

EarthEnergy



EarthEnergy
A Division of GeoScience

Robin Curtis

30 APRIL - 1 MAY EAST OF ENGLAND SHOWGROUND

GEOTHERMAL **Live!**

Part of the GeoDrilling 2008 show

Renewable – Sustainable – Proven – Achievable – Realistic

“The longest title in the
programme.....
.....”
.....

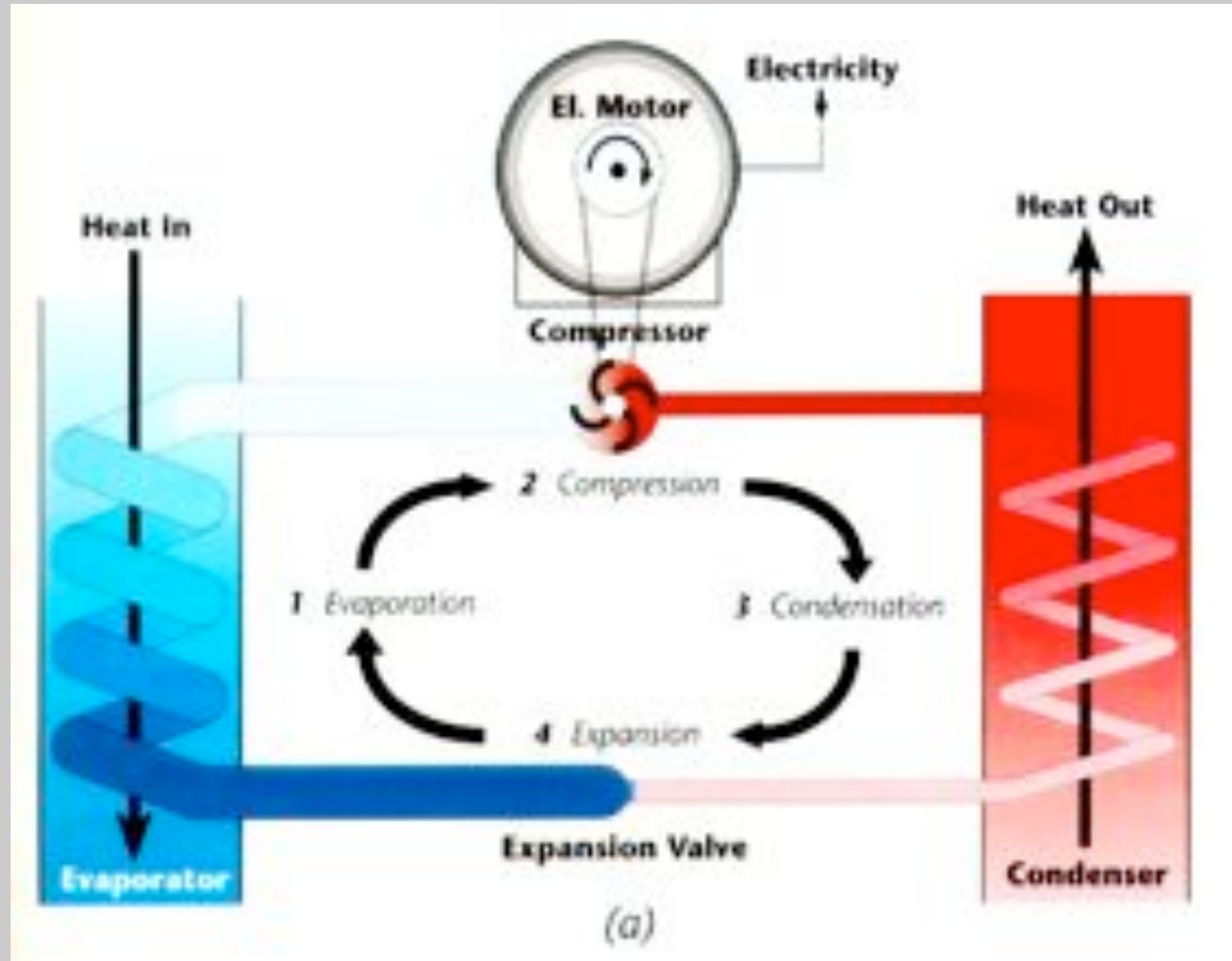
.....in 20 minutes...!!

Impossible !!

Target audience ?



"Wow -- what a waste of geothermal energy!"



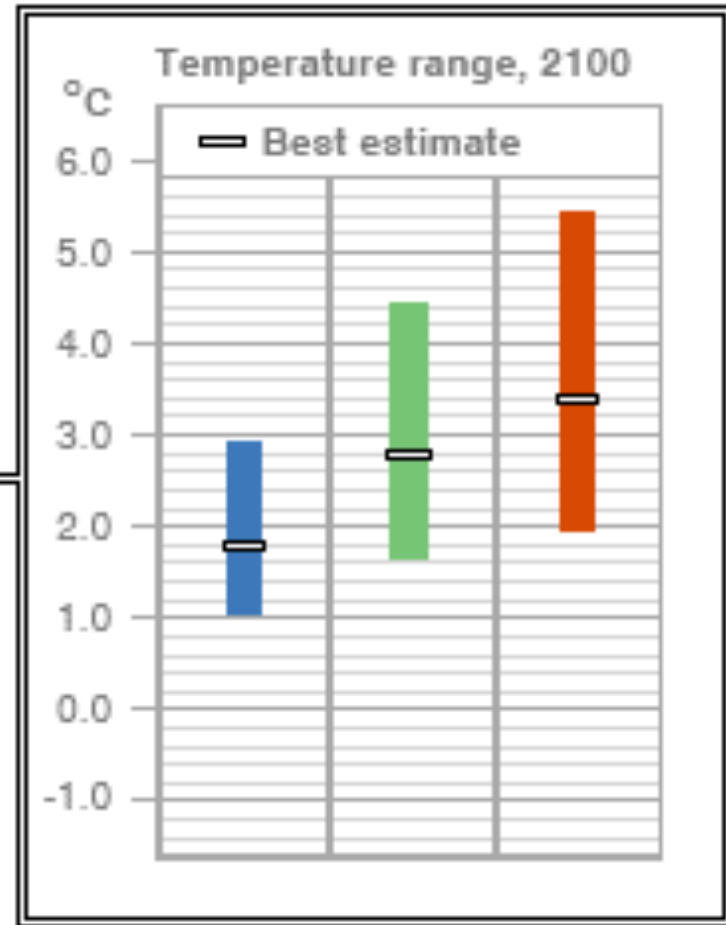
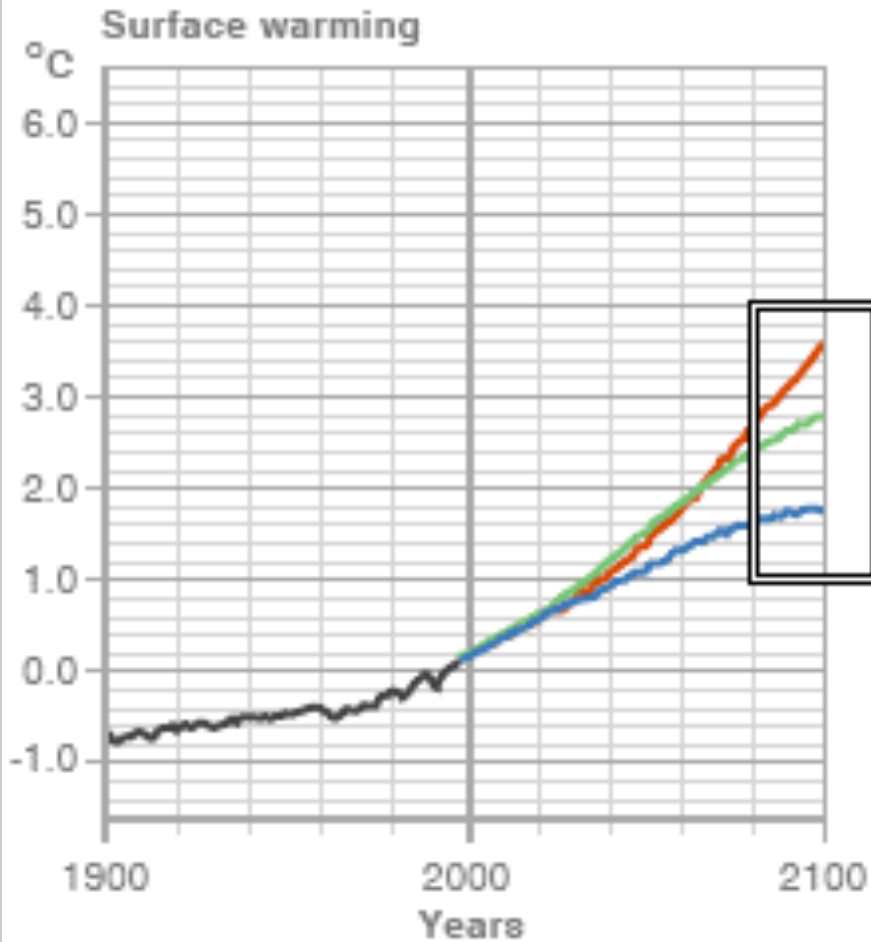
Where I am coming from....

