

Thermodynamic Similarities. Heat from Electric Heat Pumps and CHP.

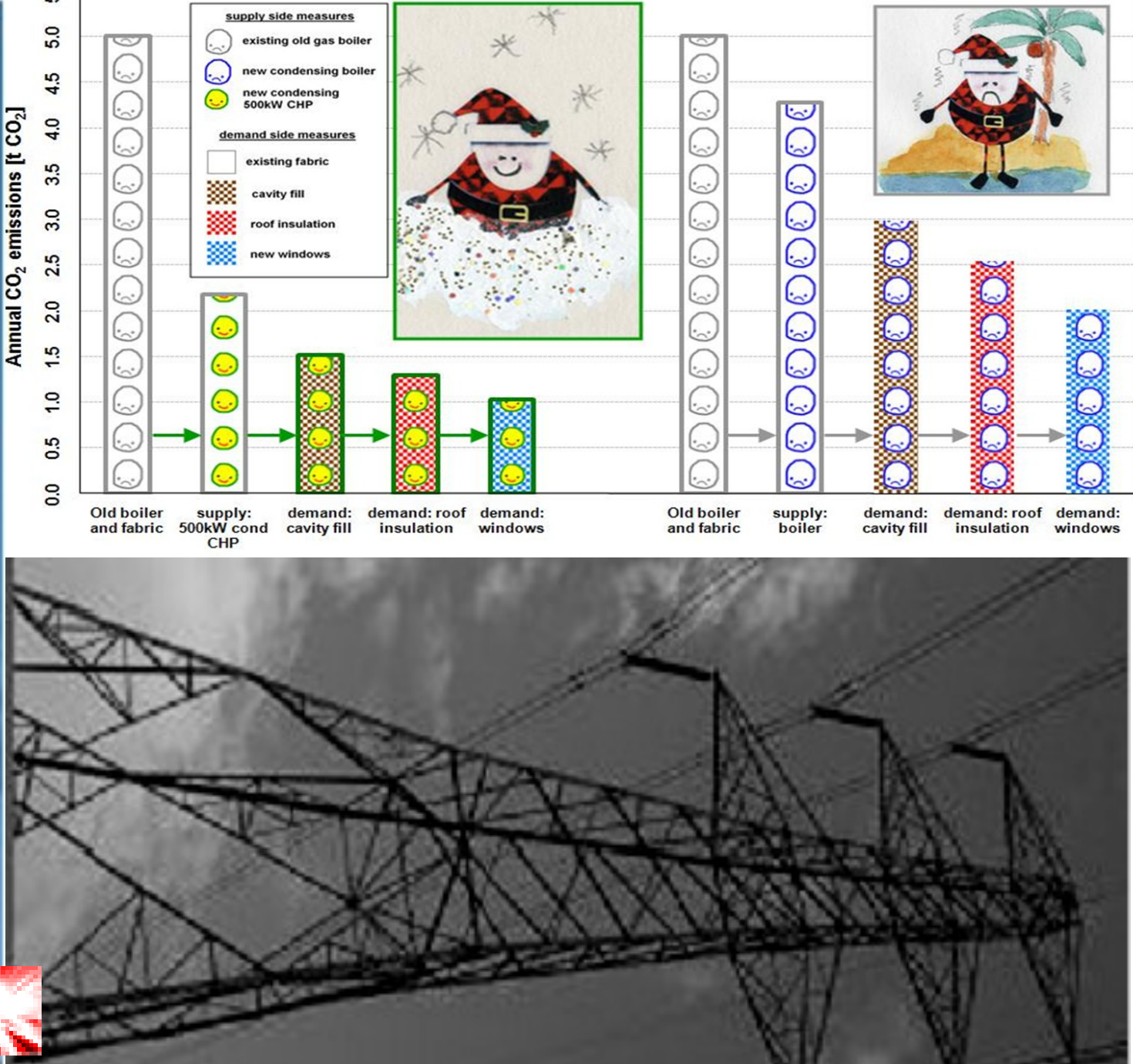
Is CHP Heat With a COP of 2.9 Renewable?

