




# **Biodiesel: The German experience**

**Dr Guido Reinhardt**

Workshop “Growth of Biodiesel Market in Cyprus”

Nicosia, Cyprus, 18 January 2007

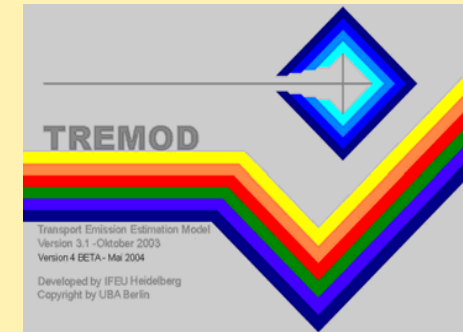
A vertical photograph on the left side of the slide shows a scenic view of Heidelberg. In the foreground, there are lush green trees. In the middle ground, a river flows through the town. In the background, the Heidelberg Castle is visible on a hillside, surrounded by more greenery.

## **IFEU - Institute for Energy and Environmental Research Heidelberg, since 1978**

- **Independent scientific research institute**
- **organised as a private non profit company with currently about 40 employees**
- **Research / consulting on environmental aspects of**
  - **Energy (including Renewable Energy)**
  - **Transport**
  - **Waste Management**
  - **Life-Cycle-Analyses**
  - **Environmental-Impact- Assessment**
  - **Renewable Resources**
  - **Environmental Education**

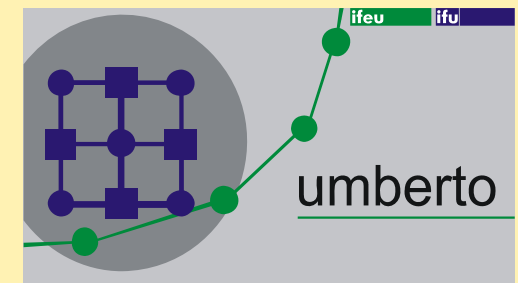
## TREMOD: Transport Emission Model

- Modelling emissions of road vehicles, trains, ships and airplanes
- Official database of the German Ministries for emission reporting



## Life cycle analyses (LCA) and technology impact assessments since 1990:

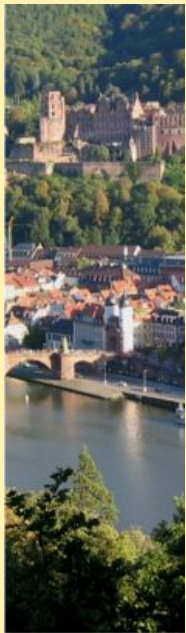
- Biofuels (all biofuels, all applications)
- Alternative transportation modes
- Renewable Energy



