DELIVERING A DECARBONISED AGRICULTURE SECTOR

COP26 FRINGE EVENT

Wednesday 10th November 2021

200 St Vincent Street, Glasgow

#

UN CLIMATE CHANGE CONFERENCE UK 2021

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Dr Jonathan Scurlock,

Chief Adviser – Renewable Energy and Climate Change, NFU

Setting The Context

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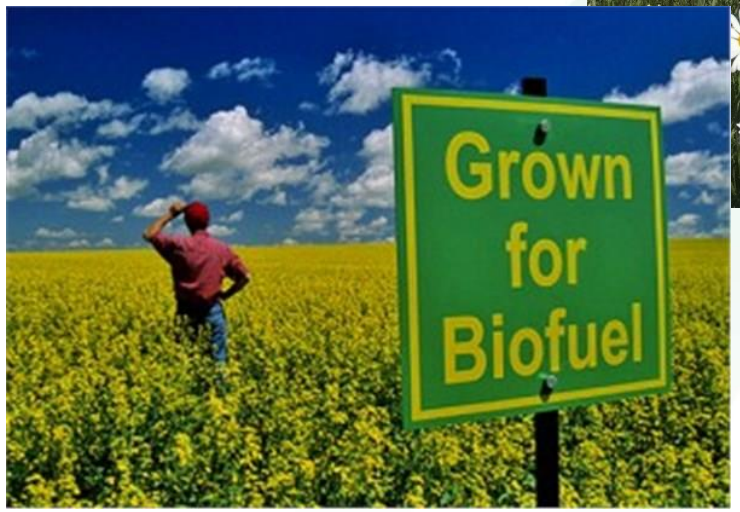
Net zero agriculture by 2040:

the evolving role of renewables



Delivering a Decarbonised Agriculture Sector

COP26 Fringe: 10 Nov 2021

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

NFU supported by NFU Mutual

NFU CYMRU

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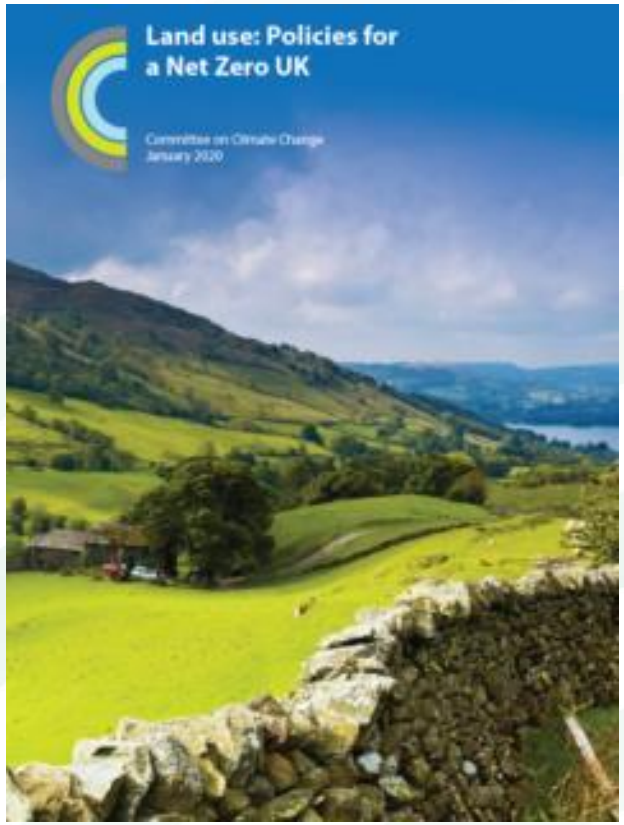
NFU and REA: influencing the net zero transition



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NFU net zero ambition includes climate-friendly food production, on-farm renewables and wide range of 'public goods' delivered by agriculture

Solar roofs are a ‘no-brainer’ – especially economic for farmers as building owners (unlike much commercial)

c. 30% of all farms: 50-300 kW PV systems for intensive livestock sheds, grain stores, dairy barns (up to 1 MW is Permitted Development since Apr 2015)

Examples of multifunctional farm landscapes

- solar farms with sheep grazing and agri-environmental features around margins (e.g. enhanced hedgerows with occasional hedgerow trees)
- wind farms or single turbines surrounded by arable crops and/or grazing
- perennial energy crops providing wildlife refuges, plus flood mitigation, early-season pollen (willow catkins) and public amenity (where footpaths cross or border such land)

N.B. net zero measures must also benefit tenant farmers as well as freeholders and landowners

Multi-purpose land: good impressions count

Solar Energy UK ambition = 40GW solar by 2030, including 25GW solar farms, up from 9GW today

Larger solar farms more challenging, but total land use still modest alongside other renewables

“Sheep may safely graze” (J.S. Bach) – and the farmer gets paid for site maintenance!