Carbon

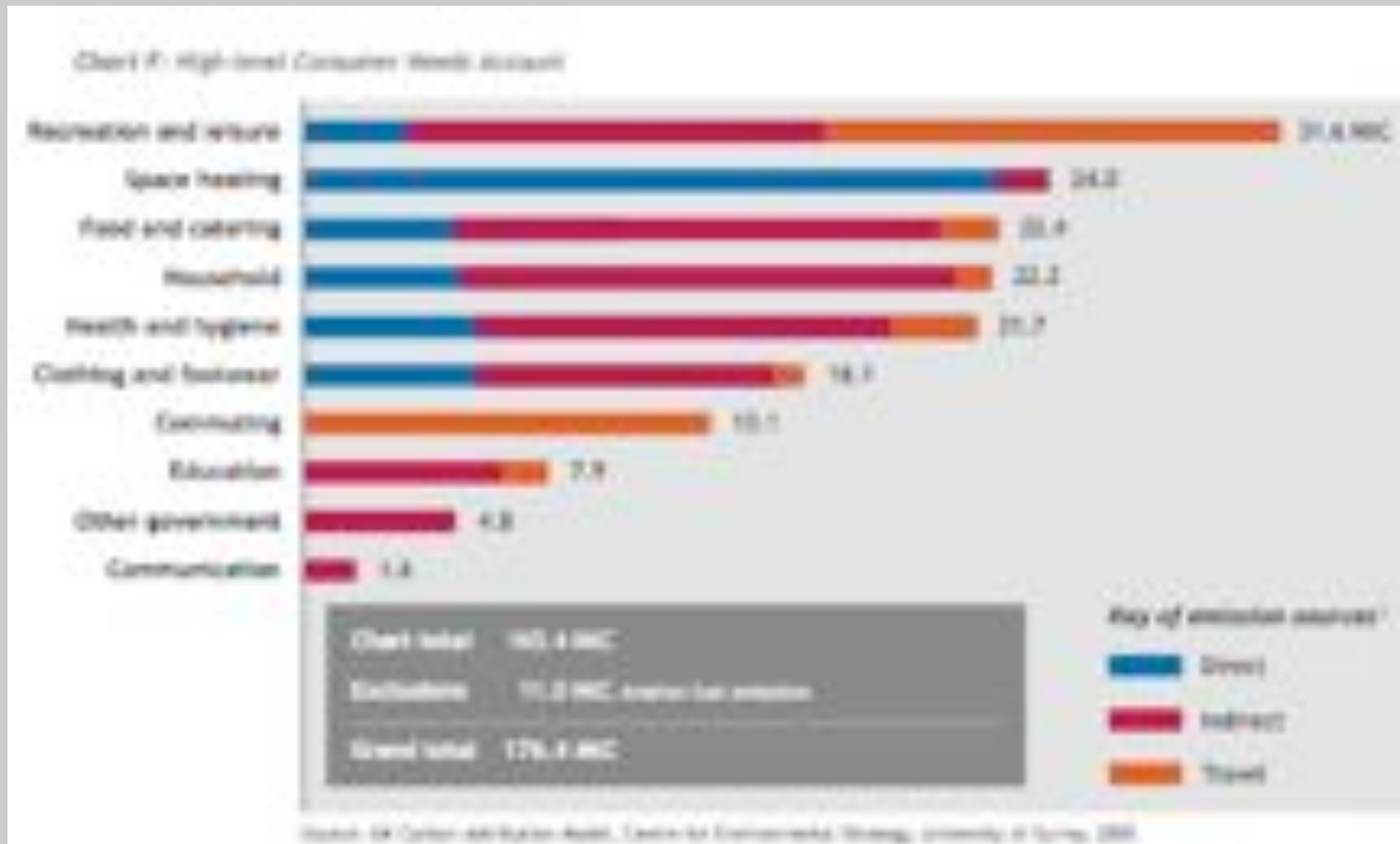
(It only appears 3 times in the titles)

GLOBAL WARMING SCENARIOS

- Scenario A2 (orange line)
- Scenario A1B (green line)
- Scenario B1 (blue line)
- 20th century (black line)



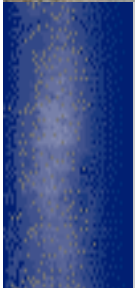
SOURCE: IPCC



**What to do in 20
minutes ?**

**Pointers -
for later
(in the bar ?)**

**Make you all feel good
first....**



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- Achievable - Realistic



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Renewable – Sustainable – Proven – Achievable – Realistic



