



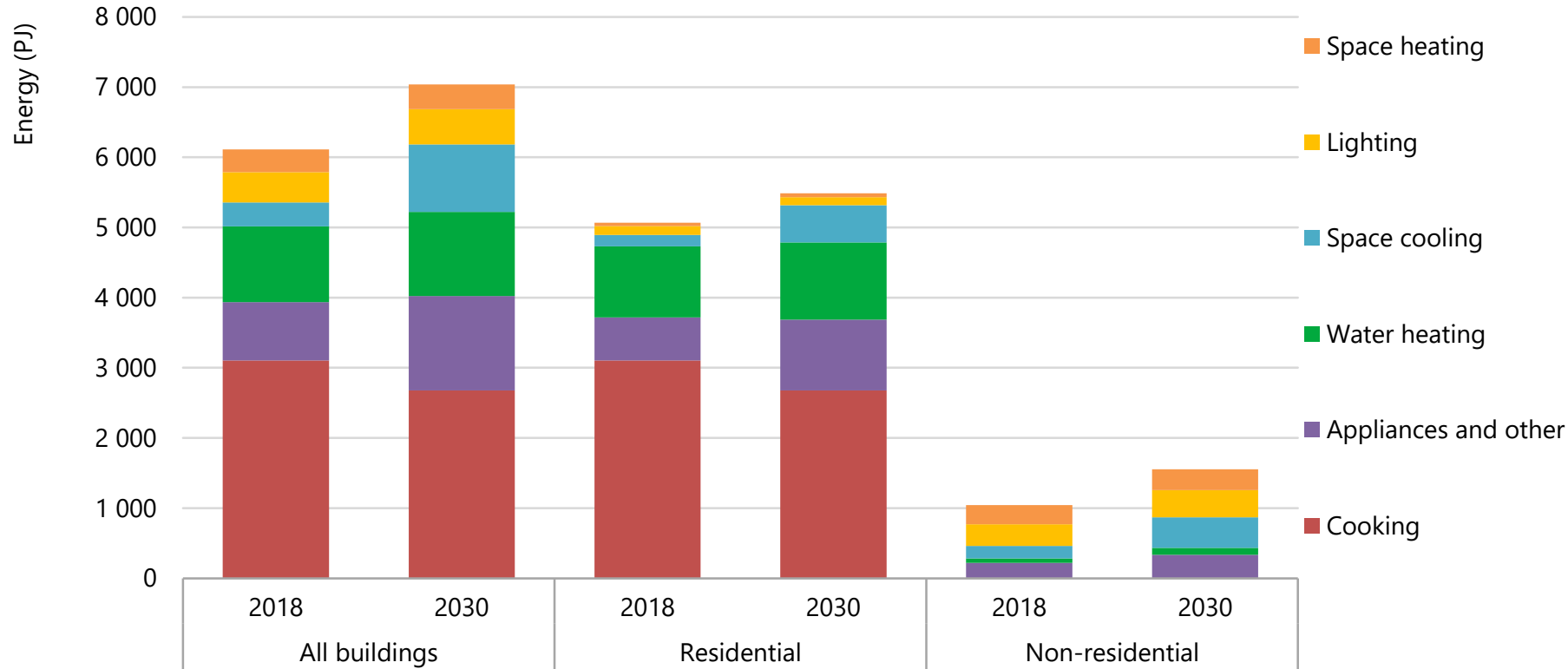
Bridging the Technology Gap

Maxine Jordan

Singapore, 16 July 2019

Building energy use is transitioning in ASEAN

Energy use by end-use in ASEAN, 2018



Building envelope technologies

Shading devices

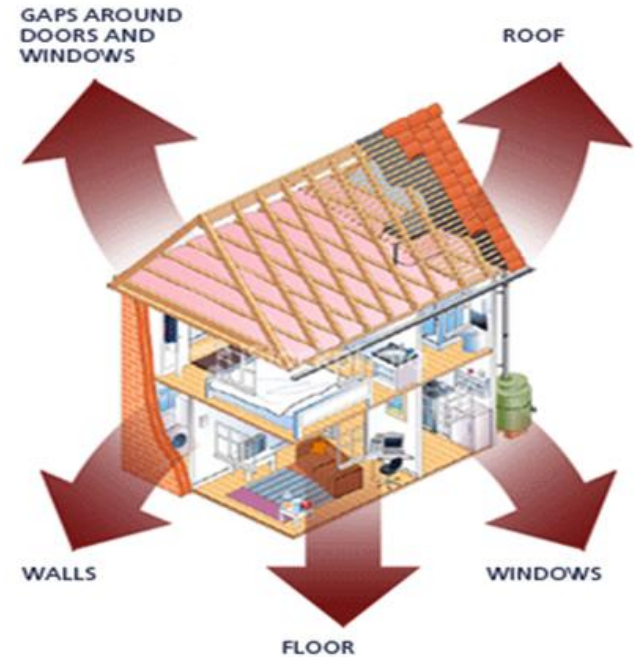
Insulation

Windows (low emissivity)