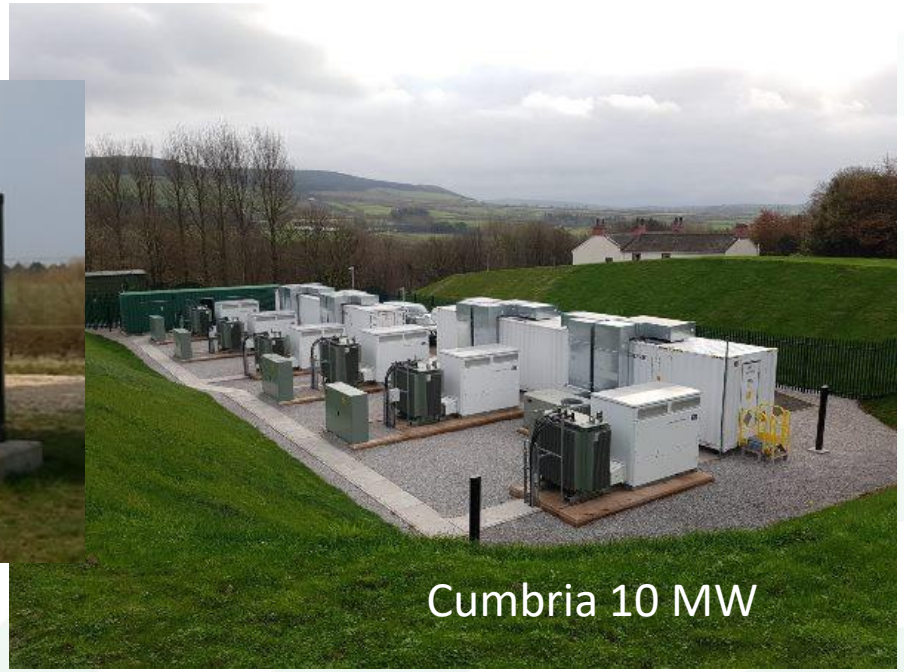
Multiple AD products including bio-CO_2

gas / electric / CO_2 / digestate

JV ENERGEN

RENEWABLE ENERGY

Warwickshire 0.8 MW

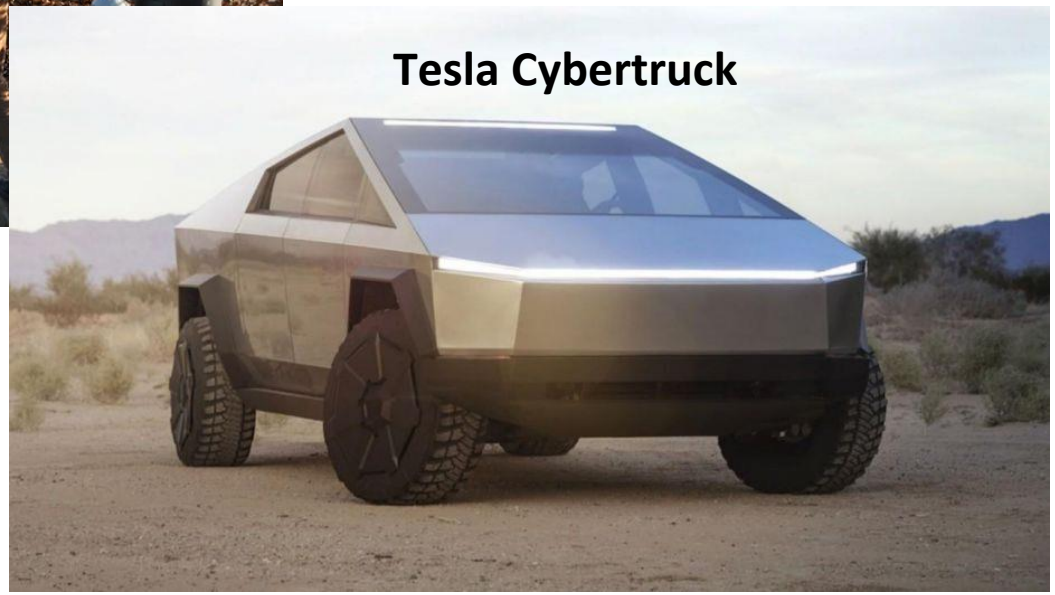

Cumbria 10 MW

Battery electricity storage

Wide range of sizes and appearances


Lincolnshire 10 MW

Electric vehicles – for farmers



Urgent need to upgrade rural electricity network to enable EV charging

Electric vehicles – for farmers

Fendt e100 Vario electric tractor (50kW / 75hp)
100 kWh battery – V2G (vehicle-to-grid) ready
Extended field trials 2019/20 in Germany

Urgent need to upgrade rural electricity network to enable EV charging

NFU Energy helps farmers identify and implement opportunities to cut cost, cut carbon and generate income

Installing small-scale renewable energy solutions (for onsite consumption)

