

# **UK BioEnergy: indigenous demand and exotic supplies**

**IEA BIOENERGY WKSHP**

**Campinas - Brazil**

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# UK Bioenergy Sector Overview

- UK self-claimed role as ‘global leader on climate change’
- Actual record of current gov ‘poor’ according to green groups
- Mechanisms to meet 12.5% and 20% targets:
  - RO (Renewables Obligation)
  - EU and UK ETS (into force 2005)
  - RFTO announced November 2005 (Renewable Transport Fuels Obligation)
  - Proposed HO

# Biofuels, Trade, Certif<sup>n</sup>

- Herman Daly- ‘Economics in a Full world’

## On Trade:

‘Free trade would not be feasible in a world having both sustainable and unsustainable economies, because the former would necessarily count many costs to the environment and future that would be ignored in the growth economies. Unsustainable economies could then under-price their sustainable rivals, not by being more efficient but simply because they had not paid the cost of sustainability. Regulated trade under rules that compensated for these differences could exist, as could free trade among nations that were equally committed to sustainability. Many people regard such restrictions on trade as onerous, but in fact trade is currently heavily regulated in ways that are detrimental to the environment.’



# Overview

- UK Bioenergy markets and policies
- Potential for indigenous supplies
- Potential to import
- Conclusions
  - Need for assurance

