Project Clover – Feasibility Phase Report

Decarbonising the Agri Food Supply Chain

August 2021

Prepared on behalf of

Wyeth Nutrition | Carbery | Glanbia Ireland | Danone (One Planet. One Health) | Dairygold (Golden Valleys, Growing Naturally) | Lakeland Dairies | Tipperary Co-op

KPMG Sustainable Futures

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Introduction to Project Clover

In response to the significance, scale and complexity of the sustainability and climate action challenges impacting the competitiveness and legal obligations of the Irish food industry, key industry representatives ("SteerCo Members"), led by Danone Ireland, formed a collaboration of industry participants in June 2020 under the banner "Project Clover" (or the "Project").

Having previously scrutinised all options for decarbonising their industrial heat processes, including biomass and electrification, the SteerCo Members concluded that switching to biomethane was the most economic and viable option available.

With biomethane available in many other jurisdictions, SteerCo Members are of the view that Ireland's lack of an indigenous biomethane industry will harm the Irish food industry's international competitiveness, impact FDI, and limit Ireland's decarbonisation ambitions under the national Climate Action Plan.

Project Clover represents a shared vision of a fully integrated, agriculture led, on-farm sustainability approach to the decarbonisation of the Irish food supply chain. Central to the vision is the use of indigenous AD biomethane to decarbonise thermal heat processes, commercialisation of its by-product digestate to produce organic fertiliser and monetisation of the currently unquantified soil carbon sequestration on Irish farms.

In September 2020, SteerCo Members commissioned Phase 1 Feasibility Study for Project Clover.

Project Clover was originally informed by the *"Integrated Business Case for a Biomethane Industry in Ireland",* KPMG / RGFI 2019, a full cost benefit analysis in compliance with the Public Spending Code, as well as earlier analyses including "*Decarbonising Domestic Heating in Ireland"*, KPMG / Ervia, 2018 and *"Business Case for Biomethane Production – Cluster Report",* KPMG/RGFI May 2020.

Project Clover Phase 1 Feasibility Study

Phase 1 Feasibility Study (Sept 2020-March 2021) considered the economic, regulatory and practical feasibility of delivering the three core workstreams:

- Developing a viable indigenous biomethane industry
- Monetising organic fertilisers
- Maximising soil carbon sequestration potential

The work was fully funded by industry participants – Danone, Glanbia Ireland, Dairygold, Carbery, Lakeland Dairies, Tipperary Co-op and Wyeth Nutrition.

These industry partners also contributed expertise, participated in workshops, and engaged with Government, while overseeing the Project through a Steering Committee.

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Feasibility Study Conclusions

- Each of the three components of Project Clover are technically and practically feasible within an Irish context.
- There remains an economic funding gap, however the feasibility study has demonstrated a number of pathways to long-term economic competitiveness.
- While the long-term ambition of 125 x 20GWh AD plants by 2030 remains credible and achievable (generating 2.5TWh of renewable gas per annum), the study recommends an initial pilot scheme based on eight farm / community based 20GWh AD plants,, to build full stakeholder buy-in, knowledge transfer and ecosystem support in a measured way.
- Clover is fully aligned with the Teagasc Signpost Farms Programme. Teagasc has indicated its support for any future Signpost Farm participation in Project Clover.
- The AD plants should be agri-based, utilising a mixture of crop and slurry inputs (incl. grass silage, rotation crops and multi-species swards).
- Ireland has sufficient feedstock potential to supply the proposed AD plants without impacting current volumes and usage.
- The use of multi-species swards should be encouraged, bringing numerous benefits including biodiversity and increased yields with lower fertiliser inputs and better drought resistance.
- The agri-based biomethane will be able to comply with EU RED II sustainability criteria and will be certified by the Green Gas Certification Scheme.
- The Feasibility Study recommends the development of a Project Clover Charter to ensure all AD plants under the scheme meet strict criteria to ensure environmental, economic and social sustainability, and create no unintended consequences.

The Potential of Project Clover

The Feasibility Study has established the business case for industry to proceed with this project. Project Clover recognises that its objectives can only be achieved through ongoing collaboration, aligned with the requirements of all stakeholders.

It has determined that Project Clover has the potential to:

- Align with the Paris Agreement, EU Green Deal, Farm to Fork Strategy, Ag-Climatise, Interim Climate Actions 2021 and national targets to reduce emissions.
- Achieve emission reductions, displacing over 680kt CO_2 per annum by 2030, in a way that is commercially viable.
- Assist in decarbonising the full supply chain, addressing scope 3 emissions.
- Generate additional revenue streams to support on-farm sustainability through the use of bio-fertilisers, multi-species pastures and carbon sequestration. While feasible, these areas need further work in the next phase of Project Clover.
- Support commercial sustainability and competitiveness of the Irish food industry.
- Support Irish industry in adapting to future legislative trends including carbon labelling and ESG reporting, and help industry to access sustainable, taxonomy-aligned finance.

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Environmental Sustainability

- Project Clover will be developed in an environmentally sustainable way.
- The Feasibility Study recommends the development of a Project Clover Charter to ensure all AD plants under the scheme meet strict criteria to ensure environmental, economic and social sustainability, and create no unintended consequences.
- AD feedstock will be produced sustainably, enhancing biodiversity by drawing on Devenish's multi-species swards research, as well as advice and experience from Teagasc.
- Project Clover will provide an outlet for excess slurry across the agriculture system, while producing organic fertilisers to displace artificial fertilisers, which will improve water and air quality and soil structure.
- Project Clover will provide a mechanism to decarbonise some of the most difficult to decarbonise sectors, where no alternative solution has been found.
- AD biomethane is a key enabler in contributing to reducing emissions in the Irish agriculture sector.
- The Teagasc AD, biomethane plant at Grange, based on grass and slurry feedstock, will be a demonstration plant for Project Clover. Clover will work with Teagasc to develop a Centre Excellence for AD Biomethane, knowledge transfer and information sharing on supporting sustainable practices and land management including carbon farming.
- Through its research and development, Teagasc is committed to supporting Project Clover and its associated carbon mitigation and carbon farming benefits.

Farmer Opportunities

- Project Clover provides an opportunity to shift the current position of agriculture within the climate debate, placing farmers at the centre of the solution.
- AD biomethane has the potential to provide a diverse additional income, greater than what can currently be achieved in the cattle, sheep and tillage sectors and from leasing the land.
- Project Clover reduces carbon emissions, complies with measurement, reporting and verification ("MRV") requirements for soil carbon sequestration, supports the principle of the EU Carbon Farming Initiative, and enhances biodiversity, water and air quality.
- provide additional income options to farmers through diversification including lease income, operational salaries, long-term price-certain feedstock supply contracts, economic ownership, chemical fertiliser displacement and soil carbon value.
- supports the potential for additional emissions savings by adapting carbon farming initiatives.
- facilitates knowledge transfer to and among farmers via Teagasc Signpost Farms Programme and Teagasc AD biomethane demonstration plant
- Project Clover supports the rural, circular bio-economy and community engagement in renewable energy production.

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Bridging the Funding Gap

- The Feasibility Study has demonstrated that biomethane has the potential to be the lowest cost option for the decarbonisation of high thermal loads as found in the Irish agri-food sector.
- While there exists a current economic gap between biomethane and natural gas prices, the feasibility study has demonstrated a long-term pathway to economic equivalence.
- Project Clover has concluded that direct exchequer revenue support is unlikely to be available, and has therefore proposed an alternative funding structure for the initial eight pilot plant roll-out whereby fixed government grants, combined with commercial construction loans, facilitate industry meeting the residual funding gap through voluntary socialisation of the incremental gas cost across multiple off-takers. This funding structure will demonstrate the viability of the technology in the short-term, without committing Government to long-term funding support.
- In the medium-term, it is proposed that a national socialisation scheme, known as Article 23 (national heat obligation scheme), will be introduced to support the longer-term ambitions of Project Clover. This will see the incremental cost socialised across a wider pool of energy users. We understand DECC intends to consult on the introduction of Article 23 in Q2 2021.
- ISIF has agreed in principle to provide commercial lending of €24m towards the initial eight pilot plant roll-out, and has indicated a willingness to extend this to facilitate the longer-term 2030 roll-out.
- Project Clover is currently seeking the balance of the capital funding from Government.
- The Feasibility Study sets out how additional revenue streams will be generated by the AD plants over time. Commercialisation of digestate as a bio-fertiliser and soil carbon sequestration income will allow biomethane costs to fall in the medium-term.
- Furthermore, there exists the opportunity for significant economies of scale to capital and operations as the sector matures. This includes clustering and standardisation of the AD plants and their funding.
- Over time, the combination of rising carbon tax, economies of scale and maturity, and additional income streams will provide a pathway to economic equivalence with natural gas for the Irish biomethane sector.
- An overarching body with a formal co-ordination mandate will be required to lead this standardisation, detailed design, funding and will provide ongoing support to the AD operations.
- A significant component of the infrastructure required to facilitate Project Clover is already under development by Gas Networks Ireland, with the first grid injection station having now received full planning permission (Project Graze, appendix 5).

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Benefits of Project Clover to Ireland Inc.

- Project Clover has the potential to displace at least 680k tn CO_2 per annum by 2030.
- Contributes towards meeting the 51% decarbonisation target in national, sectoral (especially agriculture) and local authority Climate Action Plans, in line with the Paris Agreement, European Green Deal and Farm to Fork Strategy.
- Provides independent, scientific and economic assessment and business analysis aligned with Teagasc as well as Irish Government strategy and policy under Ag-Climatise and the Climate Action Bill.
- Biomethane can contribute to achieving the 40% renewable heat target by 2030.
- Delivers the wider vision to benefit regenerative and sustainable agriculture, the rural circular bio-economy and a quality, resilient environment.
- Will create and sustain 3,000 jobs across rural Ireland. This can include the wider manufacturing and processing industries to contribute to decarbonising and sustaining Ireland Inc.
- Promotes community engagement and their direct involvement in meeting their renewable energy needs, in line with RED II requirements.
- Places Ireland at the forefront of renewable energy innovation in terms of its fully integrated, industry led approach, economic assessment, informed by science and engaging with stakeholders, and communities.

Key Requirements to Enable Project Clover

Industry is poised to implement Project Clover pending declared government policy and capital funding support - including :

- Declared policy support from Government for the long-term strategy and roadmap of Project Clover.
- Implementation of Article 23 in 2021/2022, with a biomethane target of 11% by 2030.
- Government support with match capital funding of €24m for a pilot scheme between 2020 and 2023.
- Development of a charter to underpin environmental commitments of Project Clover participants.
- Develop Teagasc Grange as centre of excellence, knowledge transfer and ongoing research & development to sustainable farming.

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Alignment with EU and national policy agendas

Alignment of Project Clover to Farm to Fork goals	
Ensure food production has a **neutral or positive environmental impact.**	Fully aligned
EU Carbon Farming Initiative. Implement new green business models that remove CO_2 from the atmosphere.	Fully aligned
Promote a **circular bio-based economy.**	Fully aligned
Reduce **pesticide use** and **excess nutrients** in the environment by 2030. Includes a **50% reduction in nutrient losses** without reducing soil fertility and a **20% reduction in fertiliser use**.	Fully aligned
Increase the proportion of **organic farming** to 25% by 2030.	Fully aligned
Implement a **sustainable food labelling framework**	Partially aligned

Alignment of Project Clover to Programme for Government goals	
Seek reforms to CAP to reward farmers for **sequestering carbon**	Fully aligned
Continue to support farmers to embrace farming practices that are **beneficial environmentally**, have a lower carbon footprint and better utilise and protect natural resources	Fully aligned
Encourage investment in **renewable infrastructure** on farms	Fully aligned
Explore opportunities for farmers from **anaerobic digestion**	Fully aligned
Deliver an incremental and ambitious reduction in the use of **inorganic nitrogen fertiliser** through to 2030	Fully aligned

Alignment of Project Clover to Ag-Climatise	
Action 1 reduce chemical nitrogen use to 325,000 tns by 2030	Fully aligned
Action 9 - Increase organic production to 350,000 ha by 2030	Fully aligned
Action 12 – promote a sustainable bio-economy in agri-food	Fully aligned
Action 17: Develop a pilot scheme in relation to on-farm carbon trading	Fully aligned
Action 20: : Engage with stakeholders to maximise the potential opportunities from Anaerobic Digestion for the agriculture sector	Fully aligned

Fully aligned | Partially aligned

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Acknowledgements

We would like to thank all of those who have participated in Project Clover over the past six months. We acknowledge the spirit of collegiality and trust between stakeholders from diverse backgrounds, who have provided substantial feedback on our research outputs.

We would like to thank the various Irish Government departments – in particular the Department of Agriculture, Food and the Marine and the Department of Energy and Climate Change who have engaged consistently throughout the course of our work. We acknowledge the support of the state agencies, including in particular ISIF, Teagasc, IDA and Enterprise Ireland

In aligning with the policy leadership from the European Commission, we acknowledge the support of officials in DG Agri and DG Clima who gave generously of their time.

Given the significant role that the Irish agri-food supply chain has to play in decarbonisation we consulted with the farming organisations, ICOS and Dairy Sustainability Ireland, to explore opportunities for the sector to play a leadership role in addressing this nexus of challenges. The Farmers Journal Trust provided leadership, support and we also want to thank individual members of the farming community for their interest, as well as those community groups who engaged with us through Community Power.

Project Clover SteerCo

This feasibility study has been undertaken through the leadership and support of the Irish dairy and food industry steering committee:

- Danone Ireland – Donal Dennehy and Paul Kennedy
- Dairygold - Liam O Flaherty.
- Glanbia Ireland - Sean Molloy, John Kealy, John Finlay.
- Carbery - Enda Buckley.
- Lakeland – Kathryn O Flynn.
- Tipperary Co-operative – Margaret Cronin.
- Wyeth Nutritionals – Ian Ryan and Brian Shiel

Project Delivery Team

On behalf of the SteerCo, the Renewable Gas Forum Ireland (RGFI) commissioned KPMG to deliver the Feasibility Study and produce this Report. A delivery team, led by RGFI and including KPMG, Gas Networks Ireland (GNI), Devenish Nutrition and Authenticity, supported this work. GNI and Devenish Nutrition provided technical input, while RGFI and Authenticity provided stakeholder engagement and communications support.

