# Net-Zero Emissions Construction, Refurbishment and Maintenance Standard

*Low carbon emissions / design out waste / whole life value*

**Robert Gordon University**

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## Contents

# Introduction

This document presents Robert Gordon University's (RGU's) requirements to appointed design / construction / maintenance teams for refurbished and newly constructed premises or facilities management to attain net-zero carbon dioxide emissions of the University's entire operations.

This document has been established to comply with the mandatory requirements under The Climate Change (Scotland) Act and supports RGU's Environmental Policy and Net-Zero Action Plan. This document is made of text, diagrams and methodology which sets out the requirements of how net-zero carbon emissions can be attained by design, construction, maintenance, facilities management.

**Please note** upon completion the project / service will be measured against the criteria required within this document.

Questions should be submitted to the RGU Energy and Sustainability Manager and Estates Senior Project Manager.

## Project Embodied Carbon Emissions

RGU understands what is required to attain net-zero carbon emissions (e.g., exchange a gas boiler to heat pumps), however, RGU also appreciates that we may produce a substantial amount of carbon emissions via the project delivery process to achieve net-zero (e.g., purchase of new product / goods which require virgin materials to produce, transportation of goods and tradespeople, disposal of waste).

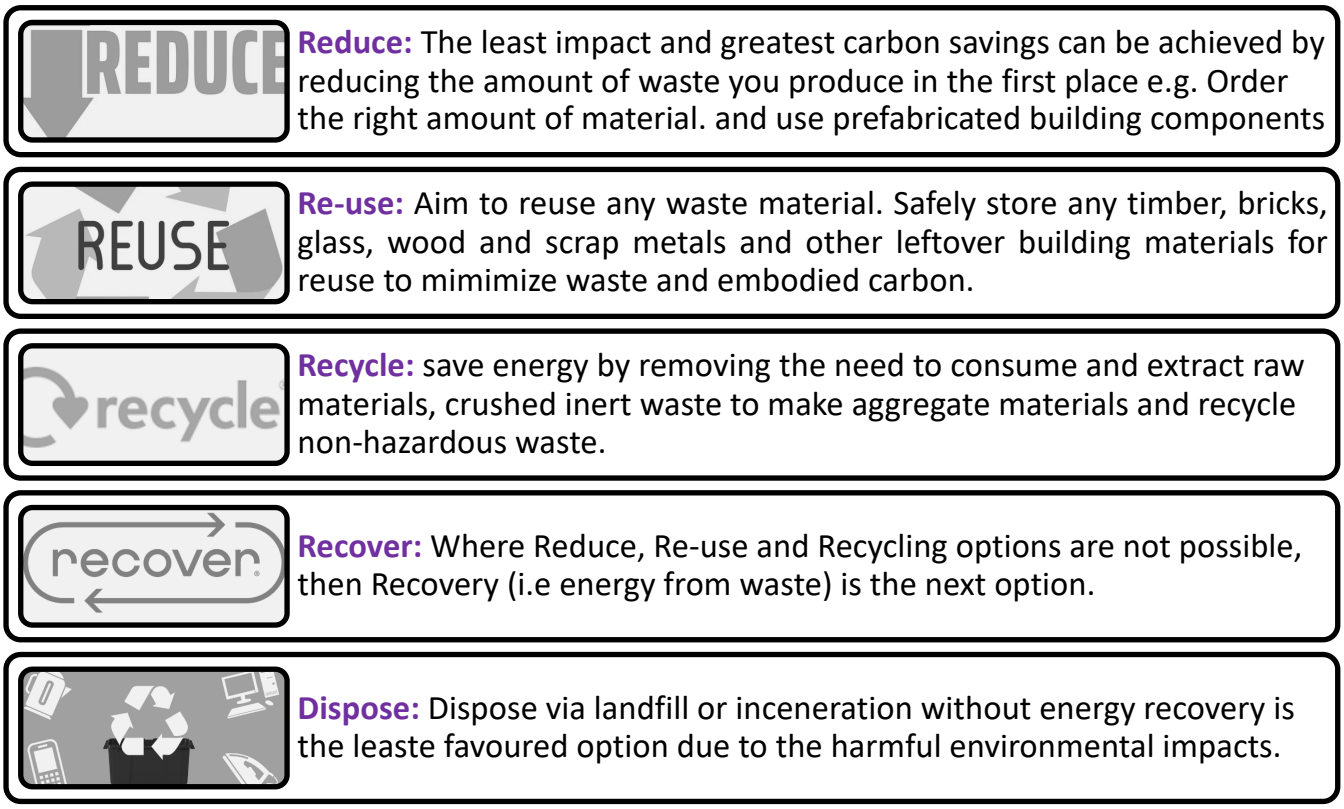
The appointed project team and supply chain shall be extremely mindful of embodied carbon emissions within the project delivery approach and shall design out any potential carbon emission hotspots.