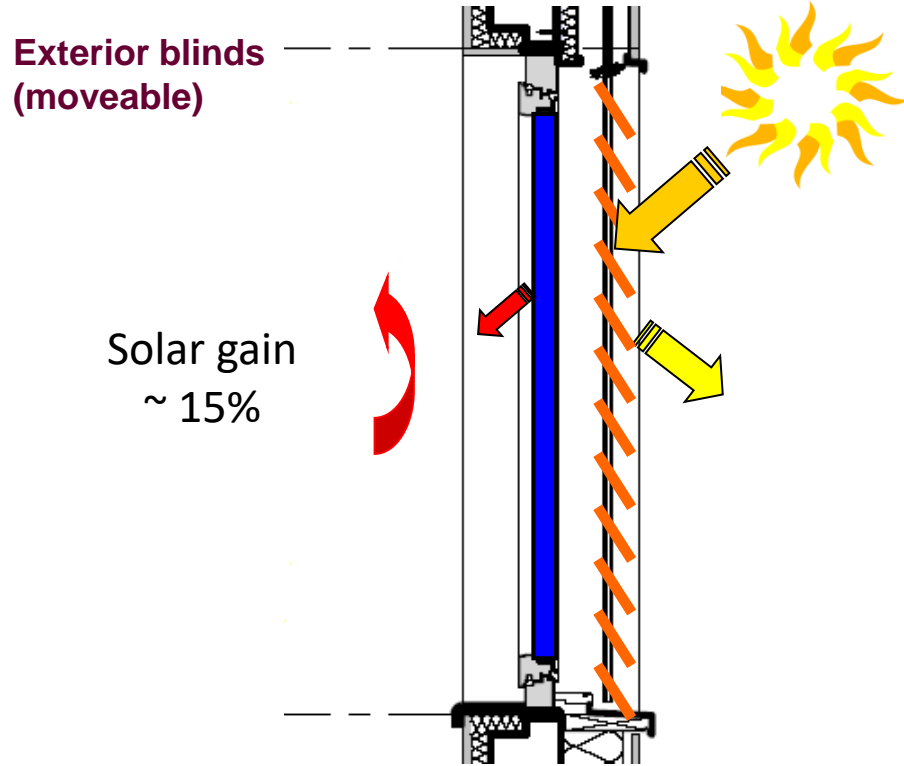
Roof (cool roof and green roof)

Air sealing

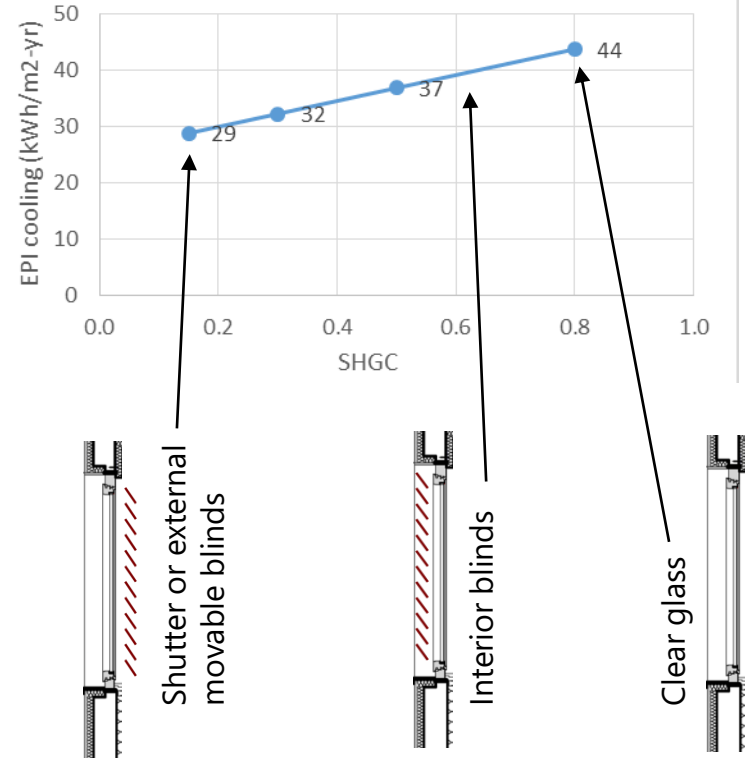
3D printing



Building envelope technology: internal vs. external shading



Source: BEEP India



Source: BEEP India

Roadmap for Buildings and Construction

Set targets for:

