Energy in Poultry

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Ballyhaise and Moorepark
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Reminder Key Agricultural Emissions

Greenhouse Gas (GHG)	Where from on the farm?		Total: 20.1 Mt of CO2 eq in agriculture of which
Carbon Dioxide CO_2	Burning of fossil fuels		0.94 Mt of CO_2 eq **5%**
Methane CH_4	Natural bi-product of enteric fermentation		12.97 Mt of CO_2 eq **64%**
Nitrous Oxide N_20	Naturally produced; emissions can be increased by cultivation & N fertiliser		6.3 Mt of CO_2 eq **31%**

Energy efficiency in poultry

- Lighting
- Cold weather ventilation
- Record & monitor
- Insulation & building sealing
- Ventilation system maintenance
- Replacement policy fans
- Variable Speed Drives for electric motors
- Farmhouses

Energy Awareness

- Develop tools to create awareness among staff
- SEAI offer a range of training and supports around energy management and standards.
- Classroom based energy management training for companies
- More effective use of thermostats, time clocks, motion sensors and insulation
- Vehicle checks and maintenance

Ventilation - poultry

- Match duct and fan sizes to the ventilation system
- Regularly clean and maintain fans, ducts and louvres to improve airflow
- Replace old fans with energy-efficient models
- Use recirculation fans (cost about €300) to improve heat distribution (especially for direct acting heating systems) – heating fuel saving likely. Link to first-stage fans to maintain normal airflow
- Seal gaps around doors, walls, windows and ventilation louvres to reduce air leakage – increases static pressure and improves ventilation efficiency and natural air mixing
- Fit proprietary “bell-mouths” to fans or “cones” to outlet fans to increase aerodynamic efficiency by typically 10%

Heating on poultry units

- Position thermostats carefully to avoid overheating buildings (avoid draughts/doors)
- Insulate roof, floor and walls (insulate concrete mass walls to the ground)
- Link heating and ventilation systems
- Use heat recovery to pre-heat incoming air with warm extract air – heat energy savings of 10-25% are achievable
- Service boilers regularly – clean heat transfer surfaces
- Replace ageing boilers with energy-efficient models or renewable energy systems (or example biomass boiler, ground/air-source heat pump, solar thermal)
- Consider radiant heaters to directly heat floor area and minimise general air temperature rise
- Restrict chicks to smaller areas with zonal control/brooding curtains –ensure a tight seal

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Lighting poultry

- Reduce lighting (within regulations) – current minimum is 20 lux over at least 75% of floor
- Replace old incandescent and tungsten halogen lights with energy-efficient fluorescent systems inside and high pressure sodium or metal halide lamps outside
- Consider LEDs – modern LEDs are dimmable and fit existing sockets. Cost is higher than standard bulbs (€9/bulb versus €0.40-0.60), but lifespan is longer (50,000hrs v 1,000hrs) and use less energy (8W) to produce twice as much light
- Use photoelectric sensors to control lighting in buildings with windows.

Other energy saving - poultry

- Use multiple electronic sensors at bird height to improve ventilation and heating accuracy – consider systems that record temperature/ventilation data to aid management
- Inverters (variable speed drive) to speed up or slow down fans as required (rather than just on or off)
- Commission an energy audit

Potential opportunities in Renewable Energy

- Biomass - heating, electricity, transport
- Hydro - electricity
- Solar - heating, electricity
- Geothermal – heating
- Wave/tidal - electricity
- Fuel cells/Hydrogen – electricity, heating, transport
- Wind - electricity

Photovoltaics

- One kilo Watt Photovoltaic, produces 822 kWh in year one with output declining by 0.7% per year.
- Average output of 764 kWh per year over 20 years

- Using 100% in the business
- 764 kWh (0.36 cent per kWh) = €275 payback/yr.

- At a cost of €1,300 per kW installed gives a simple payback of **4.7 years**
- **TAMS Grant available 40%**

- 60% for Young Trained Farmers

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PV cuts your Carbon Footprint

- Each kWh of electricity generated by fossil fuels produces around 0.47 kg of carbon dioxide.
- A 20 kW PV system will produce about 20 x 800 kWh per year (16,000 kWh)
- This reduces the carbon footprint of the business by 16,000 x 0.35 kg = 5,600 kg of **5.6 tonnes**