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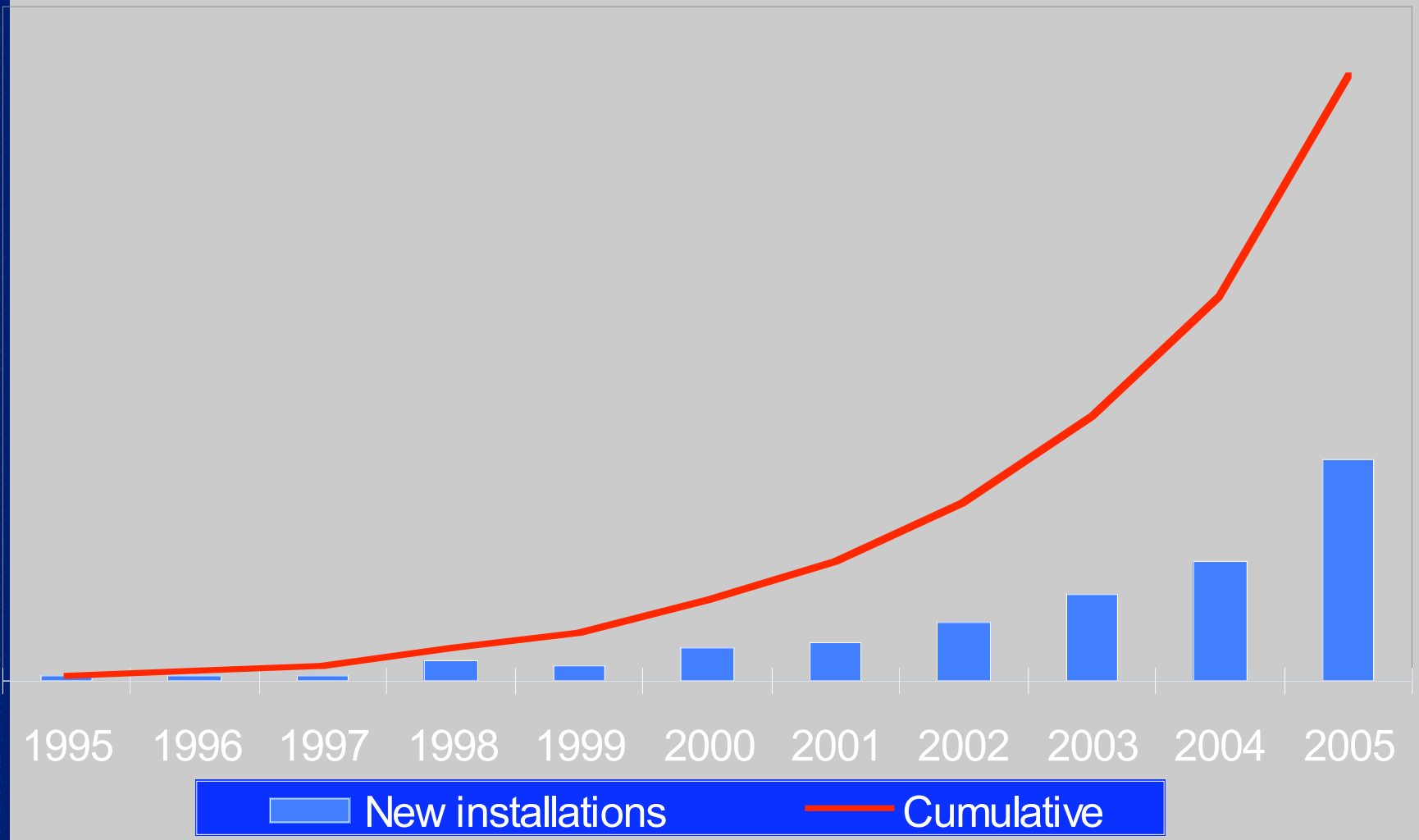




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1) We can't experiment on our customers / clients.

2) We have our detractors..

3) Nuture

Some issues we need to deal with.....

(debunking the myths)

Take care with what you say to
who....big impacts

“GeoExchange banned in the UK” ?!

GSHPs
are
“Unsustainable”
??!!



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Some other issues we need to deal with.....

(best practice v poor practice)

Best practice issues ... some examples

(Avoid working to
EN-80110X
VDI-80110X
ISO-80110X
ARI-80110X)



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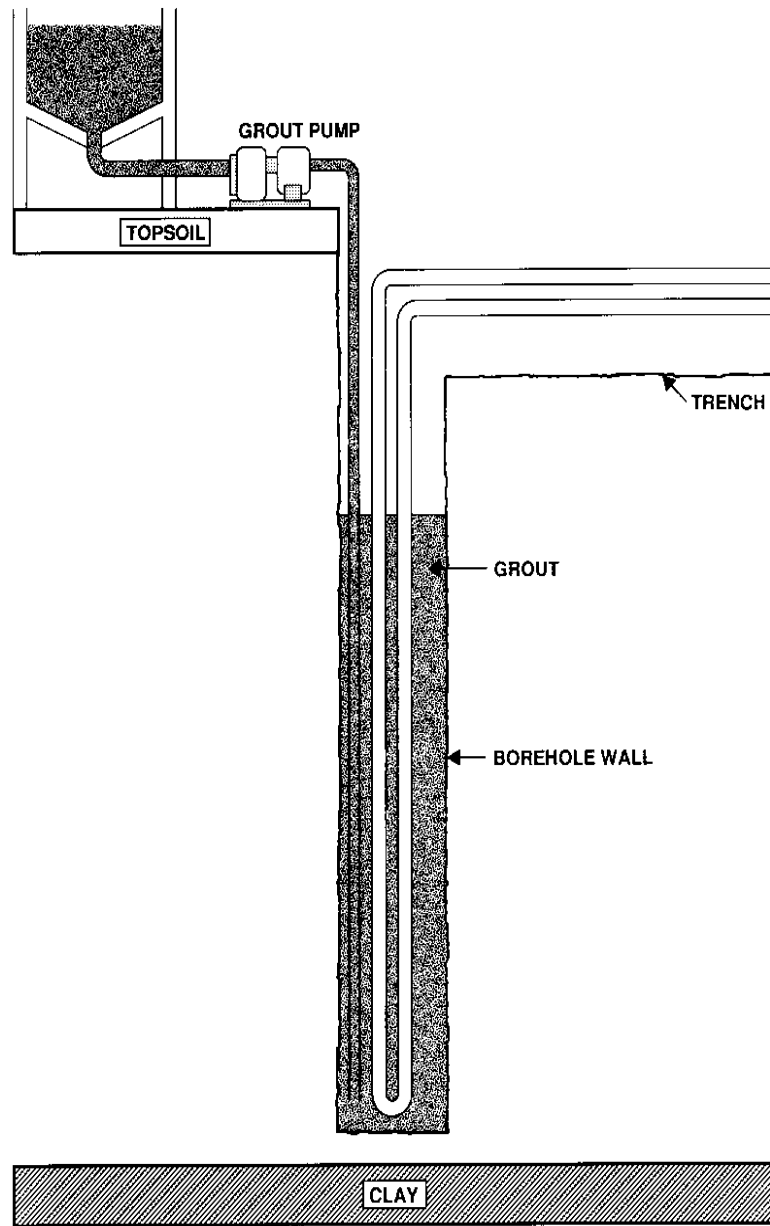
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10% contingency on ground loops?