Renewable Gas Forum Ireland | KPMG Sustainable Futures | Gas Networks Ireland | DEVENISH Beyond Nutrition | Authenticity

Section 2

Detailed Analysis

Workstream 1 Conclusions – Biomethane Plant Roll-Out

Scale of Ambition	▪ The feasibility study has concluded that the overall ambition of 125 x 20GWh plants remains an appropriate long-term level of ambition for Project Clover and Ireland. ▪ The study has however concluded that this should be progressed through an initial pilot phase of 8 x 20GWh plants to establish the sector in a measured manner.
Scheme Design	▪ The feasibility study has concluded that 20GWh is the optimum scale of AD plant for the scheme, and they should be designed to primarily utilise silage and slurry feedstock. ▪ The plants will principally utilise a virtual (tanker) transportation model for the gas, however where possible, direct grid connections should be adopted.
Sustainability Requirements	▪ The proposed AD plants are able to meet REDII sustainability requirements, both under 2021 and 2026 emission limits. ▪ The feasibility study recommends the development of an AD Charter, which will govern all plants developed under the Clover model to ensure no unintended consequences.
Capital Funding	▪ Project Clover has secured support in principal for €24m of commercial loan from ISIF to funding the initial eight pilot plants. ▪ We are seeking to support this capital funding with c.€24m of matching funding, which is currently being sought from a variety of sources.
Ownership Model	▪ Final ownership model to be developed within a phase 2, however the feasibility has concluded that it is vital farmers have strong economic alignment to the plants including direct equity ownership. ▪ Potential economic involvement of dairy co-ops to be considered further

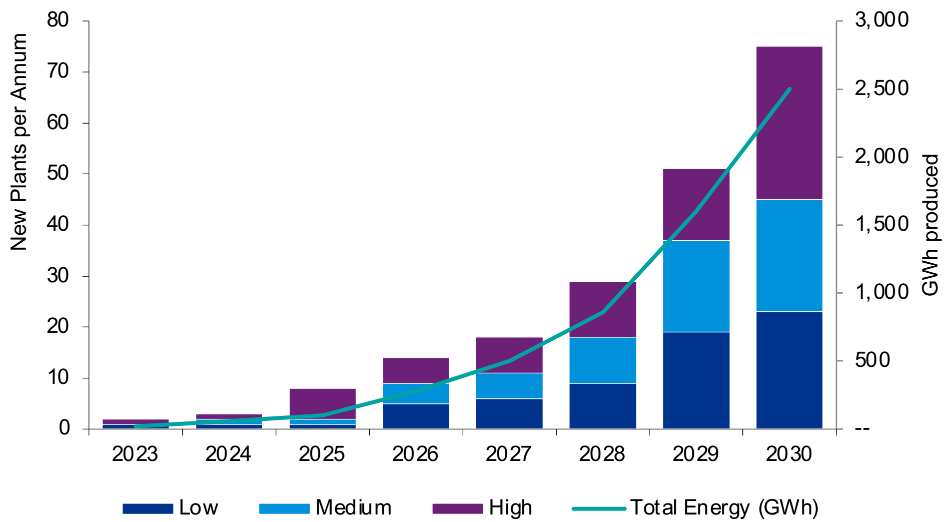
Workstream 1 - Scale of Ambition

- The feasibility study initially considered three levels of ambition, a low, medium and high scenario.
- Following conclusion of the feasibility, we have concluded that the medium scenario, of 125 plants, to be the most appropriate and achievable. This proposed ambition is in line with experience in Northern Ireland, which developed an AD industry of c.90 plants over a 5 year period, without disrupting the local agriculture dynamics. Given ROI's agriculture sector is three times the size of NI, this suggests 270 plants over 5 years is feasible.

Low scenario:
1.3TWh by 2030 (65 plants)
8% of industrial and commercial gas usage

Medium scenario:
2.5TWh by 2030 (125 plants)
15% of industrial and commercial gas usage

High scenario:
4TWh by 2030 (200 plants)
24% of industrial and commercial gas usage



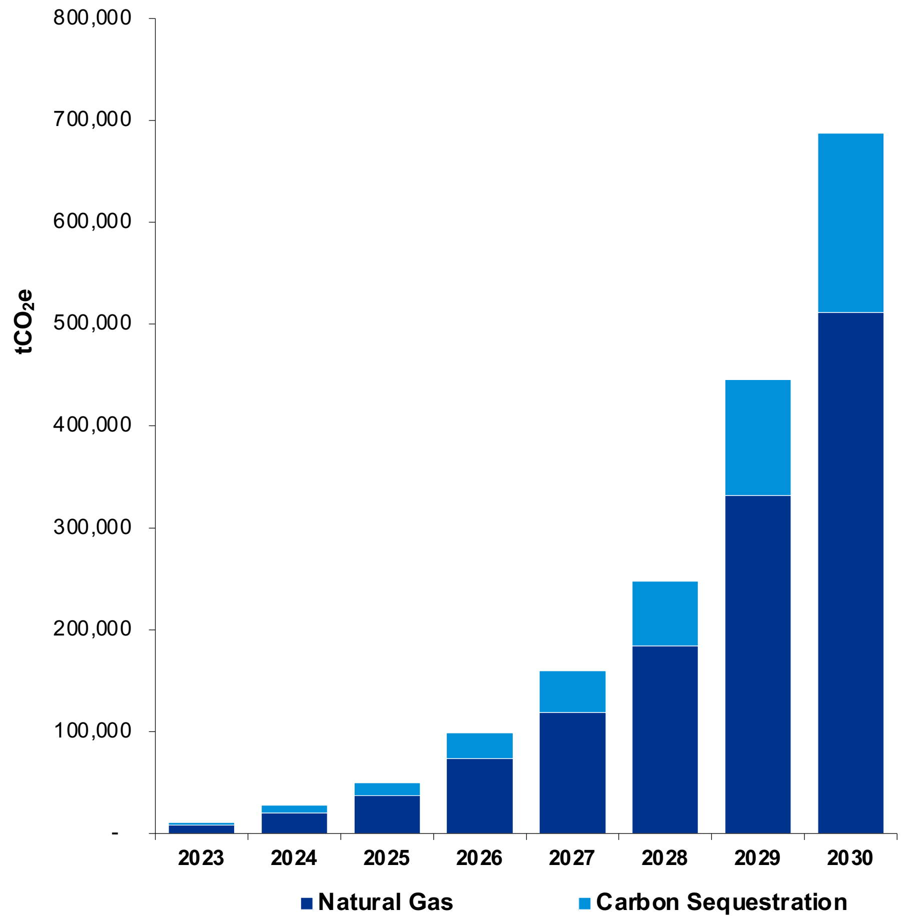
Each individual plant is assumed to produce 20GWh of biomethane

- While the feasibility study has concluded on a long-term ambition of 125 biomethane plants, members concluded that there should be an initial pilot development of eight AD plants prior to a wider national commitment. Such a pilot phase will allow the concept to be proven, design parameters to be optimised, while providing a more manageable scale to secure initial capital funding and biomethane offtake commitment.

Workstream 1 - CO_2e Abatement Potential

Project Clover has the potential to displace over 680k tn CO_2 per annum by 2030

- This calculation assumes that biomethane displaces natural gas (204g/kWh).
  - We understand rom a national carbon accounting perspective, if biomethane meets the RED II sustainability criteria, it can be considered as a zero emission factor renewable gas.
- Based on enhanced agricultural practices implemented as part of Project Clover, carbon sequestration is estimated at 1 tC/ha (3.67 tCO_2/ha).
  - As discussed in p.37 the volume of carbon is subject to uncertainty. It is expected that improved carbon sequestration levels will vary between areas and across years – with some areas having the capacity to sequester more carbon and some areas acting as carbon sources.
- Estimated savings from avoided slurry emissions and the displacement of chemical fertiliser are excluded from the adjacent figure, to avoid the risk of double counting in the RED II LCA calculation.
  - However, as discussed on p.29 avoided slurry emissions could equate to c.870 tCO_2e/plant.
  - Emission savings from the displacement of chemical fertiliser assume c.3.5 $kgCO_2e$/kg N savings in line with research by Timonen (2019)[1].
  - These estimates are subject to uncertainty depending mainly on the quality of feedstock used, processing and application technology implemented and soil quality.
- Some LCA variables can quality for re-allocation to non-energy carbon savings/credits where sufficient GHG savings are achievable without them, but only where verified Tier 3 measurement is available. Utilising default allocations from RED II will not support this option



[1] https://www.sciencedirect.com/science/article/pii/S0959652619320402

Workstream 1 - Biomethane Scheme Design

Introduction

As part of the feasibility study, the advisory team has made a significant number of design recommendations which will influence the structure and nature of the proposed scheme. In doing so, the team has considered a wide range of factors including feedback from local promoters and farmers, best practice from other markets, feedback from stakeholders, the local dynamics of the Irish agricultural sector, and the current level of ambition of Project Clover members.

This section provides an overview of the most significant scheme design recommendations from Phase 1 feasibility study.

Standardisation

A key findings from the feasibility study is that the initial pilot programme, as well as longer-term national roll-out, should seek to achieve a significant degree of standardisation across the AD plants.

Based on engagement with Irish farmers who are already progressing early-stage AD developments, each is developing their project under very different scale ambitions, using a variety of technology providers and adopting different feedstock mixes and contracting approaches. Based on KPMG's experience from the Northern Ireland ("NI) market, such an approach will lead to significant delay or potentially market failure, with individual projects struggling to secure finance on bespoke or one-off solutions, while losing any development or operational economies of scale.

Clustering and standardisation of project development and procedures, equipment and funding packages would help achieve economies of scale by preventing each promoter from 'reinventing the wheel' and allow them to leverage scale in the negotiation of contract pricing and terms with suppliers. Furthermore, it would ensure efficient technical, legal and financial due diligence processes with funders thereby reducing administrative costs and thus transaction and finance costs.

In order to drive and deliver such standardisation and co-ordination, it will be necessary to introduce an appropriate co-ordinating body which has a formal mandate, credibility and industry knowledge to provide the appropriate project management and competencies to support industry..

There are a number of potential entities which could undertake such a coordination role, including a formal Project Clover corporate body, RGFI or a fund manager overseeing capital deployment.

The following section provides detail of the key commercial recommendations and standardisations which are recommended by the feasibility study:

Agricultural-led Feedstock

While it is feasible to produce biomethane from a wide variety of feedstocks, including municipal and commercial waste, organic materials and agricultural crops, our analysis suggests that the establishment of an agricultural industry led approach represents the scenario most capable of supporting the development of a robust, scalable and sustainable industry which has the capacity to make a meaningful impact on decarbonisation.

In particular, the Irish agricultural sector has significant opportunity to utilise currently under utilised land to produce sustainable feedstock, such as multi species grass and clover silage that could displace more than 11% of Ireland's current natural gas demand without impacting existing animal feed levels. A sustainable AD industry would also provide commercial diversification for currently loss-making or marginal income farms, without materially impacting existing farm practices.

Additionally, the utilisation of animal slurry as a co-feedstock would provide one of the few options available for farms to reduce their carbon emissions and improve their overall sustainability. It is anticipated that a 20GWh AD plant would reduce CO_2 emissions by c. 5,500 tns per annum.

While the business case remains supportive of the utilisation of other commercial and food waste materials where available, the increased costs of operating and maintaining waste plants, as well as the relatively limited volume of suitable materials available, means overall economics are not significantly lower, while the volume of AD roll-out would remain a fraction of that achievable using agri feedstock.

Workstream 1 – Biomethane Scheme Design

Farm-Scale Plants

Following discussions with developers, technology providers and considering the local rural context and proposed feedstock mix, the project team has concluded that 20GWh AD plants represent the optimum plant size for Project Clover (being 20GWh of biomethane available for grid injection, net of the plants own parasitic gas usage).

A 20GWh plant represents a medium-scale agricultural AD facility, and would utilise approximately 21,000 tns of silage feedstocks per annum (around 1,000 acres of land capacity) and approx. 14,000tns of slurry.

This scale is approximately twice the size of farm-scale AD plants developed in Northern Ireland (the scale of which was largely driven by subsidy scheme design) and provides significant capital economies of scale over the NI equivalents (c.30%). Such a scale is considered necessary due to the proposed use of gas clean-up technology, which does not scale below 20GWh and would be uneconomic on a smaller plant.

This scale of plants is considered to achieve the appropriate balance between economies of scale and appropriateness for the local surroundings, including feedstock availability and digestate land spreading. Such a scale will also minimise planning permission challenges and fall below environmental impact assessment requirements.

While further (diminishing) economies of scale can be achieved from larger 40GWh plants, we feel such a scale moves closer towards industrial, rather then farm-scale operations and will be challenging to achieve in advance of local community acceptance of AD generally and maturity of the Irish AD supply chain.

Transportation and Logistics

Plants will typically have two core options for transporting their biomethane to the gas network for injection – a direct physical pipeline or a virtual pipeline consisting of specialist gas road tankers.

We expect a mixture of plant connection methods to be utilised, and would encourage the use of direct grid connection where economically viable. We understand over 100 projects have made enquiries to Gas Networks Ireland concerning direct connection to date.

While plants utilising a virtual pipeline could in theory purchase its own specialist tankers and trailers, we consider this inefficient and uneconomic and would strongly recommend that such a transportation service is procured and undertaken on a consolidated basis.

While its ongoing appetite would need to be confirmed, GNI has previously expressed appetite to provide a contract tankering service, under which it would purchase and operate the fleet in exchange for a per unit fee. Our base case financial model assumes an indicative cost for such a service.

For context, each plant is likely to require two gas tanker movements per day, not dissimilar to a milk collection service.

Standardised Funding

None of the developers we have engaged with to date have access to sufficient capital of their own and will require third party external funding. None have lined up the appropriate capital at this date.

Based on our experience of the early stage AD funding market in Northern Ireland, and the Promoters' consistent request for non-recourse funding and to retain a sizeable equity involvement in the project, we are strongly of the view that it will be necessary to establish a common and standardised funding proposition which is specifically designed to accommodate the AD scheme and the objectives of the Promoters.

A common, standardised funding approach will provide sufficient scale to attract project finance lenders (most of which will not be interested in funding a single, bespoke plant) and provide significant economies of scale in terms of funding costs such as due diligence and contract development.

Workstream 1 – Biomethane Scheme Design

Common Technology

A key part of the proposed standardisation is the utilisation of common technology providers across the cluster.

While individual promoters are likely to have their own views on technology, it is vital from a due diligence and operational economies perspective that similar technology is used across the cluster. In particular, in discussions with the technology providers, there was consistent feedback that they would only be able to establish a local servicing office if they were confident that there would be at least 5 – 6 plants in a locality.

We also queried technology provider on purchase price economies for a local cluster. All noted that there could be savings achieved, of between 10% - 15% of capex, if multiple plants were procured, however noted that this would only work if the plants were committed in a similar timeframe and that construction could be scheduled in a linear manner. Given the number of elements which need to be achieved to reach financial close on an individual plant, this may be challenging.

Feedstock Procurement Model

Each plant will require c. 38,000 tonnes per annum of feedstock, including cattle slurry, excess grass silage, rotation and catch crops.

While each of the promoters has an ability to provide a proportion of the feedstock, all will need to supplement this from third party sources.

The promoters all expressed strong confidence that they could source the required feedstock under bilateral contracts, however they agreed that some form of collective feedstock approach could be helpful.

While such a cooperative approach was not utilised for NI plants, we believe the establishment of some form of creditworthy aggregating feedstock entity could represent a key sector enabler and provide feedstock suppliers with additional comfort to embrace the sector, while significantly lowering perceived risk profile for funders, thus reducing financing costs.

Accordingly we would recommend exploring a suitable entity to undertake this aggregation role, with this party contracting with local farmers to supply a proportion of an AD plants feedstock requirement.

Common Documentation

A number of the promoters are in the process of submitting planning and permitting applications for their plants. Based on experience from NI, where the quality and applicability of planning applications was highly variable, there would be significant benefit from a standardised approach to applications, where a common, high quality submission, optimised for the preferred technology and socialised with council planners, were utilised.

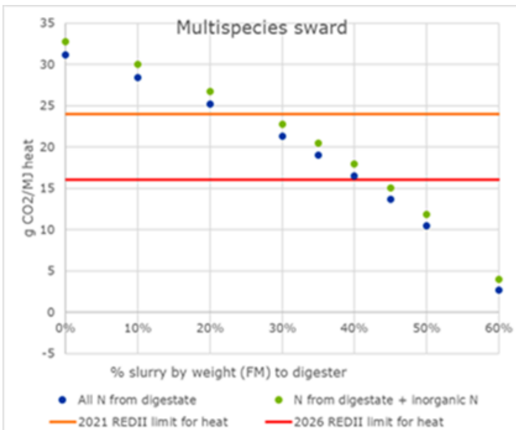
The same approach should also be used for any permit requirements of the plants, as well as the actual underlying contracts needed for the project including EPC contracts, feedstock agreements and funding documents.