## IFEU - Institute for Energy and Environmental Research Heidelberg, since 1978

- **Our clients (on biofuel studies)**

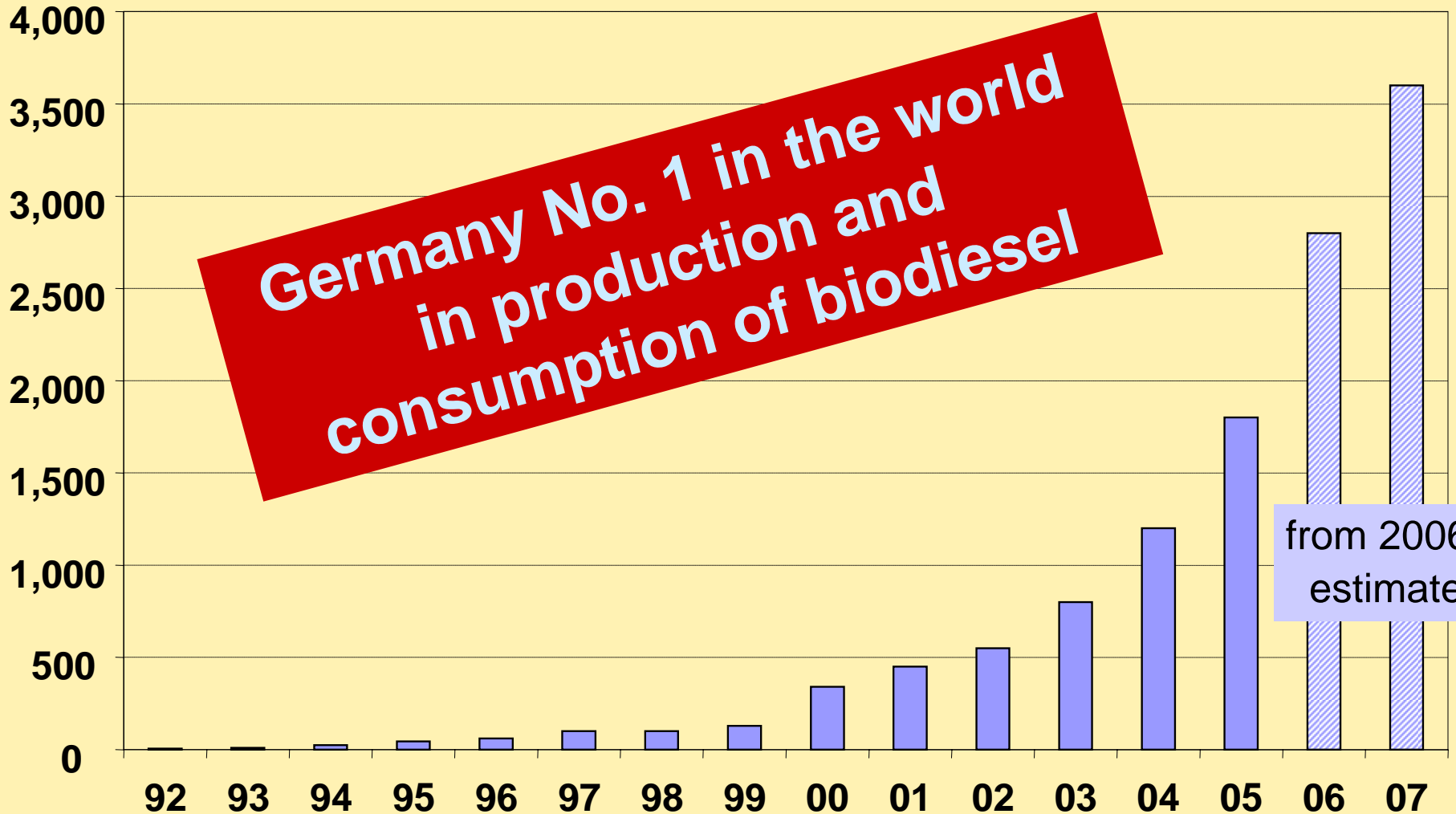
- World Bank
- UNEP, GTZ etc.
- European Commission
- National and regional Ministries
- Associations (industrial, Life-Cycle-Analyses
- Local authorities
- WWF, Greenpeace etc.
- Companies (DaimlerChrysler, German Telekom, etc.)
- Foundations (German Foundation on Environment, British Foundation on Transport etc.)