We would require the appointed project team with regards to any new build or refurbishment to contact https://www.zerowastescotland.org.uk/content/contact-form for support to create a carbon emissions reduction plan for the cradle to completion phase of the project. This plan must be submitted at tender stage and adhered to throughout the project.

# 1. Waste Prevention

## 1.1 Waste Prevention

Your business is responsible for the storage, removal, and disposal of all waste generated during your activities. It's therefore essential you understand the proper processes to follow for all types of building waste you create and make the needed arrangements for evacuation. RGU will expects that a proper waste management plan for activity period be put in place. We request for waste transfer notes periodically and follow-up with the final disposal of waste generated from our site. Waste prevention strategies should be implemented, for example, using as much of the existing furniture, fixtures and fittings as possible during the construction of the new or refurbished building to prevent the generation of waste / hazardous-waste and associated waste carrier collections which produce unnecessary carbon emissions. Where waste prevention is not possible, then such waste is deemed as a resource for example, wood, glass, plastics, scrap metals and ceramics. In order to mitigate these emissions in full the project, the team will apply the 'RGU Waste Hierarchy' throughout the project shown below (Figure 1).




## 1.2 Recycled Products

Packaging / products / goods / fixtures and fittings which are required should aim to have a minimum recycled content of 70% (100% for plastics) and be delivered with minimum packaging. Unavoidable waste shall be segregated for recycling under a bespoke project Site Waste Management Plan by the appointed project team.

# 2. Water Efficiency

## 2.1 Water Waste Prevention

Existing taps, sinks, shower bases, bathtubs, radiators etc shall be reused within the project unless these are found to be beyond repair or cannot be retrofitted / adapted to current water conservation standards.

## 2.2 Water Saving Devices

The following water saving devices shall be installed to existing or new water supply fixtures and fittings if these do not already exist:

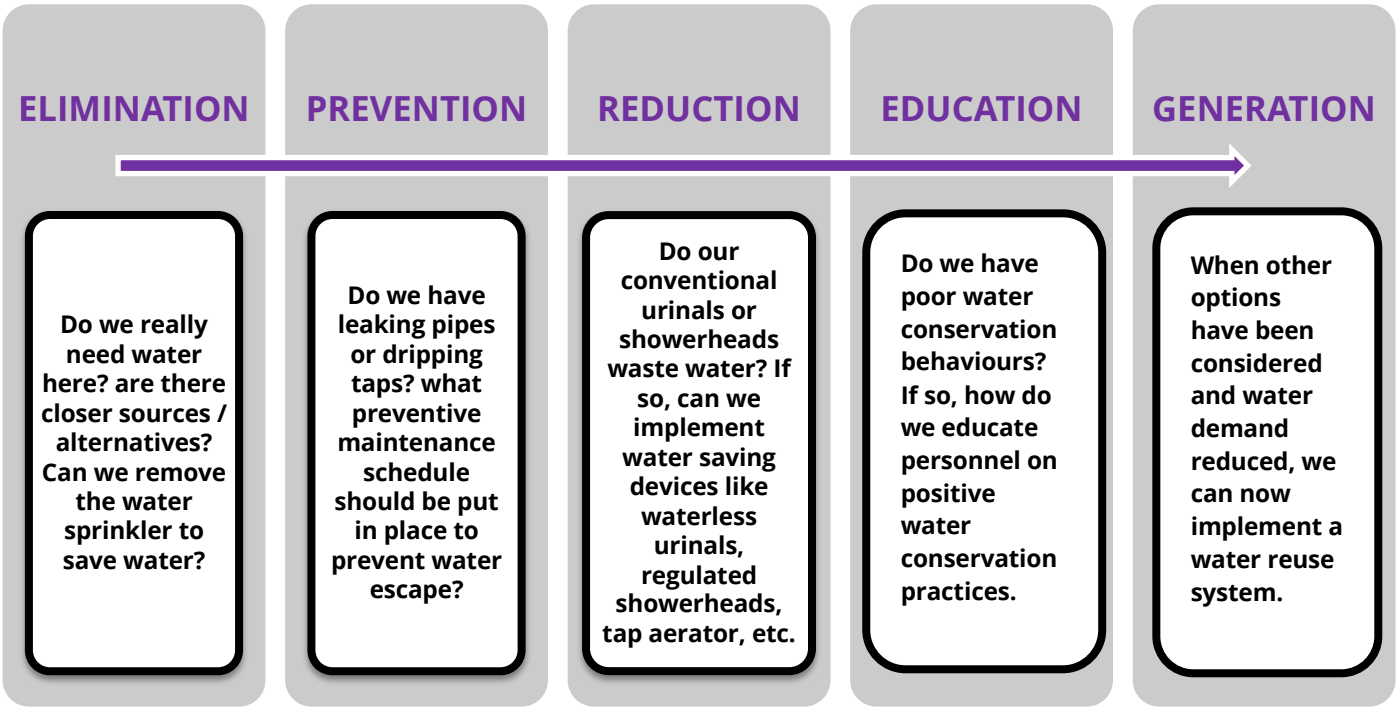
- waterless urinals, existing conventional urinals shall be retrofitted.
- water tap aerator, with a flow rate of 5 litres per minute or better.
- regulated showerhead, with a flow rate of 7 litres per minute or better
- water saving flush valve, flow rate of 6 litres for a full flush with 4 litres for a reduced flush.

