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EUROPEAN FOOD CHAIN SUPPLY
TO REDUCE GHG EMISSIONS BY 2050

WP2: Technology roadmaps and models

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01.12.22

Road maps to be generated

- Technology and strategy reviews for food chain sectors

- Case studies and modelling of varied scenarios

- Road map of options to 2050

- First road map on retail (focus of this presentation)

		Primary processing	Secondary processing	Storage	Transport (long/short)	Catering	Retail	Domestic
Meat		T2.7	T2.7	T2.4	T2.5	T2.3 (all food)	T2.2 (all food)	T2.6 (all food)
Dairy		T2.7	T2.7	T2.4	T2.5			
Fish		T2.7	T2.7	T2.4	T2.5			
Fruit and vegetables		T2.7	T2.7	T2.4	T2.5			
Bakery, confectionery		T2.7	T2.7	T2.4	T2.5			
Beverages		T2.7	T2.7	T2.4	T2.5			

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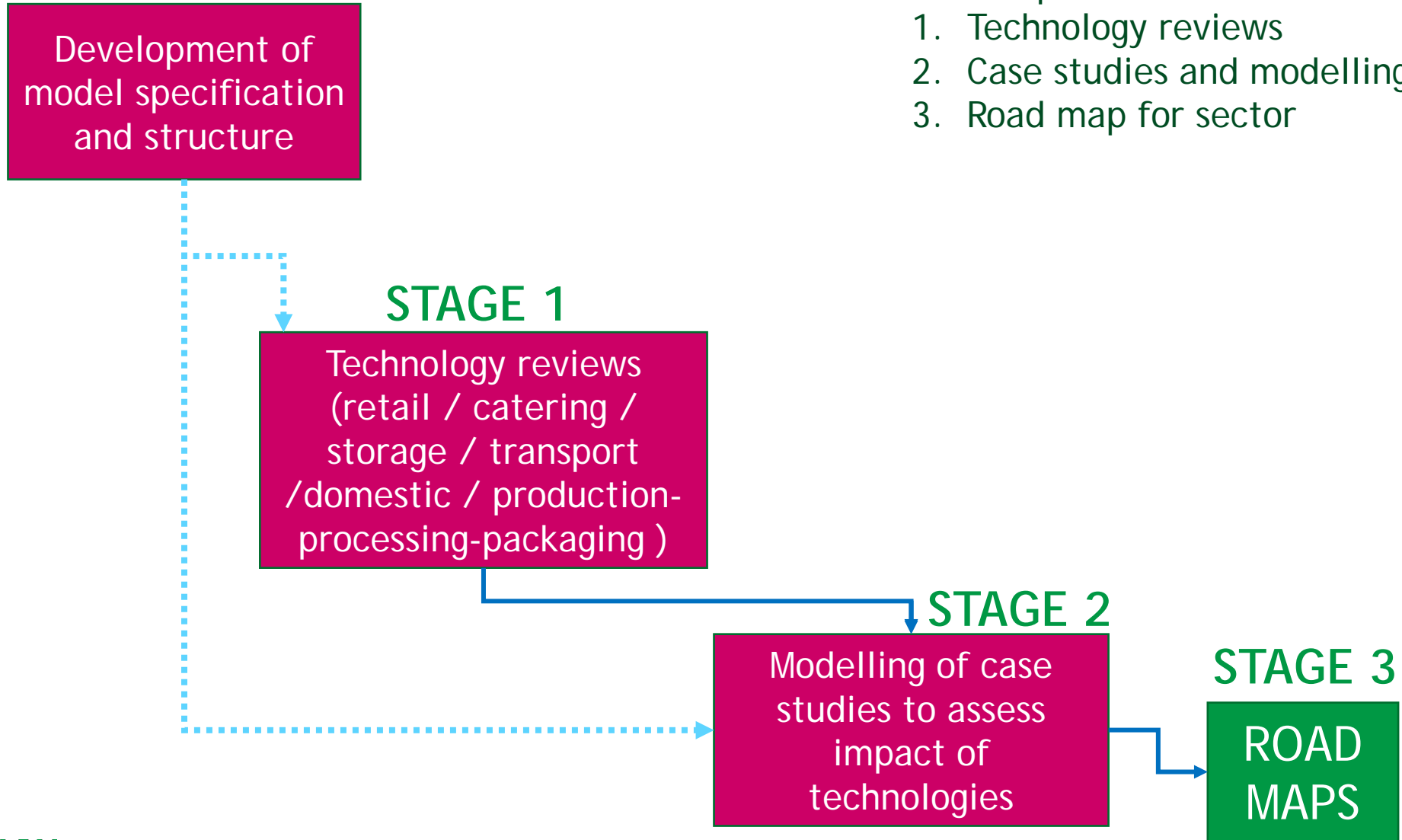EUROPEAN FOOD CHAIN SUPPLY
TO REDUCE GHG EMISSIONS BY 2050

