# The Business of Bio-Energy

## From field to finance – commercialising Ireland's potential

**15 June 2011**

**Session 2 Presentations**

BYRNE WALLACE
YOUR LEGAL BUSINESS PARTNERS

ENTERPRISE IRELAND

RSM Farrell Grant Sparks

# Programme

## Session 2 – David Hourihane, ByrneWallace - Chair

| | |
|---|---|
| 3.50 | Donal Murphy, Bank of Ireland, Global Project Finance, Director |
| 4.15 | Aidan Corbett, NTR plc, Senior Business Analyst |
| 4.40 | John Butler, Duggan Energy, Managing Director |
| 5.05 | Oliver Vigano, Schmack Biogas GmbH, International Business Director |
| 5.30 | Panel discussion |
| 5.40 | Networking reception |

# Donal Murphy

**Director**

**Global Project Finance**

**Bank of Ireland**



Bank of Ireland

# The Business of Bio-Energy …

# A Lender's Perspective

# Debt Financing for Bio-Energy

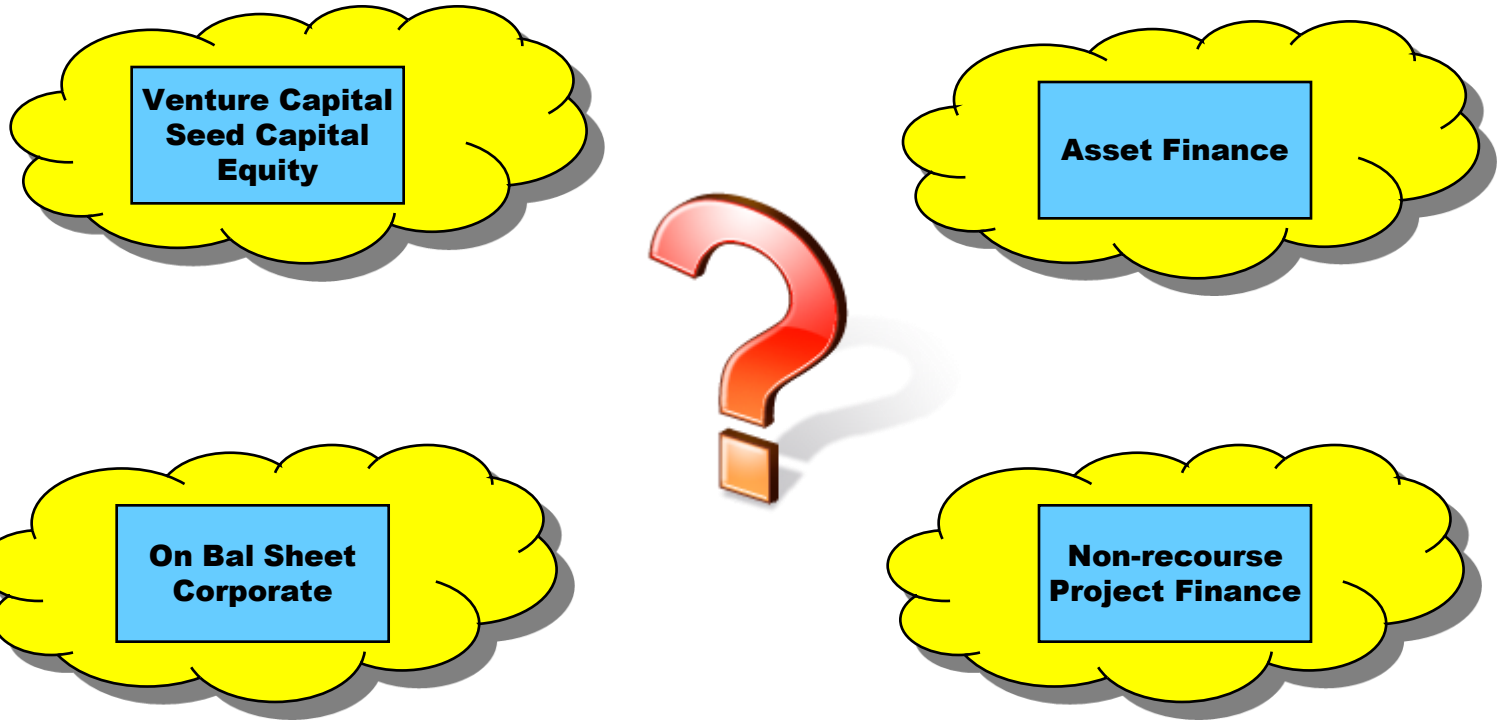
- **Bank of Ireland and Renewable Energy**
- **Sources of Finance for Bio-Energy**
- **Project Financing for Bio-Energy Projects**
- **Key “Bankability” requirements**
- **Looking Forward**

# Bank of Ireland – Experience

- **Leading Financier in**
  - **Irish Infrastructure and PPP market**
  - **Irish Wind Farm transactions**
  - **UK Waste Management transactions**
  - **European Renewable Energy**
- **Bank of Ireland .. very much “open for business”**
  - **c€400m of Project Finance debt provided in Ireland since 2007**
- **Bank of Ireland .. Renewable Energy Funds**

# Bio-Energy
# Sources of Finance

Bank of Ireland



# Project Finance Characteristics

Bank of Ireland

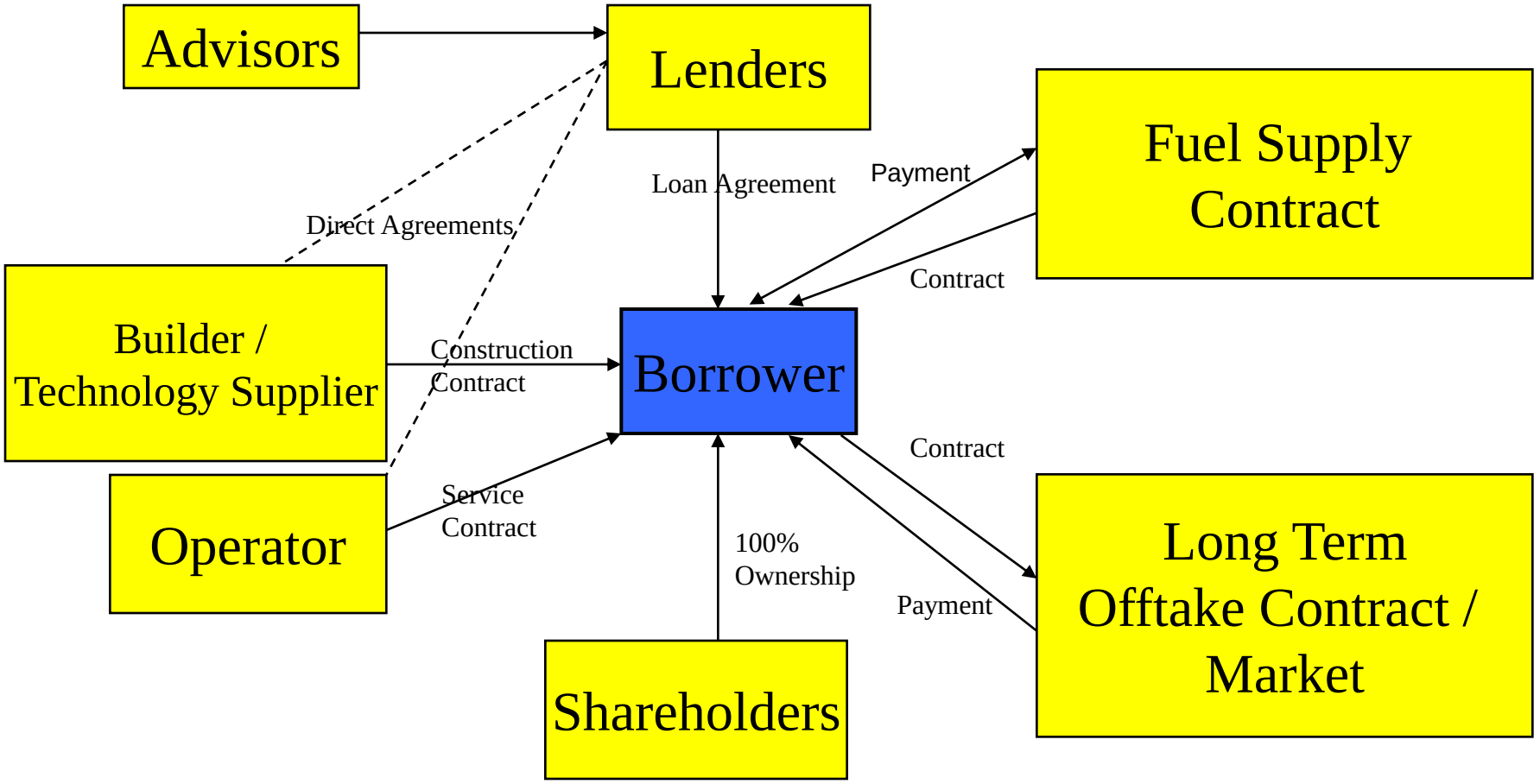
- **Cashflow-based:**
  - Cashflows need to be bankable on standalone basis
  - Robustness of sources and uses of cash.. during
    - Construction
    - Operations
- **Project Specific:**
  - Security / recourse to project assets alone
  - Ring-fenced spv as borrower
  - Non or partial recourse to sponsors/shareholders
  - Contractual support from sponsors may be required
- **Risk Assessment and Mitigation:**
  - Pass risks to party best equipped to manage them
  - Mitigate any residual risks within project structure
- **Off Balance Sheet:**
  - Potential for higher gearing… subject to structure

# Project Finance Characteristics

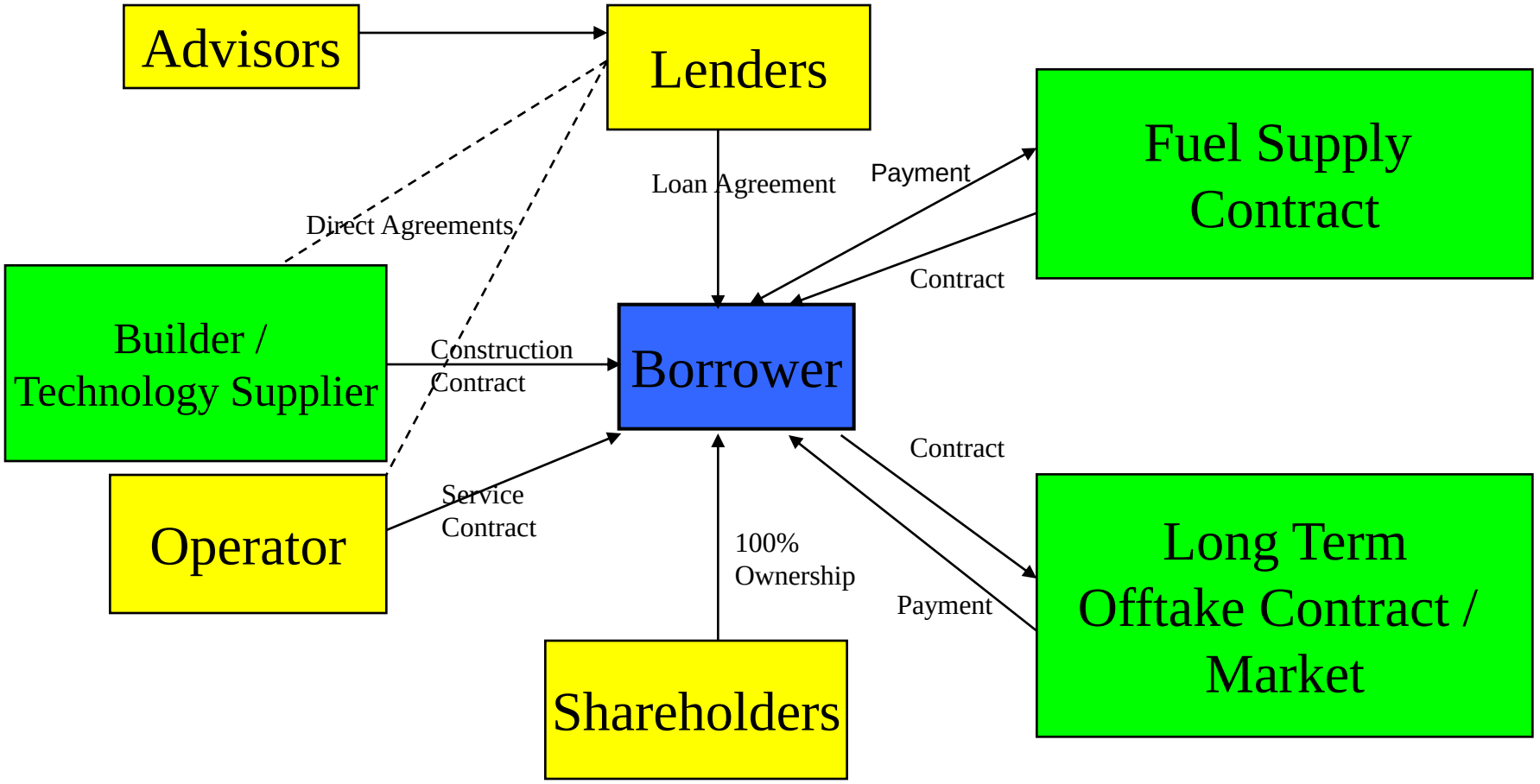
Bank of Ireland

- **Highly structured – a web of contractual arrangements**
- **Debt : Equity ratio is important – but real emphasis is on..**
- **Cash Flow**
  - **Key cash coverage covenants (DSCR, LLCR, PLCR)**
  - **Sensitivities to downsides**
  - **Cash Reserving Mechanisms**
  - **Distribution Lock-up Tests**

# Renewables – and Project Finance structures



# Renewables – and Project Finance structures



# Technology

- **Proven or Update of Proven**
- **Reputable & creditworthy supplier**
- **Fixed price, date certain delivery/installation**
- **Need to interface with construction / operating contractors**
- **Defined and guaranteed performance obligations**
- **Ongoing warranty and O&M obligations**

**All subject to:**

- **Detailed independent lender due diligence (Lender's TA)**
- **Downside sensitivity analysis and cashflow implications**

# Fuel / Feedstock supply contract

Bank of Ireland

- **Long term contract, to match/exceed tenor of debt**
- **Creditworthy counterparty**
  - **Collateral support may help**
- **Mitigate price risk – price certainty**
- **Mitigate volume risk – guaranteed supply of required amount**
- **Quality of supply (if relevant)**
- **Scope for small element of non-contracted supply?**
  - **Maybe, but impact on cover ratios and debt capacity**

# Revenue – offtake contract

Bank of Ireland

**Energy**

- **Long term contract, to match/exceed tenor of debt**
- **Creditworthy counterparty**
- **Mitigate price risk – price certainty**
- **Mitigate volume/demand risk**
- **Assignability / "Merchant Case" downside (?)**

**"By Products"**

- **Dependency on adjacent facility (?)**
  - **Creditworthiness**
  - **Strategic Importance**
  - **Contractual Commitment**
- **Third party contracts**
  - **Revenue or cost for the project – price certainty**
  - **Credit worthiness**

# …..Looking forward

Bank of Ireland

- **Importance of deal flow**
  - to Economy
  - to Market - sponsors and banks
  - to Environmental goals
- **Challenges**
  - Securing long term supply contracts
  - Strength of project counterparties
  - Scale of Projects vs Due Diligence Cost/Complexity
- **Regulatory and Fiscal Environment**
  - Supply Side
  - Energy Offtake Side
  - Incentives / Disincentives