## 2.3 Water Leak Detection and Elimination.

Following this the appointed project team will seek out any water leaks / leaking taps and repair during the project delivery phase to conserve water and associated carbon emissions. The project team will be required to not leave any equipment running that uses water when not in use and save water where possible.

To mitigate these emissions in full the project team shall apply the 'RGU Water Hierarchy' throughout the project (Figure 2).

**Figure 2 Robert Gordon University Water Hierarchy**



# 3. Energy Efficiency

## 3.1 Lighting (lamping)

### 3.1.1 Energy Conversation

The appointed project team shall incorporate as much natural lighting as possible within each space via windows and light wells.

All lamping within the building shall be replaced with the most energy efficient rated product of A++ (unless energy efficient lamping of A++ already exists within the existing building and therefore will be reused).

Lamping (both internal and external) of the building will be on an absolute practical and required basis! This means that lamp fittings for decorative or cosmetic purposes will be absolutely ruled out, otherwise known as a one room one lamp policy to conserve energy and thus reduce unnecessary carbon emissions and maintenance. The project team will be required to identify existing cosmetic lamp fittings both internal and external of the building and will design out these fittings during project delivery.

### 3.1.2 Lamp Colouring

Lamp colouring will be the same throughout the building which will be cool / pure white with exception to accommodation buildings which shall be soft / warm white.

### 3.1.3 Lamp Switch Dimmers

Lamp dimmer switches will be installed in bedrooms accommodation settings (this is where dimmer switches do not currently exist within these spaces). Newly installed dimmer switches shall work by using circuitry that rapidly turns the electricity to the lights completely on or off to save energy.

### 3.1.4 Lighting Levels

Lighting levels per area (bedrooms, offices, lecture rooms, corridors etc) will be agreed by the appointed project team and the RGU Estates Senior Project Manager to attain energy saving.

### 3.1.5 External Lamping Controls

External lamping (e.g., around buildings, car parks and site pathway network) will be primarily energised by solar power comprising of an internal rechargeable battery with secondary mains supply for resilience. These shall operate by PIR Sensor including an integrated Photocell which shall only operate during dark periods of each day. Please contact the RGU Estates Senior Project Manager to determine that the selected lamping product is valid for public safety.

### 3.1.6 Internal Lamping Controls

All internal area (e.g. offices, lecture theatres, kitchen areas, meeting rooms) lamping will be controlled by Manual On / Automatic Off lighting controls with a PIR Sensor including an integrated Photocell which shall only operate during dark periods of each day. PIR will be based on Absence Detection (lighting must be switched on manually and the sensor then switches the lighting off when the space is empty) for the areas mentioned above. PIR for corridors, internal landings, stairwells will be based on Presence Detection (automatically brings on the light as soon as it senses movement; and switches the light off when the space is vacant). Please contact the RGU Estates Senior Project Manager to determine the PIR deactivation timing per space.

## 3.2 Building Fabric

### 3.2.1 Draught-Proofing

The appointed project team will examine the building upon completion and conduct Draught-Proofing around all windows, doors, pipework, floorboards, skirting boards, cracks in walls and redundant extractor fans (both internal and external) to ensure that warm air does not escape nor let cold air in.

The project team will use a calibrated thermal imaging device to detect areas of the building which are not sufficiently insulated which allow warm air to escape (except natural ventilation). Where such areas are identified, e.g., cold or hot spots, redial action will be implemented (e.g., top up of cavity insulation) during project delivery to ensure maximum energy efficiency is attained by the completed building or refurbishment. Air tightness must achieve an Air Permeability of 7m³/m².h@50Pa.