Standards ?

VDI 4640

IGSHPA

Canadian

....GSHP Association - with BDA?

Other examples...

TR30

Corgi

CE82

EU-HP Cert

Types of gshp systems:

- 1) Ones that don't work
- 2) Ones that "work"
- 3) Ones that work

AND

Save significant carbon
Deliver significant renewables
At reasonable running cost

Low Carbon Buildings

Building Regulations Part L

- 2006 – CO₂ based compliance
- 20% improvement over 2002
- 2010 – further 25% reduction
- 2016 – “zero” carbon

Planning policies

- “Merton rule” (PPS22)
- 10 – 20% renewables contribution
- Adopted by 90+ local authorities
- Renewable cost constraints no longer a barrier

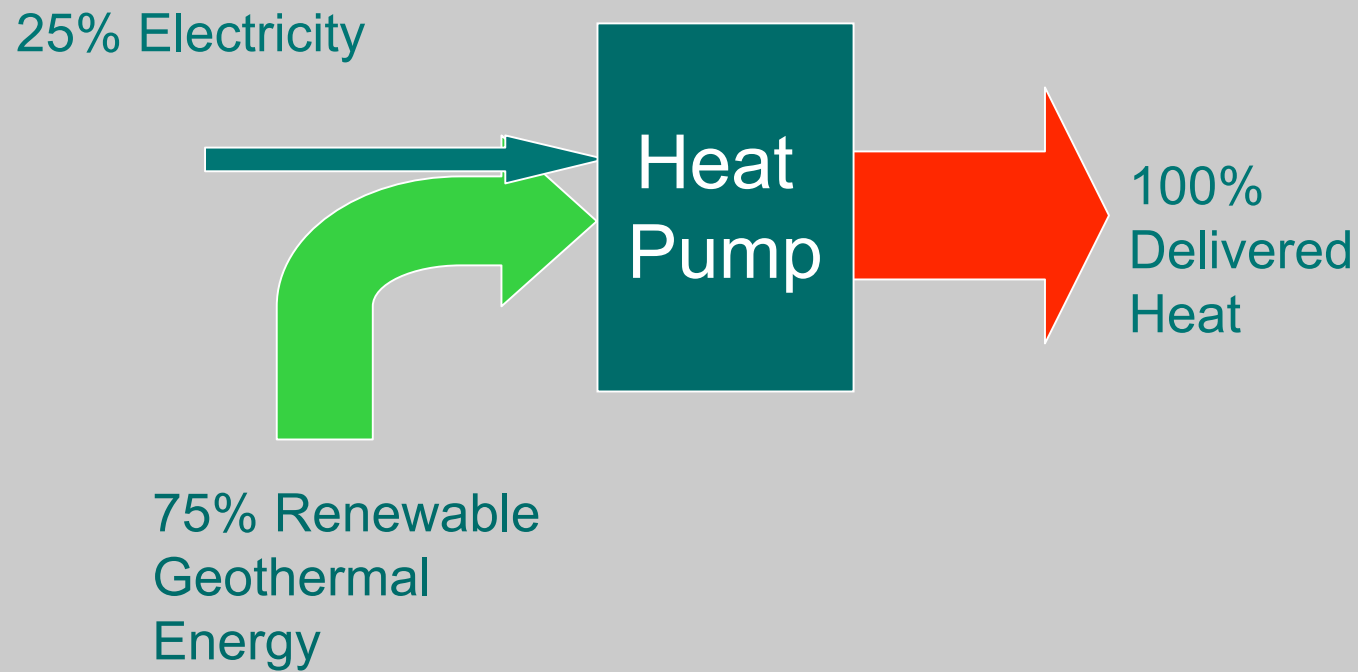
Code for Sustainable Homes

- Mandatory for all new publicly funded housing development
- Minimum CO₂ emission levels



How we got here.....

Ground Source Heat Pump

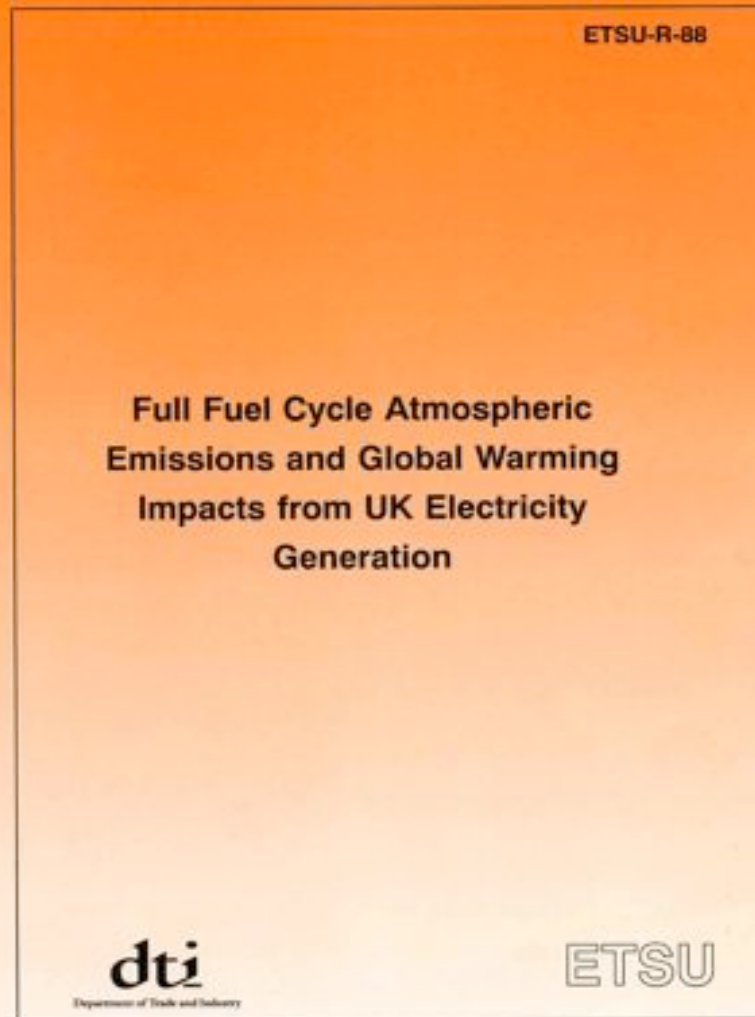


CO2 REDUCTION

It's a given....

