ENERGY STATEMENT

Planning Application for 2 No. Broiler Poultry Units with Feed Silos and Roof Mounted Solar PV System at Boiling Wells Farm, Grantham Road, South Rauceby, Sleaford

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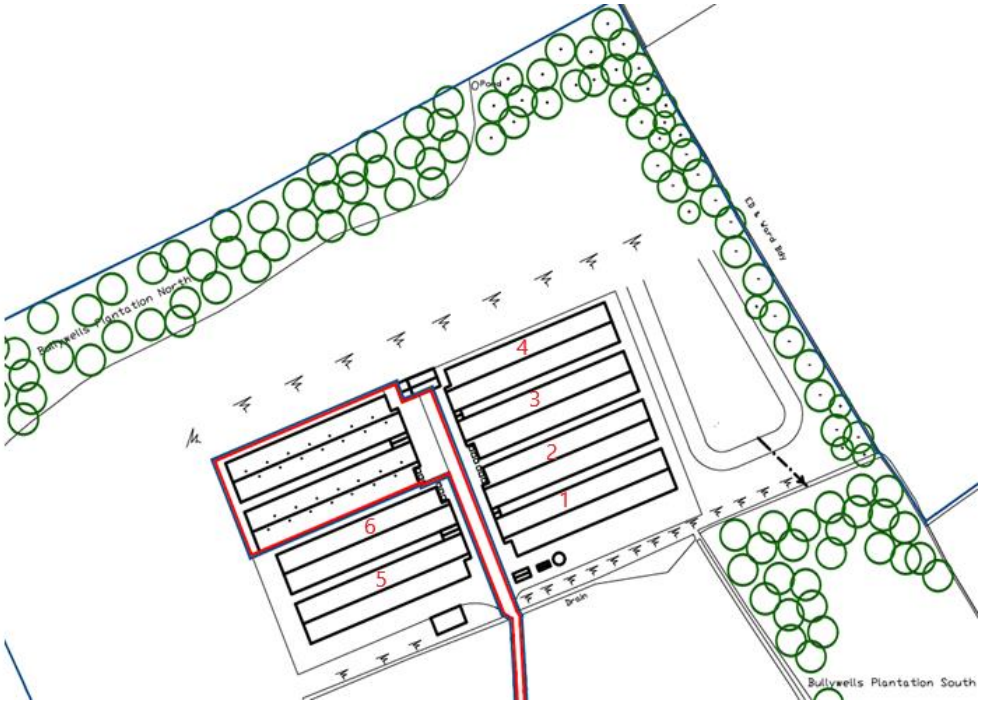
1.0 INTRODUCTION

1.1 This document comprises an 'Energy Statement' produced in accordance with the relevant provisions of Central Lincolnshire Local Plan (2023) Policy S8 'Reducing Energy Consumption – Non-Residential Buildings'. Consideration is also given to the recently published supplementary documentation Central Lincolnshire Energy Efficiency Design Guide (2023) and Providing an Energy Statement: A Guide For Applicants(July 2023). The following concerns the predicted energy usage and corresponding renewable energy generation requirements of a proposed development scheme seeking erection of 2 No. broiler poultry houses with roof mounted photovoltaic (PV) panels ancillary feed silos and hardstanding upon land at Boiling Wells Farm, Grantham Road, South Rauceby, Sleaford NG34 8QX (Easting: 504041, Northing: 345828).

1.2 The following should be read in conjuction with the the 'Planning Policy Context' section of the submitted document JHG Planning Consultancy Ltd, 2023, Environmental Report & Design and Access Statement. Such outlines compliance with other relevant policies concerning energy efficient design and resilence to climate change including S6 'Design Principles for Efficient Buildings', Policy S9 'Decentralised Energy Networks and Combined Heat and Power' and S20 'Resilient and Adaptable Design'.

<u>Proposed Development</u>

1.3 The proposed scheme entails expansion of an established broiler poultry farm. As outlined in red upon the site layout plan included below, the proposed development includes two new steel portal framed poultry units of identical specification to the existing adjacent units.