How tasks fit together

Development of model specification and structure

Final report:
1. Technology reviews
2. Case studies and modelling
3. Road map for sector

STAGE 1

Technology reviews (retail / catering / storage / transport /domestic / production-processing-packaging)

STAGE 2

Modelling of case studies to assess impact of technologies

STAGE 3

ROAD MAPS

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Stage 1: reviews

- Reviews:
  - Technologies (both technological and operational) to reduce GHG emissions across the whole food chain assessed
  - Process heating and cooling and HVAC
  - Identify the level of GHG emissions for each technology/operation change and to assess the cost and time for application
  - 95 technologies/strategies reviewed and will be part of road map

Information	Comments
Scope 2 emissions savings (% or another quantifiable metric)	Overall savings that the review indicated.
Quality of scope 2 emissions information	How robust is the available information?
Scope 1 emissions savings (% or another quantifiable metric)	Overall savings that the review indicated.
Quality of scope 1 emissions information	How robust is the available information?
TRL level	Marked as: TRL1-4 TRL5-7 TRL8-9 TRL1 - basic principles observed TRL2 – technology concept formulated TRL3 – experimental proof of concept TRL4 – technology validated in lab TRL5 – technology validated in relevant environment TRL6 – technology demonstrated in relevant environment TRL7 – system prototype demonstration in operational environment TRL 8 – system complete and qualified TRL 9 – actual system proven in operational environment
Maintainability issues	Any relevant issues are listed.
Legislative concerns	Any relevant issues are listed.
Payback time (years)	Time to recover cost of technology. This is equal to the saving in electrical energy per year divided by the cost of the technology. It does not include other ongoing costs, e.g. maintenance, cost of finance etc.

