Heating low energy buildings

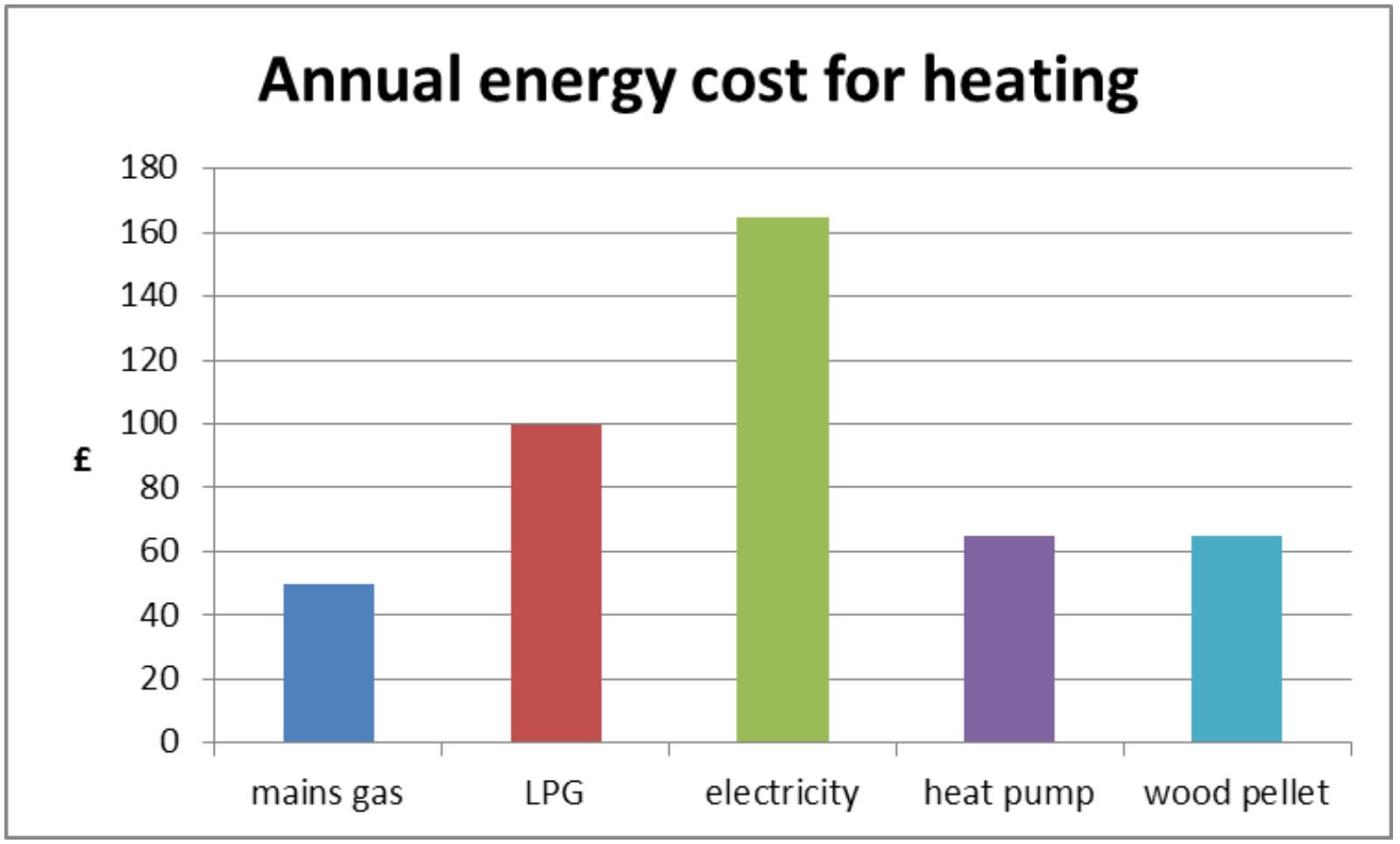
Alan Clarke

Heating these: how hard can it be?

pro clima SOLITEX

PAUL

15 kWh/(m^2.a) x 75m^2 = 1100kWh/a

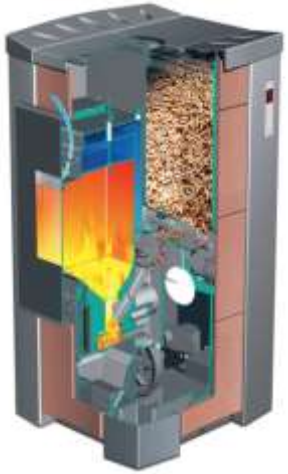


Cost of heating plant

Gas boiler
£2,000

Air source
heat pump
£7,000

Ground source
heat pump
£11,000



Pellet stove
+boiler
£10,000

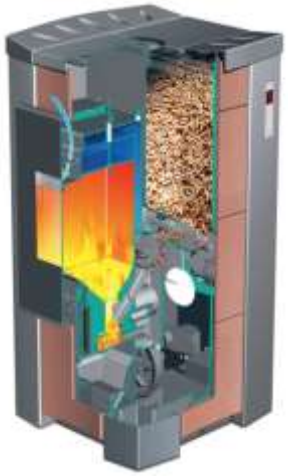
(Costs from EST)