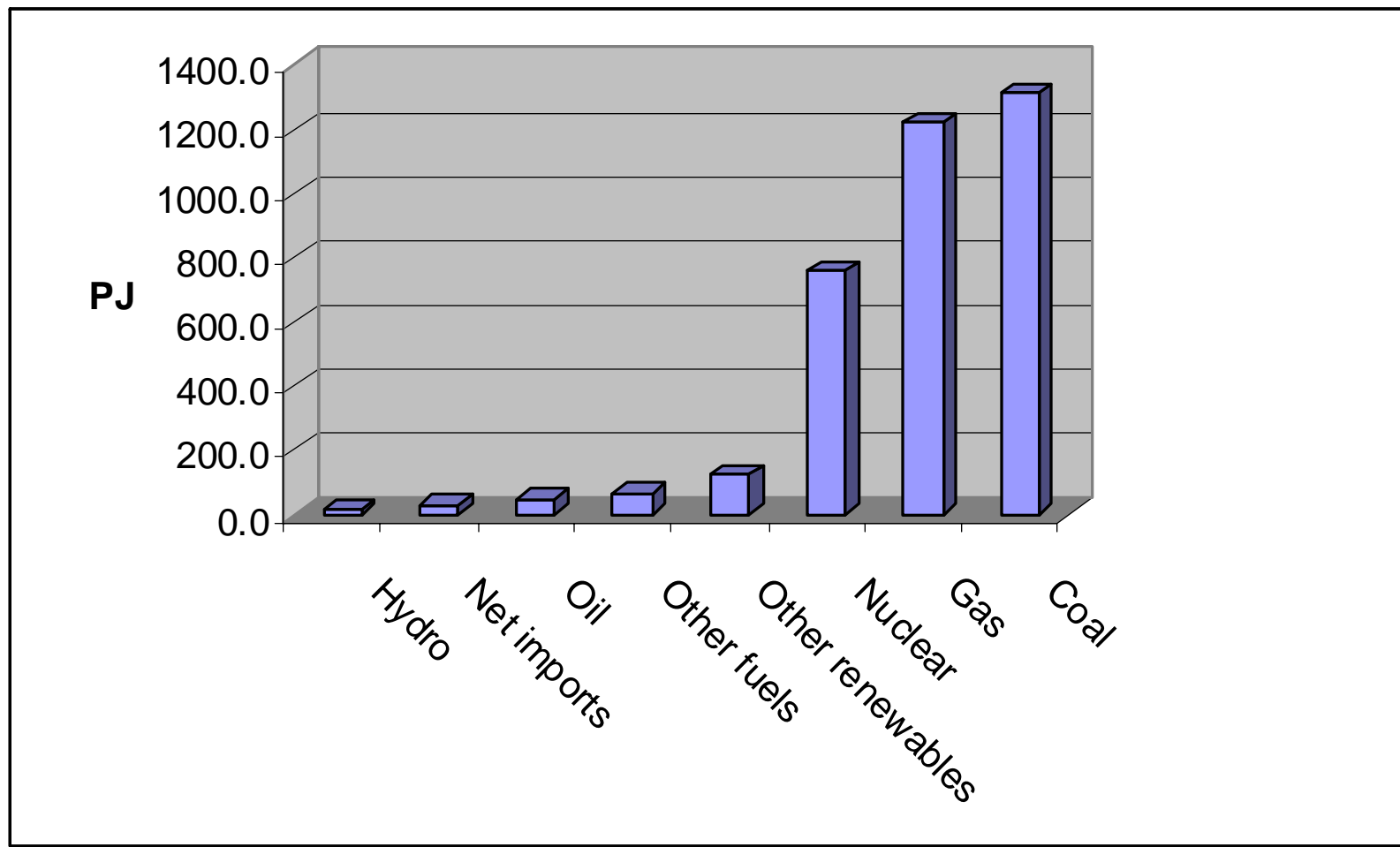
# UK Energy Markets - overview

Transport:	2.41 EJ 48 B1
Electricity (and CHP):	3.57 EJ (35% from Coal; 48Mt)
Heat:	2.39 EJ (133 Mt wood equiv.)
<b>Total:</b>	<b>8.47 EJ</b>

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# Electricity and CHP (3.57 EJ, 2004)



# UK – Renewables Obligation (RO)

- The RO is a *direct incentive* to encourage new build renewable electricity generation.
- Places a *mandatory requirement* for UK electricity suppliers to source a growing percentage of electricity from eligible renewable generation capacity (15% by 2015).
- Suppliers need to produce *evidence of compliance* to the Office of Gas and Electricity Markets (OFGEM) via:
  - *certificates*: ‘Renewable Obligations Certificates’ (ROCs).
  - Each ROC = 1MWh<sub>e</sub> generated from eligible sources.
- Allows ROCs to be *traded*

Source: Carbon Trust and DTI

# Electricity – RO cont'd

- Obliges electricity suppliers to provide a growing share of electricity generation from renewables or pay a 'buy-out' fee
- Buy-out value set at GBP40/MWh<sub>e</sub> (£4.11 per GJ<sub>primary</sub>)
- Target is:
  - 10% by 2010 (mostly wind)
  - 15% by 2015 (wind and biomass?)
  - Intention to go to 20% by 2020
- Has encouraged a rapidly growing co-firing market for biofuels

# Co-firing- broad mix of imports e.g. 1 supplier has provided this year:

- Wood pellets
  - 20,000 tonnes from the Baltic republics
- Shea meal and pellets
  - 16,000 tonnes from Scandinavia
- Palm kernel expeller
  - 7,000 tonnes, origin unknown as bought in the UK
- Olive pulp
  - 90,000 tonnes from the Mediterranean
  - 12,000 from Greece and Spain
- Olive pellets
  - 50,000 tonnes from Spain

Source: confidential (Nov05)

# Co-firing economics

- Prices paid by co-firers:
  - £5.50 to £3.50 per GJ
  - US\$9.63 to \$6.13
- High price for ‘Premium Fuel’
  - ‘low dust, high milling efficiency, high burn rate’
- Low price for ‘low grade fuel’
  - ‘high dust, low milling efficiency, low burn rate
  - E.g. olive pips

# Potential co-firing market

- Assume 5% of electricity generation from co-fired biomass by 2010:
  - Total market of 9.92 Mt wood equiv. (18 GJ/t)
  - Total market value GBP 35 to 55 million per year
  - USD 60.7 to 95.4 million

