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Retail refrigeration

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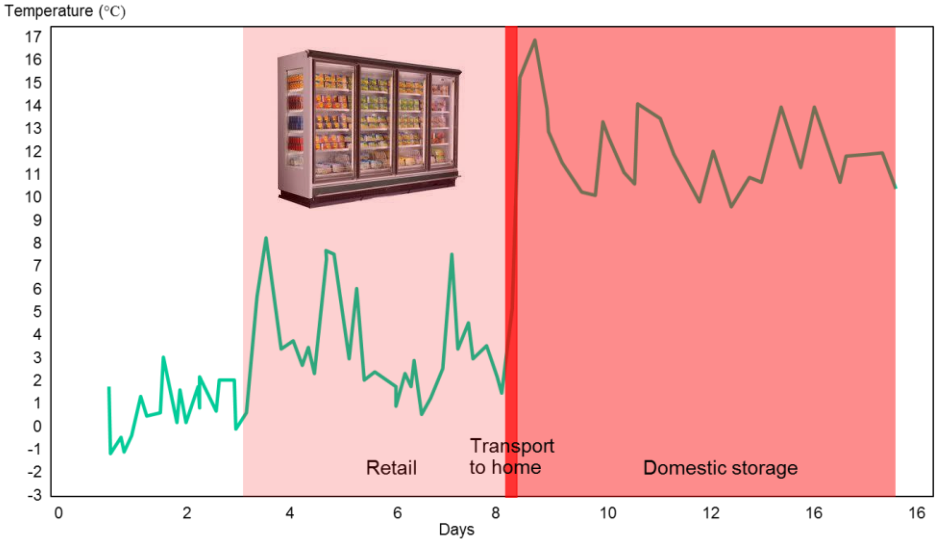
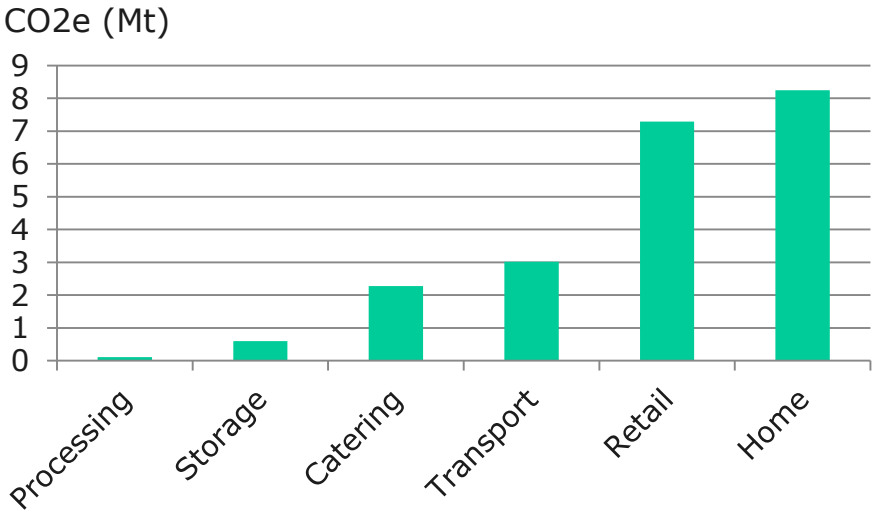
Retail refrigeration

- Temperature control, carbon emissions increase at consumer end of cold chain
- 40-70% of energy in supermarkets used for refrigeration
- UK retail refrigeration ~ 9-10 TWh/year
  - ~75% chilled, ~25% frozen
- 1.5% of UK energy used by retail
- ~7.3 Mt CO_2 (~26% direct, ~74% indirect)





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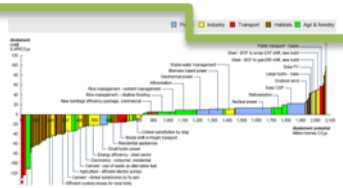
WP 2.1 Retail chilling and freezing