William R H Orchard MA(Oxon) MBA CEng FIMechE MCIBSE MIET FEI Orchard Partners London Ltd

CITY BLACKOUT

LIGHTS OUT BOILERS STOP

ELECTRIC HEAT PUMPS (EHP's) STOP



SOLUTION

20,000 CONDENSING

500KWe CHP

BACK UP WIND

LOW CO2 PIPED HEAT

75C FLOW 30C RETURN

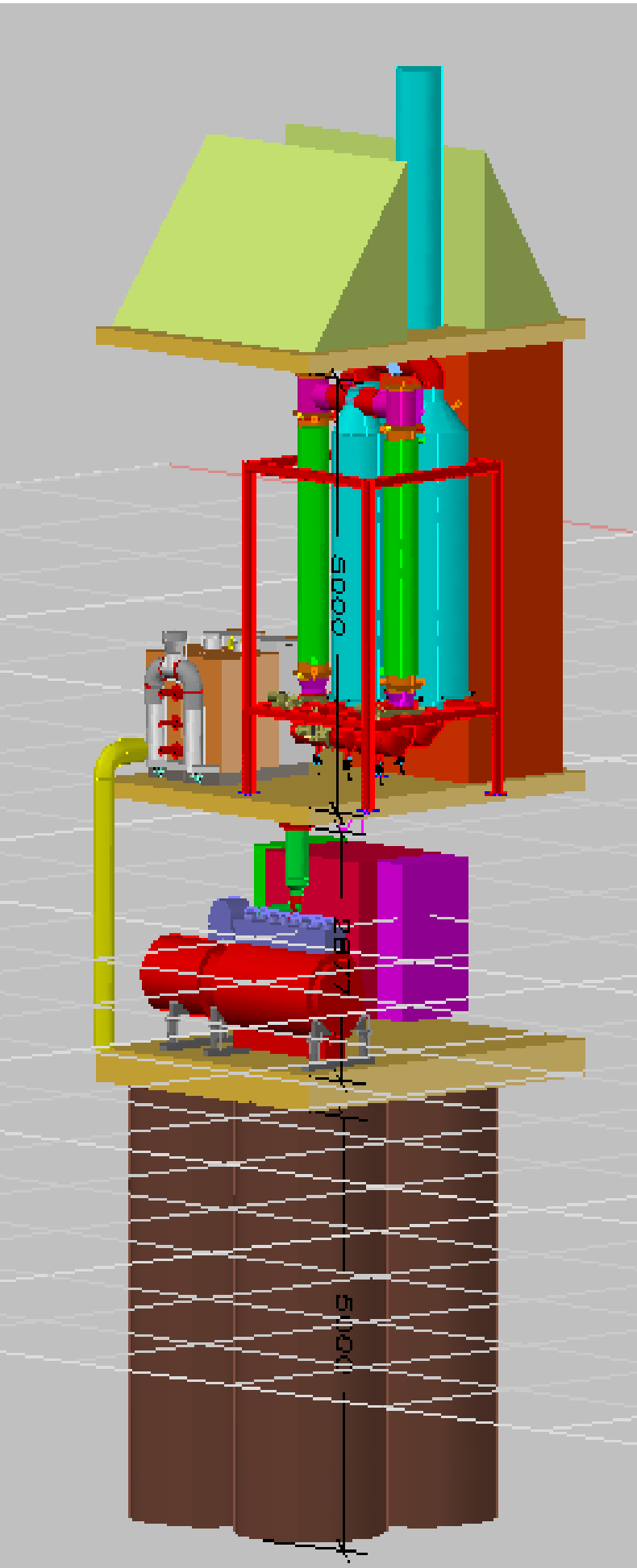
COMPATIBLE SOLAR

GEOHERMAL AND EHP's

