OP

What is the potential CO2 saving for our heat sector from installing CHP

Some ideas to stimulate debate about CHP, Biomass, Insulation and Heat Pumps to decarbonise our heat sector.

CIBSE & ASHRAE

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"Marginal Concept" Demand Changes Energy and CO2

- Effect of increasing or reducing demand by one unit of energy.
- Marginal cost per kW of heat load displaced by adding 10 mm of insulation to a building?
- Marginal loss for Electrical network with average losses of 10%?
- Marginal loss on old heat distribution network with average losses of 20%?
- Effect of insulating house with old boiler?

Heat Sink Buildings or Environment?

- All thermal electricity production CHP.
- It has to reject heat to a heat sink.
- Heat sink CCGT, Nuclear, Coal, 28 C cooling tower? Heat first used to grow tomatoes?
- Heat rejected at higher temperatures makes it economic to pipe heat to heat cities.
- Like the Electric Heat Pump some electricity is "used" to supply heat to "building" heat sinks at 95C flow 45C return or lower temperatures.

Marginal fuel burn for heat from coal fired power station to grow Tomatoes?

Method of analysis.

- Imagine one kWh of 28C heat is supplied to grow tomatoes what effect does it have on the coal burnt for electricity production?
- What are the savings of fuel and CO2 by the tomato farmer and for UK PLC if:-
- 1) He was using electricity to grow tomatoes?
- 2) He was using an old gas boiler?
- 3) He was using a wood biomass boiler?

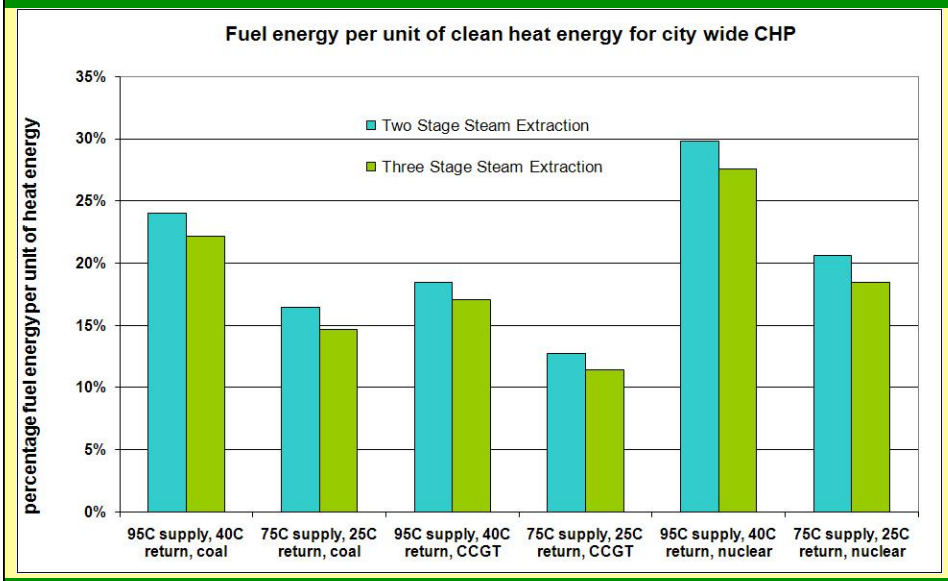
% saving for farmer? Heat sector and Electricity sector CO2 reductions?

- Heat Sector.
- 1) Electricity 100% 0.92kgCO2/kwh
- 2) Gas 100% 0.25kg CO2/kWh
- 3) Bio fuel 100% 0.43kg/CO2/kWh
- Electricity Sector.
- No reduction in CO2 emissions, valuable reduction in demand if farmer using electric heating.
- Is farmer and UK PLC better off using heat from CHP or should farmer invest in electric heat pump?

