

Agenda



2:30	Introduction and scope of the Action Plan, Elaine Groom
2:45	Mark Kelly (Feedstocks) Beatrice Smyth (Alternative Uses) George Corr (Finance)
3:30	Trevor Kerr, Invest NI
3:45	Coffee Break
4:00	Presentation of the Research Action Plan, Elaine Groom Four Areas: <ol style="list-style-type: none">1. Development of small scale solutions for biogas production and use2. Solutions for improved nutrient management3. Embedding biogas use in the rural economy4. Future crops and bio-based products
5:00	Future – Next Steps, Elaine Groom
5:30	End

Biogas Research Action Plan



- Areas for action
 1. Development of small scale solutions for biogas production and use
 2. Solutions for improved nutrient management
 3. Embedding Biogas Use in the Regional Economy
 4. Future crops and bio-based products
- Plans for international collaboration
- Funding instruments targeted for action
- Conclusions and Recommendations

1. Small scale solutions for biogas production and use



- Small systems desirable – especially for manure
 - NI average farm size is 40 ha or 80 head of cattle
 - Cost reductions needed
- Pretreatment systems – faster digestion/more gas
- Knowledge and understanding of plant biochemistry
 - New sensors; new control algorithms; web-based monitoring and control
- Reduced scale and cost of gas clean-up/upgrading
- Practical know-how on alternative uses of biogas

1. Small scale solutions: needs



Expertise in 2020

- A range of low cost, modular, scalable designs/ technologies
- New cost effective techniques for biogas cleanup and removal of trace contaminants
- Proven pre-treatment technologies for increased rate and/or extent of feedstock conversion
- Advanced monitoring, control, and reporting

Development Needs

- Simple, novel designs of components for low cost plant

Development of novel methods of biogas clean up and upgrading based on catalytic and green chemistry for:

- CO₂ separation
- In-situ removal of problematic materials.
- Low cost sulphur/ammonia removal.

Scale up and testing of technologies previously developed at laboratory scale

- Pilot scale and on-site testing
- Quantification of benefits
- Evaluation of costs

Innovative cost-effective, reliable sensors

Advanced data processing for internal control loops

Development of on-line reporting of regulatory compliance: for single plants/groups of plants

1. Small scale solutions: Activities



Activities and Key Stakeholders

- Activity meeting industrial R&D need (incl. demos).
- QUB (QUESTOR/CASE) through various departments, SWC & AFBI
- QUB – novel chemistry/catalytic gas clean up
- SWC - new iterations of conventional gas clean-up
- Pre-treatment – QUESTOR, SWC, AFBI
- Advanced monitoring – led by QUESTOR

1. Small scale solutions: Resources



Assessment of Resources Needed to 2020

- Human resources: 30 person years for research and industrial R&D
- Costs: £6 million (excl. demonstrations)
- Financing Instruments: EU programmes, national and regional funding (incl. studentships), industry

1. Small scale solutions: impact & risks



- **Expected Impact to 2020**

- Continue to build on the success of local companies in developing and building cutting edge plants in Northern Ireland.
- Begin to see licencing agreements and export of developed technologies to GB, Ireland, Europe and beyond
- NI plants performing well in interregional comparisons with an increasing reputation for innovation

- **Risks**

- Development of the sector regionally stalls

2. Solutions for improved nutrient management



- Opportunity for nutrients from digestate to offset fertiliser imports
- If separation and capture of nutrients optimised, potential to:
 - Reduce ammonia losses on land application
 - Capture and export excess phosphorus
- Desirable to optimise where digestate spread
- Concern over possible need for protection of water courses

2. Solutions for nutrient management: needs



Expertise in 2020	Development Needs
<p>- Technologies for the capture and use of nutrients from digestate as fertiliser</p>	<ul style="list-style-type: none"> • Testing and evaluation of improved methods of digestate solid/liquid separation • Techniques for capture and separation of nutrients from the liquid fraction • Slow release mechanisms for nutrients • Evaluation of new digestate-fertiliser formulations at field scale
<p>- Increased options for the management of intermediate quality digestates</p>	<ul style="list-style-type: none"> • Development of alternatives to landfill capping for poor quality digestates.
<p>- Logistics of feedstock and digestate movement</p>	<ul style="list-style-type: none"> • Analysis and methodologies contributing to increased planning feedstock and digestate logistics
<p>- Technologies for water-course protection from run-off</p>	<ul style="list-style-type: none"> • Increased monitoring of at-risk areas • Development of technologies and protection methods and their evaluation in the field

2. Solutions for nutrient management: activities



Activities and Key Stakeholders

- Testing of equipment and improved handling techniques by industry producing digestate; R&D and demos of new technologies; land holders for spreading and fertilisation; NIEA – environmental issues
- AFBI – expertise in slurry and manure separation and management; analytical techniques; hygiene
- QUB – novel fertiliser production and testing

