

From: Jerry D Murphy [jdmurphy@cit.ie]  
Sent: 19 April 2005 10:43  
To: Bob Hanna  
Cc: ilo@cit.ie  
Subject: R&D Energy

Bob,

I have read with interest the consultation paper on Energy Research Development and Demonstration.

I have attached a document outlining the work that my group (Waste to Energy Research Group) undertakes in Cork Institute of Technology.

The area is focused on biomass based transport fuel and energy generated from biomass. We examine biomass type 1 (residues) and biomass type 2 (energy crops). The work may be described as technical/ economic and environmental analysis or systems analysis. The output is aimed at influencing policy.

I feel there is a need for a body with an overview of energy RD&D. For example I was unaware Dundalk IT worked on biomass and you were unaware of our work. I think in this regard an Energy Research Council is essential as you conclude.

I believe at this juncture that techno-economic-environmental analysis of renewable energies are crucial to allow implementation of the technology that suits Ireland. Technologies are successful in different countries due to economics in those countries.

For example in Denmark anaerobic digestion coupled with CHP is successful as a district heating infrastructure is in place, carbon tax exists on fossil fuel, and electricity prices for biogas are high. This does not apply to Ireland. In Sweden biogas is used as a transport fuel to power buses; this is applicable to Ireland. Our analyses show that digestion of organic waste in a city will generate enough biogas to power the bus fleet at a competitive cost due to the gate fee obtainable.

I would be very interested in seminars related to RD&D in the area of energy.

Yours

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**Research focus**

- Investigate most up to date technology in converting biomass to energy.
- Investigate the alternative transport fuel market.
- Produce decision support software, which allows the intelligent user to analyse various waste/biomass to energy systems.
- Propose systems, which may be used for the treatment of wastes and which have potential to produce energy in the form of combined heat and power (CHP) or transport fuel.
- Carry out technical/economic/environmental analysis of these systems.
- Highlight systems which are utilised in various countries but which do not transfer well to Ireland.
- Propose systems, which are best suited to each waste and biomass under Irish conditions.

**Profile of the Waste to Energy Research Group**

Dr. Murphy has been researching and consulting in this area for over 10 years. Various projects have been worked on as outlined briefly below:

**Title: A systems analysis of potential for CH<sub>4</sub>-enriched biogas as a biofuel in Ireland.**

Duration: October 2004- October 2006

Funding: €38,000

Funding Source: Irish Research Council for Science, Engineering and Technology (IRCSET)

Description: This project examines the potential for transport fuel production from digestion of the organic fraction of municipal solid waste (OFMSW). OFMSW may be composted or digested. The project comprises a technical, economic and environmental comparison of digestion and composting of OFMSW. A national proposal for biogas as a transport fuel will be made. The maximum practical potential for biogas as a transport fuel will be evaluated.

**Title: A systems analysis of energy from waste in Ireland**

Duration: October 2000 – September 2004

CIT Funding: €50 689

Funding Source: HEA programme for research in third level institutions Cycle 2 “Environmental Research Institute” – Sustainable Energy

In collaboration with Sustainable Energy Research Group, University College Cork.

Description: The project examined various methods of generating energy from waste and biomass. The wastes and biomasses investigated included agricultural slurry,

sewage sludge, municipal solid waste, wood waste, and agricultural crops. The technologies investigated included incineration, gasification, anaerobic digestion and ethanol production. Energy production in the form of combined heat and power and transport fuel was investigated. Systems, which generated energy from wastes/biomass were investigated from a technical/economic/environmental perspective.

**Title: Comparison of public acceptability of energy from waste and energy from biomass residues in 5 EU States.**

Duration: 1999 - 2001

Funding: €17 255

Funding Source: EU INTEGRATE Project, funded by the EC 5<sup>th</sup> framework programme and the Environment Agency for England and Wales.

In collaboration with Pat Howes, (AEA Technology, UK), Bengt Hillring, (SLU, Sweden), Henrik Ortenblad, (EnergiGruppen Jylland, Denmark), Toon van de Wijdeven and Derk Heuting, (WS&P, the Netherlands).

In collaboration with Sustainable Energy Research Group, University College Cork.

