



Jaguar Land Rover

SOUTH BIW EXTENSION, HALEWOOD

Energy Statement





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Energy Statement

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1 EXECUTIVE SUMMARY

WSP has been instructed by Jaguar Land Rover to prepare an Energy Statement to support the planning application of the proposed South Body in White (BIW) Extension in Halewood.

Full planning permission is sought for the erection of a two-storey building (Use Class B2 and B8) and worker amenity facilities associated with existing manufacturing unit, together with associated infrastructure and engineering operations.

1.1 ENERGY AND CARBON TARGETS

Multiple layers of energy and carbon requirements apply to the development at a national and local level, each of which requires different targets to be met.

The delivery of renewable and low carbon energy schemes will contribute towards the mitigation of climate change. A Sustainable Energy Action Plan (SEAP) for the Liverpool City Region has been adopted to set out a programme of discrete actions that will support the overall aim of reducing a demand for energy, improving efficiency, increasing availability of low carbon energy sources and reduce CO₂ emissions.

The implications of the relevant targets for the proposed development can be summarised as follows:

- All developments must meet the prevailing Building Regulations requirements. The development will be brought forward under Part L 2013, and this has been used as the basis of this energy statement.

Proposals for the generation of energy from renewable resources, or low carbon energy development (with the exception of wind turbines) will be supported provided that any adverse impacts are addressed satisfactorily including individual and cumulative landscape and visual impacts.

1.2 ENERGY STATEMENT

The Energy Statement has been structured in accordance with the energy hierarchy: Be Lean, Be Clean, Be Green.

The proposals for the scheme have been developed in accordance with the desire to achieve an energy efficient and sustainable development. Further design development will determine the exact specification and fabric values of construction materials used and an element of flexibility is required at this stage.

Be Lean

The commercial development will be designed to achieve optimum energy performance and will incorporate the following design features:

- Exceeding the minimum fabric requirements of Part L1A (2013) of the Building Regulations.
- The development will include 100% low energy lighting.
- The development will be mechanically ventilated.

Be Green

- 2880m² of Photovoltaic Panels will be installed on the roof.

The local policy requirements can be met by a combination of efficiency measures (fabric first approach) and renewable technologies in the form of solar PV.

1.3 RESULTS

Accredited Design SBEM software IES-VE 2021 was used to determine the regulated carbon emissions for this development. The results are shown in Table 1 below.

Table 1 - Carbon emissions reductions based on the ASHP/PV based solution

	Regulated Emissions (T CO ₂)	Unregulated Emissions (T CO ₂)	% Reduction in Regulated Emissions
Part L Compliant Development	669.9	524	-
After energy demand reduction	635.0	524	5.2
After renewable energy	590.5	524	7.0