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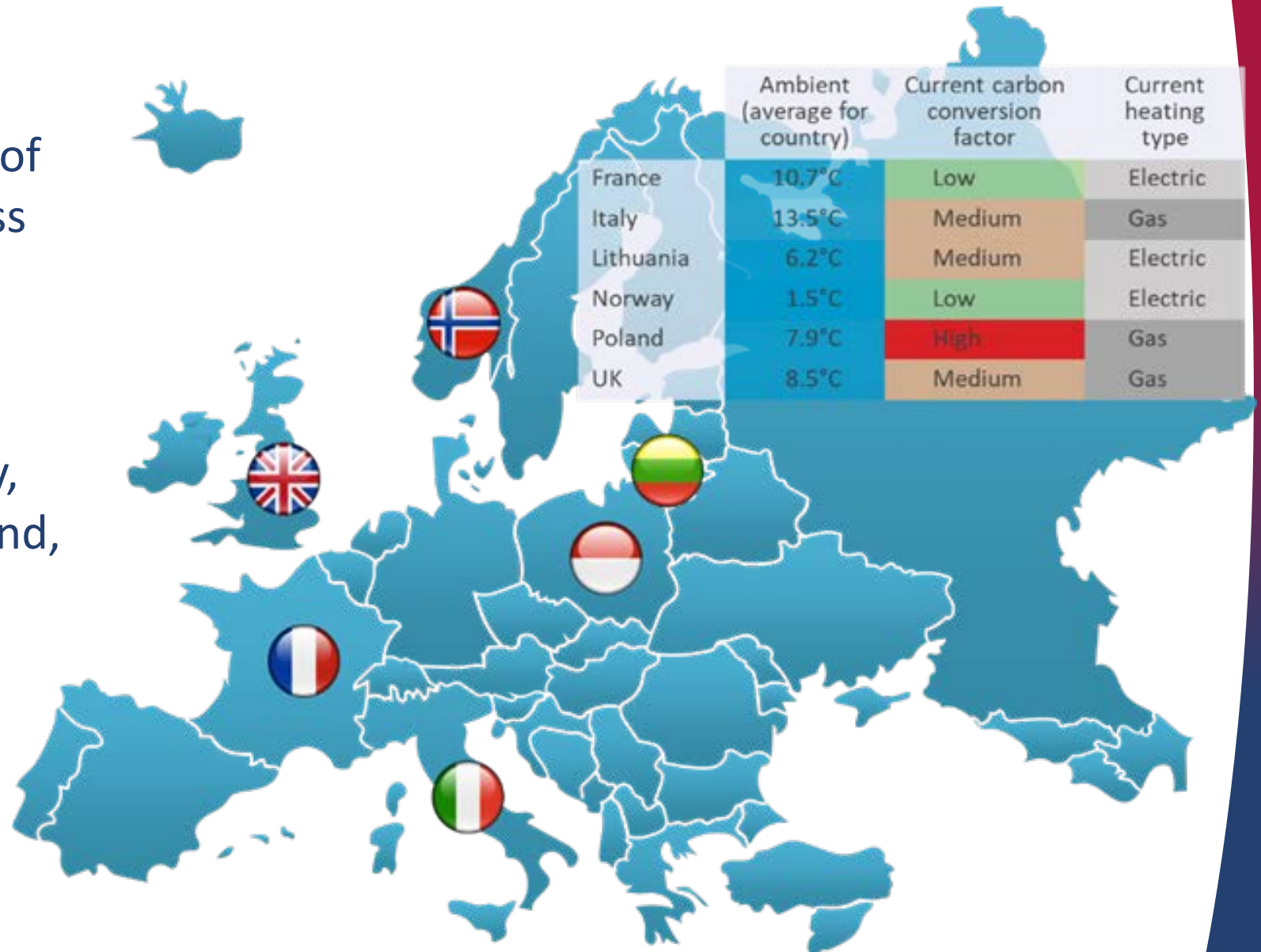TO REDUCE GHG EMISSIONS BY ZERO

Stage 1: reviews

- **Initial** assessment of technologies/strategies to find which ones show most promise

