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CHP & District Heating Group

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Homes for the Future Group

Future heating seminar
At Hoare Lea, London, 14 Sept 2016

Heating for modern homes

Huw Blackwell

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Is it Electric, or is it CHP?

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The Missing Question: how is it to be distributed?

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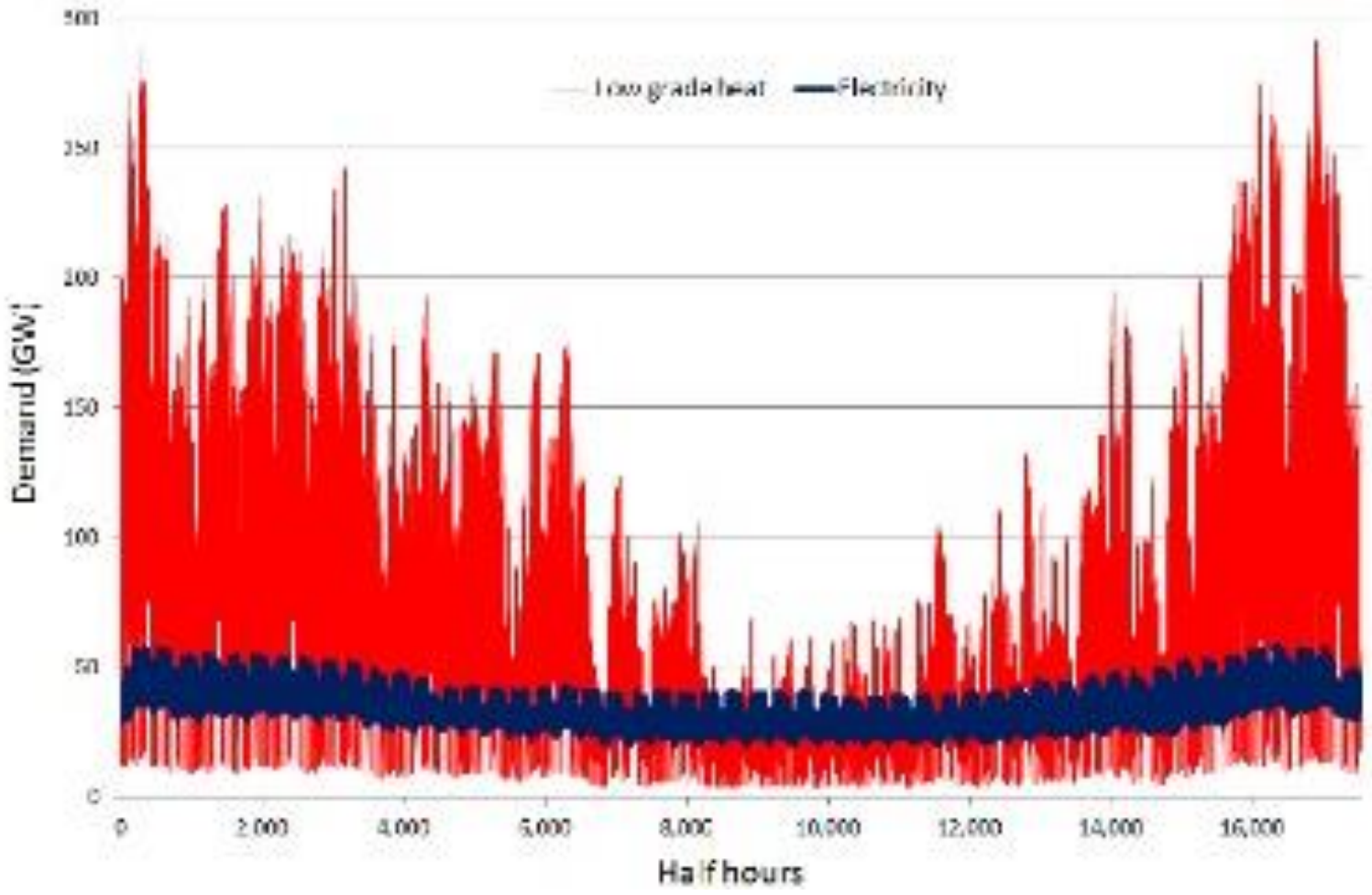
Low grade heat
Electricity
Demand (GW)
0
50
100
150
200
250
300
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
Half hours

- Electricity distribution efficiency ***decreases*** at load
- **Other loads** also seeking to be electrified (transport)
- **Unlikely electricity** becomes the main distributor of heat
- District heating efficiency is ***fixed*** – i.e. increases with heat load delivered
- In dense urban centres – **DH is a viable alternative** to the gas grid for:
    - thermal distribution
    - energy storage

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What about CHP?

