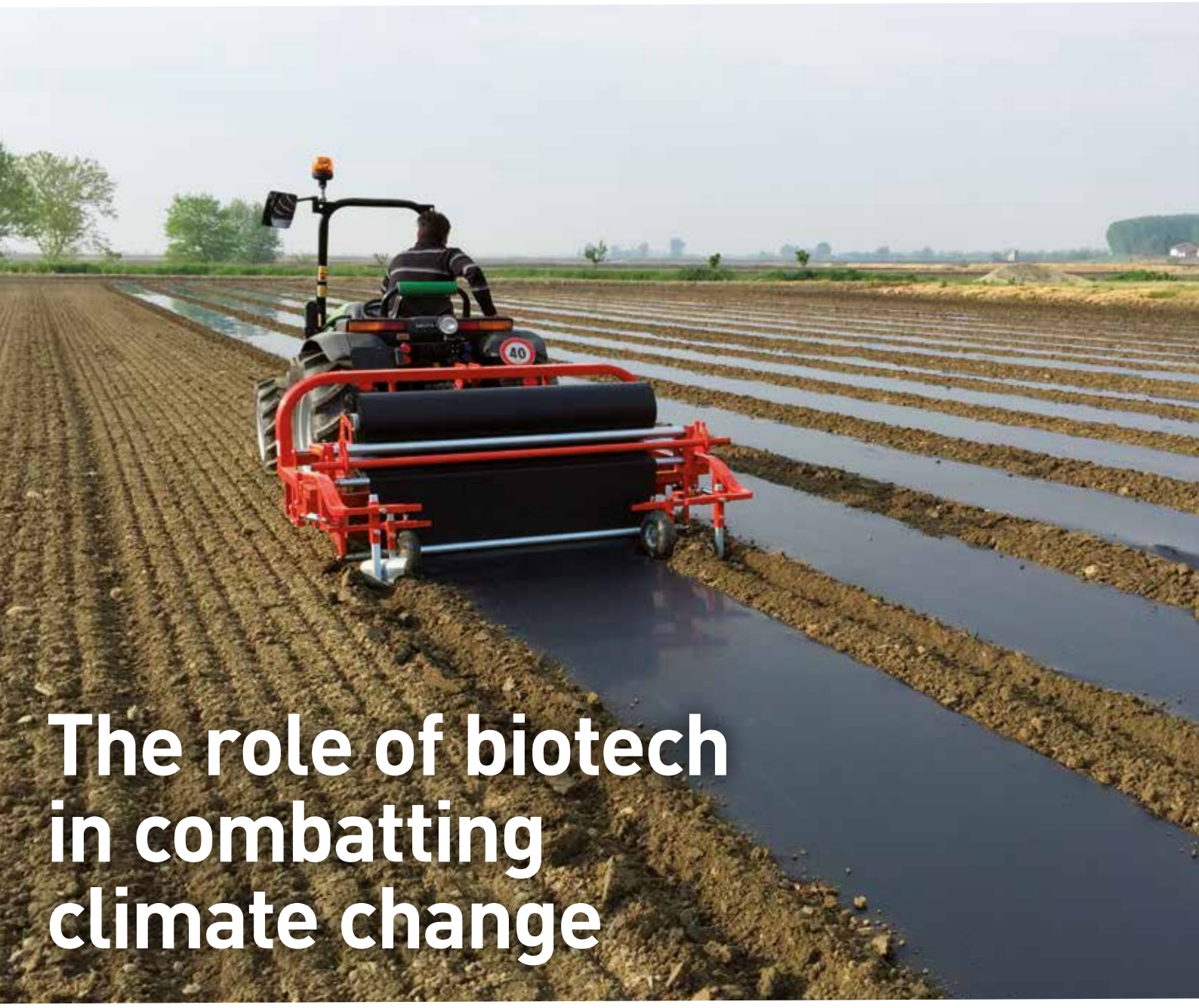
Organics Recycling & Biogas

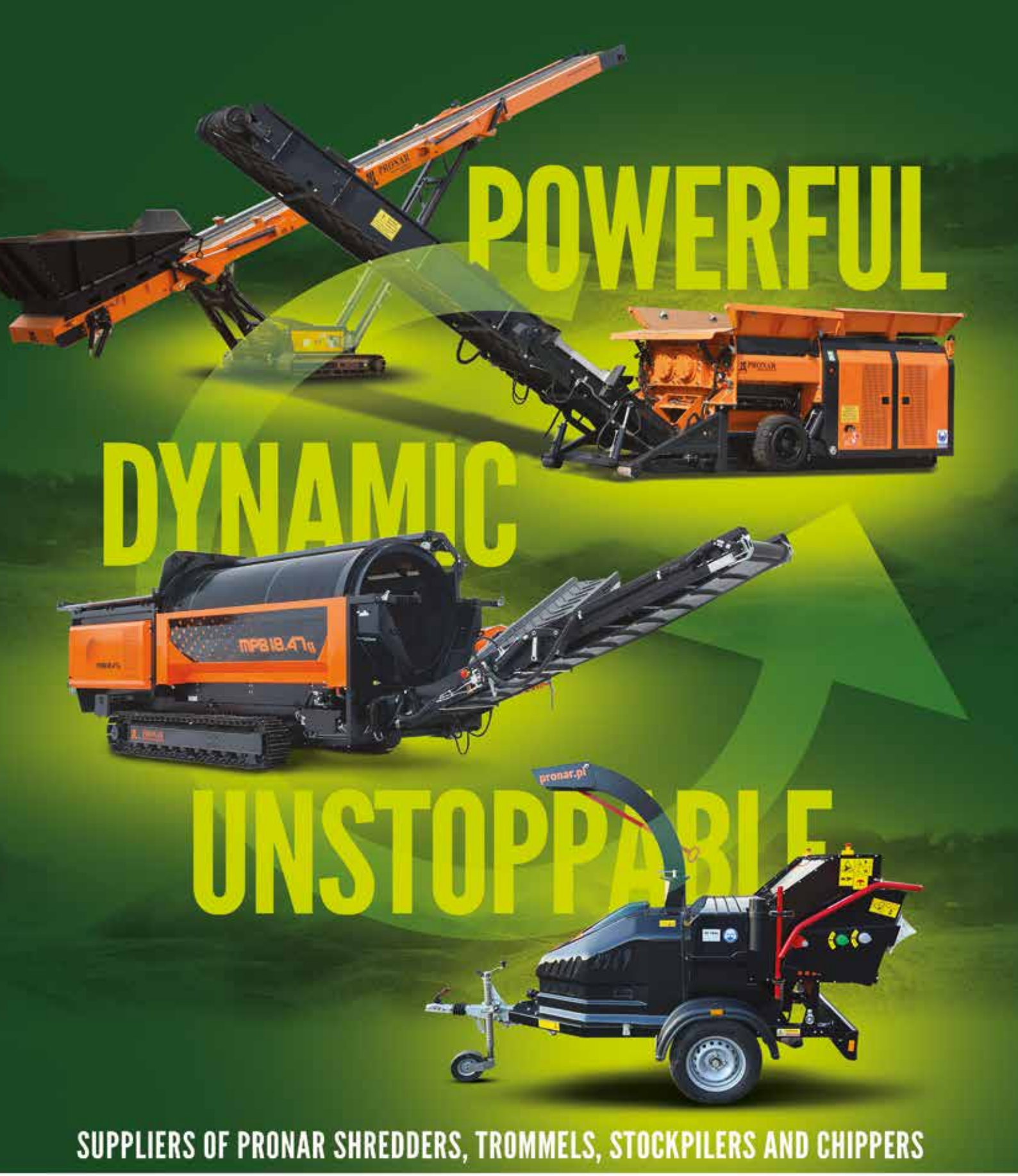
Spring 2022 Issue 49

The quarterly magazine from REA Organics and Green Gas



The role of biotech in combatting climate change

REA ORGANICS REA GREEN GAS



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Welcome

Kiara Zennaro, Head of Heat, Green Gas lead
Jenny Grant, Head of Organics and Natural Capital

Welcome to the winter edition of our magazine. Firstly, we hope you and your family are well and coping with whatever this year brings.