# Consumption of biodiesel in Germany



thousand tonnes



**Germany No. 1 in the world  
in production and  
consumption of biodiesel**

from 2006:  
estimate

Source: IFEU 2006

# What happened yesterday in Germany ?

## Bottlenecks in Germany

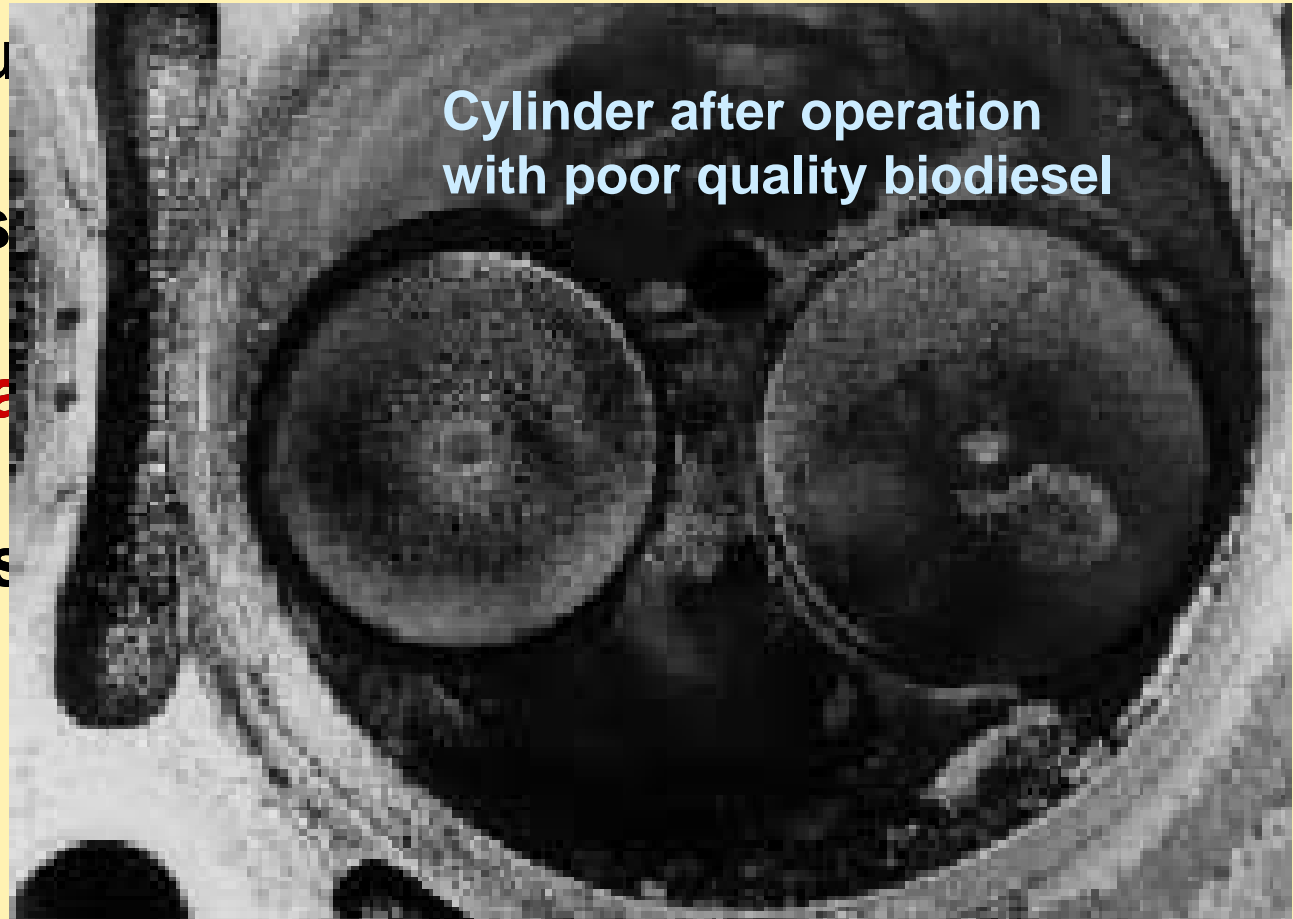
- Taxation issues
- **Technical issues**
- Biodiesel quality
- Life cycle assessment



# What happened yesterday in Germany ?

## Bottlenecks in Germany

- Taxation issues
- Technical issues
- **Biodiesel quality**
- Life cycle assessment



# What happened yesterday in Germany ?

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## Bottlenecks in Germany

- Taxation issues
- Technical issues
- ➔ **Biodiesel quality**
- Life cycle assessment

## Measures

- Tax exemption
- Biodiesel approvals (partly)
- Norm EN 14214
- Assoc. for quality management



## Association for the Quality Management of Biodiesel (AGQM)



- Founded in 1999
- Guaranteeing quality requirements for biodiesel in the whole production/consumption chain
- Members: producers, traders, filling stations, constructors, etc.