***……Bio-Energy is a sector with real potential ……***

# Contact Details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Back to itinerary

# NTR's biofuel adventure

**15th June 2011**

Aidan Corbett
Sr. Business Analyst

1 **Overview of NTR**

2 Bioverda – our first foray into biofuels

3 GPRE – thriving during turbulent times in US market

4 BioProcessAlgae – With an eye on the future

# NTR Development History

## Pre 1999

Toll Road Pioneer



## 1999 - 2002

Irish Diversification

greenstar
setting the standard

Airtricity

celtic anglian water

Irish broadband

## 2003 - 2005

International Development

Airtricity US

greenstar UK
setting the standard

Bioverda
SUSTAINABLE ENERGY

## 2006 →

Further International Development

greenstar US
setting the standard

SES Stirling Energy Systems
PURE POWER :: MADE SIMPLE

Tessera Solar

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Bringing Wind Energy Home™

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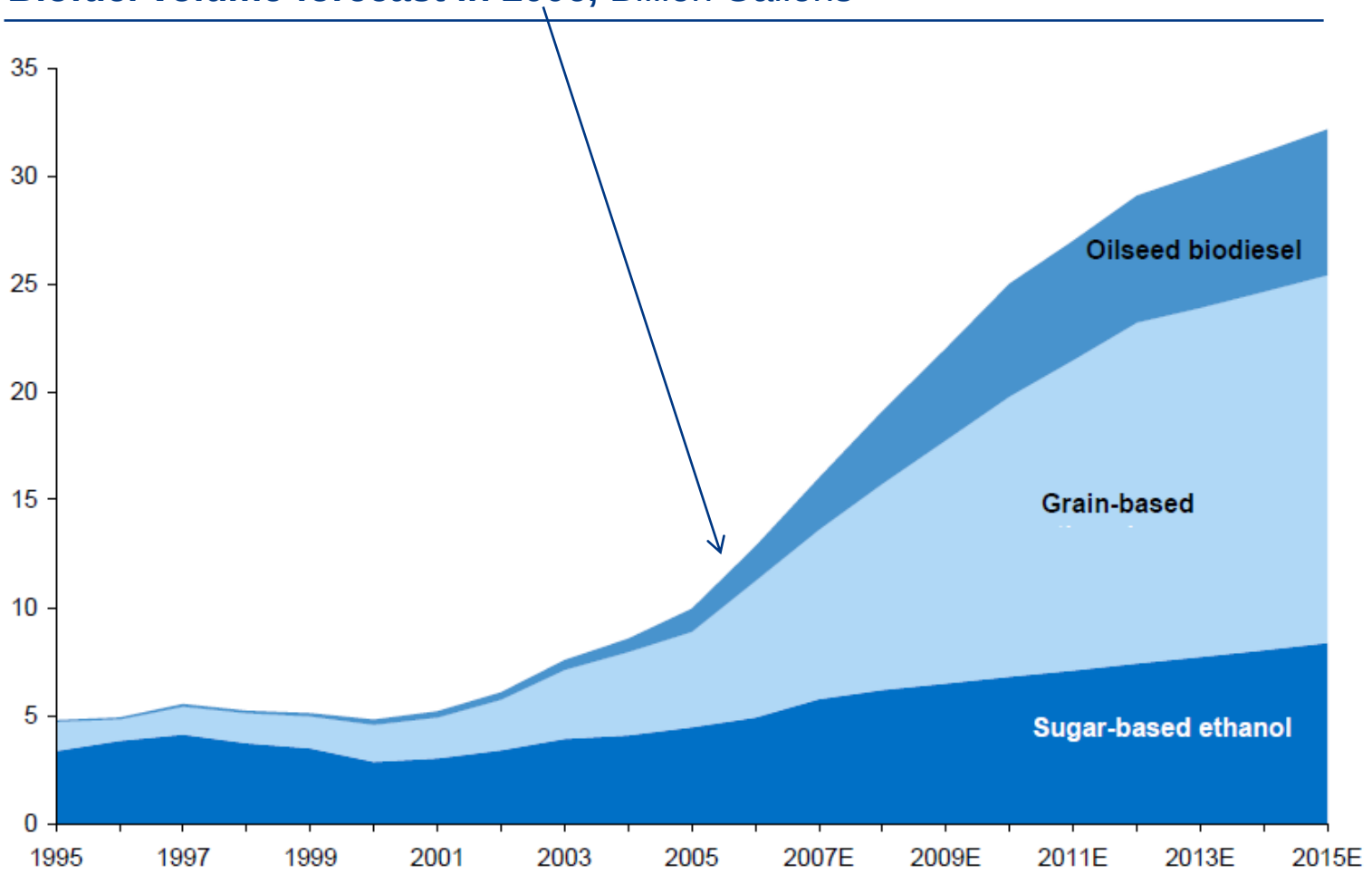
# Bioverda was our first investment in biofuels – based on a vision of a rapidly expanding market . . .

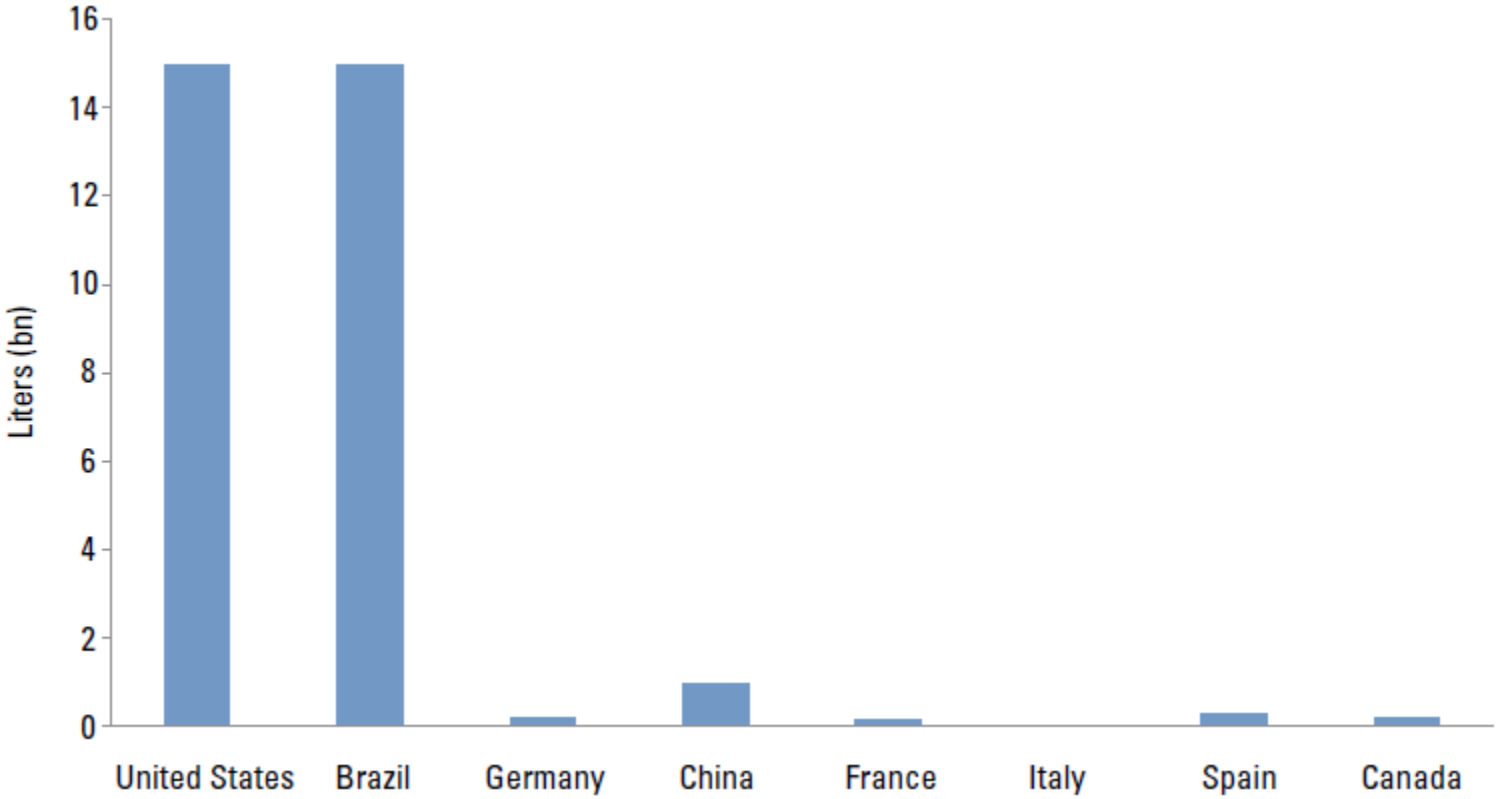
**Biofuel volume forecast in 2006,** Billion Gallons




Source: USDA, Goldman Sachs Commodity Research estimates

# . . . With the US identified as an attractive ethanol market

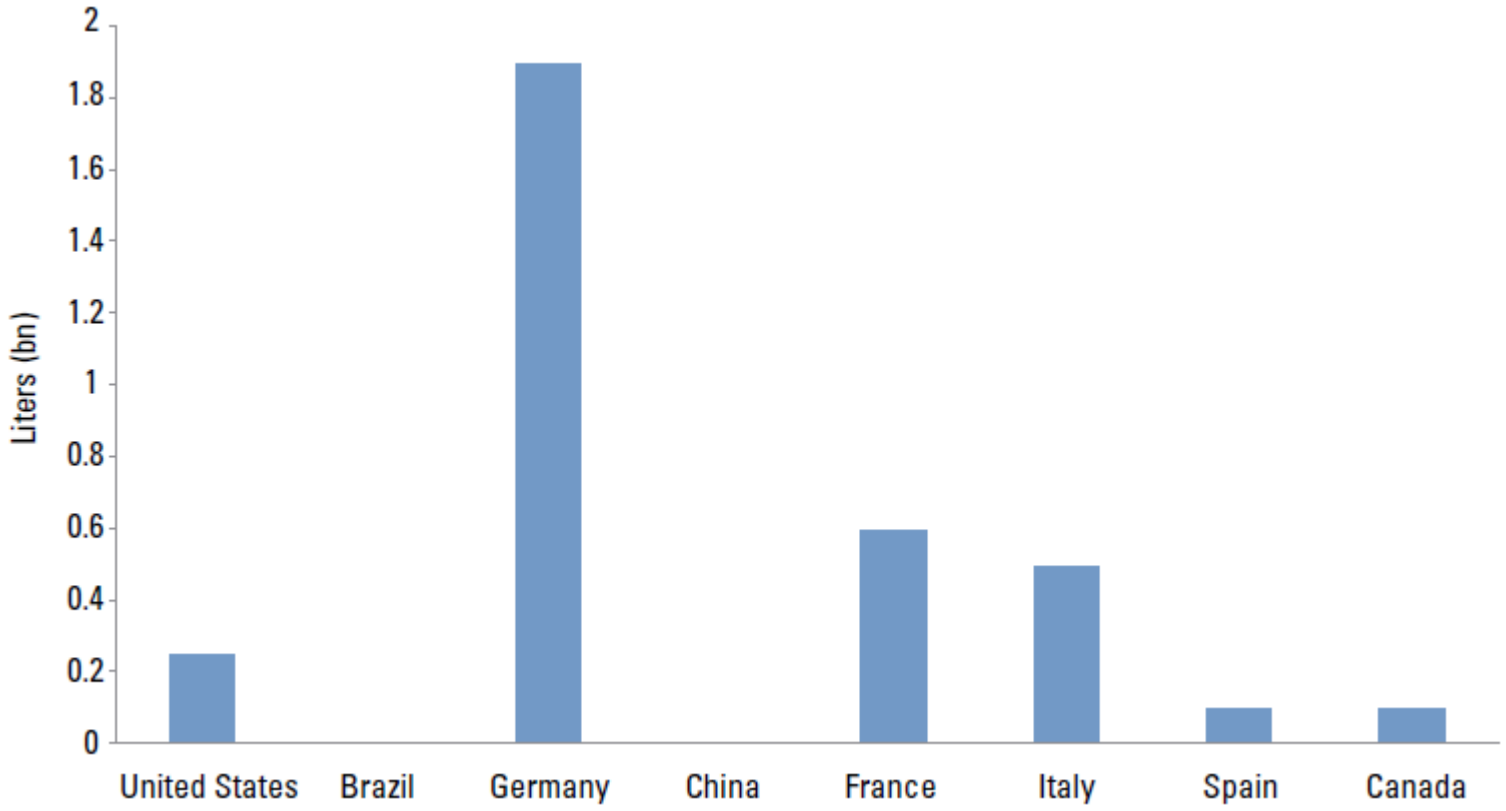
**Ethanol volumes in 2006,** Billion litres




Source: Goldman Sachs

# . . . And Germany identified as an attractive biodiesel market

**Biodiesel volumes in 2006,** Billion litres




Source: Goldman Sachs

# Bioverda activities in Germany centred on 2 biodiesel production facilities

- Germany initially imposed no tax on biodiesel, giving a 45c per litre advantage over conventional diesel
- This created a large incentive for trucking fleets in particular to begin to use B100 (100% biodiesel)
- Recent increases in oil prices also led to speculation that biofuels were to become a significant part of the total fuel supply

- German biodiesel production grew **17 fold** from 2000 to 2006
- NTR invested in 2 biodiesel plants in Germany with over 160m litres of combined production capacity

Source: *Taxing time for Europe biodiesei, Jon Evans, May 14 2008 (Biodiesel Magazine)*

# But like all holidays, tax holidays are not permanent . . .

## Tax holidays caused a boom

- At its peak, biodiesel was capturing a whopping 12% of the German fuel market
- Consequently, Government lost about €3bn in tax revenues in 2006
- Tax hikes from the German Government began on Jan 1st 2008

## End of tax holiday caused a bust

- Tax hikes along with increases imports quickly turned the fortunes of German biofuel producers
- Many trucking fleets switched back to conventional diesel
- Biodiesel accounted for as little as 2% of German fuel market by end of 2008

## Market left with reduced demand and excess capacity

- Volumes and prices dropped very quickly from the peak
- Many debt-financed plants were unable to meet interest repayments
- **NTR decided to exit German biodiesel market**

Source: *Taxing time for Europe biodiesei, Jon Evans, May 14 2008 (Biodiesel Magazine)*

# Lessons learnt from German adventure

- Just because a market is booming does not mean it will continue to do so – particularly if the boom is driven by regulation
- Try to understand how you will differentiate yourself in a commodity market
- If you are going to spend a lot of money on big capital projects, make sure that you are confident of the regulatory and market environment over a long time period
- Watch out for imports

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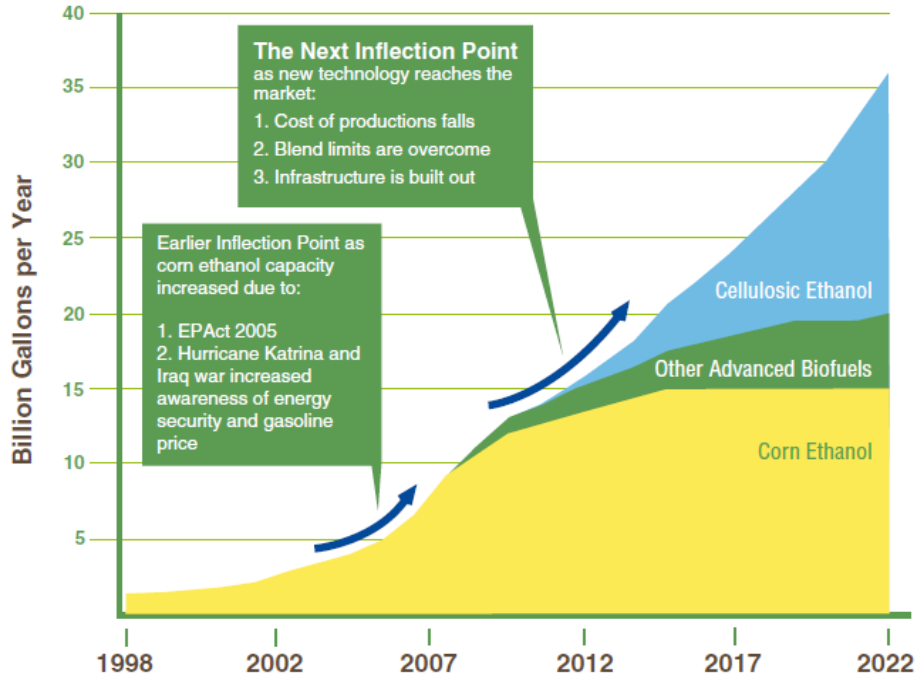
# US regulatory regime has more durable supports than Europe