Over life of 20 years, cost/year

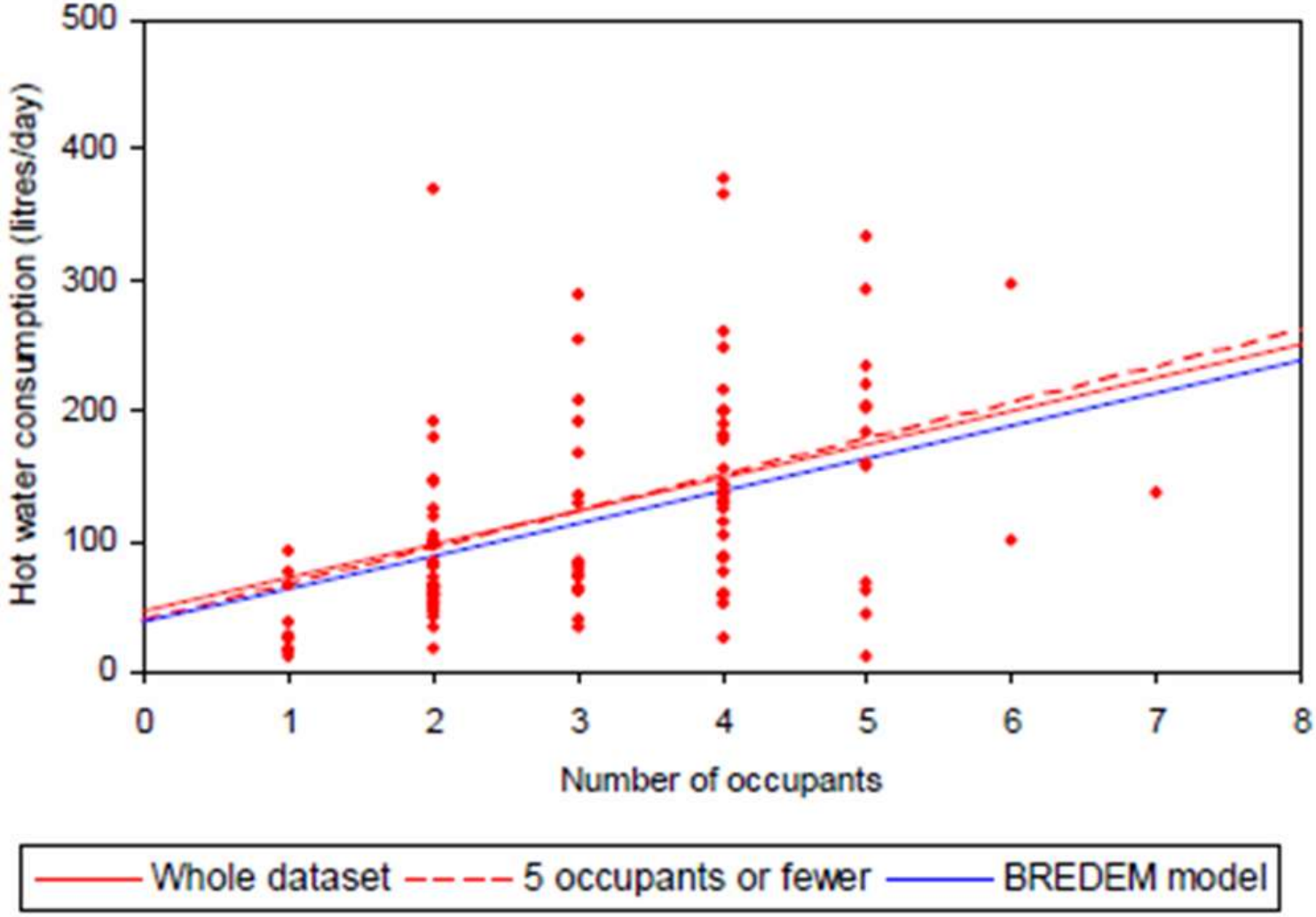
Gas boiler
£100/year

Air source
heat pump
£350/year

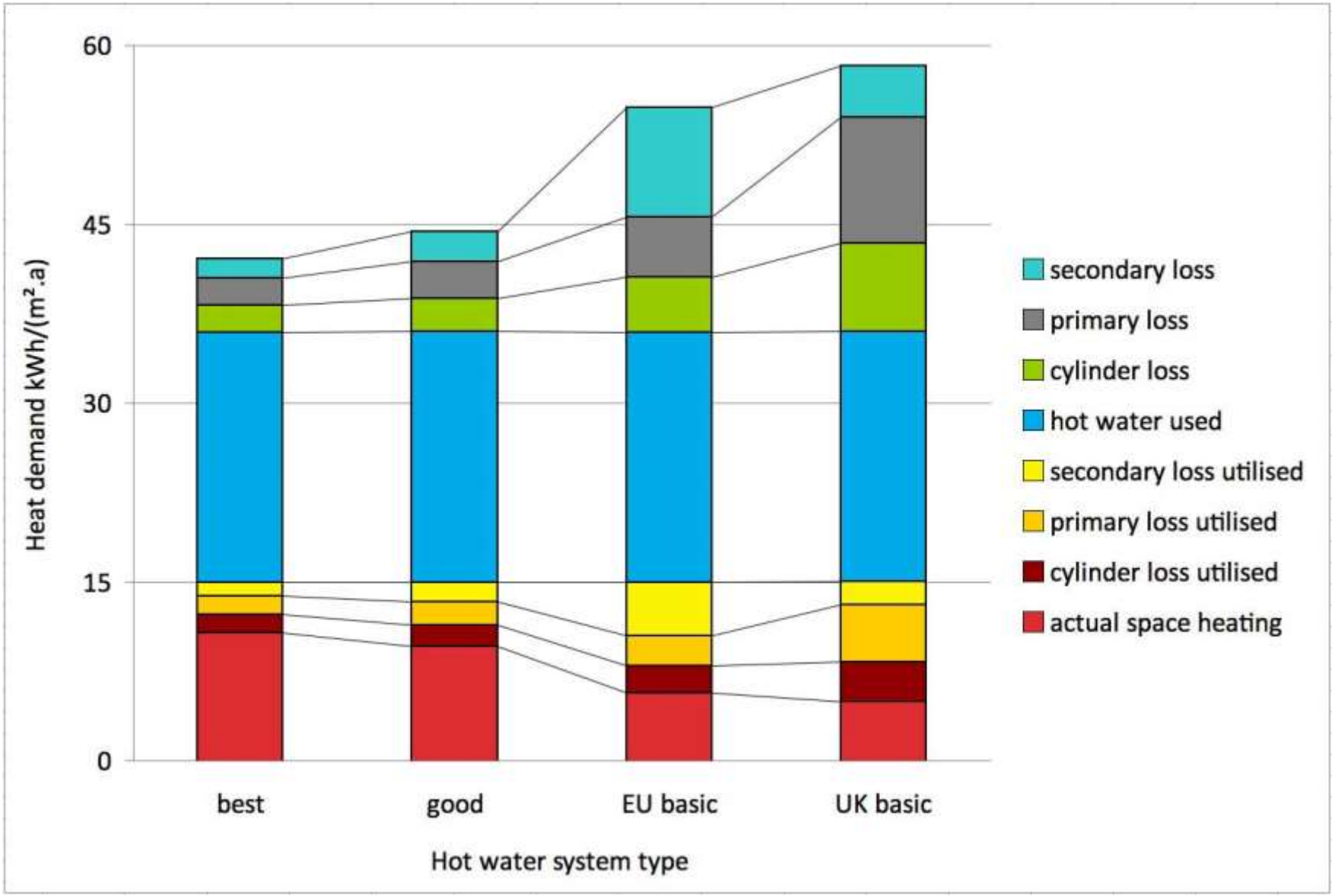
Ground source
heat pump
£550/year



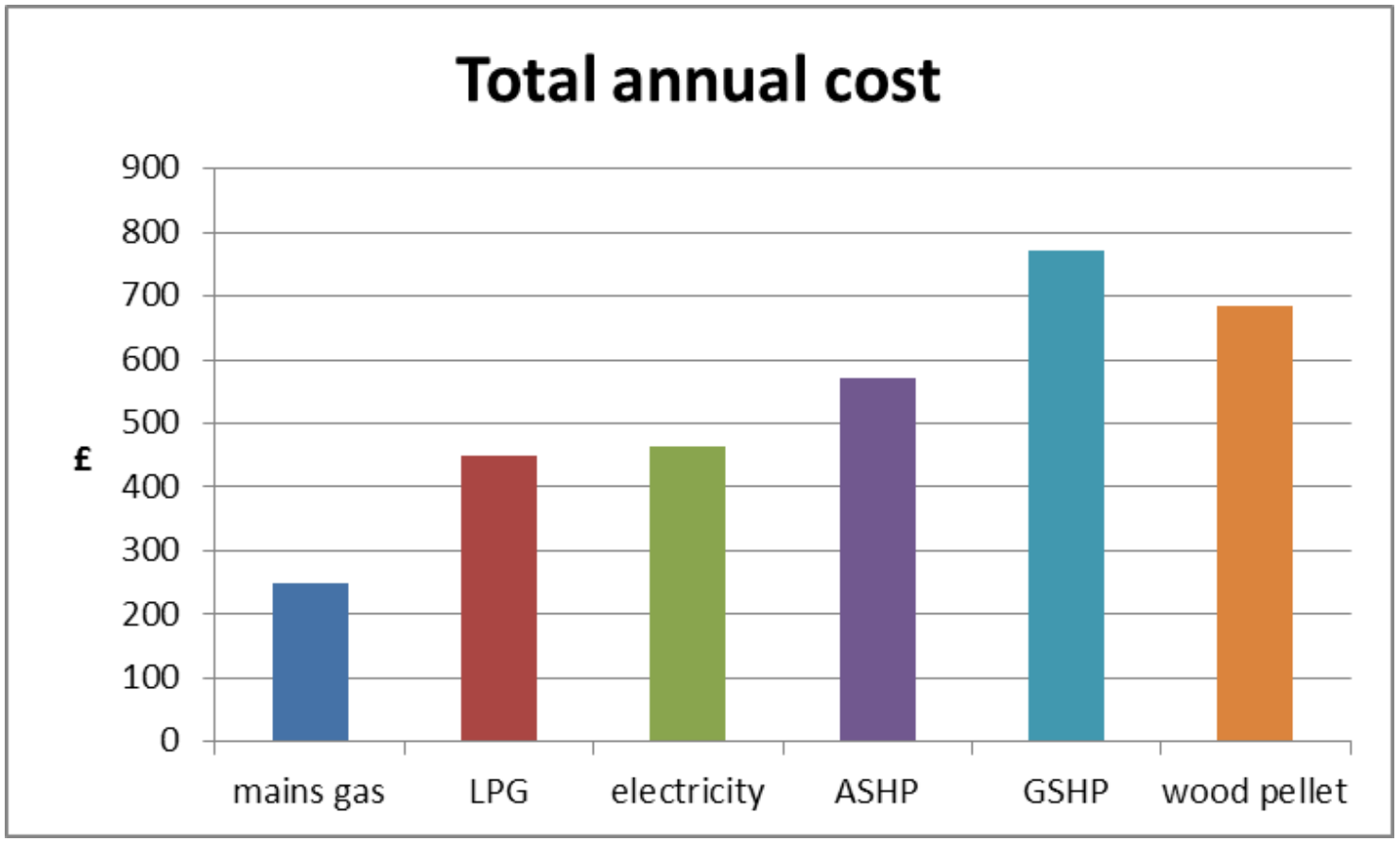
Pellet stove
+boiler
£500/year



Use is very variable - for small family house, say 2000kWh/a