RETROFITS STOCK

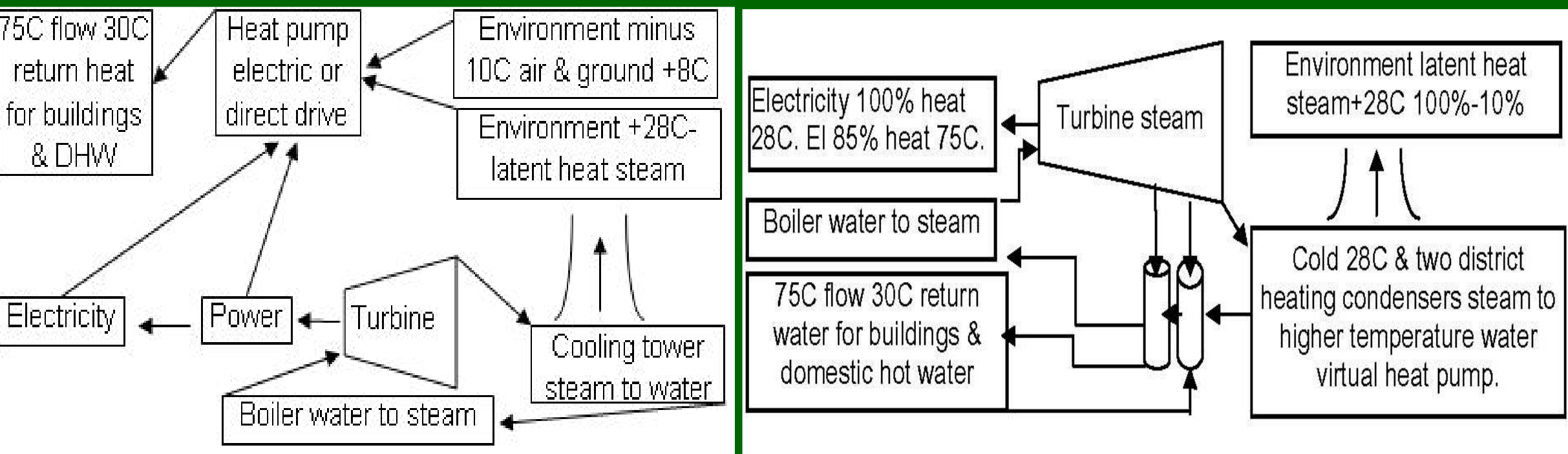
TO CODE LEVEL 4

OPTIMAL INSULATION

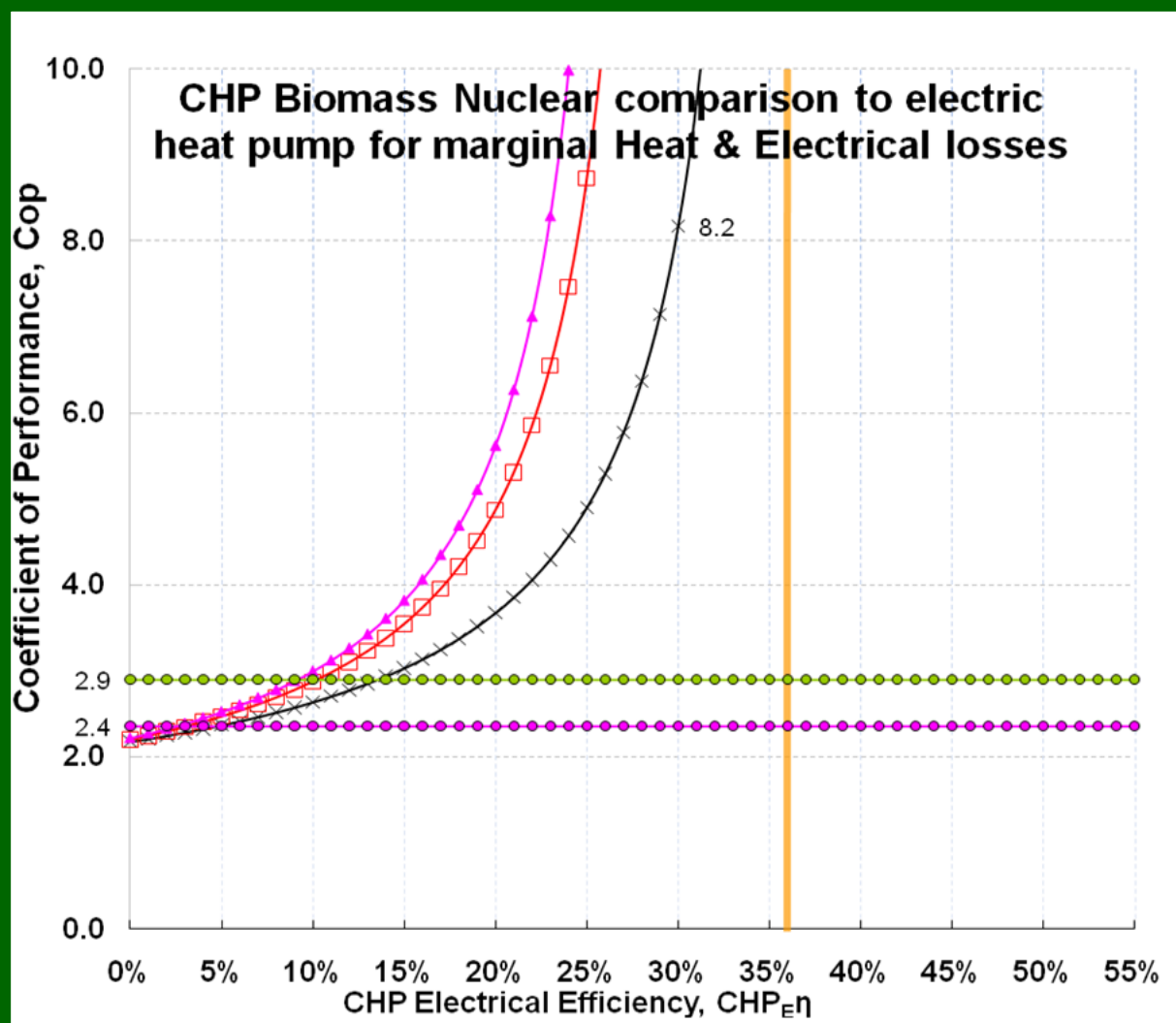
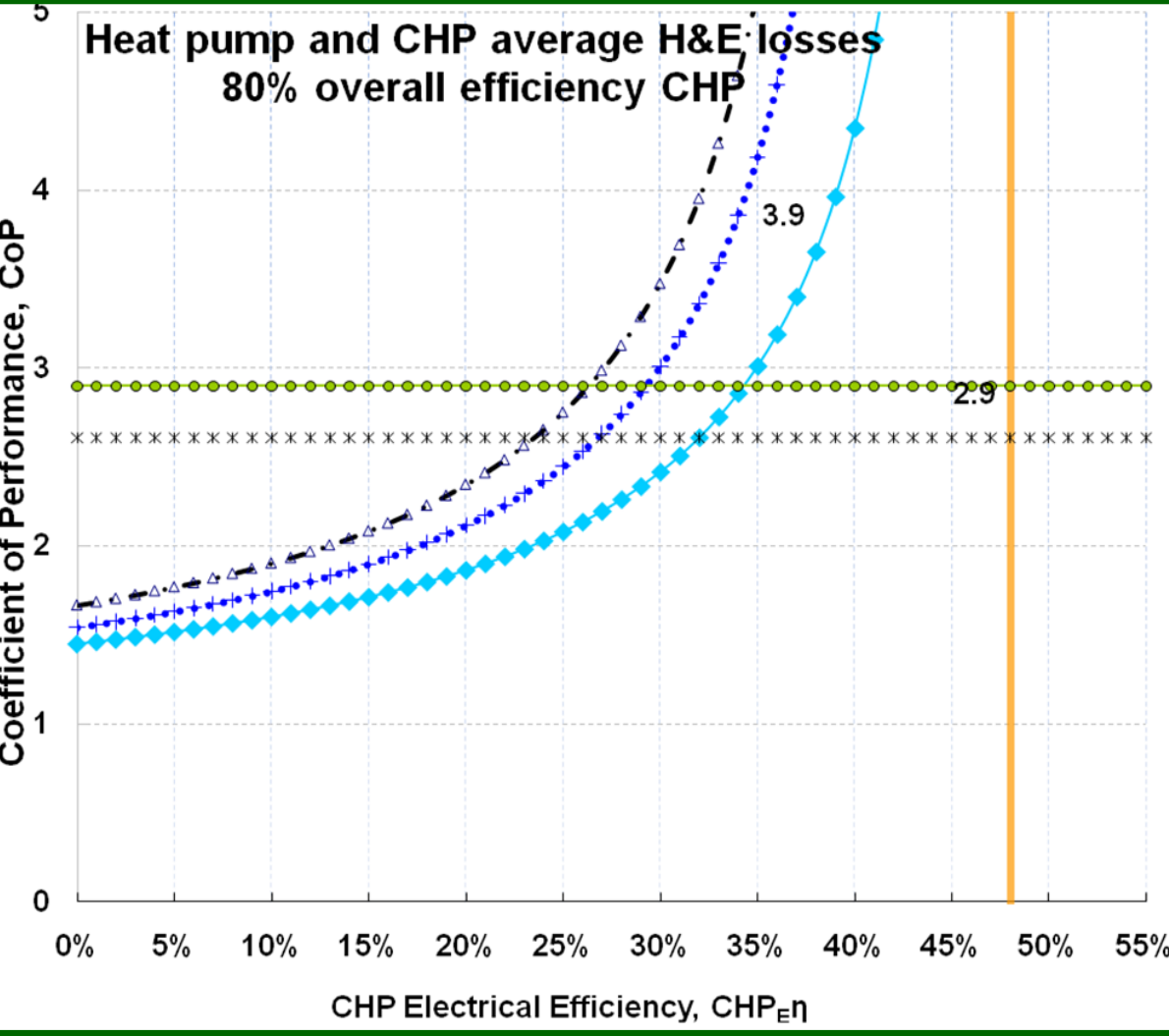


