

Energy from Landfill Gas Authorisation and Operational Challenges

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Greenstar

Greenstar (Ireland) – who we are

- Established 1999
- Irish owned and managed
- 600 employees in 25 locations
- Ireland's largest waste management company
- Recycling, Composting, Residual Landfill with Energy Recovery
- Manages household, commercial and industrial (C&I) waste
- Award winning Recycling Operation
- Operator of Ireland's most Environmentally Compliant Landfills
- Winner 2008 CIWM (UK and Irl) PEEL Cup for Operational Excellence

Targets for Renewable Energy in Ireland

- EU Renewable Energy Target % national electricity consumption

EU Directive 2001/77/EC – national indicative target - 13.2% by 2010

Irish Government Target (2007) – 15% RE by 2010

Irish Government Target (2007) – 33% RE by 2020

Table 1 Indicative RE Capacity Required

	Wind	Bioenergy	Hydro	Ocean	Solar	Total
2007	780MW	26MW	238MW	0MW	0MW	1,044MW
13.2% RE	1,100MW	92MW	240MW	1MW	0MW	1,433MW
30% RE	2,200MW	700MW	270MW	200MW	70MW	3,500MW

Sources: Department of Environment Renewable Energy Development Group,
Sustainable Energy Working Group of the Joint Steering Group for the All Ireland Energy Market

- Dispatchable forms of generation such as Landfill Gas become more important as the proportion of energy from wind increases over 15%

