PROJECT FINAL REPORT

BioEnergy Sustaining the Future (BESTF)

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Project acronym: **BESTF**

Project title: **BioEnergy Sustaining the Future: Joint Strategic Planning and Programming to Enable the Implementation of Bioenergy Demonstrations**

Funding Scheme: **ERANET Plus**

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1. Final publishable summary report

1.1 Executive Summary

The BESTF ERA-NET Plus brought together a number of national and transnational organisations with an interest in promoting the greater use of bioenergy. Its aim was to kick-start large scale investment in close-to-market implementation of bioenergy, thereby helping to achieve the key objectives of the European Industrial Bioenergy Initiative (EIBI) Implementation Plan and the Strategic Energy Technology (SET) Plan. In so doing BESTF successfully achieved all the objectives specified in the Energy 2012.10.1.1 ERA-NET Plus call topic.

BESTF addressed the need for integrated action across Europe to promote the development of bioenergy demonstrators across a number of technologies by coordinating research and development projects and providing a financial mechanism to support projects that are close to commercialisation.

The overarching objectives of BESTF were to enable commercial availability of advanced bioenergy at a large scale by 2020 and strengthen EU technology leadership for renewable transport fuels.

These were to be achieved by the implementation of a joint programme for bioenergy demonstration projects to demonstrate enhanced bioenergy technologies that would help Europe progress towards achieving its 2016 and 2020 targets. It used the leverage of public-private partnerships to manage the risks and share the financing of close to market bioenergy projects with the launch of a single joint transnational collaborative funding call with EU top-up funding to support projects. The call enabled the selection and funding of two transnational demonstration size projects. Both projects achieved significant cost reduction results thus enhancing the cost effectiveness of the technology and contributed to commercialisation in the sector.

BioSNG achieved its overarching objective of establishing the basis for the design and delivery of a commercial scale BioSNG plant, and has led to the construction of a commercial scale first of a kind BioSNG facility in Swindon UK that will convert 10,000 tonnes of waste into 22GWh of low carbon BioSNG that will be injected into the local grid (to start operation in 2018). The GHG assessment showed that BioSNG gives an overall saving of 80% compared to fossil gas. This increases to a saving of 142% if the benefit of diverting waste from landfill is taken into account and to 252% if carbon dioxide from the process is sequestered.

BioProGRess aimed to demonstrate a novel technology to simplify gas clean-up following biomass gasification. The technology demonstrated could reduce the investment cost of biomethane plants by up to 30%, increase the efficiency of converting biomass to bio-methane by approximately 5-7% and reduce operational costs by around 10% compared to current processes. The technology (including measurement devices) was implemented at GoBiGas and was tested and evaluated during 2017. The GoBiGas plant was inaugurated in 2015 and in the same year delivered biogas to the grid for the first time. Since its operational start the plant has produced and delivered 65GWh of biogas and in February 2018 the plant reached maximum capacity of 20MW.

BESTF fused joint strategic planning and programming between the Member States that subscribed to enable the implementation of transnational bioenergy demonstration projects. Without the ERANET Plus action this would have been very difficult to achieve. Its outputs also influence those Member States that were not directly involved in the project, helping to bring greater alignment between their bioenergy initiatives and those of the Consortium.

1.2 A summary description of project context and objectives

This BESTF ERANET Plus brought together a number of national and transnational initiatives in the field of bioenergy. These included research, development, demonstration and financial instruments, driven by both public and private participants. By integrating these actions, risk was minimised and confidence provided to private investors in support of bringing bioenergy closer to market and in Europe.

This project's aim was to kick-start large scale investment in close-to-market implementation of bioenergy thereby helping to achieve the key objectives of the European Industrial Bioenergy Initiative (EIBI) Implementation Plan "To enable commercial availability of advanced bioenergy at large scale by 2020, aiming at production costs allowing competitiveness with fossil fuels at the prevailing economic and regulatory market conditions, and advanced biofuels covering up to 4% of transportation energy needs by 2020. To strengthen EU technology leadership for renewable transport fuels, serving the fastest growing area of transport fuels in the world". This project has also contributed to the wider strategic European requirements: to increase the security of energy supply and to increase the sustainability of energy supply.

BESTF implemented a single collaborative funding call, which supported projects focused on the generation of bioenergy: energy generated directly or indirectly from sustainable biomass. These projects were based on prior high quality research undertaken at a European, national or industrial level that required a final "non-economic step to demonstrate the performance and reliability of all critical steps in a value chain so that the first commercial unit can be designed and performance guaranteed from the outcome of the demo unit".

New renewable energy sources (RES) are required to supplement the reduced availability of easy-to access fossil supplies, and to help mitigate their impact on climate change. The development of indigenous European bioenergy supplies is critical to both ensure the security of energy supply and to reduce greenhouse gas (GHG) emissions. Bioenergy is generated from biomass. Biomass is derived from different sources of organic matter; it can be used for heating, electricity production and for transport. Biomass use can significantly reduce GHG emissions as the CO_2 emitted when it is burnt is counterbalanced by the amount absorbed when the feedstock biomass was grown. However the net GHG savings are heavily dependent on the cultivation and fuel production process used. In the Roadmap for Renewable Energy, the European Parliament stressed the sustainability criteria for biofuels. Other RES, such as wind and solar, are inherently intermittent in supply; bioenergy can be used on demand and in a variety of different applications.

The EIBI, now integrated into the European Technology and Innovation Platform Bioenergy (ETIP Bioenergy), aimed to boost the contribution of sustainable bioenergy to the 2020 climate and energy objectives. The EIBI Implementation Plan identified seven bioenergy value chains. These were selected to reflect diversity of feedstock options from across Europe, processing options and different national bioenergy markets. These also reflect the diversity of bioenergy output, which is much broader in nature than simply biofuels. Whilst some of these value chains may also produce high-value by-products, over 70% of the bio-products produced must be bioenergy (calculated on energy content of products sold). BESTF has helped to mitigate the technological and commercial risks in realising these value chains through a public-private partnership approach. A prerequisite for public funding support for projects stimulated by this BESTF action was real, auditable financial support from the commercial sector. The public funding provided the private financial sector with confidence in their long-term investments into building commercial-scale operations.

BESTF ERA-NET Plus promoted joint strategic planning and programming for the implementation of Bioenergy demonstration projects, in accordance with the priorities set out in the EIBI SET-Plan. In the preparation of the objectives, consideration was given to the links between the EIBI, the ERA-NET Plus and the BESTF Joint call. Thus the EIBI drove the ERANET Plus ambitions, which in turn drove the BESTF call. The respective goals, purposes and specific objectives and their interrelationships as shown below:

EIBI	
Goal	Demonstration of supporting projects and/or reference plants for innovative bioenergy value chains with large market potential, based on significantly advanced feed stocks and technological options. Secured financing for subsequent commercial large scale deployment, and for gaining social acceptance, because demonstration of the sustainable and reliable performance of these innovative technologies over the complete value chain is critical.
Purpose	To boost the contribution of sustainable bioenergy to EU 2020 climate and energy objectives.
Specific Objective	To enable commercial availability of advanced bioenergy at large scale by 2020, aiming at production costs (noting that production costs of biofuels depends heavily on investment intensity, on degree of utilisation of primary energy and on feedstock price, with significant differences across geographic areas and specific feedstock types) allowing competitiveness with fossil fuels at the prevailing economic and regulatory market conditions, and advanced biofuels (sustainable biofuels with a broader material base and/or better end product properties than the biofuels currently on the market) covering up to 4% of EU transportation energy needs by 2020. To strengthen EU technology leadership for renewable transport fuels, serving the fastest growing area of transport fuels in the world.

These EIBI goals, purpose and specific objectives, provided the framework for the ERA-NET Plus action:

BESTF ERANET Plus	
Goal	To further the demonstration of enhanced technologies in order to help develop robust project plans for a range of demonstrator and flagship plants progressing towards the targets for demonstrators and flagships for both the 2016 and 2020 targets. Enhanced synergies between national bioenergy programmes, create a coherent collaboration network between promoters of national and regional programmes that can further serve the EIBI and beyond.
Purpose	To contribute to the effective implementation of the core activities of the EIBI. To bring the owners and managers of national and regional R&D programmes in the Member States together with support from the EU via a mixed mode funding mechanism, in order to strengthen the cooperation and coordination of their activities in the area of Bioenergy driving towards 2020 and indeed 2050 goals and targets.
Specific Objective	To launch a single Joint Call for proposals by the promoters of national and/or regional programmes.

The EIBI and ERANET Plus goals, purposes and objectives were the basis for those set for the BESTF joint call as follows:

BESTF Joint Call	
Goal	Encourage the submission of proposals, in which credible processes and technologies for the production of energy and molecules used for energy production are defined and demonstrated.

	Utilisation of existing infrastructure, assets and skills and building on existing initiatives present in Member States, be they publically or privately funded to predicate and deliver projects which demonstrate the commercial and technical viability of the processes to deliver bioenergy from sustainably derived biomass.
Purpose	To support part of the implementation plan of the SET-Plan European Industrial Bioenergy Initiative (EIBI) linked to demonstration projects. The results of the call for expression of interest launched by the EIBI were used by the ERA-NET Plus participants to prepare the joint call.
Specific Objective	To approve and fund several demonstration projects in the field of bioenergy and in accordance with the EIBI priorities. Funding to be provided by the EU, national agencies and private finance. To monitor the progress of resultant projects against milestones, deliverables and budget. To coordinate the dissemination of non-confidential results of the demonstration projects.

The detailed objectives of the BESTF project were to:

1. enable commercial availability of advanced bioenergy at large scale by 2020, aiming at production costs (noting production costs of biofuels depends heavily on investment intensity, on degree of utilisation of primary energy and on feedstock price, with significant differences across geographic areas and specific feedstock types) allowing competitiveness with fossil fuels at the prevailing economic and regulatory market conditions, and advanced biofuels (sustainable biofuels with a broader material base and/or better end product properties than the biofuels currently on the market) covering up to 4% of EU transportation energy needs by 2020;
2. strengthen EU technology leadership for renewable transport fuels, serving the fastest growing area of transport fuels in the world;
3. launch a single joint transnational collaborative funding call with EU top up funding to support projects focused on the next generation of bioenergy (WP2);
4. approve and fund several demonstration projects in the field of bioenergy and in accordance with the EIBI priorities. Funding to be provided by the EU, national agencies and private finance (WP3);
5. monitor the progress of resultant projects against milestones, deliverables and budget (WP4); and
6. disseminate non-confidential results gained from the programme and individual projects across the EU (WP5).