# Biodiesel quality in Germany



## Important differences between the Norm and AGQM standard

<b>Property</b>	<b>EN 14214</b>	<b>AGQM</b>
<b>Water content (mass ratio)</b>	max. 500 mg/kg	Producers: max. 220 mg/kg, all members: max. 300 mg/kg
<b>Total contamination (mass ratio)</b>	max. 24 mg/kg	max. 20 mg/kg
<b>Oxidation stability (induction time)</b>	min. 6 h	min. 6 h (check point: final user) Biodiesel sold at public filling stations requires addition of oxidation stabilisers.
<b>Period for production of winter quality biodiesel</b>	16/11 until 28/02	19/10 until 28/02
<b>Fatty acid profile</b>	–	like rapeseed (for selling at public filling stations)

- **What happened yesterday?**

**→ The situation of today**

- **What will come tomorrow?**

## Biodiesel consumption 2005:

- **Fleets**
  - 53 % via companies' and public filling stations
- **Private consumers**
  - 14 % via public filling stations
- **Blending**
  - 33 % are used for blends

# Driving forces

## ➤ Costs

### Beispielrechnung für Ihren Fuhrpark :

Ermitteln Sie selbst das Sparpotential für Ihren Fuhrpark!

In den weißen Feldern haben wir typische Werte für den Ölwechsel - wie sie Mercedes und MAN vorschreiben.

Alle Ausgangswerte können Sie individuell anpassen. Für Fragen zu diesem Vergleich stehen wir Ihnen gerne zur Verfügung.

Für eine korrekte Berechnung geben Sie bitte die Werte mit einem Punkt (.) als Trenner an und verwenden Sie die richtige Einheit.



Anzahl der Fahrzeuge :

jährliche Laufleistung :

Kraftstoffverbrauch min. Diesel :

Ölwechsel nach km (normal) :

Ölwechsel nach km (verkürzt) :

Menge Öl pro Ölwechsel :

Tages-Einstandspreis min. Diesel (30.000 l)\* :

Tages-Einstandspreis Biodiesel (30.000 l)\* :

Einstandspreis Motoröl :

Einstandspreis Ölfilter :

Arbeitszeit für einen Ölwechsel :

Arbeitskosten für eine Werkstattstunde :

worst-case Mehrverbrauch :

<input type="text" value="120000"/>	km / Fahrzeug
<input type="text" value="32"/>	Liter / 100 km
<input type="text" value="100000"/>	km
<input type="text" value="30000"/>	km
<input type="text" value="34"/>	Liter
<input type="text" value="85"/>	cent / Liter *
<input type="text" value="73"/>	cent / Liter *
<input type="text" value="2.50"/>	Euro / Liter
<input type="text" value="15.00"/>	Euro / Stück
<input type="text" value="1"/>	Stunde(n)
<input type="text" value="35.00"/>	Euro
<input type="text" value="6.0"/>	%

Endergebnis ausgeben !

\* Die angegebenen Preise dienen lediglich zur Verdeutlichung der Preisdifferenz und stellen kein Angebot dar.

# Driving forces

➤ Costs



Courtesy of IWR

➤ Image



Courtesy of RWZ Rhein-Main



Courtesy of energieroute.de

# GUINNESS BUCH DER REKORDE U R K U N D E

Das GUINNESS BUCH DER REKORDE bestätigt nach sorgfältiger Prüfung die Rekordleistung:

Europas erster Rapsöl-Brummi fährt seit 1990 mit Biodiesel (100 Prozent Rapsölmethylester) für Willi Heineking aus Landesbergen (D). Am 26. März 1999 hatte der 360 PS starke MAN-Büssing-Lkw Typ 19360 exakt 1.333.333 km hinter sich.

Hamburg, den 09.08.1999

  
REDAKTION  
GUINNESS BUCH DER REKORDE



## Guinness Book of Records

### Certificate

GUINNESS BOOK OF RECORDS confirms after thorough examination the record:

**Europe's first rapeseed lorry is running on biodiesel (100% rapeseed oil methyl ester) for Willi Heineking from Landesbergen (D). On 26 March 1999 the 360 HP MAN-Büssing lorry (type 19360) had travelled exactly 1,333,333 km.**