60
45
30
15
0
Heat demand kWh/(m².a)
best
good
EU basic
UK basic
Hot water system type
secondary loss
primary loss
cylinder loss
hot water used
secondary loss utilised
primary loss utilised
cylinder loss utilised
actual space heating

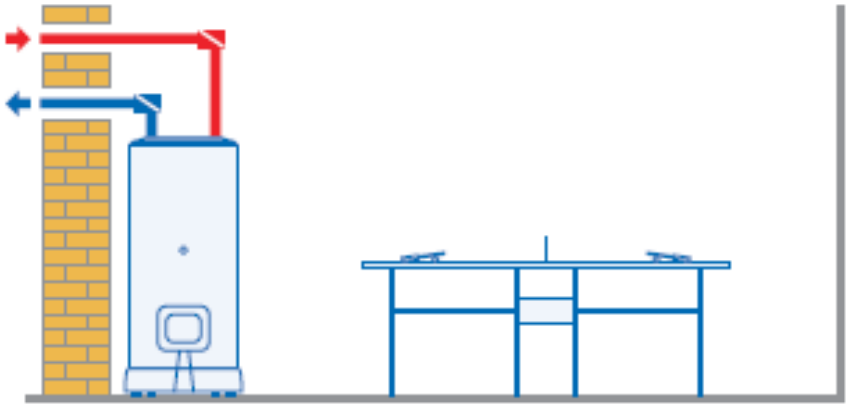
Total annual costs
heating + hot water + plant