1.3 A description of the main Scientific and Technological results

This section includes the launch and implementation of the BESTF ERANET Plus with information on the Scientific and Technological results of the transnational projects funded by the ERANET.

1.3.1 Call launch and Implementation

The ERANET Plus BESTF joint call was launched on 7th January 2013, and closed to applications on 27th March 2013. The evaluation followed a two-stage process as follows:

Stage 1 - national/regional evaluation – each funding agency reviews the applicants from its country to check that the applicant complies with the appropriate national funding agency rules eg. the applicant is an incorporated entity. Eleven projects were submitted to stage 1 and of these eight were invited to submit a proposal for stage 2 evaluation.

Stage 2 – independent expert panel review – experts were appointed with relevant expertise to evaluate proposals. Each proposal was evaluated by at least three experts using evaluation criteria provided by the consortium. The evaluation criteria were published in the call documents. Three transnational projects were selected for funding. Table 1 below shows the details of the funded projects.

Of the funded projects BioSNG (project cost €4.9M) completed successfully in 2016 and BioProGRess (project cost €5.3M) completed successfully in 2017. However, KANE closed early in 2016 without completing its objectives.

Table 1

Action	Project Acronym	Countries	Company	Completion date
BESTF1	BioSNG	United Kingdom	Advanced Plasma Power Progressive Energy Limited	2016
		Germany	Schmack Carbotech	
	BioProGReSS	Sweden	Goteborg Energi Chalmers University of Technology Renewtec	2017
		Germany	TU Berlin	
	Kane	Denmark	DONG Energy	CLOSED due to technical and commercial factors.
		Finland	Neste Oil	

Total projects costs and grant funding are detailed in Table 2 below:

Table 2

Project Acronym	Total Project Costs €	Grant requested €	EC contribution €
BioSNG	4,888,170	2,457,493	810,975
BioProGReSS	5,321,823	2,325,013	767,254
KANE		1,298,237	428,418
Totals	**10,209,993**	**6,080,743**	**2,006,647**

1.3.3 The Monitoring Process

The European Industrial Bioenergy Initiative (EIBI) sets out a comprehensive list of key performance indicators (KPIs) for RD&I projects. This aligns with the *Monitoring and Review Framework* of the SET plan.

The BESTF projects were monitored against a key subset of these KPI's (see below) in order to meet national reporting requirements of the national agencies funding the call

KPI 1: ***Price before taxes of bioenergy products in 2020 per value chain at point of sale to customer***

- Synthetic liquid fuels by gasification: < €80/MWh
- Biomethane: <= price of natural gas and other synthetic gaseous fuels by gasification dependent upon product, for example: Dimethyl Ether <€60/MWh; compressed H_2<€80/MWh; CO <€30/MWh
- High efficiency heat and power by thermochemical conversion: < €75/MWh_e; <€35/MWh_{th}
- Intermediate bioenergy carriers: <€30/MWh, competitive with Heavy Fuel Oil, but depends on actual product
- Ethanol and higher alcohols from ligno-cellulosic biomass by biological processes: <€80/MWh (equivalent to <€0.50/litre)
- Hydrocarbons by biological processes and/or chemical synthesis: < €80/MWh
- Bioenergy carriers by micro-organisms (algae) from CO_2 and sunlight: < €70/MWh for lipids (to be competitive with vegetable oils and animal fats).

KPI 2: ***GHG savings compared to fossil equivalents***

GHG savings monitored in accordance with the Renewables Directive with the following targets:

- Biofuels and bio-liquids: to be at least 60% saving.
- Other bioenergy products: whilst not defined in the Renewables Directive, in the absence of specific targets, the EC has indicated the use of the 60% target.
- Other energy products: reference data based on the JRC Well-to-Wheels study

KPI 3: ***Total bioenergy produced by EIBI projects (TWh/year)***

Targets to be:

- ***2016***: 25% of 2020 target as an intermediate stage between 2012 to 2020 reflecting maturity of first phase of demonstration projects.
- ***2020***: 35TWh total energy from EIBI projects contributing to the 20% renewables target; 17.5TWh of the 10% biofuels target for transportation will be reached by advanced biofuels

It was recognized that the projects supported by BESTF ended before 2020 and therefore would probably not necessarily achieve the targets within their project lifetime. However, projects were expected to show how (eg. via a roadmap) they would support the achievement of these KPI values by 2020. The two funded transnational projects did make progress in achieving the relevant KPIs.

1.3.4 Project results in detail

1.3.3.1 BioSNG

Project Summary:

BioSNG involved partners from UK and Germany. BioSNG addressed the issue of decarbonising heat as well as providing a low carbon solution for the transport sector. The funding and strategic backing for the project came from the BESTF ERANET programme as well as Ofgem's Network Innovation Competition.

The project aimed to develop an innovative process to convert waste and biomass into bio substitute natural gas (BioSNG) which can be used in the existing UK gas network. This approach would greatly expand the supply of renewable gas over and above existing solutions such as anaerobic digestion (AD). Previously unused waste products diverted from landfill and other biomass material could act as the feedstock for gas generation.

The technology is being showcased at a new demonstration process plant at Advanced Plasma Power's headquarters in Swindon. This facility includes gasification of refuse derived fuel and wood, gas processing, compression, catalytic upgrading to methane and carbon dioxide removal to produce BioSNG. The test plant and associated project is shows the potential of BioSNG from both a technical and commercial perspective, providing both technical demonstration of production as well as operational, economic and carbon performance. It provides the basis for commercialisation and demonstrates the potential for communities to access locally generated renewable gas.

BESTF supported demonstration plant

In the UK the focus is primarily on biomass contained within waste streams as this is the dominant and most economic indigenous resource, with commercial plants scaled for between 100-200,000 tonnes per annum of feedstock which is appropriate for local and regional facilities. With a comprehensive gas network in the UK, access to feedstock is likely to be largest constraint and work undertaken by the project partners has demonstrated that the indigenous supply chain could support 100TWh of BioSNG production.

Similar facilities could be rolled out across Europe. Local policy and resources would dictate the feedstock selection, with typically a focus on biomass rather than waste derived fuels. From a technical perspective, biomass feedstocks present less of a technical challenge than wastes due to lower levels of contamination and tighter specifications.

Details of the project

The project was successfully completed during 2016. It was a first of a kind project internationally, taking biomass from waste streams via gasification to syngas, through gas processing and catalytic conversion to

BioSNG. It achieved its overarching objective of establishing the basis for the design and delivery of a BioSNG plant operating under commercial conditions at forty times scale-up. This is a full chain facility to process 10,000 tonnes per annum of refuse derived fuel or wood-based feedstock producing 22GWh/a of gas, sufficient to heat around 1500 homes or 75 HGVs. This will be injected into the local 2 bar grid at a rate of up to 300 m3/hr. Based on the success of the BESTF ERANET project, funding was secured from the UK's Department of Transport, further support from Ofgem's Network Innovation Competition as well as Cadent to construct this £27million facility. It has almost reached mechanical completion and will be injecting first gas into the grid by the end of 2018. With feedstock contracts at the front end and gas offtake contracts for production it will to operate under commercial conditions to provide the basis for investment in larger commercial scale facilities..

10,000 tonne per annum scaled up plant under construction, based on the BESTF support facility

This has been achieved building on the outcomes from the demonstration plant including:

- The results from experimental work on the demonstration plant which also validated the process engineering models used to underpin the commercial design.
- The procedures and controls developed to operate the demonstration plant safely.
- The solutions to design issues identified in the demonstration plant project.
- The confidence in the performance of BioSNG technology given by the demonstration plant.

During 2016 detailed process modelling was completed, and an extensive suite of tests was undertaken on the demonstration facility and on an offline facility developed as part of the project. Specifically, the following objectives were met:

- Satisfactory operation of each individual plant element was achieved, with experimental results for both the water gas shift and methanation reactions closely in line with expectations.
- Integrated operation of methanation and refining was achieved, both from bottled gas feedstock and waste-derived syngas. This included the successful methanation of waste-derived syngas;

operation of the PSA to remove CO_2 from methanated syngas and enrich methane content; and production of greater volumes of methane than the facility's 50kWth design rating.

- A kinetic model of the methanation reactions was developed based on experimental data and validated using both offline rig and the demonstration plant. This showed good correlation and provides confidence for up-scaling.
- Based on this the operational envelope was assessed in order to optimise the process, specifically the behaviour of the catalysts under different reaction conditions, including temperature, pressure, reactant concentrations and diluents.
- Experimental work demonstrated that steam is effective at controlling the highly exothermic methanation reactions.
- The experimental work demonstrated that it is possible to reduce contaminants in a waste derived syngas through a combination of adsorbents and catalytic conversion to a level that does not damage the sensitive methanation catalysts.
- The demonstration plant required a detailed safety assessment. The procedures for handling explosive gases at high temperatures and pressures developed and tested in the demonstration plant will form the basis for safe operation in commercial facilities.

Designs for large scale commercial plants producing 315GWh/a and 665GWh/a of BioSNG were finalised, informed by the results of experimental testing, process modelling, an assessment of scale up risk and engagement with suppliers. This enabled the development of financial models for a range of commercial plants which showed that whilst smaller first of a kind facilities will require subsidy support, the cost of gas produced by large scale plants of this kind are expected to deliver gas at parity with fossil natural gas. This was instrumental in securing of funding for the 22GWh/a facility and more recently initial development funding for the first 315GWh/a facility. This development work is now under way.

A detailed greenhouse gas assessment was completed. This showed that BioSNG gives an overall saving of 80% compared to fossil gas. This increases to a saving of 142% if the benefit of diverting waste from landfill is taken into account and to 252% if carbon dioxide from the process is sequestered.

Other important outcomes have been related to the increase in the profile of BioSNG generated by the demonstration plant. The facility has been visited by more than fifty organisations including ministers, civil servants, grid distribution companies, regulators, academics, industry and financiers. It has featured in a large number of print, television and radio news stories and project partners have presented the project results at a large number of commercial and academic conferences. The work is also providing the basis for a number of academic papers for submission to well respected energy journals. The first of these is currently undergoing final peer-review for publication.

The results of the project are influencing the strategies of government and industry. In the UK government the Departments for Energy, Transport and Environment are all considering the role of BioSNG in future heat, transport and waste policy. In the UK, the Renewable Heat Incentive includes BioSNG as a supported form of heat. In 2018, the legislation for the UK Renewable Transport Fuel Obligation was specifically changed to include BioSNG as being eligible for enhanced support as a Development Fuel. This would not have been the case without this project.