- Invitation to stakeholders to comment on results/reviews, email me or Judith
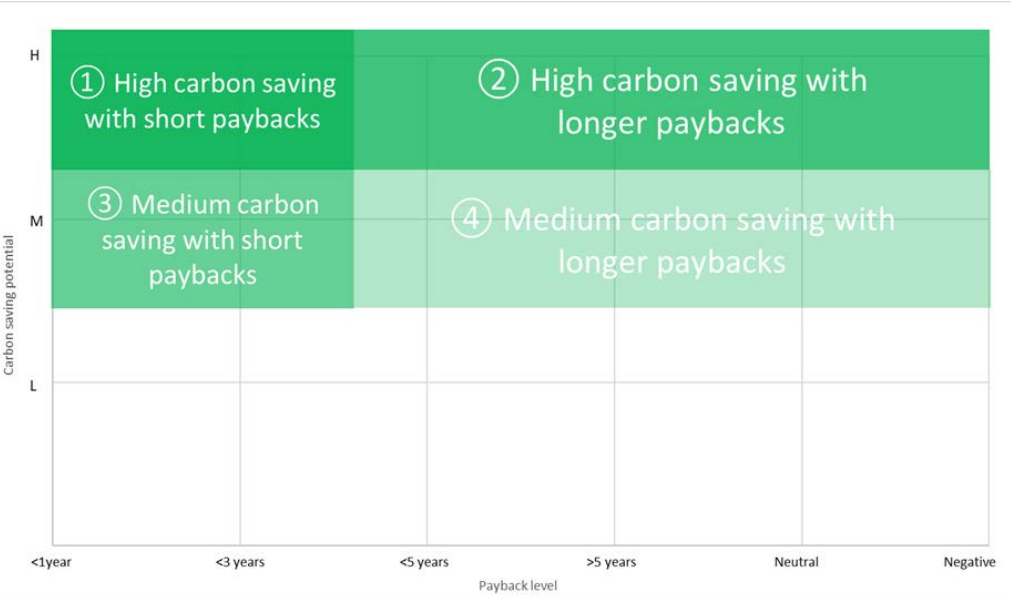