

# Energy Crops Running Out of Steam?

RELU debate in Science Week

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1800 to 1930

Royal Academy of Engineering



# A time of enormous pressure for change

- ◆ Climate Change

- ◆ Population

- ◆ World Trade Liberalisation

- ◆ CAP Reform

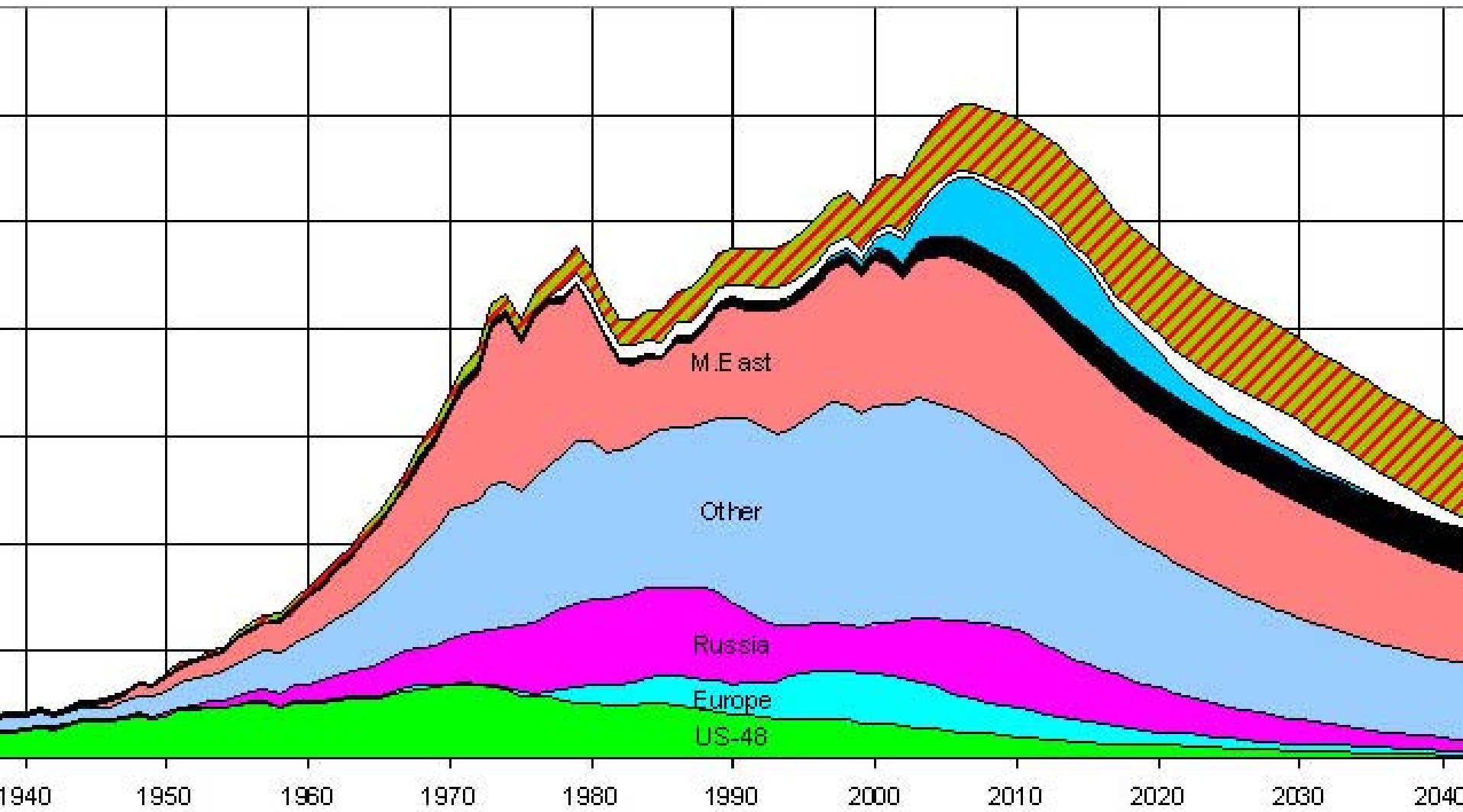
- ◆ Food Chain issues

- ◆ Energy security

- Peak oil production & increasing demand

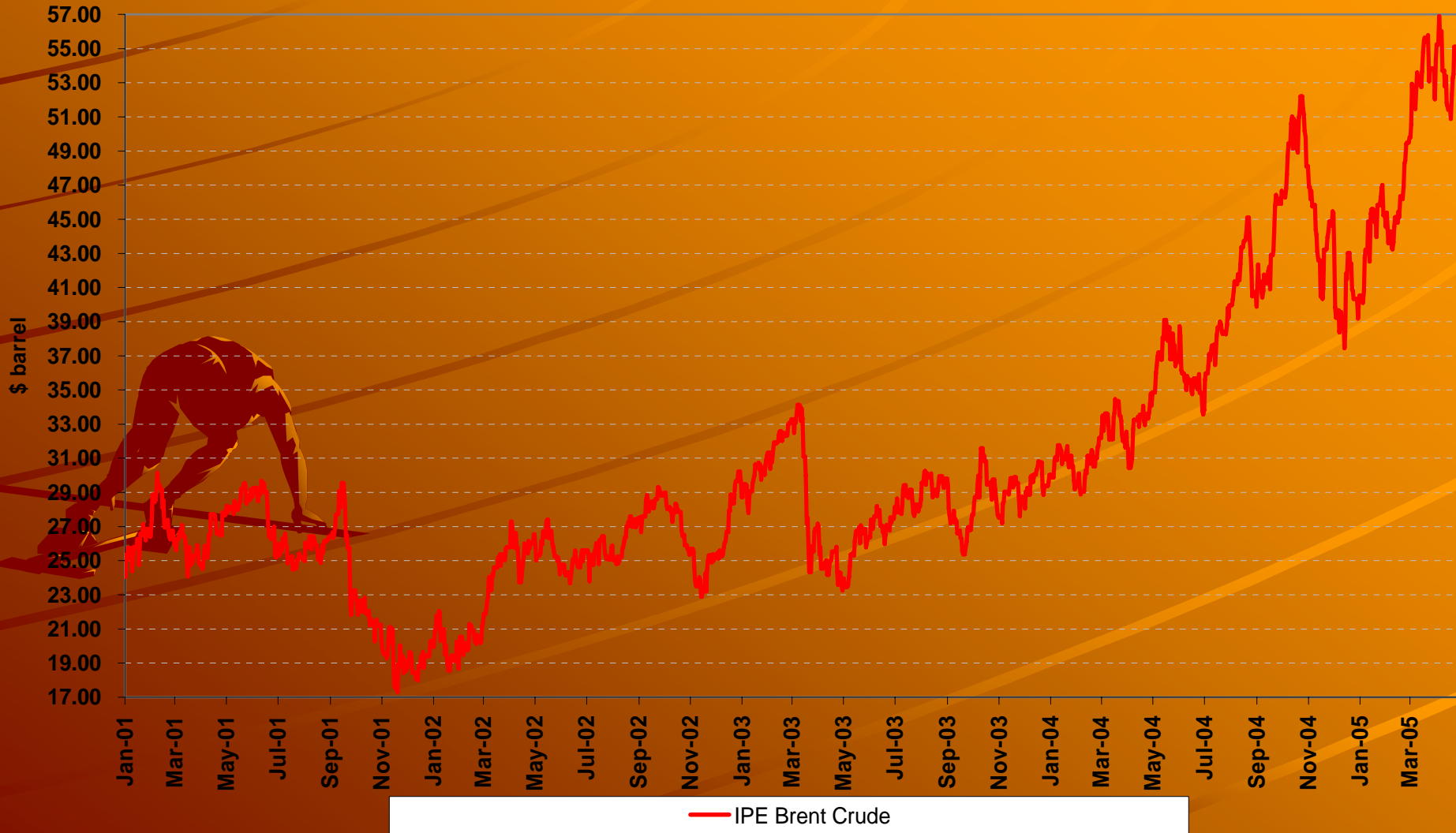
- High dependence on gas from the east

# OIL AND GAS LIQUIDS 2004 Scenario



■ US-48 ■ Europe ■ Russia ■ Other ■ M. East ■ Heavy etc. ■ Deepwater □ Polar ■ NGL