Or

- Assume biomass replaces 10% of coal-fired electricity market by 2010:
  - Wood market of 6.97 Mt wood equiv
  - GBP 24.4 to 38.3 million per year
  - USD 42.7 to 67.1 million

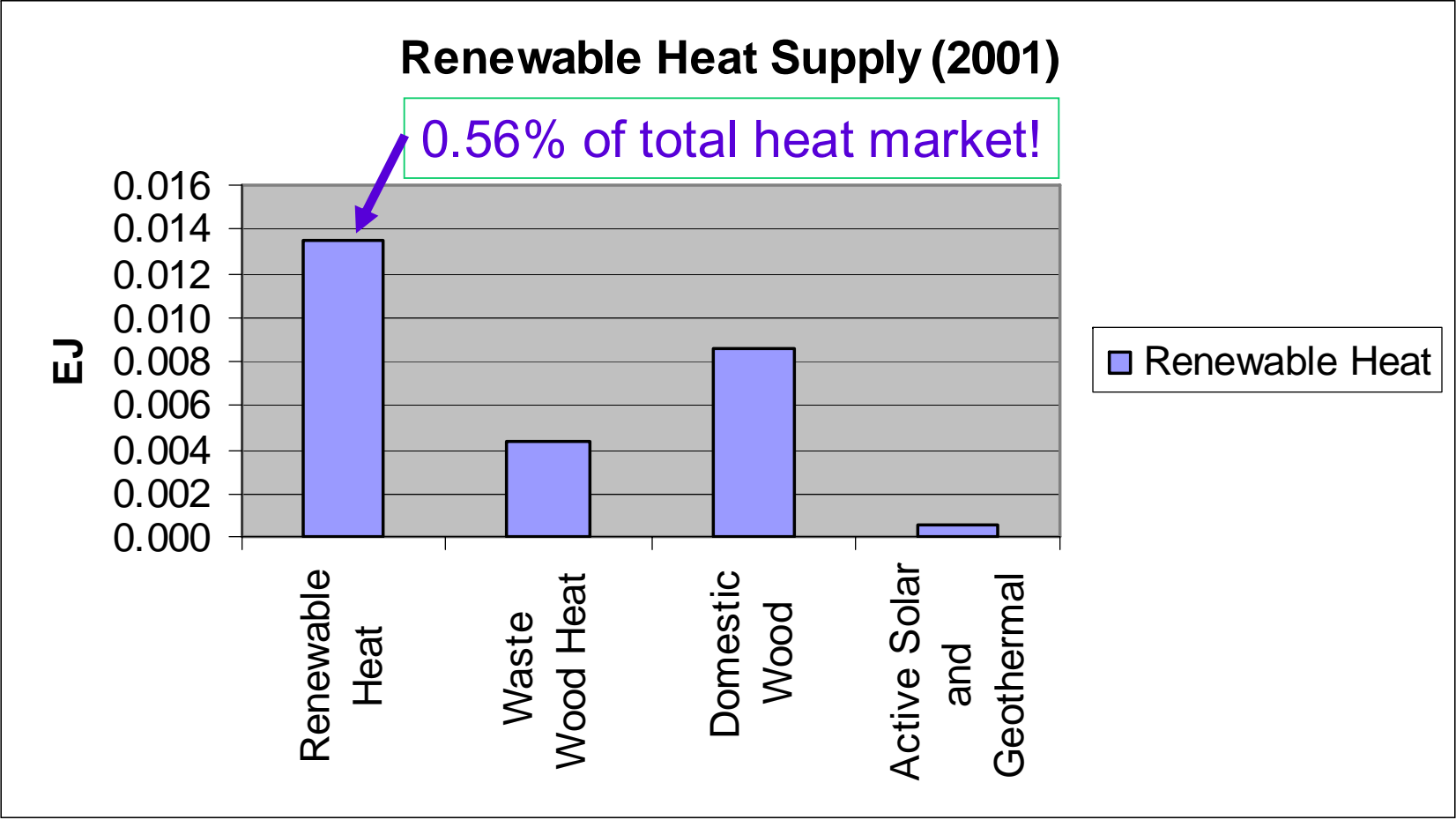
# BioElectricity – UK Land required

- 23.8 Mha land (10 dt/ha)
  - To supply 10% of 2004 UK Electricity consumption.