### 3.2.2 Loft Insulation

Loft Insulation will be inspected by the appointed project team to ensure complete area coverage of the loft space (no gaps with exception only for ventilation) and that existing insulation meets the 270mm minimum standard with the desired U-Value of 0.15 W/m$^2$K or better. Where existing loft insulation does meet this standard, the insulation will remain in situ and shall be topped up with additional insulation to the required 270mm during project delivery.

### 3.2.3 Wall Insulation

The project team will inspect the building to ascertain that sufficient Wall Insulation exists (this includes lack of sufficient coverage). Where wall insulation does not exist within the building the project team will apply insulation based on fire safety, dampness prevention followed by its high energy saving properties. Wall insulation must meet the U-Value of 0.18 W/m$^2$K or better.

### 3.2.4 Sunlight Reflective Paint (Cooled Roof / Walls)

Walls and roofs have been painted white for centuries to deflect heat known as cooled roofs / walls which aid to cool the building without mechanical cooling. The project team will apply a type of white paint which can reflect 98.1% of sunlight to the roof and exterior walls of the building with full coverage where possible.

### 3.2.5 Windows

The project team will inspect all windows, where single glazing is present in a listed building then secondary glazing or shutters shall be installed which must meet the required U-Value of 2.9 W/m$^2$K or better. If it is found that an existing double-glazing windowpane is misted inside such as the seal has 'failed' then the failed pane shall be replaced instead of replacing the whole window. Existing double glazing shall remain in situ unless in a condition beyond repair. If new windows are necessary, the required U-Value must meet 0.6 W/m$^2$K with no air leaks upon installation.

### 3.2.6 External Doors

Existing external doors shall remain in situ unless in a condition beyond repair. Existing doors shall be adapted as best possible for energy efficiency if new external doors are required, the required U-Value (W/m2K) will be 1.4 with no air leaks upon installation.

### 3.2.7 Thermal Blinds

Existing blinds or curtains shall remain in situ unless in a condition of beyond repair. If new blinds or curtains are necessary, these shall be replaced with the highest thermal efficiency rating available.

### 3.2.8 Reflective Radiator Panels and Radiator Positioning

Energy saving reflective radiator panels will be applied to the walls behind all radiators to reduce heat wastage. This will be installed as per manufacturer instructions and the selected product will be recommended by the Energy Saving Trust. The appointed project team will ensure heaters and radiators are kept clear by not placing furniture, boxes, etc in front of them.

### 3.2.9 Pipe Lagging

Energy saving lagging will be applied to all water piping used for domestic space heating and Domestic Hot Water (DHW) within the building. The lagging to be used shall have an outer foil coating for further energy saving with heat a loss of 7W/m or better. Existing lagging within the building shall be reused within the project. Upon project completion the project team will examine all lagging to ensure pipes are comprehensively insulated with no gaps (including turning points and connections) with pipes marked as DHW and space heating flow / return.

### 3.2.10 Hot Water Tank Insulation

Existing (immersion) hot water cylinder tanks within the building will be reused and shall be examined by the project team to ensure that a minimum energy saving insulation of 80mm covers the entire tank. Where this is not the case a (British Standard Kitemark) 80mm thick hot water cylinder jacket will be retrofitted to the existing tank to reduce heat loss.

## 3.3 Heating Controls

### 3.3.1 Hot Water Tank Thermostat

Existing hot water cylinder tanks will be retrofitted with a cylinder thermostat (where this is not already present). Existing cylinder thermostats will be checked by the appointed project team to ensure that they are in full working order and shall be reused in the project. Where this is found not to be the case, these will be repaired where possible (as per Waste Prevention) prior to replacement.

### 3.3.2 Room Comfort Heating Controls

Existing room / wall thermostats and wiring shall be reused within the project unless beyond repair. The project team will ensure all wall thermostats are locked out / tamperproof and located on an interior wall, away from direct sunlight, air vents, kitchens, windows, doors and ideally placed toward the centre of the building. All wall thermostats are to be positioned at 1 -1.5 metres from the floor.

### 3.3.3 Instantaneous Hot / Cooled Drinking Water Dispensers

Instantaneous hot / cooled drinking water dispensers (such as Hydro Zip Taps) will not be installed. Hot drinking water will be attained via means of an energy efficient electric kettle and cooled water via means of the kitchen cold water basin tap (where potable water exists) to reduce the new building's environmental impact.