- WP2.1.1 – Technologies will be initially investigated and sifted
- WP2.1.2 – In parallel with WP2.1 technologies will be investigated experimentally and a physical proof of concept and a prototype will be developed
- WP2.1.3 – Non technical barriers preventing uptake of new technologies, such as customer reaction, implementation, cost-benefit models, end user (supermarket) incentives will be assessed
- WP2.1.4 – The final part of this work package will involve a trial of the prototype in-store with ASDA

WP 2.1

WP2.1.1 Technologies initially investigated and sifted

Road map



WP2.1.2 Technologies investigated experimentally and a physical proof of concept prototype developed

PoC

WP2.1.3 Non technical barriers preventing uptake of new technologies assessed

WP2.1.4 Trial of the prototype in-store with ASDA

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WP 2.1 Retail chilling and freezing

- WP2.1.1 – Technologies will be initially investigated and sifted
- WP2.1.3 – Non technical barriers preventing uptake of new technologies, such as customer reaction, implementation, cost-benefit models, end user (supermarket) incentives will be assessed
- Update of retail road map to identify best technologies
  - Retrofit (technologies that can be fitted in situ to a cabinet)
  - Refit (technologies that can be applied when refitting store)
  - Future technologies (technologies available in the future)

Retrofit

- Refrigerants
- Floating head pressure
- LED lights
- EC Evaporator fan motors
- EC Condenser fans motors
- Suction pressure control
- Doors on cabinets
- Store dehumidification
- Anti-sweat heater controls
- Better cabinet loading
- Short air curtains
- Back panel flow
- Occupancy sensors and controls for cabinet lighting
- Strip curtains
- Night blinds
- Liquid pressure amplification
- Risers or weir plates
- Defrost controls
- Store lighting
- Radiant heat reflectors
- Store temperature control
- Cabinet temperature control
- Training
- Cleaning and maintenance
- Re-commissioning
- Covers
- Loading – duration and temperature

Refit and future

- Cabinet selection
- Secondary systems
- Water loop systems
- CO2 refrigeration technology
- Borehole condensing
- Dynamic demand
- Ground source
- Pipe insulation/rifling/reduced pressure drops
- Anti-fogging glass
- Optimisation of cabinet air flow
- Evaporative condensers
- High-efficiency evaporators and condensers
- Refrigeration system contamination
- SLHE
- Nanoparticles
- Heat pipes and spot cooling
- Anti-frost evaporators
- Fans
- Economisers
- Electronic expansion valves
- Reflective packaging
- Insulation e.g. VIPs
- Off-cycle losses
- Cabinet location
- Desuperheating/heat recovery
- Variable speed drives (integral)
- Internet shopping
- Supermarket cold store
- Vending cabinet concepts
- Polygeneration
- Adsorption
- Absorption
- Novel building fabric
- High-efficiency compressors
- Centralised air distribution
- Store light (natural)

Criteria

Quality of information	1-5
Barriers to staff/customers	L,M,H
Availability barriers	L,M,H
Limits to commercial maturity	L,M,H
Ease of use of installation	L,M,H
Technology independence	L,M,H
Maintainability	L,M,H
Legislative concerns	L,M,H
Energy savings	%
Scope of application	All, specific systems
Direct emissions	0%
Cost (payback)	£

Baseline store (Asda W-S-M) for model

	TOTAL kW	% of store main
REFRIGERATION	158.9	39.73%
HVAC	48.9	12.23%
LIGHTING	85.8	21.45%
FOOD PREP	63.2	15.80%
SMALL LIGHTING & POWER	0.0	0.00%
		89.21%

- Missing 10% energy!
- Currently matching cabinets to refrigeration power
- Need detailed info on HVAC, lighting and food prep

WP2.1.2

- WP2.1.2 – In parallel with WP2.1 technologies will be investigated experimentally and a physical proof of concept and a prototype will be developed
- Roadmap used to identify the technologies that have the best potential for improvement
  - Probably multi-deck chilled cabinet
  - Only commercially available technologies
  - Some technologies will not be suitable for a multi-deck or compatible

WP2.1.2

Likely current technology candidates:

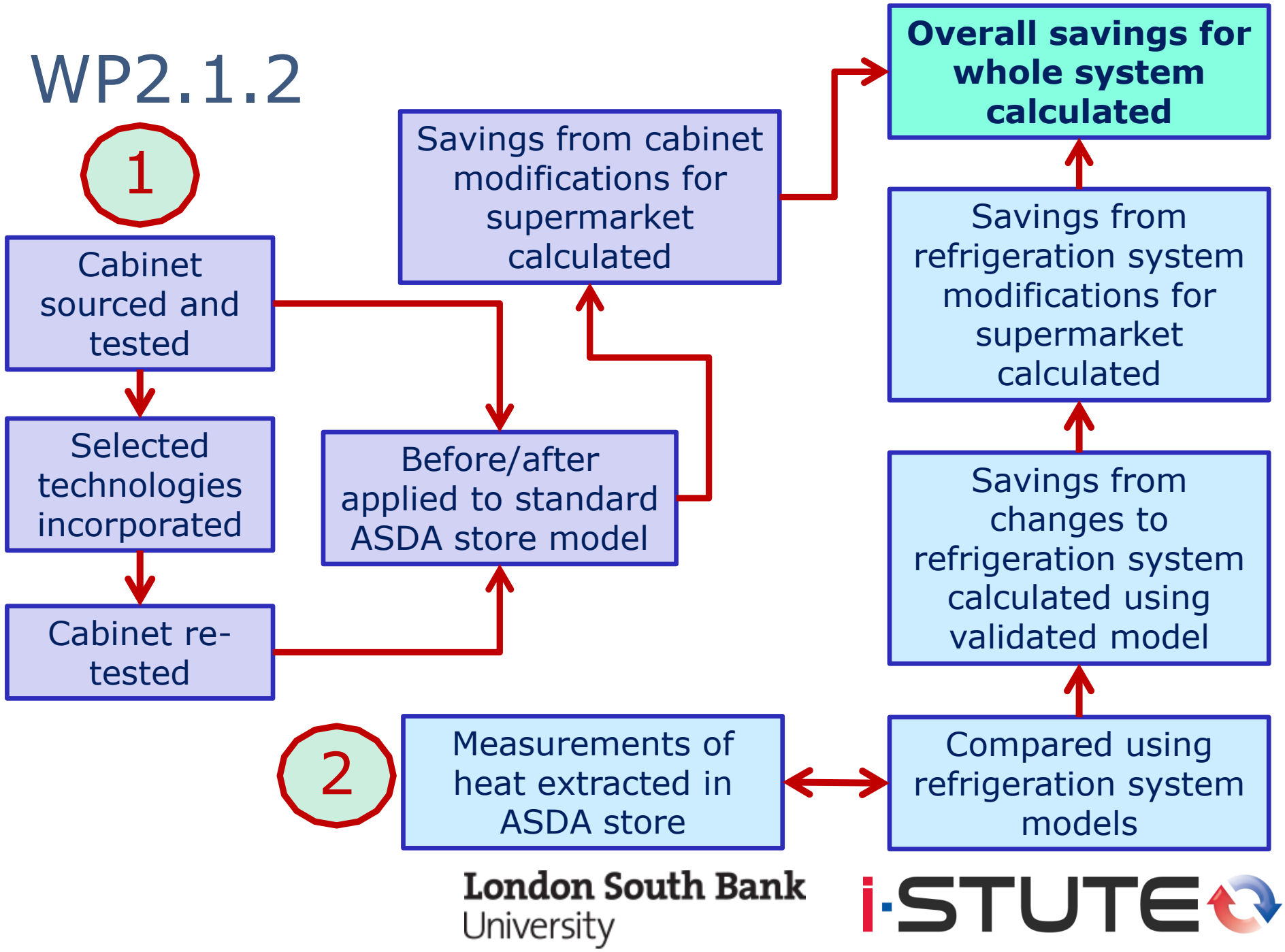
Cabinet:

1. Doors
2. LED lights
3. ECM fan motors
4. Occupancy sensors
5. SLHE
6. Anti frost evaporator
7. Insulation

Refrigeration system:

1. Floating head pressure
2. Changing refrigerant
3. Suction pressure control
4. ECM condenser fans
5. LPA
6. Evaporative condensers

WP2.1.2



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