## RFS mandate




## Tax credits and tariffs

- In addition to the mandate, a "blender's credit" exists at 45c per gallon which gave ethanol a cost advantage over gasoline and motivated blender's to use ethanol
- Total cost to the taxpayer is >$6bn and the subsidy is renewed annually
- Blender's credit can be accessed on both foreign and domestic ethanol – to reduce imports from cheaper countries, a 54 cent-per-gallon tariff exists on foreign ethanol

**Demand-side support**

**Supply-side support**

# Green Plains at a Glance

**Agribusiness 6.4% of Segment Operating Income(1)**

**Ethanol Production 79.8% of Segment Operating Income(1)**

**Marketing & Distribution 13.8% of Segment Operating Income(1)**

13 grain elevators with 31 million bushels of grain storage, agronomy services, seed, chemicals, and fertilizer sales

9 dry mill plants located in 6 states within the "corn belt" with ethanol production capacity of 740 MMGY

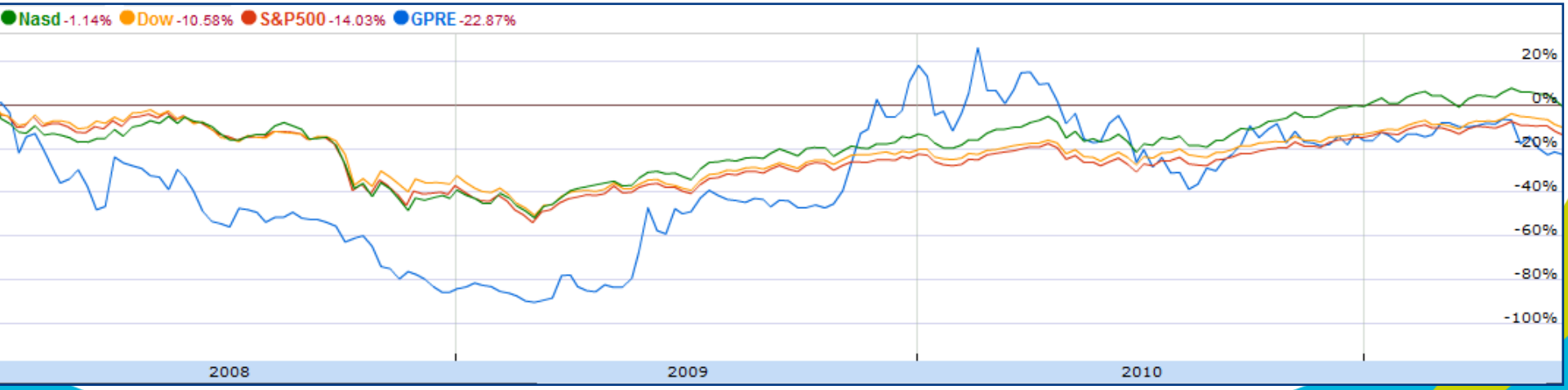
Expect to market and distribute about 1,000 MMGY(2) of ethanol

Expect to produce 100MM pounds of corn oil annually

9 Blendstar facilities provide footprint in key geographic markets with 495 MMGY of throughput capacity


Source: Green Plains Presentation, Stephen Spring Investment Conference – May 24, 2011

# Commodity prices have made GPRE a volatile stock over the past 3 years


Source: www.tradingeconomics.com

# This volatility has bankrupted a lot of ethanol producers

"VeraSun Energy, an ethanol producer that failed to foresee a drop in corn prices earlier this year, filed for bankruptcy protection on Friday"

*CNET News, Nov 2008*

"Wisconsin-based Ethanol producer Renew Energy LLC filed for Chapter 11 bankruptcy protection… Renew Energy, which is the state's largest ethanol producer, owns and operates a 130 Mmgy corn-based ethanol plant in Jefferson and a 52 Mmgy facility in Utica, Wis

*Ethanol producer magazine, Feb 2009*

Pacific Ethanol Inc.'s production – facility units have filed for bankruptcy protection as they look to restructure debt loads.

*Wall Street Journal, May 2009*

"In April (2009), Aventine Renewable Holdings Inc filed for bankruptcy protection. The company said it had nearly $800m of assets and nearly $491m of debts at year end."

*Reuters, Jun 2009*

# Meanwhile Green Plains has managed to pursue an aggressive M&A strategy

| Announced | Completed | Company | Size | Transaction Type | Consideration |
|---|---|---|---|---|---|
| Jan 2011 | Mar 2011 | Otter Tail Ag Enterprises | $60M | Scale | Cash/Debt |
| Sep 2010 | Oct 2010 | Global Ethanol, LLC | $174M | Scale | Cash/Debt/Stock |
| Apr 2010 | Apr 2010 | Wade Grain & Farmers Grain of Trenton, LLC | $26M | Scale | Cash/Debt |
| May 2009 | Jul 2009 | 2 plants in Nebraska | $121M | Scale | Cash/Debt |
| Jan 2009 | Jan 2009 | Blendstar, LLC (51%) | $9M | Capability/Vertical | Cash/Debt |
| May 2008 | Oct 2008 | VBV, LLC | $383M | Scale/Capability | Cash/Stock |
| Aug 2007 | Apr 2008 | Great Lakes Cooperative | $20M | Capability/Vertical | Cash/Debt/Stock |
| Jun 2007 | Sep 2007 | Essex Elevator, Inc. | $1.5M | Capability/Vertical | Cash/Debt |

**How has it managed to do this?**

Source: Green Plains Presentation, Stephen Spring Investment Conference – May 24, 2011

# . . .Through developing margin management as a core competency

| Ethanol Production Summary Financial Results | Q2-09 | Q3-09 | Q4-09 | Q1-10 | Q2-10 | Q3-10 | Q4-10 | Q1-11 |
|---|---|---|---|---|---|---|---|---|
| Gallons Sold (millions) | 77.1 | 107.3 | 121.8 | 123.8 | 130.1 | 128.9 | 161.6 | 172.1 |
| Operating Income (in 000's) | $2,589 | $14,143 | $28,605 | $29,188 | $15,763 | $17,152 | $35,104 | $19,428 |
| Depreciation & Amortization | 5,536 | 7,472 | 7,898 | 7,698 | 7,863 | 7,924 | 9,708 | 10,713 |
| Total | $8,125 | $21,615 | $36,503 | $36,886 | $23,626 | $25,076 | $41,034 | $30,141 |
| Per Gallon | $0.11 | $0.20 | $0.30 | $0.30 | $0.18 | $0.19 | $0.25 | $0.18 |

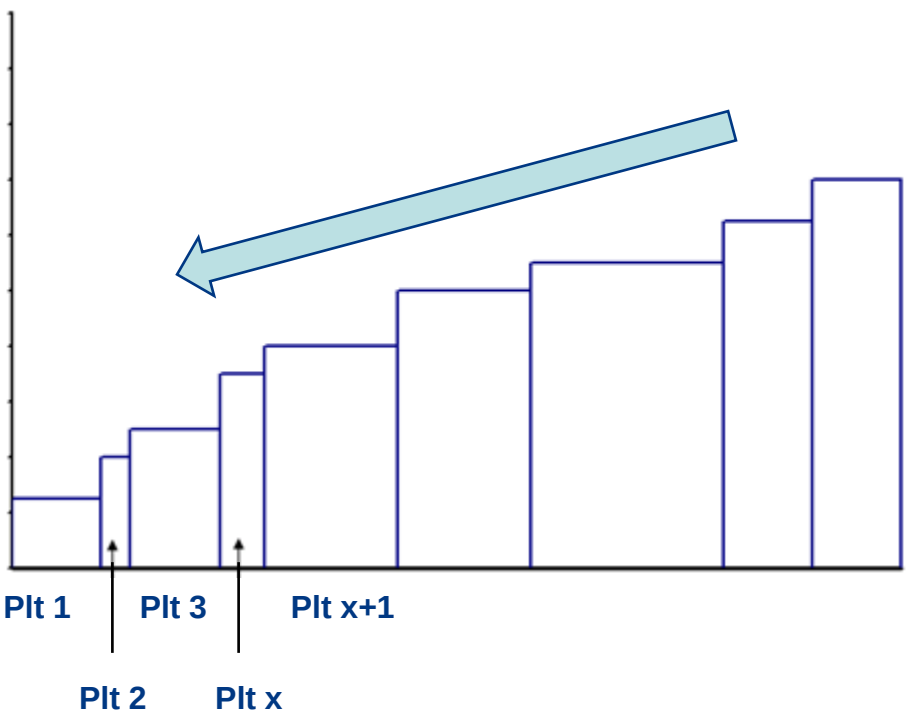
- Comprehensive risk management policy
  - Hedge percentages
  - Value-at-Risk limits
- Fundamental focus on operating margin management
- Robust risk management systems requires balanced position
- Over the last 3 years, the opportunity to lock away EBITDA margins has been present

Source: Green Plains Presentation, Stephen Spring Investment Conference – May 24, 2011

# . . . And maintaining excellent operational performance

- Develop knowledgeable and motivated workforce
- Leverage production data to optimise plant performance
- Transfer best practices and operational improvements across ethanol platform
- Refine back office support for commodities, marketing, logistics, accounting and performance modelling

**Production cost per gallon,** $/gallon




Source: Green Plains Presentation, Stephen Spring Investment Conference – May 24, 2011

# Lessons learnt from GPRE

- Understand your commodity exposure
- Do not confuse trading and risk management expertise from the operational expertise
    - But excel at both!!
- Trading and risk management expertise will ensure that you can cope with large commodity price moves and maintain liquidity
- Operational expertise will get your further down the cost curve and provide an additional margin of safety during downturns

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# BPA – photobioreactor design that provides higher yields than competition

## Competitive advantages of Algae

- Algal production is among the most **water-efficient means** to grow biomass
- **Arable land is not required** – productivity is 20x greater than high-yielding crops with no need to compete with land used for food and feed crops
- **Life-cycle emissions** are well below petro-diesel and corn ethanol
- Biomass growth is **kept under control**. Conventional agriculture is a major contributor to nitrate-polluted ground water

Source: Bioprocess Algae

# Conclusions

- Confidence in the regulatory environment is critical, particularly for long-term capital investments
- Understand your commodity risk and develop risk management as a core competency
- Be sure that you can differentiate yourself from the competition, through superior technology or in a commodities market, superior operations
- Make sure your investors understand the cyclical nature of a business operating in a commodities market
- Watch out for imports!

# END

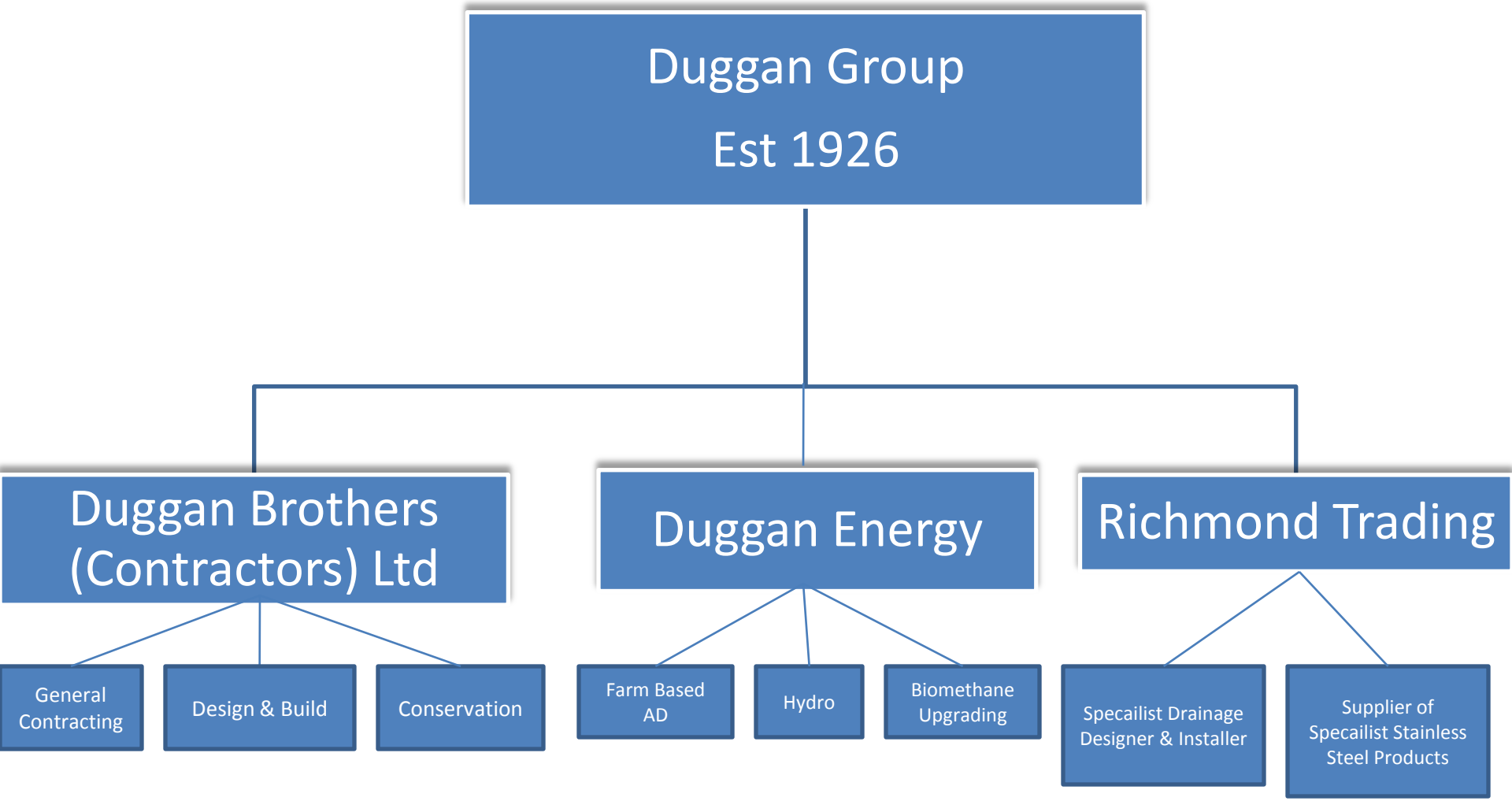
Back to itinerary

# AD In Ireland -
# An Industry In Waiting

John Butler MCIOB
Duggan Energy

DUGGAN ENERGY

# Who are we?


Duggan Group
Est 1926
Duggan Brothers (Contractors) Ltd
Duggan Energy
Richmond Trading
General Contracting
Design & Build
Conservation
Farm Based AD
Hydro
Biomethane Upgrading
Specailist Drainage Designer & Installer
Supplier of Specailist Stainless Steel Products

