

Application for a more sustainable energy system

We bought our C-listed house in Pathhead 3 years ago and would like to maintain its original character while making it more energy efficient and more sustainable. Currently, we use oil for heating our home, for cooking and for hot water. We have an old Esse (at least 20 years old) that is used as a stove and oven, but also as our boiler. With this system it is not possible to cook while not also heating the house. Also, our radiators are not controllable individually. Therefore, we are using a lot of unnecessary energy for example when we are cooking in the summer or feel very cold in one room but have to heat the whole house to raise the temperature in that particular room. Both the current energy efficiency of our property and the environmental impact (CO2) rating as stated on our last EPC are Fs which considering the climate crisis we are all facing is not acceptable.

Our oil tank is hidden behind shrubs in the garden and its fabrication and location are not conform with current safety regulations (it is for example single-walled) which means that it would need to be replaced and the landscaping of the garden would need to be adapted to accommodate a new tank. We would like to take this as an opportunity to not replace the oil tank, but to improve the whole energy system of our house so that we can move away from fossil fuels and lower our carbon footprint. We propose to

- 1) Replace the oil heating with an air source heat pump
- 2) Adapt the landscaping of the garden so that the fans of the heat pump can be hidden 8 m away from the house where currently the oil tank is located.
- 3) Replace the old hot and cold-water cylinders in the loft by a new hot water cylinder
- 4) Replace all radiators (because heat pumps work with lower temperatures and therefore radiators need a bigger heat exchange surface). Install two new radiators in rooms that currently don't have any (kitchen and study)
- 5) Replace the Esse with a modern, but traditional looking electric range cooker

Replacing the oil heating system with and air source heat pump

We have spent the last few years considering different ways to move away from fossil fuels and came to the conclusion that the only system that will work for us is an air source heat pump system. Those systems have massively evolved so that they are now very green, effective and quiet. We believe that with a system like that we will be able to keep our house at a more constant temperature which will fight dampness and therefore better preserve the building long-term. We have received four different quotes for the installation of an air source heat pump. Our favourite quote from the Smart Group is very detailed and we attach it to this application. It contains example photos of the air source heat pump fans, the new water tank and the radiators that could be installed. The system would be regulated using a Google Nest system which allows the separate controlling of temperatures in different rooms. Cooking would be completely separate from heating our house which is particularly useful in

the summer. The installation in our loft would be tidied up because the hot and cold-water tank and our shower pump would all be replaced by a smaller hot water tank and a system that operates on main pressure. The outer fans will be positioned at least 1 m (we aim for 1.5 m) from the neighbouring property which is in accordance with Scottish guidelines on this matter. All radiators will be fitted with individual valves and the temperature of our house will be regulated using a central system and thermostat. We will even be able to adjust the temperature remotely. The air source heat pump that will be fitted is either a Mitsubishi or a Vaillant system which are both highly efficient and so quiet that they were awarded a quiet mark certification.

Adapt the landscaping of our garden

We thought carefully about where to position the outer fans so that our neighbours and we are not disturbed by it and decided to not ask for their installation directly at our house but about 8 metres away into our garden, hidden behind shrubs and trees, where currently our oil tank is located. Figure 1 shows a Google Earth image of our property which indicates the oil tank/ air source heat pump position in our garden.



Figure 1: Google Earth image of our property. A) un-annotated image. B) Annotated image. Our property is marked in blue, our house in red, the position of our oil tank in orange.

All the installers we consulted confirmed that the installation of the fans 8 m away from the building would not cause problems and they approved the location we chose.