Conducting energy efficiency audits and carbon footprint assessments

Helping you assess and develop renewable energy schemes on your land

Installing electric vehicle charge points

Supporting RHI accreditations and GGSS applications

Find out more at www.nfuenergy.co.uk

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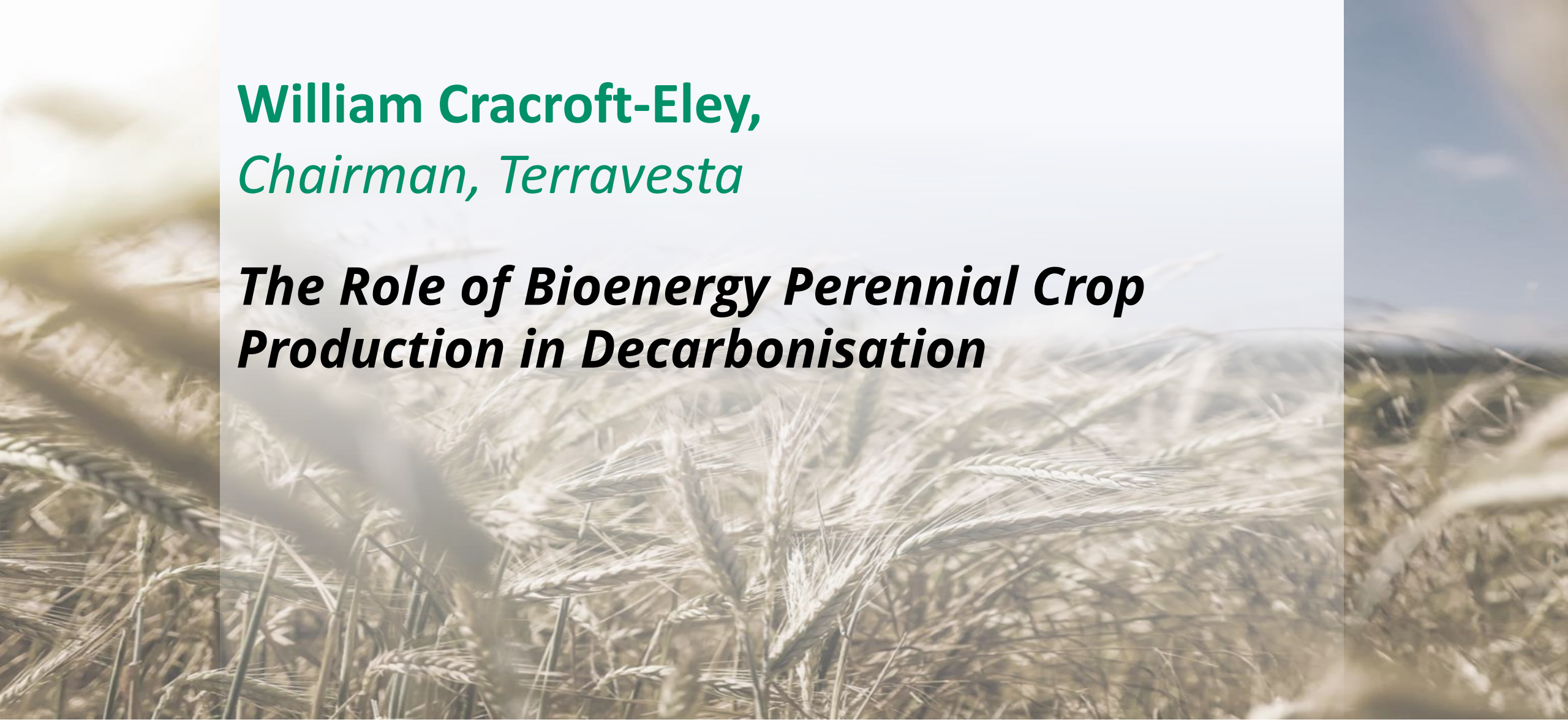

William Cracroft-Eley,

Chairman, Terravesta

The Role of Bioenergy Perennial Crop Production in Decarbonisation

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terravesta™

Growing Innovation

William Cracroft-Eley

Terravesta chairman

Philipp Lukas

Chief Executive Officer, Future Biogas

Continuing to Grow the Biomethane Potential in Agriculture

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Neil Lindsay

Land and Development Director, Solar2

How Solar PV Projects Can Help Farmers

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solar2
How Solar PV Projects Can Help Farmers

Solar 2 Ltd Introduction

- **British-based and owned Solar Developer**
- **Offices and Staff in Scotland, Wales & England**
- **20 Projects in Development throughout the UK (Devon to Angus)**
- **Over 1000MW in development – equivalent to approx. 300,000 homes' worth of energy annually if all consented**
- **Working with over 23 landowners and farmers**