Hamburg, 09/08/1999



# Approvals for biodiesel use



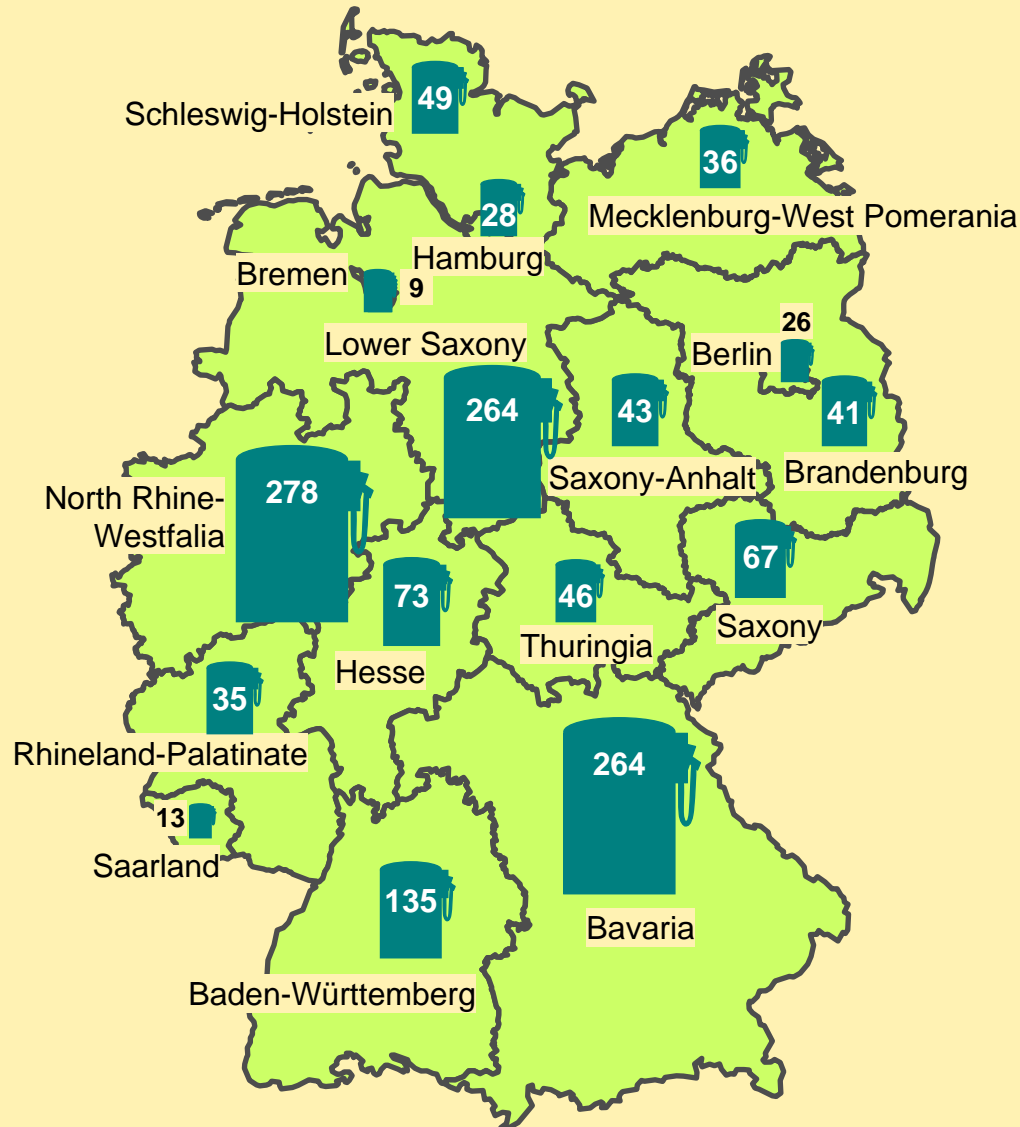
Manufacturer	Model	Biodiesel approval
Audi	A2 (8Z), A3 (8L), A4 (8E, 8E2, 8E5) except 85 kW, A4 Cabriolet (8H), A6 (4B), Allroad (4B)	approval for RME, possible malfunctioning of the auxiliary heating system or exclusion of its use
Audi	A3 (8P)	no general approval (only specific models)
Audi	A4 (8E) 85 KW; A4 (8EC, 8ED); A6 (4F); A8 (4E)	no approval
BMW		no approval
DaimlerChrysler		no approval ex works
Deutz	all engines except for 909, 910, 1015, 2015	approval if biodiesel according to EN 14214
Fendt	all tractors	approval, compliance with EN 14214
EvoBus Setra	OM 457HLA/LA, OM 501/502 LA, OM 906 LA buses	approval
Linde	all forklifts from 1.2 to 8 t load	
MAN	engines with Common-Rail system	
MAN	others	approval according to EN 14214
Neoplan Bus	engines with Common-Rail system	
Neoplan Bus	others	no general approval, only biodiesel according to EN 14214
Opel		no general approval
Still	all forklifts (different loads)	approval
VW	Polo (A03) (except Post Polo), Golf (A4), Golf Vento (A3), Golf Ecomatic (A3), Passat (B4), Passat (B5) without particulate filter, Sharan, T4, T5, LT – 2, Caddy II Wirbelkammer and SDI, TDI, Polo Classic, Lupo, Bora, Beetle, Phaeton V10 TDI, Touareg R5 TDI and V10 TDI	approval if RME according to EN 14214
VW	Golf (A5)	approval only if ordering optional RME version
VW	Touran	no approval

