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ENERGY REPORT
SHD STAGE SUBMISSION
AT
BRIDGEGATE RESIDENTIAL DEVELOPMENT
RATHGORY & MULLADRILLEN, ARDEE, CO LOUTH

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1.0 INTRODUCTION

MANDE Consulting Ltd. (MandE) prepared this Energy Report, on behalf of "The Ardee Partnership", for a proposed SHD development on a site located at Bridgegate, Rathgory & Mulladrillen, Drogheda Road, Ardee, County Louth.

The purpose of the report is to provide a building energy statement outlining the energy performance of the proposed development and identifying the services and renewable design strategy for the proposed development to demonstrate compliance with the building regulations.

2.0 DESCRIPTION OF THE DEVELOPMENT

The site is located at Bridgegate, Rathgory and Mulladrillen, Ardee, Co Louth.

The proposed development site extends to c. 13.03 ha at Bridgegate, Rathgory & Mulladrillen, Drogheda Road, Ardee, County Louth and adjoins Phases 1-3 at Bridgegate (under construction) on lands to the west, accessed from the N2 Drogheda Road. The proposals overlap the boundary of permitted development Reg. Ref.: 10174; ABP Ref: PL15.238053 (as amended) at the western boundary and will supersede granted development in this area which consists of 31 no. dwellings, crèche and community building and public open space.

The development will consist of:

A) The construction of 272 no. residential units comprising a mix of 206 no. 2, 3 and 4 bedroom houses (all 2 storeys) including 50 no. 2-bedroom houses (Type 1), 145 no. 3-bedroom houses (Types 2, 3, 6) and 11 no. 4-bedroom houses (Types 4, 5) all with private open space and car parking, alongside 66 no. duplex units (all 3 storeys) including 17 no. 1-bedroom units (Types D5, D8), 24 no. 2-bedroom units (Types D1, D3, D6) and 25 no. 3-bedroom units (Types D2, D4, D7), all with private open space in the form of terrace at upper floor level and external garden space, with 499 sqm of communal open space serving Duplex Blocks A-B (48 no. units) (served by 2 no. bin and bike stores [each c. 51 sqm] adjacent) at Bridgegate Avenue, providing a total residential gross floor area of c. 28,168.9 sqm;

B) A part 1, part 2 no. storey crèche (c. 484.1 sqm) and playground and a single storey community building (c. 165 sqm) located adjacent at a central community hub (with bin and bike store [c. 23 sqm]) accessed from Bridgegate Avenue served by car parking located on Bridgegate Green and Bridgegate Avenue;

C) A landscaped Public Park located in the northern part of the site extending to c. 3.6 ha accessed from the community hub and between duplex Blocks B & C at Bridgegate Avenue, with 2 no. pedestrian links to permitted public park adjoining to the west and 1 no. pedestrian footpath extending to the northern perimeter at Hale Street, with a reservation for a future link road to lands to the east facilitated in the northern section of the park;

D) Works to the Rathgory Tributary located to the south of Bridgegate Avenue comprising the realignment of the channel and regrading and reprofiling of land (as required), implementation of 2 no. vehicular crossings (including culverts and mammal passes) and the provision of a riparian corridor based around the open watercourse comprising landscaping and planting with safe access to the watercourse provided for maintenance purposes and 1 no. pedestrian and cyclist crossing;

E) A series of landscaped public open spaces provided throughout the site with Public Open Space 01 (c. 1.05 ha) and Public Open Space 2 (c. 0.43 ha) located within the linear park (including riparian corridor) adjacent to the Rathgory Tributary with Public Open Space 03 (c. 0.29 ha) centrally located in the southern part of the site; open spaces will provide a mix of hard and soft landscaping, pedestrian and cycle access cycle lanes provided at POS 1 and

POS 2) and a range of activities including fitness spaces, kickabout area, amphitheatre and nature based play areas;

F) Provision of shared surfaces, landscaped streetscapes including planting and landscaping at two neighbourhood streets in the southern part of the site, with roads provided to site boundaries to the east, south and west to facilitate possible future connections;

G) All landscaping including planting to consolidate treelines and hedgerows forming existing site boundaries with agricultural lands to the east and Cherrybrook residential development to the west and all boundary treatments;