CONCEPT VERTICAL STRUCTURE BUILT AT OR NEAR 500KVA STANDARD 11KV TO 415/240V TRANSFORMERS. OIL STORE UNDERGROUND. DUAL FUEL, ACTIVELY MANAGED, BLACK START, REMOVABLE ENGINE GENERATOR. TRANSFORMER, SWITCHGEAR, PEAK LOAD BOILERS, PUMPS, SILENCERS, EXHAUST HEAT RECOVERY, HEAT REJECTION FOR ELECTRICITY ONLY OPERATION. MODULAR UNITS FACTORY MADE FOR BATCH PRODUCTION.

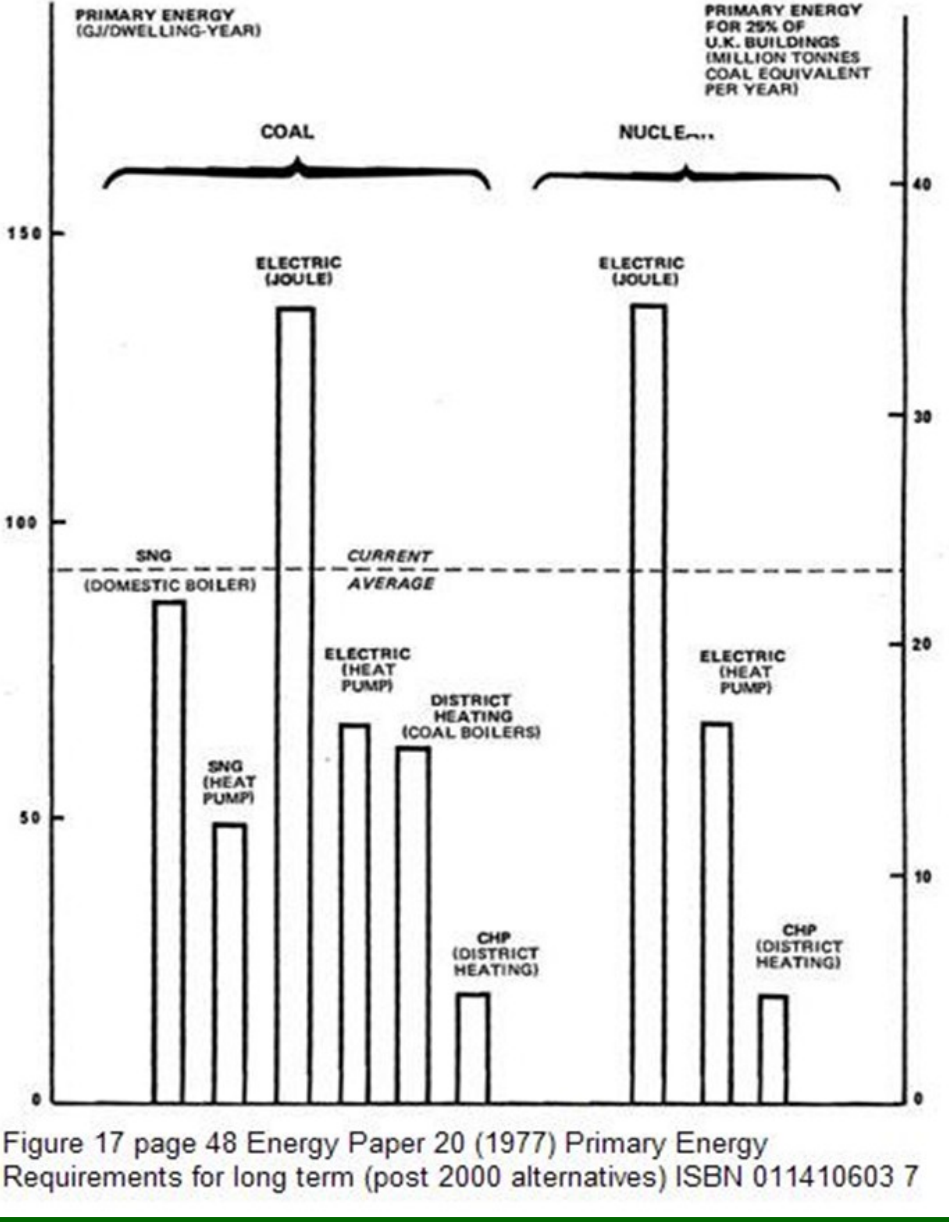
CONSUMER BENEFITS LOW CO2 PIPED HEAT DECARBONISES DOMESTIC HOT WATER AND OTHER HEAT LOADS. HOUSES MEET CODE LEVEL 4 WITHOUT RETROFIT EXTERNAL INSULATION COSTS £2-3000 PER KW OF HEAT LOAD DISPLACED. PIPES LAID TO REPLACE KERBS, CLEAR ROUTE. SERVICE TO HOUSES WITHIN PAVEMENT DEPTH OVER OTHER SERVICES



A CHP VIRTUAL HEAT PUMP UPGRADES REJECT HEAT WITHOUT EHP LOSSES CONVERTING POWER TO ELECTRICITY AND BACK TO POWER. ELECTRICAL OUTPUT 85% TO 100% DIURNAL LOAD FOLLOWING USING NIGHT PRODUCTION COUPLED WITH HEAT STORAGE . HEAT FROM EHP's CONSIDERED RENEWABLE DESPITE FOSSIL ELECTRICITY SOURCE!