2. Solutions for nutrient management: resources



Assessment of Resources Needed to 2020

- Human resources: 15 person years for research, development and testing
- Costs: £3million (excl. demonstrations)
- Financing Instruments: national and regional funding (incl. studentships), industry; EU programmes for market replication and demonstration

2. Solutions for nutrient management: impact & risks



Expected Impact by 2020:

- Begin to see licencing agreements and export of developed technologies / knowhow to GB, Ireland, Europe
 - Reduced (fossil) fertiliser imports
 - Export of excess fertiliser (phosphorus)
 - Reduced nutrient excesses and environmental impact

Risks:

- Recovery processes are inefficient
- Environmental impact limits sector growth

3. Embedding Biogas Use in the Regional Economy



- Large potential for alternative uses of biomethane in N Ireland
 - Residential, agriculture, transport, existing gas-fired electricity
 - Benefits include: reduced emissions; reduced imports; fuel security
- Issues with financing development
- Slow to gain public acceptance
- Lack of a cohesive policy framework

3. Embedding Biogas Use in the Regional Economy: needs



Expertise by 2020	Development Needs
<p>- Biogas contribution to Sustainable Energy Communities</p>	<ul style="list-style-type: none"> • Development and demonstration of technologies for heat storage and delivery • Increased penetration of knowledge of alternative uses • Improvements in efficiency of heat recovery
<p>- Developing integrated supply chains</p>	<ul style="list-style-type: none"> • Development of heat value chains and improved means of local supply • Local biomethane fuel supply chains • Gas quality standards
<p>- Reduced barriers to public acceptance</p>	<ul style="list-style-type: none"> • Increased public penetration of knowledge • Demonstration projects promoting new technologies / reduce misconceptions
<p>- Control and mitigation of financial risk</p>	<ul style="list-style-type: none"> • Support services enabling the improved development and operation of plants and projects in local communities



3. Embedding Biogas Use in the Regional Economy: activities



Activities

- Community-based demonstrations/applications of technology; education and training programmes; applied R&D
- QUB/CASE lead in collaborative research (technology) for biogas use/efficiency
- UU expertise in heat management
- Others?
- Industry (services) lead in mitigation of financial risk

3. Embedding Biogas Use in the Regional Economy: resources



Assessment of Resources Needed to 2020

- Human resources: 15 person years for research, development and testing
- Costs: £3million
- Financing Instruments: national and regional funding (incl. studentships), industry; Interreg & other EU programmes



3. Embedding Biogas Use in the Regional Economy: impact & risks



Impact:

- Local fuel/heat generation – new business / supply chains
- Reduction in imports

Risks:

- Costs vs natural gas
- Transport fuel “chicken and egg” issues
- Community acceptance of change

4. Future crops and bio-based products



Immediate Opportunities

- Alternative crops ('greening' under CAP)
- Glass-house-based crops

Longer-term opportunities

- Value-added products extracted from crops
- Chemical (and/or biochemical) transformation of biomass/crop residues
- "Micro-biorefineries"

4. Future crops and bio-based products: needs



Expertise by 2020	Development Needs
- Knowledge of a range of new crops for bioprocessing to produce biogas or biochemicals	<ul style="list-style-type: none">• Establish performance criteria under local conditions• Testing of individual crops / types• Develop processing chains and knowledge
- Knowledge of CO₂ enriched greenhouse and hydroponics-based cultivation	<ul style="list-style-type: none">• Understand contributions and limitations of digestate in greenhouses/hydroponics• Quantify opportunities for greenhouses• Scope knowledge of area and develop training courses
- Emerging knowledge of products suited to small scale biorefinery operation	<ul style="list-style-type: none">• Chemical and biochemical processes for biomass (small, high-value products)• Generic plans for microbiorefinery

4. Future crops and bio-based products: activities & resources



Activities:

- Applied research into crops and biomass transformation
- QUB lead (chemistry/catalysis/ biocatalysis) and developing collaborative R&D
- AFBI – Agronomy; CAFRE – horticulture support
- Training

4. Future crops and bio-based products: resources



Assessment of Resources Needed to 2020

- Human resources: 20+ person years for research, development and testing (followed by scale up and demonstration)
- Costs: £7+million
- Financing Instruments: national funding (incl. studentships), EU Societal Challenges

4. Future crops and bio-based products: impact & risks



Impact:

- Probably small contribution to EU (global) knowledge
- Put Northern Ireland in a strong position to take advantage of global knowledge, demand and opportunities

Risks:

- Conservative attitudes, environmental concerns, slow adoption of new practises
- Bio-prospecting - “chicken and egg” issues
- Community acceptance of change

Next steps



- Feedback
 - Informal feedback today – draft Action Plan available by email for consultation and comment
 - Email replies by 3rd February
- Final publication – mid-February
- Seeking expressions of interest & sites for testing and demonstration
- Creating links with partners for funding



- Present NI as a region to potential partners and investors
- Database of companies in supply chain
 - Directory of RTD demand and offer
 - Capability
 - RTD Facilities
 - Sites
- Survey



Do BioEnergy
Developing Opportunities in Bioenergy

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Directory

Biogas Supply Chain Directory

This directory provides information from companies and research groups who seek collaboration, wish to offer technologies, promote opportunities or develop partnerships with the Northern Ireland biogas sector.