H) Roads and access infrastructure taken from Bridgegate Avenue (permitted under Reg. Ref.: 10/174; ABP Ref: PL15.238053 [as amended]), the provision of a bus stop on the south side of Bridgegate Avenue adjacent to community hub and provision of cycle lanes at this location (continued through Public Open Space 01); a total of 480 no. car parking spaces (362 no. serving houses, 84 no. serving duplexes, 23 no. serving crèche and community building and 11 no. visitor and public open spaces), a total of 278 no. bicycle parking spaces (186 no. spaces serving duplexes [80 visitor spaces], 32 no. spaces at the community hub and 60 no. visitor spaces);

I) Provision of 2 no. ESB substations, all associated drainage and services infrastructure (surface water, foul and water supply), public lighting, SUDS drainage and works to facilitate the development.

2.1 ENERGY & CARBON EMISSIONS STRATEGY

This report outlines the energy performance of the proposed new development and compare with the standards prescribed in the building regulations TGD Part L. As part of the development's efforts to further reduce energy consumption, the residential units shall target a minimum BER rating of 'A2'/'A3' and commercial unit an A3 rating.

The built environment has been designed in order to maximise the quality of life within the development, with the health and wellbeing of the user in mind. Generous open spaces surrounding the housing units have been defined and orientated for this purpose.

Passive surveillance has been incorporated into the design. This reduces the risk of crime to all residents within the scheme, littering, and loitering of green spaces. The garden design of each unit in the scheme is integral to the health and wellbeing approach of the development and have been maximized in specific units where possible.

The proposed houses and duplex units have been designed to meet the requirements set out in the set out in the Sustainable Residential Development in Urban Areas Guidelines for Planning Authorities (2009); Urban Development and Building Heights Guidelines for Planning Authorities' (2018)" and the "Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities' (2018)".

The development will be provided with a minimum of two new Nr ESB substations on the externally located as outlined on the architects site plans.

The dwellings shall include several energy conservation measures to achieve a high energy rating for each property:

- High-performance thermal envelope with low U-values for the fabric
- Airtight construction
- Ventilation system

- Heat Pump (HP) Technology or Highly efficient Gas boiler & Photo-Voltaic (PV) Panels
- Energy efficient lighting to be used throughout.

The sustainable design of the proposed development ensures that each unit in the development performs efficiently and complies with the NZEB criteria.

3.0 LEGISLATIVE BACKGROUND

The Planning and Development Act 2000 (as amended) sets out clear requirements for the monitoring and review of local authority housing strategies. Section 95 subsection (1)(b) requires that a planning authority's development plan should include objectives to ensure that the housing strategy is implemented. Louth county council stated objectives are as follows:

"To support the development of quality residential schemes with a range of housing options having regard to the standards, principles and any specific planning policy requirements (SPPRs) set out in the Sustainable Residential Development in Urban Areas Guidelines for Planning Authorities (2009); Urban Development and Building Heights Guidelines for Planning Authorities' (2018) and the 'Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities' (2018)."

3.1 BUILDING REGULATIONS – PART D

The practical implementation of the Design and Material principles has informed the design of the building envelope, internal layouts, facades and detailing has informed the materiality of the proposed development.

The proposed dwellings and buildings are designed in accordance with the Building Regulations, in particular Part D 'Materials and Workmanship', which includes all elements of the construction. The Design Principles and Specification are applied to the housing units and the communal / amenity parts of the development.

3.2 BUILDING REGULATIONS – PART L

The current edition of the Building Regulations Technical Guidance Document Part L – Conservation of Fuel and Energy – Dwellings sets out the requirements for the minimum fabric and air permeability requirements, maximum primary energy use and carbon dioxide (CO_2) emissions as well as the minimum amount of energy derived from renewable sources, as calculated using the Domestic Energy Assessment Procedure (DEAP) methodology. The compliance with the requirements of this document is compulsory for all new dwellings.

Three design aspects demonstrate compliance:
1. The quality of building fabric
2. The limitation of primary energy use and CO_2 emissions
3. The use of energy from renewable sources

The current edition of the Building regulations "TGD-L" sets out the design requirements for Nearly Zero Energy Buildings (NZEB). In accordance with the requirements of The European Energy Performance of Buildings Directive Recast (EPBD) all new buildings must achieve the Nearly Zero Energy Building (NZEB) standard.

