Renewable Energy in British Farming

Dr Jonathan Scurlock
Chief Adviser, Renewable Energy and Climate Change
National Farmers Union of England and Wales

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Policy drivers and risk multipliers

- **climate change** – Lord Stern at Davos 2013 said: “I underestimated the risks”; IMF boss “worse than debt crisis – we will be roasted”; Peter Kendall “fresh thinking needed”: global weather disruption towards 2020 and 2050, with agriculture in ‘front line’

- volatile **oil prices**, shaky energy security: 2008 $147/bbl before crash, recently steady ~$110

- long term decline in producer prices is over? **food security** now important due to globalisation and new non-food markets (biofuels/bioenergy)

- ‘Perfect storm’ of climate change, energy and food security, converging to drive policy – a threat (increasing input costs and red tape) – or an opportunity? (self sufficiency, diversity)
Typhoon Haiyan (Nov 13): Philippines “national calamity” was a world wake-up call: but international climate talks droned on and on….

NFU participated in international farmers’ delegation 4 years ago in Copenhagen: but only a weak compromise was reached.

“We can stop this madness. Right here in Warsaw.”

Support of the UN SBSTA (Scientific and Technological Advice) required, to combat climate change while increasing food, energy and water resilience/security.
but you have to see the funny side...

“Now you can eat meat with a clear conscience!”

EU Renewable Energy Directive: 20% by 2020
27-30% proposed 2030
UK = 15% by 2020

(Thanks to Private Eye, Sep 2008)
How British farmers can help

must we be the poorest performers in Europe?

UK has abundant land-based RE resources

Get us out of the slow lane!

invest now in renewables → stable energy costs, diversification of income, lower C footprint

Eurostat, 2010
The shift towards a low-carbon economy

• ‘Green Deal’ or ‘green crap’? from culture of embedded fossil carbon (in energy and products), to a sustainable natural resource economy
• ‘Keeping the Lights On’ – as old power stations are retired
• NFU policy encourages farmers to diversify into low-carbon energy services – our aspiration is that every farmer could be an clean energy exporter – ‘Farming Delivers’ up to 25% of clean energy
• More than one in 3 farmers already diversifying into renewables
• Biggest land-based renewable resources: bioenergy (many kinds), wind power and solar PV (‘disruptive’ technology, now with batteries)
• Our agricultural buildings and land (75% of national area) are ideal platforms for solar energy capture and small-to-medium wind power
• Should farmers meet on-site energy needs only, or also export renewable electricity, heat services and fuels?
A wide choice of renewables for farmers
Wide range of government incentives, fast growth in some areas (18% renewable electricity in 2013Q4) but still some negative signals

- **Renewables Obligation** – tradeable ROC certificates to fulfill growing obligation – from 3% in 2002 to 24.4% in 2015. Ends 1-Apr-2017: to be replaced with “Contracts for Difference” for large projects
- **Feed-In Tariffs** – introduced April 2010 for solar PV, wind, hydro-electric and anaerobic digestion up to 5 MW. Index-linked, govt-backed and low-risk, modelled on schemes elsewhere in Europe. Abrupt tariff reductions in 2011/12 – now more stable “degression”
- **Renewable Heat Incentive** – Nov 2011 for commercial, subsequent revisions, domestic RHI in April 2014. Relatively high reward rate (up to 12% gross) to grow supply chain and deployment rapidly, in two phases – mostly in ‘non-domestic’ sector so far
- **Renewable Transport Fuels Obligation** – since April 2008, amended 2009 to 5% by 2013/14 - mandatory sustainability since Dec 2011, but rewards not yet linked to C savings so investment progress slow
Feed-in Tariffs (FiTs) – a success

- Since April 2010, attractive tariffs across a range of scales for wind and solar, not so good for biogas; a succession of changes to tariffs, but 2.6 GW installed, equivalent to >2.5% of UK generating capacity.
- Solar PV still a great investment, probably the most accessible of technologies; Q’ly “degression” dates (1st Jan; 1st Apr = 3.5% <50 kW). Larger roofs and ground-mounted systems may perform better under Renewables Obligation (1.5/1.4 ROCs from Apr).
- Small wind tariffs cut 20-25% in Dec 2012, annual degression now from 1st Apr 2014.
- Export meter needed for export payments >30kW.
- Definition of a ‘site’ not very clear, but avoid artificially dividing installations. Energy Performance Certificates (solar PV – cat D) since Apr 2012.
- MCS accreditation: 1000s of small suppliers, some still not compliant – farmers need trusted advice!