# Brent Crude Price Trend



# Oil Supplies: Past & Future

- ✦ Total oil used since 1850
  - ✦ 1,000 billion barrels
- ✦ Total world reserves remaining
  - ✦ 1,000 billion barrels
- ✦ %oil currently available found before 1973
  - ✦ 70%
- ✦ Time left at current world usage of 29 bbls per annum
  - ✦ 33 years
- ✦ Time left for US if it only uses oil in its own oil fields
  - ✦ 3 years
- ✦ Time left for US if it takes all of Iraq's oil as well
  - ✦ 15 years
- ✦ Time left if whole world were to use oil at the same rate as USA
  - ✦ 6 years
- ✦ % world oil used by non-US-ians
  - ✦ 75% and growing

# A few key issues

- ✦ In an age of energy efficiency
  - We waste enough heat in our power stations to heat the whole country for free
  - We only re-use 1.4 million tonnes of 5 to 6 million tonnes of reclaimed timber with the balance to landfill
  - We have failed to recognise the enormous energy resource in waste materials
  - We have failed to recognise the need to consider options for renewable heat
- ✦ And while there are many renewable sources of electricity (including biomass), there is only one widely available source of renewable high grade heat: biomass

# A time of enormous pressure for change

- ◆ Climate Change
- ◆ Population
- ◆ World Trade Liberalisation
- ◆ CAP Reform
- ◆ Food Chain issues
- ◆ Energy security
- ◆ Food Security

– Finite amount of land with competing demands for its use:

- ◆ Food production
- ◆ Energy production
- ◆ Environmental and recreational use

# UK Land Use average 2001/04

Total Cropped area	4.558 mha
Total set aside	0.665 mha
Grass < 5 years old	1.224 mha
Total arable land	6.447 mha
Grass > 5 years old	5.602 mha
Total arable + grass	12.049 mha
Woodland	0.536 mha
Common rough grass	1.235 mha
Total agric. Area	18.491 mha
Total cereals	3.113 mha