Workstream 1 - Sustainability Considerations

In order for a successful agri-based AD industry to be established in Ireland, it must be done so in a sustainable manner without adversely impacting existing farming practices and dynamics. As such, GNI has commissioned a report to assess the sustainability considerations of establishing an indigenous agri-based biomethane industry in Ireland. The report is currently being developed by KPMG Sustainable Futures and Devenish Nutrition Limited, with input from Teagasc.

Ability to meet REDII Sustainability Requirements

As outlined in the graph below, using a multi-species sward, with a mix of slurry c.45% (by mass) has the ability to meet both 2021 and 2026 RED II criteria. These preliminary results are part of ongoing work by Ricardo, SEAI with data input from Devenish Nutrition Limited.



Ability to grow Incremental Feedstock

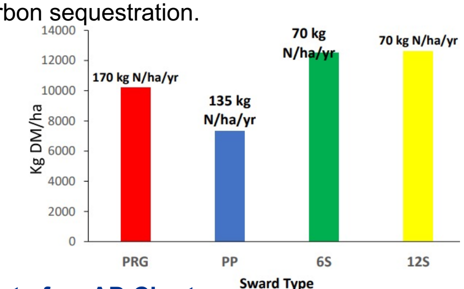
A key tenet of Project Clover is the use of incremental feedstock production only, without impacting feedstock availability for existing uses.

Teagasc research has confirmed capacity within the Irish agri-system to increase fodder production by improving average land productivity. Average land currently produces 6 tnDM / ha, while this land is capable of achieving 12+tnDM / ha. Research conducted by Devenish at Dowth Farm shows potential for multi-species swards to improve yields further (c.20%) using c. 60% less fertiliser compared to conventional swards – as summarised in the adjacent figure.

Ability to grow Incremental Feedstock

It is envisaged that surplus yields could be diverted as feedstock for AD without impacting the provision of feed whilst reducing the overall requirement for chemical fertiliser.

Results from Dowth farm (Shackleton, 2020) also show that multi-species swards can have positive impacts on biodiversity and may improve carbon sequestration.



Development of an AD Charter

To ensure the successful roll-out of an agri-based AD industry, it is proposed to develop an AD Charter. The aim of this will be to provide a general outline of key requirements participants in Project Clover must adhere to. It is suggested that the Charter be developed in line with existing frameworks and regulations, such as the RED II sustainability criteria and EU Farm to Fork Strategy.

The Charter may have varying levels of compliance i.e. General or Enhanced. Those adhering to the Enhanced requirements may be expected to displace a proportion of their chemical fertiliser with processed digestate, for example.

An additional aspect under consideration is the potential local limit on farmers supplying feedstock into an AD to ensure demand doesn't wholly shift from livestock feed production should the AD be considered more attractive. This will need to be assessed as the Charter is not expected to be too restrictive.

[1] 2020 - The Signpost Series - proactively improving human and environmental health through good science - Teagasc | Agriculture and Food Development Authority

Workstream 1 – Addressing the Biomethane Funding Gap

- The project team has calculated that the fully funded cost of biomethane to be circa €8.9c/kWh versus €2.7c/kWh for natural gas and the associated carbon costs (in 2023).
- In the absence of government subsidy (which is in place in most European countries), this funding gap must be bridged to enable the sector to develop.
- The graph below shows a number of initiatives and drivers which we believe have the potential to reduce the per unit price differential over natural gas (including monetisation of workstream 2 and 3 of Project Clover), with the remaining balance (dark blue) needing to be socialised across industry in the first instance, and ultimately across the wider gas sector if a heat obligation scheme were introduced under Article 23 of the EU Renewable Energy Directive.

5. **Digestate value/ MRV accreditation: up to 0.4c/kWh***
Workstream 2 & 3 intend to quantify additional income potential of AD from biofertilizer sales and carbon sequestration. Digestate value of €0.20 assumed from 2025 onwards and MRV accreditation of €0.2c/kWh assumed from 2027 onwards

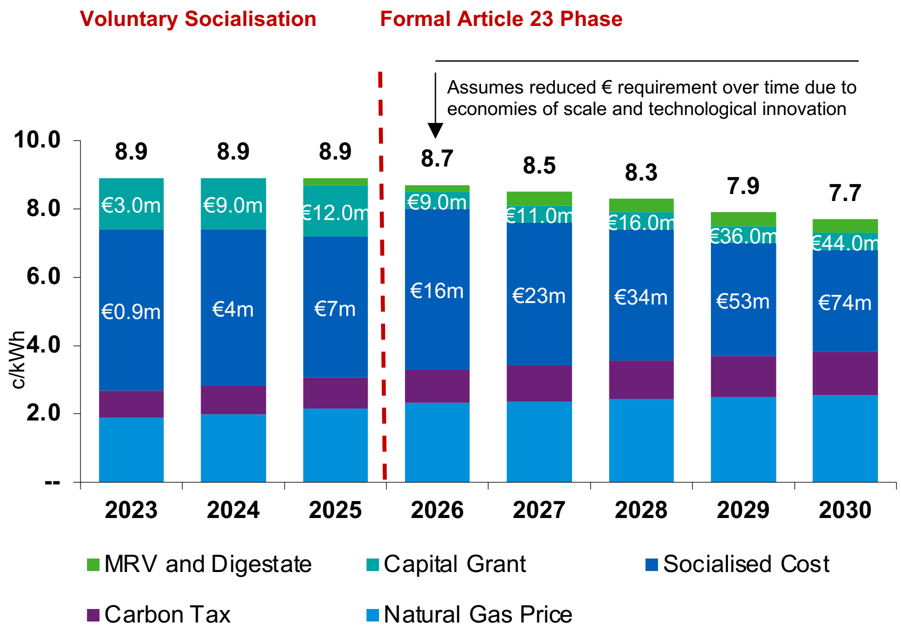
4. **Capital grants of €3.0m/plant until 2026, falling to €1m/plant by the end of the decade**
Avoids exchequer providing ongoing support

Funded by industry

3. **Voluntary socialisation of 4.1-4.7c/kWh during voluntary phase, falling to 3c/kWh by the end of the decade**
Assumes the residual funding gap is spread across 50% of ETS gas consumers in the voluntary phase

2. **Incremental carbon price: rising to €60/t by 2030**
Expected ETS carbon value of biomethane

1. **Gas price: Rising to €2.6c/kWh by 2030**
Inherent long-term replacement value of biomethane



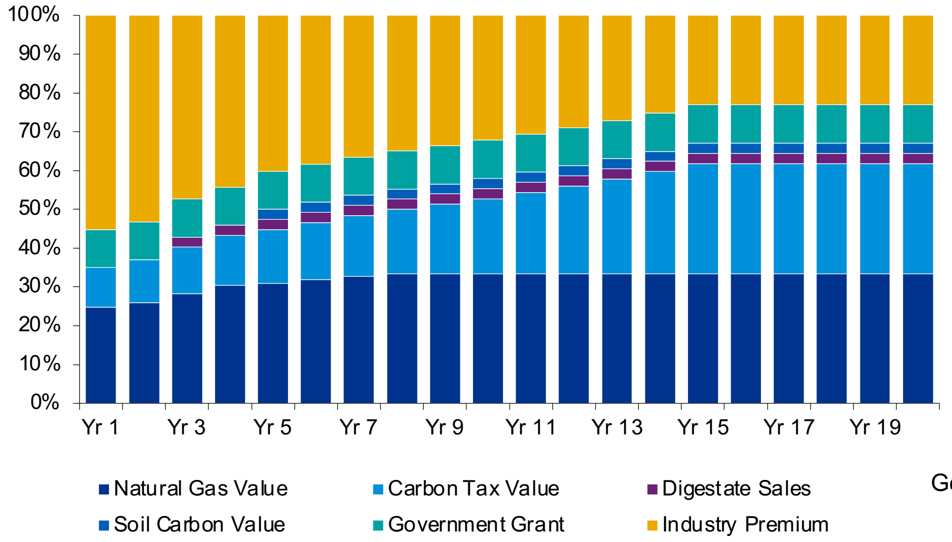
***Numbers shown above are indicative only**

***Numbers shown above are for the medium scenario**

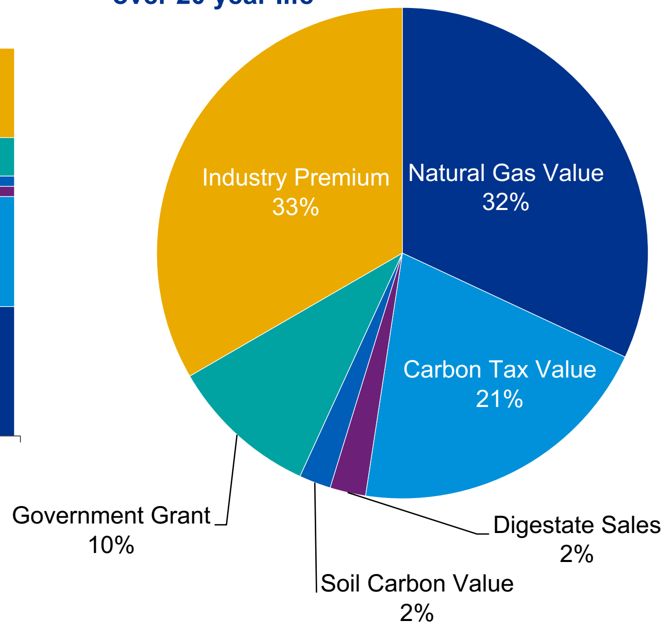
Workstream 1 - Addressing the Biomethane Funding Gap

- The tables above show the source of income for the base case AD plant progressed through Project Clover (on an annual basis in the bar chart, and over the 20-year life in the pie chart);
- This example assumes some form of capital grant of €3.0m per plant, which is shown below amortised across the 20 years to show a like-for-like comparison;
- The pie chart shows that 53% of the plant's revenue is the sale of biomethane at a price equal to the value of avoided natural gas (32%) and carbon tax (21%), while 10% is covered by the grant and 33% comes from socialisation of the Biomethane price premium by end users;
- Numbers above are shown on a real, unindexed basis

Breakdown of a sample AD Plant Economics by Year
(Annual percentage of Revenue by source)



Percentage of AD Plant Revenue by Source over 20 year life

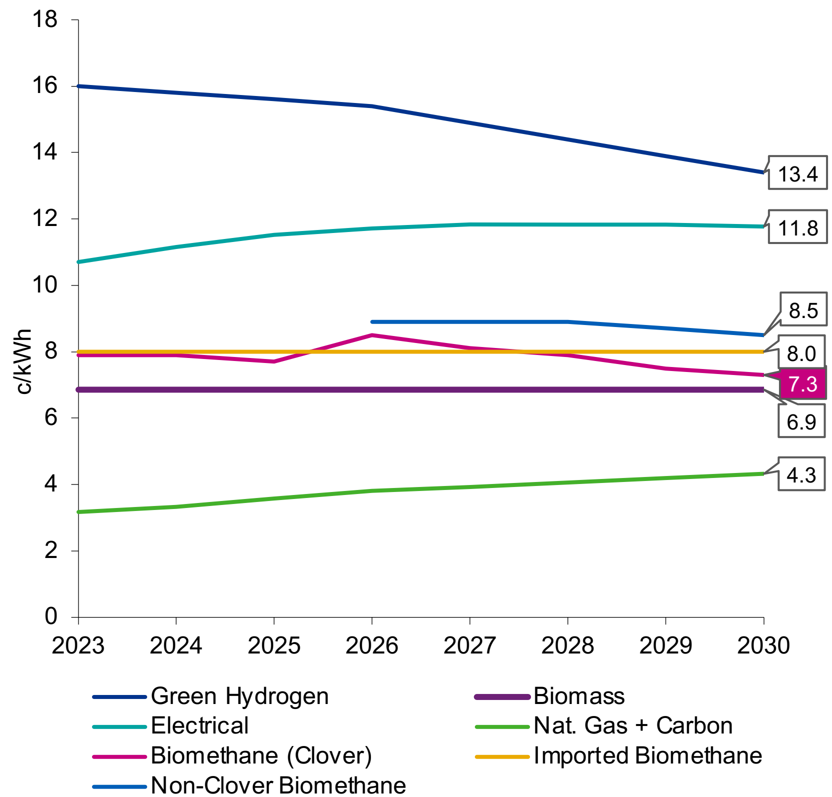


Workstream 1 - Comparison to Alternative Technologies

The feasibility study has analysed a number of alternative decarbonisation technologies for industry and concluded that biomethane delivered through the Project Clover model has the potential to be one of the lowest-cost sources of decarbonised high temperature thermal energy by 2030.

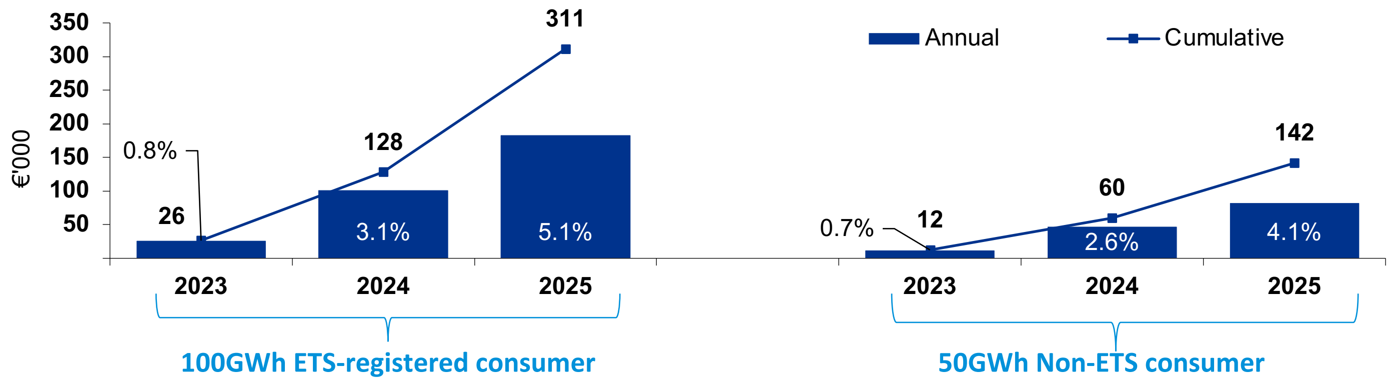
- **Natural Gas:** Natural gas is the reference price for most industrial consumers today. The trajectory that underpins this analysis is based on carbon reaching €60/t by 2030.
- **Green Hydrogen:** depends on the cost of electrolysers and the electricity used to power the process but it is likely to be among the most expensive options for process heat.
- **Direct Electrification:** Where the process runs for 6,000hrs or more per annum direct electrification will likely result in costs in excess of 10c/kWh. This may change if part electrification is pursued.
- **Biomass:** Results in a lower c/kWh cost than biomass, however it brings additional operational considerations and is less suitable for 24/7 processes due to significant maintenance outage requirements.
- **Biomethane:** Clover's additional income streams from carbon sequestration and fertiliser sale are expected to give rise to the market's lowest costs by 2030 – without the need to make any changes to existing process configurations.

Alternative Thermal Options (c/kWh)



Impact on Annual Gas Costs for Biomethane Consumers

This slide estimates the costs to a Project Clover participant in purchasing a proportion of biomethane from the AD plants over a three year period in advance on an expected wider socialisation scheme being introduced.