- Urban planning
- New buildings
- Building retrofits
- Building operations
- Systems
- Materials
- Resilience
- Clean energy

Envelope technologies

	Baseline status (2019)	Short-term (2030)	Medium-term (2040)	Long-term (2050)
Building envelope	Typical: $> _ \text{W/m}^2 \text{ OTTV}$ Exceptional: $< _ \text{W/m}^2 \text{ OTTV}$	Achieve: $_ \text{W/m}^2 \text{ OTTV}$ Aspire: $_ \text{W/m}^2 \text{ OTTV}$	Achieve: $_ \text{W/m}^2 \text{ OTTV}$ Aspire: $_ \text{W/m}^2 \text{ OTTV}$	Achieve: $_ \text{W/m}^2 \text{ OTTV}$ Aspire: $_ \text{W/m}^2 \text{ OTTV}$
Insulation	Typical: $_ \text{W/m}^2\text{°C}$ Exceptional: $\leq _ \text{W/m}^2\text{°C}$	$\leq _ \text{W/m}^2\text{°C}$ cold climate $\leq _ \text{W/m}^2\text{°C}$ hot climate	$\leq _ \text{W/m}^2\text{°C}$ cold climate $\leq _ \text{W/m}^2\text{°C}$ hot climate	$\leq _ \text{W/m}^2\text{°C}$ cold climate $\leq _ \text{W/m}^2\text{°C}$ hot climate
Windows (thermal)	Typical: $_ \text{W/m}^2\text{°C}$ Exceptional: $\leq _ \text{W/m}^2\text{°C}$	Achieve: $\leq _ \text{W/m}^2\text{°C}$ Aspire: $\leq _ \text{W/m}^2\text{°C}$	Achieve: $\leq _ \text{W/m}^2\text{°C}$ Aspire: $\leq _ \text{W/m}^2\text{°C}$	Achieve: $\leq _ \text{W/m}^2\text{°C}$ Aspire: $\leq _ \text{W/m}^2\text{°C}$
Windows (solar) + shading	Typical: $_ \text{SHGC}$ Exceptional: $_ \text{SHGC}$	Achieve: $_ \text{SHGC}$ Aspire: $_ \text{SHGC}$	Achieve: $_ \text{SHGC}$ Aspire: $_ \text{SHGC}$	Achieve: $_ \text{SHGC}$ Aspire: $_ \text{SHGC}$
Air tightness	Typical: $> _ \text{ACH}$ uncontrolled leakage Exceptional: $< _ \text{ACH}$	Achieve: $\leq _ \text{ACH}$ Aspire: $\leq _ \text{ACH}$	Achieve: $\leq _ \text{ACH}$ Aspire: $\leq _ \text{ACH}$	Achieve: $\leq _ \text{ACH}$ Aspire: $\leq _ \text{ACH}$