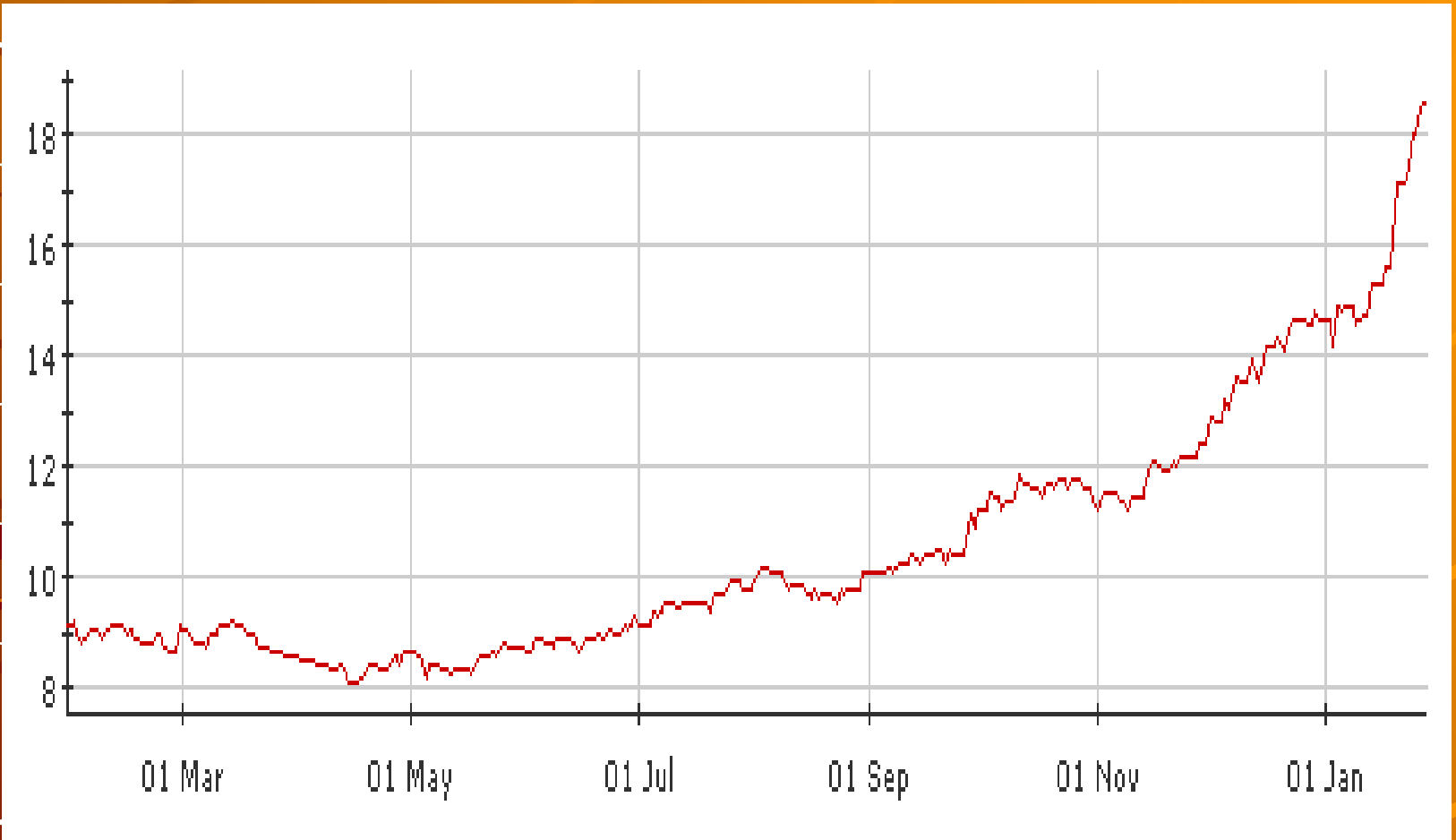
# What Is the Potential from Land?

		2005				2010			
ktonnes	Total		2%	hectares		Total		5.75%	hectares
All fuels	40,317		806			44,514		2,560	
Diesel	19,773		395	272,867		24,877		1,430	986,995
petrol	20,545	Wheat	411	177,920		19,636	Wheat	1,129	488,887
		S.Beet	411	100,260		19,636	S.Beet	1,129	275,493
<b>Total</b>	<b>Wheat</b>			<b>450,787</b>					<b>1,475,882</b>
<b>Total</b>	<b>S.Beet</b>			<b>373,127</b>					<b>1,262,488</b>
To	Produce	5%	Electricity	Petrol	&	Diesel			2,150,412