Proposed site layout plan displaying 2 No. new poultry units subject of this energy statement (outlined red) relative to existing poultry units 1-6 of identical specification

1.4 The proposed units will accordingly have external dimensions measuring approximately 97 metres by 23.3 metres plus a 33.8 metre wide linked front elevation canopy/store room. The gross external floor area of each unit will therefore be 2154 m2 (square metres). The ridge

height of the low profile buildings will be just 5.77 metres. The proposed units' rooves and walls feature insulated layers designed to achieve thermal efficiency (construction described below), thereby minimising heat loss in winter and reducing excessive solar gain in summer.

1.5 It should be noted that the established poultry farm already benefits from the presence of a substantial biomass boiler heating system. This is housed within a dedicated existing building (completed following the grant of planning permission 22/0267/FUL) situated to the immediate east of the proposed units. The wood chip fuelled renewable heating system includes two biomass boilers capable of producing a maximum energy output of 1800 kilowatts (kW). As expanded upon below, this existing system is capable of meeting the heating requirments of the proposed units without upgrading.

2.0 METHODOLOGY

2.1 The new poultry houses exhibit operational attributes that are quite distinct from other forms of development such as housing, commercial buildings, office blocks etc. In order to regulate internal moisture and CO_2 content (and in turn, odour and ammonia emissions), the poultry units require high velocity ventilation systems designed to provide a constant large volume of air flow through the entire internal aviary area. This necessity in no small part reduces the impact of energy efficiency measures such as building orientation and insulation. Conventional energy assessment tools/standards such as Passive House Planning Package (PHPP), Standard Assessment Procedure (SAP), Design for Performance for non-residential schemes and Building Research Establishment Environmental Assessment Methodology (BREEAM) cannot technically be applied to structures/operations such as that in question. Indeed, at the time of writing, there is no recognised methodology for intensive livestock unit energy assessment.

2.2 However, it was determined that an energy efficiency assessment could be undertaken through utilisation of a case study methodology. The established poultry farm includes 6 No. broiler poultry units of identical specification to those now proposed. These are currently primarily powered via connection to National Grid's electricity supply. Heating is provided by dual biomass boilers with a combined 1.8 MW output. Records accordingly exist detailing annual electricity and fuel usage. Such in turn allows an accurate estimate of both regulated and unregulated energy usage over the course of a typical year. On-site renewable energy requirements (proposed PV panels and existing biomass heating) are calculated therefrom. This approach will also inevitably account for factors such as building insulation, fabric, orientation and form (of relevance to CLLP Policy S6).

3.0 BUILDING ENERGY PERFORMANCE

3.1 As detailed within the above 'Methodology' section of this statement, the regulated and unregulated energy performance of the new poultry units is predicted following analysis of data available for 4 No. existing poultry units (which are of identical specification). The following details energy usage based on annual records of Biomass RHI (Non-domestic Renewable Heat Incentive) fuel consumption (presently used for poultry unit heating systems) and electricity usage (regulated and unregulated) for the existing units 1 – 4, which have now been in situ for a sufficient period to obtain accurate data.

Energy consumption – Existing Poultry Units

3.2 Although the site has 6 No. existing poultry sheds, two of these were only fully stocked in January 2023. As such there is not sufficient data for energy use with the 6 sheds currently in

operation. Energy usage has therefore been assessed on the basis of data obtained from operation of existing units 1 to 4 (situated to the immediate east of the application site). Copies of the site records are located in located in Appendix 1. The analysis from these buildings has highlighted the following level of energy usage.

Biomass

3.3 The established poultry units is are heated during cooler months via two wood chip fuelled biomass boiler systems, which are housed in a dedicated building located within the farm complex's northern confines. As part of the Government's Non-Domestic Renewable Heat Incentive (ND-RHI), it is necessary for all biomass boilers accredited on the scheme to have heat meters installed that register the heat generated by the biomass boilers. The heat registered on these heat meters is submitted on a quarterly basis, and the table below shows the energy usage for broiler units 1 – 4 over the past two years of operation.

