Sustainable Business Breakfast

Wiston House, 9th February 2017

Sustainable Business Network

European Union
European Regional Development Fund

Event supported by the European Regional Development Fund

What's coming up?

08:20 Welcome
Rowan Wallis, Sustainable Business Network

08:25 Best Practice Case Study: Wiston House
Amanda Bates, Corporate Services & Compliance Manager

08:45 Topic Expert: Renewable Heat
Derrick Pope & Neil Champion, Pope Consulting

09:05 Round-the-Room Introductions

09:20 Closing Address
Rowan Wallis, Sustainable Business Network

09:30 Networking

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Wilton Park

Welcome

Wilton Park

Sustainability initiatives

- Energy
- Food
- Events & travel
- New projects FY17-18
- Water
- Waste
- Staff

Wilton Park

Targets and objectives

- GGC 2020 – and the FCO
- Government Plan for Obesity
- Government Buying Standards
- DEC

Wilton Park

Energy initiatives

- LED lighting and motion sensors
- Kitchen wash up equipment
- Biomass boiler

Wilton Park

Biomass case study

- Objectives
- Timescales
- Barriers
- Benefits
- Challenges and lessons learnt

Wilton Park

Water

- In-house water filtration system
- Guest bedrooms
- Savings

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Food

- Fairtrade products
- Local supply network
- Government Buying Standards for food and catering
- Walled garden

Wilton Park

Waste streams

- Recycling
- Sewage plant
- Food

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Staff

- EGG - voluntary group
- SSG - strategic focus
- Green Gym Days
- TW3

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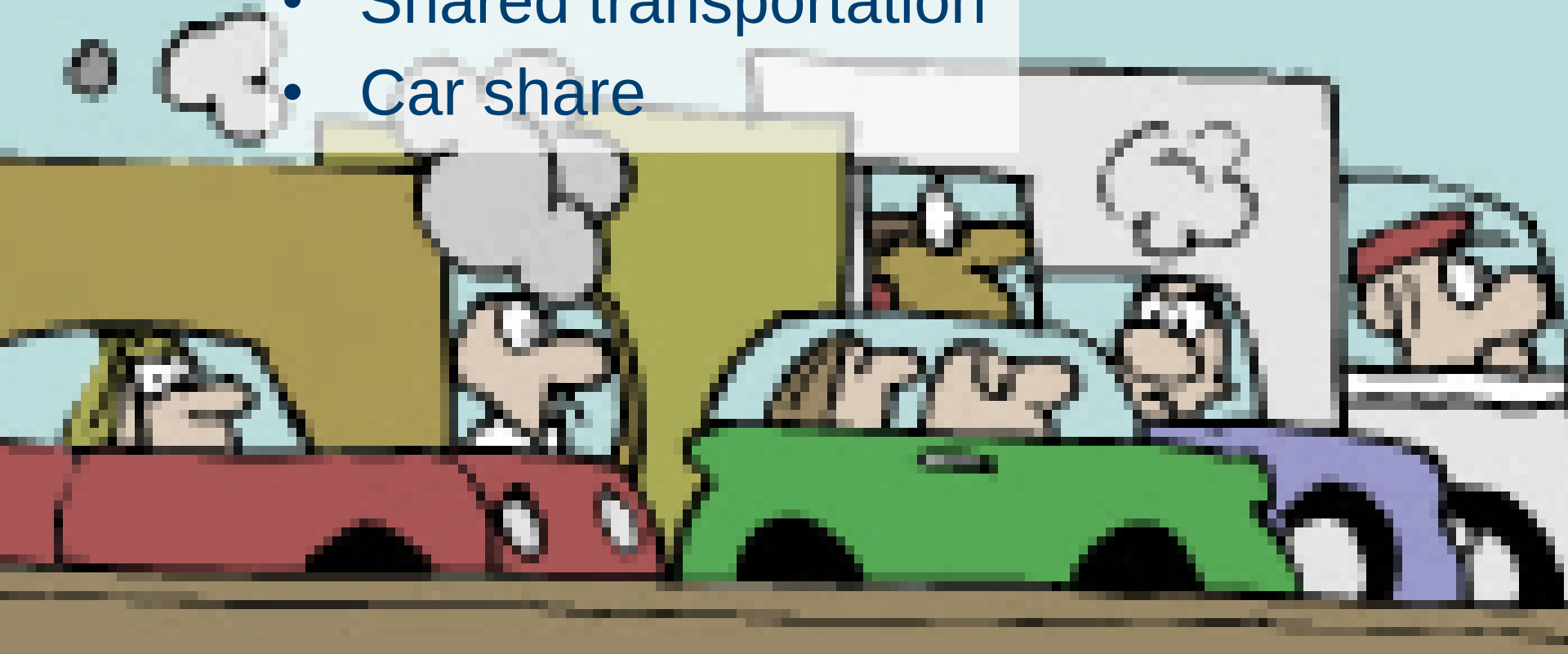
Events and travel

- Shared transportation
- Car share



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New projects for FY17-18

- Food digester
- Paper-low office
- Electric car charger ports
- Event literature

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Any questions ?