There were a few positive notes towards the end of 2021. We saw the Environment Bill become the Environment Act and bring with it the mandatory requirement for food and garden waste collections, with funding commitments in the Net Zero Strategy, although details (including timings) are still to be confirmed.

We were pleased that the Green Gas Support Scheme (GGSS) was successfully launched on 30 November and the first wave of applications was received by Ofgem. The GGSS is going to be key going forward to support the sector.

CO2 from biomethane plants continues to be in the spotlight and is being closely looked at by Government. It has become clear that biomethane plants in the UK can provide a significant opportunity to boost the UK's CO2 supplies for the usage market and help to address current and future shortages. Government wants to act on this opportunity very quickly, with both BEIS and Defra having discussions on the topic.

We also welcomed the recognition of the role that soil health plays, and we have highlighted the important role that using recycled organic materials can play in increasing soil organic matter, bringing many benefits such as improved soil structure, better water retention, reduced erosion potential and increasing the ability for soil to store carbon.

We are looking forward to continuing to work on behalf of members in 2022 and would like to invite you to get in touch if you would like to discuss any matters with us. We hope you enjoy reading this issue.

Jenny and Kiara.

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Organics Recycling & Biogas is the magazine of REA Organics and REA Green Gas member forums

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UN report on impact of agricultural plastics

In a report published in December 2021, the UN Food and Agriculture Organisation (FAO) lays out the serious implications of agricultural plastic, pushing for 'coordinated and decisive action'.

The report, 'Assessment of Agricultural Plastics and their Sustainability: A Call for Action', identifies opportunities to improve the circularity and 'sound management' of agricultural plastics. The report seeks to fill the research gap surrounding the issue, comparing it to marine plastics, a better-documented issue. Agricultural plastic pollution is, the FAO says, a far more significant problem, posing an even greater risk to food security, human health, and the environment.

Data suggests that only small fractions of agricultural plastics are collected and recycled, predominantly in developed countries. Elsewhere, the report states, most plastics are incinerated, buried, or landfilled, with record-keeping virtually 'non-existent'.

The FAO's research reveals the impact of plastics on agricultural yields, with the accumulation in surface soils of mulching film – a major category of agricultural plastic by mass – linked to reduced yield. According to industry experts, global demand for greenhouse, mulching and silage films will increase by 50 per cent, from 6.1 million tonnes in 2018 to 9.5 million tonnes in 2030.

The report recommends that agricultural plastics be addressed holistically, in line with circular principles. At the international level, the FAO calls for the development of a 'comprehensive voluntary code of conduct to cover all aspects of plastics throughout agri-food value chains'. This, the report states, should be paired with the 'mainstreaming of specific aspects of the life cycle of agricultural plastics' where appropriate, citing the Basel and MARPOL Conventions.

Commenting on the report, Sian Sutherland, co-founder of A Plastic Planet, said: "This report gives a stark warning that we cannot overlook the impact of plastic in our soils. They are the lifeblood of our planet, providing 95 per cent of our food supply, yet they are 23 times more polluted with plastic than our oceans.

"The agricultural industry is a huge contributor to this, using more than 12 million tonnes of plastic each year," says Sutherland. "Simply put, plastic is killing our soils."

EA publishes revised biowaste standard rules

In December, the Environment Agency (EA) published its revised biowaste standard rules sets. 10 new biowaste standard rules permits and generic risk assessments were added, which are SR2021 numbers 1 to 10.

The significant changes outlined in the EA's consultation response document are as follows – the EA has consolidated rule sets so that it is clear when they can be used; operating standards have been raised and best available techniques built into the new rule sets, and the EA has 'been more prescriptive' in its approach.

> "Biodegradable waste that is significantly contaminated with non-compostable contaminants shall not be accepted"

With regard to contamination in feedstock, for composting in 'open systems' and on-farm AD, the EA has stated that: "biodegradable waste that is significantly contaminated with non-compostable contaminants shall not be accepted, in particular, plastic and litter shall be no more than one per cent w/w and shall be as low as reasonably practicable by 31 December 2025".

"For composting in 'closed systems' and for AD (except on-farm), the corresponding limit is five per cent w/w and shall be as low as reasonably practicable by 31 December 2025. Operators will be notified in writing and will have three months to comply with their revised rule set or apply for a bespoke permit."

California to compost all organic waste

Counties across California are now legally required to establish plans to compost all of their organic waste, with legislation taking effect on 1 January.

The Short-Lived Climate Pollutants regulation (SLCP) broadens existing legislation that aims to reduce organic waste disposal in California by 75 per cent. Currently, organic waste constitutes 56 per cent of the state's landfilled material.

Counties must collect and divert organic waste where possible, through a two-tiered system targeted at commercial establishments.

The first tier, effective from 1 January 2022, focuses on large food distributors and retailers. Tier two, effective from 1 January 2024, will target large eateries, and will be implemented in tandem with municipal enforcement of the legislation. Failure to comply could result in fines of up to $10,000 per day.

International Compost Alliance

Jenny Grant,
Head of Organics and Natural Capital, REA

The REA is very pleased to be part of the International Compost Alliance, a voluntary partnership to advance awareness and understanding of the benefits and use of compost on a global scale. It was established by compost organisations from across Europe, North America and Australasia.

The Alliance looks to offer positive solutions for climate change mitigation, soil health and food security, building on years of collaboration between organics recycling organisations. By pooling expertise and knowledge, the Alliance seeks to maximise the recycling of organic wastes and advance the manufacturing of certified, high-quality compost.

Despite organics recycling being an affordable and proven solution to the climate change mitigation and methane emission reduction goals, it remains an underutilised and undervalued technology.

Launching on *World Soil Day* (hosted 5 December by the Food and Agriculture Organization of the United Nations), the Alliance will showcase the importance of compost and its multiple benefits. These include enhancing soil health, improving crop productivity and nutritional value, improving water quality, and supporting biodiversity protection and natural resources preservation. There will also be a focus on collaboration and joint initiatives with the potential for international research.

The founding members of this global alliance include: The Association for Renewable Energy and Clean Technology (REA); The Australian Organics Recycling Association (AORA); Compost Council of Canada (CCC); European Compost Network (ECN); International Solid Waste Association (ISWA); CRÉ – Composting and Anaerobic Digestion Association of Ireland; WasteMINZ (Waste Management Institute of New Zealand); The United States Composting Council (USCC); and The Compost Research & Education Foundation (CREF).

Membership is open to any membership-based organisation that aligns with the Alliance's vision and mission of advancing organics recycling and producing high-quality compost and digestate products.

Please see www.internationalcompostalliance.com for further details.

Biogas Sector News

Dr Kiara Zennaro

The Green Gas Support Scheme (GGSS) was successfully launched on 30 November, providing direct support for biomethane produced by AD and injected into the gas grid. At the time of writing this article, Ofgem has received a total of six biomethane applications, but we expect more to come over the lifetime of the Scheme. We have responded to Ofgem's consultation on the draft GGSS guidance and Ofgem published an updated version with a number of changes including the addition of new sections in February 2022.

The Biomass Policy Statement, published by BEIS in November 2021, is also crucial for the green gas and other bioenergy sectors. It provides a strategic view from the Government on the role of biomass across the economy, in the medium to long term. It was published ahead of next year's Government Biomass Strategy, which will review the amount of sustainable biomass that could be available in the UK, and how this resource could be best utilised across the economy to help achieve our zero emissions targets. The strategy will also assess the UK's current biomass sustainability standards. Our policy team is extensively engaged with BEIS on this.

There has also been considerable interest from Government on 'bio-' or 'green' CO2 from biomethane plants, especially in the wake of ongoing CO2 supply issues in the UK. BEIS reached out to the REA seeking evidence on what the Government can do to support CO2 capture at green gas plants in the medium term, as this sector could potentially help boost resilience and security of CO2 supplies. Thanks to our members' feedback, we were able to provide BEIS with extensive evidence on the key barriers to the deployment of carbon capture at AD plants.

Finally, we have also recently met with BEIS' team leading on the adoption of the UK Emissions Trading Scheme (UK ETS) and we were reassured to find out that they are closely looking at how the scheme could encourage low-carbon fuels including biomethane. They are also interested in power-to-methane technologies that could help capture bio-CO2 from AD plants and boost their methane production. A consultation on changes to the UK ETS is expected early next year.

