Appendix 1. QUESTOR and CASE Energy from Biomass Cluster Description

The QUESTOR Centre (QUESTOR) is an international network of partner institutions headquartered at The Queens University of Belfast cooperating to develop and deliver research and innovation outputs to an Industrial Advisory Board composed of member companies and organisations. Projects are chosen by members, but are academic-led, with industry oversight.

The Centre for Advanced Sustainable Energy (CASE) is a sister centre to QUESTOR launched in 2013, funded as an industry-led competence centre. Queen's University, University of Ulster and the Agri-Food and Biosciences Institute in Northern Ireland, provide expertise for industry-led projects. £5M funding from Invest NI is available to support collaborative projects with, primarily, SMEs in the energy sector in N. Ireland. Projects are industry-led collaborations between groups of industries and researchers.

The operation of the two centres is complementary. The Energy from Biomass Cluster operates across both centres with a shared research interest description. Projects arising are funded through one of the two centres as appropriate to the project and the business model of the centre.

Cluster Description. (includes Biomass and Biogas)

This Cluster covers new approaches for all aspects of:

- Production.
- Processing and conversion.
- Sustainability issues of biomass feed stocks for production of energy and related value-added products.

Targeted research topics include:

- Production:
- Current and potential future feed stocks (both wet and dry, including availability and competition issues and encompassing land and aqueous-based production).
- Agronomy.
- Pathogens and disease management.
- Nutrient management and control.
- Harvesting.
- Drying and preparation and optimisation (technical and economic).
- Storage and handling.
- Transport (distance issues).
- Process efficiency.

Processing and Conversion:

- Wet and dry feedstocks.
- Pretreatment – drying, crushing, pelletising, hydrolysis (such as thermal, chemical, biological, enzymatic) etc.
- Mechanical delivery into processes.
- Conversion to energy.

- Industrial vs domestic.
- Electricity, gas, heat, fuel.
- Various conversion processes (biological, thermal, pyrolysis, gasification), energy 'carriers' (liquid fuels, hydrogen, biogas & biomethane, syngas, , end use and products (fuels, fuel cell use, biochar).
- Biogas - low cost gas clean-up and management; for engines and/or upgrading (vehicle fuel, for fuel cell use or grid injection), methane to DME (dimethylether).
- Emissions, odours, NOX, SOX, and Carbon Dioxide.
- Efficiency of conversion.

Sustainability:

- Wastes and by-products.
- Water use.
- Economics and LCA.
- Carbon values (per hectare – carbon accounting).
- Energy density of feedstocks.
- Fuel choice – sustainability, costs, competition for feedstocks etc.
- Efficiency of conversion.
- Increase security & supply.
- Self-sustaining communities / model communities.
- Combinations of technologies.
- Recognition of 'not just one solution'.
- Localisation of heat and use of process heat.
- Technology size.
- Impact of land use changes.

Cross-cutting themes with other Clusters:

- Non-technical barriers.
- Technology readiness.
- Energy efficiency and use of process heat.
- Education.
- (next generation workforce) interest in STEM subjects.
- Public perception of technology and acceptance.
- Policy and planning.
- Opportunity – ensuring timeliness of communication and embedding in policy.
- Reduction of energy costs.
- Novelty and potential of technology.
- Anaerobic wastewater treatment.
- Distribution of energy and grid connection.