Issues and how they were overcome

- Phasing funding which impacted on cash flow was a constraint issue particularly towards the end of the project.

- The original programme did not allow sufficient time for value engineering. This led to a delay at the start of the project, although there was sufficient contingency to ensure all the work could be completed.
- It became clear the demonstration facility was too large to allow all of the optimisation work set out in the test plan. The partners built a smaller offline facility that provided more flexibility and greatly increased the range of experiments that could be completed under the project.
- The thermal losses from the demonstration plant were greater than expected, predominately because of higher operating temperatures. Increased throughput and thermal lagging was used to address this problem.

Added value and the future

Towards the end of the project in November 2016 a major stakeholder event was held with over 100 key individuals from government, regulatory bodies, industry and the media. The event provided an opportunity to disseminate the key findings from this programme. It also featured the start of practical work on the 22GWh, £27m plant and an announcement from Cadent (formerly National Grid) regarding their investment to complete the funding package. That project is now reaching mechanical completion and will be injecting first gas by the end of 2018.

This facility provides the basis for financing the first wave of larger scale commercial plants. Funding has been secured for the initial development of the first of these 320GWh/a facilities, which is now underway and is expected to start construction in late 2019. BioSNG offers lower costs to consumers than other forms of low-carbon heat while allowing them to continue to heat their homes using existing boilers and radiators. For transport, BioSNG is one of the few cost-effective pathways for decarbonising heavy goods transport.

By 2050 it is possible that large elements of gas networks may have partially or wholly converted to hydrogen. One of the insights gained from this BioSNG demonstration project is that the platform has the potential to produce Biohydrogen, which when combined with storage of the pre-captured carbon dioxide can offer even greater carbon savings.

The BioSNG vision for 2050 is a network of municipal scale facilities, with the potential in the UK for injection of around 100TWh per annum of low carbon gas for heat and transport. This vector is well suited to other countries with established and extensive gas networks, such as Holland and Germany.

For further details of the project please see Annex I – Detailed BioSNG project report

1.3.3.2 BioPRoGRess

Project Summary

This multidisciplinary project involved partners from Sweden and Germany, it was coordinated by Gothenburg Energy with Chalmers University of Technology, Technische Universitat Berlin and Renewtec AB as project partners. In addition Wandschneider + Gutiahr and AMENKO were involved as subcontractors.

The main objectives were to develop, implement and demonstrate new innovative syngas cleaning methods in both a pilot and in an industrial scale gasification facility in order to reduce costs. **All cost reduction calculations relate to an industrial scale plant with an output of 150MW and with a design based on the GoBiGas 1 plant**.

Project target savings were to reduce certain investment costs, of an industrial scale plant by up to 30%. For the purposes of the project investment costs included gasification, gas cleaning and methanation only and excluded building and commissioning costs (Investment Costs)**.**

It was estimated that variable costs would also reduce by at least 10% and the amount of biomethane produced in the process would increase by up to 10% (from the same amount of biomass). For the purposes of the project variable costs included fuel, rapeseed methyl ester (RME) and consumables (Variable Costs).

In addition a novel online tar measurement technique was to be demonstrated and implemented in an industrial environment (GoBiGas 1) in order to monitor and control gas cleaning.

Details of the project

The project commenced on 1st September 2014, the work plan was improved during implementation to ensure that the project results are readily usable.

As a transnational project, collaborative work has involved different national academic and industrial partners, transferring knowledge from the laboratory to a pilot and demonstrated at an industrial scale.

For example, TU Berlin contributed to testing the technology (including measurement devices) at Chalmers pilot plant gasifier, and the results were evaluated and used as input for improvements to the measurement system and planning of the installation at GoBiGas I.

Gas cleaning and online tar measurements were developed and implemented in a cost efficient way and successfully demonstrated in both the Chalmers gasifier (2-4 MW) and in the world's first industrial scale bioSNG plant (32 MW), GoBiGas I. The cleaning technology is designed for a dual bed gasifier and would require adaption prior to application in a single bed gasifier. The tar measurement technology is fully fliexible and could be used in any biomass gasifier.

The GoBiGas I demonstration unit with a dual fluidized bed gasifier is the biggest of its kind. A dual fluidized bed gasifier above 100 MW is not available due to the immaturity of the technology, but is envisaged by phase two of the GoBiGas Project. Given current understanding of catalytic effects and the successful implementation in the demonstration unit, the dual fluidized bed gasifiers can be scaled to capacities in excess of 100 MW.

The main objectives of the project were achieved as follows:

Reduction of Investment Costs by up to 30%

For a plant with an output of 150MW and of the size and design of GoBioGas 1 a reduction of 10% of the Investment Costs can be achieved by introducing the chemical looping reforming technology (CLR) and replacing the rapeseed methyl ester (RME) scrubber and parts of the active carbon beds with a heat exchanger/condenser.

Further reductions in the Investment Costs can be achieved when scaling. If the CLR technology was introduced into a plant of the size of 150 MW_{th} fuel input (ie five times greater than the GoBioGas I plant) the total reduction in Investment Costs for such a unit (including CLR) would increase signficantly.

Reduction of the Variable Cost by more than 10%

The stabilized tar composition allows for alternative cleaning methods using the proposed implementation of the coated heat exchanger/condenser technology. Using the coated plate heat exchanger with high gas quality means that scrubbing with RME becomes unnecessary. As RME consumption corresponds to 5-7 % of the Variable Cost of the GoBiGas I demonstration plant a saving of this amount is possible.

Increase the amount of biofuel produced by up to 10% using the same fuel input

Tar in raw gas produced from DFB gasification can, in poor conditions, account for up to 10% of the energy produced. When the tar is converted to syngas biofuel production is increased by up to 10%. Implementing the optimization of chemistry in the gasification process at Chalmers and GoBiGas resulted in a reduction of the tar yield of 4% compared to the start-up conditions and a reduction of 2% of the tar yield relative to normal activation over time. More importantly the remaining part of the tar produced could be valorized as additional product as a result of the stabilization of the hydrocarbon mixture.

Implementation of an online tar measurement

Developed by the research group in Berlin, this demonstrated new ways to monitor and control the operation of the gasifier and the gas cleaning equipment. Stable operation of the device over days then weeks was achieved in a challenging industrial environment. Cost reductions were achieved using recently available high-power UV-diodes instead of a laser. As a result of the collaborative measurements and identified needs a simplified device was designed, which was used along side the conventional gas analysis at the plant, continuously monitoring the lighter fraction of condensables (e.g. naphthalene) in cleaned gas after the scrubber. The device is fully integrated into the plant control system and can be applied to any other gasification application.

Issues and how they were overcome

Despite delays to grant negotiation in 2013 an initial slow spend rate, and a fire at the Swedish installation in 2017 the project made good progress and completed successfully.

Added value and the future

Planned next steps were to implement the syngas cleaning technology at a full-scale dual fluidized-bed gasifier (150MW) which would have been at the Goteborg Energi GoBiGas phase 2 plant. In March 2018 the management and board of Goteborg Energi decided to discontinue the project and stopped operations at the GoBiGas plant.

The BioProgress syngas cleaning methods were proven at a demonstration scale (GoBiGas I) but it is not currently possible to scale up to a commercial size plant to implement the results at a larger scale. Once a commercial scale plant becomes feasible the innovations can be implemented.

All funding organisations were invited to a project presentation and study tour at the installations at Chalmers and GoBiGas I during 2017.

For further details of the project please see Annex II – Detailed BioProGress project report

1.4 The potential impact (including the socio-economic impact and the wider societal implications of the project so far) and the main dissemination activities and exploitation of results

1.4.1 Impact - socio-economic impact

1.4.1.1 BESTF ERA-NET Plus Impact Assessment

BESTF fused joint strategic planning and programming between the Member States that subscribed to enable the implementation of bioenergy demonstrations. Its outputs also influence those Member States that were not directly involved in the project, helping to bring greater alignment between their bioenergy initiatives and those of the Consortium.

The ERANET Plus action, not only facilitated the cooperation and coordination of Member States, but enabled the availability of significant funding, by combining both Member States and EC funds, in order to boost the demonstration of large Bioenergy projects and facilitate commercialization. The funded transnational projects exemplified this achievement by realizing two demonstration size projects both with significant cost reduction results which further progressed commercialization in the sector. Project BioSNG contributed to the launch of the world's first commercially operating BioSNG plant (UK). Project BioProgress developed and implemented gas cleaning and online tar measurements demonstrated in the world's first industrial scale BioSNG plant (Sweden).

In addition to the funding of demonstration projects, the resultant cooperation between funding agency partners lead to the consortium members implementing further calls (without EC top up) in the BioEnergy sector which have lead to the funding of further projects. These calls fund lower TRL projects and contribute to greater knowledge and learning in the sector.

1.4.1.2 Transnational Projects Impact assessment

BioSNG offers the simplest and lowest cost solution to decarbonising heat and transport. The launch of the world's first commercially operating BioSNG plant in 2018 making gas from waste has marked further progress in the UK's rapidly growing green gas market. The new plant will produce up to 22GWh of substitute natural gas per year from 10,000 tonnes of household waste and aim to reduce greenhouse gas emissions by more than 5000 tonnes per year. The low carbon BioSNG technology has the potential to provide 100TWh of green gas per year; enough to fuel all of Britain's HGVs or meet one third of domestic heating demand. The decarbonisation of domestic heat and heavy goods transportation are two significant challenges facing Europe as it moves to a low carbon economy, and the use of green gas will have a key role to play.

Innovate UK and BEIS were extremely pleased to witness the successful BioSNG project achieve the BioSNG pilot plant deliverables within the BESTF program which led to further funding leverage towards the UK build of a full scale £25M demonstration plant to be completed and delivering biogas to the UK national grid in 2018. It is also worthy to note that independent recognition of this European endeavor saw the BioSNG consortia 'go green gas' win the prestigious UK Energy Institute prize in November 2017.

Project BioProgress developed and implemented gas cleaning and online tar measurements in a cost efficient way and successfully demonstrated this in the world's first industrial scale BioSNG plant (32 MW), GoBiGas I, Sweden.

When GobioGas-I was build, no supplier was offering a dual fluidized bed gasification system in the size range 50-150MW due to up scaling uncertainties. The new syngas cleaning method based on looping of catalytic materials (CLR) shows that **catalytic effects are independent of scale and therefore can be utilized independent of the design of the gasifier bed and the fuel feeding strategy**. This will allow up scaling to capacities well above 100 MW.