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Microgeneration rates

Year of Microgen System Installation	Domestic / Non-Domestic <6kW system		Large Non-Domestic 6kW-50kW system
	Maximum SEAI grant amount	Clean Export Guarantee (CEG) tariff	Clean Export Premium (CEP) tariff (fixed for 15 years) €/kWh
2022	€2,400	Competitive market rate (CEG) available to all micro-generators	€0.135
2023	€2,400		€0.135
2024	€2,100		€0.125
2025	€1,800		€0.115
2026	€1,500		€0.105
2027	€1,200		€0.095
2028	€900		Competitive market rate (CEG) available to all micro-generators for new installations from this point on

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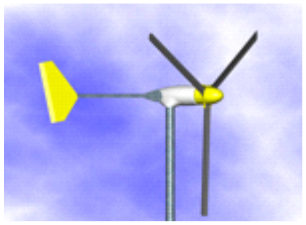
TAMS support levels

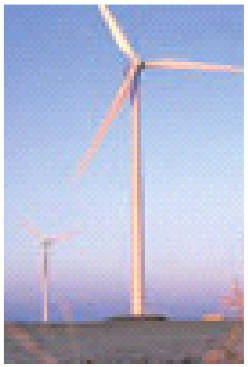
- **Solar Panels**
- Reference costs y = 1253x + 1608
- For an 11kW PV system is €15,391
- The **40% grant equates to €6156.40**

- **Rechargeable Batteries kWh**
- The cost y = 703x + 753
- For a 6 kWh (max) = €4971
- The 40% grant equates to €1988.40

100 kW – Wind Turbine cutting the Carbon Footprint

- Each kWh of electricity generated by fossil fuels produces 0.47kg of carbon dioxide.
- A 100 kW wind turbine will produce on average 245,000 kWh per year depending on the site.
- This reduces the carbon footprint of the farm business by 115,150 kg or over 115 tonnes each year





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Heat Pump Technologies

- ASHP – 300 – 400% efficient
- GSHP – Generally more efficient than ASHP

What is the SSRH?

- Govt. scheme
- Financial support to renewable heat generators
- 15 year period
- Administered by SEAI
- Technologies – Solid Biomass Boilers & Heat Pumps
- Non-domestic sector

Sustainable Support for Renewable Heat (SSRH)

- The Irish Government expects the SSRH to make a significant contribution towards their 2020 ambition of having 12 per cent of heating coming from renewable sources.

Phase one of the SSRH:

- Phase 1: the introduction of the SSRH for non-domestic installations in the industrial, business and public sectors.

Plan Projects Carefully

- Ascertain what type of fuel suits you best.
- Solid fuel (manual handling), pellets or chip (automated)
- Fuel supply, storage and delivery
- Eligibility of boiler, installer and final use of heat
- Boiler sizing
- Biomass must be the primary fuel source
- Installers will be very busy – unforeseen setbacks
- Look at track record of supplier, manufacturer and installer

Eligible Use of Heat

- Inefficient drying practices in order to maximise payments.
- Grain drying
- Wood-fuel drying
- Swimming Pools – (Municipal or Commercial)

SSRH is designed to off-set use of fossil fuels

SSRH tariff levels (Cent for each kWh of heat produced)

Tier	Lower Limit (MWh/yr)	Upper Limit (MWh yr)	Biomass Heating Systems Tariff (c/kWh yr)	Anaerobic Digestion (c/kWh yr)
1	0	300	5.66	2.95
2	300	1,000	3.02	2.95
3	1,000	2,400	0.5	0.5
4	2,400	10,000	0.5	0.0
5	10,000	50,000	0.37	0.0
6	50,000	N/A	0.0	0.0

Poultry SSRH Example

- Poultry Unit
- 400 kW boiler – cost €180,000
- Run 1,700,000 kWh/yr (50% load)
- Oil Displaced = 160,500 litres
- Oil Cost pa = €144,450 (0.90 c/litre)
- Wood Chip cost pa = €127,500 (7.5c / kWh)
- Saving pa = €16,950
- Payback without grant or SSRH = 10.6 years

SSRH extra income = 300 MWh x €56.6 = €16,980 +

700 MWh x €30.20 = €21,140 + = €41,620

700 MWh x €5 = €3,500

Heat Saving from wood chip + SSRH = €58,570 or payback 3.1 years

Comparing fuel costs

- 1,000 litres of oil contains 36.68 GJ of energy or 10,190 kWh of energy.