2 Years RHI Readings		
Month	Year	Reading (kWh)
December	2020	753,252
March	2021	502,397
June	2021	677,649
September	2021	655,770
December	2021	739,525
March	2022	552,650
June	2022	580,455
September	2022	714,789
December	2022	887,430

Table 1: RHI readings for 4 No. poultry houses

3.4 Based on the above readings, we can calculated the amount of heat used in total each year, and therefore an average usage per shed, as seen below:

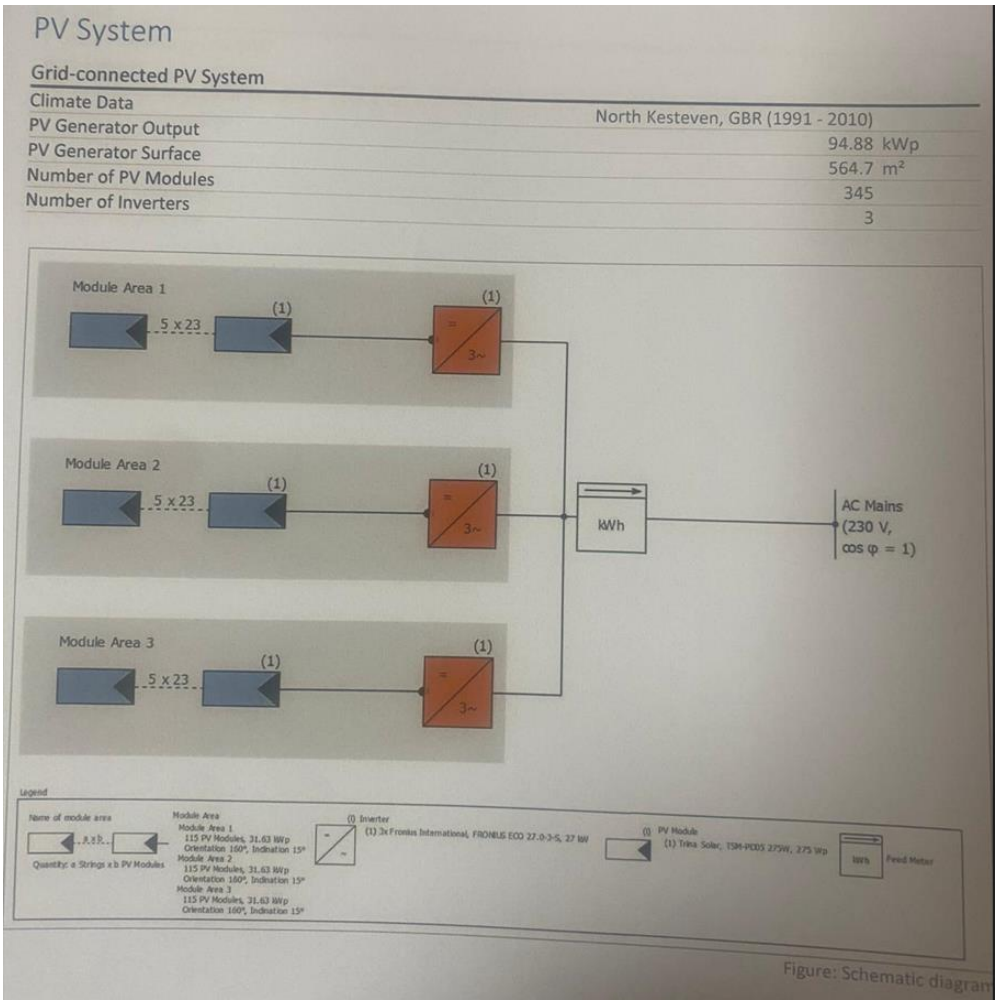
Year	Annual Units Consumed	Units Consumed Per Shed
2021	2,575,341	643,835 kWh/Unit/yr
2022	2,735,324	683,831 kWh/Unit/yr
	Average	**663,833 kWh/Unit/yr**

3.5 We will therefore use the assumption that a single poultry shed on this site will require 663,833 kWh per year for space heating.

Electrical

3.6 The electrical consumption data taken from the duration of the year 2022 accounts for seasonal variations in usage across existing poultry units 1 – 4. In addition to energy the farm has imported from the grid (taken from meter readings in electricity invoices), some of the poultry units have small roof mounted solar arrays that generate renewable power on site. It

is therefore necessary to include the generation from this array within the overall consumption of energy from the site. The schematic below shows the size of the array as being 94.88kW in size, as indicated in the schematic below:



PVsol report provided by customer which depicts a system size of 94.88kWp.