2 PROJECT BACKGROUND

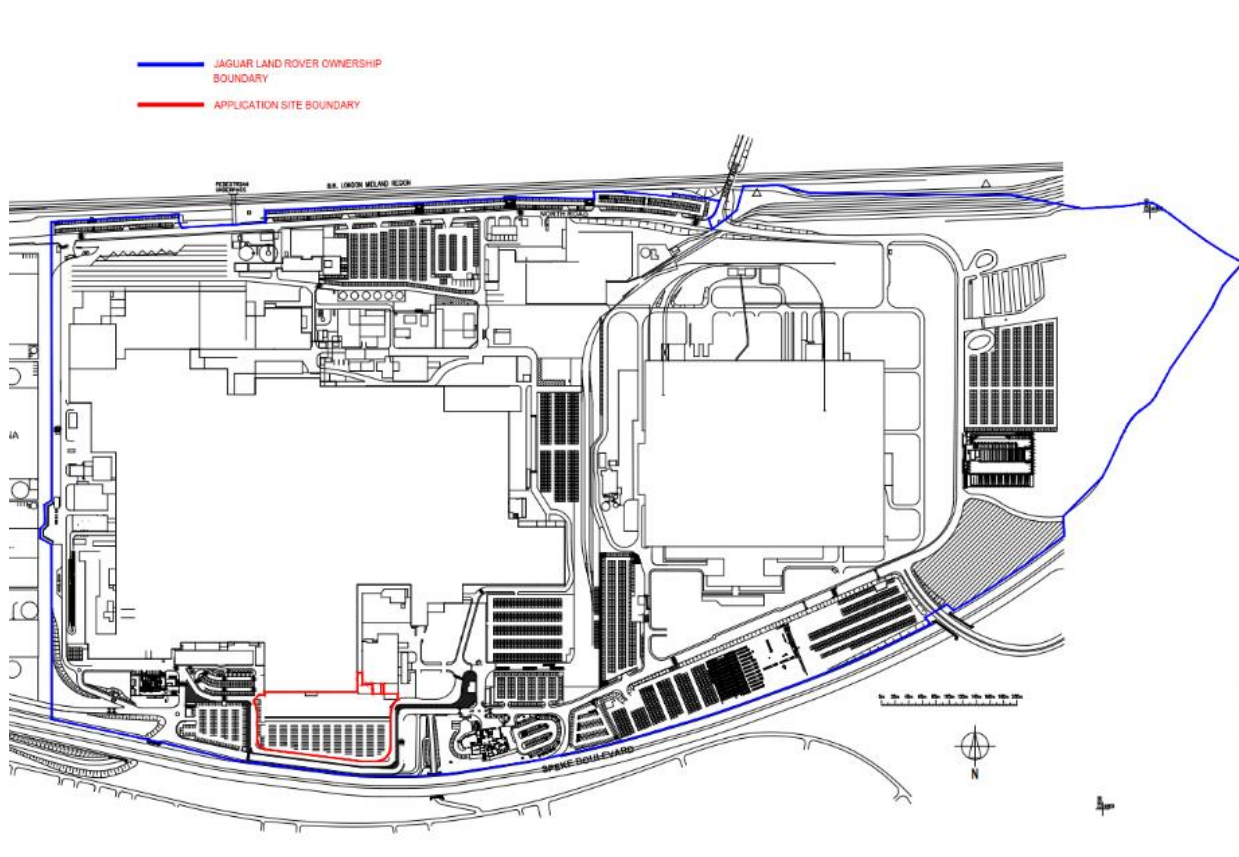
The Proposed Development is located in the south of Liverpool. The site is bound by residential areas with Halewood to the North, and Speke to the South. The site is accessed by the A561 Speke Boulevard to the south, which offers a direct link to the Knowsley express way to the east. The Proposed Development consists of the erection of a two-storey building (Use Class B2 and B8) and worker amenity facilities associated with existing manufacturing unit, together with associated infrastructure and engineering operations.

Full planning permission is sought for the total floorspace of 32,364.3 sqm split as follows:

- Ground Floor B2 / B8 floorspace: 15,728 sqm;
- First Floor B2 / B8 floorspace: 15,728 sqm; and
- Ancillary areas (staff canteen and amenity areas / toilets): 450 sqm.

The proposed building will be used in conjunction with the existing BIW operations to the north.

Figure 1 - Proposed Development (site boundary within red line)



3 POLICY CONTEXT

In terms of energy, relevant policy applies at both a local and national level.

3.1 THE KNOWSLEY LOCAL PLAN

The key policies underpinning Knowsley's approach to sustainable development include:

- Policy SD1 - Sustainable development;
- Policy CS8 - Green Infrastructure;
- Policy CS22 – Sustainable and Low Carbon Development; and
- Policy CS23 – Renewable and Low Carbon Infrastructure.

The Knowsley Local Plan sets out policies and identifies a number of objectives to improve the area. The Knowsley Local Plan was adopted in 2013 with the key policy relating to energy being CS22.

3.2 BUILDING REGULATIONS (PART L)

All new buildings constructed in England and Wales must meet the minimum requirements of the UK Building Regulations. Specifically, with regards to energy and carbon compliance, all buildings must meet the building regulations Part L 'Target Emission Rate' (TER) requirements for the Part L revision which is current at the time of initial construction works. The requirements of Part L 2013 will apply to the Halewood Site.

Since 2013, amendments have been made with the most recent being the 2022 amendments expected in June 2022. The key changes to Part L Volume 1 are that we are to deliver 31% Carbon saving over current regulations. The compliance requirements are:

- Primary energy- principal metric
- CO₂- secondary metric
- Minimum standard for fabric and mixed building services.

There was also an amendment for a change in carbon factors, particularly electric reduced from 0.519 kgCO₂/kwh to 0.136 kgCO₂/kwh and buildings need to be future proofed for zero carbon. Solar PV should also be used where heat pumps will not supply 100% of the energy.