Comes with the
technology

(in the UK)



CO₂ REDUCTION

Gas @ 0.21kgCO₂/kWh_t

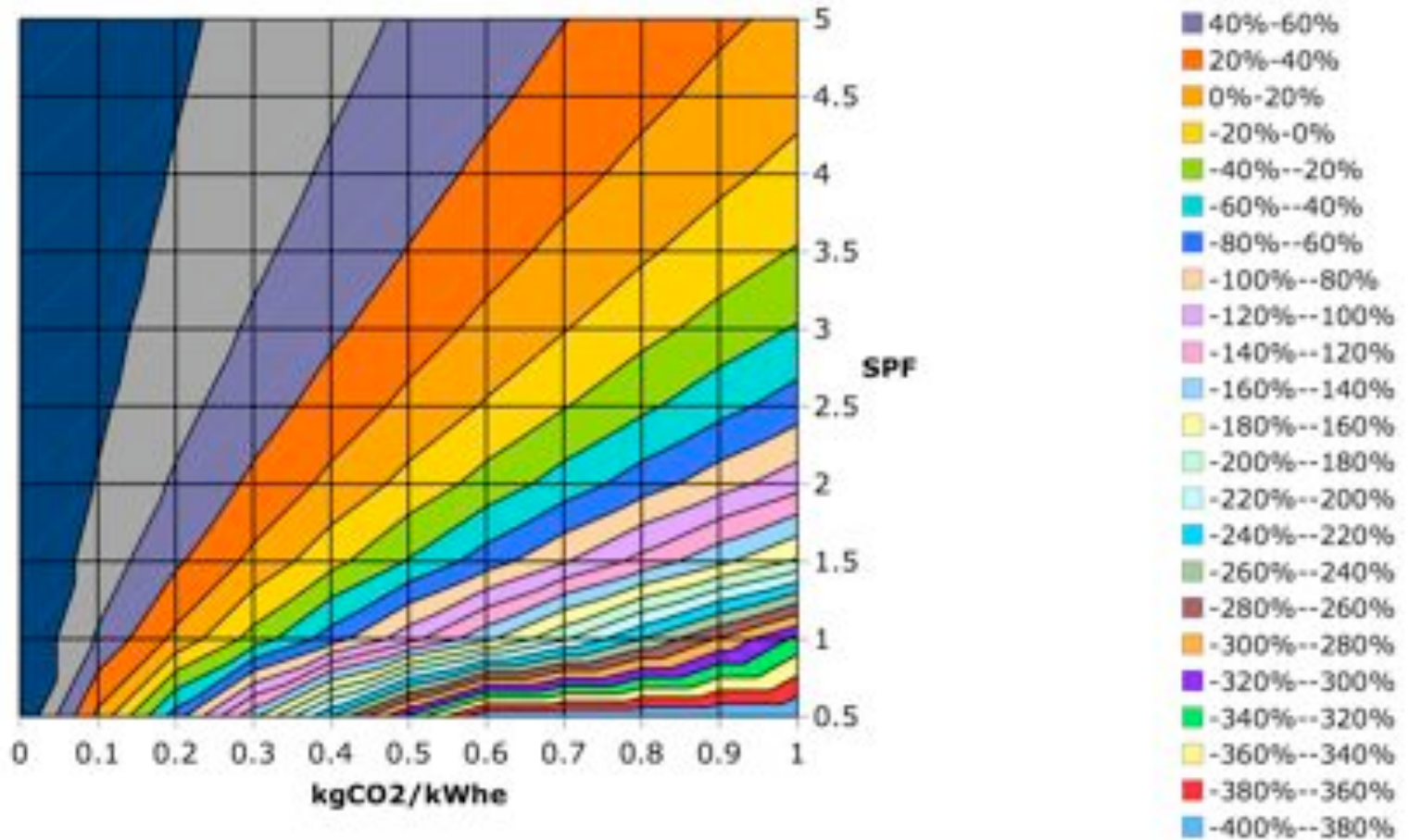
UK Electricity @ 0.45 kgCO₂/kWh_e

@ avg 85% eff gas > 0.24kg/ kWh_t
of useful heat

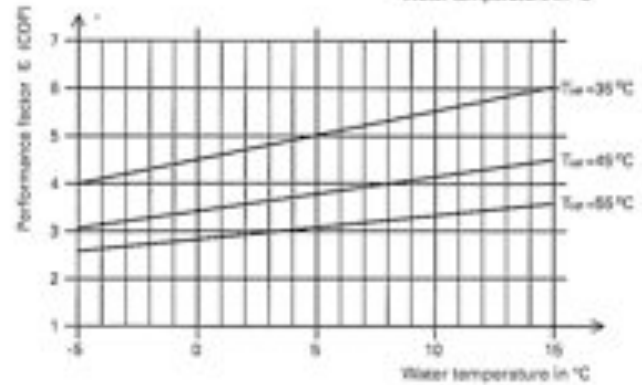
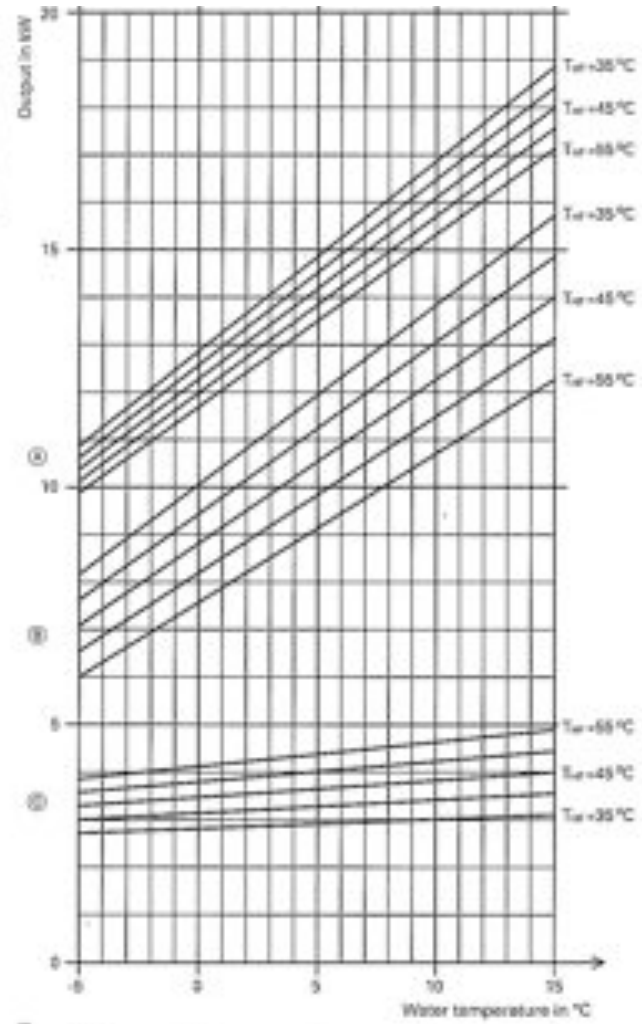
@SPF= 3.5 heat pump > 0.13kg/kWh_t
of useful heat