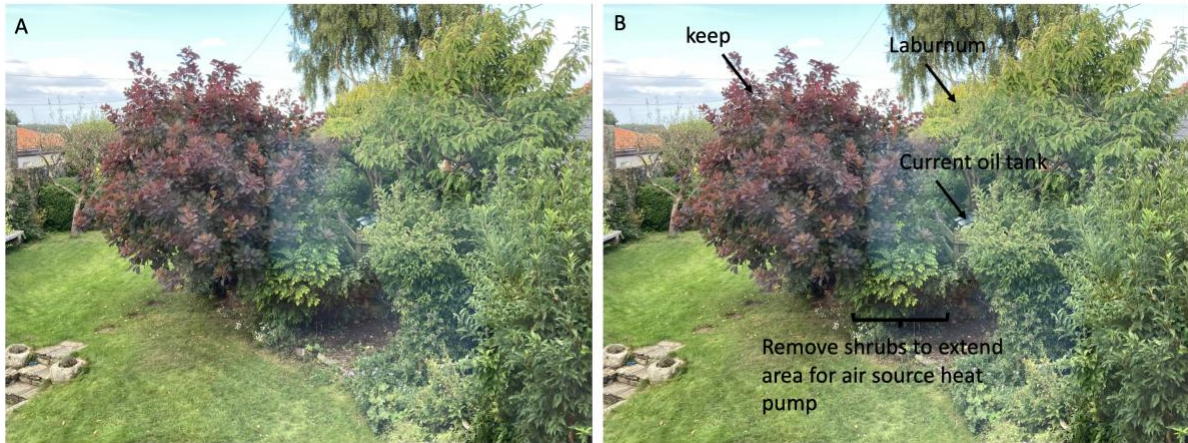


Figure 2: View from the house on our oil tank. A) original photo. B) Annotated.

The proposed changes to the landscaping of the garden are as follows: We would like to slightly extend the fenced-in area where the oil tank is located which would be necessary for both a new oil tank or an air source heat pump. We propose to remove some shrubs that are located between the red Cotinus tree and the current fence. While doing so, the air source heat pump area will be slightly extended, it will still be possible to hide this area behind a wooden fence that again will be hidden behind climbing plants and shrubs. The area is big enough to allow for sufficient clearance for the air source heat pump to work, to hide it from view and to allow enough distance from the neighbouring property (more than 1 m. We aim for 1.5m). Figure 2 to Figure 4 show the area of our garden, where the oil tank is positioned and where we propose to install the air source heat pump fans.

We are aware that we live in a conservation area and asked which trees are protected. We will make sure not to do work on protected trees without permission.

We think the only tree that may be protected in this area is the Laburnum shown in Figure 2 and Figure 4. If it is protected indeed, it will not be touched.



Figure 3: Shrubs we propose to remove. The picture also shows on the left the stem of the Cotinus which is a good distance away from the wooden fence on the right. This shows that the area is extendable while still providing the possibility to hide the new wooden fence.



Figure 4: Additional images of the oil tank location. The Laburnum can be seen on the bottom right photo.

Replace the hot and cold-water cylinder in the loft

Currently we have a hot water cylinder, a cold water tank and a shower pump in the loft which we would like to replace by one hot water tank that is connected to the internal units of the heat pump system. This will tidy up the attic and lower the risk of water damage (the shower pump for example leaked in the past). All installers confirmed that the loft is a suitable place for fitting our internal units.

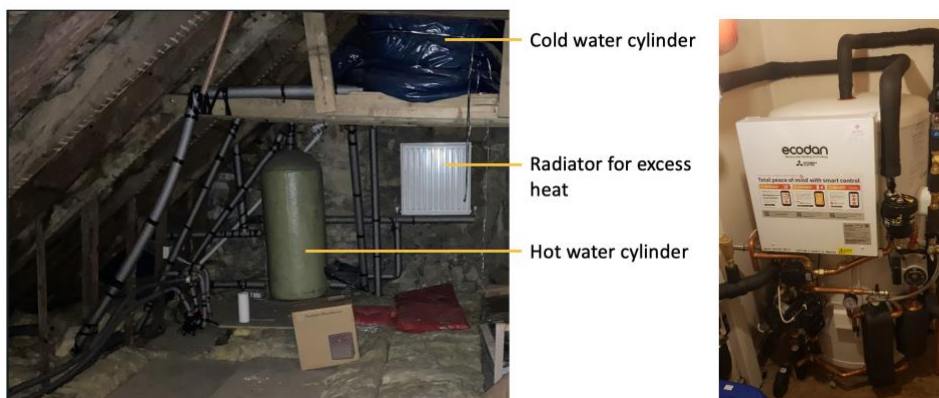


Figure 5: Water tank installations in the loft. Left panel shows current installation with a hot water cylinder, a cold water cylinder, a shower pump and a radiator for excess heat. The right panel shows an example installation provided by the Smart Group.

Replacement of radiators and installation of new ones

Air source heat pumps operate at lower temperatures than gas or oil boilers which means that radiators have to have a bigger exchange surface to effectively warm rooms. Therefore, we propose to exchange all existing radiators with the exception of the designer radiator in our upstairs bathroom that will be kept and will work well with the new system.

