FAO: Mr James Dawe
% SM Planning
80-83 Long Lane - London, EC1A 9ET

London, 12 December 2024

SUSTAINABILITY STATEMENT

Stop CO_2 Ltd

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Dear James,

We have been instructed to draft a sustainability statement regarding the refurbishment of the property at **7 Frognal Gardens, London NW3 6UY.** I will briefly outline the planned choices and the reasons that led us to adopt them.

THE CONTEXT

The property is a **two-storey semi-detached building** with a total surface area of approximately 240 m².

BUILDING ENVELOPE

The building, constructed approximately in the 1920s, features a load-bearing structure made of solid bricks without a cavity wall and double-glazed windows with thermal breaks in the frames.

We will therefore favor breathable materials of biological origin to reduce the risk of interstitial condensation. This will also help preserve indoor air quality by avoiding the release of benzene, isocyanates, formaldehyde, phenols, and other volatile organic compounds (VOCs), as well as preventing the material from becoming non-recyclable waste at the end of its life cycle. Additionally, the choice of natural materials will contribute to lowering the embodied carbon of the building.

In line with the rest of the envelope, the windows will be replaced with triple-glazed units with gas-filled cavities, preserving the aesthetic appearance of the existing windows in accordance with the recommendations of the conservation area. Replacement windows in existing buildings under Building Regulations (BR) require a maximum U-value of 1.4W/m²K, but we aim for models with performance levels exceeding the legal minimum, contributing to greater energy savings and reducing air infiltration.

External doors will also be selected based on U-values superior to the BR requirements.

As the project develops, we will consider the possibility of adopting the Building Energy Model method, which would allow us to achieve superior levels of insulation and guarantee airtightness. The goal would be to meet the levels indicated by the Passive House Standard for retrofits, verified by either a Passive House or an AECB Certifier, depending on the chosen approach.

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Should the building structure not permit compliance with the EnerPHit requirement of 25 kWh/m²a, we will aim for less ambitious levels, such as the PHI Low Energy Building at 30 kWh/m²a or the AECB CarbonLite at 50 kWh/m²a.

In such cases, the proposed intervention will consider the project holistically, designing strategies for the mechanical systems to benefit from reduced power demand and material usage, thereby lowering the environmental and climate impact of the entire intervention.

Additionally, advanced insulation contributes to prolonging the lifespan of the systems and reducing operational noise, both through downsized external units and reduced thermal demand.

The primary objectives will be:

- Ensuring maximum energy savings within the technical and economic constraints of the project to reduce operational heating costs;
- Enhancing comfort levels by reducing internal temperature fluctuations and ensuring superior airtightness, certifiable by Passive House verifiers if clients wish to obtain official certification;
- Improving indoor air quality compared to a standard dwelling.

The external insulation will match the adjacent unit's thickness on the eastern side.

The new roof will be constructed incorporating a passive ventilation system to help reduce the risk of condensation formation.

MECHANICAL SYSTEMS

Heating and hot water system

The heating and domestic hot water system will rely on an air-source heat pump installed within the shed adjacent to the current garage. Thermal exchange with the outside will be ensured by a ventilation grille, helping mitigate the already low noise impact of new-generation models, which feature a sound pressure level of only 35 dB at 5m.

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The hydronic system with a heat exchanger housed in the external unit (monobloc system) confines any risk related to refrigerant flammability to the external technical room, transferring heat inside the building solely through hydraulic piping. Traditional refrigerants such as R32 or R410 may be used, but preference will be given to systems using low global warming potential (GWP) refrigerants such as propane, ammonia, or CO_2.

An immersed load in the thermal storage will provide backup power during extremely cold days with high hot water demand and ensure the regular anti-legionella cycle.

The proposed model is as follows:

Brand: LG

Model: HM161MR

Nominal power: 16 kW

Unit dimensions: 1239 × 1380 × 330 mm

Energy class: A++/A+++

The heating system will be underfloor radiant heating with packages compatible with the suspended floor on both levels. If necessary, the residual thermal load will be supplemented with fan coil units, which can also reduce the time required for the system to reach operating temperature after prolonged shutdowns.

