

# Productive and Smart The Smart Home

*Barry Evans*

*Barry.evans@wsp.com*



# The Smart Home of the Future

- **All-Electric**
  - Heat Pumps
- **Low thermal demand**
- **Self Generation**
- **Better Control**
  - Smart controls
  - Energy Storage
  - Demand Side Response
- **Very low carbon, (but more importantly.....)**
- **Better for the person inside**
  - Fewer/Better kWhs

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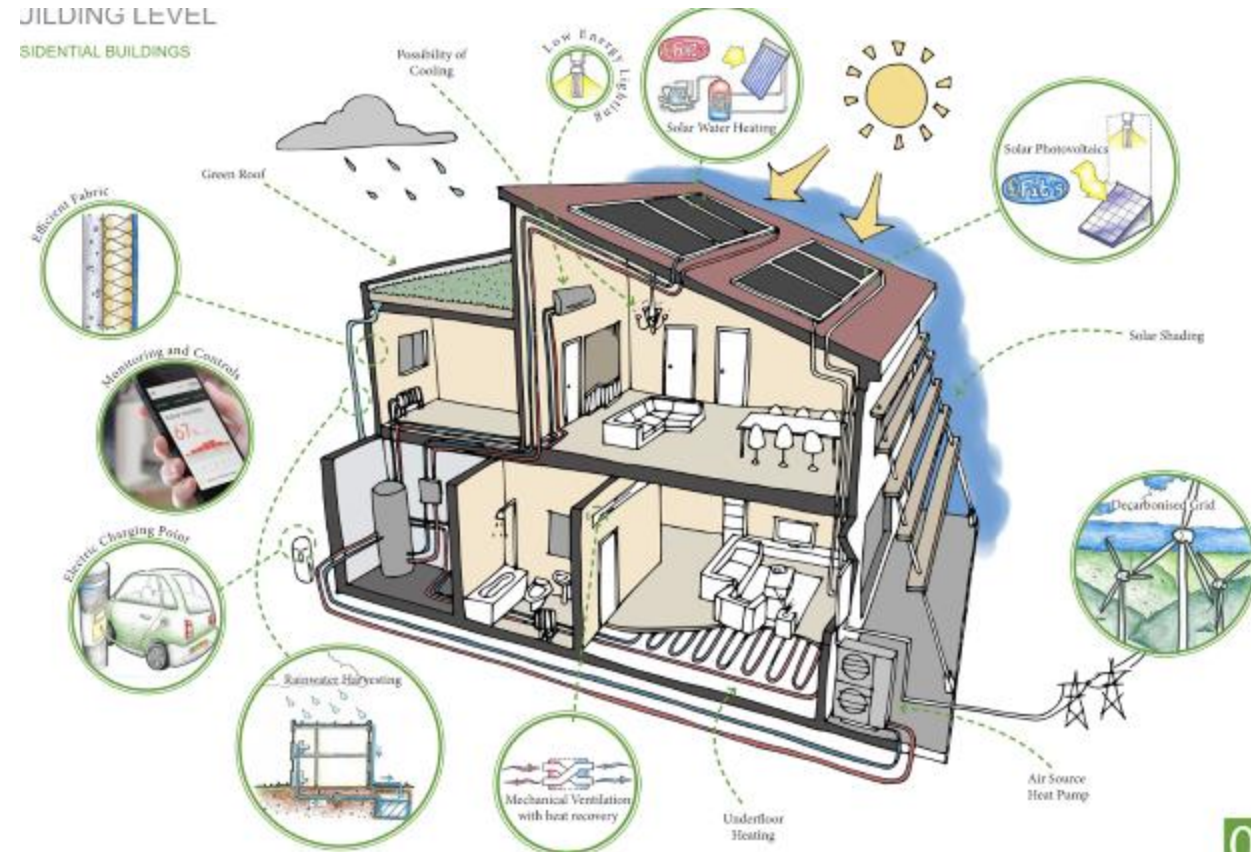


[www.liv-eco.com](http://www.liv-eco.com)