Building system technologies

Heat pump / air conditioner

Ventilation

Lighting

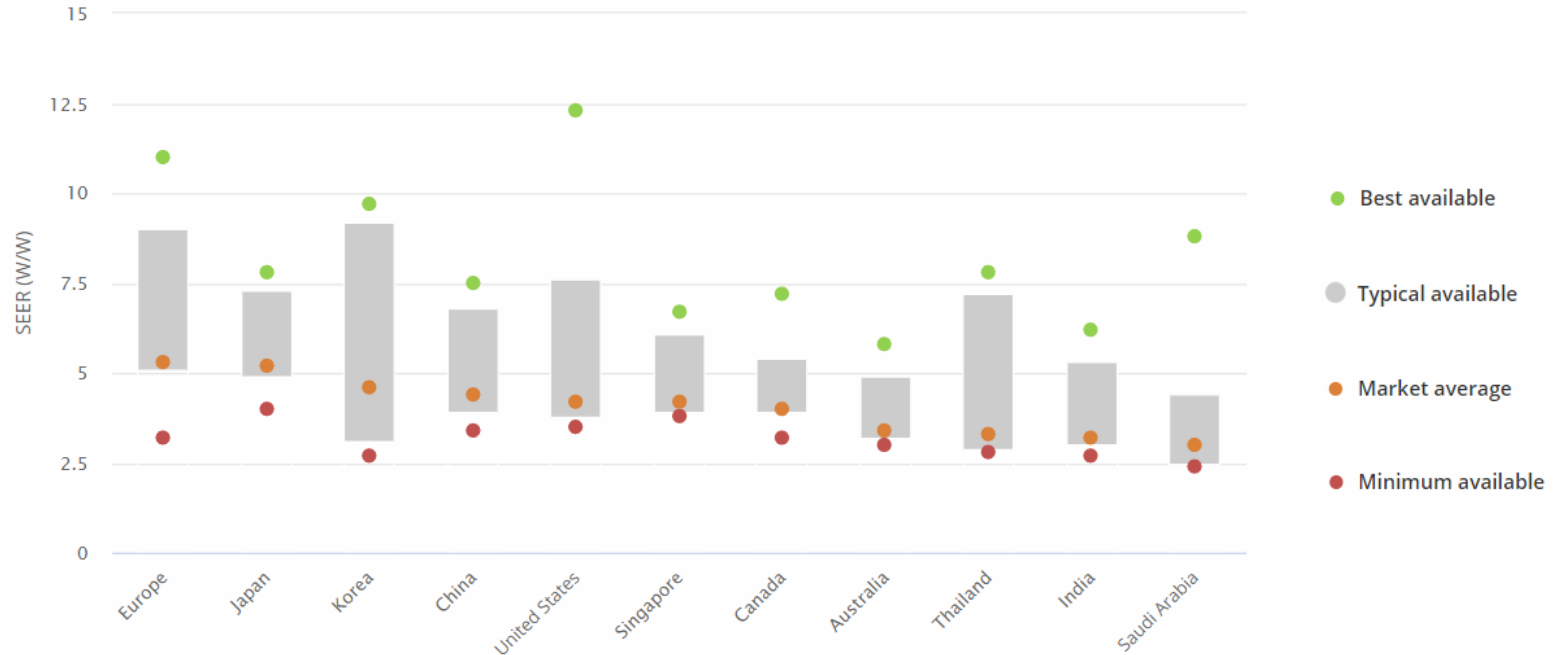
Clean cooking

Controls



Cooling

Seasonal energy efficiency ratio of residential ACs in key cooling markets, 2018



Market-available technology is more than twice as efficient as the average performance, while best available technology can be as much as five times more efficient.

Cooling and refrigeration

- Refrigerant fluids used in air conditioning equipment are harmful to the environment, either because of their damage to the **ozone layer**, or for the **Global Warming Potential** of their emissions.
- Transitions to cleaner, alternative fluids are underway, as well as a gradual phase down of the most harmful fluids under the **Kigali Amendment to the Montreal Protocol**.
- This is an opportunity to also transition to more efficient compressor technologies.
- The K-CEP programme is available to support economies in this phase down.



Find out more:

<https://www.k-cep.org/>
<https://ozone.unep.org/>

Lighting



Source: premierlightbulbs.com

Lighting is well on the path for a sustainable transition

Roadmap for Buildings and Construction

Set targets for:

- Urban planning
- New buildings
- Building retrofits
- Building operations
- **Systems**
- Materials
- Resilience
- Clean energy

		Baseline status (2019)	Short-term (2030)	Medium-term (2040)	Long-term (2050)
Heating, cooling and lighting	Space heating	Typical: __ COP Exceptional: > __ COP	Achieve: __ COP Aspire: __ COP	Achieve: __ COP Aspire: __ COP	Achieve: __ COP Aspire: __ COP
	Space cooling	Typical: __ EER and __ SEER Exceptional: ≥ __ EER and __ SEER	Achieve: __ SEER Aspire: __ SEER	Achieve: __ SEER Aspire: __ SEER	Achieve: __ SEER Aspire: __ SEER
	Ventilation	Typical: mechanical without energy recovery Exceptional: natural	Achieve: __% energy recovery Aspire: __% natural	Achieve: __% energy recovery Aspire: __% natural	Achieve: __% energy recovery Aspire: __% natural
	Water heating	Typical: __ COP Exceptional: > __ COP	Achieve: __ COP Aspire: __ COP	Achieve: __ COP Aspire: __ COP	Achieve: __ COP Aspire: __ COP
	Lighting	Typical: <100 lumens/watt Exceptional: >200 lumens/watt	Achieve: __ lm/w Aspire: __ lm/w	Achieve: __ lm/w Aspire: __ lm/w	Achieve: __ lm/w Aspire: __ lm/w