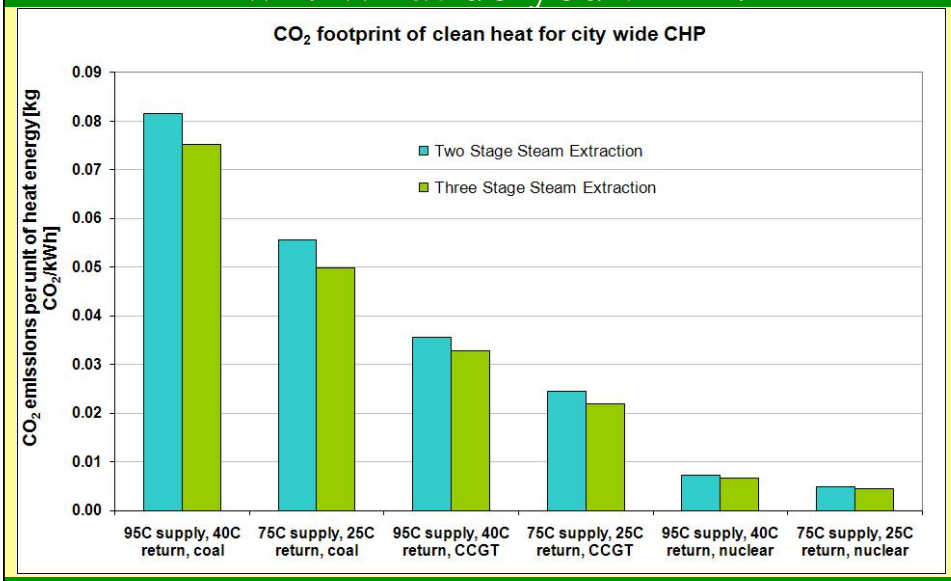
CHP Heat Pump 28C and 95C Nuclear, Gas Oil and Coal.

- Large Pass Out Steam Turbines vary their heat and electricity output from all electricity with heat rejected at 28C to a smaller amount of electricity and heat at 95C.
- Reciprocating internal combustion engines can use more fuel or less fuel than Large Pass Steam Turbines per unit of electricity. Heat normally rejected at temperature suitable to heat buildings.
- Where CHPs compete for the electricity market convention is that use of fuel for electricity generation should not change.

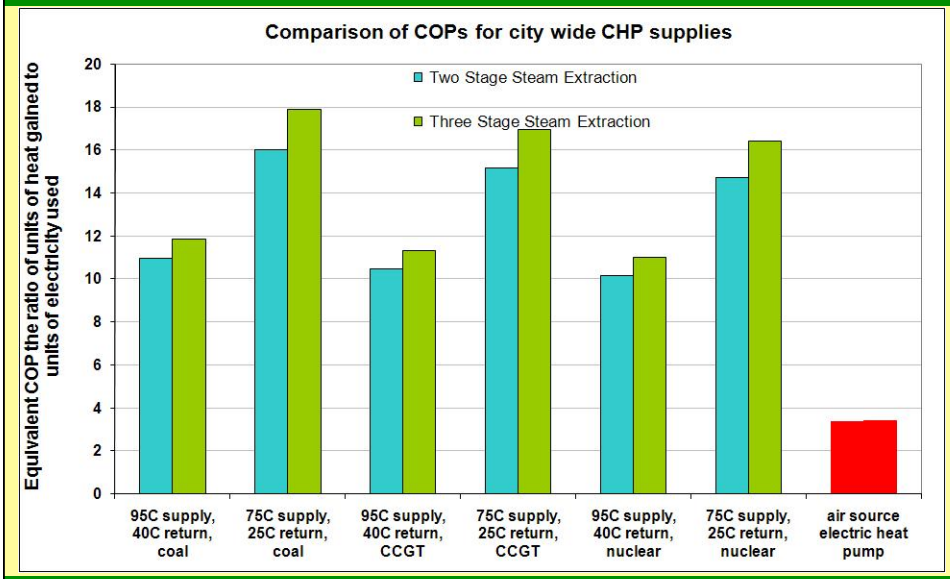
Pass Out Steam Turbine CHP



Coal 0.301 Gas 0.191 Wood 0.304 kgCO2/ kwh. What do you think?