3.7 NerG has modelled this system's output and merged this electrical generation with the site's electrical consumption to create a monthly breakdown for electrical consumption of the existing case study poultry houses (1 – 4). A table detailing annual kWh of electricity usage is included within Appendix 1. Based on the analysis of energy usage, it can be determined that each individual shed has an average annual electrical demand of 64,555kWh/yr.

Energy Consumption – Proposed Buildings

3.8 The proposed development will entail construction of: 2 No. broiler poultry units (each with gross internal floor area of 2193 m2).

3.9 As noted within the 'Methodology' section of the statement, the proposed poultry units will be constructed to a specification identical to the existing poultry houses and fitted with the same ventilation and aviary systems. Each of the proposed units' roofs feature thermally efficient layers comprising external profiled steel sheeting cladding with 280mm of loft roll insulation installed thereunder beneath steel rafters. The internal layer includes 20mm PIR board (to prevent cold bridging the steel) with 0.4mm steel sheeting (polyester coated) attached thereto in order to form the ceiling surfacing.

3.10 The low stature elevations feature profiled steel sheeting external cladding with insulated 100mm rigid cavity battens. Windows are TUF gas filled double glazed units with 'anti-sun grey' coating complemented by insulated 30mm PIR board automated blinds. The above construction accounts for the roof comprising the majority of each unit's external surface area. A substantial level of insulation to minimise heat loss in winter and reduce excessive solar gain in summer is therefore included in the roof structure.

3.11 The proposed units' benefit from a thermally efficient form factor (external surface area divided by gross internal area) and orientation. The inherently functional structures have been designed in a manner that avoids creation of a large surface area to volume ratio. Aside from aiding internal temperature stability, the simple rectilinear building form also allows effective ventilation/air flow, thus minimising electricity usage associated with these systems. Both the existing and proposed units are considered to represent examples of the latest efficient technology design principles and construction techniques. It is considered that there is no substantive reason for the design of the proposed units to deviate from that of the existing units (note photograph below).

Existing case study 'Poultry Unit 1' is of identical specification to the proposed units.

3.12 On this basis, it is reasonable to predict that **each of the proposed units will exhibit a total energy usage similar to the existing sheds of 332 kWh/m2/yr**. As with the existing units, this figure represents combined heating and electrical energy consumption. This should be regarded as the baseline pre-built energy efficiency estimate for the purposes of Policy S8 criterion a). Predicted net energy usage following integration of renewable electricity and heating technology is detailed below.

3.13 In context of the above, criterion 2 of CLLP Policy S8 stipulates that: '*To help achieve point 1 above, target achieving a site average space heating demand of around 15-20kWh/m2/yr and a site average total energy demand of 70 kWh/m2/yr. No unit to have a total energy demand in excess of 90 kWh/m2/yr, irrespective of amount of on-site renewable energy production. (For the avoidance of doubt, 'total energy demand' means the amount of energy used as measured by the metering of that building, with no deduction for renewable energy generated on site).*' Evidently, each of the proposed broiler poultry units will have a total energy demand in excess of 90 kWh/m2/yr (exceeded by 251.3 kWh/m2/yr). Under these circumstances, 7 reference is made to the Policy S8 'exceptional basis clauses'. These comprise: '*…two potential clauses allowing certain developments to not meet in full the policy requirements above, though in all cases the energy performance arrangements of points a) and b) are still required*.'