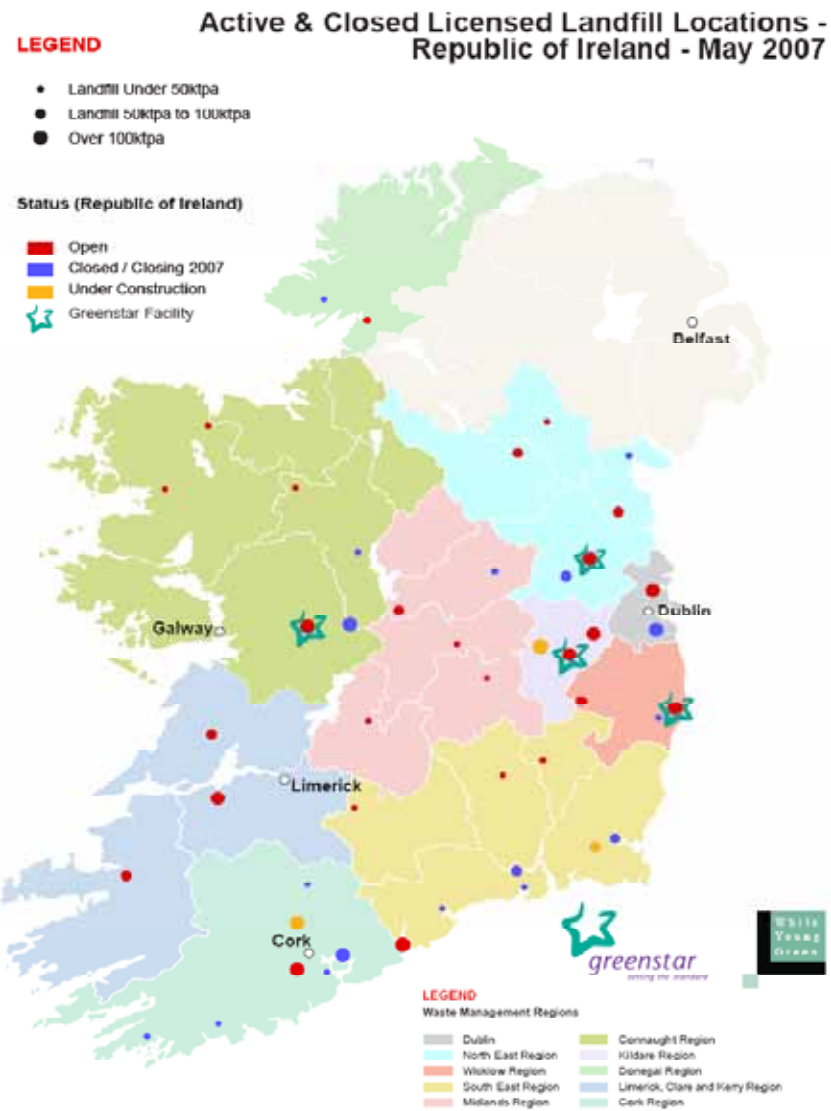
LFG Utilisation in Ireland

- EU landfill directive 2001

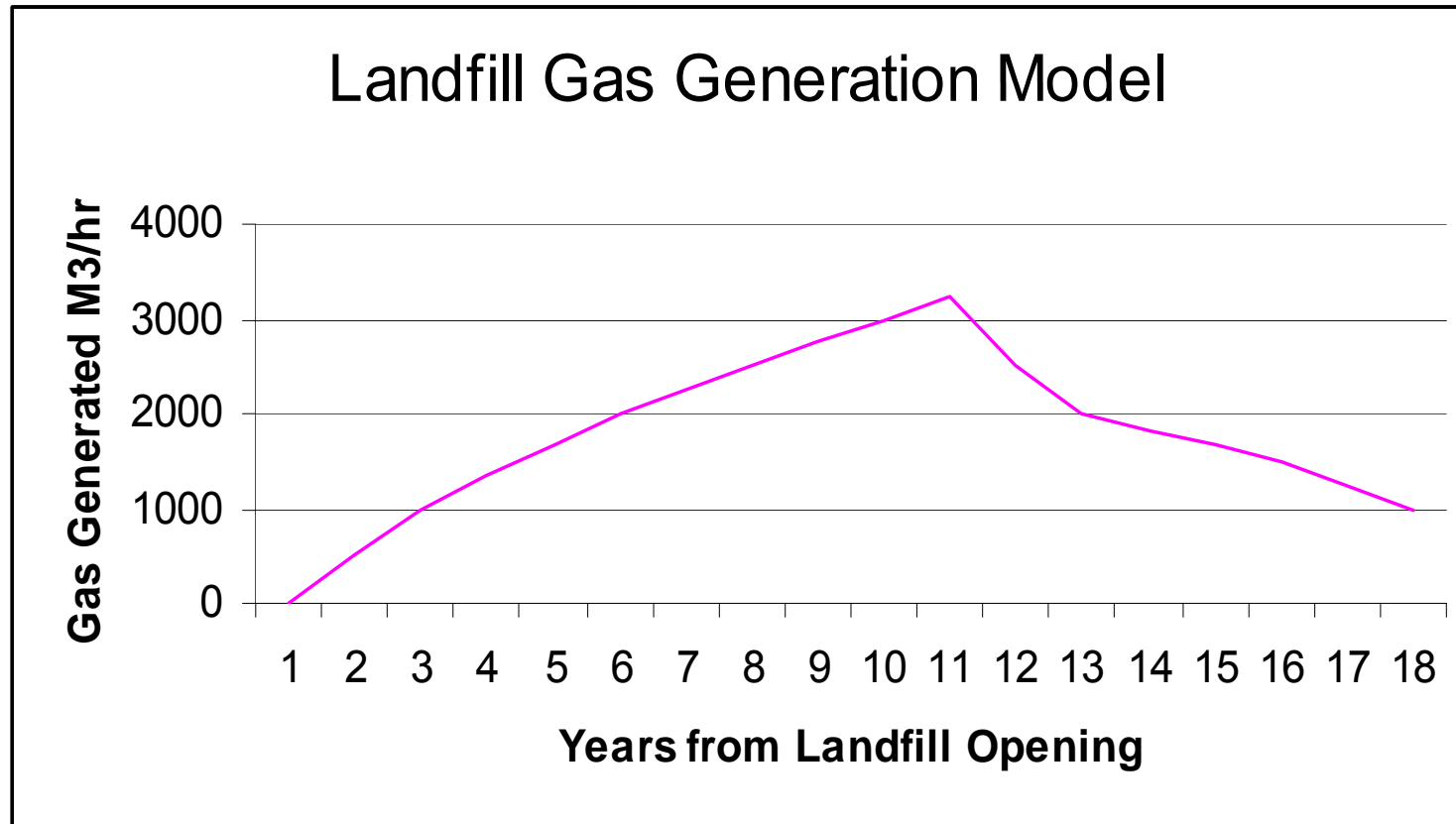
“4.2. Landfill gas shall be collected from all landfills receiving biodegradable waste and the landfill gas must be treated and used. If the gas collected cannot be used to produce energy, it must be flared.”