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Renewable Heat Technologies

Derrick Pope & Neil Champion

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Heat Pumps

A 17kW ground source heat pump serving a new chapel at Worthing Crematorium.

Heat Pumps

- Same basic principal as a domestic refrigerator.
- Very little maintenance, long operating life.
- Heat source can be air, water or ground.
- Ground source uses horizontal trenches or deep drilled boreholes (80-120m.)
- Borehole systems can be either:
  - closed loop pipework carrying brine
  - open loop where water is extracted, cooled and returned into the ground
- Deep boreholes at a steady 12°C have better performance but are more expensive.
- Trenches nearer to surface need larger area and at risk of colder atmospheric temperatures.

Trenches for 22kW GSHP


Boreholes for 180kW GSHP

Ground Source Heat Pumps

- Ground source generates low temperature hot water. More suitable for new build construction with good insulation and underfloor heating.
- Efficiency is called the Coefficient of Performance. The closer the underfloor and ground loop temperatures, the higher the CoP.
- A GSHP with a CoP of 4 is generating 4kW of heat for every 1kW of electrical energy put in.
- CoP may reach 4 with 40°C underfloor temperature but will drop back to 2 if 60°C water is needed.

Underfloor heating installation in a modern office block

Ground Source Heat Pumps

- GSHP emits approximately half CO_2 of equivalent gas fired boiler.
- As electricity is more expensive than gas, the effective cost of energy is around 4p/kWh.
- Renewable Heat Incentive provides payments for energy generated.
- GSHP attract a generous tariff: Tier 1 = 8.95p/kWh, Tier 2 = 2.67p/kWh
- Typical domestic installation costs £13,000 to £20,000 (Energy Saving Trust) compared to around £3,000 to £4,000 for conventional gas.
- RHI payments of £2,600 to £4,000/annum = 4 year simple payback


2 x 90kW GSHPs
in a school and
office complex
in Reading.

Air Source Heat Pumps

- Air source heat pumps cool the outside air to extract heat.
- Some manufacturers guarantee output down to -20°C, although at this temperature, their CoP is very poor.
- Two types; air to water and air to air.
- Air to water units deliver warm water to underfloor circuits.
- Air to air = air conditioners. Can both heat and cool.
- Air source much cheaper than ground source. A domestic air to water from £3,000.
- RHI = 2.57p/kWh (much lower than ground source)
- Larger air to air, sometimes called VRV (variable refrigerant volume) control the environment in multiple spaces, simultaneously heating or cooling as required and transferring the extracted heat or coolth with little net energy intake or rejection.