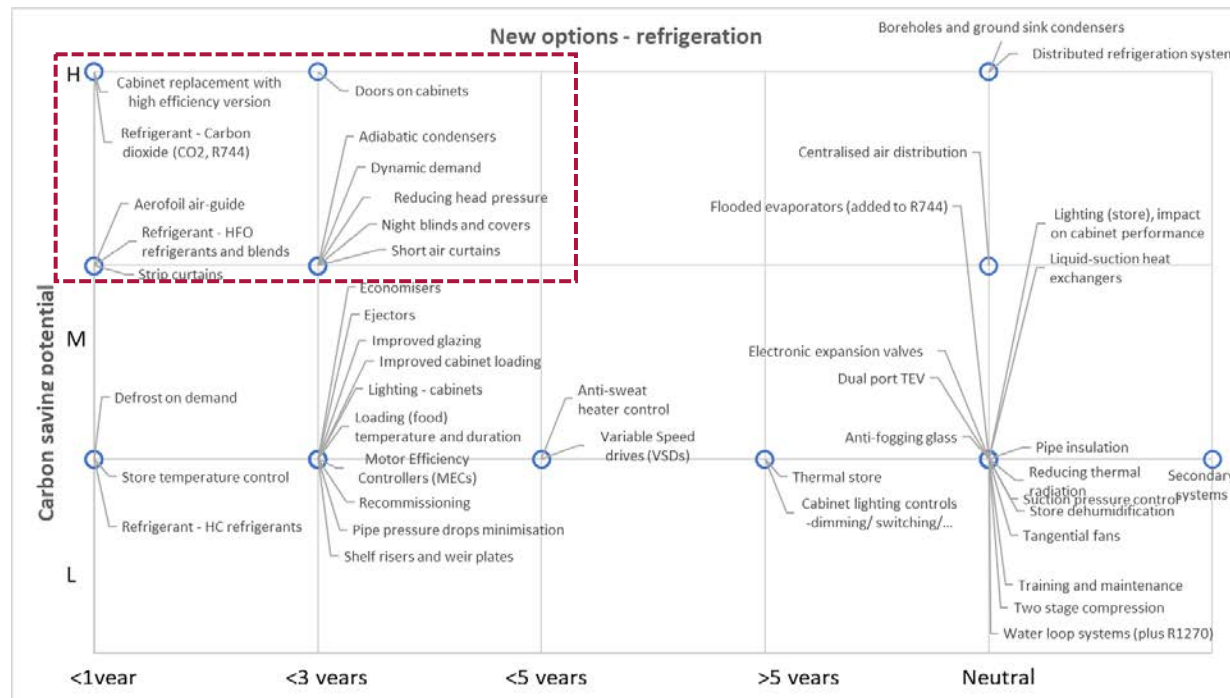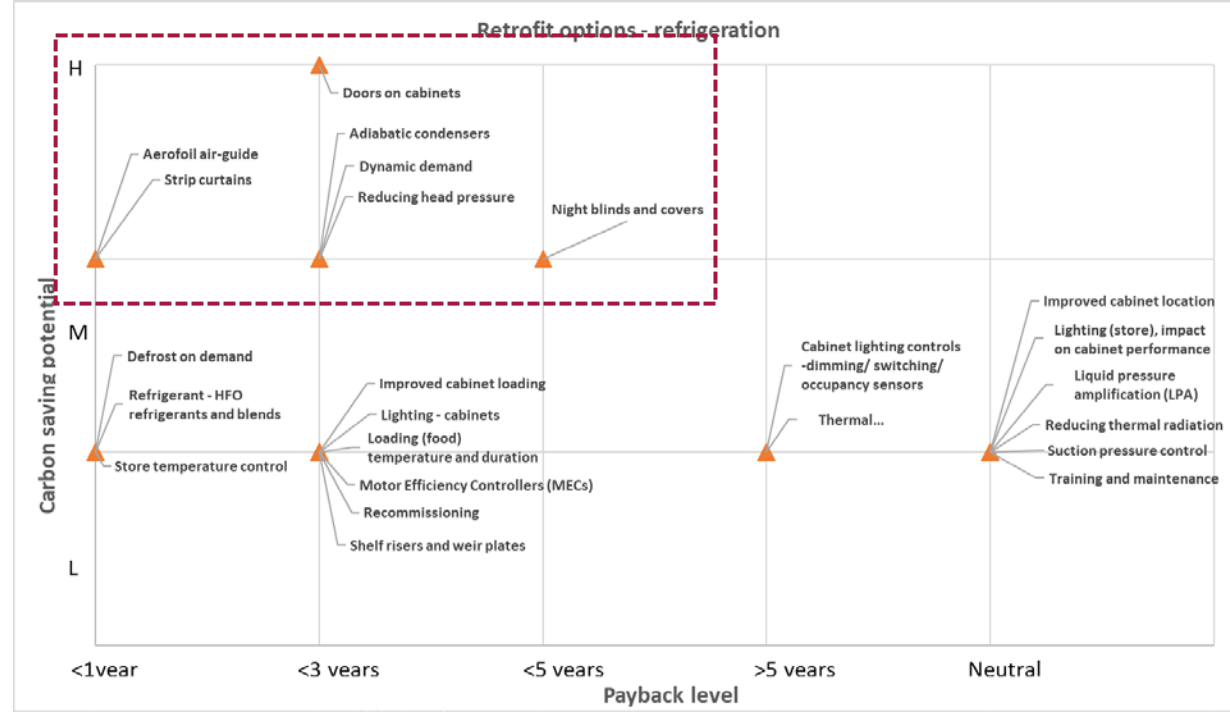
Stage 2: case studies and modelling