## 3.4 Appliances

Existing appliances (televisions, fridges, freezers, dishwashers etc) will be reused within the project unless beyond repair or over 10 years old (excluding cookers, toasters and kettles). If new appliances are necessary, the appointed project team will select the highest energy efficient rating A+++. Upon completion the project team will ensure fans, pumps and central plant such as boilers etc do not operate when buildings are unoccupied, except where they are needed for pre-heating.

## 3.5 Standby Energy

The appointed project team will ensure all electrical and electronic appliances can be switched off / unplugged and not hardwired into the wall. All electronics shall be set to energy saving mode where standby energy consumption must be eliminated where possible.

## 3.6 Heat Recovery

The appointed project team will identify potential building heat generating hot spots such as catering, server / comms rooms etc. The heat generated within identified hot spots will be extracted (via a low energy consuming method) and placed into the nearby corridor / office / living spaces or to heat hot water. The project team will ensure heat recovery is applied across the whole building.

## 3.7 Ventilation and Temperature Control

The appointed project team shall not introduce mechanical cooling / ventilation air conditioning system, this also applies to server / comms rooms where possible. The project team will take the traditional and pragmatic approach to cooling / ventilation and shall incorporate natural ventilation and cooling within the new building via airbricks, trickle vents, opening of windows and the application of thermal blinds, cooled (painted white) roofs and walls or by another non-energy consuming means. Passive heating shall also be incorporated into the building where possible. The completed building shall adhere to the following heating and cooling setpoint temperatures to combat global warming:

- Domestic kettle hot water for tea / coffee — no higher than — 90°C
- Hot water storage for bathing and washing — no higher than — 60°C
- Dishwasher hot water temperature — no higher than — 50°C
- Washing machine hot water temperature, — no higher than — 30°C
- Domestic space / room comfort heating — no higher than — 20°C
- Food refrigeration — no lower than — 3°C
- Domestic food freezing — no lower than — -18°C

Please contact RGU Estates Senior Project Manager and Energy and Sustainability Manager to confirm domestic space / room frost protection activation point.

## 3.8 Energy Benchmark

The completed project will deliver an annual energy consumption or better presented on the table below, please contact the RGU Energy and Sustainability Manager to confirm applicable building type. One year after the day of project completion the energy consumption of the building will be reviewed to ensure the energy benchmark is being attained.

**Table 1-1 Annual delivered energy consumption (kWh/m$^2$ treated net internal floor area)**

| Building Type | Annual kWh/m$^2$ |
|---|---|
| Accommodation building | 51 |
| Administration building | 83 |
| Air conditioned, prestige offices | 208 |
| Air conditioned, standard offices | 135 |
| Detached house | 51 |
| Leisure pool centre | 441 |
| Naturally ventilated, open plan offices | 80 |