# All-Electric

- **Need only one utility**
- **Heat Pumps-**
  - Very low carbon
  - Suited to low thermal demand
  - Provides cooling
- **No air pollution**
- **Allows/increases smart tech.**
  - Demand Side Response
  - Energy Storage
  - Solar

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## Low thermal demand

- **Typical home – 11,500kWh**
  - Hot water 1,500kWh
  - Space Heating – 10,000kWh
- **New home – 5,000kWh**
  - Hot water - 1,500kWh
  - Space Heating – 3,000kWh
- **Future Home – 3,000kWh**
  - Hot water - <1,000kWh (solar thermal)
  - Space Heating – 2,000kWh

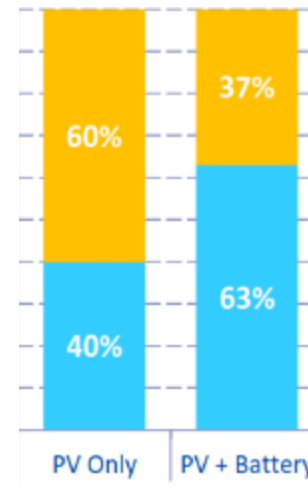
**Difference is around £250 per annum (gas)**



# Self-Generation

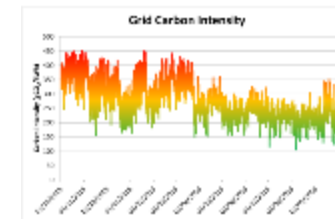
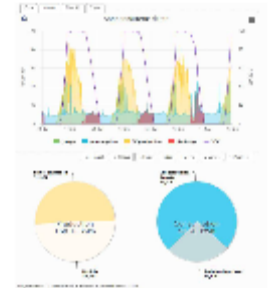
- **Solar Thermal**
  - ~50% of hot water demand
  - £50 per annum
- **Solar power**
  - ~2-4kWp system = 30-80% self-consumption
  - £100-£400 direct bill savings
- **Heat Pumps**
  - Dependent on CoP ~70% self-generation
  - Bills similar

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# Better Controlled

- **Smart Controls**
  - Use energy only when needed
  - More comfort
- **Smart energy management**
  - Energy Storage
  - Increase self-consumption
  - Demand Side Response - ToUT
  - Electric Vehicles



# Better Controlled – Smoothing Demand

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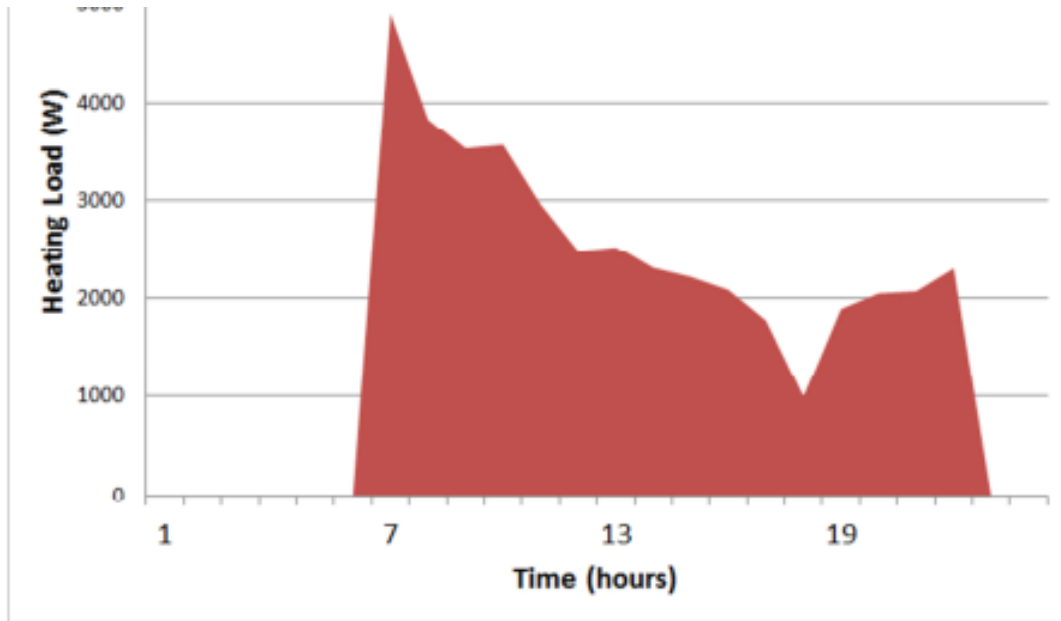


