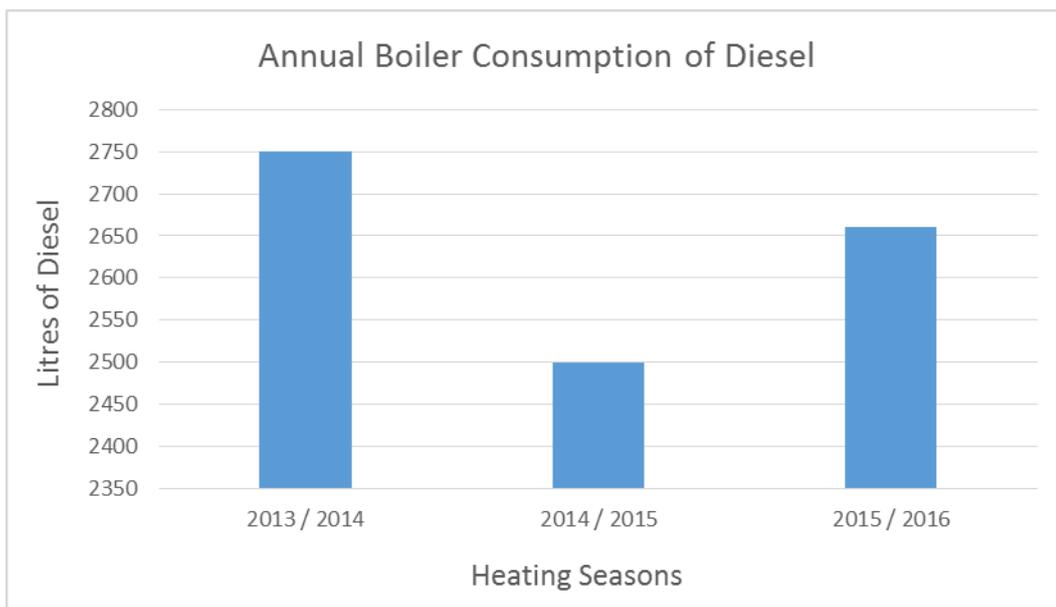


## ***Efficiency Review of Buildings & Systems***

The following report has been compiled to review the heating efficiencies of The Church, The Rectory and The Old School House. The purpose is to make suggestions on where improvements can be made with a view to generating energy and economic savings.

### ***The Church***

Heating to the church is provided from a 'Tasso' 240kW gas oil (diesel) section boiler. The boiler itself is at least 30+ years old and is not very efficient. Much of the heat is being lost directly out the flue. Having consulted Ray Mahon who has been servicing the boiler, he declared that the first time he saw the boiler in action 'the flames were coming out the side of the boiler'. Ray re-sealed it and also purchased covers to try and protect it and also maintain some heat within the system. Finally, Ray told me not to open the door on the boiler. It is warped and when doing the annual service it takes time and a lot of fire cement & rope to re-seal it.



Data provided from Glen Fuels

From the graph above, it can be seen that over the past three heating seasons, there hasn't been any major changes in the fuel consumption of the boiler itself. Range 2500 litres to 2750 litres and unless there are any adverse extremes in the coming winters either very mild or very cold, it can be assumed that the range will remain constant.

From a discussion with Rev. Waugh, the heating is set to come on approximately 2 hours before the Sunday services in the morning and the evening. He is vigilant about not having it run mid-week or all day etc.

Finally, the interior of the church was recently re-plumbed with new radiators and pipework. From an inspection in the boiler house, these appeared to be well insulated and in good state of repair.

#### Conclusion:

- To generate significant savings in fuel consumption, the boiler serving the church needs to be upgraded. Furthermore, it will have to be replaced at some point anyway as it will not go on forever.
- Replacing the boiler will not be easy and this will be reflected in any quotations received. Access to the boiler house is limited and any replacement unit will either have to be built 'in-situ' or either craned in by removing a section of the roof.
- Another option is to replace the oil boiler with a number of smaller high efficiency gas boilers. The access will not be a problem, but there will be the cost of piping gas from the road to the boiler house.

Note: Oil is currently much cheaper than gas and money was recently spent on upgrading the oil tank. This money will have been wasted if the decision is now made to convert to gas.

- A final point is that the boiler currently runs on gas oil (diesel). The boiler could be converted to run on Kerosene, which is more efficient and burns cleaner. This will generate some savings at a fraction of the cost, but is not really a long term solution.

Note: the existing oil tank can be still used with Kerosene.

### ***The Rectory***

Heating to the Rectory is provided via 2 gas boilers, the Aga cooker and 2 gas fire places. Hot water is provided from a factory insulated cylinder and can be produced either from the gas boilers or an electric immersion heater.

- Gas Pipework: An initial gas soundness test confirmed that the pipework is fine and there were no gas leaks recorded.
- 2 Gas Boilers: Heating to the house and hot water is provided via 2 Potterton Suprima boilers. These were installed when the house was built around 1998 and are therefore 18 years old. The specifications on the two boilers state that they provide 80kW of heat together, however when gas rating them I calculate that they are only providing 56kW. This would mean that they are running at approximately 70% efficient.