## 3.9 Renewable Energy

### 3.9.1 Solar PV

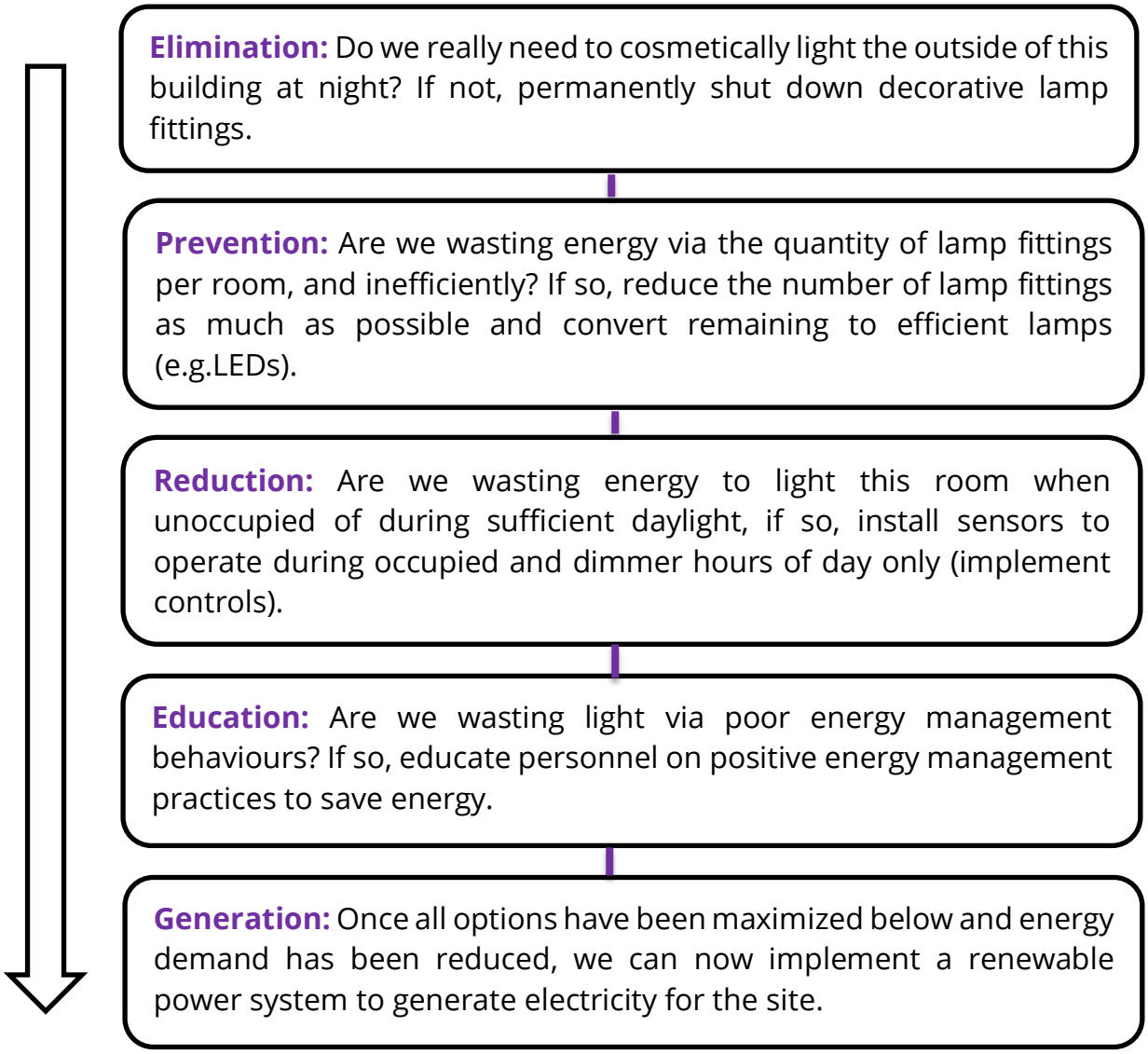
Solar PV shall be installed on the roof of the building. The appointed project team will ensure that the Solar PV attains complete coverage of the external roof area of the building to ensure maximum renewable energy is captured. The project team will also incorporate an efficient and effective Battery Storage technology which shall be integrated with the solar PV system to ensure the buildings consumes all the energy captured via the Solar PV. Battery Storage will ensure the building attains the maximum benefit of the Solar PV technology and investment.

### 3.9.2 Heat Pump

Heat Pumps shall be the renewable technology for space / comfort / hot water heating for the building. The appointed project team will select a heat pump with the best Coefficient of Performance (CoP) available, the COP value shall be no less than 4.0. The heat pump controls will be a very simplistic / user friendly interface such as a purely On / Off switch for space heating and water heating of the building in order that this system is widely assessable for RGU operation.

To mitigate these emissions in full, the appointed project team will apply the 'RGU Energy Hierarchy' (Figure 3). This will prioritise energy efficiency measures to their full potential to reduce energy demand on the National Grid prior to adopting renewable technologies to self-generate energy onsite.