CHP Same as an Electric Heat Pump? EU Award Renewable Status for Heat?



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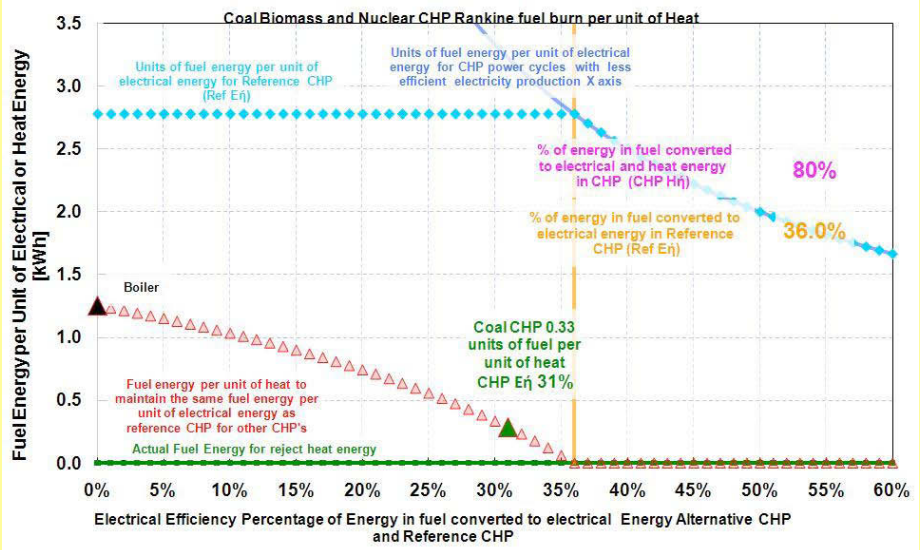
Marginal fuel burn for heat from coal fired power station to heat cities