General Policy Update

Dr Kiara Zennaro
Head of Heat,
Green Gas lead

In the run-up to COP26, under the huge pressure of hosting such an important summit, our government released a raft of policy documents and consultations, along with some really eye-catching policy announcements. They announced the end of sales for all new fossil fuel-powered cars, vans, and domestic boilers, much more energy-efficient new buildings, the end to biodegradable waste being sent to landfill and a commitment to a net-zero electricity system, all in the next 10-15 years. Important documents published ahead of the climate summit include the long-awaited Net Zero Strategy and Treasury's Net Zero Review, the Heat and Buildings Strategy, the Biomass Policy Statement and policy documents on Greenhouse Removals. We have a member briefing for each of them on our website, at www.r-e-a.net/our-resources.

Amongst many commitments, one of the highlights in the Heat and Buildings Strategy was the Government's confirmed ambition for all new heating systems installed in existing UK homes on the gas grid from 2035 to be low carbon. In other words, from this date onwards, people that need to replace their boilers (e.g. at the end of their lifetime) will need to install a low carbon heating system. The focus of the Strategy is clearly on heat pumps, but options such as hydrogen-ready boilers may be on the table, subject to strategic decisions to be taken on the role of hydrogen in heating in 2026. The strategy also reiterates the Government's commitment to increase the proportion of biomethane in the gas grid in Great Britain through the Green Gas Support Scheme (GGSS), and to look at a potential biomethane support scheme to replace the GGSS after 2025, which may include other green gases such as low-carbon hydrogen.

Consultations round-up

Jenny Grant

Current consultations include...
Single-Use Plastics: There are proposals to ban the use of commonly littered plastic items such as plates, cutlery, expanded and extruded polystyrene food and drinks containers.

England's Peat Action Plan: Defra has published a consultation that aims to address measures to end the use of peat and peat-containing products in the retail sector in England and Wales. They are seeking views on each of the proposed measures and how they could operate. The consultation also includes a call for evidence on the impacts of ending the use of peat and peat-containing products in professional horticulture and wider sectors.

Forthcoming consultations include:
Clean Air Strategy: Defra is developing policy and consultations on covers for slurry and digestate stores; low emission spreading of digestate, and the rapid incorporation of solid manures. We are expecting the consultations early in 2022 with the regulations coming into force later in the year. Defra is keen to gather views.

Fertiliser Regulations: Defra is looking to modernize and bring together the current fragmented fertilisers regulations in the UK using powers under the Agriculture Act. The EU Fertilising Products Regulation has only been partially implemented in the UK due to the timing of Brexit, and Defra is considering how to best proceed. Organic fertilisers (composts and digestates) are proposed to be included, along with mineral fertilisers. Defra is in discussion with devolved administrations, with the aim of having a UK-wide consultation. The consultation is now expected in Spring 2022.

All consultations will be circulated to members and we welcome comments to help develop the REA response. Please contact Jenny@r-e-a.net if you wish to discuss any of the above further.

Standards for environmentally sustainable investments

Emily Nichols,
Technical Manager,
Organics and
Natural Capital

Last June, the Green Technical Advisory Group (GTAG) was established to oversee the Government's delivery of a UK Green Taxonomy – a common framework setting the bar for environmentally sustainable investments. The REA's Frank Gordon is a member of the Energy Working Group, one of the groups advising government on the standards. The Government plans to open their consultation in 2022.

Last August, the EU Platform on Sustainable Finance (EUPSF) published preliminary recommendations for technical screening criteria for the EU Taxonomy. They invited evidence to inform their final recommendations. Those are due to be published soon and will be considered by the European Commission when preparing its draft delegated act, due to be consulted on in early 2022.

Anticipating likely read-across to the UK, in September the REA responded directly to the EUPSF's call for evidence and contributed to the European Biogas Association's response. One of the EUPSF's draft proposals was that at least 110m3 biogas must be produced per tonne of biowaste anaerobically digested. Taking account of member responses, the REA called for no minimum biogas yield to be set, said that the minimum yield is too high for numerous biowaste types and that it was unfair to set a single one-size-fits-all figure.

We also called for compost to be included amongst the output types produced – under the definition of 'Recovery of bio-waste by anaerobic digestion and/or composting' – as well as recognition of the latest versions of standards for industrially compostable non-packaging plastics and packaging.

Building Carbon Emissions Credibility in AD

Thomas Minter, Managing Director of Malaby Biogas, puts forward the case for GHG Emissions Savings as a universal currency to quantify the value that anaerobic digestion delivers.

The post-financial crisis coalition government heralded a new, green AD industry.

Malaby Biogas started planning the Bore Hill Farm Biodigester in 2008, which has been running since May 2012. Over the years, I have given many presentations about who we are, what we do and why. Early scepticism abounded and carbon footprints, greenhouse gas (GHG) emissions, offsetting and mitigation were all terms poorly understood by the general public as well as policymakers and elected officials. As the industry has grown and stagnated in line with changing support mechanisms, austerity, Brexit and the pandemic, I have found it difficult to translate the drive for climate action and the broad benefits the AD sector offers into a clear 'currency' that values the wider good that we contribute.

For me, the main currency driver for AD growth is GHG Emissions Savings. As the industry adjusts to different policies, the one poorly-quantified constant has been emissions savings. The fundamental AD process is consistent – bacteria converting digestible compounds into methane. The industry is flexible in applying the process: landfill diversion; food waste segregation; manures, energy crops or sewage sludges being stabilized; nutrients going to land for soil improvement, and methane being converted to renewable energy (power, heat, cooling, transport fuel). Whatever the application, there is a benefit and the conversion of methane as part of a wider system delivers climate benefit – net GHG emissions savings – recognized by COP26's Global Methane Pledge.

Carbon dioxide equivalent (CO_2eq) is the unit of currency. The problem was always how to account for it in a credible, transparent and replicable way to demonstrate the good that we do. 100 per cent of the support that the industry receives is for the energy component of AD but it delivers so much more (healthy soils, cleaner water and air, and so on). Valuing this through the currency of climate benefit is, I believe, the best way to use CO_2eq as the universal unit.

Life Cycle Assessment (LCA) methodology provides a well-established basis for evaluating GHG emissions savings by assessing the Global Warming Potential (GWP) of a system. It can be conducted on any type of AD plant under ISO/UKAS accreditation, defining project boundaries to establish a carbon footprint unit of gCO_2eq/MJ of output. We used real-world, operational data certified under the AD Certification Scheme (ADCS) to determine if we were low carbon, zero carbon or carbon negative and to what extent.

Bath University developed an LCA using OpenLCA software, EcoInvent 3.2 database and our own 2019 operation data. Its Centre for Sustainable and Circular Technologies, supported by Supergen Bioenergy hub, published the case study in July 2021. We used the results to develop site optimisation projects for future emissions savings. It identified GHG emissions savings of -2,100 tonnes of CO_2eq in 2019 with the potential to increase that to -4,360 tCO_2eq if the energy output was switched from renewable electricity production to biomethane and -6,886 tCO_2eq if the CO_2 was captured and sequestered.

While the LCA process provides a credible currency for AD, two important outcomes are worth noting:

· **Life cycle assessment of GHG emissions savings offers a framework for the global aggregation of AD impact and valorisation across varying AD system models and jurisdictions.** This provides a springboard for developing a series of operational models for AD, allowing standardization and validation using existing accreditation routes to deliver value to operators.

· **Life cycle assessment can underpin existing emissions trading schemes to help remove AD's dependence on public funds.** Further valorisation of non-GHG benefits of AD is required, such as establishing a proper fertilizer value for digestate.

Should the waste sector be exempt from the red diesel ban?

Tommy Dale,
Managing Director,
Forth Resource
Management Ltd

As an industry, I feel that we have become too reliant on 'cheap' red diesel. Whilst its price has increased dramatically over the last few years, the easiest response to most processing challenges has, for us at least, always been to buy a bigger horsepower engine – whether it be in a loading shovel or shredder – and ultimately to pour more red diesel into the fuel tank.

I believe that losing the rebate will drive innovation and ultimately lead to a more environmentally-sound and efficient resource management industry in the years ahead.