**Figure 3 Robert Gordon University Energy Hierarchy**



# 4. Transport Efficiency

## 4.1 Local Sourcing of Project Deliveries

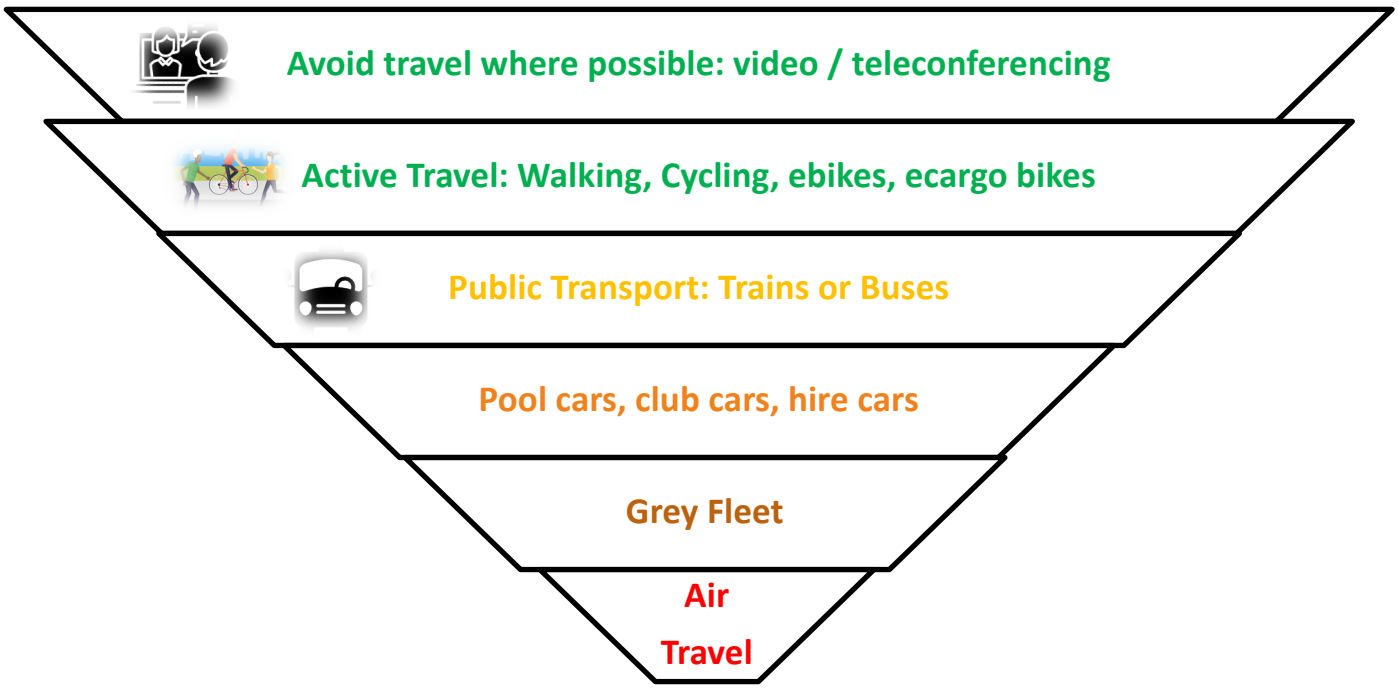
Transport reduction of goods and services will be an essential requirement of the appointed project team and supply chain via reduction of the number of deliveries / transportations which can produce unnecessary carbon emissions. Proximity / local sourcing of products and goods to be delivered to RGU will be an essential requirement to reduce fuel consumption, traffic congestion and associated carbon emissions.

## 4.2 Limitation of Vehicles Used

Further to this, a limitation to the number vehicles permitted to be used at the site (please note Covid-19 guidance will supersede this), to be included within the site traffic management plan to reduce fuel and associated carbon emissions.

The appointed project team will apply the 'Energy Saving Trust Sustainable Transport Hierarchy' (Figure 4). This will prioritise the elimination of any vehicles that the project does not essentially require, prevent the use of vehicles where possible via the use of videoconferencing technology, reduce the need to travel via vehicle by walking, cycling or public transport for staff commute. Followed by the education of personnel on fuel efficient driving techniques. Once these steps have been exhausted the project team will then approach the final step of the hierarchy where remaining company vehicles shall be full electric or hybrid or other viable technology which does not emit carbon emissions (where viable).