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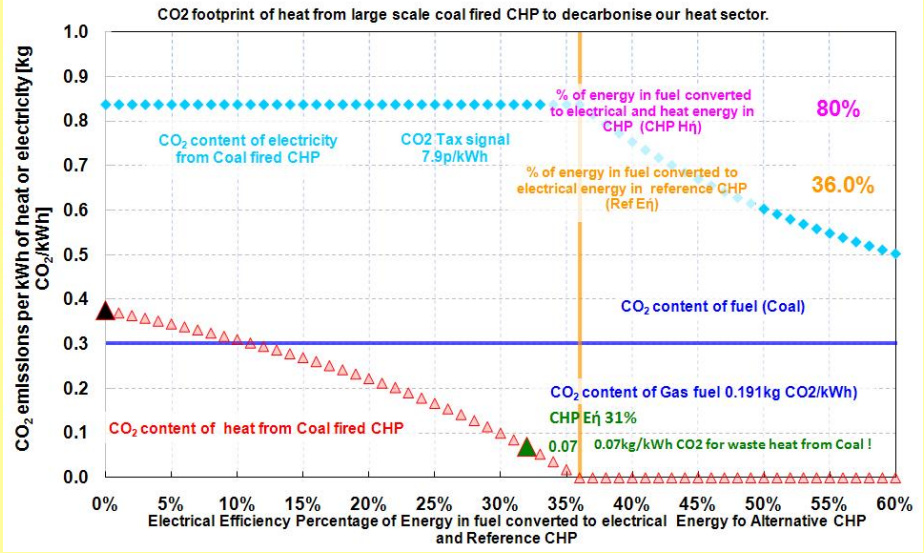
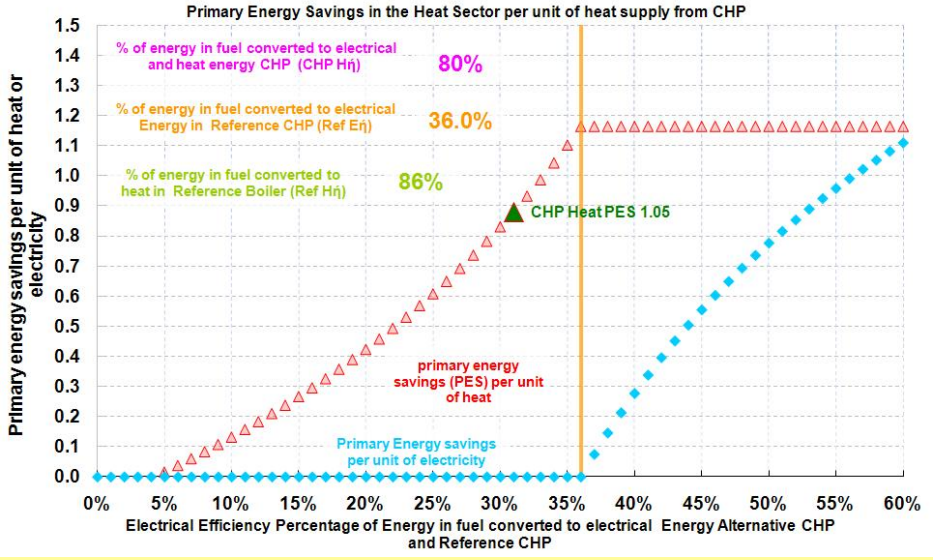
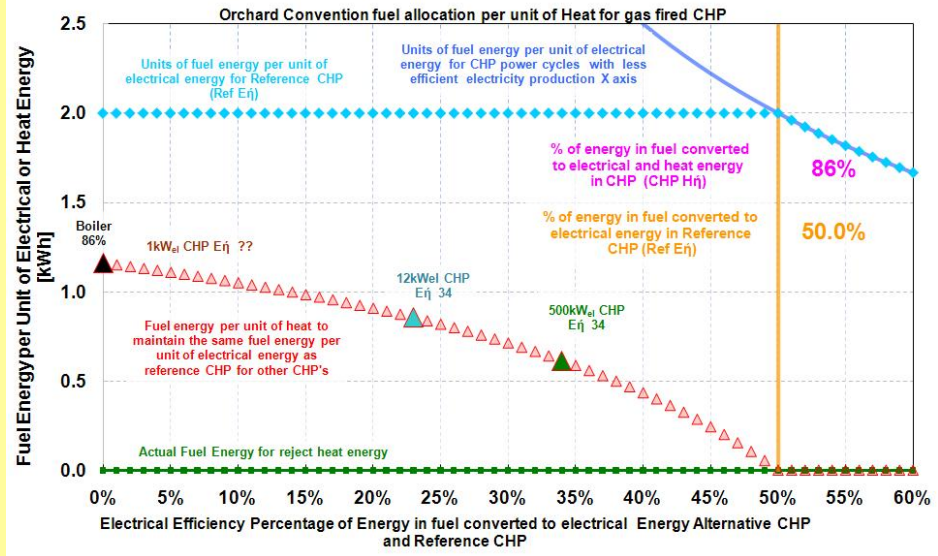
CO2 Footprint of Heat from Coal or Biomass CHP "Renewable"?



PES Heat from Biomass or Coal. Orchard Convention Heat Sector basis



Units of Fuel per unit of heat effect of Electrical efficiency.