For businesses who like to innovate, there is an opportunity to get ahead of competitors who do not. I see a big opportunity for our composting business to show that we really do care and we intend to reduce our fuel usage per ton of output through a range of measures focused on process improvements and by increasing our understanding of the biology in the composting process. We are also exploring ways to generate our own power on-site to run our growing fleet of electric vans and machinery. Investment in wind and solar is part of the plan, as is partnering with a local AD plant.

A few years down the line, I believe we will be running a mixed fleet of machines powered by a range of fuels including biogas, hydrogen, electricity and traditional diesel, but the days of fuelling up with little or no record keeping and performance management will be long behind us, and I'll be quite happy about that.

Of course, this will all cost money and we are anticipating our fuel bill next year to increase by a six-figure sum, even with the plans that we have in place to reduce fuel usage and embrace alternative power sources. To cover this additional cost we will have to increase our prices, but then so will our competitors. Our customers will not be happy about this but they will understand, and they will appreciate our efforts to mitigate this financial cost over the months and years ahead.

We are striving to play our part in building a more sustainable Scotland and are embracing the loss of 'Red' as part of the journey.

Anthony Walker,
Organics Sector
Specialist, WRM Ltd

The policy of removing tax rebates on red diesel for industries such as the waste sector is a good idea and is something that I support for the environmental gains that can be made.

The guidance identifies the principal drivers being to 'incentivise users of polluting fuels like diesel to improve the energy efficiency of their vehicles and machinery, invest in cleaner alternatives, or just use less fuel.'

The whole waste sector will no longer be able to use red diesel from April 2022, whilst agriculture and forestry will still be able to do so. But what about where the waste sector meets agriculture, such as with organics recycling? I believe we need further guidance for red diesel taxation changes.

The amazing and diverse makeup of the organics sector means that we have large corporate organisations and agricultural diversifications all providing the same climate-essential composting and digestion services to businesses and local authorities.

I wonder if there is also a specific question as to why the organics sector will be taxed more for diesel despite the huge net climate and environmental benefits that it delivers. Also, whether the organics sector should fall outside the taxation regime, being – as it is – so intrinsically linked to agriculture.

If organics activity is a small or large part of farm diversification, would it be exempt as an associated farm activity? If I use a tractor for composting and farming, would that be exempt?

Some of the positive changes that may be facilitated could be greater electrification, hydrogen-powered vehicles or process efficiencies to reduce fuel usage such as aerated static piles. However, such changes will have a significant impact on costs at a time when further investment is required. I would query the logic behind a limited transition period given that some aspects are still unclear. It will have been hard for many businesses to make investment decisions and to implement them quickly enough.

The most tax conscious of us in the industry may take advice from a customs duty consultant in order to determine which aspects are in and out of the taxation rebate. Those of us who are less tax conscious may just see how it goes – who's checking and when, anyway?

Anything that is left unclear or open to interpretation in April will drive further inconsistency within a sector that already has far too much inconsistently implemented regulation. What is certain is that the tax revenue on diesel will be vastly increased in the meantime.

Capturing carbon from biogas

The UK market for anaerobic digestion is driven by the value of the captured biogas. But, writes **Will Simpson**, with the demand to cut greenhouse gas emissions increasing, there are opportunities for the sector from the capture of CO2 as well.

As the industry for managing organic wastes has grown, so has the potential for capturing the CO2 byproduct and either reusing or storing it.

So far, this has been more of an idea, but new initiatives are starting to make good on the potential. Although anaerobic digestion already plays an important role in tackling climate change by capturing methane, the use of biogas still results in CO2 emissions. Now, innovations in how to capture this are opening up new markets for the anaerobic digestion sector, both in terms of selling CO2 for other applications and for payments for carbon capture.

And it could potentially be huge. The Committee On Climate Change estimates that there will be around one million tonnes of CO2 that could be captured annually by 2050, and many industry stakeholders suggest that this figure is actually a conservative estimate.

CO2 extraction from biogas

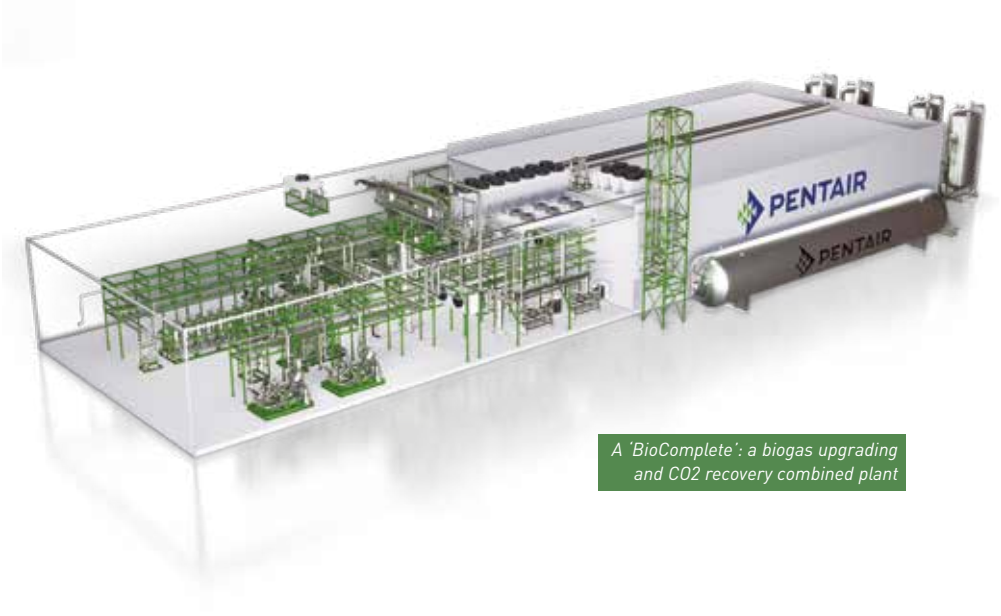
Just as there are many different approaches to the design and build of digesters, there are a range of techniques for the capture of carbon dioxide.

One such process is to separate the carbon dioxide, hydrogen sulphide and nitrogen gases that are produced in a biogas facility, and then treat them with a group of chemicals called amines. The mixture is put through an amine solution that in turn 'grabs hold' of the CO2 and releases the nitrogen.

Another option is to tackle the issue further on in the commercial process in the production of biomethane, according to John Baldwin, Managing Director of biogas industry consultancy CNG Services. A simple and cost-effective way to do this is by retrofitting existing biogas plants with the facilities for carbon capture: "When you make biogas in an anaerobic digester you're basically making two things – carbon dioxide and methane. So, if you imagine a big tank full of a mixture of CO2 and methane. What you want to do then is separate the methane out so you have almost a pure stream of CO2, so you've not got any of this nitrogen. You're starting after the amine stage – you don't need that stage with biogas because you've already separated it out of the methane, and there's no nitrogen."

A novel approach, pioneered by the French firm Air Liquide, captures the CO2 produced during a hydrogen-making process that is used to produce the sulphur-free fuels used by the oil and gas industries. Applying patented techniques (trademarked as Cryocap), hydrogen and CO2 are separated using a cryogenic process. The hydrogen is used to power fuel cells and is used in clean mobility applications like forklift trucks, while the carbon dioxide is used within the local the food industry and water treatment markets.

Another innovation, at an earlier stage of development, is a process developed by the EU-funded NTPleasure project, which uses an ultra-thin zeolite membrane to separate the CO2 from the biogas. They have also created a number of highly active catalysts which can convert CO2 to methane using an electrical discharge which 'excites' the CO2 and hydrogen molecules, causing them to break their bonds and interact with the catalyst surface. This technology, though, may be some way from widespread use – the NTPleasure team is still seeking funding to further develop its potential.



A 'BioComplete': a biogas upgrading and CO2 recovery combined plant

Applications

So, once captured, what happens to the CO2? One option employed by Oxfordshire waste management company Grundon takes fly ash that you find in an incinerator and reacts it with CO2 to make artificial limestone pellets, which effectively lock the carbon away. The finished Carbon8 aggregate is used mainly in the manufacture of lightweight concrete masonry blocks.

However, the amounts of carbon involved in these projects are small compared to those dealt with at the higher end of the carbon offsetting market. A major player here is Future Biogas, a Surrey-based firm that recently announced plans to build 25 new biogas plants with carbon capture and storage facilities by 2028. At present they operate 10 plants in the UK for a range of clients, including green financial investment portfolios for JLEN Environmental Assets Group and Aviva.