The introduction of CLR improves the economics of biofuel production by gasification and enables up scaling to commercial size plants, however, the high investment cost remain an issue.

CLR gives the opportunity to use new insights on fuel feeding and reactor design to form the basis of a process layout that utilizes CLR in combination with existing fluidized boilers. By complementing the combustor with a gasification reactor a dual fluidized bed system is generated. As existing boilers in district heating, pulp, paper and saw mills are retrofitted the investment costs will be lowered. The cleaning technology is designed for a dual bed gasifier and would require adaption prior to application in a single bed gasifier. The tar measurement technology is fully fliexible and could be used in any biomass gasifier.

1.4.2 Dissemination activities and exploitation of results

1.4.2.1 Dissemination objectives

The final objective of BESTF was to promote dissemination and exploitation of the ERA-Net Plus BESTF project and the projects it supported. This included to

- present the ERA-Net Plus BESTF project to relevant national and transnational policy makers, industry, the Research and Development base and the investment and financial communities.
- highlight the interaction of the “BESTF” project with the EIBI, the EC SET plan and other relevant initiatives.
- report on and work with all actors to deliver and facilitate learning and development on outputs and value delivered from the BESTF project portfolio and the processes employed in the BESTF ERANET Plus project

1.4.2.2 Fundamental Project outcomes

Further Bioenergy ERANETs were formed in subsequent years being BESTF2 (ERANET Plus) and laterally BESTF3 (ERANET Cofund). It was decided by the Management Group that the most efficient and effective method of dissemination would be to align all BESTF dissemination activities. This has worked well enabling the dissemination of the BESTF projects as a whole to stakeholder groups.

1.4.2.3 Dissemination of BESTF model

The lessons and experience of the BESTF model have been utilized in the subsequent BioEnergy ERANETs BESTF2 and BESTF3. The BESTF network also led to the formation of a separate ERANET BioEnergy network which has aligned with the BESTF programmes and has launched a succession of calls (without EC funding).

1.4.2.4 Dissemination highlights

Presentations at industry conferences and seminars

BioSNG and BioProGReSS were presented in a parallel event to the 24th European Bioenergy Conference on 6 June 2016 in Amsterdam entitled "EU support for bioenergy demonstration projects: current state and developments". The link below gives further details:

http://www.eubce.com/conference/parallel-events-workshops/parallel-events/eu-support-for-bioenergy-demonstration-projects-current-state-and-developments.html

On 14th June 2017 BESTF and ERA-Net Bioenergy organised a joint seminar, together with ETIP Bioenergy entitled "Bioenergy – from research to market deployment in a European context". The seminar addressed the market deployment challenge and discussed how to bridge the gap between research, demonstration projects and industry.

The workshop was organised as a side event at the European Biomass Conference (EUBCE) in Stockholm and attracted about 50 stakeholders from research, industry and governmental organisations.

The morning session focussed on the results and main highlights of the BESTF projects, followed by a selection of the ERA-NET Bioenergy projects covering a broad spectrum of Technology Readiness Levels (TRL). The project coordinators gave presentations which were followed by a lively discussion with all the speakers.

During the afternoon session BESTF and ERA-Net Bioenergy joined forces with the European Technology and Innovation Platform Bioenergy (ETIP Bioenergy), the European Energy Research Alliance (EERA) Bioenergy Joint Programme, and the European Technology and Innovation Platform Renewable Heating and Cooling (ETIP RHC) to host an interactive session focussing on how to strengthen the market uptake of advanced biofuels and bioenergy under the new Strategic Energy Technology Plan (SET-Plan) Key Action 8 (Renewable fuels and bioenergy). A key conclusion was the influence of wider commercial factors, for example availability of finance often linked to investor confidence, or the cost of other forms of energy, which impact on decisions to implement commercial scale plants.

This was an ideal opportunity to join forces and showcase and promote the results so far of both BESTF and ERA-net Bioenergy to a diverse group of stakeholders including those from research, industry and government.

Newsletters

BESTF and ERA-NET Bioenergy have published two joint Newsletters, one in December 2016 and one in November 2017.

News from both networks was included and disseminated to the bioenergy community.
A brochure entitled "Bioenergy from research to Market Deployment" was published in June 2017 to promote the results of the BESTF projects so far with links to ERA-NET Bioenergy.

http://eranetbestf.net/wp-content/uploads/2017/08/Brochure-Bioenergy-from-Research-to-Market-Deployment-in-a-European-Context-v2-web.pdf

1.4.2.5 List of dissemination activities

Table 2 below itemises the major dissemination activities which have take place during the period of the project.

Activity	Country	Date	Stakeholder	Outcome
Presentation	Navarra	Dec-11	DG Enterprise and Innovation	Informing the DG of participation in the scheme and benefits
Report	Sweden	2012	Swedish Government	Informing the Swedish government of participation in the scheme and benefits
Tekes internet, launch event, seminars	Finland	Oct-Dec 2012	Industry and academia	Advertising the opportunity for funding
Early Market Engagement document	UK	Nov-12	Industry and academia	Document issued in UK to prepare industry for upcoming call
Webinar	UK	Dec-12	Companies	Providing orientation to companies regarding their project ideas and how to proceed
Briefing	UK	Jan-13	UK Energy Ministers	Informing UK Ministers of the scheme
BESTF information meeting	Sweden	Jan-13	Swedish industry	Informing industry of scheme and providing guidance on application and eligibility
SWEA website updates	Sweden	Jan-13	Swedish bioenergy stakeholders	Dissemination of opportunity to Swedish industry
Publication in the Official Journal	Navarra	Jan-13	General public	Official Communication of the opportunities for funding
Publication in the Official Government webpage	Navarra	Jan-13	Actors in the innovation sector of Navarra	Providing information to companies potentially interested
Publication in the Catalogue of Services of the Service of Innovation	Navarra	Jan-13	Companies with interest in the call	Providing detailed information on call procedure and documentation needed
Press release	Germany	Jan-13	German industry and bioenergy stakeholders	Informing of call launch
BESTF Presentation to EIBI team	N/A	27-Feb-13	EIBI	Update on BESTF progress
Press article in Euro Heat and Power	Germany	Mar-13	German bioenergy stakeholders	
BESTF Presentation – SET plan conference	N/A	08-May-13	EU Industry, academia and funding agencies	Update on BESTF scheme and outcomes
Attendance and presentation at ERANET SMARTGrids team meeting	N/A	12-Jun-13	EU funding agencies, ERANET community	Share best practice and lessons learned from implementing ERANET plus BESTF
Representation on panel at EIBI conference	N/A	26-Jun-13	Industry, academia and funding agencies	Answer queries on ERANET plus scheme
BESTF Presentation to EIBI team	N/A	27-Jun-13	EIBI	Update on BESTF progress

Activity	Country	Date	Stakeholder	Outcome
Article in ERALEARN newsletter	N/A	Sep-13	EU ERANET community	Information regarding the ERANET plus mechanism
Presentation	Navarra	Oct-13	DG Enterprise and Innovation	Informing the DG of evaluation results
BESTF Presentation to EIBI team	N/A	05-Nov-13	EIBI	Update on BESTF progress
Briefing	UK	Feb-14	UK Energy Ministers	Informing UK Ministers of successful projects
BESTF internet, Tekes internet	Finland	Mar-14	Industry and academia	Dissemination of outcomes of BESTF1, including benefits of participation in scheme for industry partners
Information meeting	Sweden	Mar-14	Swedish bioenergy stakeholders	Dissemination of results of BESTF1 and publicising future opportunities
Poster presentation – European Bioenergy Conference	N/A	26-Jun-14	All bioenergy stakeholders	Present ERANET plus best practice and results to date
Annual Report	Finland	2014	Finnish Ministry	Informing Ministry of participation and output of the scheme
Annual Report	Sweden	2014	Swedish Ministry	Informing Governemnt of the results of the evaluation
European Bioenergy Conference	Netherlands	Jun-16	All bioenergy stakeholders	BioSNG and BioProGress presented in a parallel event
Briefing	UK	Jun-16	UK Energy Ministers	Informing UK Ministers of results of projects
BESTF Newsletter	N/A	Dec-16	All bioenergy stakeholders	Update on BESTF progress
Joint seminar with ETIP Bioenergy	Sweden	Jun-17	All bioenergy stakeholders	Seminar addressing market deployment challenges
Event brochure	N/A	Jun-17	All bioenergy stakeholders	Promoting the results of BESTF projects
BESTF Newsletter	N/A	Nov-17	All bioenergy stakeholders	Update on BESTF progress

1.5 The address of the project public website as well as relevant contact details.

BESTF ERANET **http://eranetbestf.net**

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2.1 Use and dissemination of foreground

Section A (public)

BESTF Partners

TEMPLATE A2: LIST OF DISSEMINATION ACTIVITIES

No.	Type of Activity	Main Leader	Title	Date/Period	Place	Type of audience	Size of audience	Countries addressed
1	Presentation	DRIEMA	Internal briefing/presentation	Dec-12	Navarra	Policy makers	1-50	Spain
2	Other	SWEA	Report	2012	Sweden	Policy makers	1-50	Sweden
3	Web	TEKES	Tekes internet, launch event, seminars	Oct-Dec 2012	Web	Science Community and Industry	1-500	EU
4	Other	DECC	Early Market Engagement document	Nov-12	London	Policy makers	1-20	UK
5	Workshop	DECC	Webinar providing orientation to companies regarding their project ideas and how to proceed	Dec-12	Web	Industry	1-500	UK
6	Other	DECC	Briefing informing UK Ministers of the scheme	Jan-13	London	Policy makers	1-20	UK
7	Presentation	SWEA	Informing industry of scheme and providing guidance on application and eligibility	Jan-13	Sweden	Industry	1-500	Sweden
8	Web	SWEA	Dissemination of opportunity to Swedish industry	Jan-13	Web	Industry	1-500	Sweden
9	Publication	DRIEMA	Publication in the Government Official Journal of the opportunities for	Jan-13	Navarra	Civil Society	1-500	Spain