	2023	2024	2025
Nat. Gas + Carbon[1]	3.2c/kWh	3.3c/kWh	3.6c/kWh
Clover Biomethane[1]	8.2c/kWh	8.2c/kWh	8.0c/kWh
% Biomethane[2]	0.8%	3.1%	5.1%
Unit Premium	4.7c/kWh	4.6c/kWh	4.1c/kWh
Blended Premium	0.0c/kWh (0.8%)	0.1c/kWh (3.1%)	0.2c/kWh (5.1%)

2023	2024	2025
3.4c/kWh	3.7c/kWh	4.0c/kWh
8.2c/kWh	8.2c/kWh	8.0c/kWh
0.7%	2.6%	4.1%
4.5c/kWh	4.2c/kWh	3.7c/kWh
0.0c/kWh (0.7%)	0.1c/kWh (2.6%)	0.2c/kWh (4.1%)

- The cumulative cost of participation is €311k over a three year period for a 100GWh per annum consumer and €142k for a non-ETS 50GWh consumer.
- An a per-unit basis this leads to a premium of c.5% of overall gas costs.
- A mechanism to address whether participants continue purchasing biomethane following the introduction of Article 23 or whether the projects sell their output on a merchant basis is to be determined in any follow-on phases and is dependent on the nature of the funding model.
- Participants should expect to have better visibility on a Government mechanism to address Article 23 prior to entering into any purchasing agreements.

(1) Includes transmission and distribution unit charges
(2) Based on an initial rollout of 8 x 20GWh plants socialised across buyers with a volume equivalent to 50% of ETS consumers (albeit some buyers will likely come from non-ETS market

Workstream 1 – Funding Requirements of an AD Plant

Based on the feasibility study review, we believe a standardised 20GWh AD Biomethane Plant is the optimal scale for Project Clover. A detailed, project finance standard financial model ("the Model") has been prepared to provide indicative financial projections for the construction of a 20GWh AD Biomethane Plant.

We have assumed that the gas generated by the plants will be injected into the grid using a virtual pipeline, although some plants may utilise a direct connection.

A summary of the Model is provided below.

Construction & Development Costs

It has been assumed that a single plant will have total construction costs of c.€5m based on indicative quotes from a number of technology providers as summarised below:

Sources	€'000s
1 x digestion tank, pasteurisation tanks Membrane upgrading system, compressor, biogas boiler	4,200
Civils (site clearance, building, foundations, roads)	650
Grid connection	100
Silage Clamps	200
Development Costs / Contingency	357
Total	**5,507**

Funding Structure

- The Model indicates the AD Plant has a total funding requirement of c.€5.5m, including the construction costs above, other development costs, finance fees and rolled up interest, as summarised in the table opposite.

Funding Structure (cont'd)

Sources	€'000s	Uses	€'000s
Grant	3,000	Capital & Development Costs	5,507
Senior Debt	2,988	Pre-development costs	70
		Development overhead costs	186
		Debt Fees & Interest Roll-Up	77
		Pre-Fund DSRA	148
Total sources	**5,988**	**Total uses**	**5,988**

* Analysis excludes VAT & working capital movements for simplicity

Contract for Difference/ Subsidy Requirement

The Model has been used to calculate the income requirement of the Plant based on the development costs above, operating costs we have observed for similar plants and assuming each project requires an overall post-tax Project IRR of 9% (noting that the NI Projects typically had an 11% IRR in their base case).

Based on these requirements, we calculate that a 20GWh AD Plant will require a total income of 8.9per kWh. Assuming a day one natural gas price of 2.9c per kWh, this means a required funding gap of 6c per kWh.

A summary profit and loss account for one year of operation of a single AD plant is presented overleaf.

Funding of the subsidy is discussed in more detail in the "Addressing the Funding Gap" section of this Business Case.

Workstream 1 - Biomethane Price Sensitivity Analysis

Sensitivities – Impact of Required selling price of Biomethane

- Under the Project Clover base case, each AD plant will need an income of 8.9c / KWh for its biomethane output to produce a 9% IRR.
- The table below shows the potential impact a number of design / funding decisions could have in reducing the required biomethane price, which would reduce the socialisation burden on end consumers of the gas.
- For example, if the plant was funding entirely by debt at a cost of 1% (rather than a blended cost of 6%), the lifetime value of the gas would reduce to 7.8c under the base case highlighted in red below.
- Similarly, if the plant were to received a €3m grant towards its construction, the required biomethane price would reduce to 7.7c in the base case.

Impact of sensitivities on required sales price of Biomethane gas

	6%	8%	9%	10%
Base Case	8.4c	8.7c	8.9c	9.1c
€3m grant	7.2c	7.5c	7.7c	7.9c
Silage cost €25/tonne	8.1c	8.4c	8.6c	8.8c
1% interest rate on loan (Vs 6%)*	7.3c	7.6c	7.8c	8c

** Assuming the entire funding requirement were funded by a commercial loan*

20GWh AD Plant - Profit & Loss Account	
	€'000s
Revenue	
Gas sales / subsidy	1,561
Total Revenue	**1,561**
Cost of Sales	
Grass Silage	(538)
Slurry	0
Other Feedstocks	(16)
Digestate	(50)
Total Cost of Sales	**(618)**
Gross Profit	**957**
Gross Profit Margin	*61.3%*
Operating Costs	
Gas injection costs	(90)
Gas haulage costs	(65)
Maintenance contract	(120)
Farmer Operations Contract	(40)
Lease	(20)
Rates	(20)
Insurance	(25)
Professional / accounting fees	(10)
Miscellaneous	(45)
Electricity	(175)
Total Operating Costs	**(610)**
EBITDA	**347**

* Assuming no income from soil carbon sequestration or organic fertiliser sales

Workstream 2 Conclusions - Organic Fertiliser

Policy, legislation & certification

- Policy developments at an EU and national level support the use of organic fertilisers
- EU Fertiliser Regulations extended to integrate organic fertilisers
- Use of digestate can displace Nitrates Directive issues for farmers

✓

Processing technologies

- Assessed a number of innovative technologies to process digestate into a more usable form
- Key technology under consideration is Valordig – which is a mobile unit capable of dewatering the digestate and producing nutrient selective fertiliser products

✓

Environmental, climate & fertiliser performance

- Digestate can displace emissions associated with chemical fertiliser production and slurry
- Digestate can reduce pathogen load to the environment compared with slurry
- Digestate has the potential to displace up to c.80-90% chemical fertiliser (over time)

✓

Commercialising digestate

- Identified potential to commercialise digestate but still in a developing stage
- Value of digestate depends on NPK content (variable) and nutrient availability (variable)
- Lack of dedicated market for digestate and barriers to overcome with farmers

- **Agronomic value**
- **Pathway to commercialisation and uptake uncertain**

Policy, Legislation & Certification

- Large scale, farm-based AD meets many of the objectives set out in the EU's **Farm to Fork Strategy**, including:
  - Improving the environmental impact of food production and increasing organic farming
  - Helping to reduce artificial fertiliser and pesticide use
  - Promoting a circular bio-based economy
  - Encouraging balanced regional development

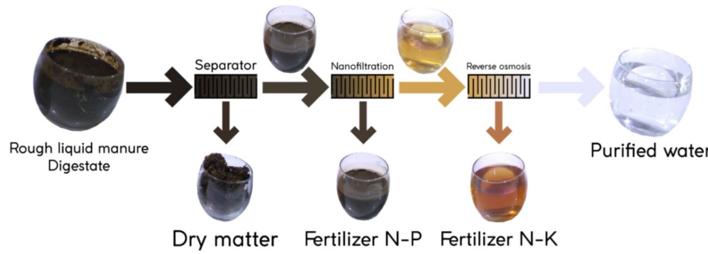
- **Programme for Government** target of 7% reduction in GHG emissions per annum from 2021 – 2030
- **Ag-Climatise** Action 1 (reduce chemical nitrogen use) Action 9 (organic farming) Action 12 (bioeconomy)

- The revised **European Fertiliser Regulations** signal a shift towards the promotion of organic based fertilisers, such as digestate
- The use of slurry as co-feedstock for biomethane and its subsequent processing for use as an organic fertiliser has the potential to displace **Nitrates Directive** issues for farmers

- There are opportunities to achieve **independent third party verification** over the chemical and biological composition of digestate. This will provide buyers with assurance over their purchase and over what is applied to land
- Engaged with potential verifiers, SGS and Celignis, who have the capability to analyse the composition of digestate

Processing Technologies

- From our engagements, we believe there are a number of innovative solutions that have sufficient **technical capability** to process digestate into a more valuable fertiliser product while producing a clean water.
- A key technology being assessed in the French **Valordig technology** – mobile unit, mechanical process (low GHG) to remove 45-60% of water. As shown below, Valordig produces nutrient selective fertiliser products.
- Valordig can be used both to dewater slurry at the front-end of AD and process the digestate at the back-end of AD.

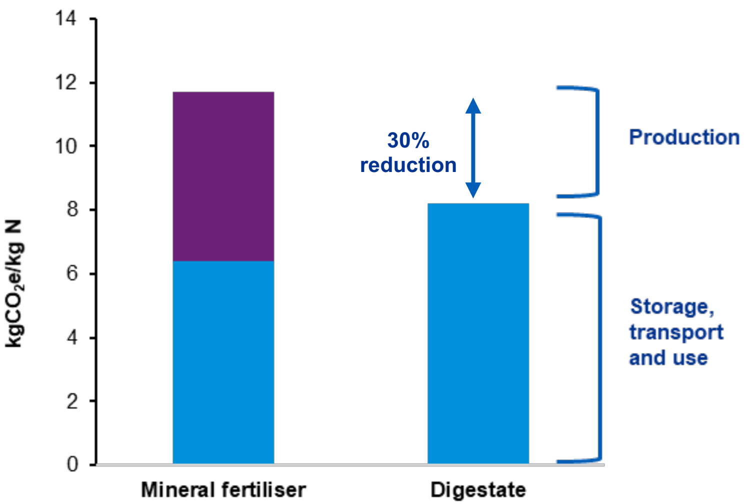


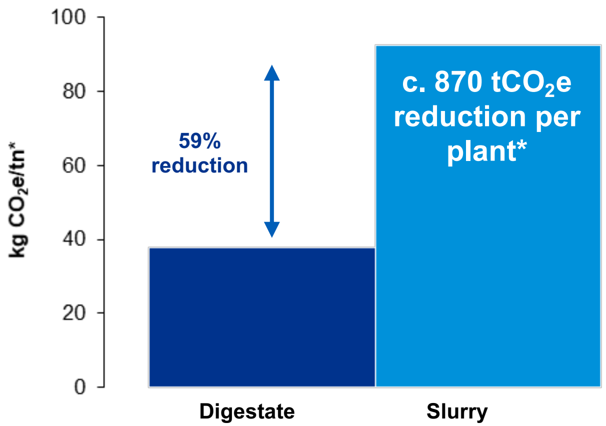
Example Valordig output

	tn	N	P	K	
Grass	19,144	**148,920**	**32,722**	**192,886**	**kg total**
Slurry	15,900	**4.63**	**1.02**	**5.99**	**kg/tn**
Other	3,281				
Total	**38,325**				
Total post AD	**32,193**				
Separated Solid Fraction					
tn	3,219	5,957	1,309	7,715	**kg**
Separated Concentrate Fraction 1					
tn	4,829	104,244	31,413	73,297	**kg**
Separated Concentrate Fraction 2					
tn	6,439	38,719	-	111,874	**kg**
4- Separated Water Fraction					
tn	17,706	*low ppm*	*low ppm*	*low ppm*	

Environmental, Climate & Fertiliser Performance

Emission savings





*Assuming 1 m^3 slurry = 1 tn slurry

Environmental benefits & challenges

- Digestate contains significantly less volatile organic acids and therefore **less odour emissions** than untreated slurry
- **Reduced pathogen** load to environment compared with land spreading of slurry
- Improved **soil health** and structure
- Given the increased NH4-N content of digestate compared with slurry, it can result in **higher ammonia losses.** The application technique for digestate should minimise the surface exposed to air and have contact with the topsoil

Fertiliser performance

- Digestate value depends on its **nutrient content and nutrient availability** - which can **vary significantly with feedstock used, processing technology, application method** and **soil quality** where is it applied.
- **Nutrient effects of digestate have a lag time** compared to the quick impact of chemical fertiliser, as such it can only be expected to displace chemical fertiliser over time, as the quality of land improves and gets used to repeated applications of digestate.
- Project Clover engaged with an AD operator in NI who has displaced up to 80-90% of chemical fertiliser with digestate – after improving the quality of land, particularly soil pH.
- Digestate has **NPK** in addition to **micronutrients and trace elements** and can **regulate soil pH** to displace lime.

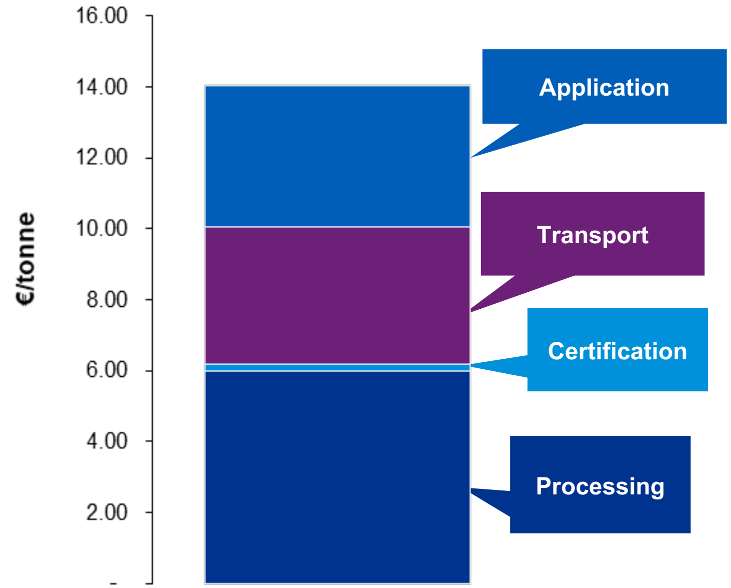
Emissions data: https://www.sciencedirect.com/science/article/pii/S0959652619320402

http://nsits.yingxiaoli.com/download/feiqiwu-wenxian/wenshi/methane-nitrous-oxide-and-ammonia-emissions-during-storage-and-after-application-of-dairy-cattle-slurry-and-influence-of-slurry-treatment2.pdf

Commercialising Digestate

Digestate costs

- The estimated **costs of commercialising** digestate:

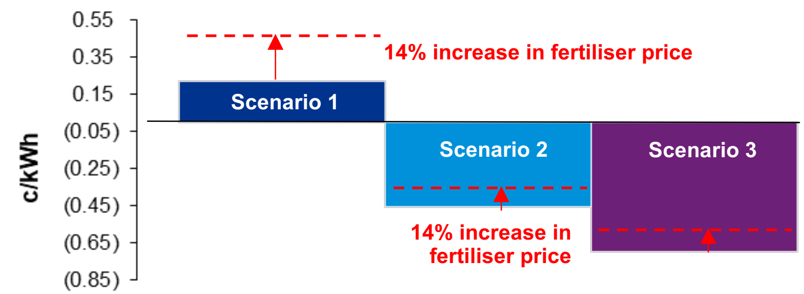


- **Processing costs**: estimated €6/tn (Valordig quote) (AD output tonnes)
- **Transport costs (10 miles):** Liquid fraction €4.13/tn; Solid fraction €2.95/tn (WRAP UK estimate) (Post digestate processing tonnes)
- **Applications costs**: Liquid fraction €4.13/tn; Solid fraction €3.54/tn (WRAP UK estimate)1 (Post digestate processing tonnes)
- **Certification costs**: €2,500 per plant (based on Celignis quote)