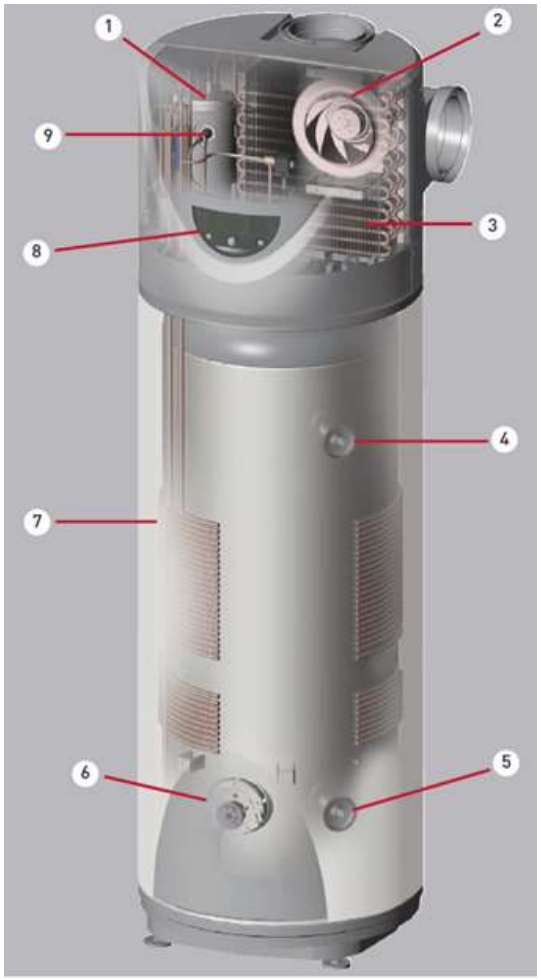
- Energy use is low – so capital cost is significant
- Hot water often the major heat demand
- Some new approaches:

Hot water heat pump

- Cheap
- Simple small heat pump
- Could use for heating too



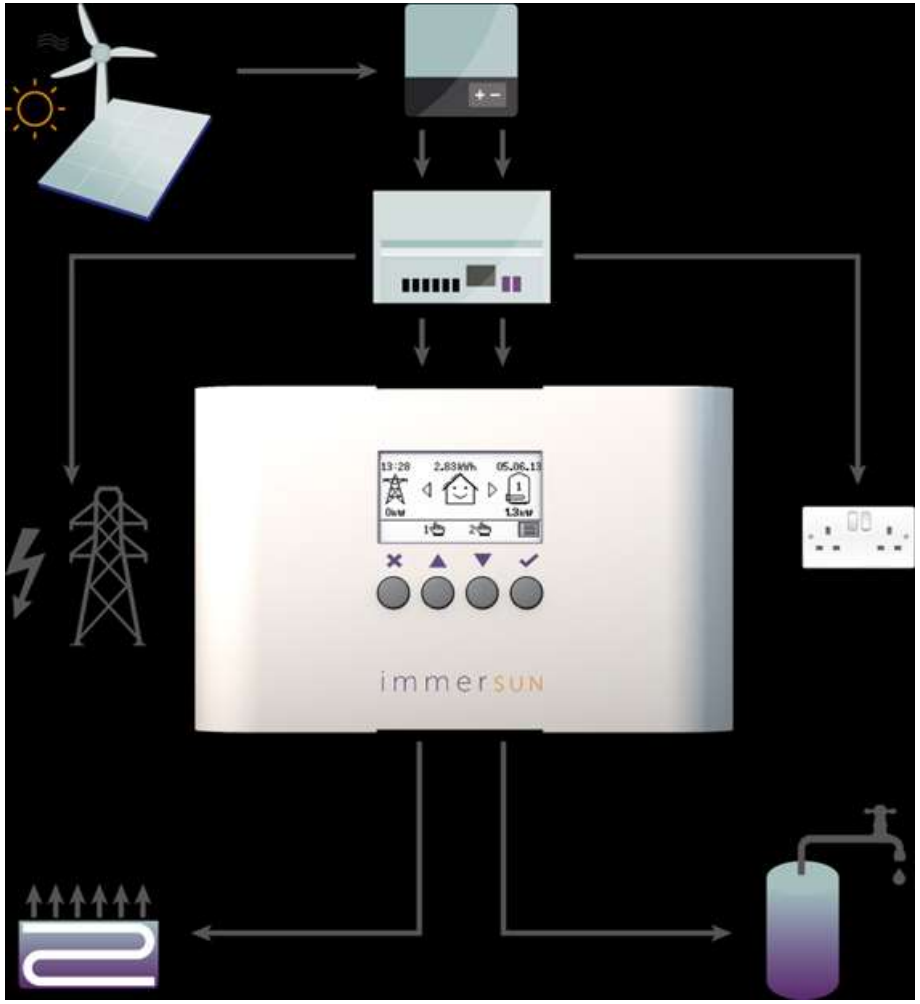
Inlet drawn from and exhaust also ducted to outside