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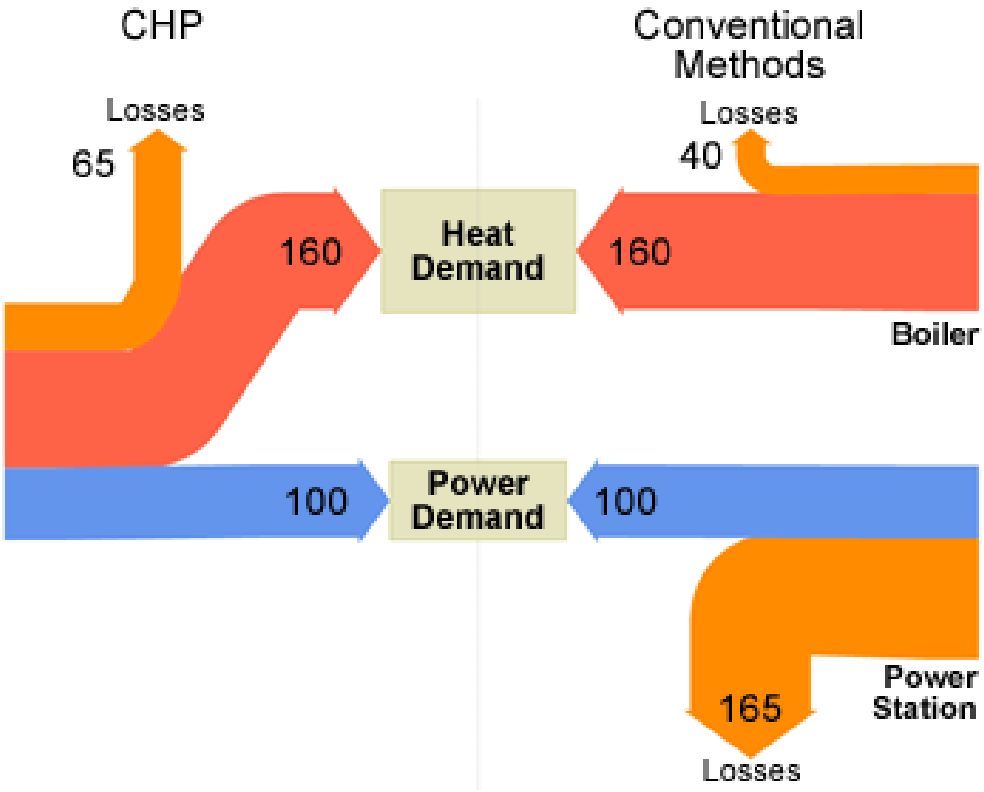
Principle of CHP