Endurance 50kW turbine (Dulas Ltd.)
Renewable Heat Incentive: progress at last

- Launched Nov 2011 for commercial sector (domestic sector delayed to April 2014) Biomass tariff >1 MW: emissions!
- Just 400 projects successful in first year (<90MW), but growth to 3800 installations/706 MW by Mar-14
- Rural communities should benefit, since many 'off-grid' homes and businesses have limited and expensive choice of fossil fuels (fuel oil, Calor LPG)
- However 1200 MW biomass heating needs ~1 Mt wood fuel – need to grow domestic supply
- NFU lobbying DECC and Defra to recognise agricultural potential (up to 10 Mt) as diverse range of sustainable bioenergy feedstocks (straw, wood fuel, perennial energy crops, wholecrop maize, grass, beet, etc. for AD)

If biomass dominates RHI, 10-15% of UK heat needs in 2020 requires 15-27 GW heating capacity and 13-19 Mt biomass fuels.
Solar water heating for agriculture

- Dairy parlour wash water one of the main applications (~100 kWh/cow/year)
- Metered water heating supported by Renewable Heat Incentive
Ground source heat pumps

- Work like a refrigerator in reverse – imagine trying to chill the soil and dumping the heat from the back of the fridge into your house!
- Higher seasonal ‘C.O.P.’ heat multiplying performance than air-source heat pumps, but MUST be sized and installed correctly.
The greatest diversification opportunity in a generation?

A variety of technologies – at small, medium and large scale – can supplement farm incomes and sustain rural livelihoods, directly and indirectly.

Renewables can meet on-site electricity needs for heating, feeders, ventilation, etc. – as well as exported power.
Solar roofs are a ‘no-brainer’ – both for farmers and now for government policy makers.

50-250 kW PV systems for intensive livestock sheds, grain stores, dairy barns: examples from around Britain.
On balance, mostly favourable public comment – DECC Solar Strategy emphasises dual land use - solar industry already responding with provision for sheep grazing, wildflower meadows, bird and bat boxes, footpath access, etc.

Until recently, large scale solar has mostly escaped stigma of NIMBY opposition – but it has arrived now.....

Yes – the grass does grow under rows of modules!
How high can we go with ground-mounted solar?

5 MW solar farm, Hampshire

- Dec 2011: total of 130 MW on agricultural land
- April 2014: total now 1600 MW (300-400 solar farms across 30? counties) out of 4000 MW
- growing share of investment alongside domestic/commercial rooftops, soon with energy storage?
Unsubsidised midi solar PV for poultry, pigs, veg stores?

- Falling cost → grid parity, likely to be subsidy-free by 2020
- users with summer peak electricity needs expected to become economic first
- e.g. £500k for 500 kW, generating 400-500 MWh/year
- if only 50% on-site use, this is worth £20-25,000 @ 10p/unit, plus £9.5-11.9k @ 4.77p/kWh exported
- £29-37k on £500k = 5.8-7.4%
- Clearly a good investment!
Medium wind power – significant growth

- Medium segment growing the most strongly now
- 100-200 MW of 7000 MW
- Potential for 1000 MW of farmer-owned single turbines and clusters?
- e.g. 5-10,000 installations of avg size 100-200 kW
- income to farmers could be substantial: £250-500 million?

Foundation installation for NFU member in Midlands
AD - agricultural or waste management?