- Case studies:

  - Modelling (EnergyPlus) of case study sites to assess technical opportunities and impact in different stores and locations

  - 6 locations: France, Italy, Lithuania, Norway, Poland, UK

	Ambient (average for country)	Current carbon conversion factor	Current heating type
France	10.7°C	Low	Electric
Italy	13.5°C	Medium	Gas
Lithuania	6.2°C	Medium	Electric
Norway	1.5°C	Low	Electric
Poland	7.9°C	High	Gas
UK	8.5°C	Medium	Gas

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TO REDUCE GHG EN 22 CNS BY 2050

Stage 2: case studies and modelling

- 3 scenarios

- Refrigerated cabinets, HVAC, cooking

- 2,100 m^2 and 600 m^2 case study stores

- Impacts: 2020, 2030, 2040, 2050

- Assess selected technologies individually and when applied together

- Generate advice based on location and potential for retrofit/new stores

- How close to a zero carbon supermarket can we get?

Do nothing
- Assume changes to electrical generation carbon conversion factor
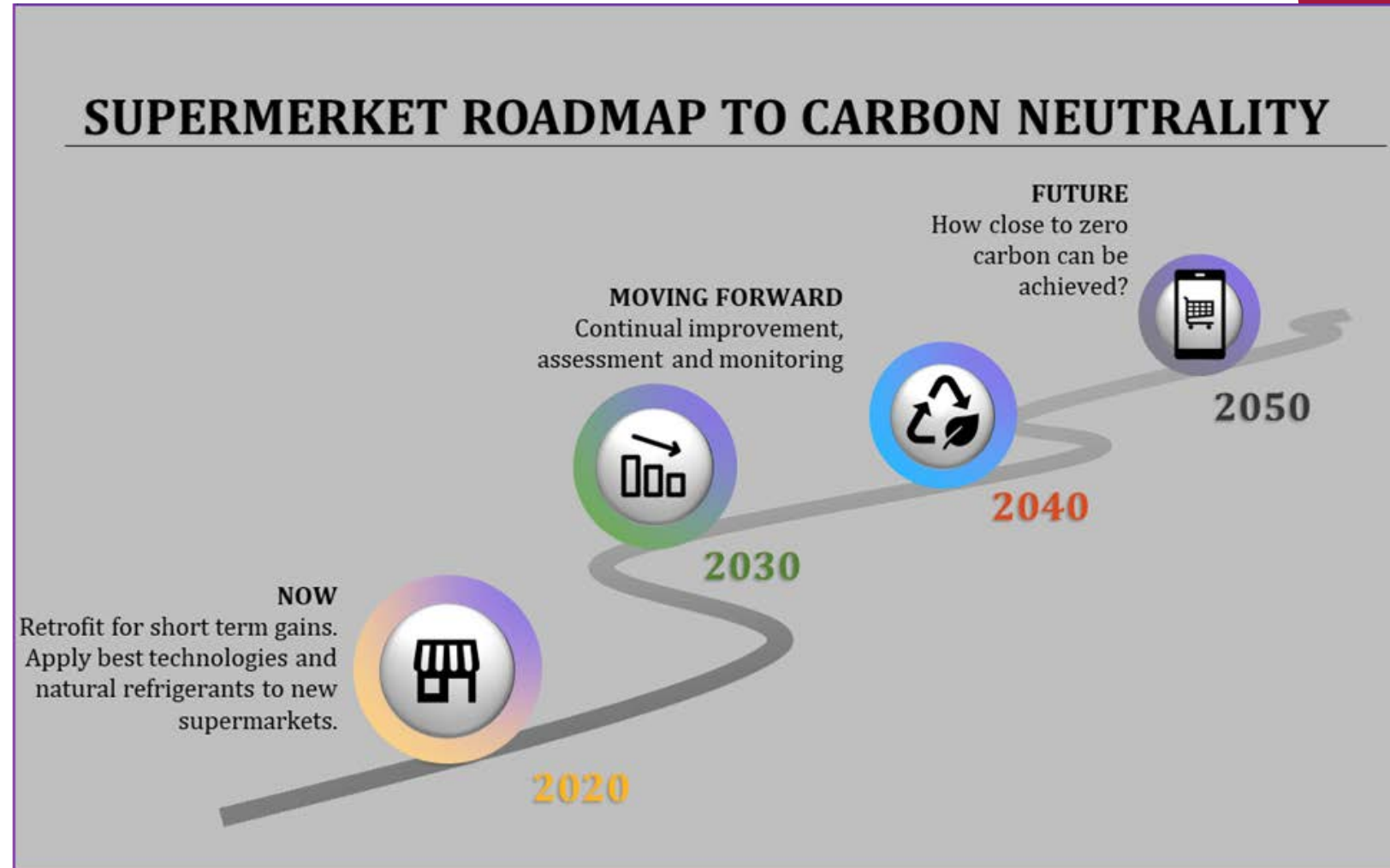- Global warming continues as predicted

Retrofit
Apply best retrofit technologies:
- Adiabatic condensers
- Defrost on demand (freezers)
- Doors on cabinets
- Dynamic demand
- HFO refrigerants (small stores)
- Reduce head pressure
- Reduce store temperature

New store
- Apply R744
- Better cabinets
- Building fabric optimisation
- Move to electricity from gas for heating
- RES (solar)

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Stage 3: road map

1. Scene setting – what are the trends?

2. What will have impact in future?

3. What are systems applied?

4. BAT (best available technology)

5. Technologies/strategies – when can they be applied, which have good paybacks?

6. What has impact (modelling)?

7. Projections for next 10, 20, 30 years

8. Reviews (as appendix)

SUPERMERKET ROADMAP TO CARBON NEUTRALITY

NOW
Retrofit for short term gains. Apply best technologies and natural refrigerants to new supermarkets.
2020

MOVING FORWARD
Continual improvement, assessment and monitoring
2030

2040

FUTURE
How close to zero carbon can be achieved?
2050

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