			funding					
10	Web	DRIEMA	Publication in the Official Government webpage providing information to companies potentially interested	Jan-13	Navarra	Industry	1-500	Spain
11	Publication	DRIEMA	Publication in the Catalogue of Services of the Service of Innovation on call procedure and documentation needed	Jan-13	Navarra	Industry	1-500	Spain
12	Press release	FNR	Information on call launch	Jan-13	Germany	Science Community and Industry	1-500	Germany
13	BESTF Presentation to EIBI team	DECC	Update on BESTF progress to EIBI team	27-Feb-13	London	Policy makers		UK
14	Press release	FNR	Press article in Euro Heat and Power	Mar-13		Science Community and Industry	1-200	Germany
15	Presentation	DECC	BESTF Presentation – SET plan conference; update on BESTF scheme and outcomes	08-May-13		Science Community Industry and Policy Makers	1-500	EU
16	Presentation	DECC	Attendance and presentation at ERANET SMARTGrids team meeting - Share best practice and lessons learned from implementing BESTF	12-Jun-13		Science Community Industry and Policy Makers	1-50	EU
17	Conference	DECC	Representation on panel at EIBI conference - Answer queries on ERANET plus scheme	26-Jun-13		Science Community Industry and Policy Makers	1-50	EU
18	Presentation	DECC	BESTF Presentation to EIBI team - update on BESTF progress	27-Jun-13		Policy Makers	1-50	EU
19	Publication	DECC	Article in ERALEARN newsletter - information regarding the ERANET plus	Sep-13		Policy Makers	1-500	EU

			mechanism					
20	Presentation	DRIEMA	Informing the DG of evaluation results	Oct-13		Policy Makers	1-50	EU
21	Presentation	DECC	BESTF Presentation to EIBI team - Update on BESTF progress	05-Nov-13		Policy Makers	1-50	EU
22	Presentation	DECC	Briefing - Informing UK Ministers of successful projects	Feb-14	London	Policy Makers		UK
23	Web	TEKES	BESTF internet, Tekes internet - Dissemination of outcomes of BESTF, including benefits of participation in scheme for industry partners	Mar-14	Web	Science Community and Industry		EU
24	Presentation	SWEA	Dissemination of results of BESTF1 and publicising future opportunities	Mar-14		Science Community Industry and Policy Makers		Sweden
25	Presentation	NA	Poster presentation – European Bioenergy Conference - Present ERANET plus best practice and results to date	26-Jun-14		Science Community Industry and Policy Makers		EU
26	Publication	TEKES	Annual Report - Informing Ministry of participation and output of the scheme	2014		Policy Makers		Finland
27	Publication	SWEA	Annual Report Informing Government of the results of the evaluation	2014		Policy Makers		Sweden
28	Conference	RVO	European Bioenergy Conference - BioSNG and BioProGress presented in a parallel event	Jun-16		Science Community, Industry and Policy Makers	1-500	EU
29	Presentation	DECC/BEIS	Briefing - Informing UK Ministers of results of projects	Jun-16	London	UK Energy Ministers		UK
30	Publication	FNR/RVO	BESTF Newsletter - Update	Dec-16	NA	Science		EU

			on BESTF progress			Community, Industry and Policy Makers		
31	Presentation	SWEA	Joint seminar with ETIP Bioenergy - Seminar addressing market deployment challenges	Jun-17		Science Community, Industry and Policy Makers		Sweden
32	Publication	RVO	Event brochure - Promoting the results of BESTF projects	Jun-17		Science Community, Industry and Policy Makers		EU
33	Publication	FNR/RVO	BESTF Newsletter - Update on BESTF progress	Nov-17		All bioenergy stakeholders		EU

Project BioSNG

TEMPLATE A1: LIST OF SCIENTIFIC (PEER REVIEWED) PUBLICATIONS, STARTING WITH THE MOST IMPORTANT ONES

NO.	Title	Main author	Title of the periodical or the series	Number, date or frequency	Publisher	Place of publication	Year of publication	Relevant pages	Permanent identifiers[1] (if available)	Is/Will open access[2] provided to this publication?
1	*Analysis of syngas methanation for bio-SNG production from wastes: kinetic model development and pilot scale validation*	*Massimiliano Materazzi, Fabio Grimaldi, Pier Ugo*	*Fuel Processing Technology*	*Volume 167, 2017*	*Elsevier*	*Netherlands*	*2017*	*pp 292-305*	https://doi.org/10.1016/j.fuproc.2017.07.009	no

[1] A permanent identifier should be a persistent link to the published version full text if open access or abstract if article is pay per view) or to the final manuscript accepted for publication (link to article in repository).
[2] Open Access is defined as free of charge access for anyone via Internet. Please answer "yes" if the open access to the publication is already established and also if the embargo period for open access is not yet over but you intend to establish open access afterwards.

		Foscolo, Phillip Cozens, Richard Taylor, Chris Chapman								
2	*Production of BioSNG from waste derived syngas: pilot plant operation and preliminary assessment*	*Massimiliano Materazzi, Richard Taylor, Chris Manson Whitton, Phillip Cozens.*	*International Journal of Integrated Waste Management, Science and Technology*	*With editor following review*	*Elsevier*	*Netherlands*	*Expected 2018*		https://www.researchgate.net/publication/327378572_Production_of_BioSNG_from_waste_derived_syngas_Pilot_plant_operation_and_preliminary_assessment https://www.sciencedirect.com/science/article/pii/S0956053X1830518X	
3	*Book: "Substitute Natural Gas from Waste: Technical Assessment and Industrial Applications of Biochemical and Thermochemical Processes"*	*Chapter authors including Massimiliano Materazzi, Richard Taylor (APP), Phillip Cozens Chris Manson Whitton (PEL), David Pickering (Cadent)*	*Elsevier S&T Books*	*In draft*	*Elsevier*	*Netherlands*	*Expected 2018*		*Link available once published*	

TEMPLATE A2: LIST OF DISSEMINATION ACTIVITIES

NO.	Type of activities[3]	Main leader	Title	Date/Period	Place	Type of audience[4]	Size of audience	Countries addressed
1	*Website*	*APP*	*www.gogreengas.com*	*30/05/2014 & relaunched 18/12/2015*	*Web*	*All types*	*Annual traffic 5,176 sessions. (measured Apr 2016-Mar 2017)*	*International*
2	*Conference*	*Cadent*	*World Gas Conference*	*May 2015*	*Paris*	*All types*	*300+*	*International*
3	*Conference*	*Cadent*	*Utility Week Live*	*April 2016*	*Birmingham*	*All types*	*100*	*Mainly UK*
4	*Conference*	*Cadent*	*Biomethane Day*	*May 2017*	*Birmingham*	*All types*	*200*	*Mainly UK*
5	*Conference*	*APP*	*Biomethane Day*	*May 2018*	*Birmingham*	*All types*	*200*	*Mainly UK*
6	*Conference*	*Cadent*	*Low Carbon Networks and Innovation Conference*	*October 2016*	*Manchester*	*Industrial*	*200*	*Mainly UK*
7	*Conference*	*PEL*	*Future of Biogas Europe*	*November 2017*	*London*	*All types*	*200*	*International*
8	*Conference*	*PEL*	*European Biomass Conference*	*June 2016*	*Holland*	*All types*	*50*	*International*
9	*Conference*	*PEL*	*European Biomass Conference*	*June 2017*	*Stockholm*	*All types*	*50*	*International*
10	*Conference*	*PEL*	*Bioresources Conference*	*September 2016*	*Durham*	*Industrial*	*100*	*International*
11	*Conference*	*PEL*	*IEA Bioenergy Special project on Bio-CCS*	*January 2018*	*Brussels*	*All types*	*50-100*	*International*
12	*Conference*	*APP PEL Cadent*	*2G Biomethane Workshop (Engie)*	*October 2016*	*Lyon*	*All types*	*100*	*International*
13	*Conference*	*PEL*	*Bioenergy Trade mission*	*March 2016*	*Oslo*	*All types*	*100*	*International*
14	*Conference*	*PEL*	*EUA Gas 2017 – The Future Role of Gas in the UK*	*November 2017*	*Burton*	*Industry*	*100*	*UK*
15	*Conference*	*Cadent PEL*	*China Britain Trade Expo 2017*	*January 2017*	*London*	*All types*	*300 + live stream to China*	*International*

[3] A drop down list allows choosing the dissemination activity: publications, conferences, workshops, web, press releases, flyers, articles published in the popular press, videos, media briefings, presentations, exhibitions, thesis, interviews, films, TV clips, posters, Other.

[4] A drop down list allows choosing the type of public: Scientific Community (higher education, Research), Industry, Civil Society, Policy makers, Medias, Other ('multiple choices' is possible).

16	Conference	PEL	International Bioenergy Conference	March 2017	Manchester	Scientific community	200	International
17	Conference	APP	Regatec	May 2018	Toulouse	Scientific community	200	International
18	Conference	APP PEL	World Energy to Waste Summit	May 2018	London	All types	200-300	International
19	Other: Site Visits/ presentations	APP PEL Cadent	Over 40 industrial company site visits including Gas industry Potential suppliers Contracting companies Waste companies End users Consultants	2015 onwards to date	Swindon	Industry	1-20 per visit	UK
20	Other: Site Visits/presentations	APP PEL Cadent	**Government agencies:** Ofgem, DECC, BEIS, Innovation UK, Environment Agency, Department for Transport, Committee on Climate Change **Politicians**, Ed Miliband, then Leader of the Opposition, Andrew Jones, Transport Minister, Local Members of Parliament	2015 onwards to date	Swindon	Policy makers	Up to 10 per visit	UK
21	Other: Site Visits/presentations	APP PEL Cadent	**Academia:** University College London, Imperial College London, EPSRC Supergen Bioenergy Hub	2015 onwards to date	Swindon	Scientific Community	Up to 15 per visit	UK
22	Visit: Launch event	APP PEL Cadent	Commercial demonstration plant launch	November 2016	Swindon	All	100	UK
23	Energy Institute (EI) Technology Award	Cadent	Technology Award	November 2017	London	Industry	400	UK
24	Media	Cadent APP PEL	BBC Radio and TV and ITV, Daily Mail, Daily Telegraph and the Guardian,CIWM Journal, Gas International, Resource, Lets Recycle, Materials Recovery Weekly, and Recycling and Waste World,	2015 onwards	Media	All	Up to ~500,000 circulation	UK

TEMPLATE A1: LIST OF SCIENTIFIC (PEER REVIEWED) PUBLICATIONS, STARTING WITH THE MOST IMPORTANT ONES

NO.	Title	Main author	Title of the periodical or the series	Number, date or frequency	Publisher	Place of publication	Year of publication	Relevant pages	Permanent identifiers[5] (if available)	Is/Will open access[6] provided to this publication?
1	*Effect of ash circulation on the performance of a dual fluidized bed gasification system*	*Sébastien Pissot*	*Biomass and Bioenergy*	*Volume 115, 2018*	*Elsevier Ltd*		*2018*	*Pages 45-55*	ISSN 0961-9534, https://doi.org/10.1016/j.biombioe.2018.04.010.	yes
2	*Advanced biofuel production via gasification – lessons learned from 200 man-years of research activity with Chalmers' research gasifier and the GoBiGas demonstration plant*	*Henrik Thunman*	*Energy Science & Engineering*	*Volume 6, Issue 1*	*Wilwy*		*21 February 2018*	*Pages 6-34*	*https://doi.org/10.1002/ese3.188*	*yes*
3	*Bed material as a catalyst for char gasification: The case of ash-coated olivine activated by K and S additionexisting dual fluidized bed gasification Systems*	*Teresa Berdugo*	*Fuel*	*Volume 224,*	*Elsevier Ltd*		*2018*	*Pages 85-93*	https://doi.org/10.1016/j.fuel.2018.03.079. *ISSN 0016-2361*	*yes*
4	Reactive Test Gas Generation Combined	*Neubauer, Y. et al.*	*Submitted to Biomass and*							

[5] A permanent identifier should be a persistent link to the published version full text if open access or abstract if article is pay per view) or to the final manuscript accepted for publication (link to article in repository).