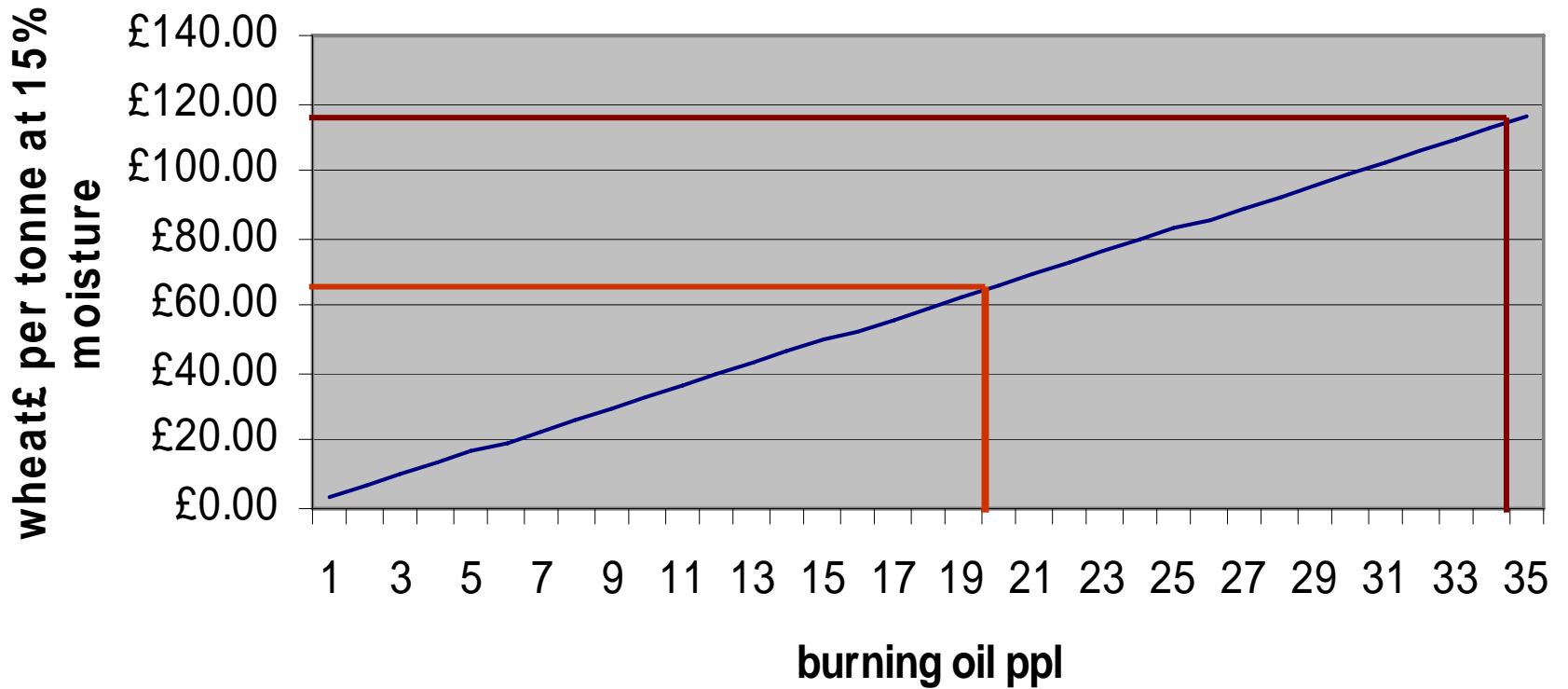
# World Sugar prices 2005/06

## US cents/lb

\$403
tonne
\$358
tonne
\$314
tonne
\$269
tonne
\$224
tonne
\$176
tonne



## burning oil v. feed wheat



# Biomass as a heat source

- ◆ Underpinning economics
  - Revenue positive
  - Capital cost higher
- ◆ No equivalent recognition of carbon saving compared to electricity and transport fuels
- ◆ Recommended UK Capital Grant scheme
  - Fixed for 5 years for boiler and kit
  - Reviewed after 4 years
- ◆ Longer term recognition of the environmental value of carbon saved from renewable heat

# Biomass and Electricity

- ✦ Current coal fired energy conversion efficiency 25% to 35%
- ✦ To be replaced by:
  - Similar number of gas fired OR
  - Larger number of CHP facilities based on biomass
- ✦ Need to overlay a map of
  - Heat need
  - Electricity need
  - Biomass availability

# Countries Leading the Way in Biomass

## ✦ Austria

- Biomass accounts for 11.2% of the total energy supply and 21% of heat production.
- The country has the advantage of being heavily forested and is also subsidising biomass by covering as much as 50% of the investment cost.

## ✦ Sweden

- By 2020 wants to be the first country worldwide to cease using oil for energy purposes. Energy production from waste and biomass plays a key role in this vision.
- Key features are the construction of 'waste-to-energy' plants and the development of district heating schemes.

# The keys to Success

- ◆ Find the process that extracts the maximum percentage of the intrinsic value of the product
- ◆ With the minimum of
  - capital investment
  - Efficiency losses in the transformation
- ◆ While identifying the maximum market value and
- ◆ Working together to ensure that a fair share of the spoil goes back to the primary producer