Roadmap for Buildings and Construction

Set targets for:

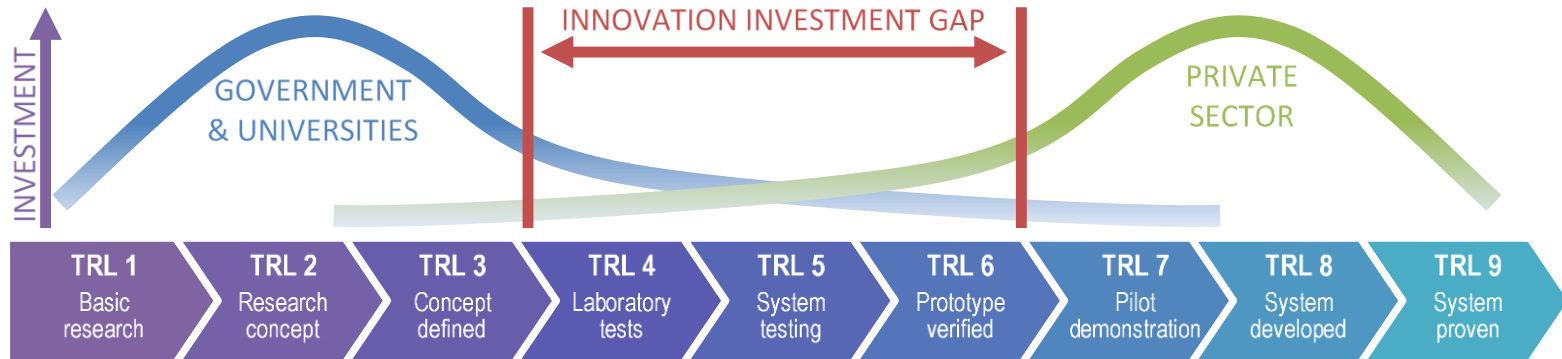
- Urban planning
- New buildings
- Building retrofits
- Building operations
- **Systems**
- Materials
- Resilience
- Clean energy

Appliances and controls

	Baseline status (2019)	Short-term (2030)	Medium-term (2040)	Long-term (2050)
Refrigerators	Typical: ___ kWh/year/litre Exceptional: ___ kWh/year/litre	Achieve: ___ kWh/year/litre Aspire: ___ kWh/year/litre	Achieve: ___ kWh/year/litre Aspire: ___ kWh/year/litre	Achieve: ___ kWh/year/litre Aspire: ___ kWh/year/litre
Cooking	___% clean cooking Typical: < ___% efficient	Achieve: ___% clean cooking Aspire: ___% efficient	Achieve: ___% clean cooking Aspire: ___% efficient	Achieve: ___% clean cooking Aspire: ___% efficient
Sensors and controls	Typically: digital, but not smart	Achieve: ___% smart Aspire: ___% smart	Achieve: ___% smart Aspire: ___% smart	Achieve: ___% smart Aspire: ___% smart
Management systems	Typical: simple or programmable Exceptional: learning and fault detection	Achieve: ___% smart Aspire: ___% smart	Achieve: ___% smart Aspire: ___% smart	Achieve: ___% smart Aspire: ___% smart