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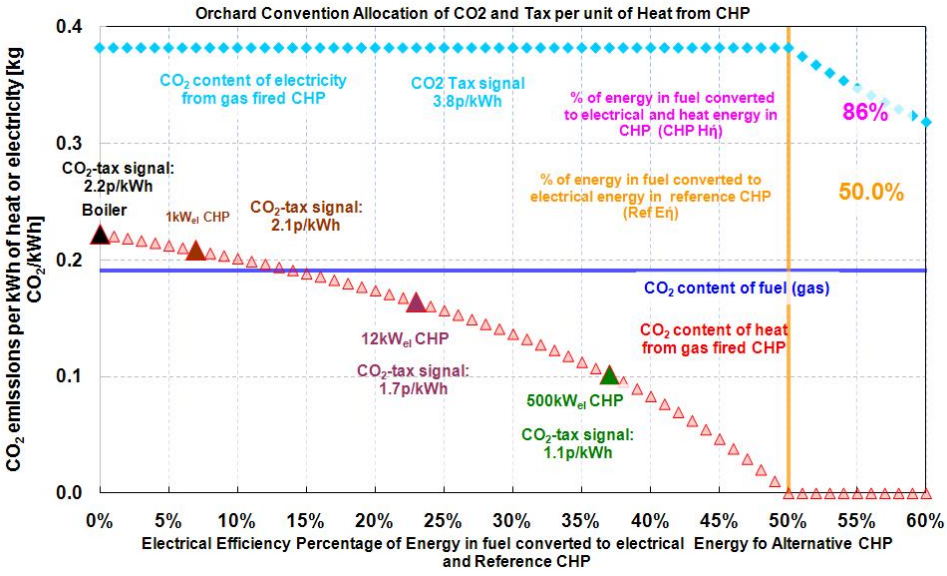
CO2 and Tax per unit of heat for Feed in Tariffs to reward CO2 savings.



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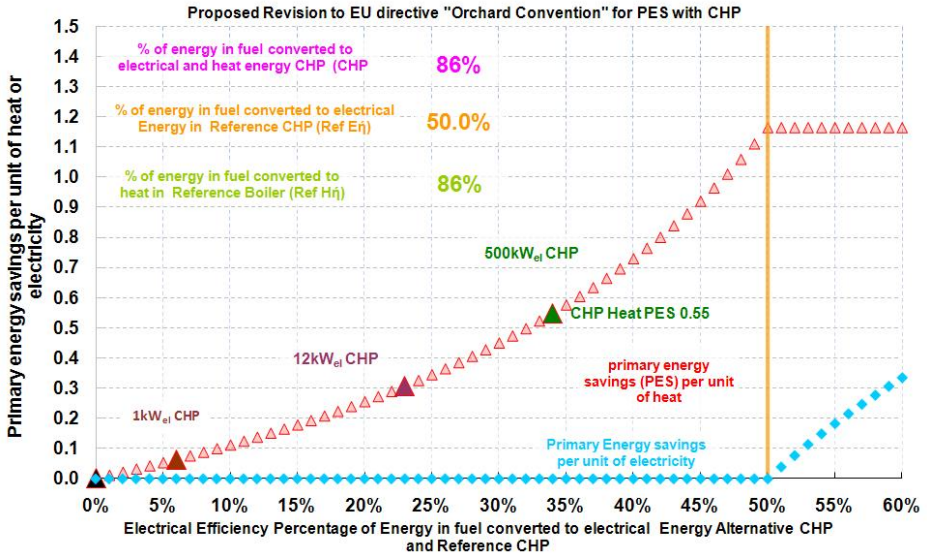
Proposed Revision to Directive Heat sector Signals for different heat sources displaced



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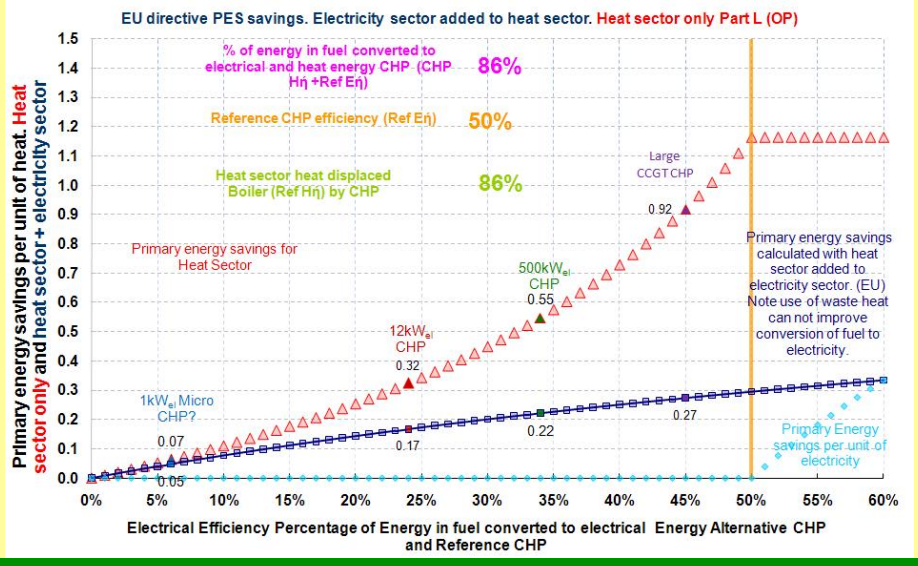
Directive Heat Sector or Heat Sector + Electricity Sector?