Figure 3a: typical daily variation in space heating demand.

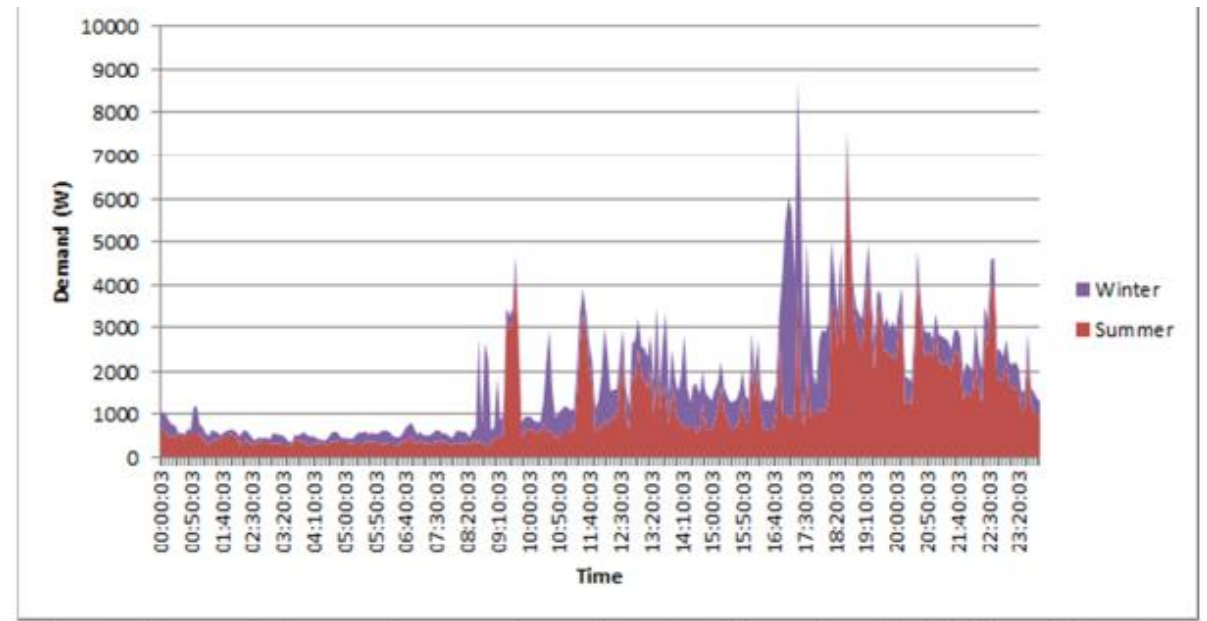
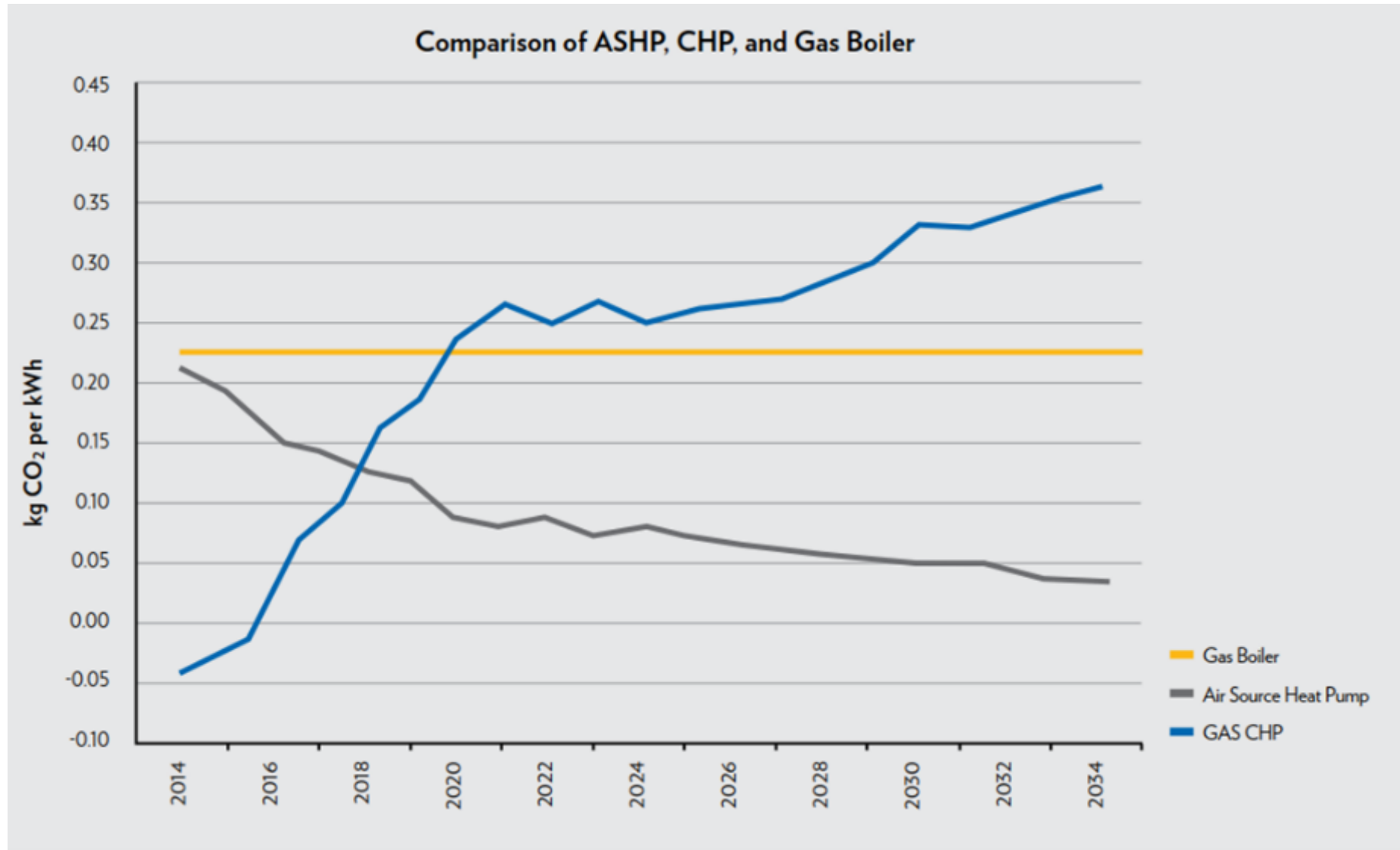