- Due to landfill size and remoteness only 8 landfills generate electricity
- 27 operating and 18 closed licensed landfills, 1 under construction
- Only 11 landfills designed from the outset to meet EU standards
- Most landfills operated by public sector- a significant source of local income
- Planned closure of small municipal landfills has been slow
- Government policy of 20 state of the art residual landfills delayed
- Landfill gas planning uncertainty associated with landfill size restrictions
- Large scale landfills have better gas management efficiencies
- Most small local authority landfills passive vent with some flaring
- Energy from landfills < 100,000 tpa utilisation unviable due to grid costs
- Currently only 9 landfills accept $\geq 100,000$ tpa

Landfills in Ireland



Typical Landfill Gas Cycle



Source: Gassim model output for a 150,000tpa Greenstar landfill

Triple Authorisation Process

EPA Licence Authorisation

Specified Engineering Works Approval - 2 months

Licence Review (if necessary) – 12 months

- Planning Permission

Engines and stacks – 3 to 12 months depending on objections

20kVa overhead lines exempt from planning

38kVa overhead lines require planning – attract high objections

- Electricity Grid Connection Application

Biggest challenge to RE developers is getting a connection

18 months to 3 years electricity grid application process duration

6 to 12 month line installation

Unclear application system

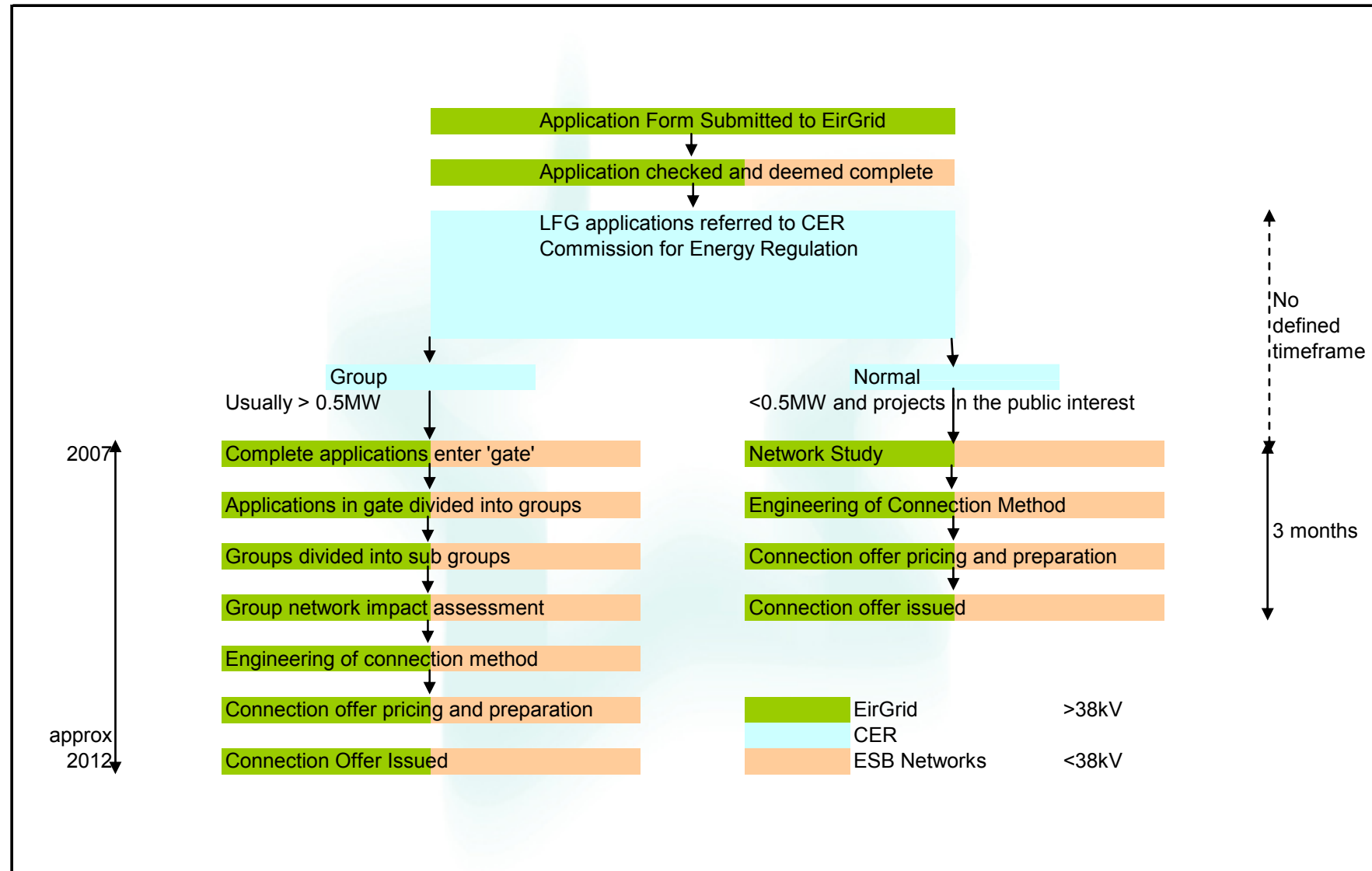
3 bodies dealing with application; CER, EirGrid, ESB Networks