How Solar PV Projects can help Farmers

- Financial Diversification & Security
- Secure long-term funding
  - Typically 40-year lease
  - Base rents depending on irradiation and grid costs
  - Indexed-linked so increases in line with inflation
  - Potential uplift if top-up Gross Income Rentals offered
  - Ability to borrow against guaranteed base rents
  - Shielding from poor harvests/ natural disasters/ bad market conditions/ loss of subsidies

How Solar PV Projects can help Farmers

Soil Quality Enhancement

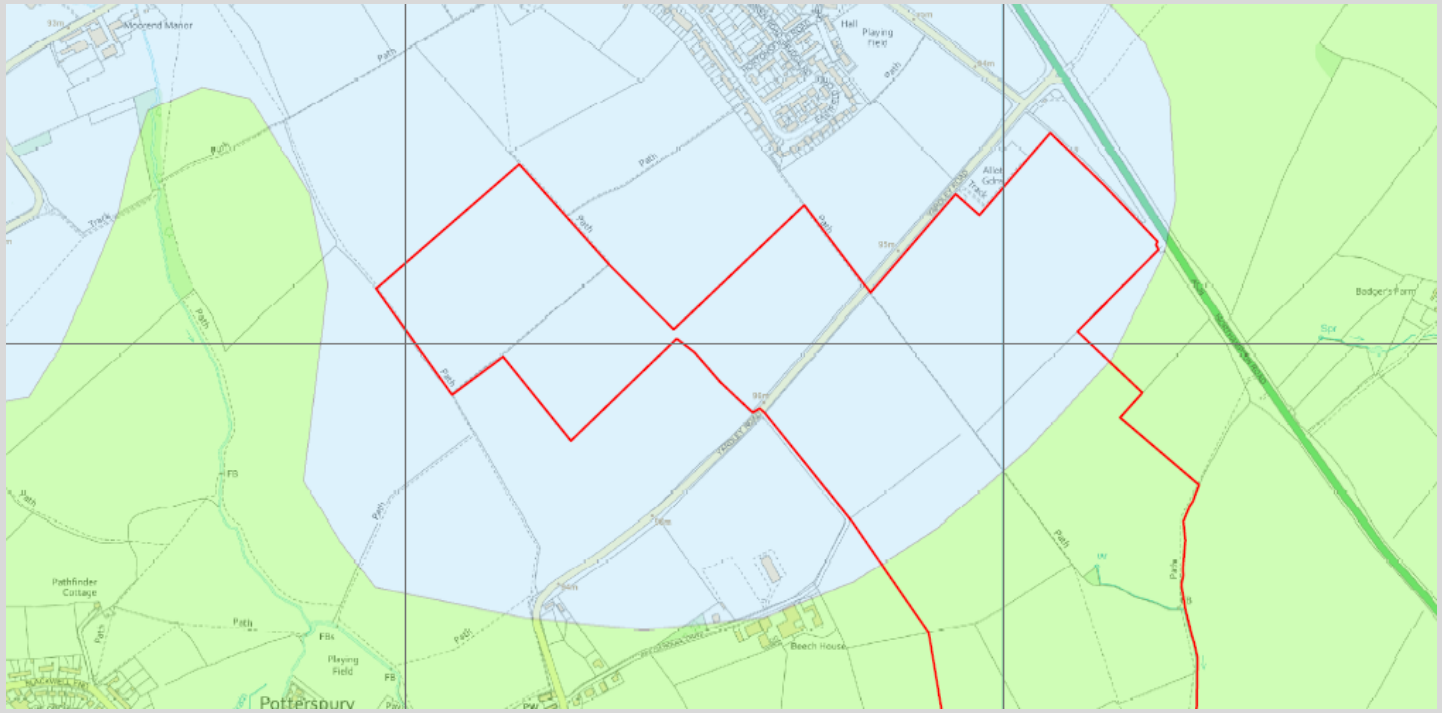
- No intensive farming
- No Pesticides/ Fertilizers
- Inaccurate ALC Maps
- Soil Pests (eg nematodes) will die off
- Better carbon storage

Increase Biodiversity

- Hedgerows create New Wildlife Corridors
- Wildflower Meadows increase Pollinators- reservoir for rest of farm

Sheep Farming

Reduction in Fuel Burning



solar2

How Solar PV Projects can help Farmers

- Impact on local communities
- Improved Rights of Way/ footpaths
- Community Benefit Funds
- Road Improvements- less traffic
- Flood Prevention Measures
- Local Education Projects

How Solar PV Projects can help Farmers

Developing World

- Offset cost of Diesel – c$0.5/ kWh
- Remove reliance on weak grid connections & very expensive power prices- Solar & Batteries can take farmers off grid
- Sometimes only source of power for irrigation