# Duggan Brothers (Contractors) Ltd

# Duggan Brothers (Contractors) Ltd

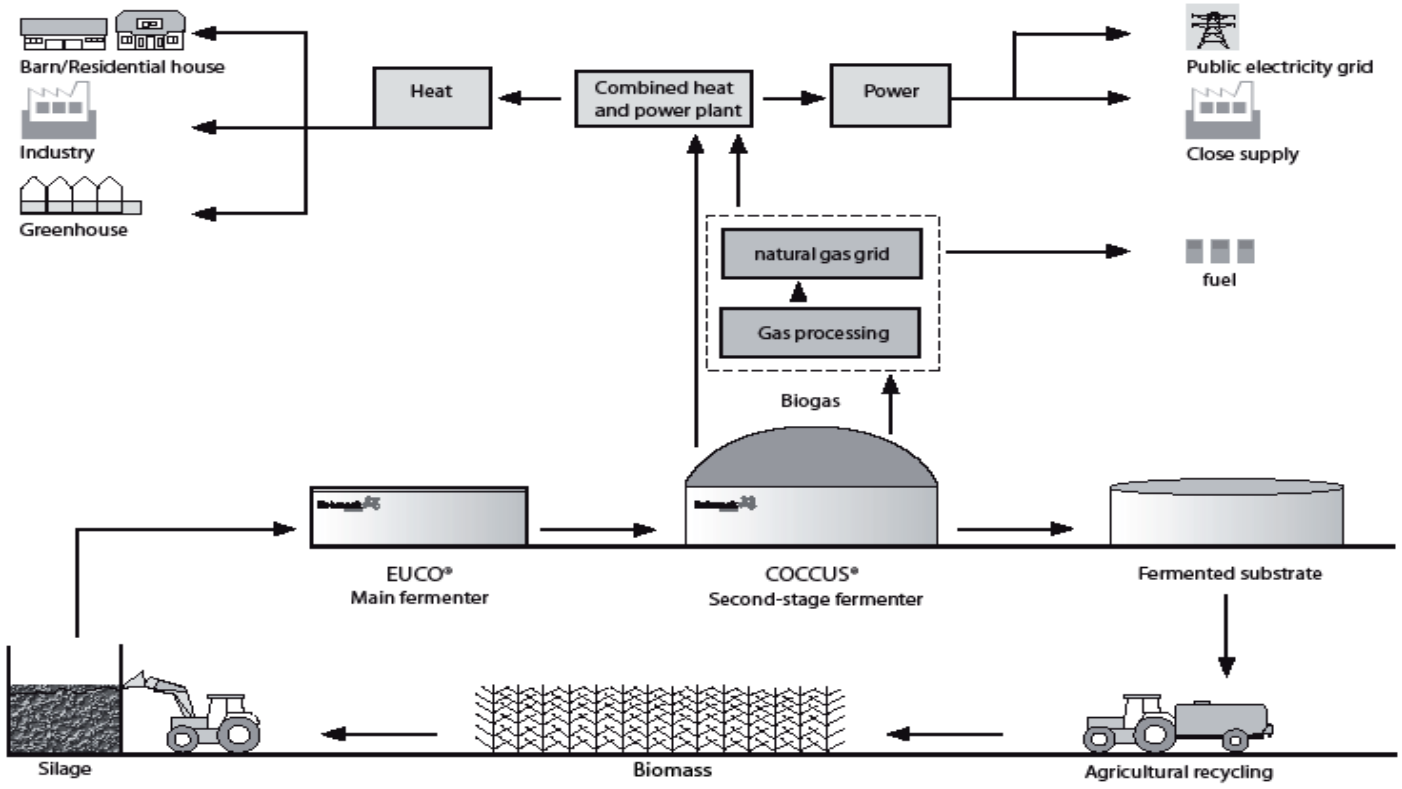
# What is Anaerobic Digestion?

Anaerobic Digestion is a technology that enables us to generate electricity and provide heat. This is done using Biogas as the fuel source.

The Biogas is created from one of our most renewable natural resource “Green Grass” in “Digesters” which are farm-based generation plants.

DUGGAN ENERGY

# How do you convert grass to gas?

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# Typical Plant Layout

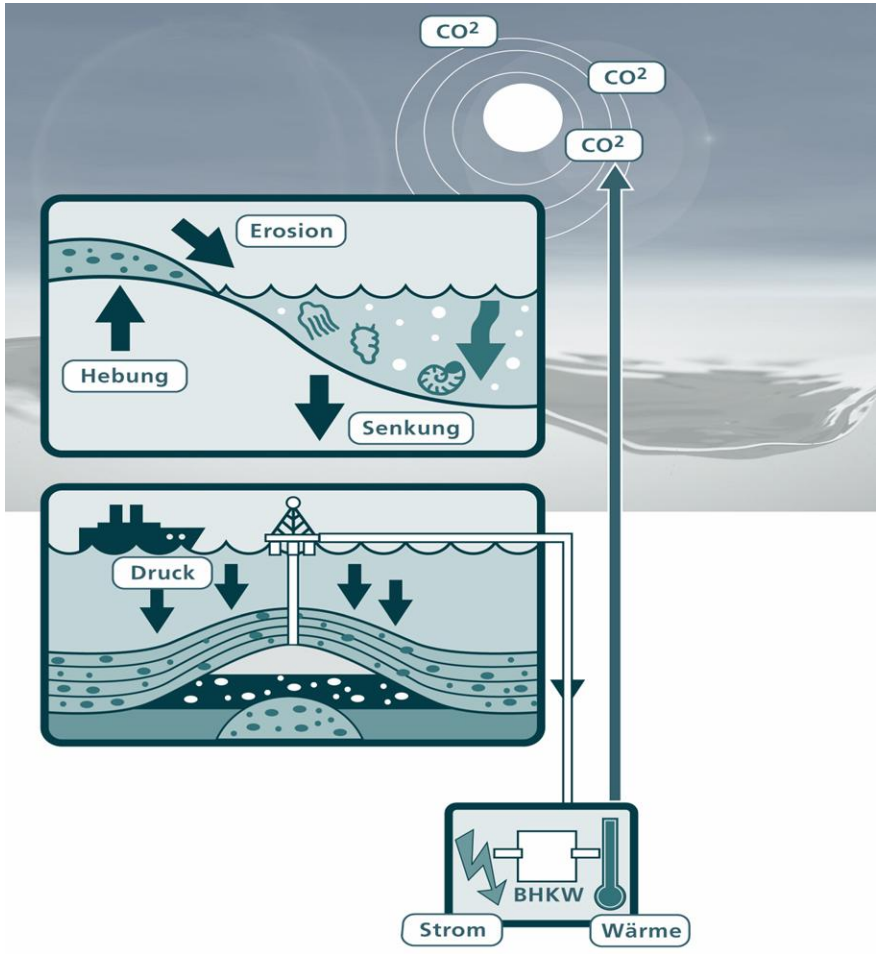
DUGGAN ENERGY

DUGGAN ENERGY

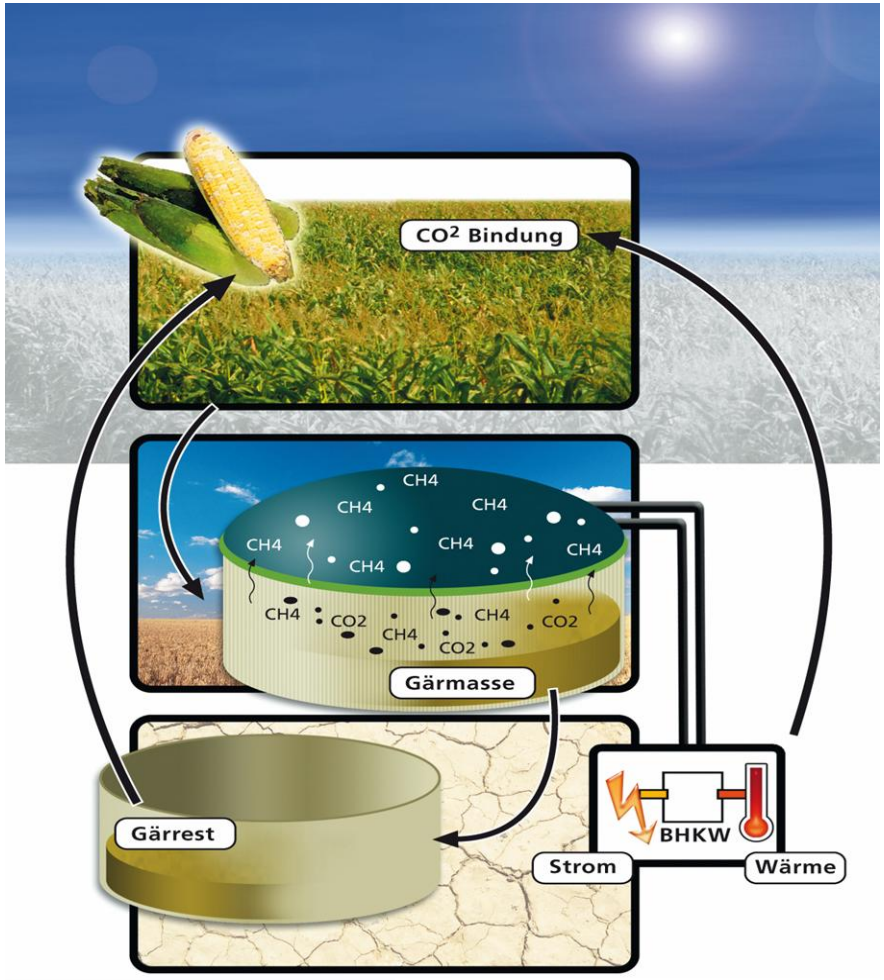

DUGGAN ENERGY

# Biogas = Natural Gas

## Natural Gas




## Biogas



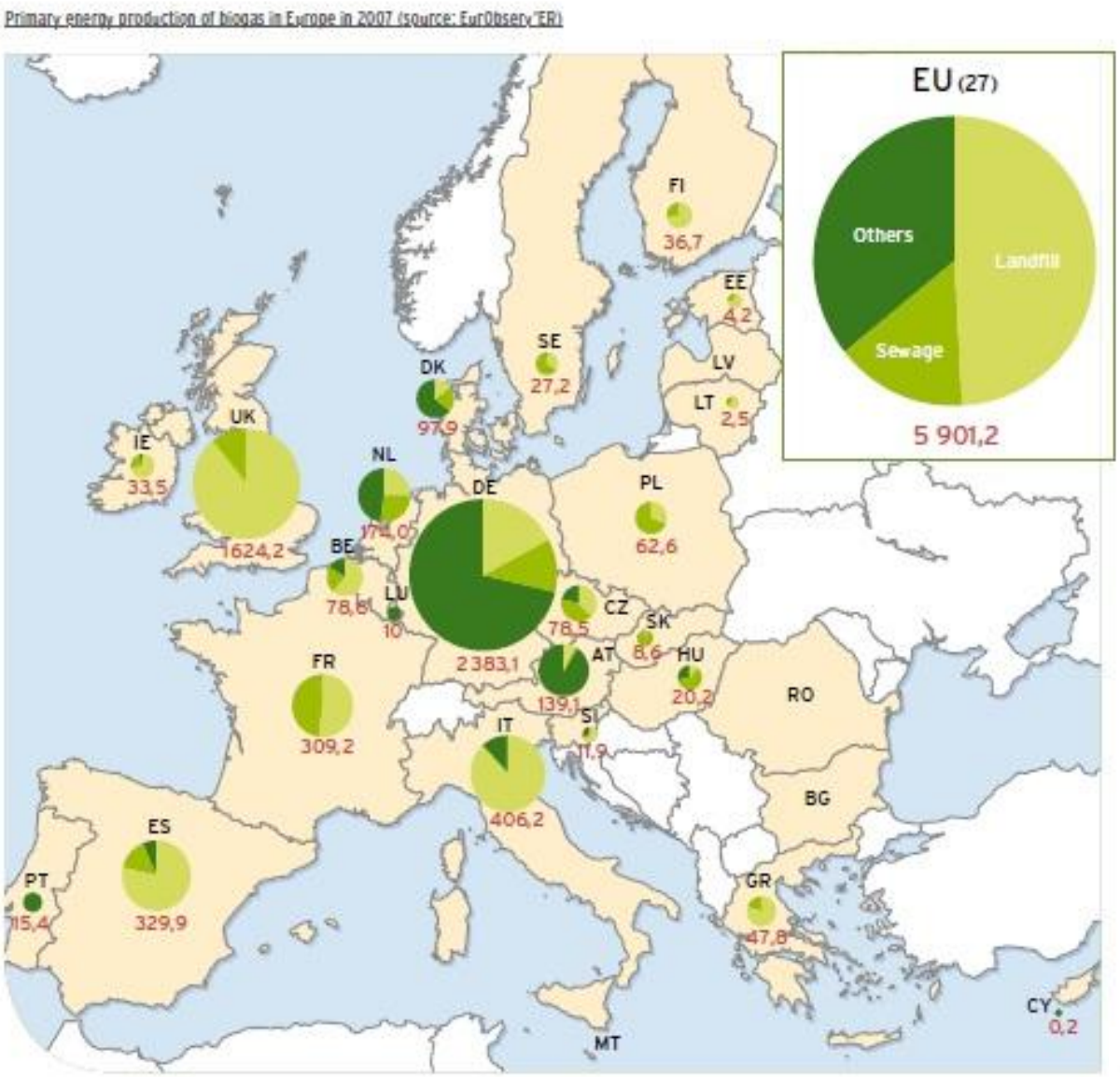

DUGGAN ENERGY

# What are the benefits of AD in Ireland?

- It has the potential to create up to 12,000 rural based jobs in the long term, especially in areas that are becoming employment blackspots i.e. rural areas.
- It has the ability to supply a proportion of our energy requirements without reducing our current Agriculture output.
- Create a new indigenous industry similar to what our EU neighbours are doing.
- It will reduce our Greenhouse Gas Emissions.
- This industry is not dependent on initial capital investment by the government but a sustainable REFIT scheme similar to other EU countries.
- If it is allowed develop correctly it will have a positive effect on the exchequer.
- The development of this industry will also help address food and organic waste disposal issues.
- AD plants are able to be connected into the Distribution Network . Hence, power generated in an area is used in that area.
- Infrastructural changes to the main grids should be minimal.

DUGGAN ENERGY

# Biogas Production in Europe

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# The Problems:

- Currently the REFIT (Renewable Energy Feed In Tarrif) is too low.
- The current price is 12c and we need it increased to 22c index linked for Agriculture Based Plants.
- Ireland is almost unique in not offering a meaningful programme to stimulate this Indigenous Industry

DUGGAN ENERGY

# What are the National Benefits?

- Create an indigenous industry that uses feedstocks that are currently not being used to their full potential
- Create Jobs in rural Ireland
- Added incomes for our rural economies
- Reduce waste going to landfills and reduce our Green House Gas Emissions'
- Secure our Energy Supplies into the future

DUGGAN ENERGY

# The potential in Ireland to produce home grown electricity from grass

- A 380kw plant will require feedstock to the value of €240,000 per year. This feedstock must be produced locally.
- 1000 plants would add an extra €240,000,000 to the rural economy per annum.
- Currently to make up for our shortfall on the National Grid we have to purchase Fossil fuels from abroad meaning this money is leaving Ireland rather than sustaining local communities.
- A previous study has shown we could sustain up to 4000 plants.

DUGGAN ENERGY

# Economic Benefits

- Other economic benefits to the exchequer could be extra corporation tax from the various co-operatives that would be established.
- Manufacturing industry to benefit if mechanical equipment for AD plants is manufactured in Ireland
- Foreign Banks have shown that they would be willing to finance these plants in Ireland if the REFIT was increased. Currently most of them are looking to invest in NI as a result of the ROC's system and that money could be coming here with the right stimulus.
- As said previously if managed correctly AD could have a positive effect on the Exchequer.