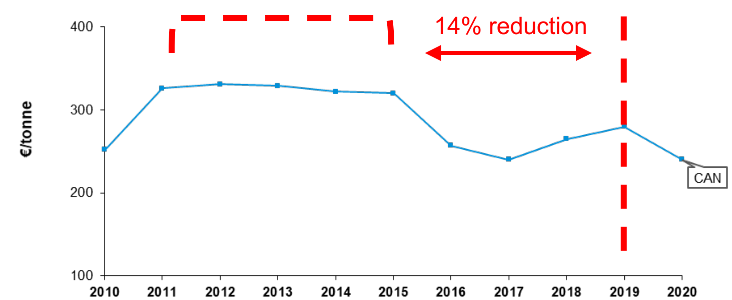
[1] https://wrap.org.uk/sites/default/files/2020-08/WRAP-Digestate-compost-good-practice-guide-reference-version.pdf

Estimated net income

- The estimated **net income**[2] per plant:



- **Revenue:** S1 €24/tonne; S2 €15/tonne; S3 €12/tonne (Post digestate processing tonnes)
- **Fertiliser prices:** N 0.90 €/kg; P 2.00 €/kg; K 0.80 €/kg – subject to change as indicated in the price variation[3] below



- Historical fertiliser prices show a decline over the last 5 years. Expected net income from digestate is sensitive to price variation as summarised in the above graph showing the impact of a 14% increase in fertiliser prices.
- Assumptions provided in **Appendix 1.**

[2] **Net income** = revenue less costs

[3] **CSO data**

Workstream 3 Conclusions - Soil Carbon Sequestration

Policy

- Soil carbon sequestration is gaining increased attention across both EU and national policy
- Farm to Fork Strategy, Programme for Government and Ag-Climatise support soil carbon sequestration

✔

Routes to monetise soil carbon

- It is unlikely that soil carbon would gain recognition under the EU ETS
- Two alternatives assessed are the voluntary carbon market and insetting
- Existing methods and guidance developed for soil carbon in the voluntary market

✔

MRV framework

- Proposed a high-level MRV framework based on Australian ERF guidance and experience, and the voluntary market
- It is proposed to adhere to the most detailed IPCC method – Tier 3

✔

Volume of soil carbon sequestration

- Existing research varies significantly on baseline sequestration rates and increases from improved land management.
- It is expected that there is capacity to improve current sequestration.
- **Additional carbon** stored is relevant for carbon credits i.e. potential to improve beyond baseline

!!

Value of soil carbon sequestration

- Value of soil carbon function of market price and additional carbon sequestered.
- ETS price unlikely
- International voluntary market price varies significantly, averaging at c. €10 /tCO_2e – regional EU market c. €30 /tCO_2e

!!

Policy

- EU **Farm to Fork Strategy** aims to roll-out an EU Carbon Farming Initiative to reward farmers for sequestering carbon – from engagements with DG CLIMA and DG AGRI understand this is likely to form part of the CAP
- EU **Circular Economy Action Plan** plans to develop a regulatory framework for certifying carbon removals

- **Programme for Government** aims to seek reforms to the CAP to reward farmers for sequestering carbon.
- **Ag-Climatise Action 17:** *Develop a pilot scheme in relation to on-farm carbon trading to reward farmers for the public goods they are providing*

- The Government announced the establishment of a **National Agricultural Soil Carbon Observatory** to reflect the climate impact of agriculture in the National Inventory and to capture the benefits in ESR obligations.
- Teagasc will monitor soil carbon using between 10 and 15 flux towers which estimate the net CO_2 exchange or the difference between photosynthesis (uptake) and respiration (loss) from soils

Routes to Monetise Soil Carbon - Options

Voluntary carbon market

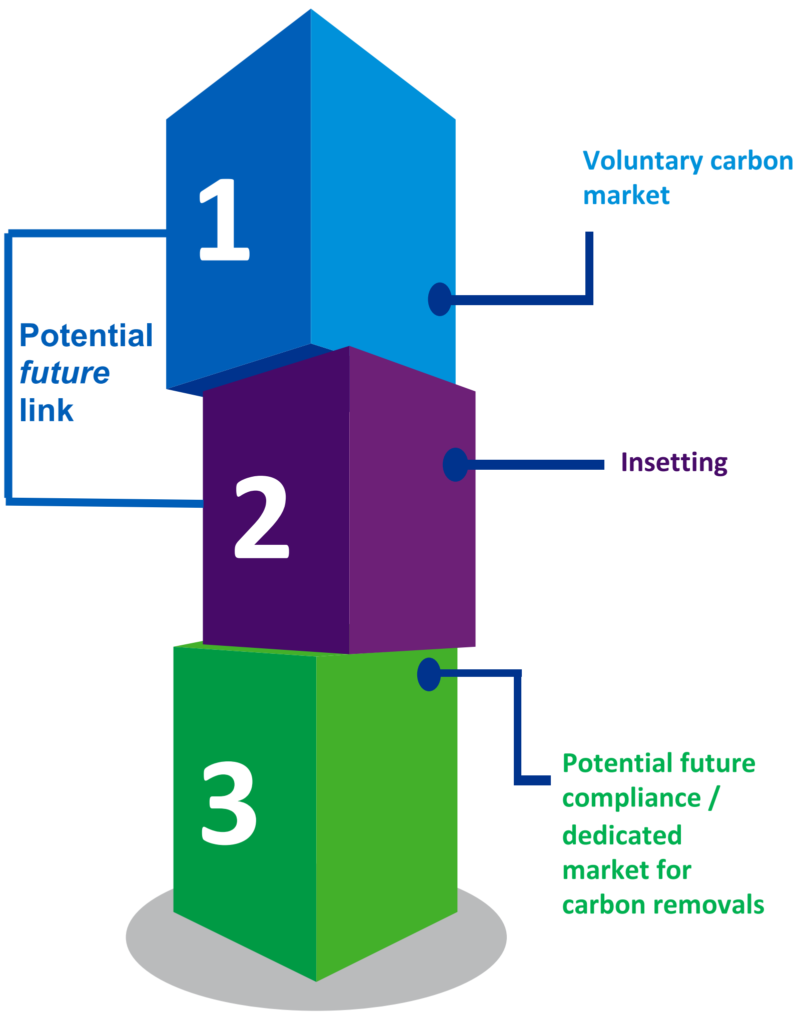
- Growing interest in soil carbon projects, with major carbon crediting mechanisms releasing methodologies and guidance for developing fungible soil carbon credits.
- These credits can be used as **offsets**
- **Prices vary significantly** and there are high registration costs.
- Regional markets are developing across Europe which could be a potential alternative to the voluntary market.

Insetting

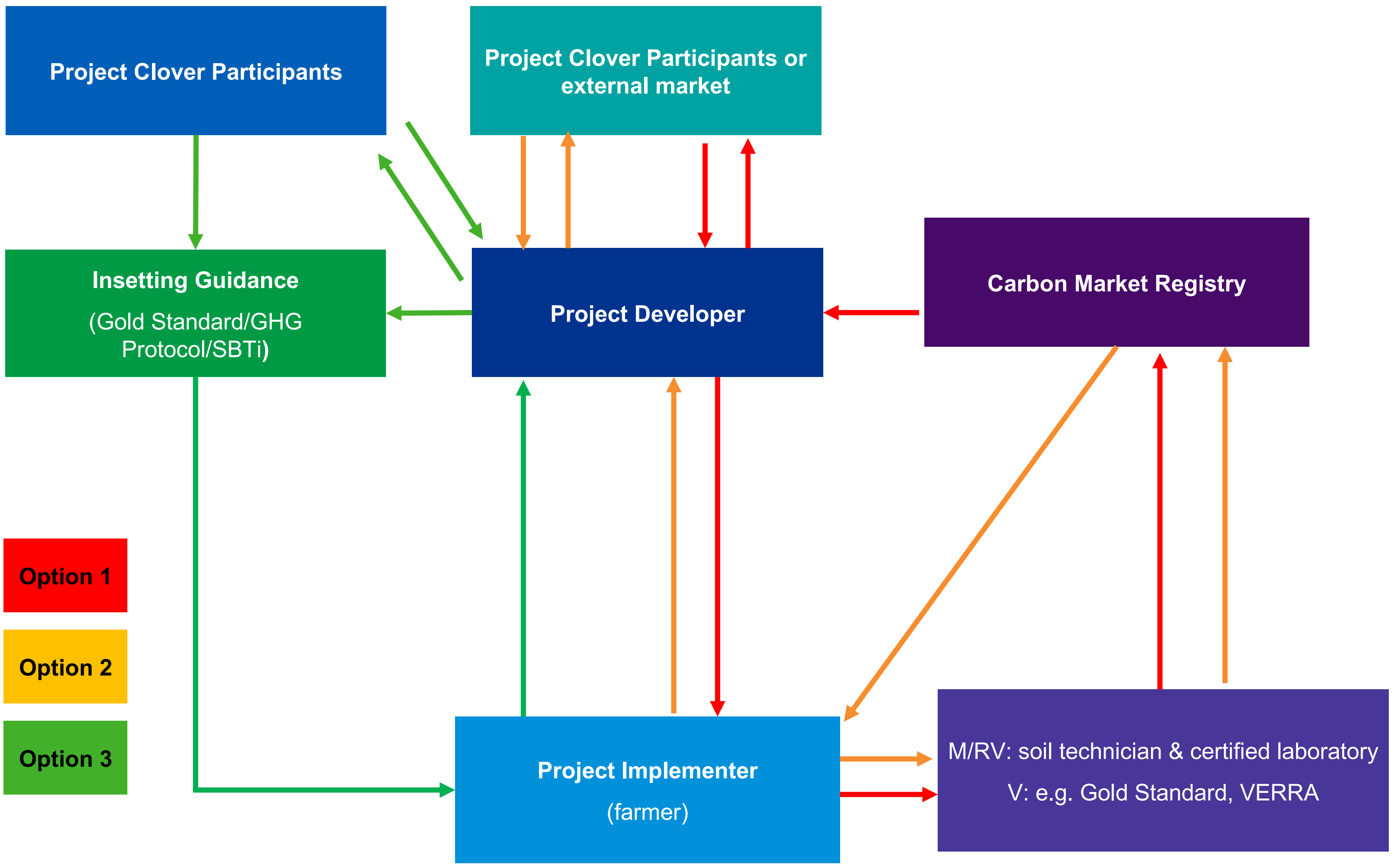
- Provides an opportunity for companies to **invest within their value chain** to reduce their carbon footprint.
- Opportunity for companies to market low carbon products.
- Appetite for insetting will depend on **internal carbon price.**

Potential future compliance / dedicated market for carbon removals (excluded from further analysis)

- European Commission is currently developing an EU Carbon Farming Initiative to reward carbon sequestration. This scheme is likely to form part of the CAP.
- In the future, carbon sequestration projects could be integrated into the EU ETS, or a separate trading mechanism.
- However, there has been no formal announcement or plan to do so in the coming years. As such, this option is excluded from further analysis.



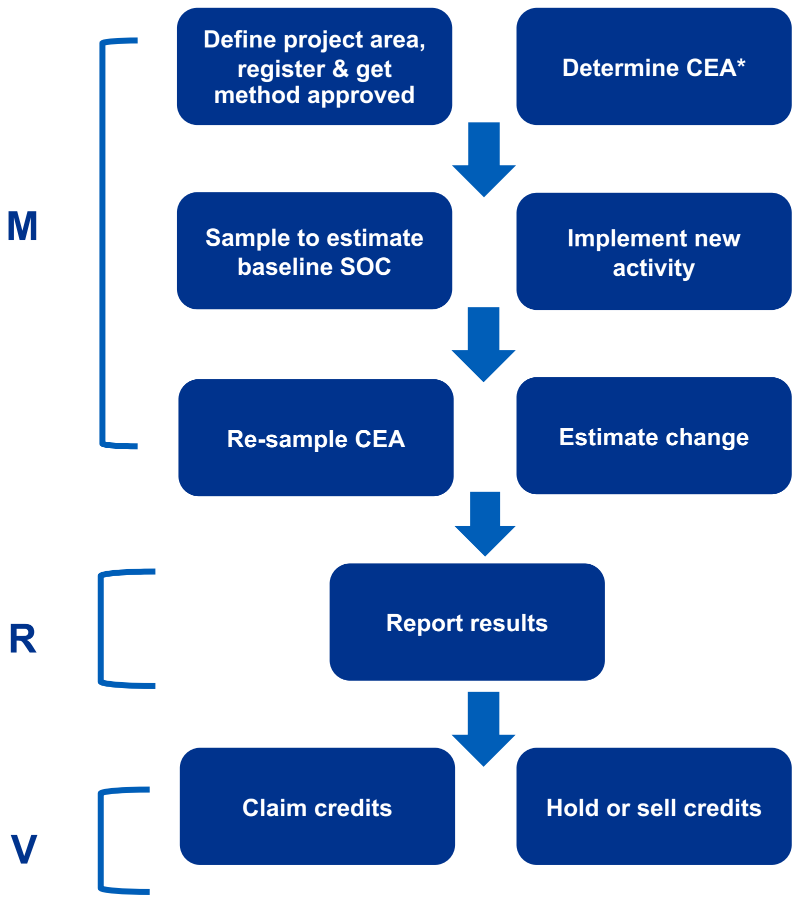
Routes to Monetise Soil Carbon - Governance



MRV Framework

MRV framework

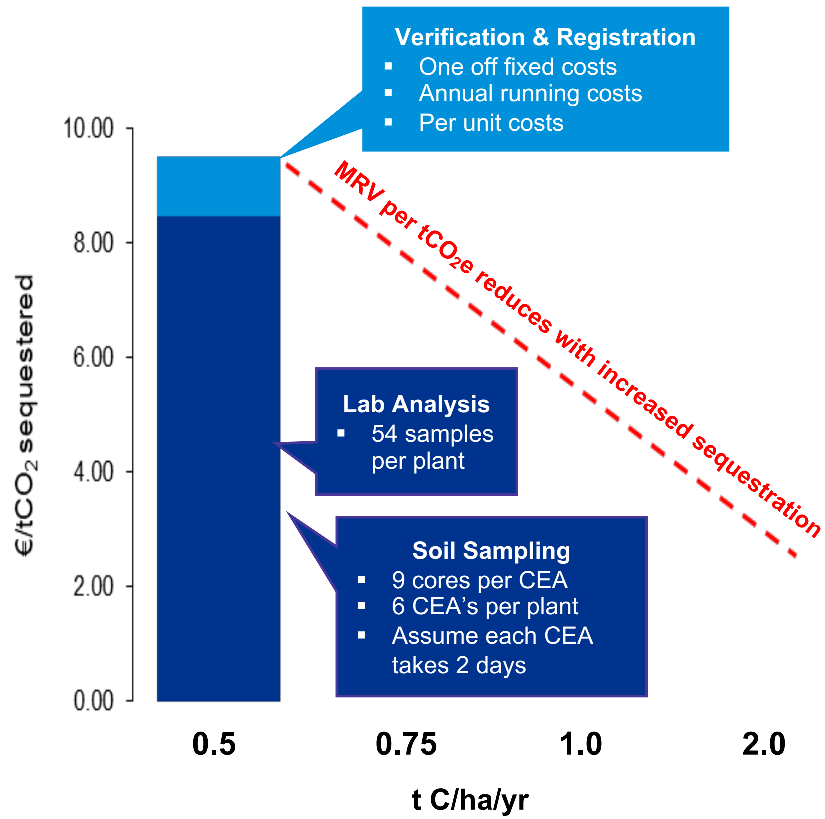
- A high-level summary of a potential MRV framework:



* CEA = carbon estimate area – sampling area

Estimated MRV costs

- Costs will mainly stem from soil sampling, laboratory analysis and registering / getting independent verification with a recognised carbon crediting mechanism.
- Estimated costs are based on Australian ERF guidance[1] and VCS fee schedule[2]. MRV costs per tCO_2e will vary depending on the amount of carbon sequestered.