3.14 Policy S8 details two 'exceptional basis clauses' that allow a development proposal to achieve strategic acceptability. Clause 2 concerns adherence to an accredited energy efficiency certification scheme, noting that: '*…as an alternative to policy requirements 1-2, that the*

proposal has compliance with BREEAM Outstanding or Excellent.' However, the BREEAM assessment methodology is designed for conventional commercial buildings such as offices and it cannot be applied to intensive livestock development of the nature proposed. 'Clause 1 (technical or policy reasons)' is however considered to be applicable to assessment of the proposed broiler poultry units. Clause 1 stipulates: '*Where, on an exceptional basis, points 1-2 cannot be met for technical (e.g. overshadowing) or other policy reasons (e.g. heritage) or other technical reason linked to the unique purpose of the building (e.g. a building that is, by the nature of its operation, an abnormally high user of energy), then the Energy Statement must demonstrate both why they cannot be met, and the degree to which each of points 1-2 are proposed to be met.*'

3.15 In this regard it is emphasised that the proposed intensive broiler units are considered to be, by the nature of the operation, 'abnormally high energy users'. Unlike with conventional commercial development, the poultry units will each accommodate 33,150 chickens. As detailed within the 'Air Quality' chapter of the accompanying 'Environmental Report & Design and Access Statement', poultry litter will generate odour and ammonia emissions, with the latter potentially building up to a harmful level if confined. To prevent adverse effects, the poultry litter must exhibit a moisture content of below 40% and emissions effectively dispersed. For reasons of animal welfare, human health and amenity, it is therefore necessary for the poultry units to incorporate high velocity large volume ventilation systems. A number of roof mounted fans must accordingly run constantly throughout any given year in order to deliver sufficient internal airflow and drying of poultry litter. As a result of this, the units' internal aviary area can become very cold in winter. A powerful heating system is therefore required to address animal welfare needs. Inevitably, the heating of the necessarily 'drafty' aviary area is very inefficient (similar to heating a home with all windows open). Conversely in summer, a high volume of airflow is required to assist with unit cooling. As ventilation is a required to prevent odour/ammonia built up, the units' can't realistically be kept cool through high levels of insulation and sealing the aviary area off from hot outside air temperatures. For these reasons, the livestock units will always be a high energy user and adequate mitigation cannot realistically be provided in the form of building design, insulation etc.

3.16 Nevertheless, with reference to Clause 1 criteria a) to c), it is emphasised that the energy needs of both poultry units (each with floor areas significantly exceeding 1000 m^2) will be entirely addressed on-site via renewable sources (refer to 'Proposed Renewables' section below). It will not therefore be necessary for the applicants' to enter into legal agreements for the provision of off-site ancillary renewable energy development or provide financial contributions to the LPA in support of remote renewable energy infrastructure.

Renewable Energy Technology

3.17 In accordance with 'Criterion 1' of Policy S8, the proposed broiler poultry units will produce at least the same amount of renewable electricity on-site as they demand over the course of a year. With regard to heating requirements, the new units will utilise spare capacity within an existing on-site renewable biomass boiler system, thereby aligning with the provisions of Policy S9 'Decentralised Energy Networks and Combined Heat and Power'. This will be achieved through implementation of the following technology/systems:

PV (Photovoltaic) Solar Array

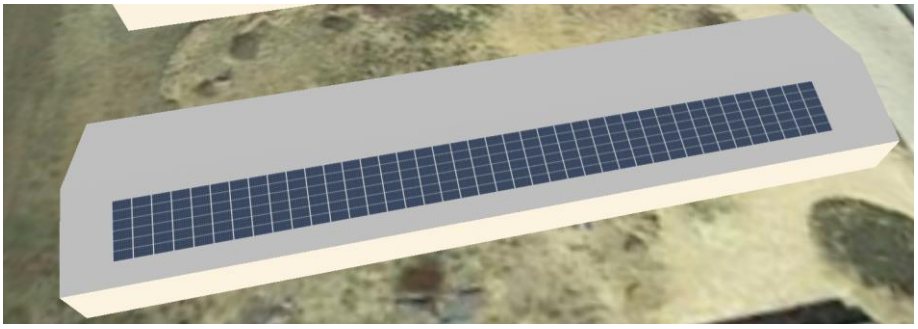
3.18 Each poultry unit benefits from a substantial roof area, thus presenting an opportunity to utilise roof mounted PV panels. In contrast with freestanding ground mounted arrays, roof mounted panels allow more efficient use of land and typically benefit from excellent solar exposure.