The biogas that these AD plants produce is put into the grid and sold through to a corporate customer. After the separation, the CO2 that is left is liquified by compressing and chilling it. "Technically it's relatively straightforward," claims Future Biogas CEO Philipp Lukas. "You get a volume of carbon dioxide [approximately] 30 tonnes or so in a big tanker at -20 to -25 degrees celsius. You take that to a port-side facility, collect it from a variety of locations there, stick it in on a ship and it's sent to the [carbon capture] facility."

In June 2021, Future Biogas announced that it had signed an agreement to supply CO2 to Northern Lights, a joint venture between Equinor, Shell and Total Energies to use an area 2600 metres below the North Sea for carbon capture and storage.

> "A novel approach, pioneered by Air Liquide, captures a hydrogen-making process to produce the sulphur-free fuels."

"What they do is pump it down a well similar to the ones from which you would have extracted oil and gas," explains Lukas. "When you get to two or three kilometres down in the North Sea there are lots of caps of impermeable rock, underneath which, in some cases, has collected oil and gas. One of these capped areas that don't have any oil or gas is where Equinor has chosen for the repository. Effectively, the carbon is being put back to where it should be."

You might assume that piping CO2 back below the North Sea would be inordinately expensive, but Lukas maintains that, with projects like these, huge economies of scale kick in. "All forms of geological sequestration are between £400-1000 per tonne of CO2, so it's considerably higher than the EU Emissions Trading Scheme or the UK Emissions Trading Scheme pricing, which is around €80/90. But the premium is paid by people who want to buy permanently sequestrated negative carbon. If you go out and look at people like Swisslife Reims, Microsoft – they have all been buyers in that market."

The carbon offsetting market is certain to grow over the next few years as businesses seek to fulfil their sustainability obligations. For many, rapidly decarbonising their operations quickly represents an enormous challenge, so purchasing carbon offsets is necessary if they are to hit net-zero targets. For responsible corporations, the ability to accurately measure the amount of CO2 captured and have confidence that this has been permanently sequestered makes projects like the partnership between Future Biogas and Northern Lights very attractive.

How large might this market become? "McKinsey put out a report last year saying that it could be £50 billion by 2030," says Philipp Lukas. "Personally I think it's going to have to be if we're going to stand any chance whatsoever of sticking to 2 degrees, let alone 1.5. We're not going to be able to decarbonise fast enough, which means we'll have to do everything we can to remove CO2 from the atmosphere as well.

"So it's part of the solution, but a tiny cog in an enormous problem. You can definitely see it removing several million or tens of millions of tonnes of CO2 but, compared to the hundreds of thousands of millions of tonnes that we currently emit, it's no silver bullet. Though nor, frankly, is anything. But it has huge potential, particularly because you've got that double benefit – it's making clean energy and removing CO2 as a processed byproduct from the atmosphere."

Investment in quality enables AWO Recycling to grow

Tom Bedford, Director of organics reprocessor AWO Recycling, discusses the company's long standing relationship with Komptech GB, detailing how the partnership's continued success is underpinned by technology that improves productivity.

AWO Recycling is a family-owned business based in Cambridgeshire, which principally reprocesses municipal and agricultural green waste. Established in 2006, the company is owned and operated by brothers Tom and Danny Bedford at a 2.5-acre site on the family's farm near Huntingdon.

Initially Tom and his father Stuart started the composting business, processing waste from vegetable pack houses in the late 90s. It wasn't until 2004 that the Bedfords decided to scale up, with planning permission and a waste management permit, initially for treating up to 25,000 tonnes at a time.

The company has worked with Komptech equipment to process compost from its open windrow operation from very early on. First with a Komptech Mustang trommel screen, followed by a Magnum three way split screen a few years later. As the business continued to grow, AWO added an Easystar screener from Komptech UK to work alongside the Magnum. This increased the range of products that the company could sell, with improved separation of the oversize fraction to make a biomass product.

As the business evolved, in 2014 it purchased a Hurrikan S windsifter, to replace a trommel screen that had in turn replaced the Magnum. "The biggest problem that faces the composting industry is the oversize that you're left with at the end. Everyone wants to try and clean up the oversize product free of contamination so they can try and get a market for it," explains Tom.

The Hurrikan is designed to separate the unwanted elements, using air extraction to expel the lighter plastic fraction and a magnet to extract ferrous metals. A stone belt also allows stones to roll safely out of the equipment.

He adds: "The biomass market is opening up, but it's still a challenge to get material clean enough to send away for biomass. The Hurrikan is renowned to be the best separator for cleaning up light fractions. Other people have tried, but nothing seems to be better than the Hurrikan."

For all composting businesses, contamination is a perennial issue. Although the Hurrikan is a significant investment for a business on the scale of AWO Recycling, as far as Tom Bedford is concerned, it boils down to a simple equation: "The question is how much you're going to spend getting rid of contaminated material, as opposed to spending a little bit on a machine and

The slower running speed means contaminants are not 'blitzed', which helps the process of sifting them out to improve the overall quality of the output compost

cleaning it up and not having that big expense."

After-sales and support

When Komptech appointed John Hanlon to manage its UK dealership in 2016, this helped bring two key supplier relationships for AWO Recycling under one roof. The company had already purchased CASE loading shovels from Hanlon, which according to Bedford, has a reputation 'second to none' in the industry for supplying loading shovels.

"When Hanlon took on Komptech, it was a breath of fresh air," he adds, reflecting that the after-sales and support have played a key role in continuing to buy Komptech equipment.

Although the team at AWO Recycling handles most of their maintenance - Tom's brother Danny is an experienced engineer - the responsive approach of John Hanlon and Komptech is a big plus. "They do any breakdowns or anything that needs diagnosing," says Bedford. "They respond if there's a major breakdown. We're never waiting long for an engineer to come out. They have plenty of field service engineers out there."

Scaling up

AWO Recycling has steadily grown its municipal customer base. Last year, it was awarded the contract by Peterborough City Council to process approximately 10,000 tonnes of green waste annually. This adds to commitments taking material from East London Waste Authority's household waste recycling centres (via ELWA's contractor Renewi) and a long-term contract with Fenland District Council.

A key element in preparing the operation to manage this has been the recent acquisition of a Komptech Crambo 5200 shredder. "It sounds a bit corny," says Bedford, "but since we started composting, the Crambo shredder was like the holy grail to us. Everyone wants the Crambo because it is the premium green waste shredder.

"I thought the cost of it was going to be way out of our ballpark, but they [Komptech GB] managed to put together a really good finance package for us over a certain number of years, which made it affordable for us. It's like a rental agreement with a balloon payment at the end - like a lot of car deals today - but it made it affordable for us. It gave us a brand new machine, which had the throughput that we needed, the reliability we needed. We knew we were going to get back up from Hanlons as well. As we were doubling our capacity, we wanted peace of mind that we wouldn't have too much downtime with the new machine backup.

"We used to have a high-speed Willibald Shark shredder, but because it was a high-speed shredder, a lot of the contamination in there gets blitzed into more particles than the slow speed Crambo. So if you've got a big bin bag, instead of being smashed into 1000 pieces, it'll probably just get torn into five or six pieces by the slow speed shredder."

Keeping the plastic contaminants larger makes it easier to sift this at the back end with the Hurrikan. Any oversize can also be put through the Crambo to reshred and also screened out for biomass.

Another feature of the Crambo, which makes a big difference to AWO's operation, is that it has its own tracks, which makes it easier to move around the site. It is able to manoeuvre into small spaces, in the process saving time. "I would never buy another shredder without tracks again," comments Bedford, noting the direct impact on productivity: "We get a good hour of extra shredding a day, which adds to the throughput. So we're able to shred an extra 60 tonnes a day."

Beyond these investments, AWO has partnered with Komptech GB to rent drum screens when materials require quick shifting. In the January / February period, when the stock of composted material begins to accumulate on-site, the Komptech Cribus 5000 is hired to clear the backlog and supplement AWO's fleet.

"We're a lot more confident going for tenders now, having everything that we need on-site," reflects Bedford on the evolution that his business has undertaken and the confidence that the machinery can meet growing demand.