HEAT FROM CHP EQUALLY RENEWABLE WHERE ONE UNIT OF ELECTRICITY PRODUCES OVER 2.9 UNITS OF HEAT (COP) TO MEET EU RENEWABLE DEFINITION (EHP). CHARTS SHOW COP OF HEAT FROM CHP AND EHP INCLUDING MARGINAL AND AVERAGE LOSSES IN ELECTRICAL AND HEAT NETWORKS AND THEIR EFFECT. THE RIGHT CURVE IS LARGE SCALE REMOTE CITY CHP OVER 100 MWe. THE MIDDLE CURVE IS CHP AT LOCAL TRANSFORMERS. THE LEFT CURVE IS FOR CHP AT DWELLINGS. HORIZONTAL LINES SHOW ESP AT POWER STATION AND CONSUMER NOTE EFFECT OF LOSSES ON COP.



500KW CHP WITH A COP OF 3.9 FOR HEAT AND LARGE CHP's WITH COPS OF 10 TO 18 JUSTIFY RENEWABLE HEAT STATUS. EP 20 RANKS CHP AHEAD OF EHP FOR A BIOMASS & NUCLEAR FUTURE WITHOUT NATURAL GAS. ELECTRICAL DIVERSITY AT TRANSFORMERS, BENEFITS CHP AND FUEL CELL STACKS. MINIMAL DIVERSITY EHP. TRANSFORMER SIZE x THREE FOR EVERY 6KW OF HEAT LOAD?