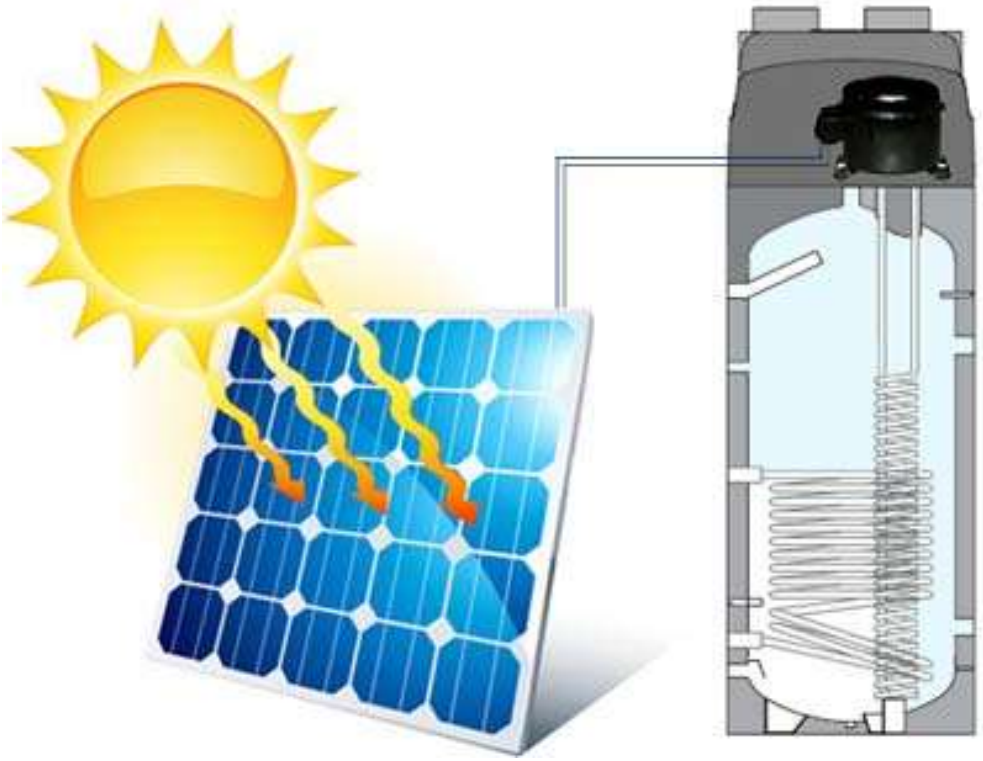
LEGEND

1. Compressor
2. Fan
3. Evaporator
4. Hot Water Outlet
5. Cold Water Inlet
6. Electric Element (1kW +1.5kW)
7. Condenser
8. User Interface
9. Expansion Valve

PV to hot water



PV…heat pump…hot water store



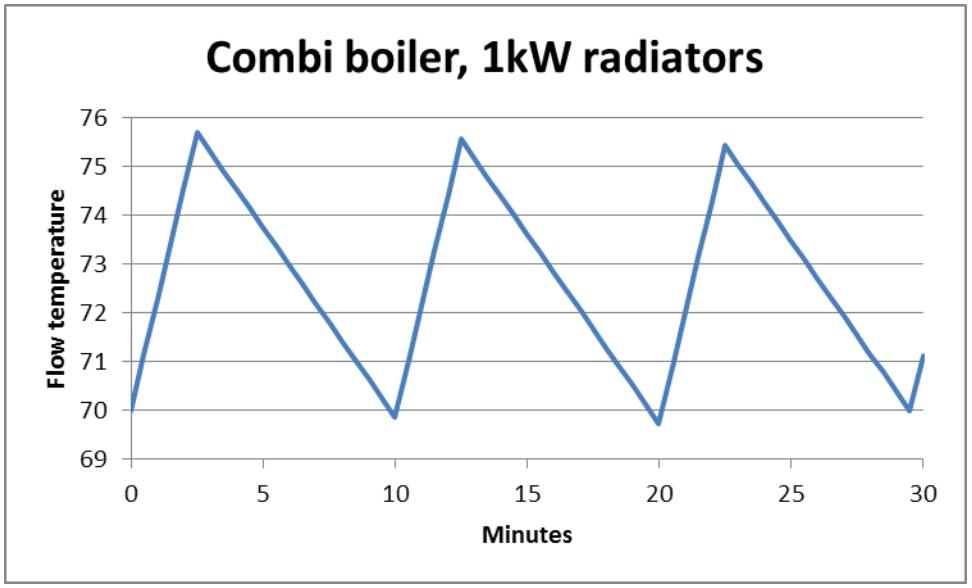
Heating distribution

Radiators use convection – able to distribute heat throughout a house from a few locations.