[6] Open Access is defined as free of charge access for anyone via Internet. Please answer "yes" if the open access to the publication is already established and also if the embargo period for open access is not yet over but you intend to establish open access afterwards.

	with on-line Tar Monitoring and Comparison with Off-Line Liquid Samples Analysis.		*Bioenergy, 10/2017*							
5	*Recirculation of reactive fines–an optimization strategy for existing dual fluidized bed gasification Systems*	*Sébastien Pissot*	*25th Europea n Biomass Conference & Exhibition*						*Bioprogress.se*	*Yes*
6	*Understanding the start-up – Knowledge transfer from bed material testing at Chalmers to the operation of the GoBiGas gasification unit*	*Martin Seemann*	*24th European Biomass Conference & Exhibition*						*Bioprogress.se*	*yes*

TEMPLATE A2: LIST OF DISSEMINATION ACTIVITIES

NO.	Type of activities[7]	Main leader	Title	Date/Period	Place	Type of audience[8]	Size of audience	Countries addressed

[7] A drop down list allows choosing the dissemination activity: publications, conferences, workshops, web, press releases, flyers, articles published in the popular press, videos, media briefings, presentations, exhibitions, thesis, interviews, films, TV clips, posters, Other.

[8] A drop down list allows choosing the type of public: Scientific Community (higher education, Research), Industry, Civil Society, Policy makers, Medias, Other ('multiple choices' is possible).

1	*Conference*	*Julian Borgmeyer*	*tcbiomass 2015,*	*September 2015*	*Chicago*	*Scientific community/industry*		*USA*
2	*Conference*	*Henrik Thuman*	*tcbiomass 2015,*	*September 2015*	*Chicago*	*Scientific community/industry*	*Plenary presentation >100*	*USA*
3	*Popular science article*	*Jörgen Held*	*Energy insight*	*2016*				
4	*Poster*	*Stephan risse*	*Regatech*	*May 2016*	*Malmö*	*Scientific community / Industry*	*200*	*EU*
5	*Confernce*	*Jörgen Held*	*Regatech*	*May 2016*	*Malmö*	*Scientific community / Industry*	*200*	*EU*
6	*Conference*	*Martin Seemann*	*Methanation and Second Generation Fuels,*	*19-20 May 2016,*	*Nuremberg, Germany*	*Scientific community / Industry*	*80*	*EU*
7	*Conference*	*Jörgen Held*	*Methanation and Second Generation Fuels,*	*19-20 May 2016,*	*Nuremberg, Germany*		*80*	*EU*
8	*Conference*	*Martin Seemann*	*Presentation at 24th European Biomass Conference & Exhibition*	*2016.*	*Amsterdam,*	*Scientific community / Industry*	*100*	*EU*
9	*Conference*	*Julian Borgmeyer*	*Presentation at 24th European Biomass Conference & Exhibition*	*2016.*	*Amsterdam,*	*Scientific community / Industry*	*100*	*EU*
10	*Popular science article*	*Jörgen Held*	*BEsustainable Magazine*	*February 2017*				
11	*Popular science article*	*Jörgen Held*	*Energy insight*	*February 2017*				
12	*Popular science article*	*Jörgen Held*	*GASenergi nr. 1*	*February 2017*				*Denmark*
13	*Conference*	*Henrik Thunman*	*Regatech*	*May 2017*	*Malmö*	*Scientific community / Industry*	*200*	*EU*
14	*Conference/Presentation at the side event Bioenergy – from Research to Market*	*Ingemar Gunnarsson*	*25th European Biomass Conference &*	*12-15 June 2017*	*Stockholm, Sweden*	*Scientific community / Industry*	*50*	*EU*

	Deployment in a European Context		*Exhibition*					
15	*Conference/Plenary*	*Martin Seemann*	*25th European Biomass Conference & Exhibition*	*12-15 June 2017*	*Stockholm, Sweden*	*Scientific community / Industry*	*300*	*EU*
16	*Confernce*	*Sébastien Pissot*	*25th European Biomass Conference & Exhibition*	*12-15 June 2017*	*Stockholm, Sweden*	*Scientific community / Industry*	*100*	*EU*

Section B (Confidential[9] or public: confidential information to be marked clearly)

Part B1 – not applicable

Part B2

BioSNG – no new patents, trademarks, registered designs etc were registered during the period of the project

Type of Exploitable Foreground[1]	Description of exploitable foreground	Confidential Click on YES/NO	Foreseen embargo date dd/mm/yyyy	Exploitable product(s) or measure(s)	Sector(s) of application[2]	Timetable, commercial or any other use	Patents or other IPR exploitation (licences)	Owner & Other Beneficiary(s) involved
General advancement of knowledge	*Understanding of reaction kinetics for catalytic conversion of syngas to methane*				*Energy*	*5-10 years*		*Owners of biomass conversion plants*

[9] Note to be confused with the "EU CONFIDENTIAL" classification for some security research projects.

BioProgress

Type of Exploitable Foreground[10]	Description of exploitable foreground	Confidential Click on YES/NO	Foreseen embargo date dd/mm/yyyy	Exploitable product(s) or measure(s)	Sector(s) of application[11]	Timetable, commercial or any other use	Patents or other IPR exploitation (licences)	Owner & Other Beneficiary(s) involved
General advancement of knowledge	*Optimization of chemistry in an dual fluidized bed*	*No*			*energy*			*Future investors and owner in biofuel plants*
General advancement of knowledge	*tailoring of reaction pathways*	*Yes*	*31/12/2018*		*energy/materials*	*5-10 years*		

[19] A drop down list allows choosing the type of foreground: General advancement of knowledge, Commercial exploitation of R&D results, Exploitation of R&D results via standards, exploitation of results through EU policies, exploitation of results through (social) innovation.

[11] A drop down list allows choosing the type sector (NACE nomenclature) : http://ec.europa.eu/competition/mergers/cases/index/nace_all.html

3.1 Report on societal implications

BESTF

A General Information *(completed automatically when **Grant Agreement number** is entered.*

Grant Agreement Number:	321477
Title of Project:	BioEnergy Sustaining the Future
Name and Title of Coordinator:	BEIS

B Ethics

1. Did your project undergo an Ethics Review (and/or Screening)? 1 If Yes: have you described the progress of compliance with the relevant Ethics Review/Screening Requirements in the frame of the periodic/final project reports? Special Reminder: the progress of compliance with the Ethics Review/Screening Requirements should be described in the Period/Final Project Reports under the Section 3.2.2 *'Work Progress and Achievements'*	***No***
2. Please indicate whether your project involved any of the following issues (tick box) :	***No***
RESEARCH ON HUMANS	
2 Did the project involve children?	***No***
3 Did the project involve patients?	***No***
4 Did the project involve persons not able to give consent?	***No***
5 Did the project involve adult healthy volunteers?	***No***
6 Did the project involve Human genetic material?	***No***
• Did the project involve Human biological samples?	***No***
• Did the project involve Human data collection?	***No***
RESEARCH ON HUMAN EMBRYO/FOETUS	
7 Did the project involve Human Embryos?	***No***
8 Did the project involve Human Foetal Tissue / Cells?	***No***
9 Did the project involve Human Embryonic Stem Cells (hESCs)?	***No***
10 Did the project on human Embryonic Stem Cells involve cells in culture?	***No***
11 Did the project on human Embryonic Stem Cells involve the derivation of cells from Embryos?	***No***
PRIVACY	
12 Did the project involve processing of genetic information or personal data (eg. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?	***No***
13 Did the project involve tracking the location or observation of people?	***No***
RESEARCH ON ANIMALS	
14 Did the project involve research on animals?	***No***
15 Were those animals transgenic small laboratory animals?	***No***
16 Were those animals transgenic farm animals?	***No***
17 Were those animals cloned farm animals?	***No***
18 Were those animals non-human primates?	***No***
RESEARCH INVOLVING DEVELOPING COUNTRIES	
19 Did the project involve the use of local resources (genetic, animal, plant etc)?	***No***
20 Was the project of benefit to local community (capacity building, access to healthcare, education etc)?	***No***
DUAL USE	
• Research having direct military use	***No***
21 Research having the potential for terrorist abuse	***No***

C Workforce Statistics

3. Workforce statistics for the project: Please indicate in the table below the number of people who worked on the project (on a headcount basis).

Type of Position	Number of Women	Number of Men
Scientific Coordinator		
Work package leaders	10	9
Experienced researchers (i.e. PhD holders)		
PhD Students		
Other	1	2

4. How many additional researchers (in companies and universities) were recruited specifically for this project?	**0**
Of which, indicate the number of men:	

D Gender Aspects

5. Did you carry out specific Gender Equality Actions under the project?

○ Yes
✓ No

6. Which of the following actions did you carry out and how effective were they?

	Not at all effective				Very effective
❑ Design and implement an equal opportunity policy	○	○	○	○	○
❑ Set targets to achieve a gender balance in the workforce	○	○	○	○	○
❑ Organise conferences and workshops on gender	○	○	○	○	○
❑ Actions to improve work-life balance	○	○	○	○	○

○ Other:

7. Was there a gender dimension associated with the research content – i.e. wherever people were the focus of the research as, for example, consumers, users, patients or in trials, was the issue of gender considered and addressed?

○ Yes- please specify

✓ No

E Synergies with Science Education

8. Did your project involve working with students and/or school pupils (e.g. open days, participation in science festivals and events, prizes/competitions or joint projects)?