Oil at €1.20 litre = €1,200 / 10,190 kWh = **11.77 cent per kWh**

- Wood chip at €140 per tonne @ 30% moisture content 3,400 kWh per tonne = **4.1 cent per kWh**

Market Opportunities

- Does not contain banded sweet spots like UK – 199kW or 999kW
- Leisure centres, hotels, hospitals, nursing homes where 1,000 MWh of heat are covered by the two first tariffs.
- Running installations of around 300kW to 400kW at 3000 full load hours – securing €38,000

Fuel Requirement

- Rule of Thumb – Biomass boilers require about 1t of dried woodchip a year (30% moisture) for every kilowatt installed.
- Logistics is key – transport is expensive
- Woodchip has a range of moisture contents
- Quality Assurance

Fuel Storage Requirements

Boiler Output	80 kW	350 kW	1,000 kW	2,000 kW
Fuel input	25 kg/hr (100 kW)	100 kg/hr (400 kW)	300 kg/hr (1,200 kW)	600 kg/hr (2,400 kW)
1 m3 / 150 kg storage	6 hrs	1.5 hrs	Too small	Too small
4 m3 / 600 kg storage	24 hrs	Too small	Too small	Too small
16 m3 / 2,400 kg	4 days	24 hrs	8 hrs	Too small
48 m3 / 7200 kg	12 days	3 days	24 hrs	12 hours
55 m3 / 8250 kg	14 days	3.4 days	28 hrs	14 hours
500 m3 / 75,000 kg	Too big	31 days	10 days	5 days

CO_2 Emission Factor

Energy Source	CO_2 emission kg/kWh
Grid electricity	0.346
Natural Gas combustion - Heating	0.205
Coal - combustion	0.340
Kerosene	0.257

If I use 4,000 kWh of electricity in the year I'm producing
4,000 x 0.346kg = 1,384kg or 1.4tonnes of CO_2

Kerosene Oil has 10.5 kWh per litre. 1,000 litres = 10,500 kWh
10,500 x 0.257 = 2,698 kg or 2.7 tonnes of CO_2

SSRH - Application Process

Online Application Portal

Project Assessment Application Form

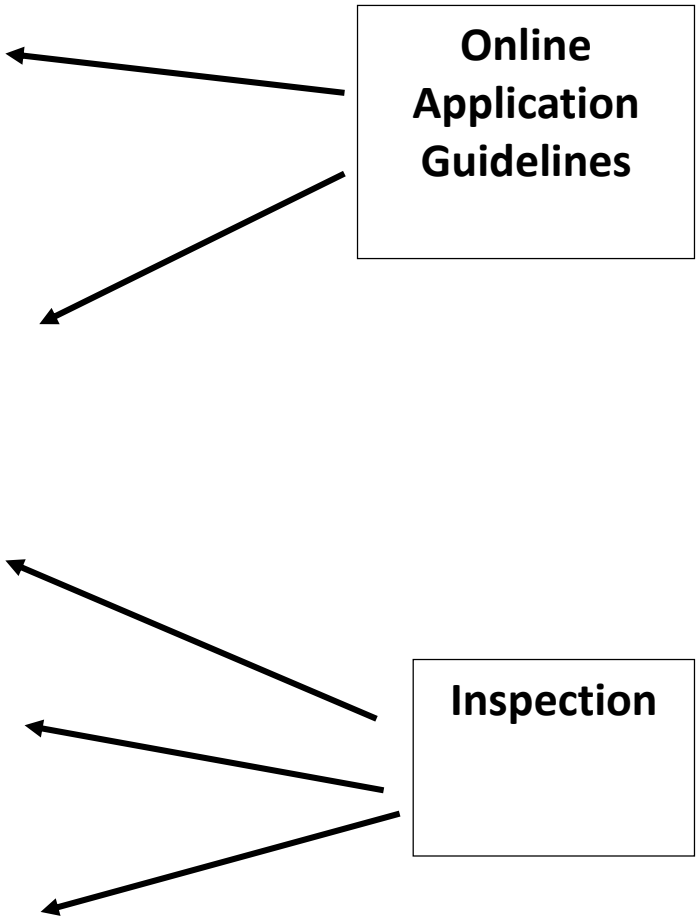
Letter of offer

Project Installation and Commissioning

Project inspection and verification

Payment stage & contract

Ongoing obligations



Take Home Message

ENERGY EFFICIENCY IS PARAMOUNT

GET TO KNOW THE FUEL YOU'RE GOING TO USE

- Understand the fuel you're going to use, it's pros and cons, key design considerations, availability - and stick to it.

DESIGN YOUR FUEL STORAGE AND RECEPTION AROUND YOUR FUEL CHOICE

- Think about lifecycle costs, practicalities of fuel delivery and storage.

USE PROVEN TECHNOLOGIES

- Don't try to reinvent the wheel.

SSRH

- Presents a range of new business and financial opportunities for the commercial and agricultural sectors.

Thanks for your attention