Heat Pumps

Outside air to water or air to air heat pump

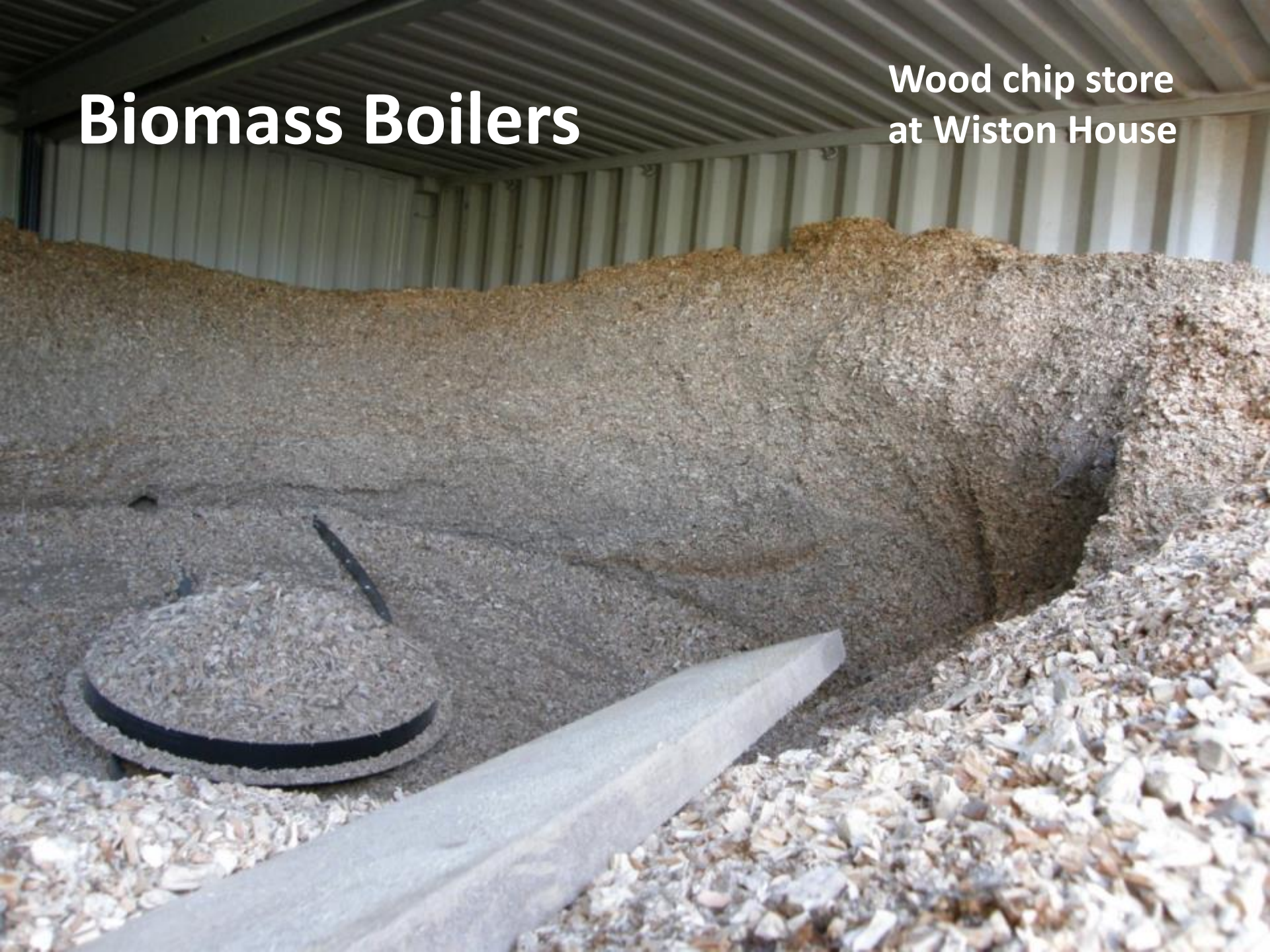
Typical VRV ceiling cassette


Wood pellets!

Biomass Boilers

- Burning biomass fuel is considered carbon neutral
- Most suitable where there is a significant requirement for year round or seasonal heat.
- Generates hot water at about 80°C, for heating, domestic hot water generation or industrial process.
- Fuels include; industrial waste, straw, Miscanthus (Elephant Grass), bio-gas and bio-oil.
- Most common for automatic feed systems are wood chip and wood pellet.