**Figure 4 Energy Saving Trust Sustainable Transport Hierarchy**



# 5. Sustainable Materials

## 5.1 Whole Life Value (Cost)

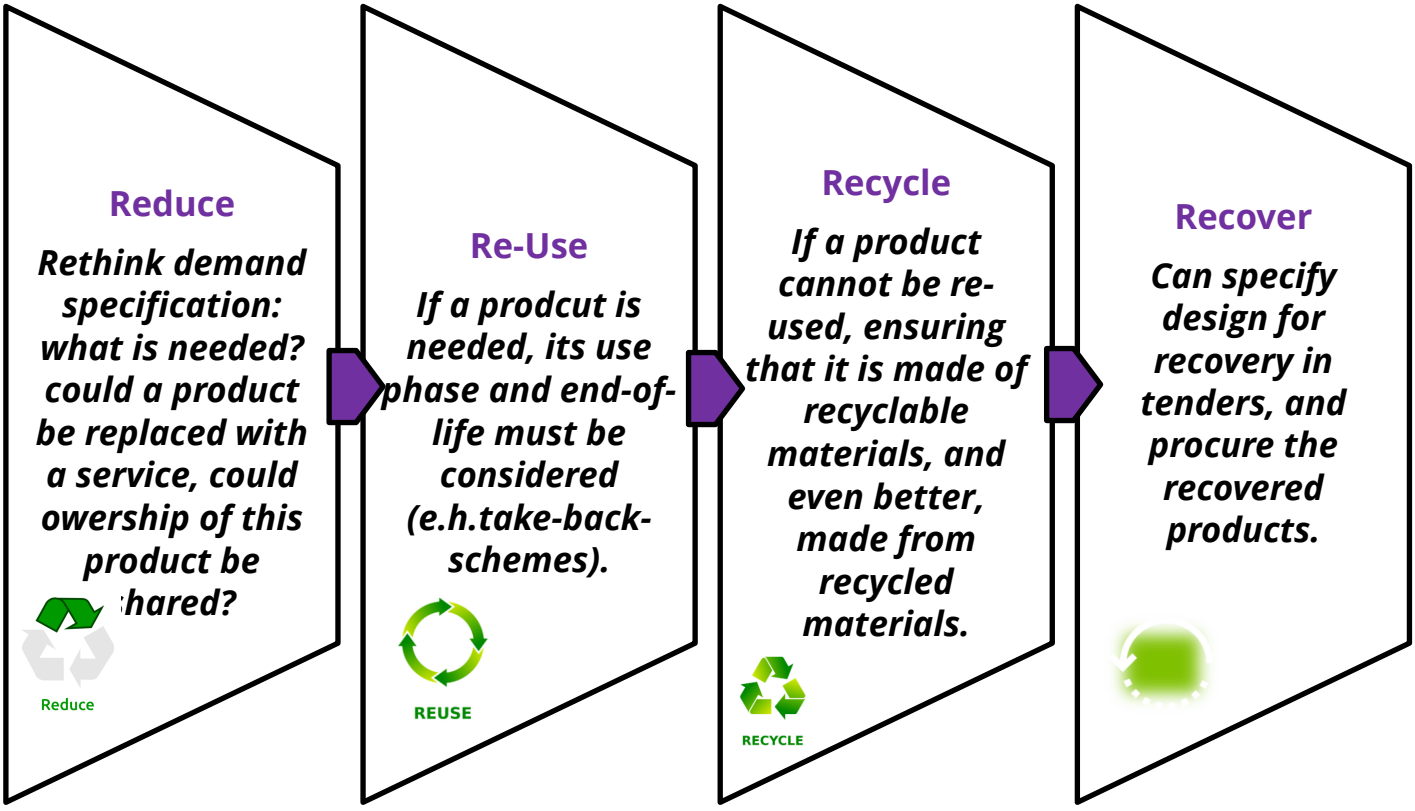
When procuring materials, the appointed project team will take a wider, long-term view of carbon emission reduction. The lifetime positive and negative impacts of the new building on climate change from its construction, use, maintenance and repairs, decommissioning and disposal, will need to be recognised and accounted for within the project design (built to last).

## 5.2 Long Life / Loose Fit

The appointed project team will take cognisance of the new building's ability to evolve and adapt through time to reflect changes in fashion, use, needs and impacts such as climate change, occupation capacity, digital technology and demographics.

We will require the appointed project team to apply RGU's net-zero carbon emissions ethos and adopt our approach and hierarchy's (**Figure 1 to 5**) for the procurement of materials.

**Figure 5 Zero Waste Scotland Circular Procurement Hierarchy**



# 6. Biodiversity, Carbon Capture and Air Quality

The appointed project team will ensure that any grounds surrounding the building will enhance biodiversity such as a wildflower meadow to increase biodiversity and to positively contribute to the restoration of insect and wildlife population (e.g., bees, hedgehogs). This also includes planting native broad leaf tree species to preserve Scotland's environment and help sequester carbon dioxide emissions. The project team will also be required to incorporate a form of biophilia within the building, the selection of plants will be based on low maintenance (e.g., less watering) and to enhance air quality.

Please contact the RGU Energy and Sustainability Manager to determine that this section is or not appliable to the intended project.

# 7. Climate Change Legislation Applicable to RGU

The appointed project team will ensure that the lifespan of the project and completed building complies with the following climate change legislation:

- Making Things Last: a circular economy strategy for Scotland
- The Assessment of Energy Performance of Non-domestic Buildings (Scotland) Regulations 2016
- The building (Energy Performance of Buildings) (Scotland) Regulations 2016
- The building (Scotland) Act 2003
- The Climate Change (Scotland) Act 2009
- The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019
- The Energy Efficiency (Private Rented Property) (Scotland) regulations 2020
- The Energy Performance of Buildings (Scotland) Amendment (No. 2) Regulations 2012
- The Fluorinated Greenhouse Gases (Amendment) Regulations 2018
- The Motor Vehicles (Refilling of Air Conditioning Systems by Service Providers) Regulations 2009
- The Ozone-Depleting Substances Regulations 2015
- The Road Traffic (Vehicle Emissions) (Fixed Penalty) (Scotland) Regulations 2003
- The Road Vehicles (Construction and Use) (Amendment) (No. 3) Regulations 2009
- The Water (Scotland) Act 1980
- The Waste (Scotland) Regulations 2012