How Solar PV Projects can help Farmers

Thank you

Charles Stevenson

General Manager, JCB

Decarbonising Agricultural Machinery

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JCB
ROAD TO
ZERO

JCB ROAD TO ZERO 16 Different Product Groups, 350 Different Products

COMPACT MACHINES

LARGE MACHINES

LOW ENERGY, LOW HOURS

HIGH ENERGY, HIGH HOURS

URBAN

ISOLATED / REMOTE


JCB ROAD TO ZERO
JCB: First and Best on Electric Machines


JCB
JCB


JCB
525-60
JCB


C14
JCB
525-60
ELECTRIC
JCB


JCB
525-60
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All-electric handling

While electric handling machines have a clear demand in inner-city construction, JCB has also marketed its 525-60 E Loadall to the agricultural sector. We took it on farm to see how it performs

There could have been no better time to put an electric vehicle to the test. Arriving on farm the week we drove Hooleys and petrol buying led to fuel shortages at the pumps, as well as higher than average red diesel prices, there's certainly a very practical appeal to having a machine you can plug in, instead of filling up.

JCB's E-Tech range has been developed to offer alternative fuel solutions to the construction and agriculture sectors. Key to using electric power is the ability to work silently in built-up areas, produce zero emissions and reduce fuel spend for operators. There are operational benefits as well, independently powering the drive system and the hydraulics eliminates the boom lag found in traditionally fuelled machines – all while offering the same lift capacity and lift height (3,300kg up to 6m) as the 525-60 AGRI Plus unit.

It's certainly impressive but its capabilities come with caveats, as we quickly found out. The farm on which we tested the machine did not have three-phase electrics, meaning we could not take advantage of the fast-charger, which can charge the battery from 25% to 80% in around an hour, according to the company. Instead, we had to use the mains charging capability, which takes around eight hours for a full charge. That's eight hours of downtime for every four hours of operation.

Here, it becomes clear that the 525-60 E will, currently, suit farms with a very specific layout. Livestock farms with the handler used for feeding tasks could perhaps get away with using the mains to charge, topping up the 525-60 between morning and afternoon feeds. Sourcing this with the fast charger will further free up the telehandler for additional tasks during the day without fear that the battery will run flat.

Being close to a charging point – particularly the fast charger – would also pay dividends during office operations. For loading, as we found, a well laid-out yard close to the muck heap, clamp or other store would facilitate charger between loads. For any sort of in-field work, it's hard to see how operators could complete a full day of work without further investment in a JCB Power Pack.

The electric model retails for £87,930, compared to £84,175 for the AGRI Plus machine. For a correctly set-up farm, its a jump that could be paid back when fuel savings are considered.

Jumping into the cabin, the controls and layout are familiar. In fact, driving the machine is almost identical to driving the diesel variants – with a couple of exceptions. With no engine noise, the 525-60 is nearly silent, which does mean you can hear the whine of the hydraulics more clearly.

Secondly, instead of a traditional fuel gauge, there's a percentage indicating how much charge is remaining. Like with other battery powered devices, we did notice that the charge drained quickly below 20%.

The compact dimensions of the machine came in handy early. Retrieving some big bags from the back of a shed, we were able to navigate the narrow gateways, including a sharp 90-degree turn to avoid hitting the edge of the shed on the way out. It's just 1.84m wide and with the four-wheel steer we could easily make our way around. We then had good visibility from the cab to hook the bags up. Even extending the boom out, the machine also felt well balanced.

Swapping between implements was easy as well. It's fitted with a robust hydraulic tool fitting and non-impact stability and the addition of in-cab pressure release and hydraulic locking means it's a tool-less and no-swap attachments.

Once this was done, we set about pushing up a pile of sand to make room over at the bottom of the yard. Here we found a key difference in the power distribution when compared to the diesel machine. Whereas power would be allocated between the traction and the hydraulics from a single unit on the diesel machines, the dual electric motors offered some advantages and disadvantages when it came to lifting work.

To a start, the drive is handled by a 27kW motor, compared to 55kW for the hydraulics system. While on paper, the drive motor provides nearly 100Nm more torque, in practice we found that the machine would simply stop once it encountered a certain amount of force.

This was not necessarily a problem, but it did require a bit more finesse approach to various tasks. Instead of simply pushing into the pile and lifting out, we took advantage of the dual system, pushing forward and lifting and adjusting the boom as we moved.

Another minor issue was the lack of sun visors. These are available as an option but it feels like an

As the buzz around electrification of farm machines marches on, JCB is the latest manufacturer to join the fray with its 525-60E telehandler. **Alex Heath** put the battery powered loader to work on a range of tasks on a beef unit and a potato grading line.

Buzzing around buildings

In recent months, JCB has been at the forefront of rolling out zero-emissions machines, launching a whole portfolio of battery powered options, under the E-Tech branding.

Products range from mini-diggers to mini-dumper trucks to indoor skid loft lifts and access platforms.

One of the largest and most versatile machines for us is the 525-60E. Capable of lifting 2,600kg to 6 metres, from a distance is very similar to its diesel counterparts.