Biomass Boilers



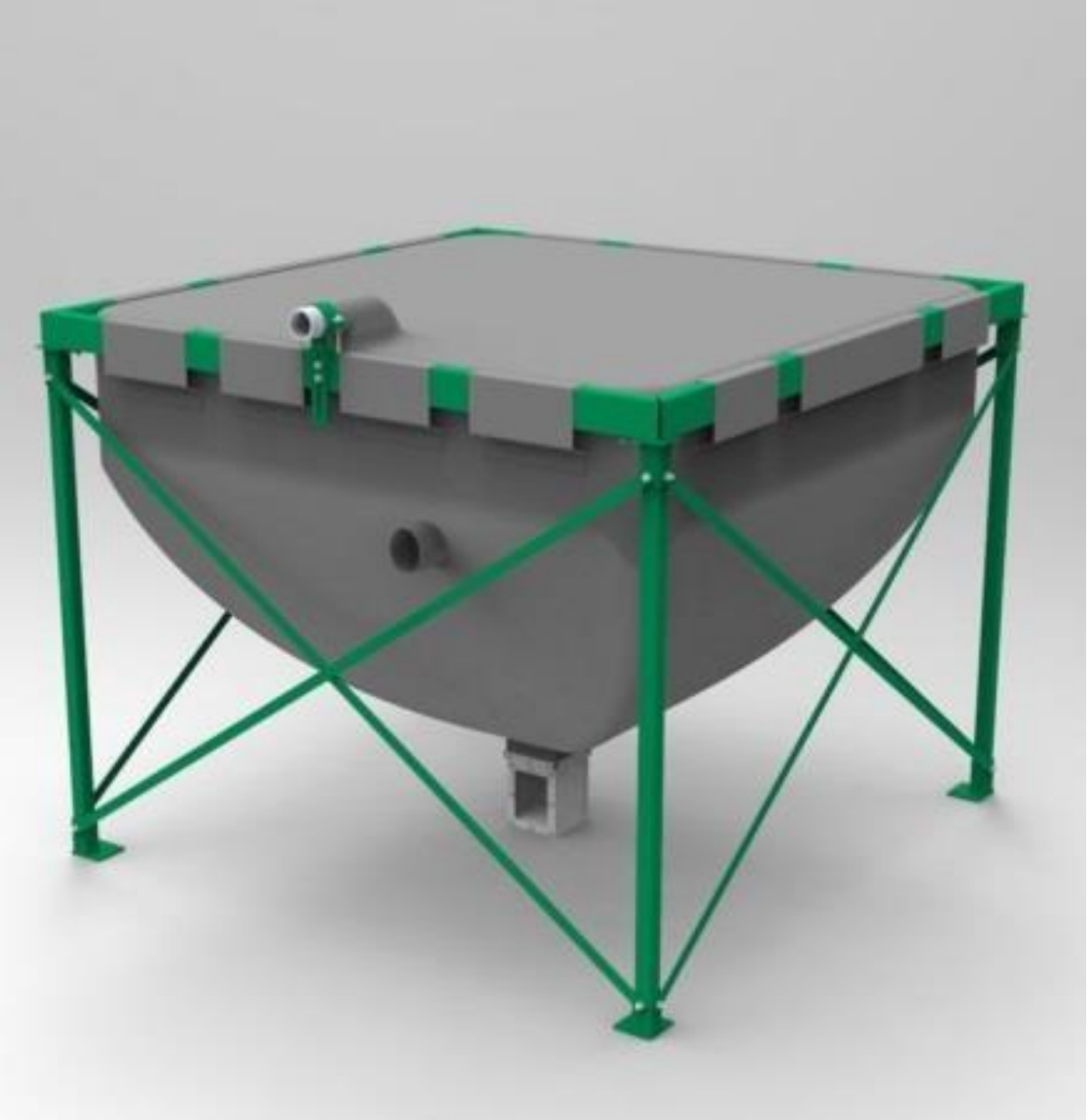
Wood chip store
at Wiston House

Biomass Boilers

- Require a large storage hopper in proximity to boiler with access for deliveries.
- Woodchip usually delivered to burner by system of augers.
- Pellets are smaller and lighter and can be blown.
- For smaller installations, lightweight fabric hoppers can be used.
- Pellet delivery can be bagged, bulk (tipper) or blown by tanker, similar to fuel oils.
- Woodchip delivery may depend on capability of supplier.
- Solid fuels cannot turn on and off like a gas burner and may need a buffer vessel to absorb heat and flatten demand.

The wood chip store at Wiston House is formed from shipping containers

Wood chip store



A typical fabric pellet store

‘Blown’ pellet delivery

Biomass Boilers

- Capital costs much higher than conventional gas or oil plants.
- Domestic size plant typically costs £10,000 to £12,000.
- 150kW packaged plant (like at Wiston House) costs approximately £160,000.
- Current RHI: Tier 1 = 2.95p/kWh, above Tier 1 = 0.78p/kWh
- RHI from 1st April: Tier 1 = 2.91p/kWh, Tier 2 = 2.05p/kWh to encourage base load sized boilers.
- Bulk wood pellets = 4.34p/kWh (Energy Saving Trust) (gas = 4.18p/kWh , oil = 3.58p/kWh)
- Payback usually between 8 to 16 years, depending on energy used and fuel price.
- If heat is essential to business, a back up system may be needed.

150kW wood pellet boiler installed in a Cheltenham school

Pope Consulting was appointed by Wilton Park in 2007 to take their biomass project forward.


Wiston House has year round demand
for heating and domestic hot water

Biomass Boilers

- Wiston estate extends to 6,200 acres.
- 1,200 acres of which are woodland.
- A wood burning solution was requested for lower fuel costs, a green solution and a teaching resource.
- Softwood trimmings and poorer quality sweet chestnut used for boiler. No other commercial use for this timber.
- Thinning poorer quality trees improves conditions for more the valuable wood stock.
- 400 tons/annum of wood burned in boiler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Building Services Consulting Engineers

Chichester and Maidenhead

Thank you, any questions?

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Round-the-Room Introductions

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What's next?

Case Study Visit: Glyndebourne
7th March, 09:30 to 11:30, free – join the reserve list

Tour of Tangmere Solar Farm
26th April, 09:30 to 11:30, free

Visit: www.sustainablebusiness.org.uk/events

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And finally…

Energy Audits
Free on-site assessment to identify opportunities to reduce energy usage and costs

Energy Efficiency Grant Scheme
Up to £5,000 to cover a third of the cost of installing energy saving measures

Funded by the European Regional Development Fund.
Let us know if you are interested.
Full details to follow…

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