Units:
Fuel
CO_2
NO_X

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Fuel
CO_2
NO_X

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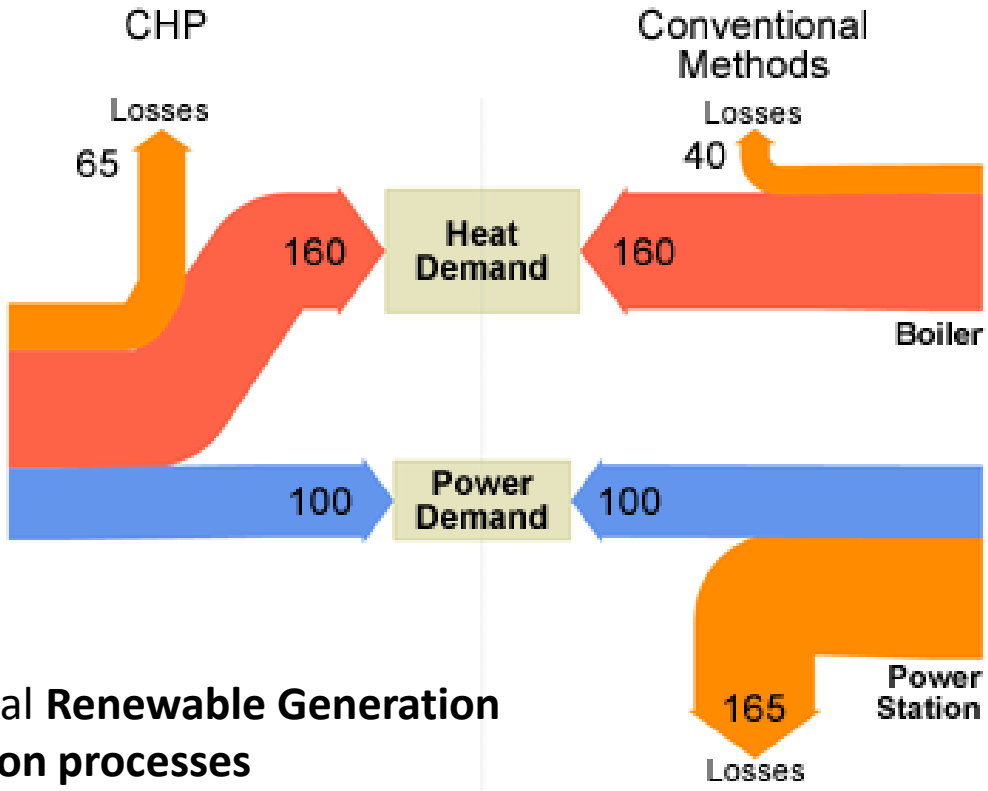
Principle of CHP



Units:
Fuel
CO_2
NO_X

Units:
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NO_X

75% all Electrical **Renewable Generation** from **combustion processes**

If there is a renewable fuel supply, why not use it in CHP?

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What about Electric Heat?

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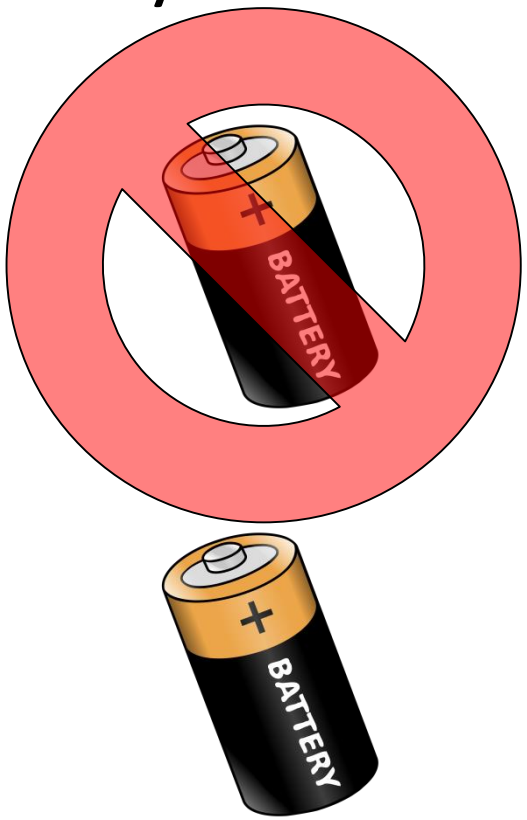
Renewable Electricity Intermittency



<u>Renewable Electrical Supply</u>

Wind, PV, Tidal

Energy in = Energy Out

(Limited storage)