4 BASELINE CARBON EMISSIONS

The first stage of the energy assessment is to establish the baseline site energy demand and CO₂ emissions based on accredited SBEM software for the commercial area.

Accredited SBEM software, IES-VE 2021 was used for the whole building modelling. Energy modelling was undertaken based on the methodology from Part L2A of the Building Regulations. Any building services installed have complied with the limiting values listed in the relevant Non-Domestic Building Services Compliance Guide.

In order to calculate the baseline carbon emissions, a 'notional' fabric performance has been assumed. These are described in the table below.

Table 2 – Notional Fabric performance and backstop values

Element	Notional Fabric Performance	Fabric Performance – Backstop Values
Ground floor U-value (W/m ² K)	0.22	0.25
External Wall U-value (W/m ² K)	0.26	0.35
Roof U-value (W/m ² K)	0.18	0.25
Vehicle Access Door U-value (W/m ² K)	1.50	1.50
Pedestrian Door U-value (W/m ² K)	2.20	2.20
Glazing U-value (W/m ² K)	1.60	2.20
Glazing G-value	0.55	-
Curtain Wall Light Transmittance	0.71	-
Air permeability (m ³ /hr.m ² @ 50 Pa)	7	10

Table 3 summarises the baseline carbon emissions for the whole development.

Table 3 - Overall baseline regulated and unregulated carbon emissions

	Regulated Emissions (T CO ₂)	Unregulated Emissions (T CO ₂)
Building Regulations Part L 2013 Compliant Development – Commercial	669.9	524

5 BE LEAN: REDUCE ENERGY DEMAND

The first step to achieving Building Regulations compliance and the targets outlined previously is to reduce energy demand. The measures associated with reducing demand can be termed as 'Energy Efficiency Measures'. The Proposed Development will incorporate a number of relevant energy conservation measures; the benefits of which are discussed below. Further detailed design development will assess the exact specification and fabric values used in construction materials. In line with the energy hierarchy, a "fabric first" approach is to be utilised before consideration of on-site renewable energy generation.

In summary the following measures will be included:

- Good levels of air tightness;
- High performance building fabric;
- High performance glazing;
- 100% low energy lighting; and
- Mechanical ventilation.

5.1 BUILDING FABRIC

At this stage it is anticipated that an overall U-value for the external wall will be around 0.18 W/m²K or better. For the purposes of this assessment this value has been used, though solutions will be sought to reduce the U-value further where possible in order to realise further carbon reductions.

Glazing to the development will be specified to achieve a g-value of around 0.35 whilst this is lower than the notional value, this is considered to provide an appropriate year-round balance between maximising daylighting and beneficial wintertime solar gain, and minimising summertime solar gains to reduce the overheating risk and need for comfort cooling.

The current proposals for the building fabric performance for the Proposed Development are summarised in Table 4. Further opportunities to improve upon these will be considered at the detailed design stage.

Table 4 - Fabric performance targets

Element	Notional Fabric Performance
Ground floor U-value (W/m ² K)	0.22
External Wall U-value (W/m ² K)	0.18
Roof U-value (W/m ² K)	0.18
Vehicle Access Door U-value (W/m ² K)	1.50
Pedestrian Door U-value (W/m ² K)	1.50
Glazing U-value (W/m ² K)	1.40
Glazing G-value	0.35

Rooflight U-value (W/m ² K)	1.00
Air permeability (m ³ /hr.m ² @ 50 Pa)	3

5.2 BUILDING SERVICES

A high-performance MEP standard is proposed for the scheme. Table 5 lists the expected specification for the heating system, lighting, and ventilation strategy for the proposed commercial development.

Table 5 - General heating, cooling, ventilation, and lighting specification for commercial area

Element	General Specification
Ventilation	AHU supply ventilation system serving all area with heated fresh air
Internal lighting	Part L 2021 standard for non-domestic - <i>general lighting have an average luminaire efficacy of 95 luminaire lumens per circuit-watt and Display lighting have an average light source efficacy of 80 light source lumens per circuit-watt. have a rated power usage no greater than 0.3W/m² in each space. 7 W/m² was used as a viable specification to ensure compliance.</i>
Primary heat source	Gas boiler efficiency 91% for Part L compliance
Heating controls	Time and Temperature zone control
Overheating control / cooling	Mechanical Ventilation

5.3 CARBON EMISSIONS REDUCTION

Based upon the energy efficiency measures outlined and excluding the contribution of low or zero carbon technologies the following total carbon emissions are calculated in Table 6.