**But.....: no approvals at all for all new models of passenger cars**



# The situation of today

## AGQM-Biodiesel filling stations in Germany



**Status 2005:**

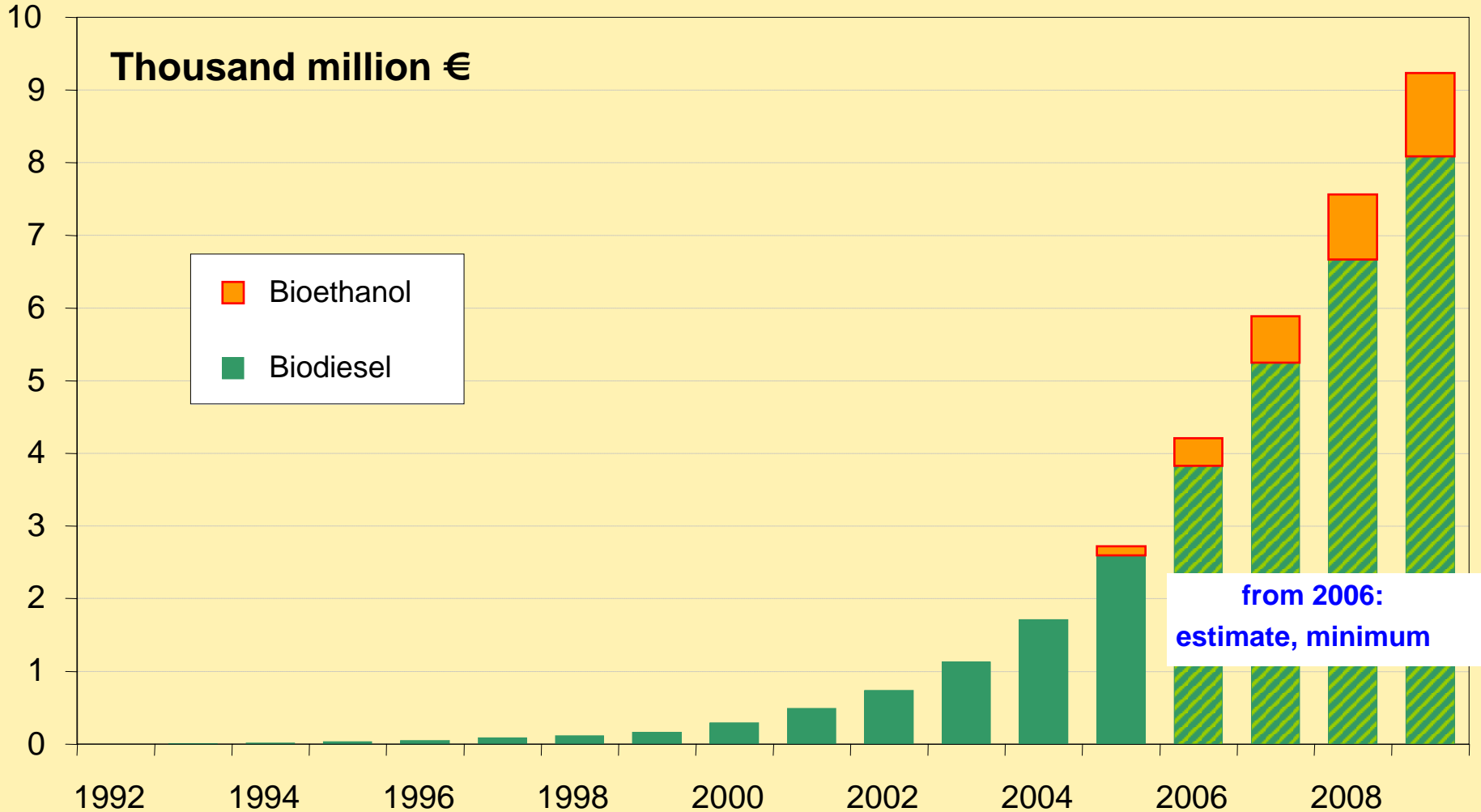
**about 1,900 (i.e. 12%)  
public filling stations  
offer biodiesel**