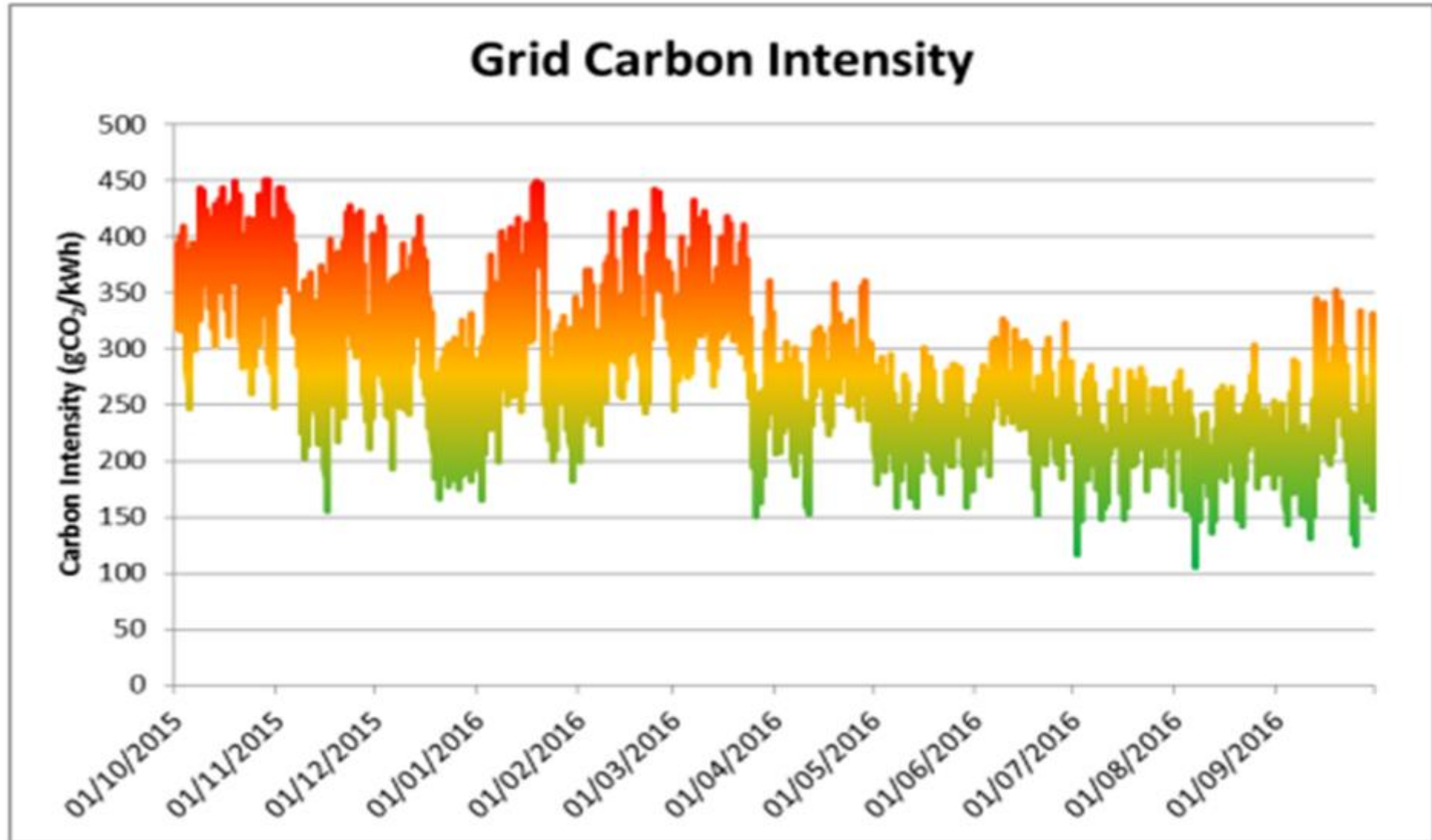
Figure 6: Measured winter and summer domestic electrical demand profiles (Knight and Ribberink, 2007).

# Very Low Carbon



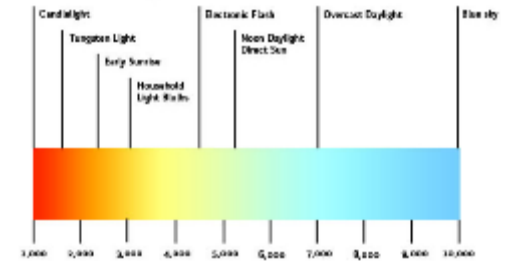


# Very Low Carbon



# Smart Homes should be Better Homes

- Improving internal air quality
- Comfort taking
- More/Better lighting
- Cooling in very hot weather
- Increased daylighting
- More powerful showers



# Smart Home Issues

- Social issues around energy opportunities
  - More savvy more savings
  - More money more savings
- Paying for the grid
- Current regulations don't recognise smart energy management



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