120kWp roof mounted solar PV installation on a poultry house completed by NerG Ltd

3.19 As outlined in 'methodology' section of this Energy Statement, each poultry unit (existing and proposed) has a typical electrical demand of 64,555kWh annually. The basis for this summarised in the table below, which details the extrapolation of annual electricity usage exhibited by the existing case study poultry units (1-4).

Electrical consumption for 4 No. existing poultry houses	175,167kWh
Existing 94.88kWp Solar PV system Modelled Annual generation *(taken from installers sales documentation)*	83,053kWh
Total electrical demand for 4 No. existing poultry houses	258,220kWh
Electrical demand for 1 No. existing poultry house	64,555kWh

3.20 Evidently, for the proposed 2 No. poultry units, it was necessary for NerG Ltd to design a system capable of generating enough annual solar energy to deliver the combined electrical energy requirements 129,110kWh/yr (i.e. 64,555kWh/yr or 29.4 kWh/m^2/yr for each new poultry unit).



130.29kWp solar PV system modelled on 1 No proposed poultry house

3.21 NerG Ltd have accordingly proposed the installation of 130.29kWp of solar PV to cover the annual energy consumption of the 2 new proposed sheds. This would consist of 258 No. 505Wp roof mounted panels with 2 No. 50kW inverters (note image included above). When modelled, this **PV system is expected to generate 132,049kWh annually (or 30.1 kWh/m^2/yr for each unit)**. This means that more than the development's annual electrical requirements will be generated on site.

Existing Biomass Boiler Heating System

3.22 The proposed scheme will utilise an existing biomass boiler heating plant. This includes two boilers with combined 1.8 MW output. The system is not however running a full output in order to heat the 6 No. existing poultry units. The combined biomass boilers have sufficient spare capacity to address the heating demands of the new poultry units. Each of **the proposed units will utilise an estimated 663,833 kWh of renewable heat energy per year, which equates to 302.7 kWh/m^2/yr**.

3.23 The biomass boiler will essentially pipe hot water though heat exchangers in each unit during the cooler months of late autumn, winter and early spring. This works in tandem with the ventilation systems in order to ensure temperatures do not drop below the required threshold irrespective of air flow/ambient temperatures. The biomass boiler system can be regarded as a decentralised renewable energy network for reason that it allows heating to be provided 'off-grid' through combustion of renewable wood chip fuel. This arrangement aligns with CLLP Policy S9.

Combined Renewable Output

3.24 Evidently, the **proposed renewable technology will allow a total energy generation (heat and electrical) of 322.8 kWh/m^2/yr per proposed unit** (with each new poultry unit technically consuming 322.1 kWh/m^2/yr). It will not therefore be necessary for the applicants' to provide the LPA with off-site contributions for renewable energy infrastructure under the provisions of Clause 1.

4.0 CONCLUSION

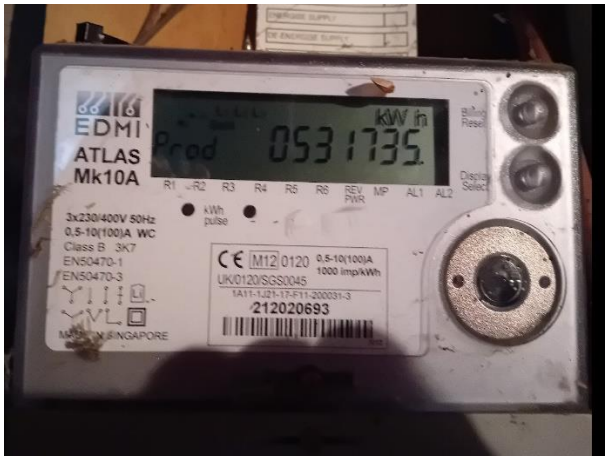
4.1 This document comprises an 'Energy Statement', which has been produced in accordance with the requirements of Central Lincolnshire Local Plan (2023) Policy S8 'Reducing Energy Consumption – Non-Residential Buildings', in relation to a development scheme seeking erection of 2 No. broiler poultry units with ancillary biomass boiler building. For the reason that the broiler units require constant high volume ventilation to deliver necessary levels of animal welfare and avoid adverse environmental effects, the operation exhibits high levels of

energy usage. It will not therefore be possible to achieve compliance with Policy S8 criterion 2 because each unit exhibits a total energy demand in excess of 90 kWh/m2 /yr (comparative analysis of existing units predicts a total energy usage of approximately 332 kWh/m2/yr per unit).