DUGGAN ENERGY

# Where are the Opportunities for Investors?

- In developing Biomethane Plants
- In becoming involved in Co-Ops
- In partnering with individual farmers and developing AD Plants on the farmers land

DUGGAN ENERGY

# What is Biomethane ?


DUGGAN ENERGY

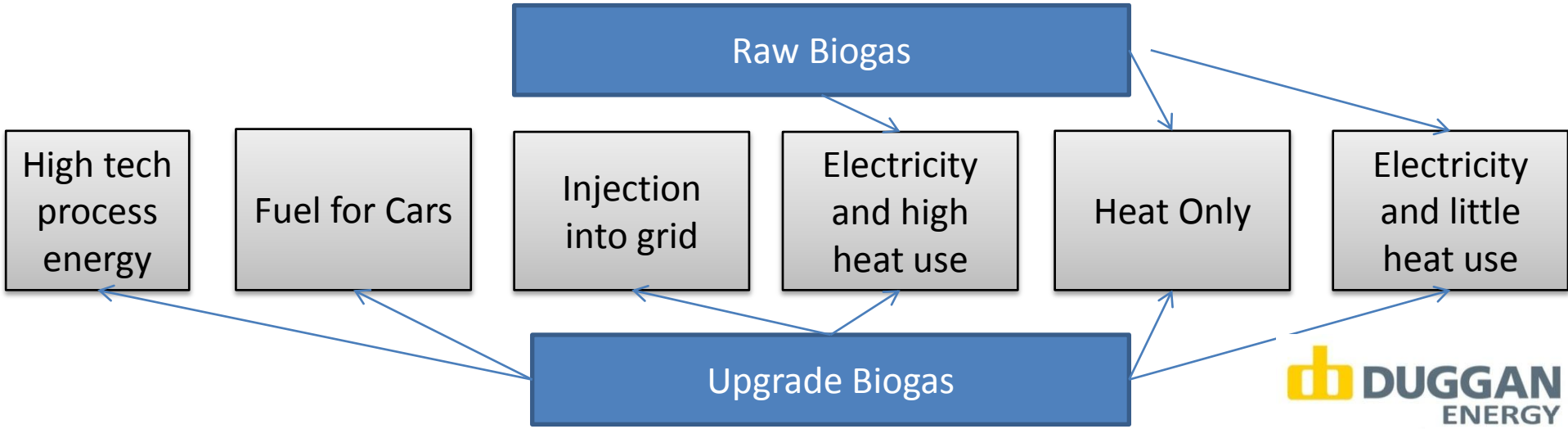
# Versatility of Biogas

## Biogas

- Production of Electricity and Heat (Co-Generation)
- Prod of Electricity alone
- Production of Heat alone

## Biomethane

- Injection into Gas Grid
- Transportation Fuel
- High Tec Process Industry
- Raw material for chemical industry




DUGGAN ENERGY

# Map of German Biomethane Injection installations

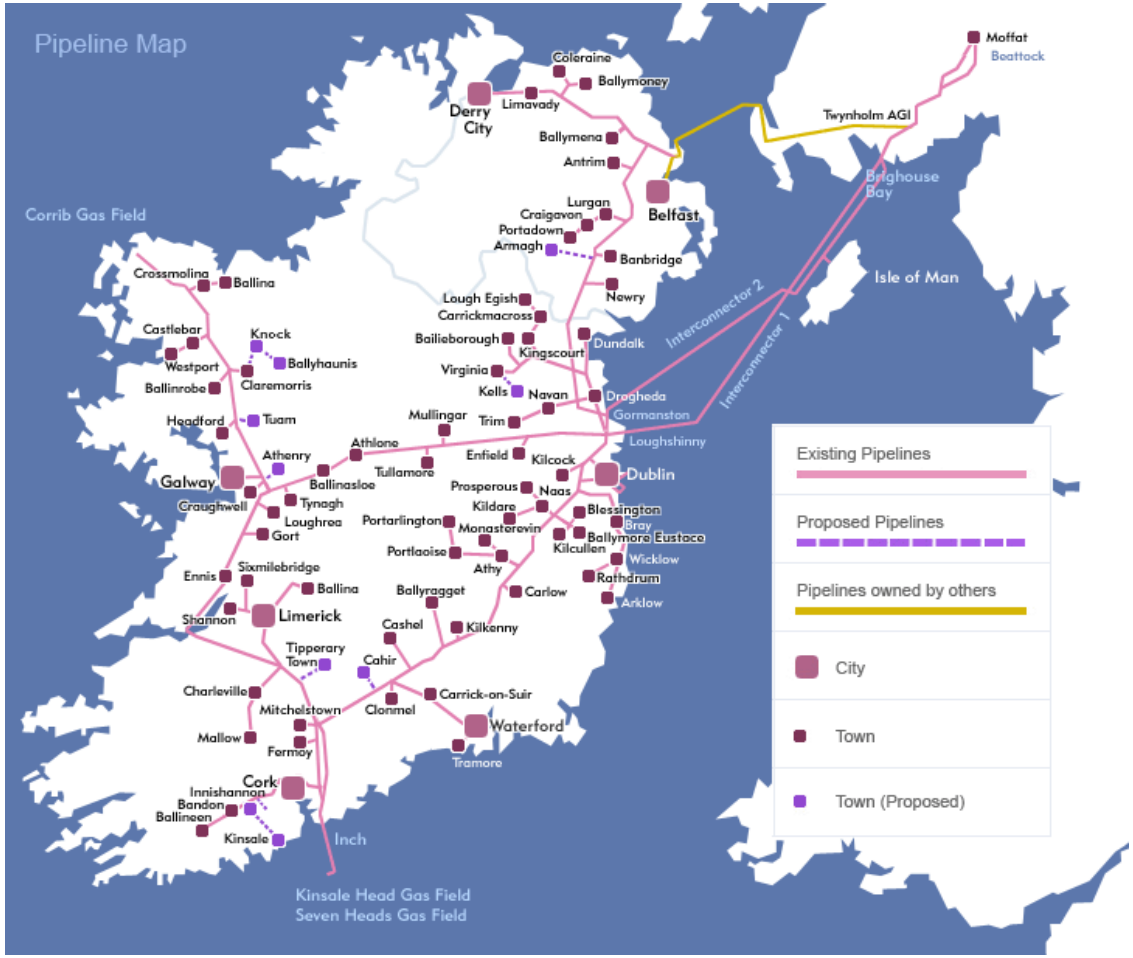

DUGGAN ENERGY

# Biomethane in Ireland

- One of the main opportunities is using Biomethane as a transport fuel.
- We currently import approx €6,000,000,000 worth of fossil fuels per annum
- Biomethane could help to drastically reduce this figure by utilising materials that are currently being sent to land fill or released into the atmosphere
- It can also provide us with a secure energy supply into the future.

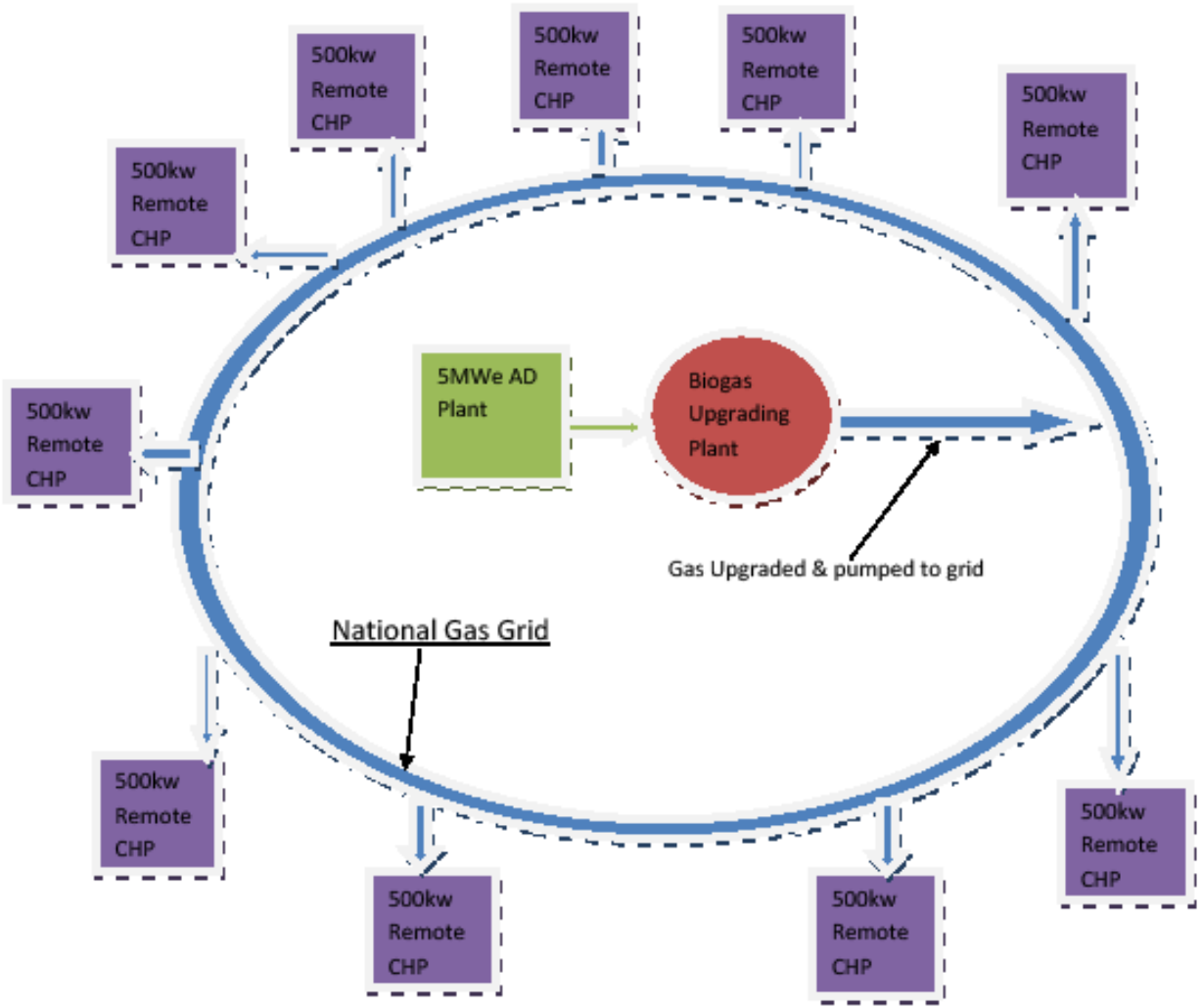
DUGGAN ENERGY

# Gas Network Map




DUGGAN ENERGY

# DE Northern Ireland Project




DUGGAN ENERGY

# Co Operatives

© NL shop * www.ClipartOf.com/44136

DUGGAN ENERGY

# Stoke Bardolph  Nottingham

DUGGAN ENERGY

# Individual Farmers

- A 500kw plant could cost up to €2m to build
- IF the project is geared at 60:40 the farmer will have to come up with about €800,000
- As most farmers may not have this amount of money available there are a numbers of opportunities for Equity Partners to get involved.
- A plant of this size would generate an income of over €1m if it was built in the North, on electricity sales alone. We are happy to talk to anyone about these opportunities.

DUGGAN ENERGY

# Summary of Benefits

Less money leaving the country to purchase Fossil Fuels

Less Greenhouse Gas Emissions

Transport Fuel

Landowners increased income


Less dependance on imported fuels, security of supply

DUGGAN ENERGY

# Thank You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# Schmack Biogas GmbH-
# Company and Industry Drivers

June 2011

Abertay University



22.06.2011

# Content

# Content

# Schmack Biogas – A Member of the Viessmann Group

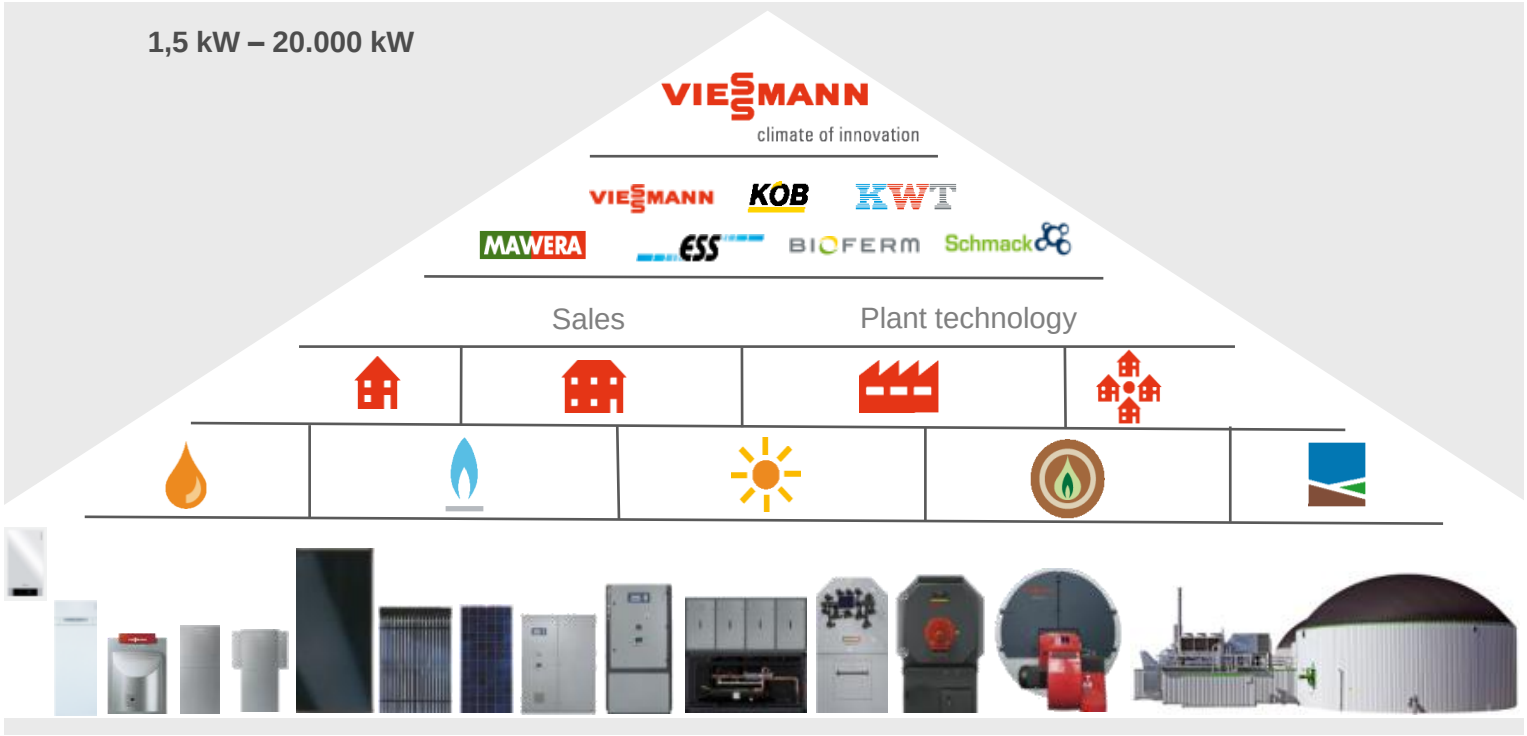
Viessmann Werke GmbH & Co. KG

- Founded: 1917
- Headquarter: Allendorf (Eder), Germany
- Products: Complete supplier of heat- and cooling technology
- Employees: 9,400
- Revenue: 1.7 Billion Euro
- Share Renewable Energy: > 25% (in 2008)
- Export share: 54 %


- Family Owned in the Third Generation
- Sales in over 74 countries worldwide
- www.viessmann.com

# Complete. Efficient. Sustainable.

## The Viessmann Comprehensive Range




Viessmann: Individual solutions with efficient systems for all energy-sources and utilities