= 46% reduction in CO₂

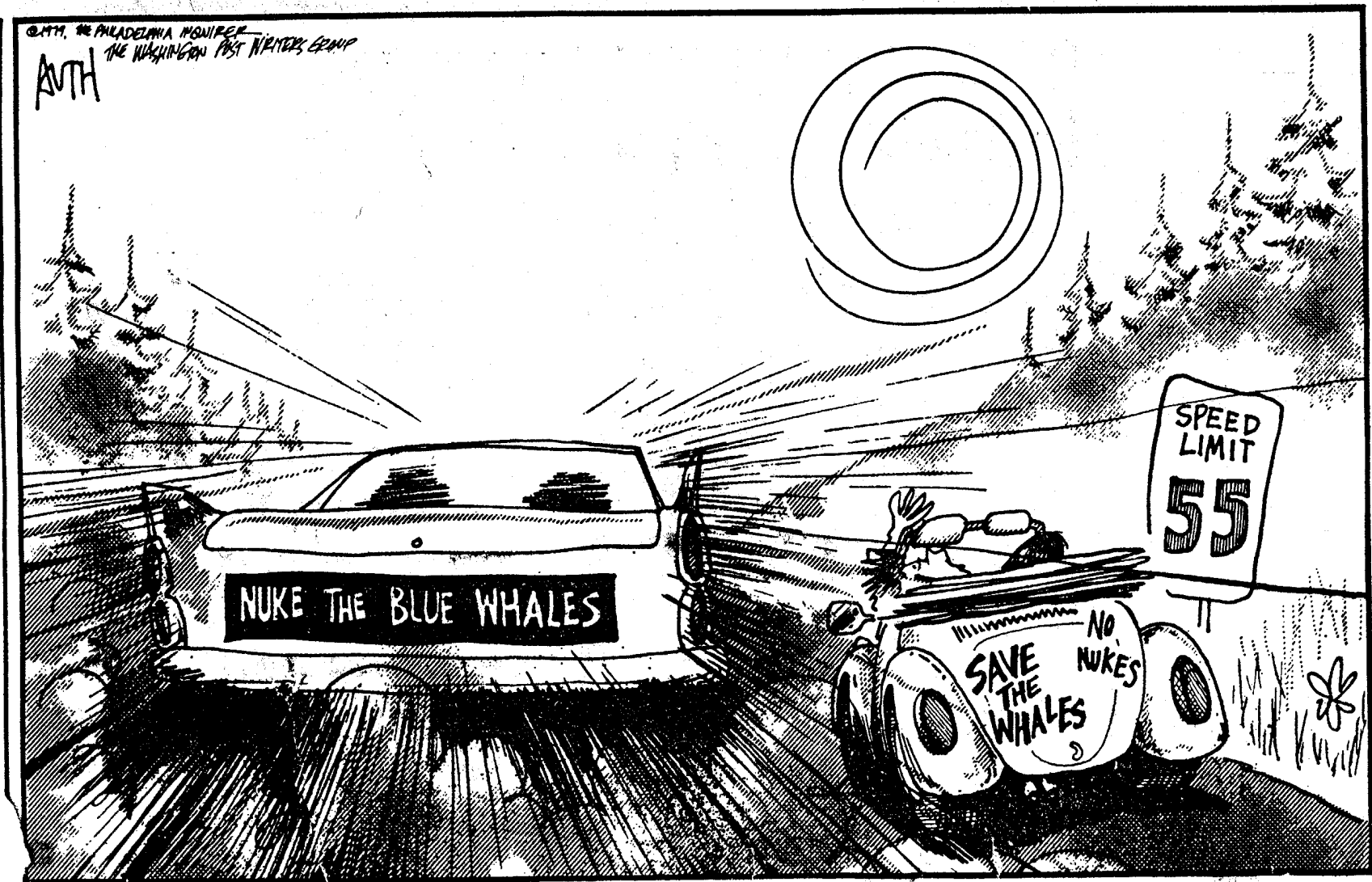
Heat Pumps vs Gas - CO2 saving

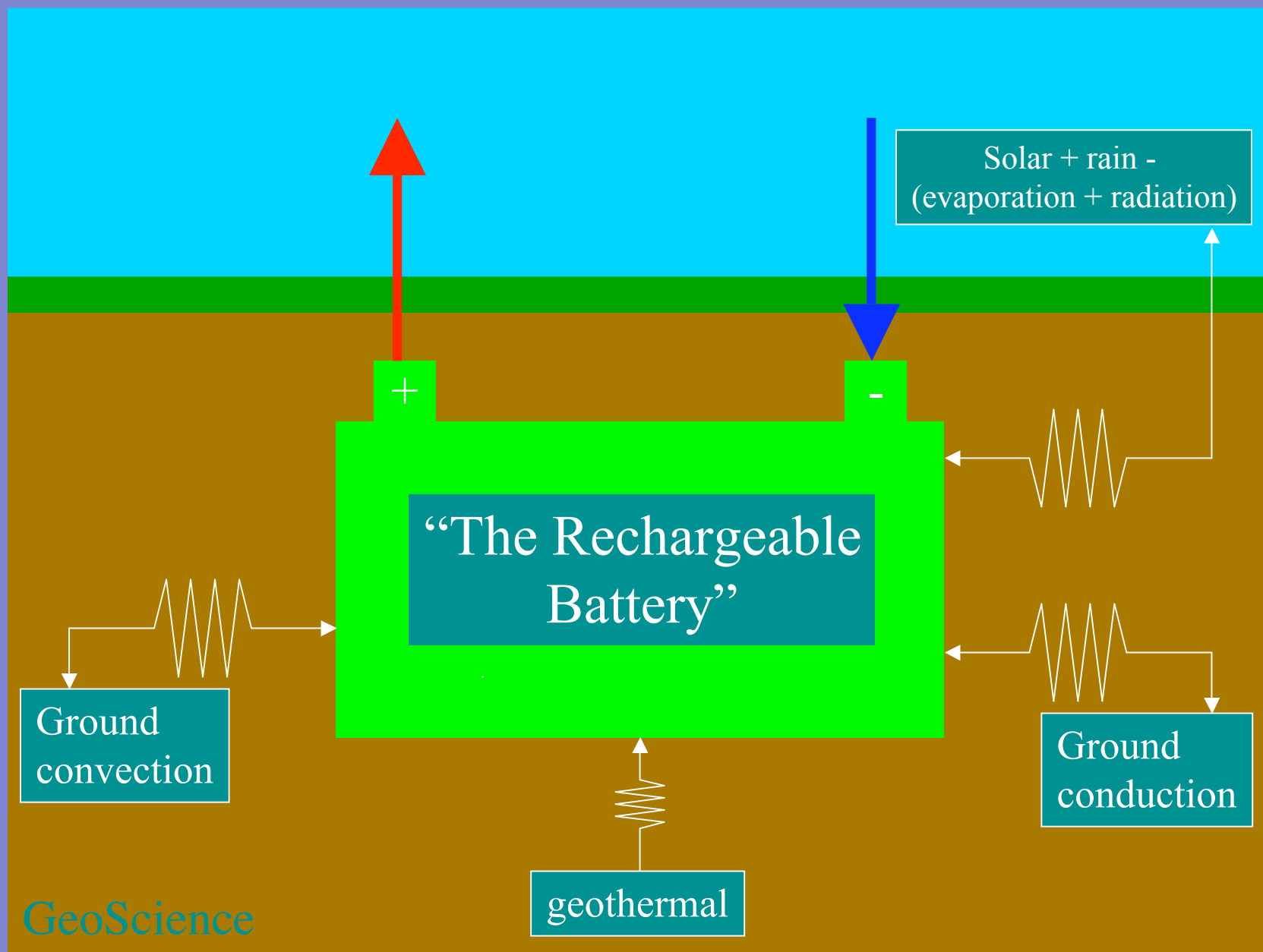


Operating point	W10/ W35	W5/ W45	W5/ W55
Heat output	kW 15.80	15.20	14.20
Refrigeration capacity	kW 13.80	11.90	10.10
Electrical power consumption	kW 3.00	3.70	4.50
Performance factor ϵ (COP)	5.58	4.09	3.22