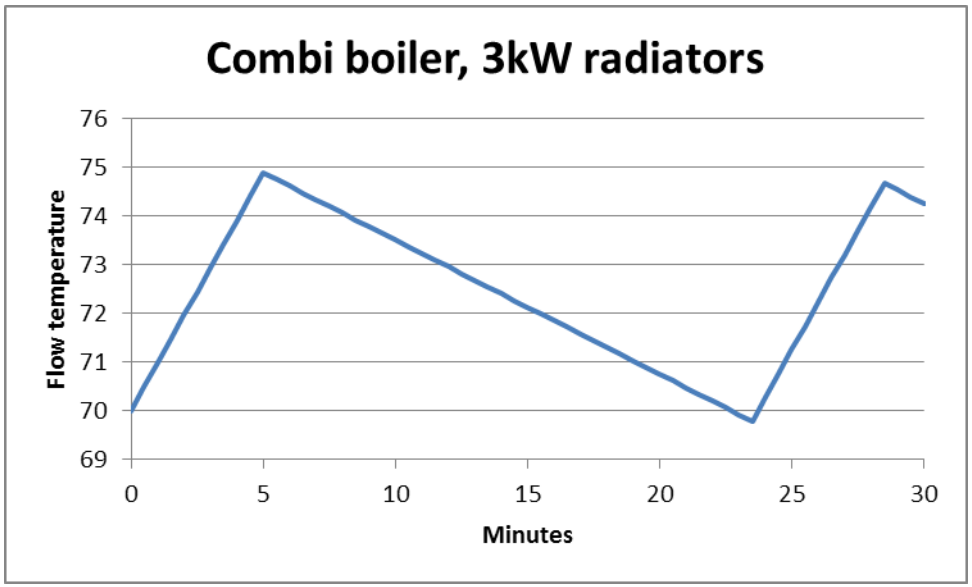
Underfloor heating uses radiation – cannot transfer heat to other rooms.

