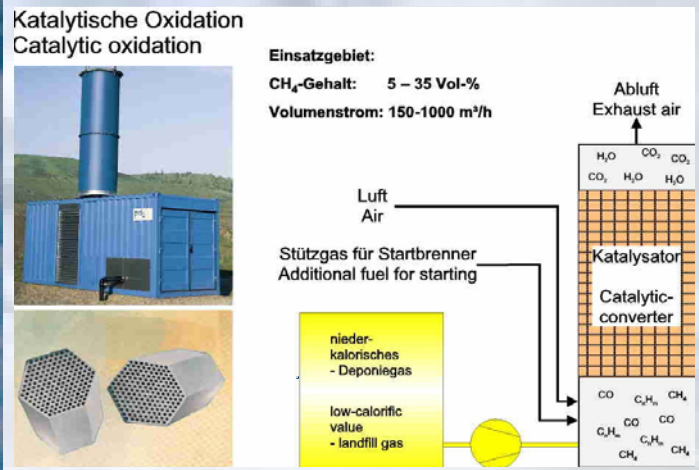


We have two low methane projects as JI – projects in Germany !!

DEPOPTHERM® (UMAT GmbH) und VocsiBox® (HAASE AG), non catalytic systems pro 2

or technical biofilter ???

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In order to be able to roughly estimate the CO2 savings that may be taken into account for certificates, the process chains (current situation < -- > future situation) must be documented:

1) What is the current situation?
What happens to the landfill gas/waste at present? We need the input quantity, landfill gas quantities, composition of the gas, landfill size (waste quantities and type -> gas prognosis), applied energies (process heat and electricity; how is the latter produced at present?) and the current CO2 emissions.

2) What is the situation like subsequent to treatment (e.g. co-generation sets, gas engines, low methane oxidation systems)?
Besides the input quantity (landfill gas) that should be identical, information is required for the new process.

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In order to be able to roughly estimate the CO2 savings that may be taken into account for certificates, the process chains (current situation < -- > future situation) must be documented:

**3) When gas is converted into electricity, what does the electricity replace?** Electricity from the supply network or an individual plant. In the first case, the energy from the supply network or 'grid' consists of a mixture of water power, electricity generated in nuclear power plants, and coal-based electricity generation. Therefore the amount of CO2 produced per kWh for each of the different technologies is required. In the case of an individual plant, the description of the system is required (e.g. combined oil heat and power station). Where is the heat supposed to go, is it used? (-> further CO2 certificates)

**4) How is the plant financed?**
Are there any subsidies granted? Does any particular compensation exist for the electricity (similar, for example, to the renewable energy act (EEG) in Germany or the NFFO in the UK)? Is it a private investor; is it an "inland" investor? Is the measure undertaken cost-effective? Do acts or guidelines stipulate this measure at present or will they do so in the future?

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## a) First assessment

For the creation of a first assessment (assessment of the CO2 savings documented on one or two pages), a cost of approx. 1,000 Euro is estimated (exclusive of taxes and travel expenses). The customer (e.g. the operator of a landfill) will be refunded for these costs when commissioning the complete study (a to c). On this basis, the customer must decide whether or not the project shall be continued.

## b) Project Idea Note (PIN)

In case the project should be continued, the next step would be the implementation of the so-called Project Idea Note (PIN). The PIN is supposed to document the project technically, economically and legally. All influences that the system may have globally must also be taken into consideration and, vice versa, the global influences on the system. This finally indicates whether or not there are any objections to the project and to what extent CO2 quantities will be credited to the customer. This document also enables the customer to make provisional contracts with potential buyers. The costs are very high: they amount to approx. 10,000 Euro plus VAT, travel expenses (Europe) res. to 15,000 Euro plus VAT and travel expenses (Asia).

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## c) Project Design Document (PDD)

For certification purposes, a so-called Project Design Document (PDD) is required, consisting mainly of the PIN, monitoring and validation plan. Depending on the complexity, the costs will be between 15,000 and 20,000 Euro plus taxes and travel expenses (Europe) res. between 25,000 and 30,000 Euro plus taxes and travel expenses (Asia). The costs for the establishment of the PIN will be charged proportionally.