<u>Renewable CHP Supply</u>

Biomass, Refuse, Sludge, Biogas etc

Storage of fuel possible

For both Renewable Electricity and CHP *<u>heat</u>* storage is possible

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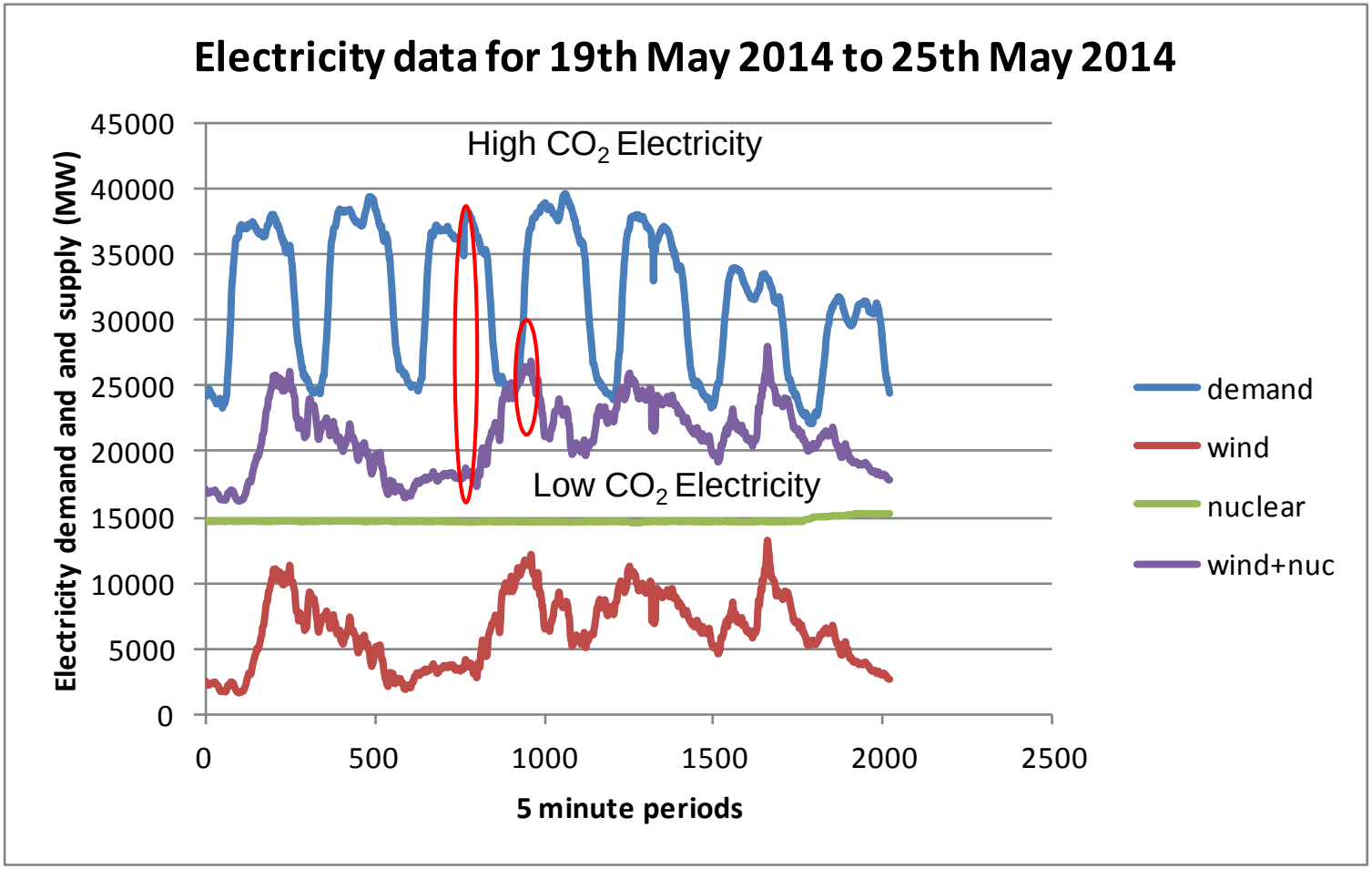
Electrical Demand/Supply Mismatch



Credit: Paul Woods @ AECOM

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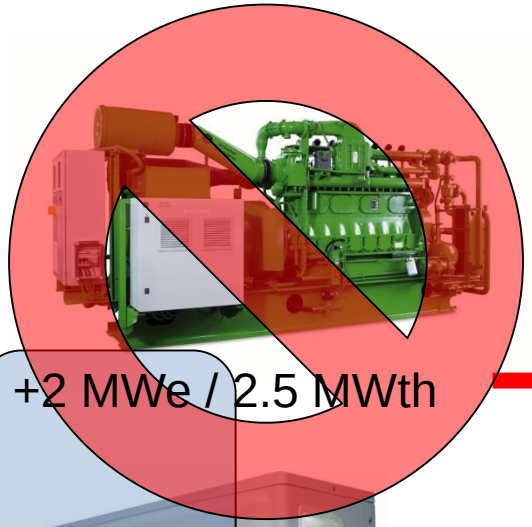
High CO_2