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# Heat: Current; from renewables



# Heat: markets by technology

- Biomass: if it were to supply 10% of the heat market, it would require:
  - A resource of 0.24 EJ (14.1 Mt biomass):
    - Notional land area req. = c. 1.4Mha (10 t/ha)
    - c. 4.3% UK land area
  - Generate an industry with biomass (pellet) sales worth **£ 700 Million** per year plus would need:
    - c. 200k 50kW units over 10 years (capital value **£900M**)
    - c. **£85M/yr** if installing 17 000, 50kW units per year!

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# Transport (RTFs): markets & costs

- Total UK market for biofuels as anticipated by:
  1. EU Biofuels Directive (2% by 2005 and 5.75% by 2010; energy basis)
  2. Renewable Transport Fuels Obligation (Dft; Nov 2005)- 5% vol 2010 (same eventual object as EU Directive.)

Fuel	PJ	Market
Bioethanol	53	£ 741M
Biodiesel	41	£ 858M
<b>Total</b>	<b>94</b>	<b>£ 1 600M</b>

# Biofuels in the UK

- 20p/l fuel duty reduction on biodiesel and bioethanol
- UK use
  - 10 million litres per month in summer 2005
    - ~0.25% of road transport fuel sales
  - 5% biodiesel blends available at around 110 sites in the UK; 20% and 95-100% blends available at a very small number of sites
  - more recently low level bioethanol blends (<5%) are being introduced by smaller fuel suppliers
- UK production (2004)
  - biodiesel: 9,000t (waste oils and rapeseed); bioethanol: 0t
- Market prices in Spring 2005
  - 33-48p/l for biodiesel; 26-35p/l for bioethanol

# Biofuels in the UK

- UK production plans

- Biodiesel

- Argent Energy 35,000t/yr plant in Motherwell, Scotland (in operation since April 05)
- Greenergy / Novaol 100,000t plant (preferred location is Humber estuary)
- Biofuels Corp 250,000t plant in Teesside
- Global Commodities UK / Rix Biofuels expansion of plant in Hull to 150,000t (Teesside)
- Global Commodities UK plans for 180,000t plant in Lowestoft in eastern England

- Bioethanol

- British Sugar 55,000t plant in Wissington, Norfolk
- Green Spirit Fuels plant in Henstridge on the Somerset / Dorset border

# Transport Fuel Economics

<b>Lead replacement petrol</b>	<b>UK Pence per litre</b>	
<b>Price at pump</b>	<b>88.5</b>	
		25.8 <sup>†</sup>
Cost		
Margins		2.4
<b>Duty</b>	<b>47.1</b>	
<b>VAT</b>	<b>13.2</b>	
<b>All tax</b>	<b>60.3</b>	
<b>All tax as a percentage of price</b>	<b>68</b>	

Note:

<sup>†</sup> Based on USD60 per barrel equiv to USD 45c or Euro 39c per litre

# UK Market Value for Bioethanol

<b>Biofuel as Lead replacement petrol</b>	<b>UK Pence per litre</b>	<b>US\$/l</b>
Price at pump	89.89	\$1.57
<b>Cost</b>	<b>47</b>	<b>\$0.82</b>
<b>Margins</b>	<b>2.4</b>	<b>\$0.04</b>
Duty (20p/l derogation)	27.1	\$0.47
VAT	13.39	\$0.23
All tax	40.49	\$0.71
All tax as a percentage of price	45%	

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# Conclusions

Bioenergy Sector	PJ Biomass	Market Value
Bio Heat <sup>a</sup>	239	£ 900M
Biofuels <sup>b</sup>	c. 150	£1 600M
Bioelectricity <sup>c</sup>	172	£ 800M