The table below outline the minimum fabric U value for each element as outlined in the Building regulations TGD-L:

Maximum Building Fabric U-values

Building Fabric Element	TGD-L / NZEB U-value (W/m^2K)
- Pitched Roof	0.16
- Flat Roof	0.20
- External Walls	0.18
- Ground Floor / Exposed Floor	0.18
- External doors, Windows, Rooflights	1.40
Air Permeability (Air Tightness)	5.0 $m^3/h\ m^2$ @ 50Pa

The table below outline the minimum energy values for the dwelling as outlined in the Building regulations TGD-L:

Energy / Carbon Performance Targets

Element	TGD-L / NZEB
Maximum Permitted Energy Performance Coefficient (MPEPC)	0.30
Maximum Permitted Carbon Performance Coefficient (MPCPC)	0.35

Renewables	TGD-L / NZEB
Minimum Amount of Energy from Renewable Sources	20%

4.0 SUITABILITY OF ENERGY TECHNOLOGIES

TRADITIONAL HEATING TECHNOLOGIES		
Traditionally the following technologies were used to provide space heating and hot water for residential developments:		
Direct Electric Heating Direct acting electric heaters, with or without storage element, is used to provide space heating. Domestic hot water is generated in a hot water cylinder fitted with an electric immersion heater. While the capital cost of this solution is low, it cannot satisfy the requirements of the current Building Regulations – Part L. However, this solution may still be viable in certain applications (e.g. in a small, well insulated, mid-floor apartment), if supplemented with a suitable Renewable Technology as listed in the next section.	✘	Not deemed suitable as it would require a large amount of energy to be generated from renewable sources to offset poor primary energy efficiency of direct electric heating.
Hydronic Heating using Boilers Hydronic heating utilises water as the medium for transporting the heat energy from the heat source (boiler) to heat emitters (radiators). The boiler is fired with the fuel available on site, i.e. natural gas, LPG, heating oil, coal, wood. While this solution used to be the most widespread through the industry, it has its limitations in meeting the requirements of the current Building Regulations – Part L. Generally, it must be supplemented with one or more of the Renewable Technologies listed in the next section.	✓	Suitable. It is proposed to use gas boilers and Solar PV collectors for this project subject to further assessment at the detailed design stage.
Warm Air Heating Combined heating and mechanical ventilation system using air as the medium for transporting heat. Rarely used in Ireland and more suitable for houses than apartments.	✘	Not deemed suitable for a project of this scale.
Communal Heating A variation of the hydronic heating with the individual boiler in each replaced with a centrally located boiler(s) serving all dwellings. A Heat Interface Unit (HIU) installed in each dwelling provides control and metering of heat energy used in the dwelling. Communal heating benefits from improved efficiency of the central boilers over individual, often oversized boilers. It also creates an opportunity to introduce Renewable Energy Technologies that would not be viable at small scale, e.g. Biomass or CHP (Refer to the next Section).	✘	Not deemed suitable for a project of this scale.

RENEWABLE ENERGY TECHNOLOGIES

The use of renewable energy technologies is promoted and required by the Building Regulations Part L since 2005, gradually increasing with each revision of the Regulations, i.e. 2011 and 2019. The most current TGD-L for nearly Zero Energy Buildings (nZEB) require that at least 20% of building energy is derived from renewable sources.

There is a number of low & zero carbon technologies available that may be suitable for a development of this type.