- ⊙ Heat output
- ⊖ Refrigeration capacity
- ⊕ Electrical power consumption





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Type 1 ...don't work



RSPB

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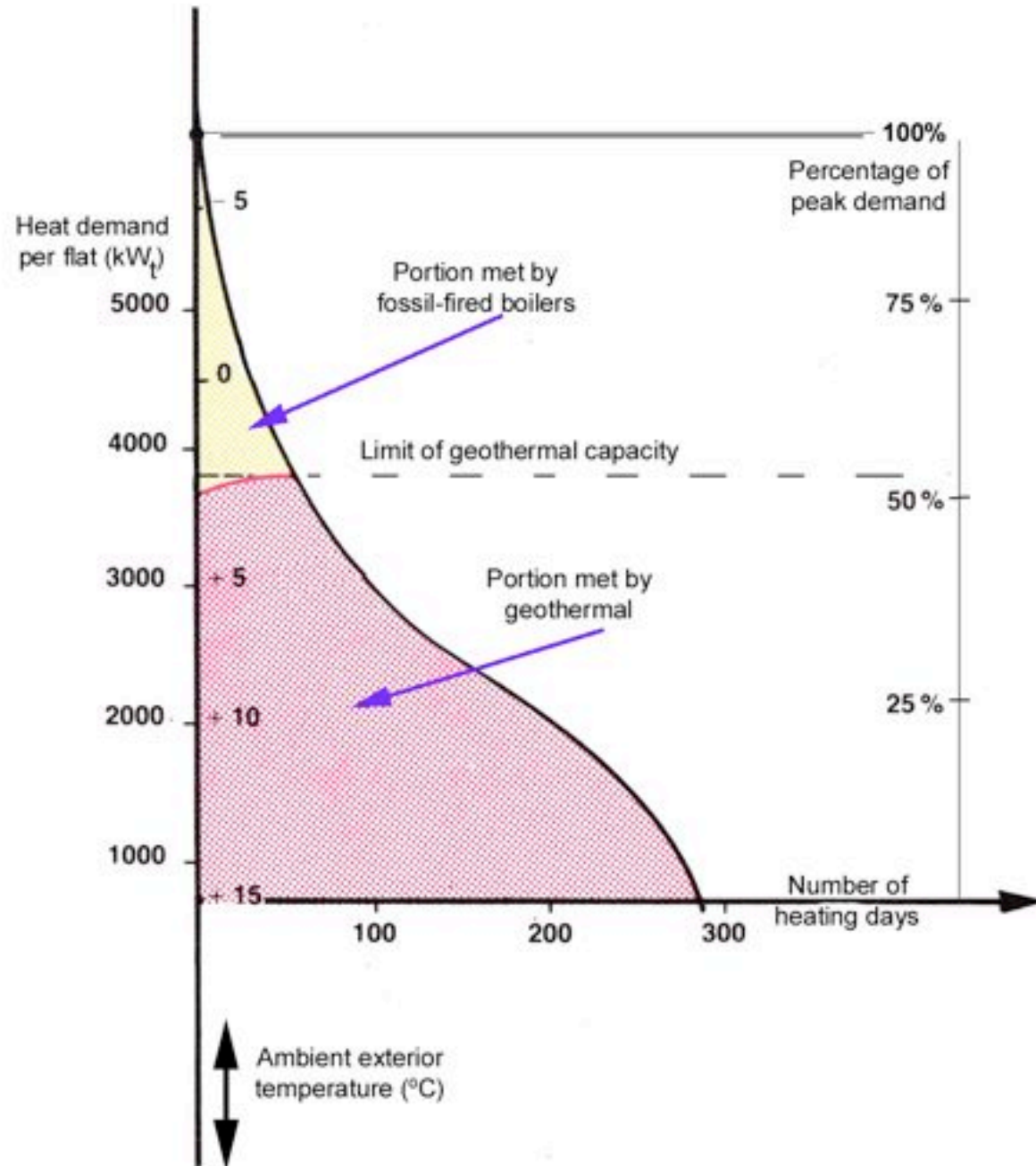


Type 1 ...don't work

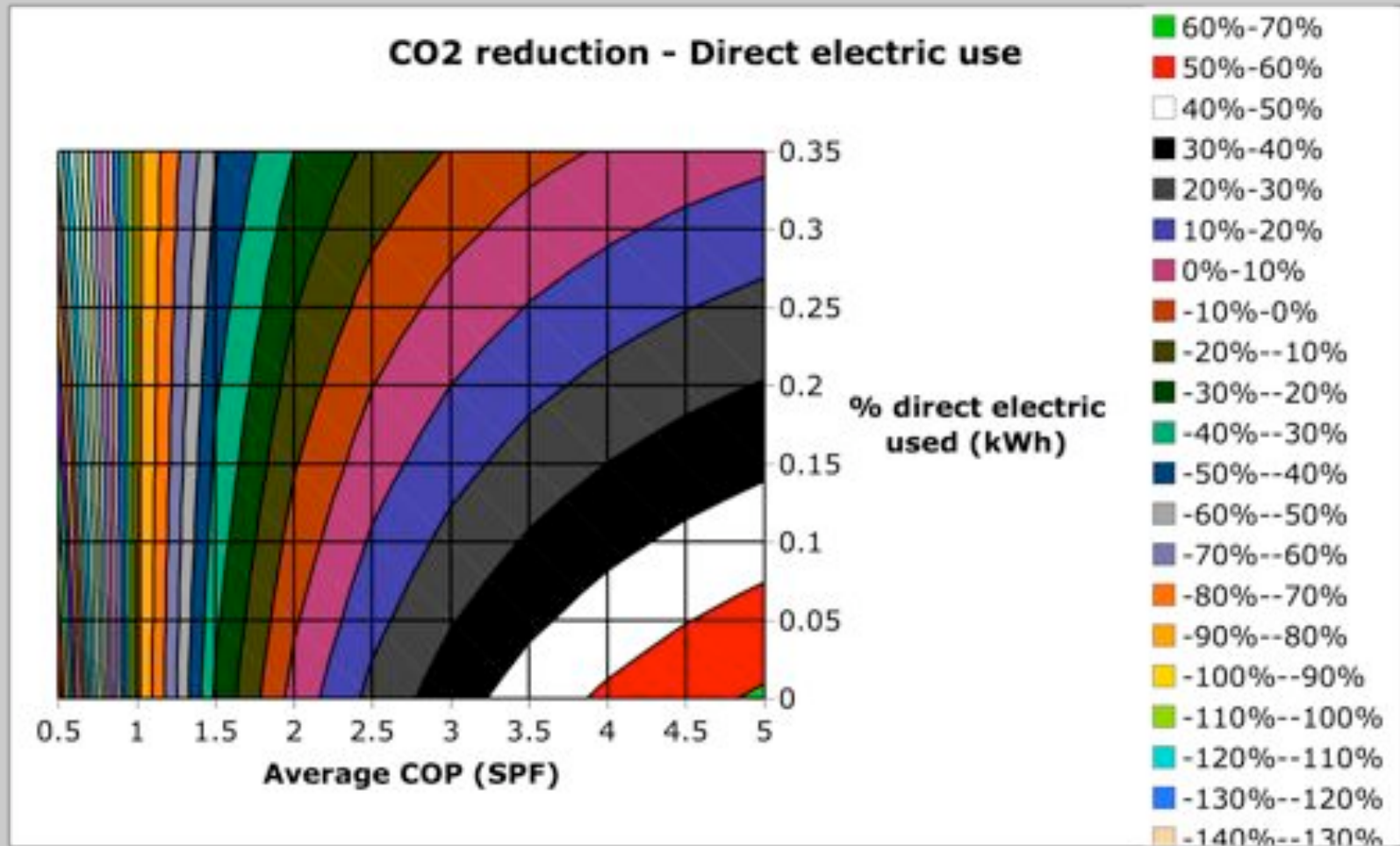
...you probably won't be
around for long if you
concentrate on these...