○ Yes

✓ No

9. Did the project generate any science education material (e.g. kits, websites, explanatory booklets, DVDs)?

○ Yes- please specify

✓ No

F Interdisciplinarity

10. Which disciplines (see list below) are involved in your project?

○ Main discipline[12]:
○ Associated discipline[18]:
○ Associated discipline[18]:

G Engaging with Civil society and policy makers

11a Did your project engage with societal actors beyond the research community? *(if 'No', go to Question 14)*

✓ Yes
○ No

11b If yes, did you engage with citizens (citizens' panels / juries) or organised civil society (NGOs, patients' groups etc.)?

○ Yes- in determining what research should be performed
○ Yes - in implementing the research
✓ Yes, in communicating /disseminating / using the results of the project

[12] Insert number from list below (Frascati Manual).

11c In doing so, did your project involve actors whose role is mainly to organise the dialogue with citizens and organised civil society (e.g. professional mediator; communication company, science museums)?	○ ✓	Yes No

12. Did you engage with government / public bodies or policy makers (including international organisations)

- ○ No
- ✓ Yes- in framing the research agenda
- ✓ Yes - in implementing the research agenda
- ✓ Yes, in communicating /disseminating / using the results of the project

13a Will the project generate outputs (expertise or scientific advice) which could be used by policy makers?

- ✓ Yes – as a **primary** objective (please indicate areas below- multiple answers possible)
- ✓ Yes – as a **secondary** objective (please indicate areas below - multiple answer possible)
- ○ No

13b If Yes, in which fields?

Agriculture Audiovisual and Media Budget Competition Consumers Culture Customs Development Economic and Monetary Affairs Education, Training, Youth Employment and Social Affairs		✓ Energy Enlargement Enterprise Environment External Relations External Trade Fisheries and Maritime Affairs Food Safety Foreign and Security Policy Fraud Humanitarian aid		Human rights Information Society Institutional affairs Internal Market Justice, freedom and security Public Health Regional Policy Research and Innovation Space Taxation ✓ Transport	

13c If Yes, at which level?

- ○ Local / regional levels
- ✓ National level
- ✓ European level
- ○ International level

H Use and dissemination

14. How many Articles were published/accepted for publication in peer-reviewed journals?	**0**
To how many of these is open access[13] provided?	**0**
How many of these are published in open access journals?	
How many of these are published in open repositories?	
To how many of these is open access not provided?	**0**
Please check all applicable reasons for not providing open access:	
❑ publisher's licensing agreement would not permit publishing in a repository ❑ no suitable repository available ❑ no suitable open access journal available ❑ no funds available to publish in an open access journal ❑ lack of time and resources ❑ lack of information on open access ❑ other[14]: ……	

15. How many new patent applications ('priority filings') have been made? *("Technologically unique": multiple applications for the same invention in different jurisdictions should be counted as just one application of grant).*		**0**
16. Indicate how many of the following Intellectual Property Rights were applied for (give number in each box).	Trademark	**0**
	Registered design	**0**
	Other	**0**
17. How many spin-off companies were created / are planned as a direct result of the project?		**0**
Indicate the approximate number of additional jobs in these companies:		

18. Please indicate whether your project has a potential impact on employment, in comparison with the situation before your project:

❑	Increase in employment, or	❑	In small & medium-sized enterprises
❑	Safeguard employment, or	❑	In large companies
❑	Decrease in employment,	❑	None of the above / not relevant to the project
✓	Difficult to estimate / not possible to quantify		

19. For your project partnership please estimate the employment effect resulting directly from your participation in Full Time Equivalent (*FTE = one person working fulltime for a year*) jobs:	*Indicate figure:*

[13] Open Access is defined as free of charge access for anyone via Internet.
[14] For instance: classification for security project.

Difficult to estimate / not possible to quantify	✓

I Media and Communication to the general public

20. As part of the project, were any of the beneficiaries professionals in communication or media relations?

Yes ✓ No

21. As part of the project, have any beneficiaries received professional media / communication training / advice to improve communication with the general public?

Yes ✓ No

22 Which of the following have been used to communicate information about your project to the general public, or have resulted from your project?

✓	Press Release	✓	Coverage in specialist press
❑	Media briefing	✓	Coverage in general (non-specialist) press
❑	TV coverage / report	❑	Coverage in national press
❑	Radio coverage / report	❑	Coverage in international press
✓	Brochures /posters / flyers	✓	Website for the general public / internet
❑	DVD /Film /Multimedia	❑	Event targeting general public (festival, conference, exhibition, science café)

23 In which languages are the information products for the general public produced?

❑	Language of the coordinator	✓	English
❑	Other language(s)		

Project BioSNG

A General Information *(completed automatically when **Grant Agreement number** is entered.*

Grant Agreement Number:	321477
Title of Project:	BESTF Bio-SNG Demonstration Plant
Name and Title of Coordinator:	Chris Manson-Whitton – Progressive Energy

B Ethics

1. Did your project undergo an Ethics Review (and/or Screening)? 22 If Yes: have you described the progress of compliance with the relevant Ethics Review/Screening Requirements in the frame of the periodic/final project reports? Special Reminder: the progress of compliance with the Ethics Review/Screening Requirements should be described in the Period/Final Project Reports under the Section 3.2.2 *'Work Progress and Achievements'*	***No***

2. Please indicate whether your project involved any of the following issues (tick box) :	*No*
RESEARCH ON HUMANS	
23 Did the project involve children?	***No***
24 Did the project involve patients?	***No***
25 Did the project involve persons not able to give consent?	***No***
26 Did the project involve adult healthy volunteers?	***No***
27 Did the project involve Human genetic material?	***No***
• Did the project involve Human biological samples?	***No***
• Did the project involve Human data collection?	***No***
RESEARCH ON HUMAN EMBRYO/FOETUS	
28 Did the project involve Human Embryos?	***No***
29 Did the project involve Human Foetal Tissue / Cells?	***No***
30 Did the project involve Human Embryonic Stem Cells (hESCs)?	***No***
31 Did the project on human Embryonic Stem Cells involve cells in culture?	***No***
32 Did the project on human Embryonic Stem Cells involve the derivation of cells from Embryos?	***No***
PRIVACY	
33 Did the project involve processing of genetic information or personal data (eg. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?	***No***
34 Did the project involve tracking the location or observation of people?	***No***
RESEARCH ON ANIMALS	
35 Did the project involve research on animals?	***No***
36 Were those animals transgenic small laboratory animals?	***No***
37 Were those animals transgenic farm animals?	***No***
38 Were those animals cloned farm animals?	***No***
39 Were those animals non-human primates?	***No***
RESEARCH INVOLVING DEVELOPING COUNTRIES	
40 Did the project involve the use of local resources (genetic, animal, plant etc)?	***No***
41 Was the project of benefit to local community (capacity building, access to healthcare, education etc)?	***No***
DUAL USE	
• Research having direct military use	***No***
42 Research having the potential for terrorist abuse	***No***

C Workforce Statistics

3. Workforce statistics for the project: Please indicate in the table below the number of people who worked on the project (on a headcount basis).

Type of Position	Number of Women	Number of Men
Scientific Coordinator		1
Work package leaders		6
Experienced researchers (i.e. PhD holders)		3
PhD Students		1
Other		4

4. How many additional researchers (in companies and universities) were recruited specifically for this project?	**0**
Of which, indicate the number of men:	

D Gender Aspects

5. Did you carry out specific Gender Equality Actions under the project?

○ Yes
✓ No

6. Which of the following actions did you carry out and how effective were they?

	Not at all effective				Very effective
❑ Design and implement an equal opportunity policy	○	○	○	○	○
❑ Set targets to achieve a gender balance in the workforce	○	○	○	○	○
❑ Organise conferences and workshops on gender	○	○	○	○	○
❑ Actions to improve work-life balance	○	○	○	○	○

○ Other:

7. Was there a gender dimension associated with the research content – i.e. wherever people were the focus of the research as, for example, consumers, users, patients or in trials, was the issue of gender considered and addressed?

○ Yes- please specify

✓ No

E Synergies with Science Education

8. Did your project involve working with students and/or school pupils (e.g. open days, participation in science festivals and events, prizes/competitions or joint projects)?

✓ Yes- please specify: Worked with Supergen bioenergy Hub

○ No

9. Did the project generate any science education material (e.g. kits, websites, explanatory booklets, DVDs)?

○ Yes- please specify

✓ No

F Interdisciplinarity

10. Which disciplines (see list below) are involved in your project?

○ Main discipline[15]:

○ Associated discipline[18]:

○ Associated discipline[18]:

G Engaging with Civil society and policy makers

11a Did your project engage with societal actors beyond the research community? *(if 'No', go to Question 14)*

○ Yes
✓ No

11b If yes, did you engage with citizens (citizens' panels / juries) or organised civil society (NGOs, patients' groups etc.)?

✓ No

○ Yes- in determining what research should be performed

○ Yes - in implementing the research

○ Yes, in communicating /disseminating / using the results of the project

[15] Insert number from list below (Frascati Manual).

11c In doing so, did your project involve actors whose role is mainly to organise the dialogue with citizens and organised civil society (e.g. professional mediator; communication company, science museums)?	○ ✓	Yes No

12. Did you engage with government / public bodies or policy makers (including international organisations)

- ○ No
- ○ Yes- in framing the research agenda
- ✓ Yes - in implementing the research agenda
- ✓ Yes, in communicating /disseminating / using the results of the project

13a Will the project generate outputs (expertise or scientific advice) which could be used by policy makers?

- ○ Yes – as a **primary** objective (please indicate areas below- multiple answers possible)
- ✓ Yes – as a **secondary** objective (please indicate areas below - multiple answer possible)
- ○ No

13b If Yes, in which fields?

Agriculture Audiovisual and Media Budget Competition Consumers Culture Customs Development Economic and Monetary Affairs Education, Training, Youth Employment and Social Affairs		✓ Energy Enlargement Enterprise Environment External Relations External Trade Fisheries and Maritime Affairs Food Safety Foreign and Security Policy Fraud Humanitarian aid		Human rights Information Society Institutional affairs Internal Market Justice, freedom and security Public Health Regional Policy Research and Innovation Space Taxation ✓ Transport	

13c If Yes, at which level?