However, while the overall look may be consistent between the two machines, underneath they are radically different.

Electric

The firm says it has been designed from the ground up as an electric vehicle and it has not simply had the diesel powerplant replaced with a battery and motor.

The chassis is redesigned, as less holes need to be drilled to fit for engine mounts and cooling packs.

Likewise, the positioning of components has been rethought, and strategically placed for better weight distribution, as cables and hoses provide more flexible routing.

Packing a 24kWh battery and two motors, JCB's 525-60E proved itself capable at a host of tasks.

Armed with an array of tools, we got stuck into a deep litter cattle court, really testing the little loader's ability to tear out heavy muck, as well as using it around a potato grading line, a major market that the machine is being targeted at.

HYDRAULICS

The rear-mounted gear pump and electric motor provide plenty of poke for hydraulic functions, allowing for multiple operations to be carried out at once.

Booming up and out while tipping is a doddle.

Because it is run from an electric motor with 100 per cent torque from start up, operations are swift.

They are also independent of the throttle, which is used exclusively for travel speed.

Using the same boom as its diesel counterpart, it has an active hydraulics feature, allowing for rapid retraction and lowering of the boom.

However, finesse is not one of the loader's strong points and a lot of care has to be taken when lowering the boom, especially with a grab on.

Likewise, the load back from the joystick makes it difficult to realise where the tips of the tines at the front plate on the grab is, not ideal when clearing sheds at a better-shelter rate as is often the case.

For pallet and box work however, where more care is naturally taken, it is easy enough to ensure the correct pallet tine placement, and it highlights said items to also a tyrannic, with this anyoft driving style an electric loader affords you.

We would like to see some handling modes added that perhaps slowed hydraulic performance at times and allowed for the setting of over-tape position, just to make jobs like mucking out that bit easier.

Lift capacity is a breath of fresh air, and in the time we had the loader, we once did the 6970200 load limiter kick out the hydraulic functions.

Even with the 1.7cu.m grab full of wet, heavy muck and the loader nearing its 6m limit, full use of the hydraulics was possible, allowing you to make the most of its 2.2t nominal rating.

DRIVE TRAIN

JCB has rolled out the side-mounted 'engine box', where the part of a diesel engine is replaced by the likes of batteries, inverters and other electrical gadgets.

One battery capacity is offered, a 24kWh lithium ion store, running at 48 volts.

Placed low down, this provides the lowest seat with the removal of the ICE.

An array of cables emerge from this, an illustrated lump and transport out next to a pair of motors. The first is at the rear of the boom and used for all hydraulic functions. This motor produces 22kW (29.5hp) and is revealed directly to a gear pump putting out 85 litres/minute.

Also at the rear is a 44-litre reservoir.

The reason for its position is simple – it adds more rear end ballast.

The second motor is a 17kW (22.7hp) unit, coupled to a transfer box that splits power between both axles.

A short shaft sends power to the front and a longer one to the rear.

A drum brake on the transfer box is used for braking, but in reality, this is used very little.

Under braking, the battery recoups some of the energy.

Data

For ancillaries around the loader – lights, wiper, heated windows, heater/blower etc – a 12V system is used, which is charged off the main battery using a DC to DC charging system.

From its telematics data of existing diesel machines in this class, the manufacturer says the amount of energy on board would ease 30 per cent of its customers covered for a 'normal working day'.

This has to be ratio-adjusted by the fact when an engine is on-idle, it is still burning fuel.

When the xHandler stops, energy use is all but non-existent, depending on how many ancillaries are running.

The main factor or does not quote a length of time the machine will run for and entirely depends on the type of work you are doing.

Tootling round a yard, moving a stacking boxes, or pushing up feed and spreading out, we could envisage maybe six hours of meaningful work, before bailing out to recharge.

What we did find, however, is that mucking out with the grab soon drained the battery.

We started off in the mid-morning with 75 per cent charge and the figure stood at 14 per cent an hour-and-a-half later.

In reality, lifting heavy material and running an attachment on the third service will see about two hours of work completed before needing a top-up.

Driving the machine is a fairly simple affair, very much point and shoot. It behaves very much like its diesel stable mate, but vibrations and engine noise are obviously non-existent.

Pushing into a muck pile sees the wheels slip fairly shortly after engaging with it, but using the hydraulics to make a decent bucket is easy enough.

Top speed is a sedate 15kph, but it is unlikely the machine will ever do much roading, or fast work.