Notes: Total = c. 550PJ

a Bioheat equiv to 14Mt biomass (2.8 Mha = 8.6% land area)

b Biofuels = 5.6 BI EtOH or 4.1 BI Biodiesel (2.4 Mha)

c Bioelectricity = 9.5 Mt biomass (1.9 Mha)

- UK land area 24Mha

# Indigenous Supplies

## Key issues:

- Land availability and opportunity costs
- Residue availability and opportunity costs
  - Including ‘doing nothing’
- Would require between 3 and 5 Mha (10 dt/ha) to meet these modest demands
  - Total UK land area 24 Mha
  - Arable land area 5 Mha

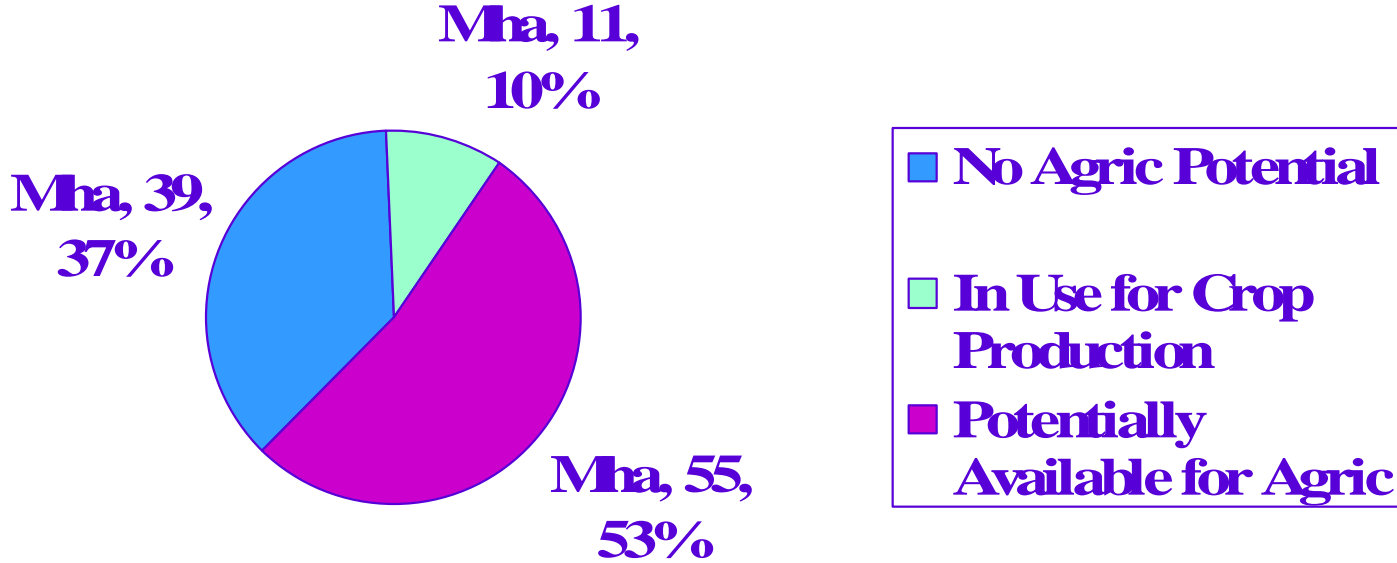
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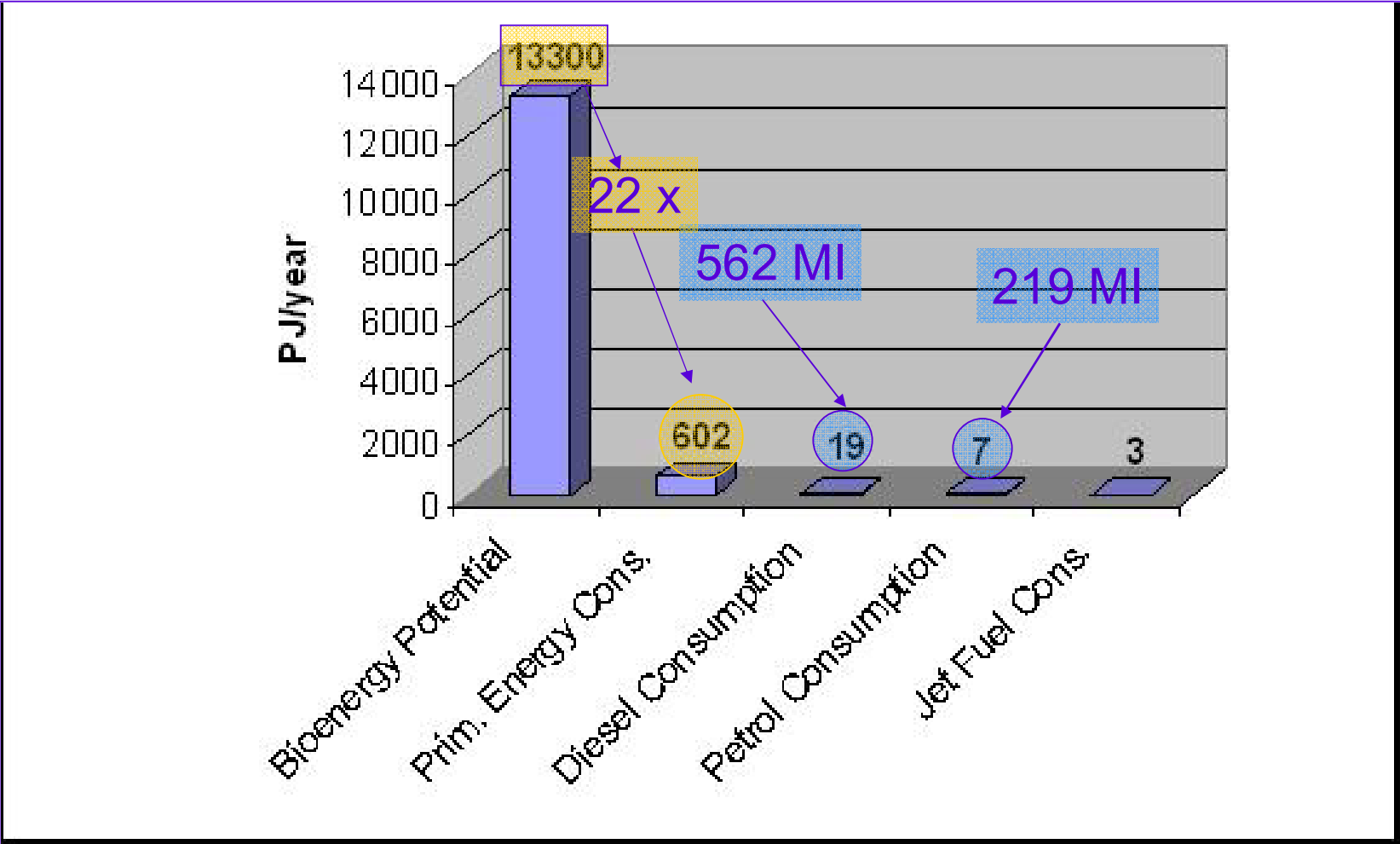
# Exotic Supplies

- Residues for co-firing
  - Truly global reach (see co-firing section)
- From dedicated energy cropping
  - South America (Brazil)
  - Sub-Saharan Africa (Tanzania)
    - GTZ Tanzania Country Report- 1<sup>st</sup> draft (WIP and Themba): [www.bioenergy-lamnet.org/gtz/](http://www.bioenergy-lamnet.org/gtz/)
    - CARENSA: [www.carensa.net](http://www.carensa.net)