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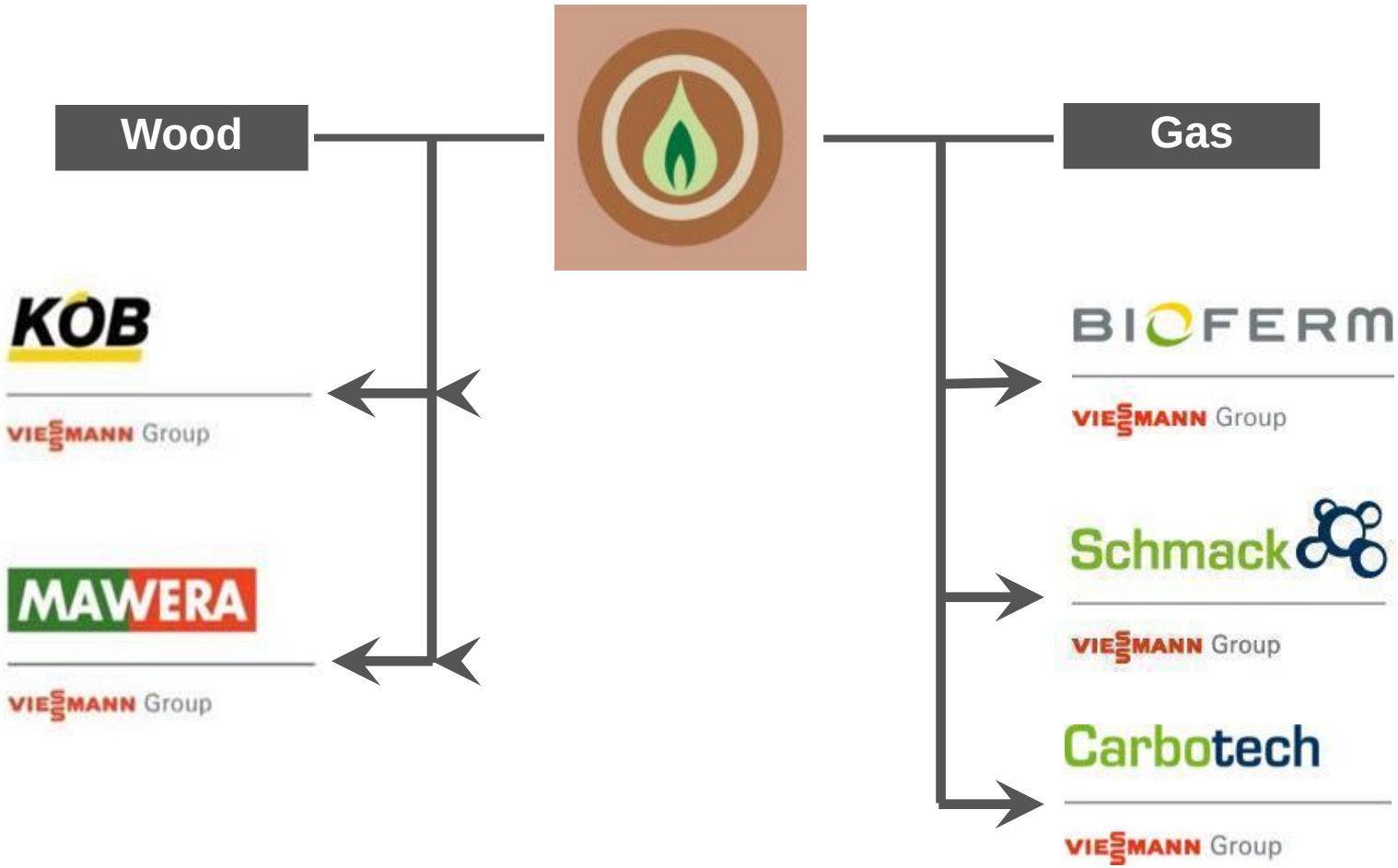
# Schmack Biogas – A Member of the Viessmann Group



# Ad Plant Systems

Schmack
VIESMANN Group

## Non-pumpable Inputs

**BIOFerm Technology (IVC)**

## Pumpable Inputs

**EUCO Titan**

**COCCUS Titan**



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# Content

# Schmack Biogas in the Viessmann Group

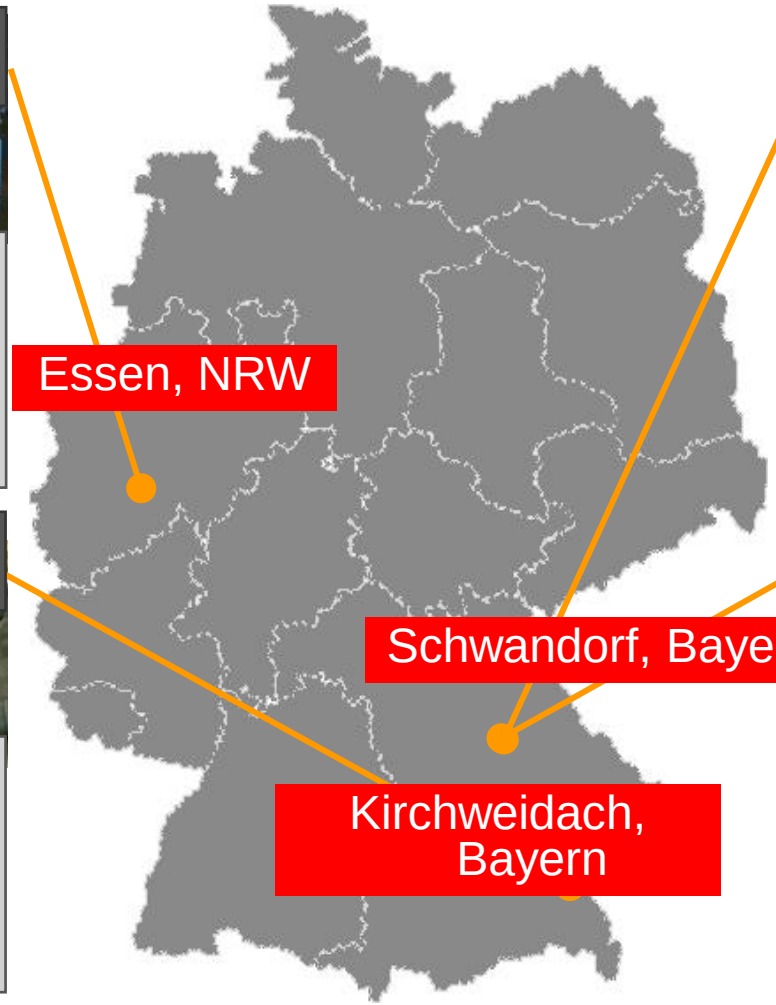
VIESMANN Group

## Schmack Carbotech GmbH

- Gas to Grid Upgrading Technology

## Schmack Biogas GmbH

- Sales
- Project Development
- Plant Constructiong
- Commissioning




## Schmack Biogas Komponenten GmbH

- Feeder Technology
- Agitators
- Materials Handling
- Digester Heating

## Schmack Biogas Service GmbH

- Technical Service
- Biological Service
- 24/7 Remote Monitoring



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# Schmack Biogas GmbH

- Founded: 1995
  Member of the Viessmann Group as of January 1, 2010
- Headquarter: Schwandorf, Germany
- Products: Turn-Key
  Biogas Technology
  Biogas Components
  Biological Service
  Technical Service
- Employees: ca. 250

- Constructed over 230 biogas plants to date with ca. 100 MW of installed capacity
- Ulrich Schmack consulted Chancellor Merkel at the Chancellor's Energy Summit
- www.schmack-biogas.com

# Schmack Biogas GmbH HQ

Schwandorf (Bavaria), Germany




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# AD Process Flow Scheme

# Scheme of a EUCO Titan Schmack AD plant


1 PASCO (dosing station)
2 CALIX (reception pit)
3 EUCO (high performance digester)
4 COCCUS (pit storage digester)
5 AIO All-in-One-Module (CHP, system cpontrol and material distibution)
6 Transformer station
7 SULA (gas-tight fermentation residue store)



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# PASCO Dosing STATION

Proven Technology – from 5 to 80 m³



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# EUCO Plug Flow Digester

## High Performance Digester Handles up to 15% Dry Matter Substrates



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# REMEX EUCO-Agitator

Robust Mixing Technology



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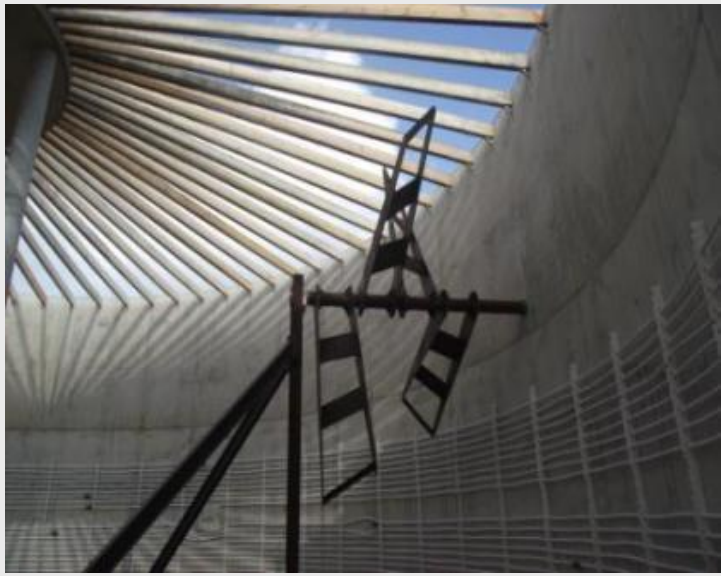
# COCCUS Secondary Digesters

## Providing High Gas Yields

# Inner View COCCUS Digester

## Robust Mixing in Secondary Digesters



# SULA Tertiary Digester

## Covered Digestate Storage



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# Separator

Separation of Digestate (solid/liquid)

# Combined Heat and Power (CHP)

# Schmack Biogas  1st UK Reference: Severn Trent Water Stoke Bardolph 2MWel Energy Crop AD Plant



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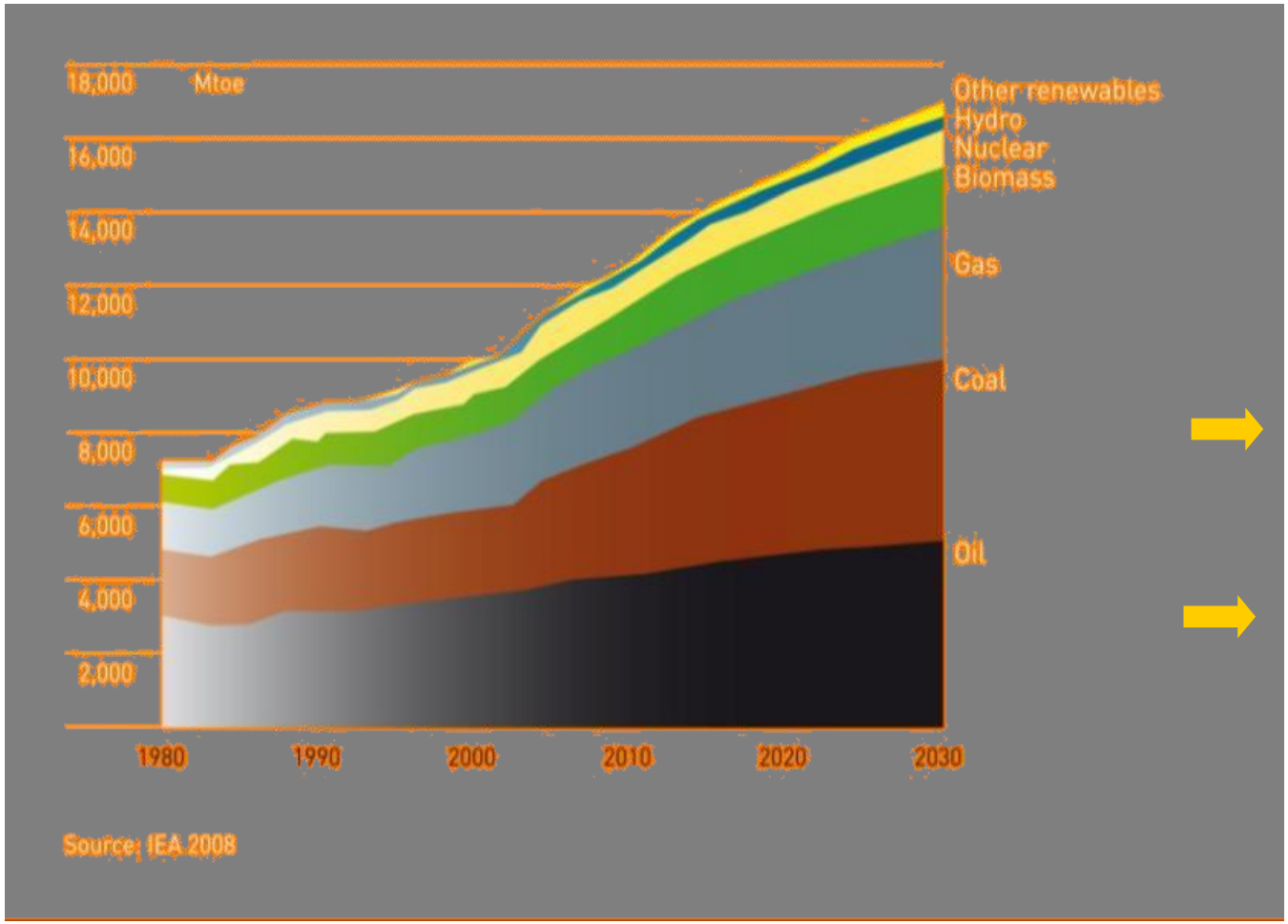
# Content