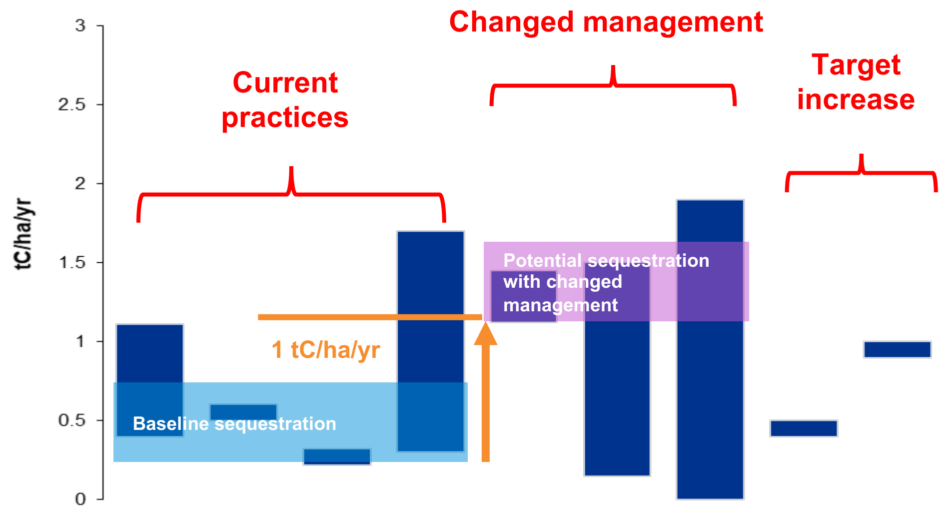


[1] Understanding your soil carbon - Simple method guide (cleanenergyregulator.gov.au)
[2] Program-Fee-Schedule_v4.1.pdf (verra.org)

Volume of Soil Carbon Sequestration

- It is the **additional carbon sequestered beyond baselines** that is relevant for Project Clover.
- **Value from carbon (credits)** is only gained from **additional carbon** sequestered above the baseline
- The level of carbon sequestered by soils largely depends on **land management, soil type and climate**.
- It is understood that soil carbon does not increase without limit, but eventually reaches a saturated level. Research from the EPA estimates that **Irish grasslands** maintain an average carbon **saturation of 48%** and **cropland soils** have an average **saturation level of 38%**[1]
- Best practice agricultural management interventions have the potential to increase sequestration beyond baseline levels.
- **Further research** must be done to understand the expected **sequestration improvements** and **permanence** from improved land management.
- The development of a robust baseline and understanding the impact of improved land management is anticipated to take place over a **minimum 5 year time** period.
- Given the heterogeneity across Irish soils, it is expected that there will be **significant variances** in **improved carbon sequestration between areas** and **across years**
- Some soils are expected to have the capacity to sequester more carbon and some areas may continue to act as carbon sources.

- The figure summarises a range of studies looking at the carbon sequestration rates of agricultural soils
- Unless noted, the estimates are **total carbon sequestered, not additional**.
- The orange arrow provides a target increase (i.e. **additional) for soil carbon** sequestration. This estimate is subject to uncertainty.



Current practices	Teagasc (2020); Truc et al. (2018); O'Brien et al. (2014); Soussana et al. (2007)
Changed management	Watson *et al*. (2007); Vleeshouwers and Verhagen (2002) **(net effect of measures);** European Climate Change Programme (2004)
Target increase	Minasny *et al.* (2017) **(Irish agricultural & forestry land target increase to achieve 4p1000 initiative)**

[1] https://www.epa.ie/pubs/reports/research/climate/EPA%20RR225_web.pdf

Section 3

Farmer Proposition

Farmer Benefits

Macro Benefits

- Assist in decarbonising the agri supply chain – further supporting the global marketing of Irish food and drinks products.
- Delivering improved air, water and soil quality.
- Providing rural investment and income diversification

Commercial

- **Benefit to dairy farmers and pig farmers:**
  - Decarbonisation of slurry and removal of potential Nitrates Directive limitations / derogations.
  - Secure supply of organic fertilisers from AD SPV and reduced chemical fertiliser and herbicide reliance.
  - Help decarbonise the diary processing sector.
- **Benefit to tillage and beef farmers**:
  - Opportunity to earn a guaranteed income from the implementation of improved land management practices:
    - Revenue from feedstock provision to AD plant
  - Secure supply of organic fertilisers from AD SPV, and reduced chemical fertiliser and herbicide reliance.
  - Improved soil quality and productivity.
- **Other complementary farm incomes:**
  - Potential for operator fees, land-leasing income (farms where AD plant is sited), equity ownership and carbon farming.

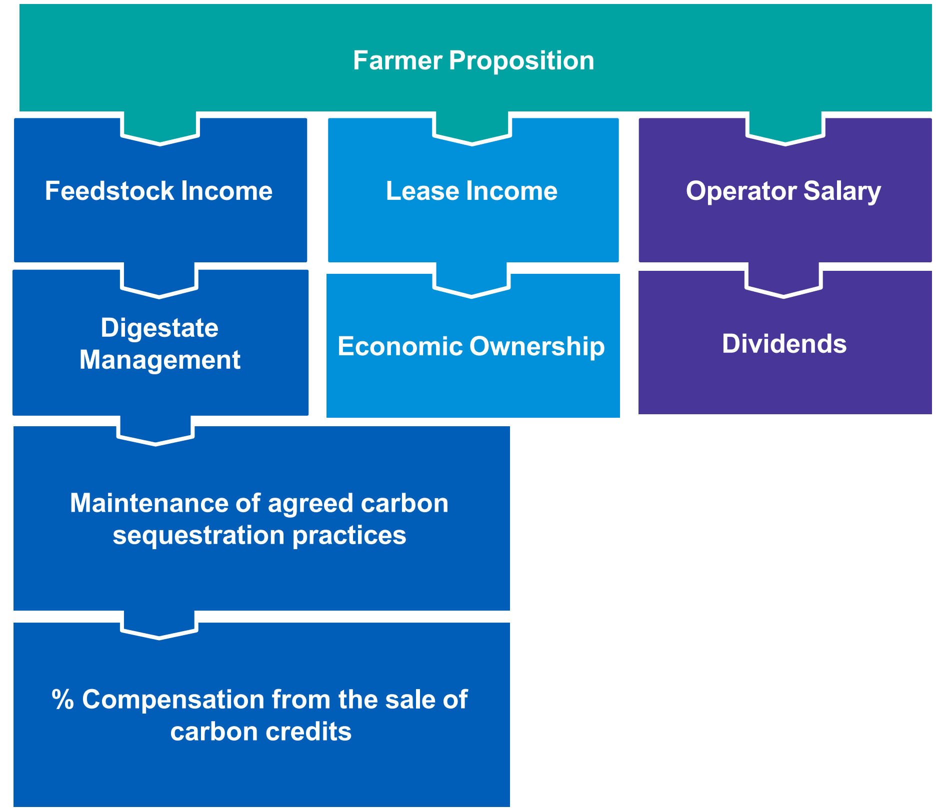
Digestate as an organic fertiliser

- Processed digestate is a zero carbon source of organic fertiliser.
- Digestate will be available in different homogenised nutrient forms – efficient compliance with Nutrient Management Plans
- Less emissions (GHG and odour) compared to slurry.

Farmer Benefits

Farmer Opportunities	
Feedstock Income	▪ The farmer enters into a medium-long term agreement to provide up to 100% of the feedstock requirement for the AD plant. ▪ The farmer guarantees feedstock obligations to a reasonable cap. ▪ The farmer may be required to provide financial guarantees over the performance of the feedstock contract.
Lease Income	▪ The farmer provides the AD plant site.
Operator Salary	▪ The farmer will be responsible for the day to day operations of the plant, supported by a third party maintenance and support company.
Digestate	▪ The farmer will be responsible for managing digestate produced by the AD plant.
Carbon Sequestration	▪ The farmer implements agreed practices to enhance soil carbon sequestration. ▪ % compensation from sale of carbon credits.
Economic Ownership	▪ A core finding of research conducted is the need for famers to have “skin in the game” to deliver a high performing AD plant. ▪ Famers should have equity ownership.
Dividends	▪ The farmer carries out the required tasks and ensure the plant is performing optimally.

Farmer Opportunities (cont’d)



Comparison of Farmer Average Net Income / Profits

- **AD biomethane has the opportunity to increase farmers average income per acre and provide certainty of income for the future.**
- **AD biomethane has the potential to provide an income greater than what can currently be achieved in the cattle, sheep and tillage sectors and from leasing the land.**
- **The diagram below shows the potential increased income per acre for farmers. The average net profit figure takes into account the associated costs and savings from the use of digestate over chemical fertilisers following the first year of the scheme when digestate becomes available from AD biomethane plants.**

AD Average Income
€567 - €646
per acre

Farm Type	Average Income (excl. direct payments) per acre
Cattle Rearing	€ 299
Cattle Other	€395
Sheep	€262
Tillage	€632
Dairy	€1,323

Leasing Land
€202
per acre

AD Average Net Profit
€132 - €146
per acre

Farm Type	Average Net Profit (excl. direct payments) per acre
Cattle Rearing	€(62)
Cattle Other	€(17)
Sheep	€(48)
Tillage	€123
Dairy	€277

Source: National Farm Survey, CSO (2017) and KPMG Research

Farmer Economics

A key finding from engagements with Promoters and feedback from AD projects in NI, is the need for the farmer/ Promoter to be incentivised in the Project. As such the commercial structure outlined below will allow the farmer/ Promoter to have 'skin in the game' which should help support a high performing AD plant.

Financial proposition for farmers

01 **Payments for feedstock** modelled at €28/tn sillage (assuming 25% DM content). Payments result in c. €552k per annum (unindexed) or €10.1 m over a 15 year life of the Plant.

02 For **Lease Income**, expected to be for livestock farmers, a fixed annual rent of €20k for the site, equating to c. €368k in lease income over the 15 year lifetime of the Plant.

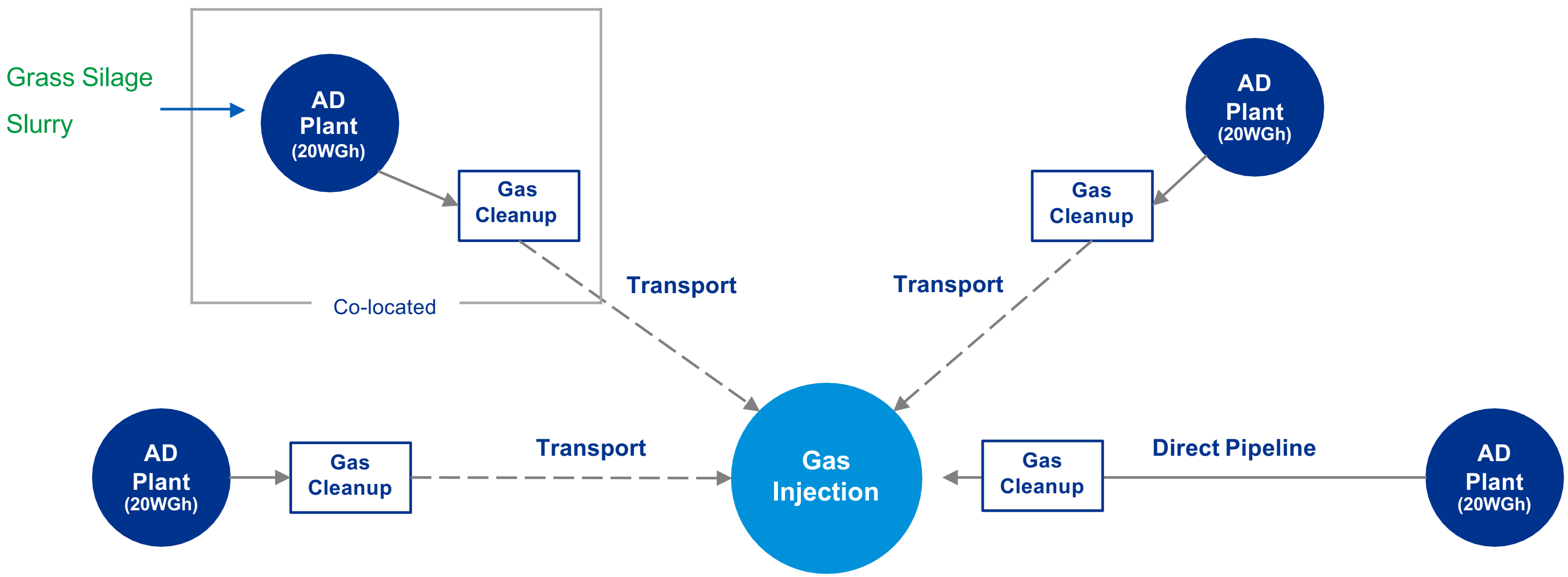
03 **Operator Salaries** are proposed at €40k annually, resulting in c. €736k over the 15 year lifetime of the Plant.

04 **Economic Ownership** – assumed investors provide up to 100% of the funding for each AD plant and take a majority shareholding in the asset, with the farmer receiving a minority shareholding in the SPV.

05 **Digestate –** Promoters will receive €2/tonne for the removal of digestate - €66k per annum until digestate is commercialised and sold on the fertiliser market.