Single heat source

Boiler size problem

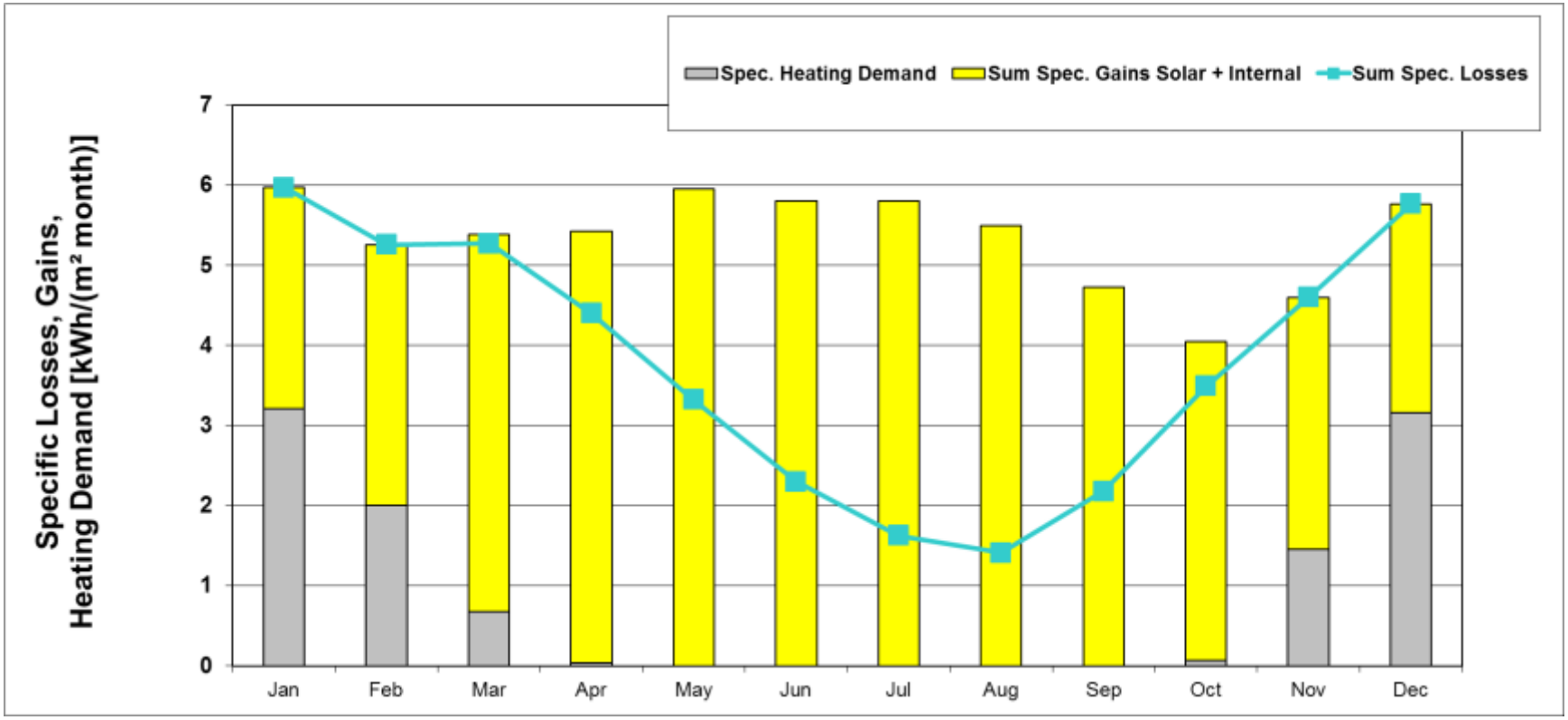


Radiators sized according to heat loss

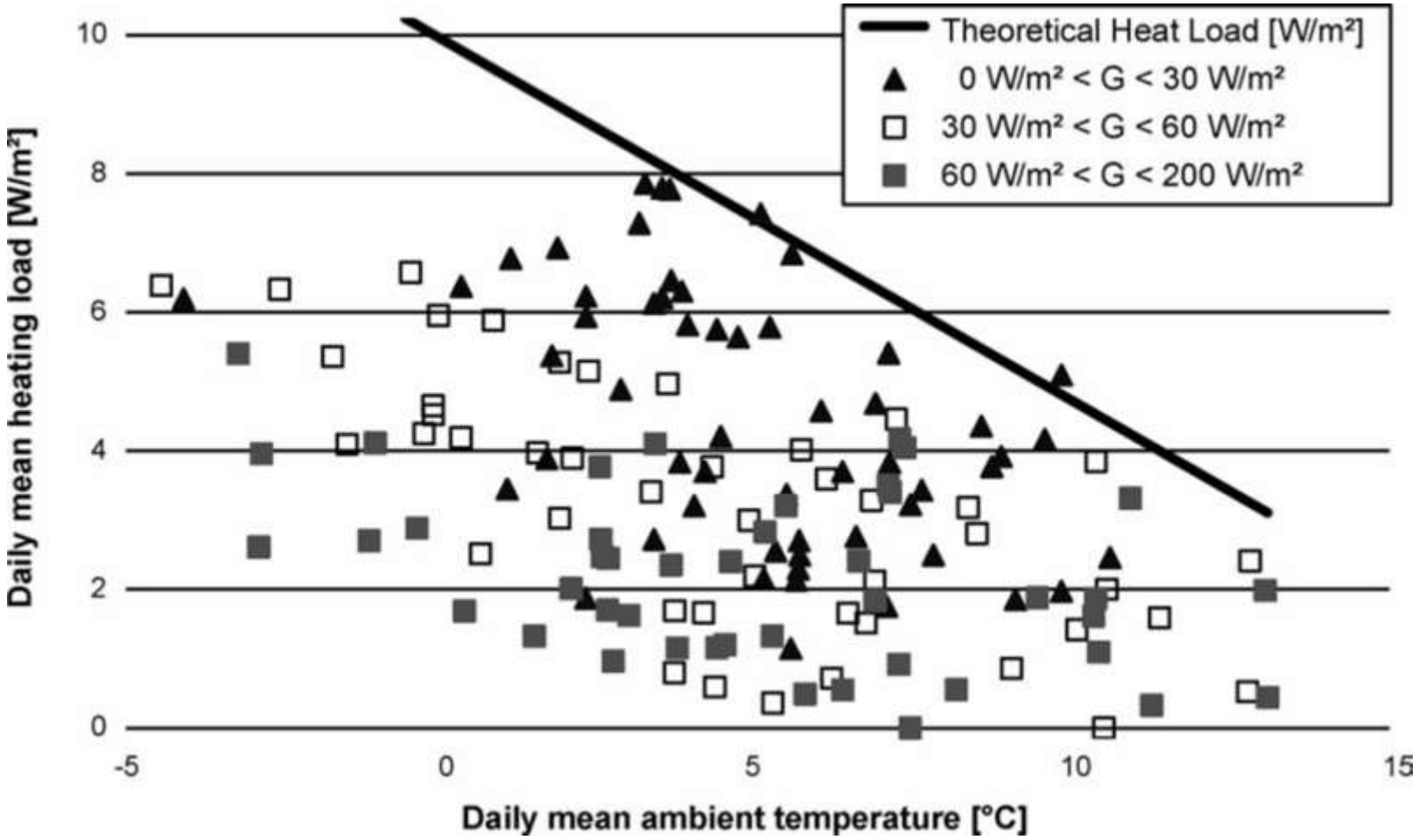


Radiators sized according to heat source

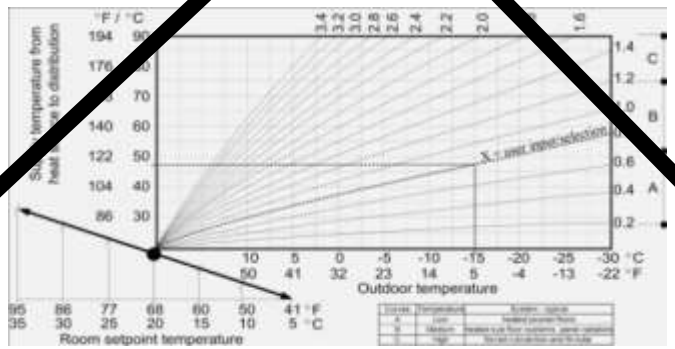
Solar/internal gains & heating demand



heating load v. ambient temperature for different insolation levels



Temperature control



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Simple can be harder than complex: You have to work hard to get your thinking clean to make it simple

Steve Jobs

Life is really simple, but we insist on making it complicated.

Confucius