# 1st Driver: Rising Global Energy Demand




World energy demand expands by 45% between now and 2030

average rate of increase of 1.6% per year

with coal accounting for more than a third of the overall rise



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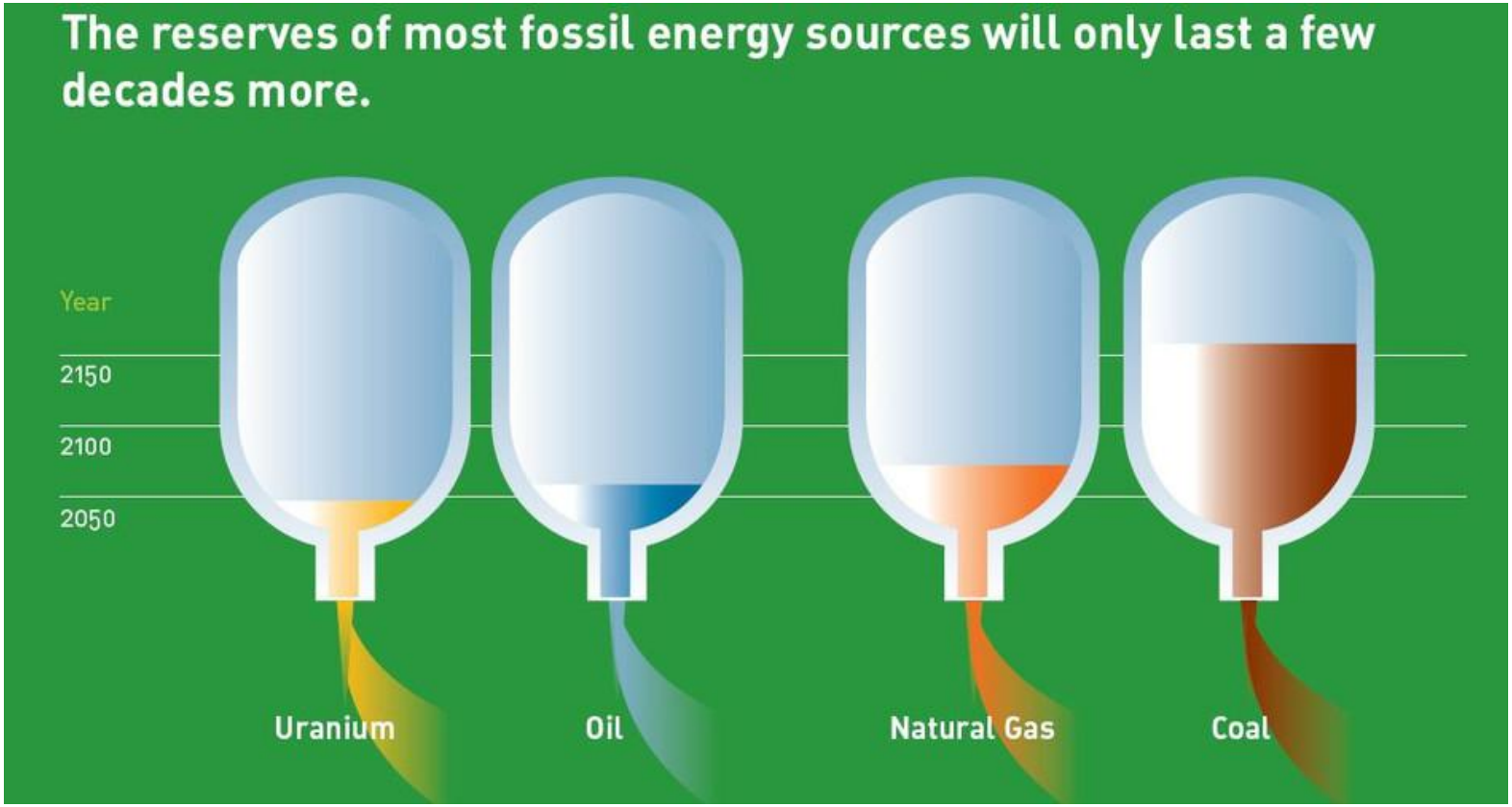
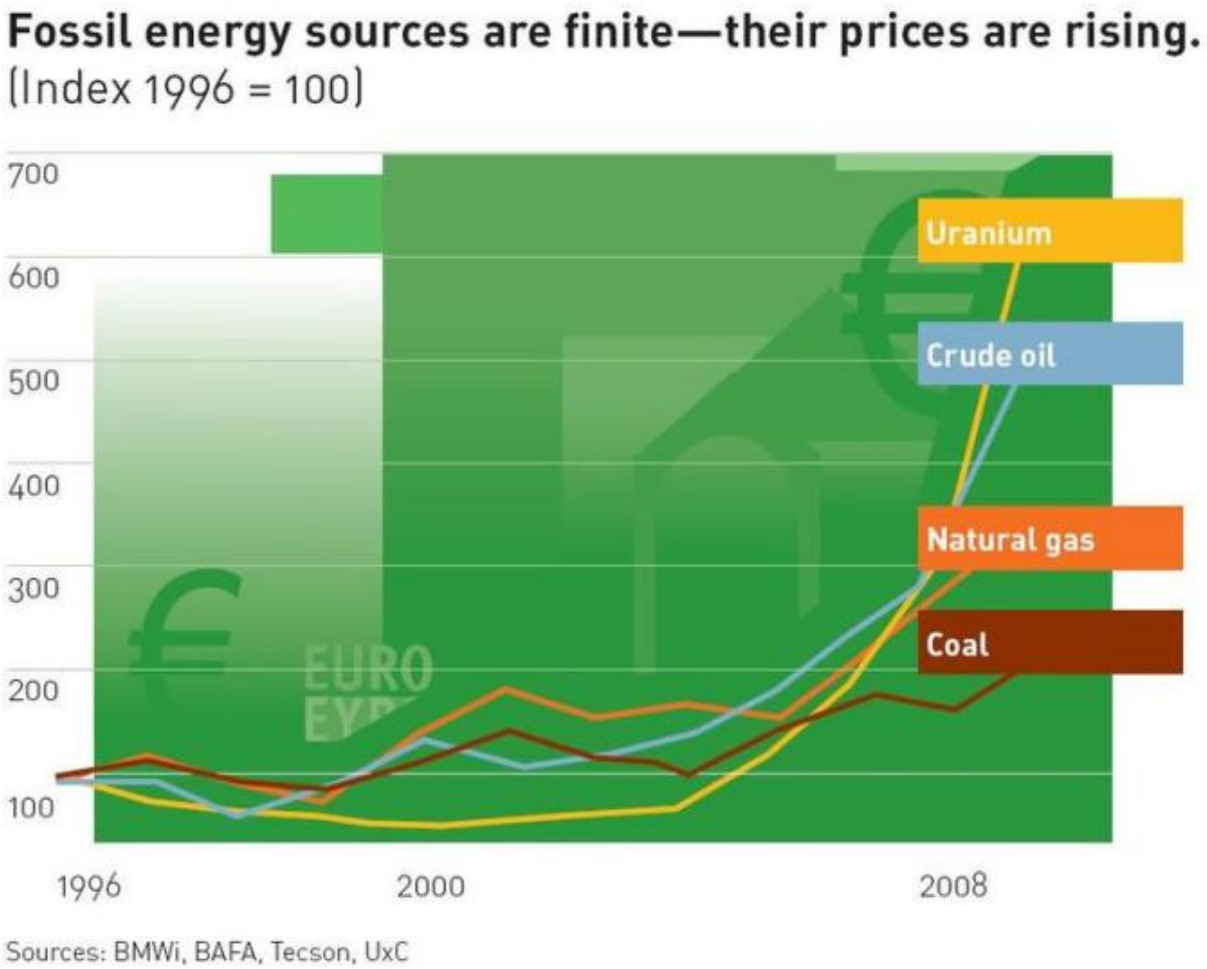
# 2nd Driver: Limited Energy Resources

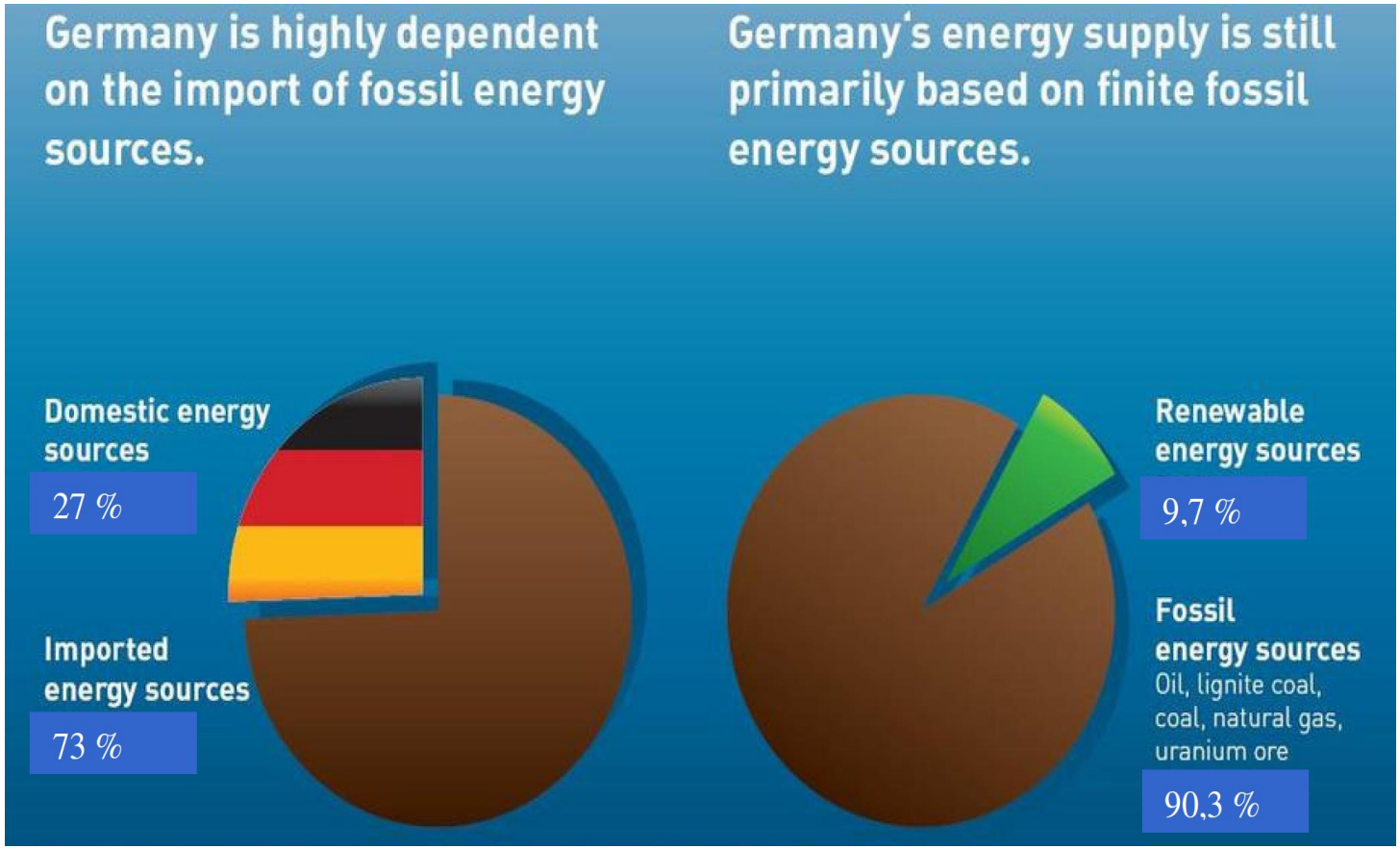



Consequence: Rising prices

# Consequence: Rising Energy Prices



# 3rd Driver: Germany's Dependence on Imports




Sources: BMWi, BMU

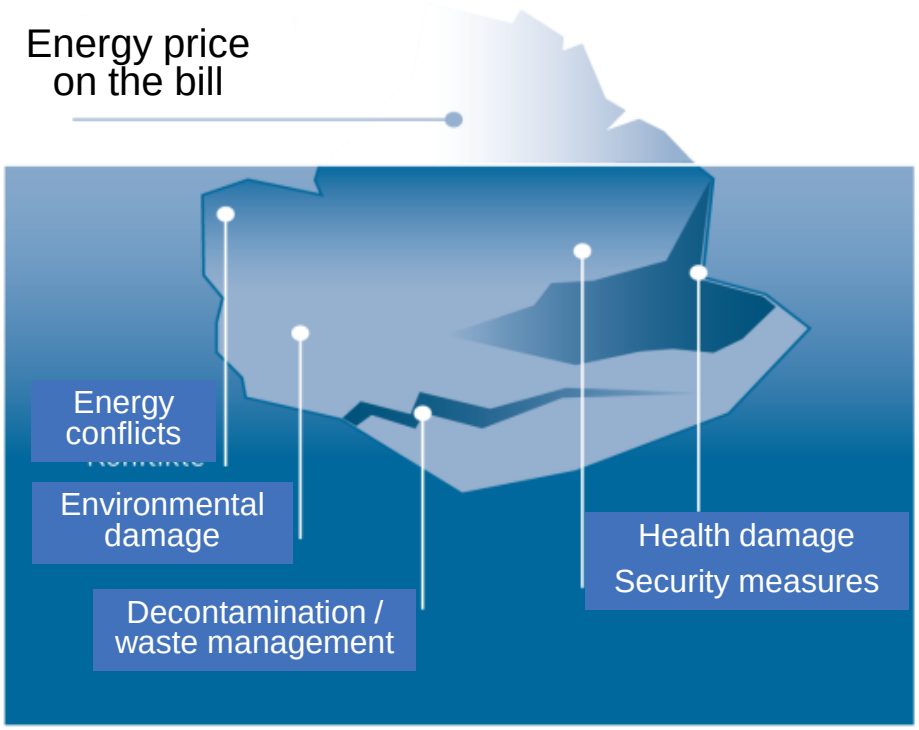
# 4th Driver: Risks of Nuclear Energy

- No safe final disposal for the hazardous waste
- Danger of accidents
- High risk of weapons-grade plutonium or uranium falling into the wrong hands (see disputes with North Korea and Iran)
- Barrier for further investment in renewable energy: fluctuating renewable energies need flexible power plants – no base load technologies

Last week German Government agreed to phase-out the utilization of nuclear energy in Germany by 2022!!

# 5th Driver: Climate Change

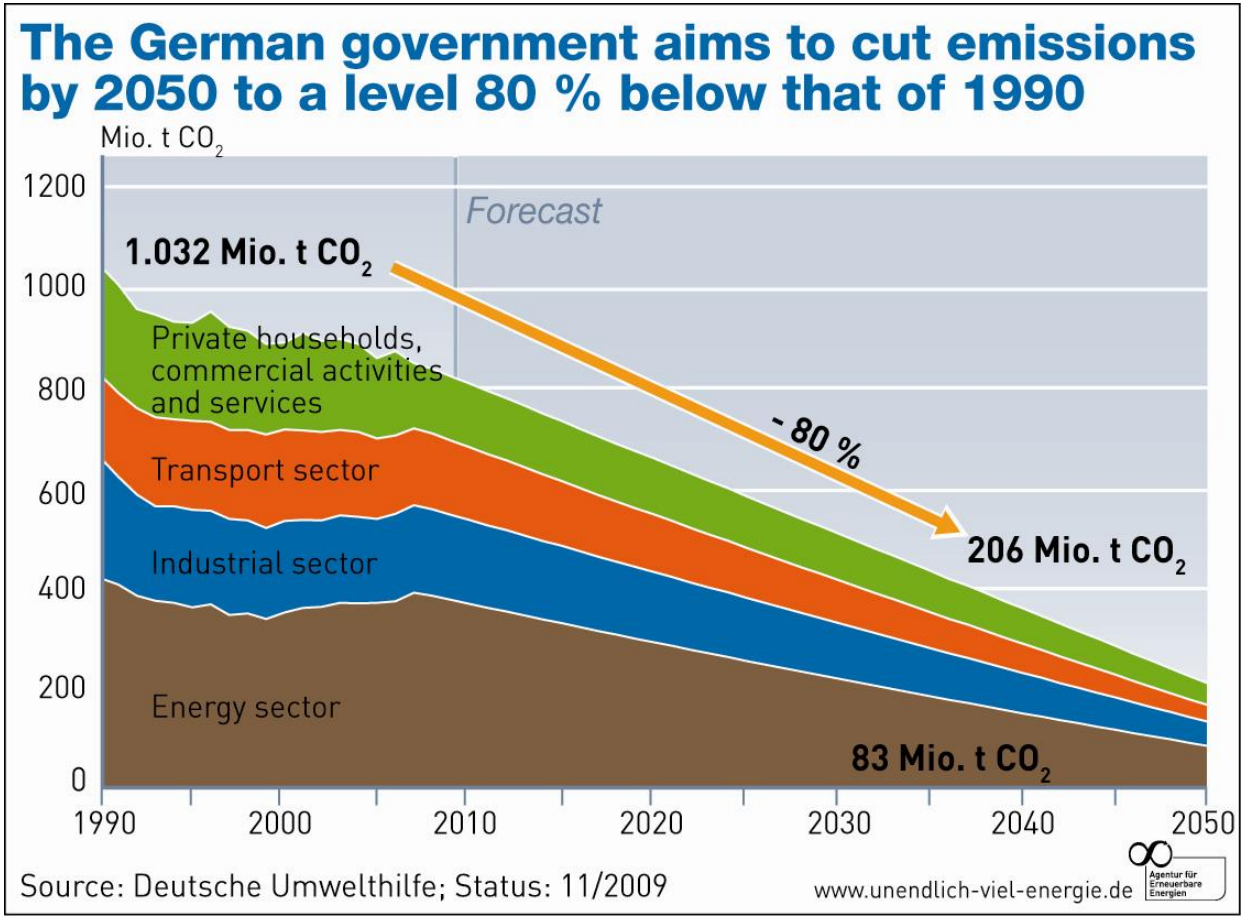
Many costs of our conventional energy supply are hidden under the surface




Consequence:
Young technologies need political and financial support in order to compensate future hidden costs