- ○ Local / regional levels
- ✓ National level
- ✓ European level
- ○ International level

H Use and dissemination

14. How many Articles were published/accepted for publication in peer-reviewed journals?	**1 (2 in development)**
To how many of these is open access[16] provided?	**0**
How many of these are published in open access journals?	
How many of these are published in open repositories?	
To how many of these is open access not provided?	**1**
Please check all applicable reasons for not providing open access:	
❑ publisher's licensing agreement would not permit publishing in a repository ❑ no suitable repository available ❑ no suitable open access journal available ❑ no funds available to publish in an open access journal ❑ lack of time and resources ❑ lack of information on open access ❑ other[17]: ……	

15. How many new patent applications ('priority filings') have been made? *("Technologically unique": multiple applications for the same invention in different jurisdictions should be counted as just one application of grant).*		**0**
16. Indicate how many of the following Intellectual Property Rights were applied for (give number in each box).	Trademark	**0**
	Registered design	**0**
	Other	**0**
17. How many spin-off companies were created / are planned as a direct result of the project?		**2**
Indicate the approximate number of additional jobs in these companies:		**50**

18. Please indicate whether your project has a potential impact on employment, in comparison with the situation before your project:

✓	Increase in employment, or	✓	In small & medium-sized enterprises
❑	Safeguard employment, or	❑	In large companies
❑	Decrease in employment,	❑	None of the above / not relevant to the project
❑	Difficult to estimate / not possible to quantify		

19. For your project partnership please estimate the employment effect resulting directly from your participation in Full Time Equivalent (*FTE = one person working fulltime for a year*) jobs:	*Indicate figure:*

[16] Open Access is defined as free of charge access for anyone via Internet.
[17] For instance: classification for security project.

Difficult to estimate / not possible to quantify	✓

I Media and Communication to the general public

20. As part of the project, were any of the beneficiaries professionals in communication or media relations?

✓ Yes ○ No

21. As part of the project, have any beneficiaries received professional media / communication training / advice to improve communication with the general public?

✓ Yes ○ No

22 Which of the following have been used to communicate information about your project to the general public, or have resulted from your project?

✓	Press Release	✓	Coverage in specialist press
✓	Media briefing	✓	Coverage in general (non-specialist) press
✓	TV coverage / report	✓	Coverage in national press
✓	Radio coverage / report	❑	Coverage in international press
✓	Brochures /posters / flyers	✓	Website for the general public / internet
✓	DVD /Film /Multimedia	❑	Event targeting general public (festival, conference, exhibition, science café)

23 In which languages are the information products for the general public produced?

❑	Language of the coordinator	✓	English
❑	Other language(s)		

Project BioProgress

A General Information *(completed automatically when **Grant Agreement number** is entered.*

Grant Agreement Number:	321477
Title of Project:	BESTF - BIOPROGRESS
Name and Title of Coordinator:	Ingemar Gunnarsson – Goteborg Energi

B Ethics

1. Did your project undergo an Ethics Review (and/or Screening)? 43 If Yes: have you described the progress of compliance with the relevant Ethics Review/Screening Requirements in the frame of the periodic/final project reports? Special Reminder: the progress of compliance with the Ethics Review/Screening Requirements should be described in the Period/Final Project Reports under the Section 3.2.2 *'Work Progress and Achievements'*	***NO*** ***0Yes 0No***
2. Please indicate whether your project involved any of the following issues (tick box) :	***NO***
RESEARCH ON HUMANS	
44 Did the project involve children?	
45 Did the project involve patients?	
46 Did the project involve persons not able to give consent?	
47 Did the project involve adult healthy volunteers?	
48 Did the project involve Human genetic material?	
• Did the project involve Human biological samples?	
• Did the project involve Human data collection?	
RESEARCH ON HUMAN EMBRYO/FOETUS	
49 Did the project involve Human Embryos?	
50 Did the project involve Human Foetal Tissue / Cells?	
51 Did the project involve Human Embryonic Stem Cells (hESCs)?	
52 Did the project on human Embryonic Stem Cells involve cells in culture?	
53 Did the project on human Embryonic Stem Cells involve the derivation of cells from Embryos?	
PRIVACY	
54 Did the project involve processing of genetic information or personal data (eg. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?	
55 Did the project involve tracking the location or observation of people?	
RESEARCH ON ANIMALS	
56 Did the project involve research on animals?	
57 Were those animals transgenic small laboratory animals?	
58 Were those animals transgenic farm animals?	
59 Were those animals cloned farm animals?	
60 Were those animals non-human primates?	
RESEARCH INVOLVING DEVELOPING COUNTRIES	
61 Did the project involve the use of local resources (genetic, animal, plant etc)?	
62 Was the project of benefit to local community (capacity building, access to healthcare, education etc)?	
DUAL USE	
• Research having direct military use	No
63 Research having the potential for terrorist abuse	

C Workforce Statistics

3. Workforce statistics for the project: Please indicate in the table below the number of people who worked on the project (on a headcount basis).

Type of Position	Number of Women	Number of Men
Scientific Coordinator		1
Work package leaders		3
Experienced researchers (i.e. PhD holders)	1	2
PhD Students	2	3
Other	2	1

4. How many additional researchers (in companies and universities) were recruited specifically for this project?	**2**
Of which, indicate the number of men:	2

D Gender Aspects

5. Did you carry out specific Gender Equality Actions under the project?

○ No
○

6. Which of the following actions did you carry out and how effective were they?

	Not at all effective				Very effective
❑ Design and implement an equal opportunity policy	○	○	○	○	○
❑ Set targets to achieve a gender balance in the workforce	○	○	○	○	○
❑ Organise conferences and workshops on gender	○	○	○	○	○
❑ Actions to improve work-life balance	○	○	○	○	○

○ Other:

7. Was there a gender dimension associated with the research content – i.e. wherever people were the focus of the research as, for example, consumers, users, patients or in trials, was the issue of gender considered and addressed?

○ Yes- please specify

x No

E Synergies with Science Education

8. Did your project involve working with students and/or school pupils (e.g. open days, participation in science festivals and events, prizes/competitions or joint projects)?

x Yes- please specify: Yearly bachelor thesis: students design construct and build an operational unit of the GoBiGas plant.

○ No

9. Did the project generate any science education material (e.g. kits, websites, explanatory booklets, DVDs)?

○ Yes- please specify

x No

F Interdisciplinarity

10. Which disciplines (see list below) are involved in your project?

○ Main discipline[18]: 2.3

○ Associated discipline[18]:

○ Associated discipline[18]:

G Engaging with Civil society and policy makers

11a Did your project engage with societal actors beyond the research community? *(if 'No', go to Question 14)*

○ Yes
x No

11b If yes, did you engage with citizens (citizens' panels / juries) or organised civil society (NGOs, patients' groups etc.)?

○ No

○ Yes- in determining what research should be performed

○ Yes - in implementing the research

[18] Insert number from list below (Frascati Manual).

○ Yes, in communicating /disseminating / using the results of the project		
11c In doing so, did your project involve actors whose role is mainly to organise the dialogue with citizens and organised civil society (e.g. professional mediator; communication company, science museums)?	○ ○	Yes No
12. Did you engage with government / public bodies or policy makers (including international organisations)		
○ Yes - in implementing the research agenda		
○ Yes, in communicating /disseminating / using the results of the project		
13a Will the project generate outputs (expertise or scientific advice) which could be used by policy makers?		
Yes – as a **secondary** objective (please indicate areas below - multiple answer possible)		

13b If Yes, in which fields? ENERGY

Agriculture		Energy		Human rights	
Audiovisual and Media		Enlargement		Information Society	
Budget		Enterprise		Institutional affairs	
Competition		Environment		Internal Market	
Consumers		External Relations		Justice, freedom and security	
Culture		External Trade		Public Health	
Customs		Fisheries and Maritime Affairs		Regional Policy	
Development Economic and Monetary Affairs		Food Safety		Research and Innovation	
		Foreign and Security Policy		Space	
Education, Training, Youth		Fraud		Taxation	
Employment and Social Affairs		Humanitarian aid		Transport	

13c If Yes, at which level?

- ○
- ○ National level
- ○ European level
- ○

H Use and dissemination

14. How many Articles were published/accepted for publication in peer-reviewed journals?	**3**
To how many of these is open access[19] provided?	**3**
How many of these are published in open access journals?	**2**
How many of these are published in open repositories?	**1**
To how many of these is open access not provided?	**0**
Please check all applicable reasons for not providing open access:	
❑ publisher's licensing agreement would not permit publishing in a repository ❑ no suitable repository available ❑ no suitable open access journal available ❑ no funds available to publish in an open access journal ❑ lack of time and resources ❑ lack of information on open access ❑ other[20]: ……	

15. How many new patent applications ('priority filings') have been made? *("Technologically unique": multiple applications for the same invention in different jurisdictions should be counted as just one application of grant).*		**0**
16. Indicate how many of the following Intellectual Property Rights were applied for (give number in each box).	Trademark	**0**
	Registered design	**0**
	Other	**0**
17. How many spin-off companies were created / are planned as a direct result of the project?		**0**
Indicate the approximate number of additional jobs in these companies:		

18. Please indicate whether your project has a potential impact on employment, in comparison with the situation before your project:

❑	Increase in employment, or	❑	In small & medium-sized enterprises
❑	Safeguard employment, or	❑	In large companies
❑	Decrease in employment,	x❑	None of the above / not relevant to the project
❑	Difficult to estimate / not possible to quantify		

19. For your project partnership please estimate the employment effect resulting directly from your participation in Full Time Equivalent (*FTE = one person working fulltime for a year*) jobs:	*Indicate figure:*

[19] Open Access is defined as free of charge access for anyone via Internet.
[20] For instance: classification for security project.

Difficult to estimate / not possible to quantify	❑

I Media and Communication to the general public

20. As part of the project, were any of the beneficiaries professionals in communication or media relations?

○ Yes x No

21. As part of the project, have any beneficiaries received professional media / communication training / advice to improve communication with the general public?

○ Yes x No

22 Which of the following have been used to communicate information about your project to the general public, or have resulted from your project?

x	Press Release	x	Coverage in specialist press
❑	Media briefing	❑	Coverage in general (non-specialist) press
❑	TV coverage / report	❑	Coverage in national press
❑	Radio coverage / report	❑	Coverage in international press
❑	Brochures /posters / flyers	x❑	Website for the general public / internet
❑	DVD /Film /Multimedia	x❑	Event targeting general public (festival, conference, exhibition, science café)

23 In which languages are the information products for the general public produced?

x	Language of the coordinator	x	English
x	Other language(s)		

4.1 FINAL REPORT ON THE DISTRIBUTION OF THE EUROPEAN UNION FINANCIAL CONTRIBUTION

This report shall be submitted to the Commission within 30 days after receipt of the final payment of the European Union financial contribution.