# Potential Land for Biofuels in Tanzania (Mha)



# Gross Potential Bioenergy versus current Demand (2002)



# UK Assurance Development Activities

- RO
  - no assurance (£40 per MWh<sub>e</sub> buy-out)
- RTFO
  - ‘Mandatory Reporting’ will be required backed up by ‘voluntary assurance scheme’
  - The Government’s feasibility study is available via:  
[http://www.dft.gov.uk/stellent/groups/dft\\_roads/documents/pdf/dft\\_roads\\_pdf\\_610329.pdf](http://www.dft.gov.uk/stellent/groups/dft_roads/documents/pdf/dft_roads_pdf_610329.pdf)
  - Buy-out price likely to be set at 25 to 30p/l and replace the existing duty reduction
- HO
  - no indication yet but similar concerns about ‘sustainable supply chains’

# Biofuels Assurance: GHG & Sustainability

Two main processes for development:

1. UK Home Grown Cereals Authority.
2. Low Carbon Vehicles Partnership (LowCVP)

# Biofuels Assurance: GHG & Sustainability

UK HGCA work (Home Grown Cereals Authority) - [www.hgca.com](http://www.hgca.com)

- 2 reports:
- 1. P. Billins, J. Woods, and R. Tipper. Developing Carbon and GreenHouse Gas Assurance for Bioethanol Production in the UK. London, UK:HGCA. 1-64, 2005.
- 2. J. Woods, G. Brown, and A. Estrin. BIOETHANOL GREENHOUSE GAS CALCULATOR: user's guide. London, UK:HGCA. 1-38, 2005. [Annex 4 to main rpt]

Full URL:

[http://www.hgca.com/cms\\_publications.output/2/2/Publications/Publication/Developing%20Carbon%20and%20Greenhouse%20Gas%20Assurance%20for%20Bioethanol%20Production%20in%20the%20UK.aspx?fn=show&pubcon=2732](http://www.hgca.com/cms_publications.output/2/2/Publications/Publication/Developing%20Carbon%20and%20Greenhouse%20Gas%20Assurance%20for%20Bioethanol%20Production%20in%20the%20UK.aspx?fn=show&pubcon=2732)

# Biofuels Assurance: GHG & Sustainability

UK LowCVP - [www.lowcvp.org.uk](http://www.lowcvp.org.uk) (Fuels Working Group)

– 3 reports:

1. J. Rickeard, G. Punter, J-F. Larivé, R. Edwards, N. D. Mortimer, R. Horne, A Bauen, and J. Woods. WTW Evaluation for Production of Ethanol from Wheat. London:LCVP. FWG-P-04-024:1-39, 2004. JW.  
<http://www.lowcvp.org.uk>
2. A Bauen, J. Howes, A. Chase, R. Tipper, A. Inkinen, J. Lovell, and J. Woods. Feasibility Study on Certification for a Renewable Transport Fuel Obligation. G. Archer. London, UK:LCVP. FWG-P-05-07:1-80, 2005.  
<http://www.lowcvp.org.uk/resources/agendasandminutes/working.cfm?catid=3&catName=Fuels>
3. A Bauen, J. Howes, A. Chase, R. Tipper, and J. Woods. A common methodology for calculating the greenhouse gas emissions of biofuels G. Archer. London, UK:LCVP. FWG-P-05-07:1-80, 2005.
  - [To be finalised in December 2005](#)

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# Conclusions

- UK needs substantially more biofuels than it can produce indigenously for:
  - Meeting its Kyoto commitments on GHGs
  - Energy security
- Without certification (minimum GHGs) it cannot quantify the GHG benefits AND accepts that they could be negative, particularly for biofuels

# Conclusions Cont'd

- Beware complexity from this rural land and people intensive activity
  - J. Woods, S. Hemstock and W. Burnyeat. 2006 **Bio-energy systems at the community level in the South Pacific: impacts & monitoring.** *Mitigation and Adaptation Strategies* (in press)
- Be even more aware of the potential advantages of bio-trade IF done wisely!

I THANK YOU!