**1,406 offer AGQM-  
biodiesel**

# Biofuels in Germany



## Cumulated revenue loss through mineral oil tax exemption



## Dual concept for biofuels

**Tax on biofuels  
from 08/2006**

- **Energy tax law  
15/07/2006:**
  - Stepwise increasing tax on biodiesel, biodiesel blends and plant oil
  - Other biofuels tax-free
  - Tax exemption for agriculture and forestry

**Biofuels quota  
from 01/2007**

- **Biofuel quota law  
18/12/2006:**
  - Fixed quota for biodiesel
  - Stepwise increasing quota for bioethanol
  - Stepwise increasing quota for sum of biofuels

## Tax on biofuels from 08/2006:

### ■ Pure biodiesel:

- 7 ct/L 01/08/06 – 2007
- 13 ct/L in 2008
- 20 ct/L in 2009
- 26 ct/L in 2010
- 32 ct/L in 2011
- 45 ct/L in 2012

### ■ Biodiesel blends:

- 15 ct/L until 31/12/06
- 47,04 ct/L from 2007

### ■ Pure plant oil:

- 0 ct/L in 2006 & 2007
- 8 ct/L in 2008
- 17 ct/L in 2009
- 25 ct/L in 2010
- 32 ct/L in 2011
- 45 ct/L in 2012

### ■ Tax exemption for agriculture & forestry

### ■ Ethanol/ETBE tax-free!

## Dual concept for biofuels

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## Biofuels quota from 01/2007:

- **Quota for biodiesel:**
  - 4,40 % from 2007 - 2015
- **Quota for bioethanol:**
  - 1,20 % in 2007
  - 2,00 % in 2008
  - 2,80 % in 2009
  - 3,60 % from 2010 - 2015
- **Quota for all biofuels:**
  - 6,25 % in 2009
  - 6,75 % in 2010
  - 7,00 % in 2011
  - 7,25 % in 2012
  - 7,50 % in 2013
  - 7,75 % in 2014
  - 8,00 % in 2015

**Note:** Quota means minimum quota,  
% relates to energy content

Source: Federal Government 2006

## Biofuels quota from 01/2007

### ■ Remarks and conclusions:

- Overall biofuels quota higher than EU Biofuels Directive (2003/30/EC) goal (5,75%)
- Biofuels quota, i.e. no obligatory blending !
- Trading of quota possible
- Fine for non-compliance with quota:
  - 60 ct/L for biodiesel and overall quota
  - 90 ct/L for bioethanol quota
- Yearly check: none (in contrast to biofuel tax law)

- **What happened yesterday?**
- **The situation of today**
- ➔ **What will come tomorrow?**



# Biofuels demonstration in Berlin

This might be  
history



# Consumption of biodiesel in Germany

thousand tonnes



Source: IFEU 2007

# Last but not least

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→ **Thank you very much for your attention and I'm happy to answer your questions**

**Dr. Guido Reinhardt**



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