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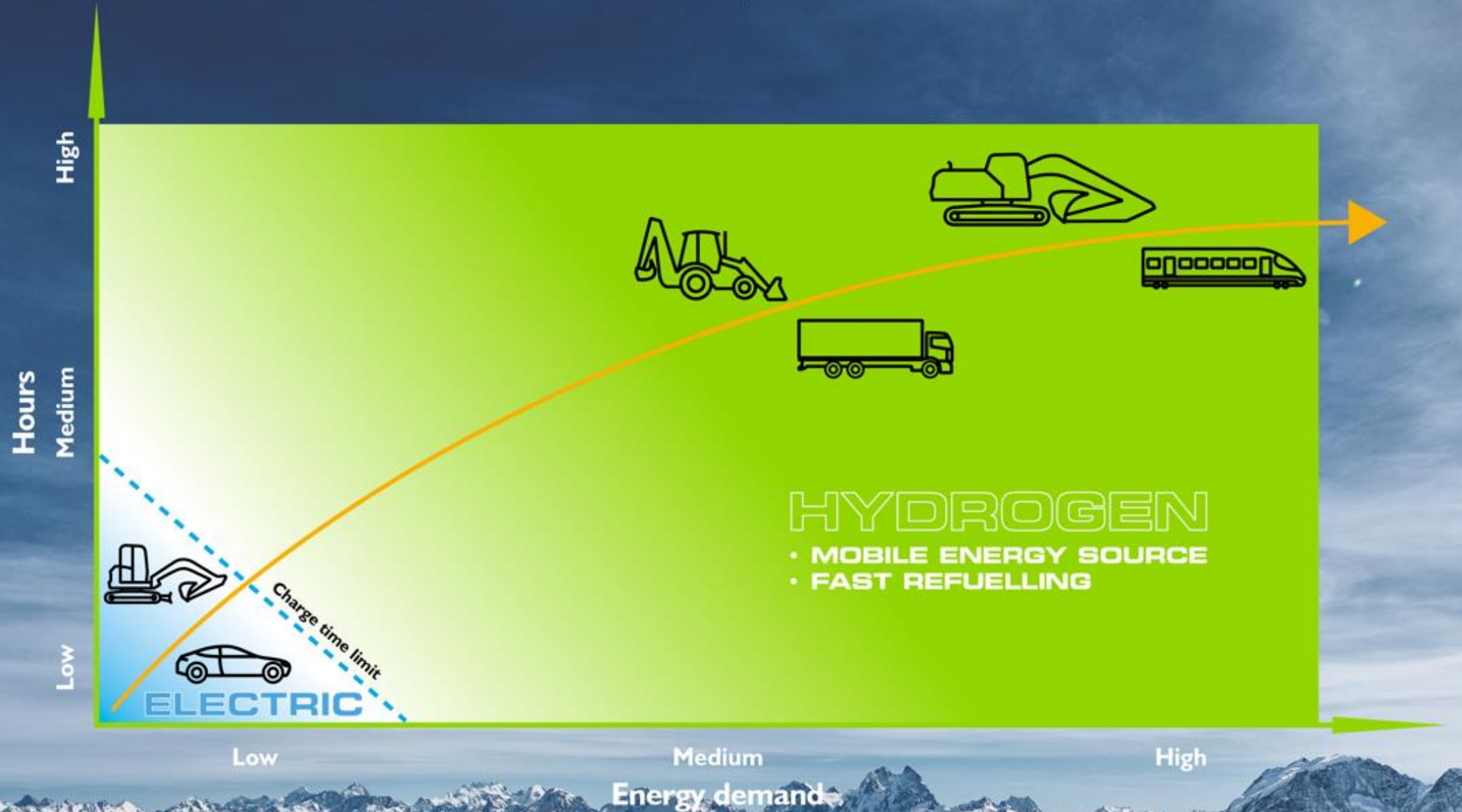
Electric?