Wind Power (micro turbines) Micro wind turbines are normally fitted to the roof of the building. They convert energy of wind into electricity. Typically, they provide small amounts of electrical energy.	✘	Not deemed suitable for a suburban location due to aesthetical and noise implications.
Wind Turbines A mast mounted wind turbine can generate significant amounts of electrical energy. However due to the physical size and clearances required from buildings or trees, they are suitable for sites with large open areas.	✘	Not deemed suitable for a suburban location due to size, aesthetical and noise implications.
Solar Photovoltaic Solar Photovoltaic (PV) collectors convert the energy of the sun into electricity that can be used within the household reducing the amount of electricity imported from the grid. PV collectors can be installed on the roof or integrated with external walls. While only up to 20% of the sun irradiation available is recovered, this energy form (electricity) comes with the flexibility of being suitable for many uses.	✓	Suitable. It is proposed to use Solar PV collectors for this project subject to further assessment at the detailed design stage.
Solar Thermal Solar Thermal collectors convert the energy of the sun into heat energy used to generate domestic hot water or/and contribute to the central heating. Typically, the collectors are installed on the roof, however certain types can be integrated with external walls without compromising on the solar energy yield. While the solar energy recovery rate of 70-80% is superior to that of PVs, the heat energy can only be used to heat water. Also, solar thermal systems require a certain level of maintenance in order to operate efficiently.	✘	Not deemed suitable due to complexity of the system and the required maintenance implications.
Biomass Fired Heating Biomass Fired Heating uses CO_2 neutral fuels (wood chips, wood pellets, straw) to generate heat energy for heating and domestic hot water. This technology requires a significant amount of space to accommodate boilers, fuel storage and transportation, fuel deliveries by trucks. It also required regular ash removal and a stepped-up maintenance regime. Generally suitable for large communal / district heating schemes only, where a frequent maintenance can be justified. To be fully sustainable, the fuel needs to be sourced locally. Also, while the CO_2 generated may be environmentally neutral, there are other emissions (NOx, smoke) that may not be suitable for urban sites.	✘	Not deemed suitable due to added complexity of the system, additional maintenance required. Also, implications in relation to the fuel deliveries and local emissions of CO_2, NO_x and particulates.

RENEWABLE ENERGY TECHNOLOGIES – CONTINUED		
<u>Combined Heat & Power</u> Combined Heat & Power (CHP) is a system that utilises an internal combustion engine to mechanically drive an electric generator and produce electricity. At the same time the waste heat emitted from the engine is utilised for space or hot water heating purposes, resulting in an improved overall energy efficiency over a traditional electricity generation in power plants. Generally suitable for communal / district heating schemes only.	✘	Not deemed suitable for a project of this scale.
<u>Geothermal / Ground Source Heat Pump</u> Ground Source Heat Pump (GSHP) utilise the natural heat of the ground. A refrigeration cycle is used to draw energy from the low-temperature medium (ground) and heat the higher-temperature medium (heating water). The amount of energy transferred is much higher than the amount of energy required to power the system. There are two general types of GSHP systems: with horizontal or with vertical collector. Horizontal collector comprises a large amount of piping installed below the ground, i.e. it may suitable for large open areas. Vertical collector comprises of piping coil in a deep borehole, i.e. it is more suitable where space comes at a premium.	✘	Not deemed suitable due to added complexity of the system and additional cost.
<u>Air Source Heat Pump</u> Air Source Heat Pump (ASHP) utilise the natural heat of the ambient air. A refrigeration cycle is used to draw energy from the low-temperature medium (air) and heat the higher-temperature medium (heating water). The amount of energy transferred is much higher than the amount of energy required to power the system. The energy efficiency of an ASHP is generally lower than that of a GSHP especially during the coldest weather, and it may require supplementation with electric heater at peak heat demand times, however such occurrences are not very often in the relatively mild climate in Ireland. The capital investment for an ASHP is lower than for a GSHP as the expensive ground collector required for the latter is not present.	✓	Suitable. It is proposed to use ASHP unit in individual heating systems subject to further assessment at the detailed design stage.
<u>Exhaust Air Heat Pump</u> Exhaust Air Heat Pump (EAHP) is a certain type of an ASHP which draws energy from the air being extracted from the house through the ventilation system. As the temperature of this air is constant throughout the year, the output and energy efficiency of an EAHP also stays constant, i.e. it is not affected by low ambient air temperatures. Another advantage of an EAHP is that it can help in ventilating the house with its constantly running fan. The downside of EAHPs is the limited output that is related to the ventilation requirements of the house – EAHPs are deemed suitable for relatively small and well insulated houses or apartments.	✓	Suitable. It is proposed to use EAHP unit in individual heating systems subject to further assessment at the detailed design stage.

5.0 DWELLING BUILDING DESIGN

High-performance building fabric elements are being considered and selected in order to minimise unnecessary heat loss from the internal spaces.