The carbon emissions for the development are shown to be lower than the minimum requirements of the Building Regulations.

Table 6 - Be Lean: Carbon emissions after the application of energy efficiency measures

	Regulated Emissions (T CO ₂)	Unregulated Emissions (T CO ₂)	% Reduction in Regulated Carbon Emissions
Building Regulations Part L 2013 Compliant Development	669.9	524	-
After energy demand reduction	635.0	524	5.2

6 BE GREEN: RENEWABLE ENERGY TECHNOLOGIES

Renewable Energy Technologies are those listed below which can provide a source of energy on-site that is not primarily based on the consumption of fossil fuels or grid electricity and/or utilises a heat source that is renewable such as ground source and solar thermal systems.

- Wind Power
- Biomass Heating
- Heat Pumps for Heating and/or Cooling
- Solar Thermal Hot Water Heating
- Photovoltaic Panels

We have evaluated a number of renewable energy technologies and outlined how they may be applied to the development.

6.1 WIND POWER



Harnessing the kinetic energy of wind can provide a renewable source of on-site electricity generation. Wind turbines need to be positioned where a frequent and steady source of wind is available that is not too turbulent or uneven in direction. Typically wind turbines are positioned on the roof of buildings that are significantly higher than their surroundings and or located in open areas where there is minimum disruption to prevailing winds.

The development is located within an urban environment with numerous adjacent buildings of similar height providing turbulent wind conditions unsuitable for wind power generation.

Wind conditions prevent the implementation of wind power generation from being feasible. In addition, wind turbines are not considered to be appropriate in townscape and architectural terms to provide wind turbines on top of the building. On that basis they are not proposed for the South BIW Extension site development.

6.2 BIOMASS HEATING



Biomass heating has embodied environmental impacts from transport and fuel combustion which makes it less desirable in Air Quality Management Areas (AQMAS). A review of the potential impact on air quality from increased wood fuelled biomass use in London has been carried out by AEA Energy & Environment and was published in December 2007. The assessment indicates that potentially increasing the contribution from small-scale wood fuelled biomass combustion may lead to a substantial increase in nitrogen dioxide and particulate matter concentrations.

However, there are several technologies such as ceramic filters, electrostatic precipitators or bag filters which can all be used to significantly reduce the emissions to air and have successfully been used on biomass systems located within AQMAS.

Solid biomass relies on a reliable fuel supply which must be delivered and stored on site. Sites using biomass solutions therefore require good access routes both of which are viable on this site.

Biomass boilers also have weekly maintenance requirements and relatively high fuel costs compared to gas.

On that basis they are not proposed for the South BIW Extension site development.

6.3 GROUND / WATER / AIR SOURCE HEAT PUMPS



Heat pumps use electricity to turn low grade heat to a higher temperature typically suitable for providing heating and domestic hot water. They work most effectively when the source temperature (whether that is external air, the ground, or a large body of water) is at a relatively high temperature while the required output temperature is relatively low, i.e. between 35°C and 45°C.

Some heat pumps can also be reversed to provide cooling.

Heat pumps produce no emissions at point of use and so do not have an impact on air quality in the locality. Additionally, their carbon emissions will reduce in line with the existing and expected decarbonisation of the national grid.

Heat pumps are measured by their coefficient of performance (CoP); that is the ratio of input electricity to the output of heat. Air source heat pumps (ASHPs) generally operate between a CoP of 2.5 and 3, while a good ground or water source heat pump (GSHP / WSHP) may operate between 3.5 – 4.5. These CoPs vary considerably depending on the local source temperatures and the building heat distribution system.

This technology operates most effectively when used to provide space heating via very low temperature systems such as underfloor heating or low temperature radiators. If higher temperatures are required, the CoP reduces. As ground temperatures are stable year-round, GSHPs provide a consistent level of performance throughout the year. Whereas the coefficient of performance of air source heat pumps is directly related to the air temperature. This means the CoP of an ASHP drops in the winter, when demand is greatest but rises in the summer when heating is not normally required.

The ground conditions present at the site alongside the cost of digging boreholes results in ground source heat pumps being unfeasible. Additionally, water source heat pumps require a large source of water near to the site. This is not something present therefore this option is not feasible.

On that basis, heat pumps are not proposed for the Jaguar Land Rover site development.