**These prices may only be specified in more detail after a rough copy has been initially carried out. In addition, costs for certification and fees must be taken into consideration. Estimated range: 15,000 to 60,000 Euro.**

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In contrast, proceeds of approx. 2 to 6 Euro per ton CO2 are noted at present. This price may rise up to 10 Euro per ton CO2 adequate.

**Rough estimate: 2000m3/h landfill gas * 0.7 kg / m3/h * 8,760 h pa * 23 GWP (CH4 / CO2) * 5 Euro / t CO2 – adequate * 0.5 (50 vol % CH4) - > approx. 705,000 Euro pa Income**

Subsequent to the establishment of the first assessment, every operator / customer knows the respective range of saved CO2 emissions. He will thus be able to recognize at a relatively early stage whether or not the project will be profitable.

## 2.3 Equivalents of the trade with CO2 certificates

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| Price per "t"CO2e | "Stock exchange" | Source |
|---|---|---|
| 6,58 € | Hessen Tender, spring 2003 | Technical journal: wlb 1-2/2003<br>Pilot project of the Hessian state government www.Hessen-tender.de |
| 40 € | Fine from 2005 on for companies for each ton of "unapproved" CO2 | Council of the European Union – Political agreements dated December 11th 2002, 14935/02 "Greenhouse gas emission allowance trading", article 16 |
| 100 € | Fine from 2008 on for companies for each ton of "unapproved" CO2 | Council of the European Union – Political agreements dated December 11th 2002, 14935/02 "Greenhouse gas emission allowance trading", article 16 |
| £ 15 | UK Emissions Trading Group | www.greenergy.com/our_company/media_centre/arc_april_2000_co2.html |
| 12 € | Franzjosef Schafhausen | BMU (German Ministry / Office of environmental XI.03 |
| 5 – 11 € | Actual market prices | By the author |

**Actual prices / Costs low methane projects:**

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**a) High quantity, low loading (for non catalytic systems, Poor gas system – German standard)**

**1500m3/h mixed gas, loading 1 vol. % CH4, energy demand approx. 15 kW el, operating hours p.a. 8400h**

**Costs arising in this example: approx. 10 - 15 € / t CO2 equivalent**

**Actual prices / Costs Biogas projects methane projects:**

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**> 250m3/h biogas (approx. 1 MW th)**

**Costs arising in this example: approx. 3,7 – 5,5 € / t CO2 equivalent**

# DAS – IB GmbH DeponieAnlagenbauStachowitz
# Landfill Gas Technology


Deponieentgasung nach GUV 17.4
Biogasnutzung nach VBG 52 und GUV 17.6/7.4

## Thank you for your attention !

**Remember: Learn CO2e – Trading …and get into the pole position.**
**Or be: Best of the Rest.**

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**LFG Technology, www.das-ib.de**

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- Consulting, planning & design, project management
- Familiarisation and training of system operators
- Independent Expert & Specialist
- Export in ATEX – Zoning according to 99/92/EG and 94/9/EG

## 2.5 Possible proceeds and costs involved due to the trade in CO2 certificates concerning the application of the technologies

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As the following paragraphs deal with landfill gas (with CH4 as the main gas), we are talking about CO2 certificates. However, in the narrower sense these are "carbon dioxide equivalents" with an equivalent global warming potential.

### *2.5.1 Requirements*

**a) „Project document“ / „Base line“**

In these documents, CO2 reductions and technology are determined, as well as substitutions and the reference situation.

**b) Validity / validation**

During validation, the method applied for the determination of the emission reduction is examined and fixed one single time.

**c) Monitoring report**

This report documents and proves the relevant data concerning the emission reduction. An observation period is fixed.

**d) Certification**

Subsequent to the examination of the monitoring report according to validation, a CO2 reduction quantity is certified for the observation period (usually a calendar year).

**Phases b) and d) must be accompanied and confirmed by independent departments, phases a) and c) may be supplied by the project-executing organization itself.**