Technology Readiness Level

Technology Readiness Levels (TRL) and the technology development cycle

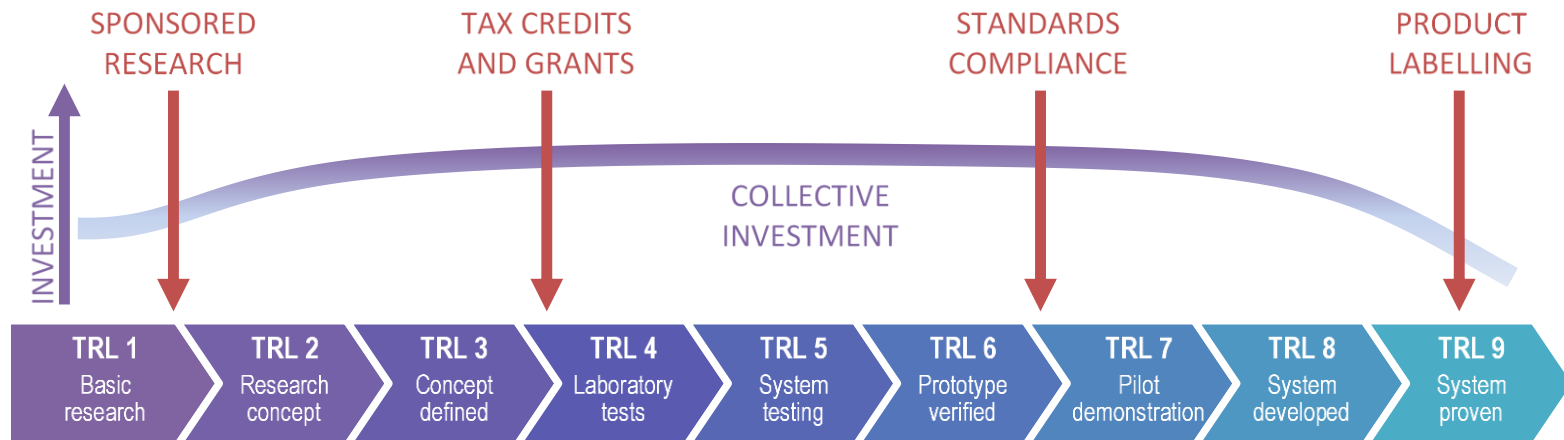


Sources: Adapted from Wikipedia (2019), GAO and the Executive Office of the President (2012).

Investment is needed to push products and services through the technology development stages. Products still in testing mode often fall into the “valley of death” investment gap. Policy and market strategies can help overcome this.

Pushing through the innovation investment gap

Policy and market strategies

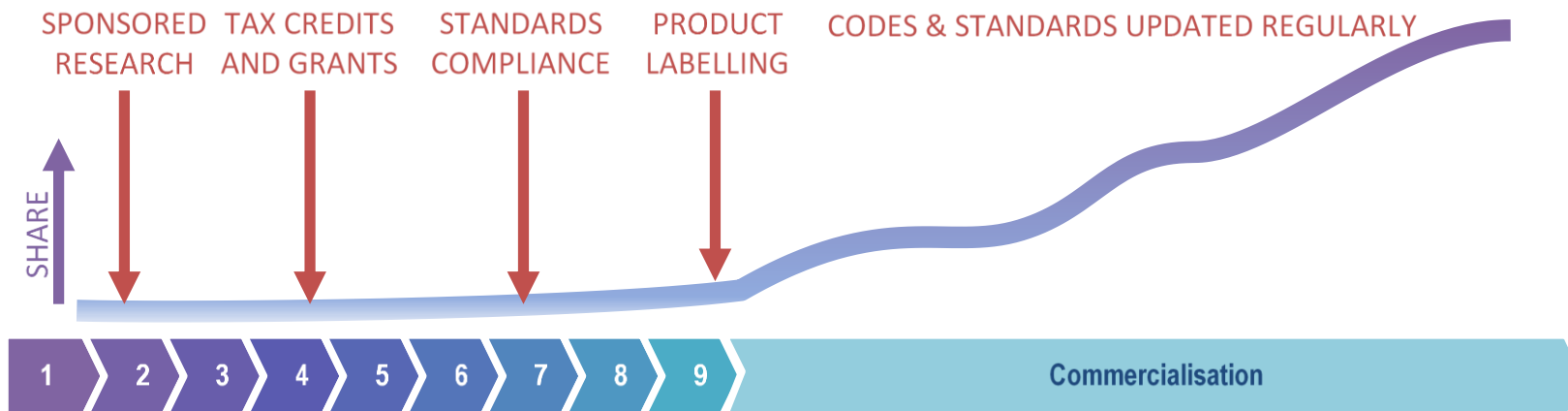


Sources: Adapted from IEA (2013) and Wikipedia (2019).

Standards and compliances and product labelling help pull products through the final stages by providing confidence of performance, and information to consumers on the benefits of these more energy efficient products.

Pushing through to commercialisation

Policy and market strategies



Sources: Adapted from IEA (2013).

Updating codes and standards maintains consumer confidence and helps transition the sector from old to new and efficient products and services.

Thank you!

Questions at the end of the session please.