The role of biotechnology in combatting climate change

From artificial spider silk to compostable plastics, biotechnology is at the heart of a manufacturing revolution towards a more sustainable future. By **Emily Nichols**

In November, the BBIA held its event 'Climate Change and the Role of Bio-based and Biodegradable Materials' at the House of Lords, promoting policy recommendations.

After Managing Director David Newman's scene-setting introduction, Paul Mines, CEO of Biome Bioplastics, informed the audience that biotechnology is the next green revolution. He said, "Alongside investment in renewable energy and sustainable transport, we need to be making more advancements in sustainable materials and chemicals, including investing in biotechnology. Without this, we simply won't achieve net-zero."

Using enzymes, microorganisms and plants, scientists have already created artificial spider silk, bio-based non-biodegradable plastics, bio-based biodegradable plastics, bio-based compostable plastics, meat substitutes, biofuels, antibiotics, antibodies, vaccines, and low-temperature washing powders. According to Mines, 'these have the potential to replace fossil fuels, improve human health and deliver low energy processes'.

Current UK Net Zero Models are dominated by energy and do not consider the role of biomass in the production of chemicals and materials. To address this, the Industrial Biotechnology Leadership Forum (IBLF) has commissioned a body of work from Imperial College and LCA Works that seeks to set out the scenarios and requirements for the future supply and adoption of bio-based products to maximise GHG abatement.

> "Biotechnology has the potential to replace fossil fuels and improve human health"

REA policy on liners

In the right applications, compostable products can aid more efficient management of biowastes and reduce food contamination in dry-recyclable waste streams.

Considering a key application, the REA's policy on liners and re-purposed bags for the collection of household and business source non-packaged and user-unpackaged food wastes recommends: use only of liners/re-purposed bags (made of plastic or paper) independently certified compliant with BS EN 13432 or BS EN 14995; caddy/bin liners user-made from a re-purposed paper item; or no liner/re-purposed bag ('naked') if the bin-user so chooses.

Our policy facilitates lower contamination by non-compostable plastics, avoiding the financial costs of sending front-end-removed liners/repurposed bags to Energy from Waste (EfW) or landfill and the associated negative impacts on the environment. It also enables policy-compliant liners/re-purposed bags to be fed into

Novamont's soil biodegradable mulch film

digesters after suitable pre-treatment (such as autoclaving) or front-end-removed at the AD facility and sent for feeding into an IVC facility. We appreciate that the design of new AD facilities, and the adaptation of existing ones where feasible, is a highly relevant topic for reasons beyond packaging considerations, such as the management of digestates.

Changing the conversation

After gathering stakeholders' views, including those of the REA, A Plastic Planet published their working paper 'The Compostable Conundrum'. Designed to guide and inform conversations on plastic pollution and the role of compostables, its goal is to pivot discussions away from 'compostable materials are better because they are not plastic', towards a better understanding of their 'key role in capturing biowaste which can be converted into high-quality compost and digestate to regenerate our rapidly depleting agricultural soils'.

The UN has recognised that regenerating topsoil and improving its organic carbon content – using composted biowaste – as key to sequestering CO2 and mitigating climate change. The 4:1000 Initiative highlights that global soils contain two to three times more carbon than the atmosphere. If carbon levels were to increase by 0.4 per cent, or four per cent per year, in the first 30-40cm of soil, the annual increase of atmospheric CO2 would be significantly reduced.

Turning to pollution by microplastics, researchers from the Leibniz-Institute of Freshwater Ecology and Inland Fisheries in partnership with Freie Universität Berlin have found that terrestrial microplastic pollution is much higher than marine microplastic pollution – an estimate of 4 to 23 times more, depending on the environment. There is a range of sources and, in the UK's organics recycling industry's case, we know that technologies for removing packaging, liners and re-purposed bags from biowastes differ in their performance. They are also not 100 per cent successful, and cost- and performance-effective machines for sorting compostable from non-compostable items are yet to be made available.

The Environment Agency would like to see industry knowledge-sharing of the best available techniques for removing non-compostable plastics. New Standard Rule permits are introducing limits for non-compostable plastics within incoming wastes. All permits (standard and bespoke) will require such contamination to be reduced to As Low As Reasonably Practicable before biowaste is fed into the first phase of biological treatment in AD and composting facilities. This should aid production of quality composts and digestates beneficial for regenerating our depleted agricultural soils.

Green and Red Lists

Bearing in mind those change-drivers and approaching legislation mandating separate food waste collection across the EU and in England, A Plastic Planet's working paper includes a Green List that recommends packaging and non-packaging product types that should be industrially compostable,

> "Biowaste plays a key role in regenerating our rapidly depleting agricultural soils"

while its Red List recommends others that should not. The latter are products that: don't carry food waste to composting or AD facilities, aren't easy to compost or anaerobically digest, and/or can be made of material(s) other than compostable ones. Examples are magazine sleeves, mailing bags and non-food packaging bags.

Green listed are compostable product types that: carry food, beverage residues, plant waste or soil to composting or AD facilities; are too small, flimsy, flexible, multi-laminated and hard to recycle in any other waste stream; and/or currently contaminate biowaste streams when made of non-compostable plastic. Examples are tea bags, food condiment sachets, food tray films, kitchen caddy and food waste bin liners, carrier and lightweight bags, and lightweight bags for fruits and vegetables. It's recommended such bags are designed [for re-purposed, later use] as per kitchen caddy [and] food waste bin liners.

These lists and others produced will evolve over time. We have yet to see how well 'green list' items might match with Defra's waste collection consistency guidance, which may describe items that should be included in food and garden waste streams.

Much development and diversification of compostables has taken place over the last 21 years, with a growing diversity of items designed to biodegrade in other environments jostling for market share. We hope the array of R&D, industry and policy-focused discussions will result in aligned policies that: see the differences between material origins, product degradation behaviours and suitable management options for End of Life phase; drive appropriate uses of biodegradable items; and, in the case of compostables for organic recycling, support more efficient biowaste management and better protect soils from plastic pollutants.

Compostables: a sub-set of biodegradables

Compostable products are a sub-set amongst the range designed to biodegrade in specific human-controlled 'environments' or natural environments. Standards such as BS EN 13432 and BS EN 14995 specify pass/fail criteria for, respectively, industrially compostable packaging and plastics (and optional extra pass/fail criteria for industrially digestible-compostable packaging and plastics) while AS 5810 and NF T51-800 specify pass/fail criteria for plastics suitable for home composting.

CCS & BCS

Emma Laws, Research and Communications Assistant, and
Georgia Phetmanh, Schemes Manager at REAL, provide the latest on the Compost and Biofertiliser Schemes and the REAL Research Hub

COMPOST AND BIOFERTILISER CERTIFICATION SCHEMES

CCS UKAS Accreditation

The existing CCS Certification Bodies were invited to apply to the pilot accreditation programme, which was launched last year with the United Kingdom Accreditation Service (UKAS), and all three have now achieved accreditation for the Compost Certification Scheme.

Organic Farmers and Growers (OF&G), NSF Certification (NSF), and Aardvark Certification Ltd (ACL) successfully completed the pilot programme this winter, gaining accreditation to ISO/IEC 17065 and the CCS. Accreditation by UKAS demonstrates the competence, impartiality and performance capability of these organisations and increases the robustness of the Scheme. This also means that CCS certificates are now UKAS accredited.

REAL has been working with UKAS since 2015 to set up specific accreditation for the Scheme, which has involved revision of British Standards Institute PAS 100 and the CCS Scheme Rules, ensuring that the scheme documents are fit-for-purpose, and facilitating discussions with the Environmental Regulators. We are very proud that the Scheme has reached this important milestone in its development.

BCS 'Understanding Test Results' Webinar

In October 2021, we held our first 'Understanding Test Results' webinar for BCS operators. This webinar was developed earlier in the year following positive feedback from CCS producers who had attended the CCS 'Understanding Test Results' webinar.

It provides an overview of the methods used for various PAS 110 tests as well as the importance of reviewing results and how results can be best understood. It also covers in particular the Residual Biogas Potential (RBP) test, and why inoculum inhibition has been experienced by some of the operators on the scheme, as well as the current procedure for operators to follow if they experience this.

The webinar is delivered by Tom Aspray who independently audited the Approved Laboratories between 2015 and 2019 and is now Technical Advisor to REAL.