6.4 SOLAR THERMAL



Solar thermal generation involves capturing solar radiant heat to preheat or heat domestic hot water.

Correctly located and orientated, solar thermal systems can meet a proportion of a building's domestic hot water dependent on the expected demand profile and available space for locating ST collectors.

A solar thermal system is able to work well alongside a number of different heating solutions including gas boilers or heat pumps, though the majority of the benefit would be during the summer months.

On that basis they are not proposed for the South BIW Extension site development.

6.5 PHOTOVOLTAIC PANELS



The feasibility of providing photovoltaic (PV) panels has been assessed based upon estimated energy production (kWh) from the installed location along with manufacturers cost data to enable a life cycle cost analysis to be undertaken. Panels correctly oriented, maintained and not obscured by shading can be expected to provide in the region of 867kWh/kWp in Liverpool.

Therefore, Solar PV panels located on the top roof areas can be used to provide electricity generation which can contribute to the Local Authority Targets.

On that basis they are proposed for the South BIW Extension site development.

6.6 SUITABILITY APPRAISAL

All renewable energy technologies which may be considered feasible for the scheme have been assessed and summarised in Table 13.

Table 6 - Renewable technology suitability appraisal

Technology		Appraisal
Wind		Not suitable at this site.
Biomass		Not suitable at this site.
Heat Pumps	Air Source	Not suitable at this site.
	Ground Source	Not suitable at this site.
	Water Source	Not suitable at this site.
Solar Thermal		Not suitable at this site.
Photovoltaic Panels		Suitable at this site and recommended for inclusion.

6.7 CARBON EMISSIONS REDUCTION

All renewable energy technologies which may be considered feasible for the scheme have been assessed, the outcomes of which are summarised above. From that exercise, it was concluded that a circa 2880 m² of PV system will be included in this scheme to provide the remainder of the carbon reduction requirements.

The results after the inclusion of renewable energy technologies are shown in the table below

Table 7 - Be Green: Carbon Emissions Utilising PV Panels

	Regulated Emissions (T CO ₂)	Unregulated Emissions (T CO ₂)	% Reduction in Regulated CO ₂ Emissions
Building Regulations Part L 2013 Compliant Development	669.9	524	-
After energy demand reduction	635.0	524	5.2
After renewable energy	590.5	524	7.0

7 RESULTS

Both applicable steps taken from energy hierarchy; Be Lean (Use Less Energy) and Be Green (Renewable Technology measures) are summarised below. The target for the site is to achieve Building Regulations compliance (less than 669.9 tCO₂ per annum), whilst meeting the sites energy requirements from on-site low carbon generation.

7.1 ENERGY CONSERVATION AND ENERGY EFFICIENCY (BE LEAN)

Through the application of the measures identified in Section 5 the regulated carbon emissions are shown to be 635.0 TCO₂ per annum.

7.2 RENEWABLE TECHNOLOGY (BE GREEN)

The feasibility of a range of renewable technologies has been assessed in the context of the local policy target. A PV system has been put forward for inclusion resulting in a reduction in regulation carbon emissions of 79.4 TCO₂ per annum. Overall, this produces a reduction in regulated carbon emissions to 590.5 TCO₂ per annum.

Through the use of the Be Lean and Be Green framework, regulated carbon emissions have been shown to be reduced by 7.0 % against Part L 2013 (1.8 % from the use of renewables), meeting the local policy target. Additionally to this comparative Be Lean and Be Green reduction, the proposed development sets out to be low carbon and will achieve a cumulative reduction in carbon emissions of 11.8% over Building Regulations Part L 2013 baseline, incorporating high levels of fabric efficiency, good controls, efficient supply of energy and the use of renewable energy.

7.3 CONCLUSION

A combination of demand-reduction measures, energy-efficiency measures and low-carbon and renewable energy will deliver the Applicant's desired on-site reduction target around carbon emissions.

The impact of these design measures in terms of how the development will deliver the energy and carbon reduction is summarised below.

Figure 2 - Summary of the estimated carbon emissions reductions for the whole development



Table 8 - Regulated carbon dioxide savings from each stage of the energy hierarchy

	Regulated carbon dioxide emissions savings (T CO2 per annum)	Regulated carbon dioxide emissions savings (%)
Savings from energy demand reduction	34.9	5.2
Savings from renewable energy	44.4	7.0
Total Cumulative Savings	79.4	11.8



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