06 **Dividends** – Paid once project debt is repaid

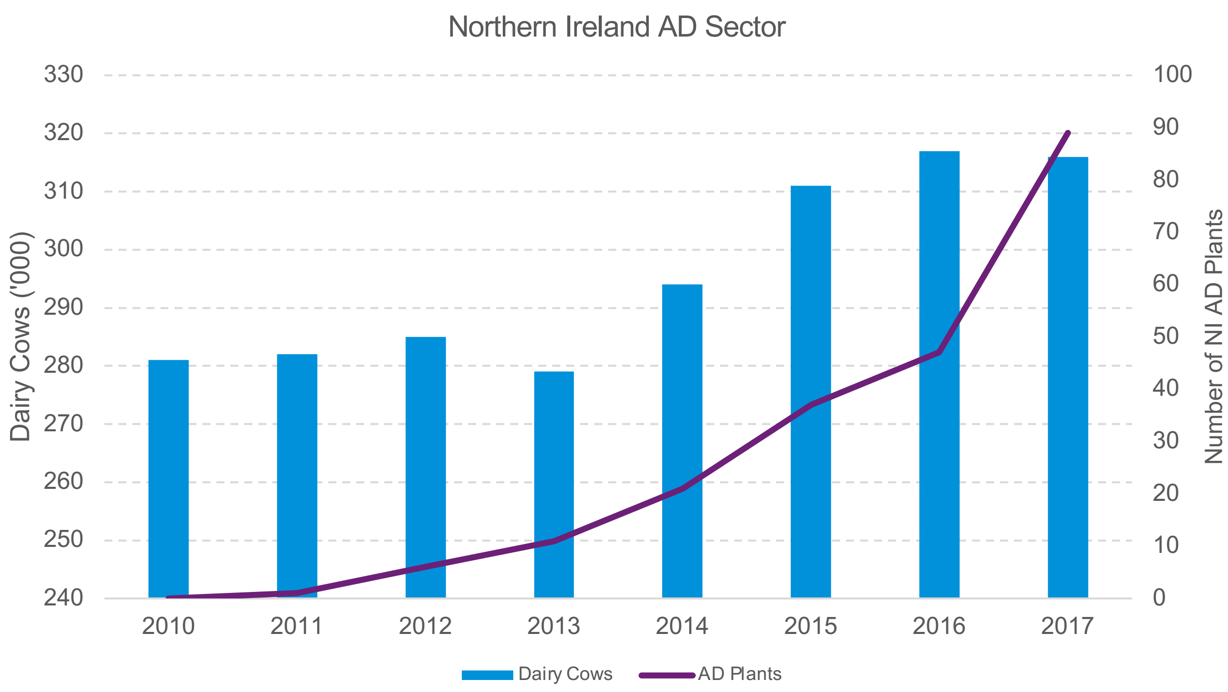
Proposed Project Structure



Cookstown, Northern Ireland, 15GWh

Northern Ireland Case Study

Northern Ireland AD Sector had no negative impact on animal numbers



NI AD Sector Statistics

- 90 AD Plants
- Consumes 700,000 tns silage annually
- Dairy numbers grew 12%, overall cattle 4% during period of deployment
- Grass production area expanded by 3%, while consumption increased by 10%, showing productivity gains

Section 4

Conclusion

Conclusion

- Due to our forage -based agricultural system, Ireland has the potential to be a leader in biomethane production, using on-farm Anaerobic Digestion (AD).
- Project Clover addresses Agri food sustainability and competitiveness - will enable industry to decarbonise thermal energy requirements and also supports the decarbonisation of the wider supply (Scope 1, 2 and 3).
- Industry is committed to a long-term, scalable solution but requires Government support – specifically match funding of €24m is required for the pilot phase and a willingness to support a long term pathway.
- While the study has successfully demonstrated the feasibility of Project Clover's three workstreams, before moving to Phase 2, industry members require clarity from Government in support of the long term funding model.
- Specific asks of Government are :
  - Capital Funding of 50% to match and complement the ISIF funding
  - the early implementation of Article 23, which requires suppliers to socialise the cost through a renewable heat fuel obligation scheme.
  - Additional revenue streams are realistic and achievable – commercialising bio-fertilisers. Monetising carbon sequestration is considered to be worth pursuing in the longer term. Both require further work in Phase II.

Section 5

Appendices

Appendix 1 - NI Farmer Case Study

Overview

Farm-scale AD plants in Northern Ireland provide a very useful reference for the proposed development of the sector in Ireland. While the biogas from these plants are typically utilised for electricity production, rather than grid injection, the basic farm-level principles remain the same.

Based in Cookstown, the reference site detailed below was established in 2014 by three beef, dairy and pig farmers respectively. The farmers have a long history of cooperation, sharing infrastructure and machinery.

Together they developed a 500kW AD plant (about half the size being proposed for Project Clover) on an independent, yet centrally located site, to all three farms. The site is wholly owned by a company which acts as an aggregating entity for the three farmers and enters into leasing, feedstock and operations under an SPV structure.

The site processes 18,500 tonnes of feedstock per annum, consisting of 11,000 tonnes of grass silage and c.7,500 tonnes of slurry. The farmers have committed c.50% of their current silage production capacity to the plant.

Feedstock	Annual Input (tns)	Electricity Yield (kW)
Grass Silage	11,000	500kW
Slurry	7,500	<10kW

- Each farmer dedicated 200 acres of land, based on a three-cut system:

Farm	Capacity	Tn / unit	Annual Output (tns)
Farmer 1	200 (65% of land)	20	4,000
Farmer 2	200 (47% of land)	20	4,000
Farmer 3	200 (40% of land)	20	4,000
Total	c. 600		12,000

The plant uses the biogas it produces to create electricity, which it exports on the grid through an onsite grid connection. The plant receives government subsidy for each unit of electricity generated.

Site Layout

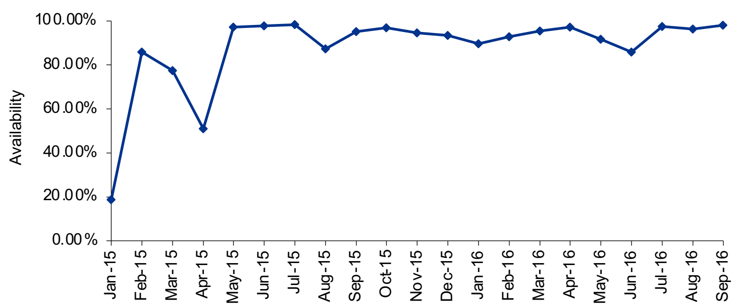
The three acre site comprises storage / digester tanks, a technical building and a CHP house as illustrated in the site photograph below. The farmers use their existing slurry storage for digestate storage during the closed season.

0.5MW Cookstown AD Plant

The plant has now been operating for over four years, with operational performance in excess of 92% of capacity overall. Such has been the success, the farmers successfully expanded the plant from its original 500kW to 750kW.

All digestate produced on the site is used as fertiliser on the three farms.

Operational Performance for first 2 years operation



Appendix 1 - NI Farmer Case Study (cont...)

"Would you do it again?"

"Absolutely! It has the potential for years to come."

Consultation

As part of this engagement, KPMG met with and interviewed the farmers involved in this reference AD plant to get first hand feedback on their experiences and learnings from operating the plant over the past four years. A summary of this consultation is outlined below.

Business Model

The farmers reported that a co-operative approach has been a great success. Each farmer was involved in providing one third of the feedstock and involved in one third of the operation and running of the plant.

Changes in Farming Practices

They highlighted the following changes in farming practices, as a result of developing an AD plant, and which these farmers saw as positive developments.

- The development of the AD plant had enabled each farmer to reduced their beef herds by 50% thus freeing up substantial acres of land for use for silage production for the AD plant. This meant a reduction in herd from 500-600 cattle to 300 cattle for one of the farmers. This approach was favourable given the diminishing returns achievable from beef cattle. This change of farm practice resulted in more than doubling the amount of land used for silage production.
- It also brought some underutilised land brought back into production and they are making more efficient use of land by investing in it. They made substantial investment in improving soil quality by reseeding the majority of their land, and have a 6 yearly reseeding programme planned.
- Overall, changes have improved soil quality and resulted in increasing yield tonnage from c16 tonnes/acre to c23/24 tonnes per acre.
- The farmers have maintained a smaller beef herd as small parcels of land remain too wet or steep and so are not suitable for silage/cutting. Therefore, the least productive land is used for grazing cattle while the most productive is allocated to silage.

Technology

Initial technology was under-designed for local conditions, with insufficient power to mix material effectively. This suggests a different type of mixer or a more powerful mixer is required for Irish silage. Now, silage is cut to 4mm to support more effective mixing.

A lack of maceration pumps - the feeder wagon did not include a macerating system. Therefore silage needs to be cut to 4mm to facilitate maceration. This is cut to 4mm at harvesting and currently does not incur additional expense to harvesting costs.

An external heating system is preferable to an internal heating system as it means any issues or problems can be resolved without the need to empty the tank. In an internal system, it is necessary to empty the tank before investigating and resolving problems with the heating mechanism.

Feedstock

A 10km radius is the maximum for sourcing slurry or other feedstock.

The farmers initially used poultry litter which was free but the ammonia levels proved problematic and this has now been replaced by pig paunch which is purchased at a low cost.

Cattle paunch has proved problematic as it contained too much debris, for example, fence wire, stones etc, unlike pig paunch which is debris free as they are contained in pens and can access only grain and water.

Support

The NI ROC subsidy scheme was essential in making the operation economical, and the farmers could not have gone ahead without this subsidy. [In NI, the ROC subsidy scheme closed to new assets in 2017/2018].

In addition, bank finance needs to affordable, with interest rates of c3-4% maximum to make it economical.

Appendix 2 - Commercialising Digestate - Scenario Assumptions

- Digestate is **typically considered as a cost** for AD plants with operators commonly paying farmers to take it offsite.
- With the incoming **EU Fertiliser Regulations in 2022** which recognises digestate as a fertiliser product and the specific requirements to reduce chemical fertiliser and nutrient losses in the EU Green Deal **Farm to Fork Strategy**, it is anticipated that the uptake of organic fertiliser will increase.
- Land is likely to require a few years of continuous digestate application to become used to the lag effect in its fertiliser performance.
- Further work on **communicating the benefits** and getting **farmer buy-in** for the use of digestate as a replacement fertiliser **is required**.
- The table below provides a summary of two scenarios used to estimate the expected revenue from digestate.
- The nutrient values were provided by an NI AD plant operator as well as using default estimates for agricultural digestate from the UK's Agriculture and Horticulture Development Board RB209. Each scenario was modelled through the use of Valordig technology – which dewaters digestate reducing its weight by c.55%.
- Figures below are subject to uncertainty – mainly depending on the quality of feedstock, processing technology and soil quality. Results may vary impacting the expected revenue from the sale of digestate.
- In terms of the chemical fertiliser replacement value (%) – Scenario 2 and 3 adhere to guidance provided by the UK's Agriculture and Horticulture Development Board RB209 – assuming 55% N availability, 60% P availability and 90% K availability[1].
- Scenario 1 is a higher assumption, taking **a longer term outlook** on the potential for digestate to displace chemical fertiliser. Not all of the nutrients applied in digestate are expected to be immediately available for plant uptake. They are estimated to be released slowly over a period of time[1,2].
- From our engagement with an NI AD operator, digestate may have the potential to displace between 80-90% of chemical fertiliser over time with repeated applications. However this varies with the type of feedstock used, soil quality, application method and processing technology implemented.
- The European Biogas Association notes that typical digestate has levels of 75-85% available N which can be increased to 90-95% using separation[3]. The variability in the N fertiliser replacement value of digestate ranges in literature from 54 – 102% [1,4]
- The availability of P and K in digestate also varies with soil quality, digestate quality and application technique - ranging from 50-100%. Teagasc guidance notes that organic fertilisers can supply 100% of the crop P and K requirements on soils with medium P and K index (3-4)[5].
- Any digestate application strategy will have to comply with the NAP regulations.

		Scenario 1			Scenario 2			Scenario 3		
	€/kg	kg/tn	% chemical fertiliser replaced	total	kg/tn	% chemical fertiliser replaced	total	kg/tn	% chemical fertiliser replaced	total
N	**0.90**	5.46	84.8%	4.63	4.53	55%	2.49	3.6	55%	1.98
P	**2.00**	1.02	100%	1.02	0.88	60%	0.53	0.7	60%	0.45
K	**0.80**	5.99	100%	5.99	4.82	90%	4.34	3.7	90%	3.29

Appendix 2 - Commercialising Digestate - References

1. Agriculture and Horticulture Development Board Nutrient Management Guide (RB209) Organic Materials; https://projectblue.blob.core.windows.net/media/Default/Imported%20Publication%20Docs/RB209%202021/RB209_Section2_2021-210208_WEB.pdf

2. Teagasc (2020) MAJOR AND MICRO NUTRIENT ADVICE FOR PRODUCTIVE AGRICULTURAL CROPS; https://www.teagasc.ie/media/website/publications/2020/Major--Micro-Nutrient-Advice-for-Productive-Agricultural-Crops-2020.pdf

3. European Biogas Association (2014); https://www.europeanbiogas.eu/wp-content/uploads/2014/12/Digestate-in-the-Nitrates-Directive_EBA-Position-paper-1.pdf

4. SYSTEMIC (2020) Mineral Concentrate PowerPoint Presentation (systemicproject.eu)

5. Teagasc Organic Manures; https://www.teagasc.ie/crops/soil--soil-fertility/organic-manures/

Glossary of Terms

AD	Anaerobic Digestion
CBA	Cost Benefits Analysis
CGI	Central Grid Injection
CHP	Combined Heat and Power
CO2	Carbon Dioxide
DAFM	The Department of Agriculture, Food and Marine
DAFI	Directive for Alternative Fuelling Infrastructure
DCCAE	The Department of Communications, Climate Action and Environment
DM	Dry Matter
EPA	Environmental Protection Agency
EPC	Engineering, Procurement and Construction
ETS sector	Any company or body within the EU that emits a large amount of greenhouse gas emissions is included in the Emissions Trading System
EU	European Union
FY	Financial Year
GB	Great Britain
GGCS	Green Gas Certification Scheme
GHG	Greenhouse Gas
GNI	Gas Networks Ireland
GWh	Gigawatt Hours
Ha	Hectares

IRR	Internal Rate of Return
ISIF	Ireland Strategic Investment Fund
kWh	Kilowatt Hours
LESS	Low Emissions Slurry Spreading
MACC	Marginal Abatement Cost Curve
MJ	Megajoule
MRV	Measurement Reporting and Verification
MSA	Management Service Agreement
MT	Million Tonnes
MWth	Megawatts Thermal
NI	Northern Ireland
NECP	National Energy & Climate Plan
Non ETS sector	All greenhouse gas emissions that are not from companies in the ETS sector
OSI	Organic Soil Improver
PA	Per annum
PSO	Public Service Obligation Levy
RGFI	Renewable Gas Forum Ireland
RED II	Renewable Energy Directive II
SEAI	Sustainable Energy Authority of Ireland
SPV	Special Purchase Vehicle
Tn	Tonne
TSO	Transmission System Operator
TWh	Terawatt Hours

Important Notice

Important Notice

KPMG wish you to be aware that the work it carried out for RGFI was performed to meet specific terms of reference agreed with them, and that there were particular features determined for the purposes of the engagement and the needs of RGFI at the time. The report should not therefore be regarded as suitable for use by any other person or for any other purpose. Should you choose to rely on the report you do so at your own risk. KPMG will accordingly accept no responsibility or liability in respect of it to persons other than RGFI.

We have not verified the reliability or accuracy of any information obtained in the course of our work, other than in the limited circumstances set out in our Engagement Letter with RGFI

Project Clover – Feasibility Phase Report

August 2021

Prepared on behalf of

Wyeth Nutrition | CARBERY | glanbia ireland | DANONE ONE PLANET. ONE HEALTH | dairygold Golden Valleys, Growing Naturally | Lakeland DAIRIES | TIPPERARY COOP

Core Contributors

Renewable Gas Forum Ireland | KPMG Sustainable Futures | Gas Networks Ireland | DEVENISH Beyond Nutrition | Authenticity

Consultation on Renewable Heat Obligation

PROJECT CLOVER – AGRI FOOD INDUSTRY COLLABORATION

PJ McCarthy, CEO, RGFI

FOR AND ON BEHALF OF PROEJCT CLOVER INDUSTRY PARTICIPANTS |

Q1 Do you think that a Renewable Heat Obligation is an appropriate measure to introduce?

In response to the significance, scale and complexity of the sustainability and climate action challenges impacting the competitiveness and legal obligations of the Irish food industry, key industry representatives (“SteerCo Members”), led by Danone Ireland, with Glanbia Ireland, Lakeland Dairies, Dairygold, Carbery Group, Wyeth Nutrition and Tipperary Co-operative formed a collaboration in June 2020 under the banner “Project Clover” .

Having previously scrutinised all options for decarbonising our industrial heat processes, including biomass and electrification, the SteerCo Members concluded that switching to biomethane is the most economic and viable option available.

Our viewpoint is informed by independent economic assessments, full cost benefit analysis in compliance with public spending code, in depth business analysis and feasibility studies, carried out by reliable and trusted independent qualified professionals, underwritten and warrantied, in consultation with large gas consumers and key stakeholders.