We received positive feedback on this webinar, with attendees finding the content clear and useful, agreeing that they would recommend attending to others. We will soon be scheduling another and encouraging more AD operators to sign up.

RESEARCH HUB

The first project

January marked the first anniversary of the completion of the Research Library. The first annual review meeting was held in December 2021, where the decision was made for NNFCC to continue its maintenance of the library for 2022 to 2023.

The second project

The second project, 'To develop a 'data pack' on the properties, characteristics, and content of digestate that will provide the context for the development of new uses of outputs from Anaerobic Digesters', is now complete. The data pack and valorisation report are now available to the industry and can be requested from REAL at a fee. All scheme participants will be entitled to a free copy.

The 3rd and 4th projects

In 2021, two research projects were selected for funding. The first is titled: 'Plant Response Test Failures: Investigation of contaminants and phytotoxins in 'End of Waste' composting feedstocks and finished composts', and aims to investigate the factors that can increase the likelihood of failing the plant response test (PRT). Its selection was met with support from compost producers as, while PRT failures are low, the time the test takes makes retesting challenging. The second project is titled: 'Evaluation of the potential for the improvement of the Residual Biogas Potential (RBP) test and investigation of alternative test procedures for PAS110 biofertilisers'. This project was proposed by an operator and will be useful in assessing the operation of the RBP test and deciding how to respond to inoculum inhibition. A Tender Invitation Document for each has been released and REAL is seeking a suitable contractor for the respective projects.

Fuelling a sustainable world

With eight offices across four continents, Anaergia operates some of the world's largest anaerobic digestion facilities and its equipment has been installed in more than 1,700 sites worldwide. The aim of its UK subsidiary is to increase organics recovery from waste streams and maximise methane recovery from those organics. "Traditionally, the majority of UK AD feedstock has been source-segregated food waste or energy crops," says Sam Smith, Projects Director. "We are actively exploring alternatives to increase the volume of organics that can be accessed by the UK's AD industry."

Accessing alternative feedstocks

The organic fraction found in municipal solid waste (MSW) is currently under-utilised by the UK AD industry. This material is typically separated during the production of refuse-derived fuel (RDF) and is often sent to landfill due to quality issues required for beneficial treatment.

"In the past, MSW processors have regarded the organics in residual waste as a problem," says Sam. "But with the right technology – such as Anaergia's OREX system, which recovers up to 90 per cent of putrescible waste – it can be extracted and processed in an AD plant, providing residual waste processing businesses with a sustainable outlet for their organics and improving profitability."

The OREX forms a key part of the new EQTEC Deeside RDF project: a 9.9 MWe waste-to-energy facility that combines a 182,00-tonne waste reception plant with advanced gasification technology and a 2 MW anaerobic digester. Anaergia will develop the engineering design for both the waste processing facility and the AD plant.

Upgrading underperforming assets

Anaergia UK is also focused on optimising and improving existing biogas plants. "The UK is home to a number of under-performing AD assets," says Sam. "Improving their performance makes sense from a sustainability and financial perspective. Our team is able to service them, and our project experts can advise on all aspects of plant upgrading and improvement to enhance performance and increase returns."

During 2021, Anaergia completed a project to more than double the processing capacity of an AD plant in southeast England and is also nearing the end of a major upgrade to a site in the Midlands.

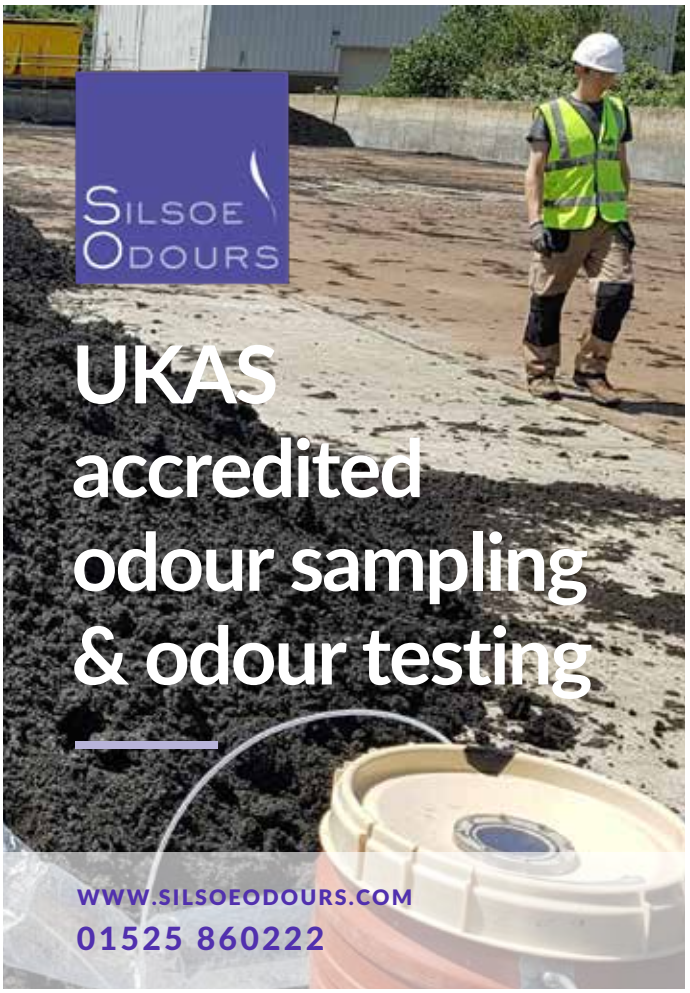
> "We are actively exploring alternatives to increase the volume of organics accessible by the UK's AD industry."

Future challenges

Anaergia cites feedstock security and the industry's need to become financially self-sufficient as key obstacles to overcome. "Trying to predict the UK's waste landscape is difficult," admits Sam. "Legislation requiring separate collection of household organic waste in England is imminent and will lead to greater volumes of segregated food waste coming onto the market. However, we don't believe the situation will become any less complicated. Feedstock will continue to be variable and challenging but technological solutions such as the OREX can ensure that organics can still be recovered from whatever waste stream they end up in."

The path to self-sufficiency

Regarding the AD industry's reliance on government incentives, Sam believes that biomethane and carbon capture could provide an alternative: "There is a real market for renewable natural gas (RNG) in the UK and we can see this driving up the price of biomethane. There are also opportunities from carbon capture. CO2 is created in the biogas upgrading process, but – due to a stigma around waste-derived CO2 – few commercial outlets have been available. However, the shortages that threatened to derail UK food production in 2021 have highlighted our CO2 insecurity. With AD offering an alternative supply source, could this help the industry become financially self-sufficient?"