Description: The project investigated the public acceptability of incineration and energy production from wastes and biomass residues in five EU states. In two of these states (Denmark and Sweden) incineration is accepted and has a long history. In two of these states (UK and Ireland) incineration is extremely controversial and incineration has a very low capacity relative to the municipal solid waste generated. In the fifth state (the Netherlands) a large investment in incineration technology took place in the early 1990's and the technology, which was controversial, is now accepted. The project investigated means of improving public perception of incineration.

## **Publications**

### **Peer-reviewed journal papers**

- JD Murphy, E McKeogh, G Kiely; "Technical/economic/environmental analysis of biogas utilisation," *Applied Energy*, Volume 77, Issue 4, pp. 407-427, April 2004, also in: *Current Readings in Transport Economics*, Volume 1, No.4, 2004.
- JD Murphy, E McKeogh; "Technical, economic and environmental analysis of energy production from municipal solid waste," *Renewable Energy*, Volume 9 pp. 1043-1057, 2004 also in: *Current Readings in Transport Economics*, Volume 2, No.1, 2004.
- JD Murphy, K McCarthy; "The potential ethanol production from energy crops and wastes for use as a transport fuel in Ireland," *Applied Energy*, in press.
- JD Murphy, E McKeogh; "The benefits of integrated treatment of wastes for the production of energy," *Energy*, in press.
- JD Murphy, K McCarthy; "The optimal production of biogas for use as a transport fuel in Ireland," *Renewable Energy*, in press.

- JD Murphy, N Power; “The optimal method of energy production from newspaper in Ireland,” *Waste Management*, under review, submitted January 2005.
- JD Murphy, N Power; “The optimal treatment of biodegradable municipal waste,” *Journal of Environmental Science and Health*, under review, submitted March 2005.

### Articles from published peer-reviewed conference proceedings

- T Sakkas, H Kaldeli, **J D Murphy**, J Kaldelis; “A Techno-Economic-Environmental Analysis of the Potential Ethanol Production Technology in Greece Utilizing Organic Fraction of Municipal Solid Waste (OFMSW).” In: 1<sup>st</sup> National Conference of Renewable Fuels, National Technical University of Athens, 27-28 January 2005
- JD Murphy; “Biogas systems: small is beautiful,” In: AAM Sayigh, editor. *World Renewable Energy Congress VII* hosted by US Department of Energy, National Renewable Energy Laboratory (NREL), Denver, Colorado, USA, August 28 – September 3, Elsevier, 2004.
- TK Sakkas, **JD Murphy**; “The potential energy from waste in Athens, utilising gasification and ethanol production technology,” Greek National Conference, Environmental Protection Agency, 6 – 8 November 2002 (published in Greek).
- JD Murphy; “The economics of biogas utilisation,” In: *Irish Biogas Conference: Renew Your Waste*, Sustainable Energy Ireland (SEI), 11-12 April 2002, Environmental Protection Agency, Johnstown Castle, Wexford, Ireland, (published as a CD).
- JD Murphy, E McKeogh, T Sakkas, S O’Neill; “Potential energy from waste in the Republic of Ireland,” In: *Proceedings Renewable Energy in Maritime Island Climates*, Conference C76 of the Solar Energy society, Odyssey Centre Belfast, 10-11 September 2001, pp. 59-66.

### Reports

- PS Howes, B Hillring, T van de Wijdeven, D Heuting, H Ortenblad, **J D Murphy**; *Comparison of public acceptability of energy from waste and energy from biomass residues in 5 EU states*; AEA Technology, 154 Harwell, Didcot, Oxfordshire, 2001.

### Theses/Dissertations

- K McCarthy; “A proposal to meet the Biofuels Directive in Ireland,” MEng. thesis, Higher Educational Training Awards Council, Cork Institute of Technology, Cork, Ireland, 2004.
- TK Sakkas; “A techno-economic-environmental analysis of the potential for gasification and ethanol production technologies in the Republic of Ireland,” MEng. thesis, Higher Educational Training Awards Council, Cork Institute of Technology, Cork, Ireland, 2002.

JD Murphy; “The benefits of integrated treatment of wastes for the production of energy,” Ph.D. thesis, National University of Ireland, University College Cork, Ireland, 2003.