4.2 Nevertheless, use of the farm's existing biomass boiler heating system and the implementation of Solar PV technology will allow the proposed units to meet (and marginally exceed) annual energy demands through on-site renewable generation. It is therefore evident that the proposal achieves compliance with Criterion 1 of Policy S8 on the basis that the development can generate at least the same amount of renewable electricity on-site (and preferably on-plot) as it demands over the course of any given year. It is not therefore necessary for the applicants' to make contributions to the LPA for off-site infrastructure under Policy S8 'Exceptional Basis' Clause 1.

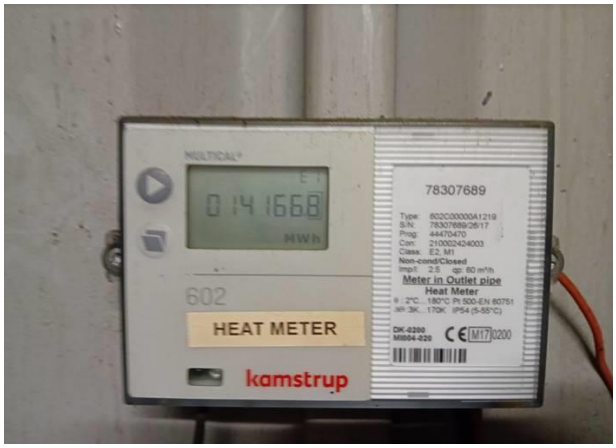
Post Construction Testing & Monitoring

4.3 CLLP Policy S8 stipulates that: '*Weight will be given to proposals which demonstrate a deliverable commitment to on-going monitoring of energy consumption, post occupation, which has the effect, when applicable, of notifying the occupier that their energy use appears to exceed significantly the expected performance of the building, and explaining to the occupier steps they could take to identify the potential causes of such high energy use.*' To address this requirement, post construction, the site manager and personnel will be trained in the operation and monitoring of the renewable energy systems. Meters are/will be installed to record the generation of both heat and electrical power (note monitoring equipment examples illustrated below).



Typical PV generation meter.

4.4 Records of monthly electrical generation will be taken via the above meter system. Combined predicted electricity generation from all PV panels will be 132,049kWh kwh/yr, which will marginally exceed the estimated combined electricity usage of the proposed poultry units.



Typical biomass boiler heat generation meter.

4.5 Similarly, the existing biomass boiler heating system includes a heat generation meter (note photograph included above). This again allows monthly records to be taken to record energy generation. Predicted annual performance comprises 5,310,664 kwh/yr of total output (663,833 kwh/yr of heat energy per unit). This accounts for the energy demands of the existing and proposed units (i.e. 8 No. poultry units each stocked with 33,150 birds).

4.6 It is emphasised that the above comprises a prediction of electrical and heat energy performance based upon annual average generation and usage calculations. Performance may vary due to changes in climatic conditions, biomass fuel quality, poultry unit stocking density or deviation from standard operational practices. NerG Ltd and JHG Planning Consultancy are not liable for variations in equipment performance.

APPENDIX 1

Existing Poultry Farm Energy Usage – Table below detailing electricity consumption from existing 'case study' units 1-4 in kWh/yr.

Month	Electricity from Grid *(taken from meter readings)*	Modelled Electricity from Solar PV	Total electrical load for 4 No. Sheds
January	14,957.9	1,854	16,811.90
February	14,362.5	2,987	17,349.50
March	18,154.7	5,783	23,937.70
April	12,270.3	10,693	22,963.30
May	16,580.6	11,476	28,056.60
June	9,007.8	11,979	20,986.80
July	14,910.1	11,820	26,730.10
August	18,431.6	9,180	27,611.60
September	8,686.9	8,118	16,804.90
October	14,596.6	4,633	19,229.60
November	16,739.9	2,897	19,636.90
December	16,468.8	1,632	18,100.80
Total	**175,167.7**	**83,052**	**258,219.7**