In addition to the reduction in energy consumption and associated carbon emissions for space heating and ventilation through a high performance fabric, high efficiency heating systems are being proposed for use throughout the development, minimising heat losses through the buildings fabric as well as a lower then required air permeability rate, helps to ensure lower energy consumption rates and associated carbon emissions are achieved throughout the year thus reduces the overall cost of heating for the end user.

The buildings will be designed and constructed in accordance with the building regulations and best practices and can be summarised as follows:

Fabric Insulation Values

The following target U-values have been adopted for the project:

Fabric	Target U Value	Building Regulations (U value)
Floor	0.18W/m^{2}K	(TGD-L max. = 0.18W/m^{2}K)
External walls	0.18W/m^{2}K	(TGD-L max. = 0.18W/m^{2}K)
Flat roof	0.16W/m^{2}K	(TGD-L max. = 0.16W/m^{2}K)
External doors and windows	1.40W/m^{2}K	(TGD-L max. = 1.40W/m^{2}K)

Air permeability

The target air permeability of 5.0m^3/h/m^2 is consistent with the maximum air permeability allowed under TGD-L. This level or air permeability should be achievable by adherence to the BR Part L 2011 Acceptable Construction Details and monitoring during the construction.

6.0 BUILDING SERVICES SYSTEMS DESIGN

Energy technologies for this development shall be selected on the following basis:

- Operation strategy: individual vs communal
- Compliance with the Building Regulations – Part L (NZEB)
- Life-cycle cost

The selection of technologies will be confirmed at the detailed design stage. Based on our experience we would deem the following combinations to be suitable:

Renewable Technologies

In order to demonstrate the compliance with the Building Regulations Part L, each dwelling is required to have a portion of its energy requirements provided from a source of renewable energy.

In addition to heat pumps additional Solar PV panels on the roof of the residential buildings may be provided as required to ensure building regulation compliance subject to detailed design.

Heating system

Individual Air Source Heat Pump, Exhaust Air heat pumps or Gas boiler and Solar PV panels subject to detailed design.

The dwelling shall be heated by means of either underfloor heating or low temperature radiators / fan coil units. In addition, electrical radiant panel heaters shall be considered during the detailed design.

Heating controls in the dwellings consists of a heating zone with individual time and temperature controls.

Domestic hot water

Domestic hot water shall be generated in every dwelling with individual time and temperature controls.

Ventilation

There are two options currently being analysed for use within the development. The solution will be confirmed in the detailed design.

i) The first option is the introduction of a ‘whole house extract ventilation system’ (MEV), which operates by extracting warm, stale air from dwelling wetrooms either centrally or decentralised.

ii) The second option is a whole dwelling approach with ‘mechanical ventilation with heat recovery system (MVHR). The unit works by extracting warm, stale air from ‘wetrooms’ (kitchen, utility, bathroom, etc.), and extracting the embodied energy (heat) from this exhaust air and re-introducing this captured energy into the incoming fresh air.

Water Conservation Measures

The requirements for low flow sanitary ware (circa 6 ltrs/min) in each dwelling shall be considered in the detailed design. This is a water conservation initiative and reduces waste by restricting water flowrates to a shower within the dwelling.

The shower head fittings could be provided with a reduced water flow to allow for the conservation of water use as well as reducing energy used to heat hot water.

Lighting

Provision for natural daylight in modern buildings helps to create a better internal environment for occupants and helping to assist in the well-being of the inhabitants.

All light fittings are to be based on LED type (A+ Rated bulb) located throughout each occupiable space, such as bedroom, lobby, living/dining etc. A significant reduction in electrical energy usage may therefore be achievable through the use of high efficiency lights.

External Lighting will be energy efficient and provided with LED type with photocell technology.

7.0 CONCLUSION

This Sustainable/Energy Report provides significant and relevant detail in relation to the energy of the proposed development, in support of the standards, principles and any specific planning policy requirements (SPPRs) set out in the Sustainable Residential Development in Urban Areas Guidelines for Planning Authorities (2009); Urban Development and Building Heights Guidelines for Planning Authorities' (2018)."

As demonstrated in this report, the proposed development will be constructed to high building standards and will provide a sustainable, energy efficient development for future occupants.