The kitchen currently does not have a radiator, because the Esse produced enough excess heat to keep it warm. We propose to install a new radiator where our dining area is. When our living room was extended, no additional radiator was installed in the extended part. As a consequence the existing radiator is too small to heat the room and it often remains cold. There are two options, one is to install a new radiator on the wall which is currently behind our sofa, the other is to install that new radiator and also replace the old radiator with a new one. Figure 6 shows the position of all radiators we propose to replace in red, all radiators we propose to install in green, the radiator we plan to keep in blue and the Esse in purple. Figure 7 and Figure 8 show photos of the current radiators, Figure 9 and Figure 10 proposed positions of new radiators and Figure 11 shows an example photo of radiators that are typically installed by the Smart Group.

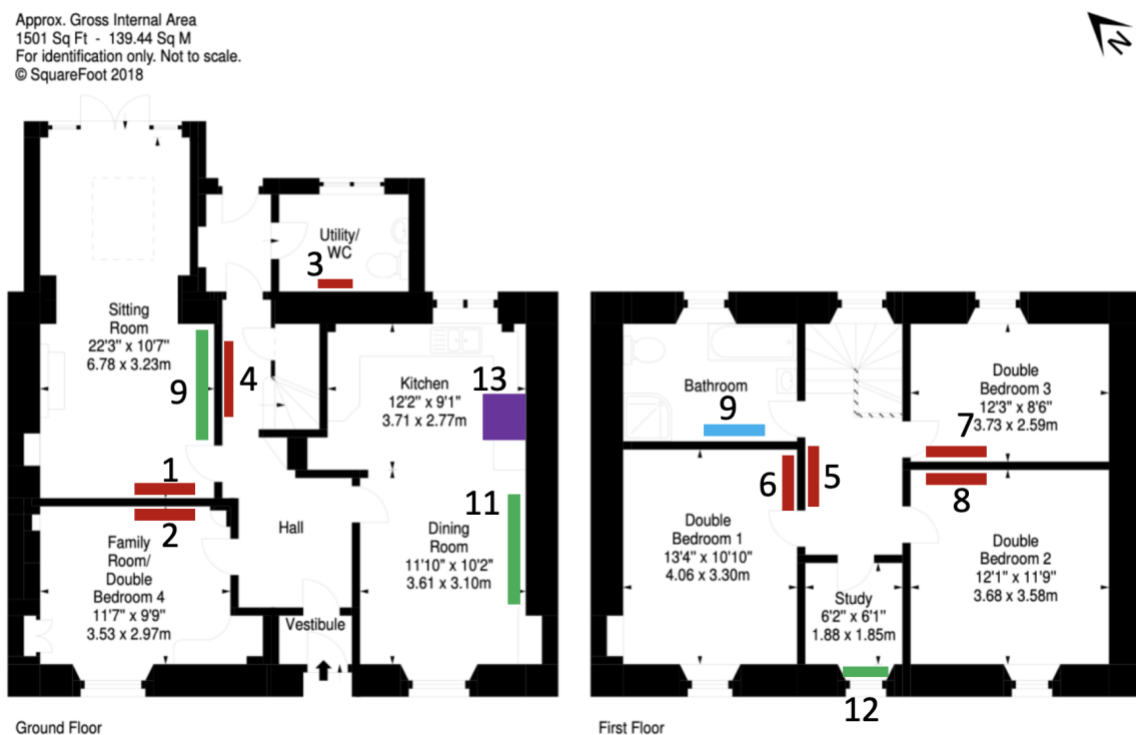


Figure 6: Floor plan showing the old radiators we propose to replace in red, positions of new radiators that we propose to install in green, the position of one designer radiator that will be kept in blue and the position of our Esse (which is used for cooking and a boiler for hot water generation and heating) in purple.