JCB ROAD TO ZERO

The Right Technology for the Right Application



JCB ROAD TO ZERO Accelerating Zero Carbon – Robust and Cost Effective

HYDROGEN

- COST EFFECTIVE
- ROBUST
- ESTABLISHED SUPPLY CHAIN
- EASY TO MANUFACTURE & SERVICE
- QUICK TO IMPLEMENT

Hydrogen motor

Hydrogen tanks

Refuelling point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Jenny Grant

Head of Organics and Natural Capital, REA

The Role of Compost and Digestate to help Decarbonise Agriculture

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10th November 2021

THE ASSOCIATION FOR RENEWABLE ENERGY & CLEAN TECHNOLOGY

Delivering a Decarbonised Agriculture Sector

The role of compost and digestate to help decarbonise agriculture

Jenny Grant

Who we are

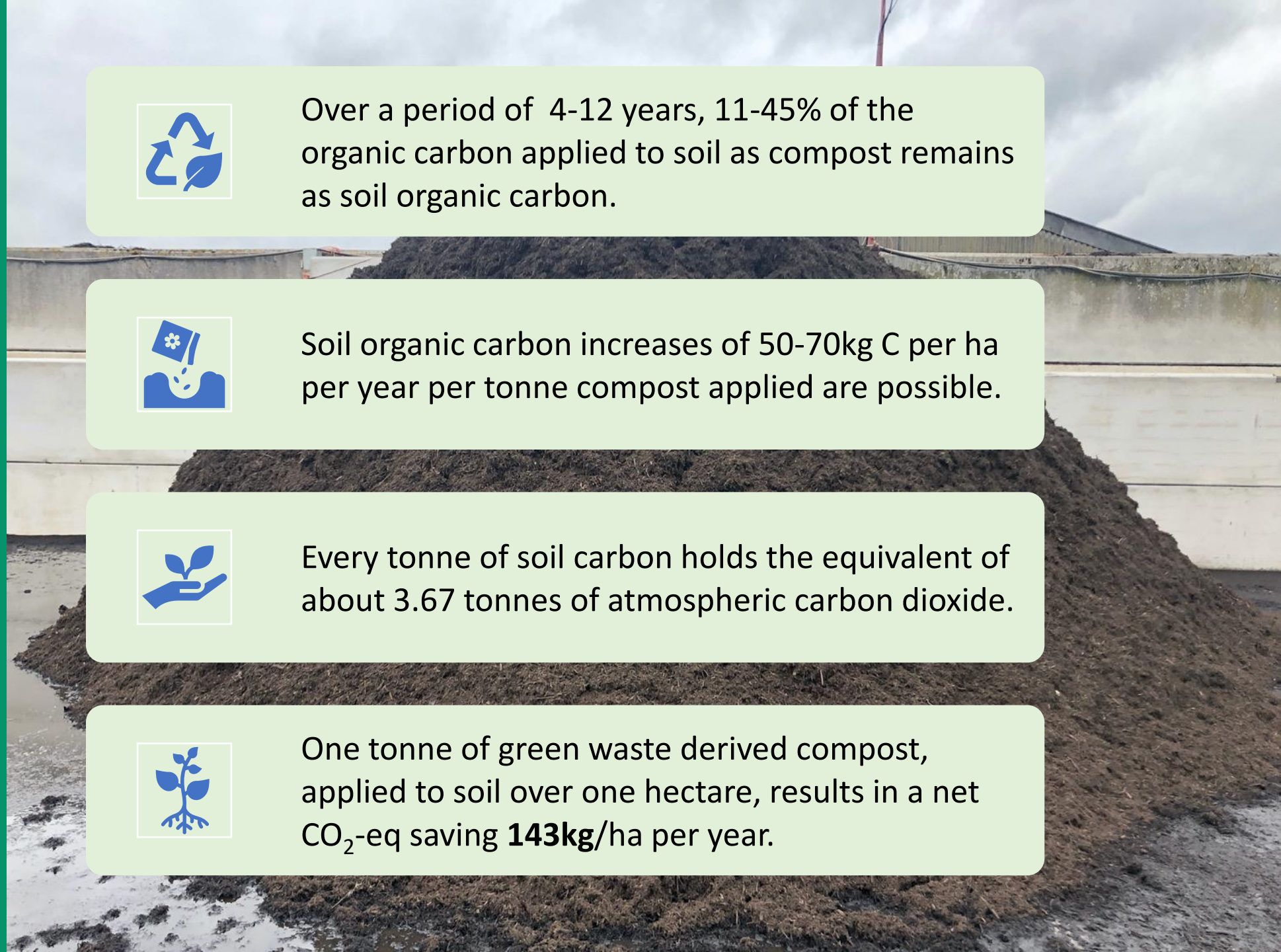
Our Subsidiaries

REAL
RENEWABLE ENERGY ASSURANCE LIMITED


‘Despite all our accomplishments, we owe our existence to a six-inch layer of topsoil and the fact that it rains’

Benefits of compost

Compost has the potential to sequester carbon in the soil



Over a period of 4-12 years, 11-45% of the organic carbon applied to soil as compost remains as soil organic carbon.

Soil organic carbon increases of 50-70kg C per ha per year per tonne compost applied are possible.

Every tonne of soil carbon holds the equivalent of about 3.67 tonnes of atmospheric carbon dioxide.

One tonne of green waste derived compost, applied to soil over one hectare, results in a net CO_2-eq saving **143kg**/ha per year.

Benefits of digestate

Image courtesy of 4R Group

Maximising the potential

- Organics industry produced 3.2MT compost and 7.75MT digestate in 2018
- Need to maximise capture of organics
- Quality feedstocks and outputs
- Recognition of value of outputs
- Organics play vital roles in:
  - Changes to soil health policies
  - Carbon footprint reduction
  - Enabling reduction of peat usage

Thank you!

Jenny@r-e-a.net

PANEL DISCUSSION

Chair: **Dr Nina Skorupska**, Chief Executive **REA**

- **William Cracroft-Eley**, Chairman, **Terravesta**
- **Philipp Lukas,** Chief Executive Officer, **Future Biogas**
- **Neil Lindsay,** Land and Development Director, **Solar2**
- **Charles Stevenson**, General Manager, **JCB**
- **Jenny Grant**, Head of Organics and Natural Capital, **REA**

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