- Government tends to emphasise diversion of waste from landfill; NFU sees also a rural economic / diversification opportunity.
- On-farm AD - manures and farm-based (silage) feedstocks, regulated under low-risk environmental permitting, income mostly from energy sales only. Typical scale 600-3000 m³, 100 kW–1.0 MWe. Small AD benefits from enhanced FITs/RHI and project development support.
- Waste-licensed AD – multiple organic feedstocks, may be based in rural locations but different business model (income from both energy and gate fees). Typical scale up to 10,000 m³, 0.5-5 MWe – more profitable and ‘bankable’ (RO or FITs), but longer development lead time.
How small is still viable for farm AD?

Several manufacturers (UK and imported) trying to ‘downsize’ AD without losing reliability, process control, safety, etc. Typically 25 kW-250 kW

Aim is mostly farm slurry, little or no crop feedstock. Target price £100-300k but hard to show economic return, only modest energy output, difficult to quantify or reward other benefits (nutrients, water resources, GHG emission)
Recent AD policy developments

- AD Strategy and Action Plan (June 2011): progress on environmental permitting; planning/permited development; electric/gas grid connection
- Dec 2013, ~120 non-sludge AD plants in Britain, 300 projected by 2015, so 1000 still feasible? But Germany now has 7800 (4GW)!
- German FIT / EEG reforms are also driving availability of smaller sizes (150 kW; 75 kW) for farm AD, alongside British innovation
- but UK FITs for smaller on-farm AD (<250 kW) will be "degressed" (reduced) too quickly in 2014: constrained FITs budget under pressure
- both AD industry and government share this concern: seeking further support from Defra, e.g. WRAP fund  www.wrap.org.uk/onfarm
Beyond biofuels - wide range of UK biomass feedstocks

Limited UK forest/woodland area means that agricultural biomass is more important than in some other EU member states.
Perennial energy crops, straw and woodfuel

• Alongside wind / solar, bioenergy will provide thermal power generation for grid stability as well as process heat: ~50 Mt biomass feedstocks needed

• NFU calls for 10 Mt non-waste biomass – e.g. 4 Mt straw, 3.5 Mt perennial energy crops on 350,000 ha, and 2.5 Mt from enhanced woodland management

• Environmental benefits of perennial crops deserve reward (biodiversity, permeability, low inputs, nutrient and flood management) – CFE / CAP greening

• But poor market development, loss of flexibility in marketing, cannot be diverted back to food/feed uses like grain-based feedstocks, not for marginal land only

• Only modest planted area so far (10,000 ha in UK, 50,000 ha in EU) – some British producers supplying propagation markets elsewhere in Europe

Short rotation coppice willow
top (harvested every 3 yrs)

Miscanthus
(bottom harvested annually)
Grid connection – progress at 2012/13 DG-DNO Fora

• Local system capacity maps – updated and publicly accessible
• Kicking out the jargon! – further work across all DNOs and ENA to make web-based information simple and consistent
• ENA could host DNO connections helpline – further work with REA, RenewableUK, ADBA, etc. on list of type-tested approved kit
• Process of continuous feedback established with annual fora

**Both wind and solar DG projects of all sizes may be delayed by years awaiting grid reinforcement, despite fast project build times: on-site energy storage may offer a solution**
NFU Members can opt in and out at any stage:

- initial advice on energy management
- a second opinion on supplier quotes
- finding approved suppliers
- complete project management

Linked to support from NFU Legal Panel Firms, Rural Surveyors Panel, NFU Mutual
Take-home messages – yes, we can!

• Farmers and growers are not just ‘in the front line’ of climate change – the NFU believes strongly we can also offer solutions
• Agriculture/horticulture enjoys many natural energy resources: for on-site power, fuels/heat, and export of energy to other sectors
• Government policy and consumer pressure → low-carbon products from agriculture, including both food and energy services

Dr Jonathan Scurlock
Chief Policy Adviser, Renewable Energy and Climate Change
National Farmers’ Union
Stoneleigh Park
Warwicks CV8 2TZ
jonathan.scurlock@nfu.org.uk

85,000 miles powered by EU veg oil!