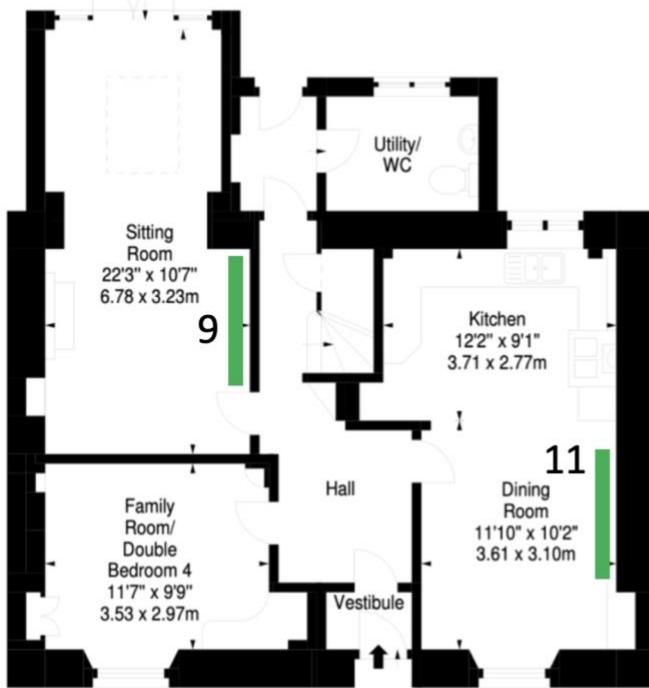


Figure 7: Photos of old radiators we propose to replace on the ground floor. Their positions are marked on the floor plan in the middle.



Figure 8: Photos of old radiators we propose to replace on the first floor. Their positions are marked on the floor plan in the middle.

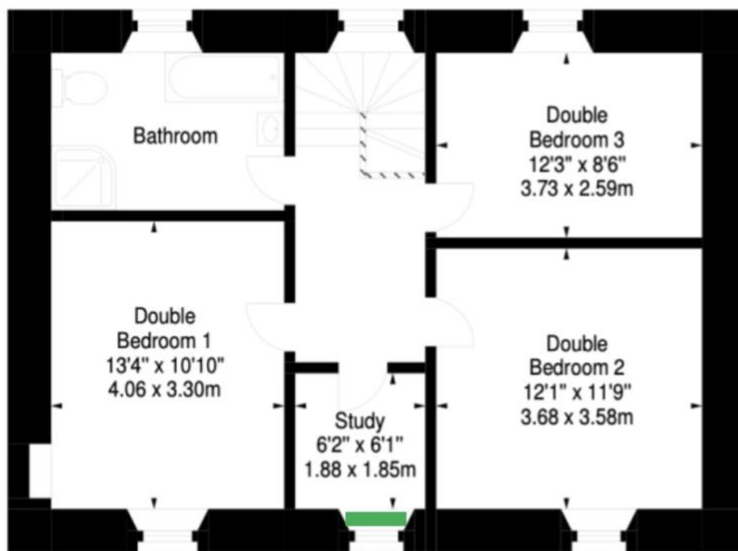
Approx. Gross Internal Area
 1501 Sq Ft - 139.44 Sq M
 For identification only. Not to scale.
 © SquareFoot 2018



Ground Floor



Figure 9: Positions of the new radiators we propose to install on the ground floor level. The radiator in the sitting room will go behind the sofa.



First Floor



Figure 10: Position of the new radiator we propose to install in the upstairs study. The photo shows the electric heater currently required in this room which will be removed.



Figure 11: Example image of new radiators as supplied by the Smart Group

Replacement of the Esse

As described above, we use an Esse for cooking which doubles as our boiler for heating and hot water. Although we love the appearance of the Esse, it is a major obstacle when trying to make our home more energy efficient. We therefore propose to replace it with a modern electric range cooker that looks traditional. Figure 12 shows the position and appearance of our Esse, Figure 13 shows a potential replacement.

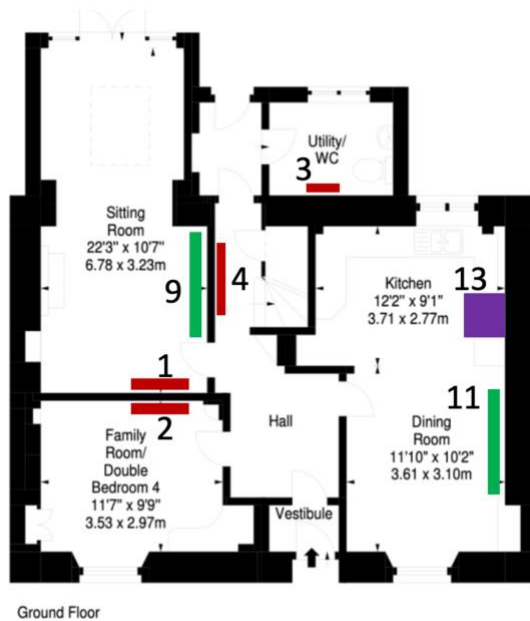


Figure 12: position and appearance of our Esse which is currently used for cooking and as a boiler for hot water generation and heating. We propose to remove it and to replace it with a modern but traditional looking electric range cooker.



Figure 13: Image of potential replacement oven. Taken from <https://prcdirect.co.uk/rangemaster-cdl110ecbl-b-classic-deluxe-110cm-ceramic-range-cooker-black-brass.html>