The Project Clover Feasibility Study (See “Other”) proposes that a national renewable heat fuel obligation scheme (RHO), should be introduced as a matter of urgency. The RHO would socialise the incremental cost of producing renewable gas biomethane across all gas consumers and would provide certainty and confidence to the renewable gas industry, consumers, shippers/suppliers, technology provider and investor sector that an enduring solution is in place to support production and delivery of biomethane at scale.

By supporting the production of renewable gas, the RHO will also improve the commercial sustainability and competitiveness of the agri food and beverages industry, provide sustainable farm practices and land management, regenerative farming, support rural employment and the circular bio-economy/bio-refinery goals, in line with Government targets.

Q2. If not, what alternative measures would you consider appropriate to increase the use of renewable energy in the heat sector?

The proposed RHO is the only secure way of encouraging the development of Ireland’s renewable gas supply and would not be subject to variations or pressures that can be faced through the provision enduring subsidies. The RHO is a key ask of Government to support the development of biomethane production in Ireland and recognising the needs of industry for biomethane to decarbonise heat/thermal demand.

It is our opinion that a Public Service Obligation Scheme or Auction process would not be appropriate mechanisms in socialising the funding gap for renewable heat technologies. We need to develop the renewable heat sector to a level of maturity before introducing auctions. By way of comparison the renewable electricity sector was supported while developing to a level of maturity and has introduced auction process which is appropriate and an approach that could be supported in principle for renewable heat once the industry reaches a point of maturity.

Q3. Do you agree that the obligation should apply to all non-renewable fossil fuels used for heating as set out above?

Yes.

Q4. It is intended that electricity used for heating purposes and renewable/waste district heating systems would be exempt from this obligation, do you agree with this approach?

We agree in principle with this proposal, as electricity is subject to separate supports for renewable electricity.

Q5. Do you agree that the portion of fossil fuel input used in CHP plants to generate heat would be considered to be part of the obligation?

Yes we agree with this position. This is an essential part of supporting the manufacturing and process industries to decarbonise their primary energy demand and reduce emissions, under Scope 1 and 2.

Q6. Are energy suppliers the most appropriate bodies to become the obligated parties in the heat sector?

Yes - It is our opinion they are best placed to become the obligated parties for a fair and efficient RHO system.

Q7. Is the 400 GWh of energy supplied an appropriate level for a supplier to become obligated?

We recommend having a lower or zero threshold so that smaller suppliers can be included, applying fair and equitable treatment for all entities in the shipper/supplier sector and ensuring that the use of renewable heat obligation scheme is embedded across the board.

Q8. Do you agree with the 2023 start date for the obligation?

Yes. The RHO is urgently required to support biomethane renewable gas production to allow it to play its vital role in decarbonising difficult to decarbonise thermal processes and heating demand and supporting the manufacturing and processing industries to be sustainable and competitive.

Q9. In terms of the obligation rate, do you agree with the proposed initial level of obligation of 0.5%?

We support a more ambitious target of at least 1% to begin with, in view of the level of ambition shown by our members, and in particular industry, to decarbonise their thermal demand for processes. This has been shown to be achievable through the findings and conclusions of the *KPMG Integrated Business Case for Biomethane in Ireland* and *Cost Benefit Analysis* and the *KPMG Project Clover Feasibility Study Report.*

Q10. In terms of ambition for a 2030 target, what level of ambition do you think is appropriate? 3% minimum; 5% medium ambition; 10% higher ambition; Other?

Gas is dominant in meeting the requirements for industry's thermal processes.

Through Project Clover there is already solid evidence that even taking a conservative "medium" ambition, it is technically, commercially and environmentally feasible to produce 2.5TWh of sustainable biomethane by 2030 with 125 x 20GWh agri-feedstock AD plants. This is scalable and the KPMG/Devenish 2021 Sustainable Feedstock Report has shown feedstock capacity to achieve 9.5TWh of biomethane by 2050. Which supports the findings of the KPMG/RGFI Integrated Business Case for Biomethane in Ireland 2019, where the potential for biomethane production is 9TWh.

Given the pressure and legal requirement to decarbonise our economy and the fact that biomethane renewable gas is the only option to decarbonise difficult to decarbonise sectors such as industrial thermal processes, the obligation rate should be set as high as possible.

We support the view that 10% minimum of gas supplied should be renewable gas by 2030, aligned with current level of ambition, deployment and capability of the biomethane industry and in line with current practice across EU member states.

Q11. Do you agree with the first obligation period being multiple years 2023-2025 to give the industry time to develop supply lines?

Yes, in principle we support this, with Government announcing and providing advance notice to the market by the end of 2021, with agreed targets set for each of these years reflecting the capacity to supply biomethane, the fuel of choice in this case .

Q12. Once the first period 2023-2025 expires, do you agree with the obligation then becoming an annual obligation?

Yes we agree with this approach in principle, in consultation with the renewable heat industry.

Q13. Do you agree with suppliers being able to trade credits in order to meet their obligation?

It is our opinion suppliers should only be able to trade credits if there is no way that they can access a renewable heat supply, on foot of clear evidence of market participation to secure renewable heat for their obligation targets.

Q14. Do you agree with allowing 10% carry over of renewable credits to be used in the following year's obligation?

We recommend that any carry over of credits should only be applied in exceptional circumstances and should not become the norm.

Q15. What are the sustainable energy sources likely to meet the Renewable Heat Obligation at an obligation rate of (i) 3%, (ii) 5%, (iii) 10% by 2030?

The EU Commission report on availability of feedstock for biomethane production, shows that Ireland has the highest potential per capita to produce biomethane versus other Member states. Teagasc research and studies, support the potential for increased productivity, and incremental feedstock from multispecies swards is a sustainable crop that enhances soil health, with 70% reduction in nitrogen requirements and increased productivity, and is drought resistant. With no increase in carbon emissions or competition for animal fodder.

The KPMG/Devenish GNI Sustainable feedstock report findings supports the position of the RGFI Fully Integrated Business Case for biomethane in that 9TWh of biomethane is practically achievable by 2050, in conjunction with other new innovative technology, utilising the national network of AD biomethane plants to produce bio hydrogen at scale, can be pursued.

Q16. Will there be enough sustainable indigenous supply to meet this demand?

There has been a number of research and reports carried out in relation to sustainable indigenous supply. It is our opinion supported by KPMG/Devenish and Teagasc reports and conclusions that clearly shows that there is sufficient potential for sustainable indigenous supply to meet demand. Project Clover has looked at the sustainability of biomethane production and has concluded that feedstock will not be an issue and that environmental sustainability can be assured through underpinning the development of the sector by an AD Charter, where participants of the scheme, commit to ensure no unintended consequences to the environment.

Q17. Do you agree that for renewable fuel delivered directly to a consumer that this will be the point of supply?

Yes, in principle, the shipper / supplier should be the point of supply. In addition to the supply of the biomethane, the benefits of the Green Gas Certificates are to be passed onto the industry consumers and claimed for end use for renewable heat, in this case. The Green gas Certification Scheme is being implemented by GNI in collaboration with RGFI, is a robust system that is fully transparent and accountable for the certificates in tracing the end use of the biomethane and claiming of carbon credits is essential for consumer confidence in the sustainability of the biomethane to decarbonise their heat demand.

The Green Gas Certification Scheme has been design by Dena & DBFZ to comply with the sustainability criteria under Renewable Energy Directive II & III.

Q18. Which option to you think should be applied for renewable energy that is indirectly supplied (e.g. via the natural gas grid)?

A combination of both Option A & Option B should be considered for biomethane and would be the most economical, fair and equitable approach, ensure no competitive advantages under either Options. As above, the consumer comes first and confidence in the chain of custody for the biomethane and green gas certificates, therefore, a robust system of Green Gas certificates that is fully transparent and accountable for the certificates in tracing the end use of the biomethane and claiming of carbon credits is essential for consumer confidence in the sustainability of the biomethane to decarbonise their heat demand.

The RED II states in Article 23 that "*when adopting and implementing the measures, Member States shall aim to ensure the accessibility of measures to all consumers."*

Q19. Do you think the costs set out above are reflective of likely costs?

Based on the proposed obligation rate the costs set out appear reflective of likely costs, however we recommend that the obligation rate and targets for biomethane needs to be higher, starting at 1% in 2023, increasing to 1.5 in 2024, and upward target out to 2030 to include the 2.5TWh target for biomethane by 2030

Q20. Are these costs reasonable to impose on consumers?

Socialisation is generally accepted as being fair and reasonable approach to decarbonising heat/thermal demand, with cost on consumers is based on consumption levels.

Q21. Do you agree with the intended position in relation to penalties for non-compliance?

The setting on initial targets and annual review of targets should be taking into account the ability for capacity building and delivery of obligation rates, to avoid penalties, regular engagement with the renewable heat industry to advice on appropriate targets is strongly recommended.

Q22. Do you think the proposed obligation poses a significant risk to increased energy poverty?

1. Fossil fuel prices will continue to rise as supply diminishes, price of carbon increases, and as the world moves towards renewable energy to combat the effects of climate change. As renewable energy becomes mature and mainstream, the related technology continues to improve, commitment to ongoing and continuous improvements to efficiencies and competitiveness, its production costs decrease and provides a consistent, long-term indigenous biomethane with security of supply and storage capability. The RHO is central to the development of the biomethane renewable gas sector in Ireland and is therefore helping to address future energy poverty and does not pose a significant risk.

2. Climate change and associated food, water and energy poverty is likely to have the most detrimental effects on the most impoverished people. Therefore the proposed RHO ultimately helps to address energy poverty and does not impose a significant risk. The KPMG report on Decarbonisation of Heat demand 2018, concludes that biomethane is the lowest cost option to decarbonise heat demand.

3. Replacement of fossil fuels improves air quality particularly in inner city areas where poorer people are more likely to be affected. When adopting and implementing the measures referred to in the first subparagraph, Member States shall aim to ensure the accessibility of measures to all consumers, in particular those in low-income or vulnerable households, who would not otherwise possess sufficient up-front capital to benefit.

4. Article 23 outlines that when adopting and implementing the measures referred to in the first subparagraph, Member States shall aim to ensure the accessibility of measures to all consumers, in particular those in low-income or vulnerable households, who would not otherwise possess sufficient up-front capital to benefit.

Q23. How best the impacts on energy poverty could be minimised?

The KPMG Decarbonisation of Heat report concludes that biomethane is the lowest cost option and least disruptive for renewable heat technology available, and supported by the KPMG/RGFI Integrated business case for biomethane in Ireland with a full cost benefit analysis in compliance with Public Spending Code. Biomethane can address energy poverty in an economical practical way.

Q24. Do you agree with the outlined approach for additional support for green hydrogen?

We believe that all renewable gas technologies should be supported, including green hydrogen, which is set to play an important role in the future. However the current priority is to establish the production of biomethane as it is an already proven technology with a full commercial and environmental analysis to support its trajectory.

Q25. Do you think that offering multiple credits for green hydrogen in the heat sector might have unintended consequences for supply in other sectors such as transport?

We recommend that Government engage further with RGFI and industry on this issue to ensure a fair and equitable approach is taken in the roll-out of the development of all renewable gas technologies across all sectors.

General input – any topic not covered in the questions above.

Introduction to Project Clover

In response to the significance, scale and complexity of the sustainability and climate action challenges impacting the competitiveness and legal obligations of the Irish food industry, key industry representatives ("SteerCo Members"), led by Danone Ireland, with Glanbia Ireland, Lakeland Dairies, Dairygold, Carbery Group, Wyeth Nutrition and Tipperary Co-operative formed a collaboration in June 2020 under the banner "Project Clover" .

This agri-food industry collaboration is seeking to assist in the decarbonisation of the Irish food supply chain, using indigenous renewable gas (biomethane) produced on Irish farms. This renewable gas would be used to displace natural gas in industrial processes where other decarbonisation technologies are not suitable. Such technology is fully proven, and Ireland remains one of the few European countries yet to deploy it at scale.

Having previously scrutinised all options for decarbonising their industrial heat processes, including biomass and electrification, the SteerCo Members concluded that switching to biomethane was the most economic and viable option available.

With biomethane available in many other jurisdictions, SteerCo Members are of the view that Ireland's lack of an indigenous biomethane industry will harm the Irish food industry's international competitiveness, impact FDI, and limit Ireland's decarbonisation ambitions under the national Climate Action Plan.

Project Clover represents a shared vision of a fully integrated, agriculture led, on-farm sustainability approach to the decarbonisation of the Irish food supply chain. Central to the vision is the use of indigenous AD biomethane to decarbonise thermal heat processes, commercialisation of its by-product digestate to produce organic fertiliser and monetisation of the currently unquantified soil carbon sequestration on Irish farms.

In September 2020, SteerCo Members commissioned a Phase 1 Feasibility Study for Project Clover under the direction of the Renewable Gas Forum (RGFI) and produced by KPMG with technical input from Gas Networks Ireland, Devenish Nutrition and communications support from Authenticity.

The KPMG Project Clover Feasibility Study Report has concluded that agri-feedstock based biomethane production at scale, is the only feasible way to decarbonise the thermal demand in manufacturing and processing industries in Ireland.

It has shown that 125 x 20GWh AD plants by 2030, generating 2.5TWh of renewable gas per annum is technically, commercially and environmentally feasible. The recent KPMG/Devenish Sustainable Feedstock Report concluded that Ireland has sufficient feedstock potential to supply the proposed AD plants and future expansion to 9TWH by 2050 without impacting or competing with current volumes and usage for animals and food production.

The vision is for:

"A consumer led, at scale, renewable gas industry

- *decarbonising difficult to decarbonise sectors i.e. the thermal demands of industry and agriculture*
- *supporting sustainable feedstock, profitable agriculture and the circular rural economy*
- *aligned with EU and national sustainability and climate action policies*
- underwritten by an AD Charter to ensure no unintended consequences.
- A just transition to achieving targets in emissions reduction by 2030 and carbon zero by 2050."

This vision:

• Aligns with the Paris Agreement, EU Green Deal, Interim Climate Actions 2021 and national targets to reduce emissions.

• Achieves emission reductions, displacing over 680kt CO_2 per annum by 2030, in a way that is commercially viable.

• Support on farm incremental and sustainable forage through the use of bio-fertilisers, multi-species pastures and carbon sequestration.

• Supports security of supply, storage of biomethane and importantly commercial sustainability and competitiveness of the Irish food & beverages industry, including the wider manufacturing and processing sector.

• Supports Irish industry in adapting to future legislative trends including carbon labelling and ESG reporting, and help industry to access sustainable, taxonomy-aligned finance

The agri-based biomethane will be able to comply with EU RED II &REDIII sustainability criteria and will be certified by the Green Gas Certification Scheme being implemented by GNI.

Furthermore, there exists the opportunity for significant economies of scale to capital and operations as the sector matures. This includes clustering and standardisation of the AD plants and their funding.

An overarching body with a formal co-ordination mandate will be required to lead this standardisation, detailed design, funding and will provide ongoing support service to the AD operations, with continuous ongoing improvements, efficiencies and competitiveness.

A significant component of the infrastructure required to facilitate Project Clover is already under development by Gas Networks Ireland, with the first Central Grid Injection facility having secured full planning permission.

While there exists a current economic gap between biomethane and natural gas prices, the Feasibility Study has demonstrated a long-term pathway to economic equivalence. Factors are the rising price of fossil fuels, the rising price of carbon and the commercialisation of the digestate by-product. Carbon farming will play a key role in further reducing carbon footprint and regeneration of soils.

The Project Clover Feasibility Study proposes that a national heat obligation scheme, Article 23 should be implemented no later than 2023, with announcement to the markets before the end of 2021, to support the longer-term ambitions of Project Clover and an indigenous biomethane industry. This will see the incremental cost socialised across a wider pool of energy users.

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