Thermostats will be installed in individual rooms for temperature zoning, enabling savings of up to 17% compared to traditional solutions.

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Solar thermal

The domestic hot water system will be integrated with two heat-pipe solar thermal panels capable of supplementing the heat pump s output in winter and mid-seasons and covering up to 100% of summer demand. This will not only reduce grid energy demand but also extend the heat pump's lifespan and reduce operating noise.

Proposed panels:

Brand: Kloben

Model: Sky Pro 18

Aperture area: 3.43 m²

Dimensions: 1927 × 2002 × 116 mm

Conversion efficiency: 71.80%

Domestic Hot Water

The thermal plant room will house highly insulated pipes for the distribution of both the heating system and domestic hot water, including timed recirculation to enhance efficiency and service quality during peak demand. Attention will be given to reducing water consumption, particularly hot water, to lower demand and save energy. Flow restrictors on taps and water-saving showerheads will reduce peak electrical demand and potable water usage. Hot water distribution lines will also be made available to appliances (dishwasher and washing machine) to reduce power consumption during washing cycles, leveraging the renewable energy generation from the heat pump and solar thermal system if installed.

An insulated thermal storage system will supply domestic hot water generated by the integrated heat pump system and will be equipped with a secondary inlet for the solar thermal system.

Ventilation system

A mechanical ventilation system with heat recovery (92.5% efficiency), equipped with ePM10 50% (M5) and Coarse 65% (G4) filters, and potentially an air sanitiser to eliminate viruses and bacteria, will be sized based on final design results for thermal transmittance and airtightness levels. We will opt for two separate units, one for each floor, placed indoors to minimise ductwork invasiveness and overall noise. Supply and exhaust vents will be located at the rear of the house to keep the East and South facades free of entry holes. A night bypass system will provide free cooling for enhanced summer comfort.

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Electrical systems

We propose to integrate thermal generation with a MCS-approved Solar PV system, using an in-roof mounting structure to minimise aesthetic impact and reduce building material usage, given the planned roof replacement. The proposed system will achieve approximately 4.1 kWp with nine panels on the South-facing roof slope.

Proposed panel:

Brand: Aiko

Model: Neostar 2S

Module power: 455 W_p

Dimensions: 1757 × 1134 × 30 mm

Conversion efficiency: 22.8%

The inverter and battery storage will be installed internally. The system will supply energy to the house, covering both electrical and part of the thermal demand, as well as charging an electric vehicle. During the night, off-peak tariffs will allow for the storage of residual energy not produced during the day, aligning with grid demand for peak-shaving and load-balancing purposes.

Conclusions

The overall project approach reflects a holistic perspective on the building-system integration, aimed at maximising energy savings and contributing to the following benefits:

- ✓ Reducing energy demand from the grid, aligning with the government's Net Zero Strategy objectives
- ✓ Contributing to flattening seasonal and daily electricity demand peaks, alleviating the load on the national generation system
- ✓ Maximising local energy production from renewable sources, using heat pump systems, solar thermal, and photovoltaic systems with associated daily storage, to reduce energy costs and extend the lifespan of heat pump generators
- ✓ Minimising material consumption and the overall embodied carbon footprint of the building
- ✓ Improving psychrometric parameters of indoor environments, enhancing comfort and air quality while reducing the risks of respiratory illnesses and the accumulation of harmful pollutants

- ✓ Reducing the toxicity and non-recyclability of materials at the end of their life cycle
- ✓ Mitigating noise pollution from systems, by minimising operational times, selecting low-impact technologies, and employing additional acoustic shielding

We have adopted a design strategy that not only aims to improve the quality of indoor living but also demonstrates that it is possible to retrofit an old building without resorting to the more impactful demolition and reconstruction process. This approach ensures high levels of energy and natural resource savings, in alignment with the guidelines outlined by Historic England in its Advice Note 18 (HEAN 18), published in July 2024.