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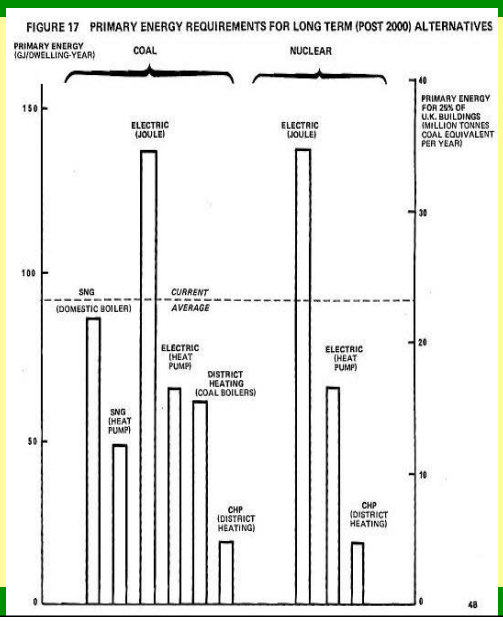
Energy Paper 35 Analysis of CHP



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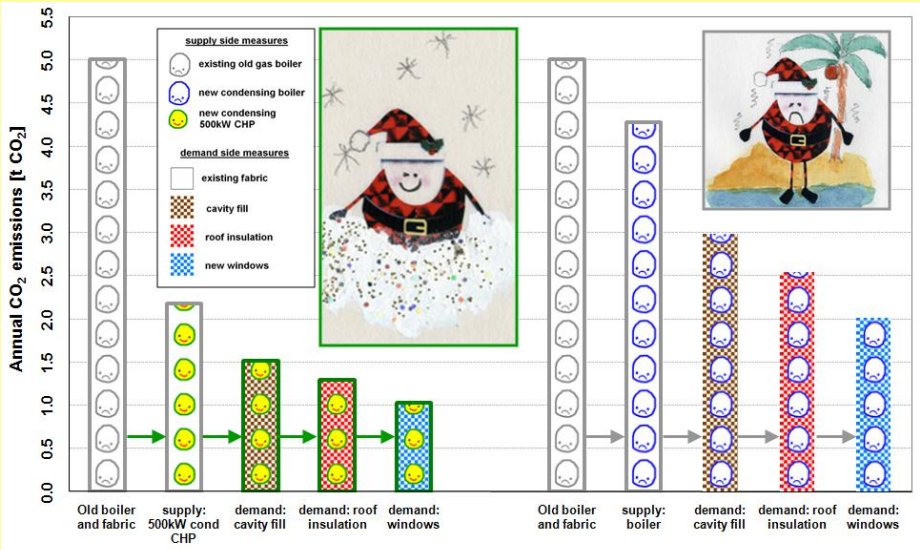
500kW Condensing CHP Option



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Some issues for debate.

- Can use reject heat from power generation improve the efficiency of Electricity generation to give CO2 savings in the Electricity sector?
- How should primary energy savings be assessed sectors added together or separate?
- Should displacement of electric heating be considered by EU and CHPQA as in Part L?

Some issues for debate.

- Should heat from CHP be defined as Renewable if Electric Heat Pumps are considered Renewable?
- Should we think about Nuclear and Coal fired City wide CHP as recommended in Energy Paper 35 to secure our future instead of relying on imported gas?