More noticeable is when you turn on the two boilers together at maximum, the high speed at which the gas meter is clocking up gives an indication of how much gas is being used by the boilers.

Note the following results from flue gas readings from each boiler:



Name: Delgany Parish Properties  
 Phone: 0863276291 (Gordon Elliott)  
 Date: 30<sup>th</sup> May 2016

```

K455 V 1.85B
CHRISANDER LTD
01-2874716
SERIAL NO. 134811152
DATE      03/05/16
TIME      08:39:42
POTTERN SUPREMA.
COMBUSTION LHS
.....
FUEL      NAT  GAS
O2 %      10.6
CO2 %      5.8
CO ppm    46
FLUE °C    147.5
INLET °C   18.2
NETT °C    129.3
EFF (G)   91.4  91.3
LOSSES    8.7
XAIR %    102.9
-----
Cal. due on 28/07/16
CO/CO2    0.0007
PRS mbar  0.00
  
```

```

.....
Customer
.....
Appliance
.....
Ref.
.....
  
```

```

K455 V 1.85B
CHRISANDER LTD
01-2874716
SERIAL NO. 134811152
DATE      03/05/16
TIME      08:44:50
RHS
COMBUSTION
.....
FUEL      NAT  GAS
O2 %      10.1
CO2 %      6.1
CO ppm    55
FLUE °C    129.8
INLET °C   18.2
NETT °C    111.6
EFF (G)   82.7
LOSSES    17.3
XAIR %    93.5
-----
Cal. due on 28/07/16
CO/CO2    0.0008
PRS mbar  0.00
  
```

```

.....
Customer
.....
Appliance
.....
Ref.
.....
  
```

Flue gas readings for each boiler show that the CO ppm (carbon monoxide), CO2% and the CO / CO2 Ratios are all within acceptable levels. Therefore the boilers are operating satisfactorily, are safe and providing heat. However, due to their age they have been superseded by much more efficient boilers that are now available on the market.

- The gas Aga cooker. This can be considered as a 'luxury' item, however, the burner (when turned the max) is only rated at 5kW. Therefore comparing it to the boiler's 80kW, it is only using a fraction of the gas. To run a gas Aga, it costs approximately €30 per week depending on gas prices. Finally an Aga will radiate heat out from the kitchen to the surrounding area. Therefore other radiators can be turned down and according to Rev. Waugh, the radiator in the kitchen is never turned on. During the summer months, the Aga is switched off because it simply gets too hot to have it on.
- The 2 gas fire places. These are not used as primary sources of heat, but are simply a comfort factor for when guests are present. According to Rev. Waugh they are only used a handful of times each year.
- Heating and hot water systems. The general pipework and radiators are all in a good state of repair. When the heating is turned on, all radiators come up to heat quickly and the systems appear to be working sufficiently.

#### Conclusions:

- The hot water and heating systems within the rectory are in a good state of repair.
- To make significant savings in fuel consumption, it would be recommended that the two gas boilers be replaced with a single modern high efficient condensing boiler.
- It would be recommended that the existing electric immersion be fitted with a simple analogue timeclock.
- Finally the timeclock to the boilers could be updated with a modern electric equivalent.

#### Analysis of 3 Gas Bills Provided from 21/09/15 to 29/03/16:

- Similar to the oil graph for the church above, it is possible to compare the consumption of gas in the rectory year on year from the previous bills. From the 3 bills provided it can be seen that the rectory consumed 2292m<sup>3</sup> of gas from 21/09/15 to 29/03/16.
- Total gas bill for this period = € [REDACTED]  
Cost of Aga cooker = €30 x 27 weeks = €810.  
Cost of 2 Boilers = [REDACTED] - 810 = € [REDACTED]
- Estimated annual running cost of the two boilers to allow for heating from the beginning of September to the end of April = €1500.  
Estimated costs for replacing the two boilers with a single high efficiency condensing boiler = €3200.  
Efficiency gains = approximately 25%. (Replacement unit = 95%, Existing Unit = 70%)
- Payback Period: Savings to be generated = €1500 x 25% = € 375 per heating season.  
€3200 / 375 = 8.5 years.  
Therefore if the existing two boilers are replaced with a modern condensing equivalent, the payback period is 8.5 years.

### **The Old School House**

Heating to the Old School House is provided via a 40kW Ferolli Oil Boiler. This and the associated systems including pipework and radiators were only installed in the last number of years and are therefore in a good state of repair. Heating is provided via tokens, given to individual groups to heat their designated room or area. The flue gas analysis from the boiler as shown below indicates that the unit is operating at 91.4% efficiency. There is no current economic or other need to replace any of the heating systems within the Old School House.

```

COMBUSTION
.....
FUEL          L OIL
O2 %          7.4
CO2 %         10.0
CO ppm        72
FLUE -C       182.1
INLET -C       12.3
NETT -C       169.8

EFF (C)       91.4
LOSSES        8.6
XAIR %        54.8
-----
Cal. due on 28/07/16
-----
  
```

```

.....
Appliance
FEROLLI 40KW
Ref.
.....
  
```

```

.....
NOZZLE SIZE:
2.0 60° W
  
```