Please click here to submit your profile

Filters:

All Company Types All Profile Types All Collaborations

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Name	Country	Keywords
Harp Renewables	Ireland	Anaerobic Digestion Facility, Association, Consulting, Investment/Financing, Plant Operation, Plant supplier/manufacture, Project Development/planning, Research and development, Services, Supplier of plant components, Training
Knowledge Transfer Partnerships	United Kingdom	Research and development
QUESTOR ATU	United Kingdom	Consulting, Research and development, Services, Training
QUESTOR Centre	Northern Ireland	Consulting, Research and development, Services, Training

Funding Sources



Funding Programmes for Basic and Applied Research:

DEL and CAST Studentships;
UKRC; H2020 : Marie Curie
Actions, ERC, Societal Challenges

Funding Programmes for R&D and Demonstration:

Innovation Vouchers, Invest NI,
Intertrade Ireland, TSB, H2020:
Societal Challenges, LEIT, Life+,
SME Instrument.

Northern Ireland Cluster Activities:

- *Development of new cost-effective, energy-efficient and sustainable technologies for biogas production and use within energy supply chains*
- *Development of technologies and services optimising the benefits of biogas for Northern Ireland agriculture, infrastructure and communities*
- *Provision of research expertise and facilities for manufacturers to commercialise ideas from R&D activities*

Development of innovative biogas-related technologies

Optimum use of biogas for the benefit of the region

Export of know-how and technology

Funding Programmes for Training and Knowledge Transfer:

Innovation Vouchers, KTPs,
FUSION, H2020: Marie Curie
Actions & Erasmus+

Funding Programmes for Promotion and Market Replication:

ERDF, Interreg V, H2020:
Intelligent Energy Europe, SiS
SME Instrument

Regions Targeted for Collaboration



- North Rhine Westphalia
 - Longstanding research and business links;
 - mature biogas use
- Linköping, Sweden
 - “Biogas City” – biogas use is mature and widely accepted
 - New Industry-linked Biogas Centre in Linköping Univ.
- Eszak Alföld Region (North Great Plains), Hungary
 - Grass-based agriculture contributes 11 % of the regional GDP, double the national average.



ATBEST



Advanced Technologies for Biogas Efficiency Sustainability and Transport

Funding scheme: EU Framework 7, Marie Curie ITN
Budget: € 3.86 Million
Duration: 4 Years, 1st July 2013 - 30th June 2017
Research team: 12 PhD and 2 Post Doctoral researchers

The ATBEST ITN will develop innovative research and training for the biogas industry in Europe. It comprises eight training sites located in the UK, Ireland, Germany and Sweden. It is a multidisciplinary collaboration between internationally-renowned research teams and industrial partners, each with complementary expertise in a wide range of environmental technologies.

14 researchers will be recruited and each will participate in secondments, 3 Summer Schools and an international conference. The aim is to establish long-term collaborations and develop structured research and training relevant to industry and academia along the biogas supply chain: biogas production from feedstock to its utilisation as an energy source.

Project Partners

- Queen's University Belfast (Coordinator)
- University of Duisburg-Essen
- Cologne University of Applied Sciences
- University College Cork
- Teagasc
- Linköping University
- Bord Gáis
- Scandinavian Biogas Fuels



Project topics

- Sustainability and Life Cycle Assessment of feedstock digestion systems
- Synergies from co-digestion of grass silage with other feedstocks
- Supplementation of trace elements to optimise biogas production – bioavailability and microbial response
- Development of macroalgae as substrate for biogas production
- Genomic optimisation of hydrolysis in biogas production
- Analysis of anaerobic fermentation process by online spectroscopic UV/Vis, NIR and MIR-measurement.
- Combined H₂S and CO₂ removal processes for upgrading bio-gas.
- Novel technologies for integrated biogas separation and compression
- Surplus electricity to biogas via hydrogen.
- Micro-reforming of biogas for micro-combined heat and power generation
- Biogas distribution concepts for the transportation sector
- Applications of biogas in chemical energy storage and liquid fuel production
- Developing strategies to facilitate the integration of biogas into the existing gas infrastructure
- Digestate distribution for large biogas plants; storage and transport.





Conclusions and Recommendations



- Creation of an expanded biogas innovation cluster
 - Operation? Costs? Activities?
- Continues operation of website as focus for regional activities
- Travel/brokerage meetings to develop projects
- Action Plan:
 - One vision, for shared action
 - Many actors, shared goals
 - Many pathways, lots of sources of help and advice