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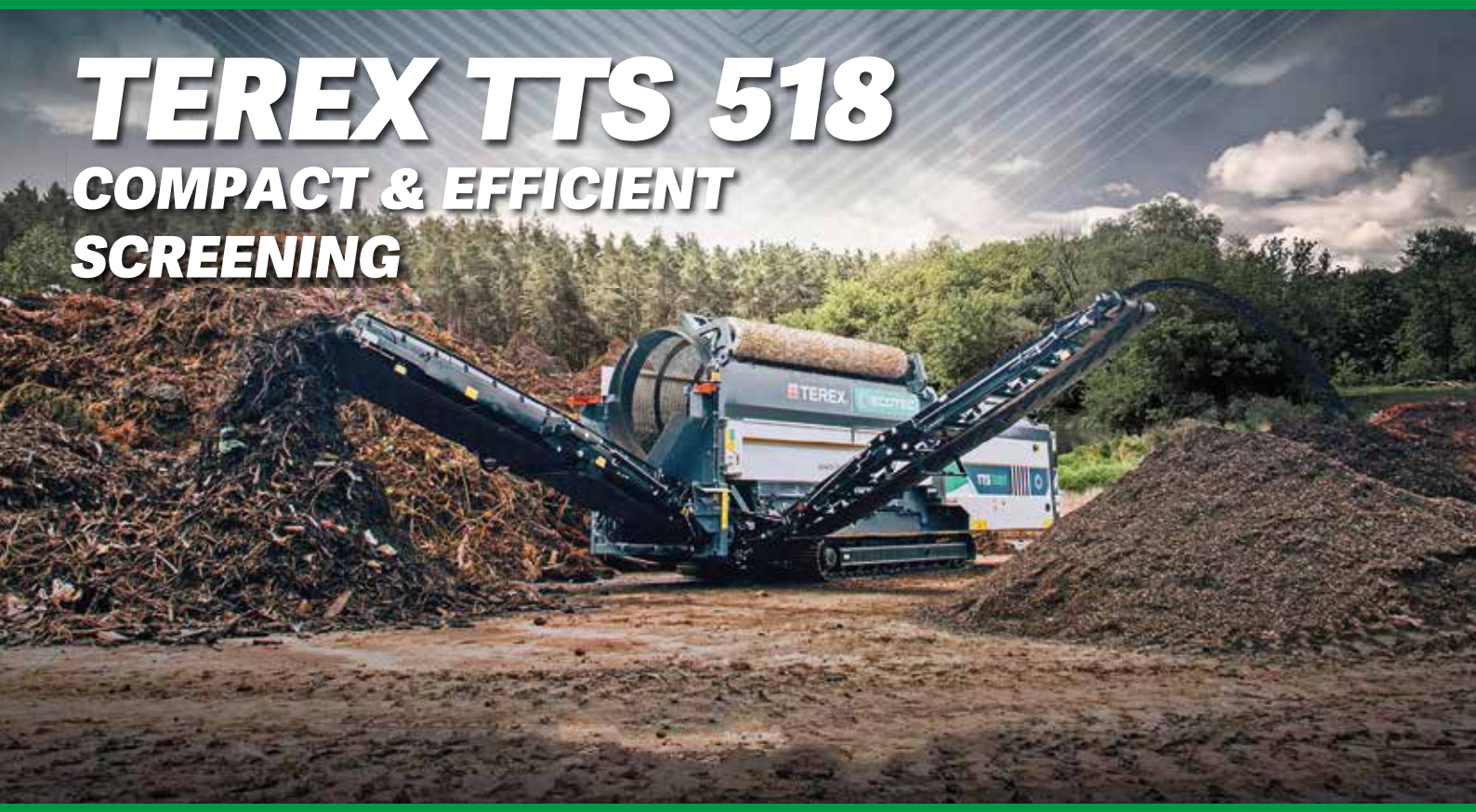

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Green Gas Steering Group

The growth of the anaerobic sector, writes **Mark Richmond**, Technical Director of consultancy WRM, is being mirrored by the increasing number of regulations surrounding it, requiring industry to implement a host of site improvement works in order to remain compliant.

Mark Richmond, Technical Director, WRM Ltd.

The increase in the capacity of the UK anaerobic digestion sector continues to be accompanied by growing environmental regulation, with operators of waste processing sites now being required to comply with an increasing range of standards.

Over the last 18 months, the Environment Agency (EA) has contacted all biowaste treatment sites with Regulation 61 notices, requiring operators to make an assessment of their operations against several regulatory matters, including Best Available Technique (BAT) conclusions, containment standards, bioaerosol emissions, and soil and groundwater contamination. With the majority of operator responses duly returned to the EA, operators are now starting to see the process progress, with improvement conditions being added to permits.

Typical improvement conditions seen include ones that align with BAT conclusions, as set out in the waste treatment Best Available Techniques Reference Document (BREF) note, some of which may be challenging for operators to respond to.

Containment is another area of focus for the EA, and compliance against the CIRIA C736 standard for lagoon design and secondary containment measures requires further work on several improvement conditions seen to date. The focus on containment includes investigative work to demonstrate that engineering standards have been applied in the original design, and may also require the upgrade of infrastructure where standards cannot be evidenced.

Site improvement works brought about by the regulatory review will, in some cases, be costly and may come at a time when operators are focusing on other matters, such as securing long-term waste feedstocks from local authorities. But the regulatory nature of the improvement conditions cannot be overlooked if enforcement action is to be avoided, and the industry response to Regulation 61 must therefore be a sector priority for the year ahead.

REA Green Gas steering group members

William Mezzullo, *(Chair)* Senior Business Development Manager, Centrica Energy Trading

David Hurran, *(Vice Chair)* CEO UK, Air Liquide Biogas Solutions Europe

Anna Becvar, Earthcare Technical

John Baldwin, Managing Director, CNG Services

Neil Liddell-Young, Strategy and Development Director, Severn Trent Green Power

Lucy Hopwood, Director and Lead Consultant for Bioenergy and Anaerobic Digestion, NNFCC

Lucy Owen, Environmental Compliance Manager, Marches Biogas

Philipp Lukas, Managing Director, Future Biogas Ltd

Richard Gueterbock, Director, Food Chains

David Kinnersly, Head of Agribusiness, Fisher German

Thomas Minter, Managing Director, Malaby Biogas

Organics Steering Group

With the Environment Agency to start enforcing Farming Rules for Water comes the need to improve market conditions for the organics sector, writes **Graeme Kennett**, Principal Environmental Consultant at Mabbett & Associates Ltd.

Graeme Kennett,
Principal Environmental Consultant, Mabbett & Associates Ltd.

The main subject of conversation last autumn, in the organics and landspreading sector, has surrounded the announcement that the Environment Agency (EA) would start enforcing the Farming Rules for Water (FRfW) 2018. The headlines that grabbed attention were that the EA were to ban applications of organic manure to land during the autumn and winter periods.

Although the FRfW have been in place since 2018, there has been little regulatory effort applied prior to the announcement to enforce them.

This lack of effort is reflected by the fact that the sector remains in a poor place with inadequate storage – both at the producer and recovery ends of the process. This, in turn, puts severe pressure on legitimate operators, as the cost of removal and application does not allow for investment in the required storage infrastructure.

Applications continue to be made to land at unsuitable times by those who seek just to 'get rid of stuff', undermining the benefits of the activity. Waste producers, who just want to see their tanks empty, don't really understand the mechanics of what's involved and are often happy to accept the lowest removal fee, with no thought to duty of care or other implications.

The situation can improve by developing long term contracts with waste producers that guarantee outlets but also allow for investment to be made in storage; by increasing regulatory pressure and scrutiny on producers and operators through audits and random inspections, and through the swifter assessment of storage permits and planning applications.

As inorganic fertiliser becomes increasingly expensive and the requirement for agriculture to reduce its carbon footprint ever more urgent, the potential of organic fertilisers applied to land at the right time and in the right amount has never looked better. However, the sector needs to up its game and demonstrate that the activity is still the best practicable environmental option.

REA Organics steering group members

Dr Becky Wheeler, *(Chair)* Business Development Manager, 4R Group

Justin Dampney, *(Vice Chair)* COO, Eco Sustainable Solutions

Andy Sibley, Managing Director, Envar

Charlie Trousdell, Charlie Trousdell Associates

Tony Breton, Market Specialist – UK & Ireland, Novamont

Stuart Hayward-Higham, Technical Development Director, SUEZ Recycling and Recovery UK

Ralph Lodge, Technical Director, Enva Resource Management

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The Government's Waste and Resource Strategy will introduce requirements for all food and garden waste to be separately collected opening opportunities for growth in the sector. Alongside this, there are a wide range of regulatory changes (e.g. the new Farming Rules for Water and the Quality Protocol) which themselves create many new challenges.

This year's event offers an opportunity to get up to speed with all these changes, challenges and opportunities, alongside technical information for the sector and the chance to meet and catch-up face-to-face with colleagues.

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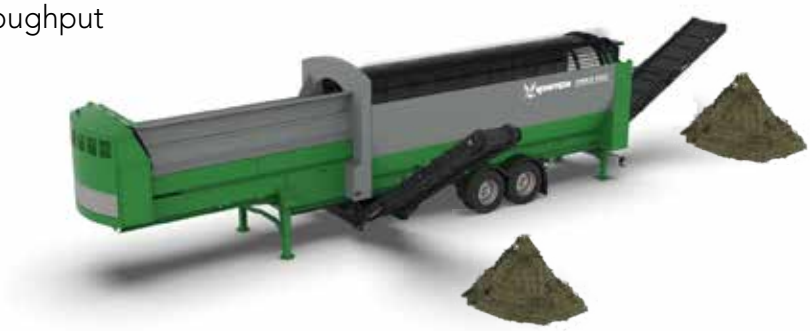

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