System designed to deal with high volume of wind applications

Long process is unsuited to the cycle of gas generation in landfills

Must repeat full application if more engines needed

Electricity Connection Application



High Connection Costs

- Grid Connection Point can typically be 5 to 20 km from the landfill
- Connections to lines < 20kV are not 'contestable' i.e. the design and construction must be done by monopoly ESB Networks
- Frequent delays with overland connections due to landowner dissatisfaction – forcing more underground proposals
- 20kV: €50,000/ km overland; €100,000/km underground (estimate)
- 38kV: €100,000/km overland; €250,000/km underground (estimate)
- Additional substation and metering costs up to €350,000
- Delays in application process can shorten the viable life of project
- Infrastructure costs – Engines etc – approx €1million per MW
- Landfill gas utilisation carries significant operational cost risks
- Projects < 1MW unviable

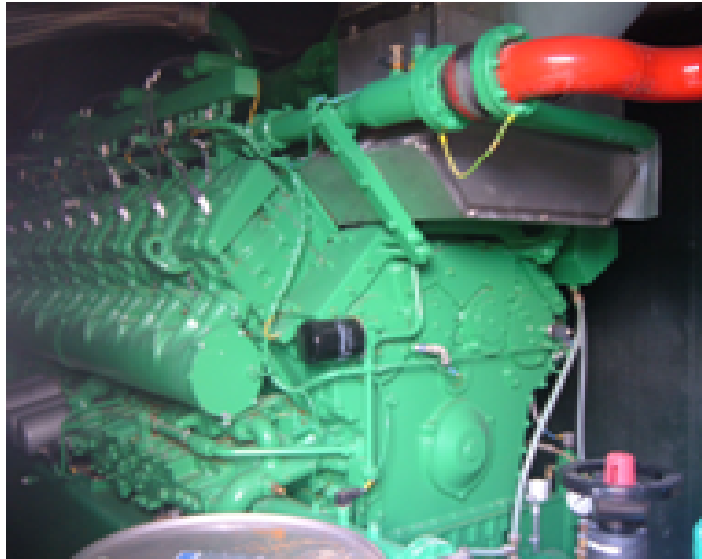
Biogas Utilisation – Greenstar



Greenstar Utilisation Plant, KTK landfill

- KTK landfill, Co Kildare, Ireland
 - 275,000 tpa ; No food or green waste
 - leachate recirculation
 - 3 engines
 - Generating 3.75 MW of electricity
 - Joint Venture Greenstar Gas Energy
 - 25% owned GAS GmbH Germany
 - 75% owned Greenstar
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- Greenstar is awaiting Electricity Connection approval for power generation on 3 other landfills

Biogas Utilisation – Operational Risks



- June 2006, engine M1 suffered catastrophic failure after less than 1 year
- Investigation of other two engines M2 and M3 showed similar symptoms
- Build up of siloxane deposits on cylinder liners
- Piston and liner seized leading to failure
- November 2006 dewatering / chilling treatment system installed
- Increased maintenance regime

Renewable Energy Prices

- REFIT Renewable Energy Feed In Tariff LFG €70 per MWhr
 - REFIT 15 year guaranteed tariff
 - Better prices available outside of REFIT
 - **LFG in Northern Ireland (UK ROCs) attracts about €100 per MWhr**
 - LFG tariff not reflecting the costs and operational risks
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- Offshore Wind recently awarded REFIT increase from €59 to €140
 - Biomass CHP increased from €70 to €120

Recommendations

- Ireland needs to close down old inefficient landfills < 50,000 tpa and landfills which will never be used for energy.
- In the short-term Ireland needs to facilitate the development / expansion of a limited number of purpose built modern landfills to a scale which will economically support bioenergy utilisation.
- A less complex electricity connection application process is needed with defined timeframes.
- A single point environmental/ planning licensing system is needed for landfill gas applications.
- International benchmarking of electricity connection costs.
- A transparent and equitable renewable energy tariff system that recognises the costs, environmental benefits and operational risks in LFG utilisation.



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Thank You