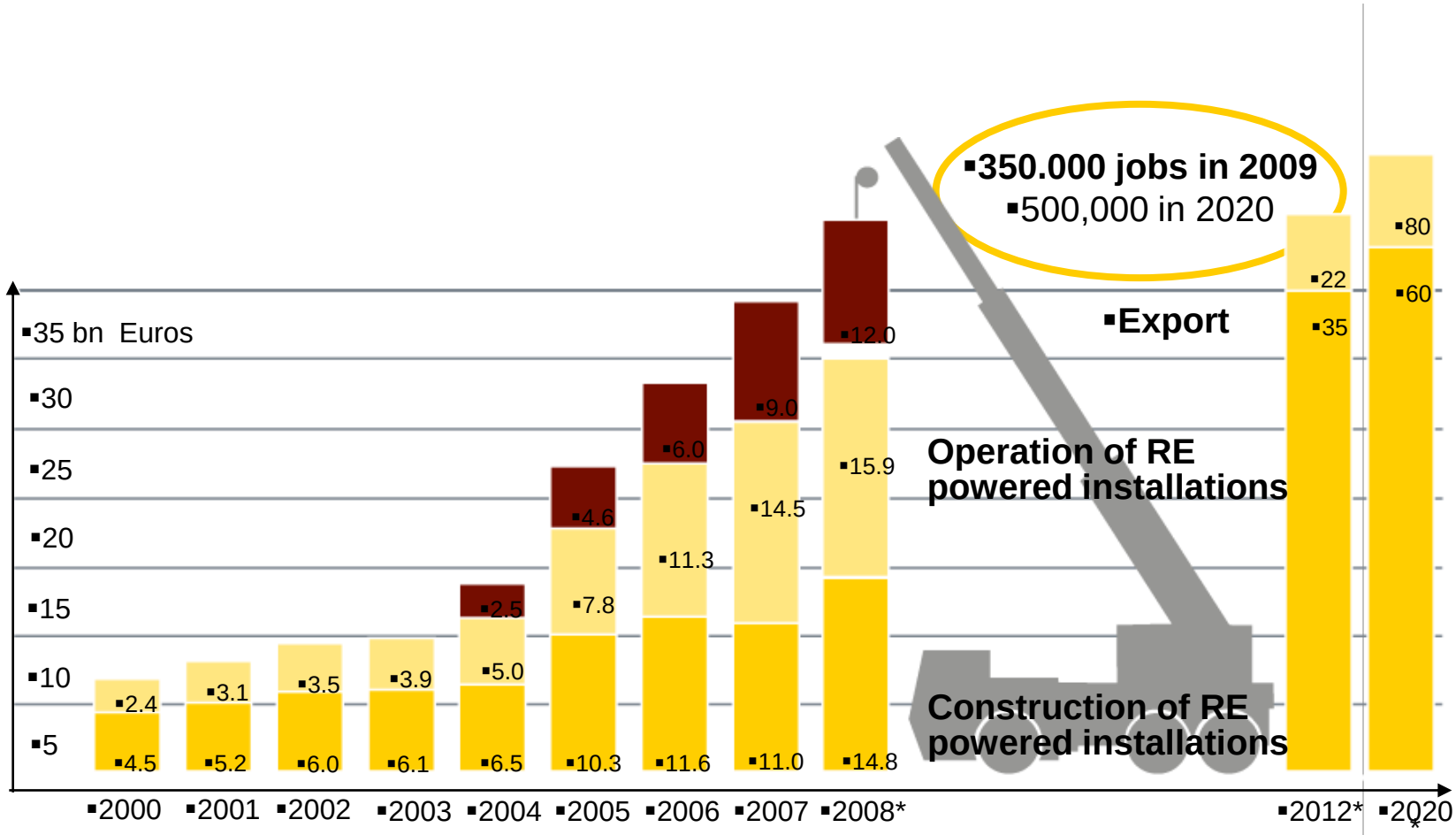
Get RE ready for the market, make technology available and affordable

# 6th Driver: Latest G8-Target Decision*




* July 9th, 2009, in Aquila,
Italy: 80% reduction of greenhouse gas emissions
till 2050

# Support for RE establishes an Industry and Ensures Economic Growth (=7th Driver!)




Sources: BMU * Industry forecast



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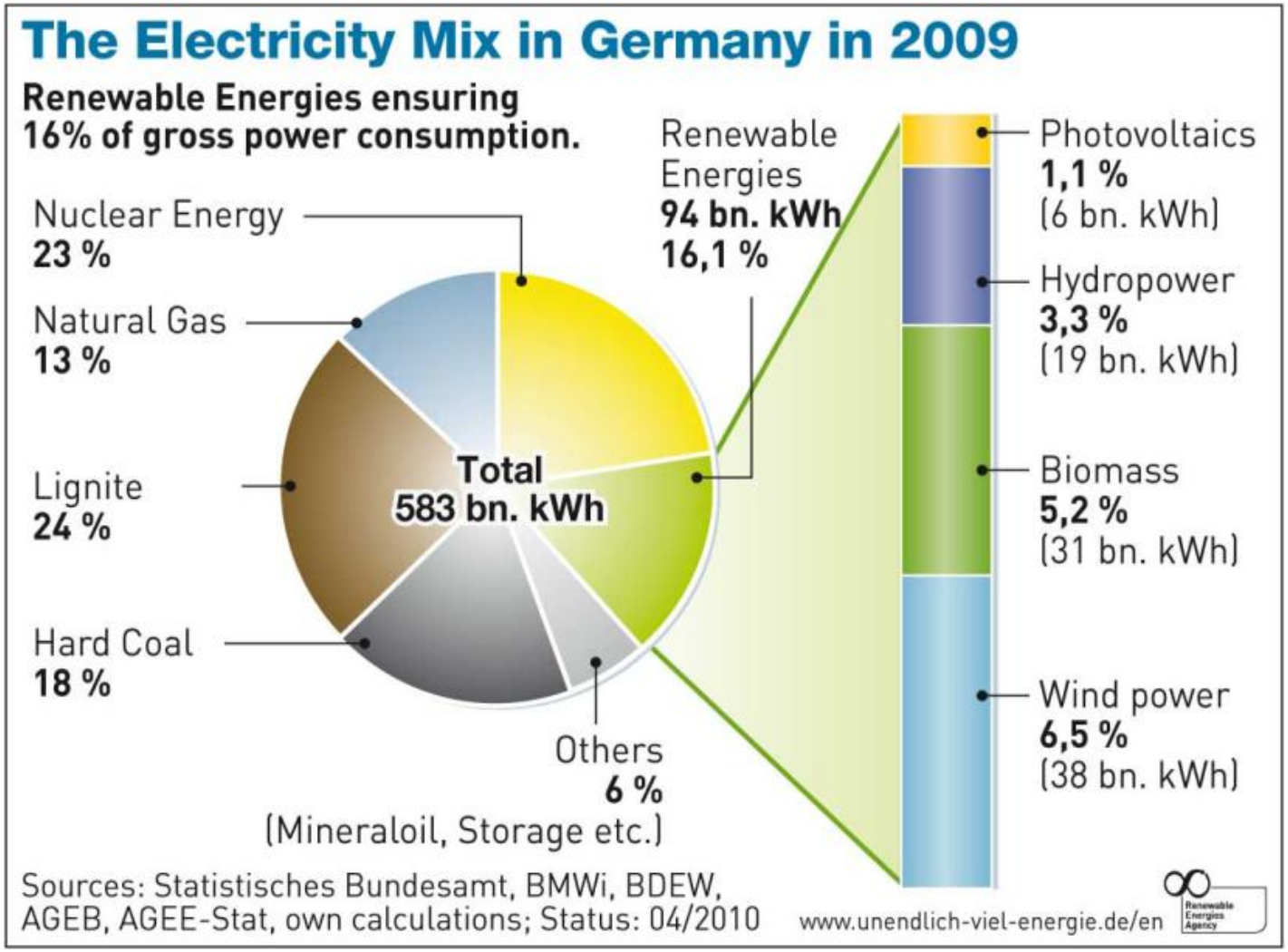
# Content

# German RE Resources Act ("EEG") – The Objective

**The Purpose of this Act was to:**

- to facilitate a sustainable development of energy supply, particularly for the sake of **protecting our climate** and the environment,
- to **reduce the costs of the energy** supply to the national economy, also by incorporating external long-term effects,
- to **conserve** fossil fuels
- and to promote the **further development** of technologies for the generation of electricity from renewable energy sources."

# Today RE Delivers 16 % of the Total Electricity Consumption



# The EEG 2009

| | | | <=150 kW | <=500 kW | <= 5 MW |
|---|---|---|---|---|---|
| 1. | **Basic compensation** | | 11,67 Cent **(+ 1 Cent)** | 9,18 Cent (unchanged) | 8,25 Cent (unchanged) |
| 2. | **Clean air – bonus - new** | Old plants | 1,0 Cent | 1,0 Cent | |
| | | New plants | 1,0 Cent | 1,0 Cent | |
| 3. | **Renewable primary products bonus - new** | | 7 Cent **(+ 1 Cent)** | 7 Cent **(+ 1 Cent)** | 4 (unchanged) |
| 4. | **Landscape work bonus - new** | | 2 Cent | 2 Cent | |
| 5. | **Bonus for > 30 % manure - new** | | 4 Cent | 1 Cent | |
| 6. | **Bonus for innovative technologies (without Gasinjection)** | | 2 Cent (unchanged) | 2 Cent (unchanged) | 2 Cent (unchanged) |
| 7. | **Bonus for innovative technologies (with Gasinjection)** | New Plants | Depending on the size of the gas treatment 0/1/2 Cent | | |
| | | Old Plants | 2 Cent | | |
| 8. | **KWK- Bonus** | | 0/2/3 Cent **(+ 1 Cent)** | 0/2/3 Cent **(+ 1 Cent)** | 0/2/3 Cent **(+ 1 Cent)** |

# Reduction of Greenhouse Gas Emissions (Use of Slurry)

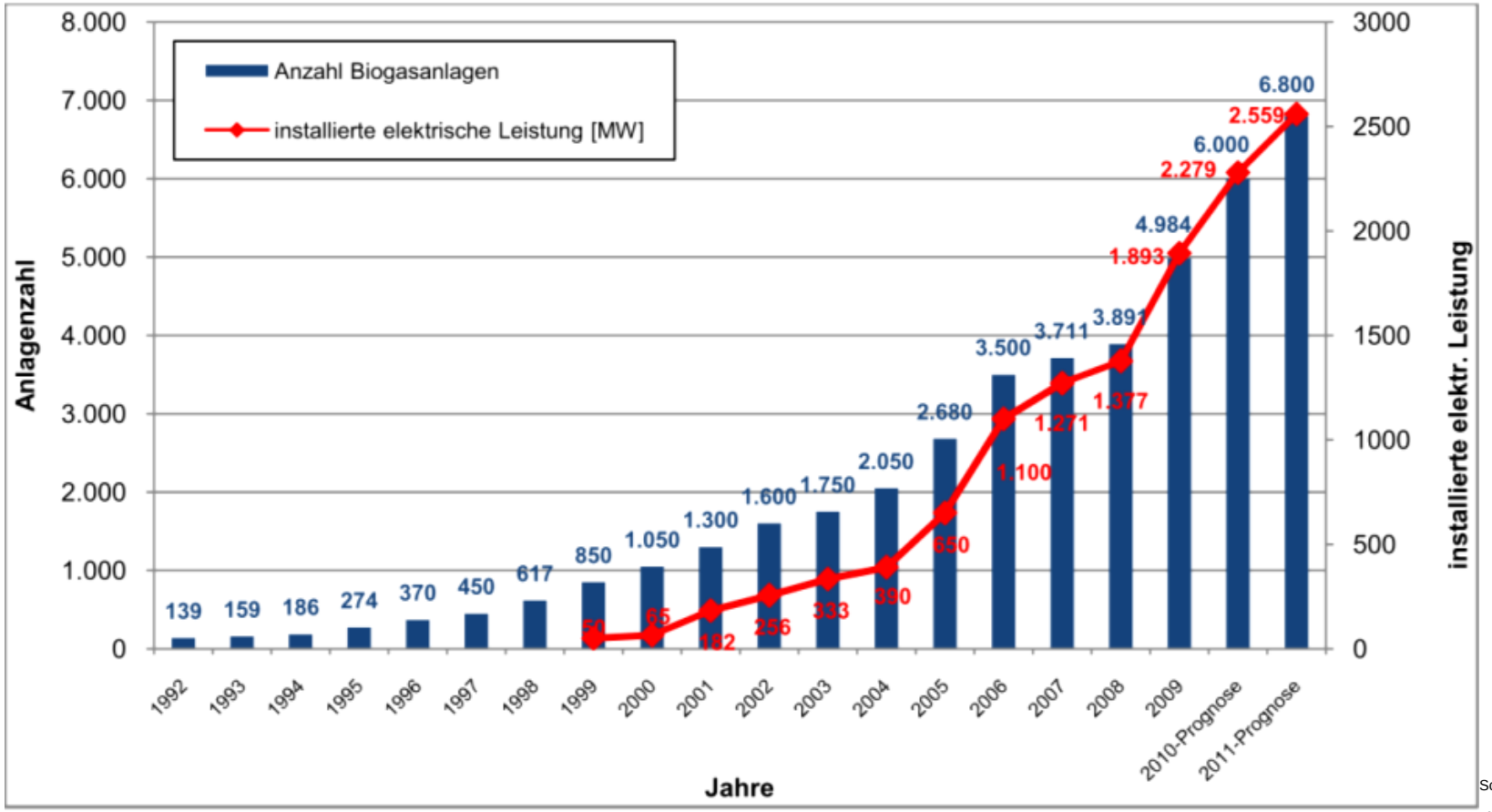
## Carbon footprint of Livestock farming can be significantly improved by AD

**Avoiding Methane Emissiones($CH_4$) by use of slurry in AD plants**

| Animal | Stock in D (Source: Federal Ofice for Statistics 2008) | $CH_4$-Emissions from Slurry[kg/t animal*a] (Source: Bavarian State Ministry for Agriculture and Forestry 2003) | $CH_4$-Emissions[t/a] | Up to 90 % of $CH_4$-emissions from Slurry can be avoided by use in AD; here assumed: 85 % | Avoided $CH_4$-emissions [t/a] by use in AD | $CH_4$-Climate-factor | $CO_2$-equivalent [t/a] avoided by using 80 % of the available slurry in AD |
|---|---|---|---|---|---|---|---|
| Cows | 4.200.000 | 34,5 | 144.900 | | | 25 | |
| Beef | 8.800.000 | 16,2 | 142.560 | | | 25 | |
| Swine | 26.700.000 | 3,2 | 85.440 | | | 25 | |
| Summe | | | 372.900 | 0,85 | 316.965,00 | 25 | 6.339.300 |
| | | | | By using 80 % of the produced slurry in D in AD it is possible to avoid a $CO_2$ equivalent [t/a] | | | 6.339.300 |

- Today 20 % = 1,3 Mio. t

# Number of biogas plants and Installed Power Capacity



# Overview of AD Facts in Germany

## Biogas-Branchenzahlen auf einen Blick

| | Ende 2009 | Prognose Ende 2010 | Prognose 2011 |
|---|---|---|---|
| Anlagenzahl (davon Einspeiseanlagen) | 4.984 (30) | 6.000 (50) | 6.800 (80) |
| installierte elektrische Leistung in Megawatt | 1.893 | 2.280 | 2.560 |
| mit Strom versorgte Haushalte in Mio. | 3,5 | 4,3 | 4,9 |
| Umsatzvolumen in D in Mrd. € | 4,44 | 4,70 | 4,71 |
| Arbeitsplätze | 16.000 | 19.000 | 20.000 |
| Exportrate in % | 10 | 16 | 23 |

# Thank You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Back to itinerary



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# Panel Discussion

David Hourihane, ByrneWallace

BYRNE WALLACE
YOUR LEGAL BUSINESS PARTNERS

ENTERPRISE IRELAND

RSM Farrell Grant Sparks

# Networking reception

BYRNE WALLACE
YOUR LEGAL BUSINESS PARTNERS

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RSM Farrell Grant Sparks