Type 2
“work”...
but

The temptations of supplementary heating..



Getting into hot water...



WARNING !!

Do not assume that what applies
ex UK always applies here...

Type 3
“work”...
and getting somewhere

Type 3 - Domestic

Well insulated

Appropriately sized ground loop

Properly sized ground loop - thermal and hydraulics

Low temperature distribution system

Buffering

DHW

Separation of heating and hot water temperatures

Weather compensation

Controls (constant running ??)

System Annual fuel costs Annual CO2
(tonnes)

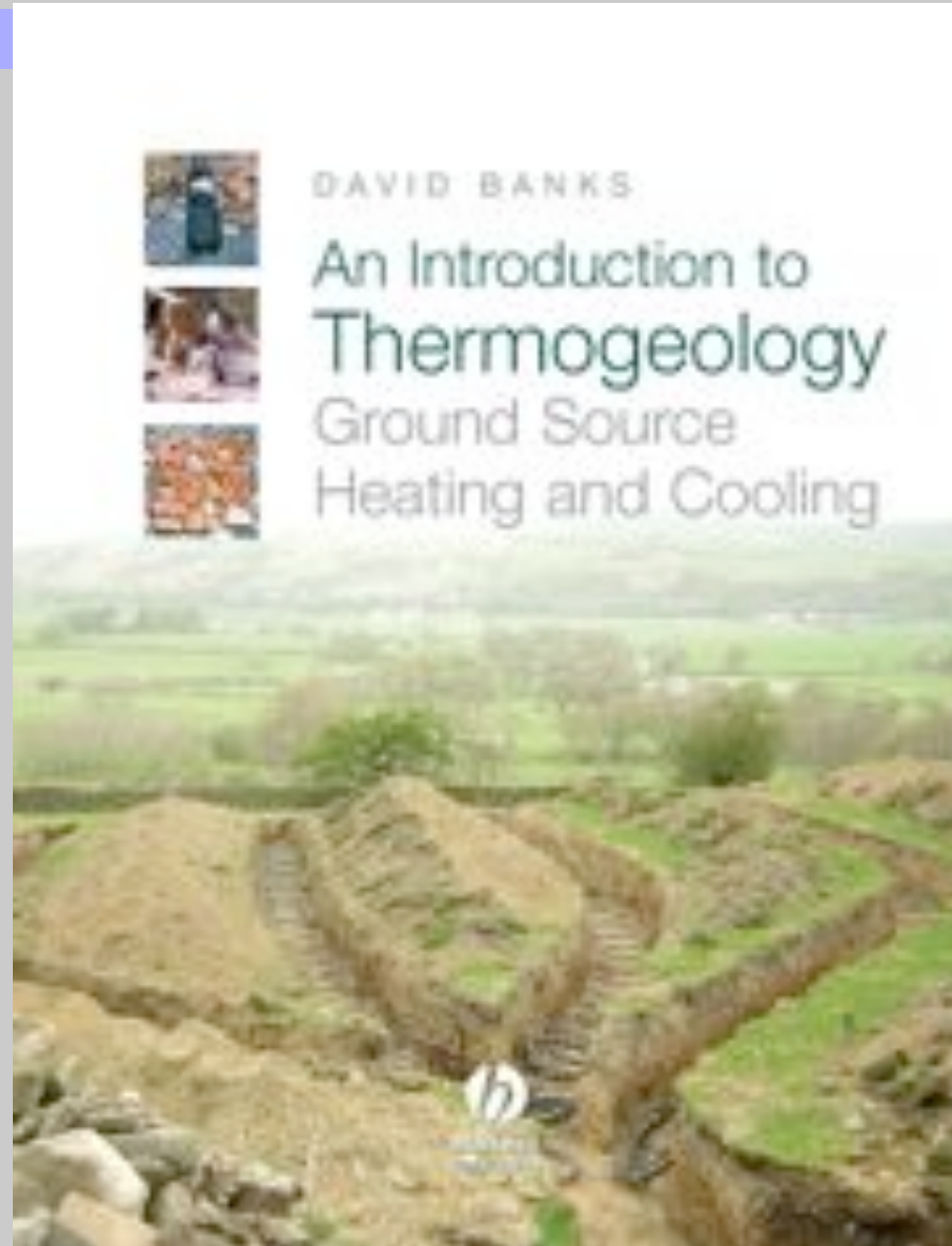
GSHP	£215	1.6
Natural gas (cond)	£300	2.9
Natural gas (non-c)	£345	3.3
LPG (bulk)(non-c)	£500	4.3
LPG (bottle)(non-c)	£670	4.3
Oil (35sec)(non-c)	£300	4.4
Elec (store+panels)(E7)	£510	6.5
House coal	£380	6.6
Smokeless solid fuel	£515	7.5

(100m² - 12500kWh/yr as per SAP 2001)

Type 3 Non-Domestic

- Low energy building
- Building loads / modelling ?
- Properly sized ground loop - thermal and hydraulics
- Thermal testing ?
- Distribution system(s) and temperatures
- Buffering
- Controls - Weather compensation
- Use of passive cooling
- Use of “heat recovery” to obtain free heating / cooling

Thermal Testing ?





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CONCLUSIONS

- Established, robust, technology
- Can offer significant renewable heat
- Can offer low CO₂ emissions

- BUT we have to push for getting it “right”

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