+2 MWe / 2.5 MWth

2.5 MW Electrical Swing

Low CO_2

-0.5 MWe / 2.5 MWth

2.5 MWth

VARIABLE HEAT LOAD

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High CO_2

+2 **GWe** / 2.5 **GWth**

2.5 GW Electrical Swing

Low CO_2

-0.5 **GWe** / 2.5 **GWth**

2.5 GWth

VARIABLE HEAT LOAD

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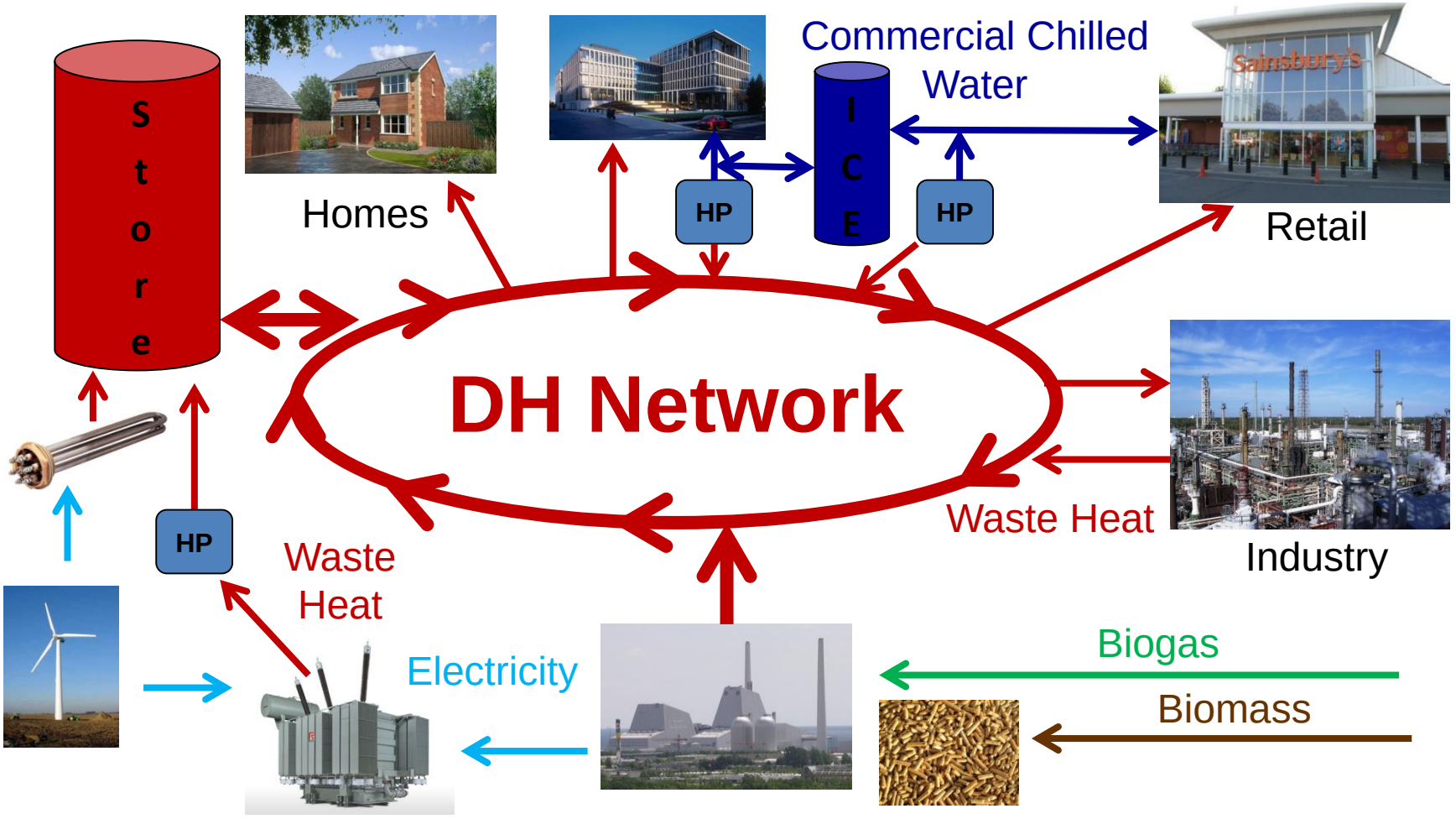

- **No magic bullets**
- *District heating* likely to be key to:
  - move heat around
  - manage thermal demand swings
  - manage electrical demand/supply variations?

  But only in urban areas
- *CHP*:
  - Has a future with renewable fuels
  - Helps to manage the intermittency of renewable electrical fuels
- *Electrical heating*:
  - Has a future with excess renewable electricity and thermal storage
  - Likely to be easier to manage and more efficient centrally