Energy Efficient End-Use Equipment
International Energy Agency

APEC workshop

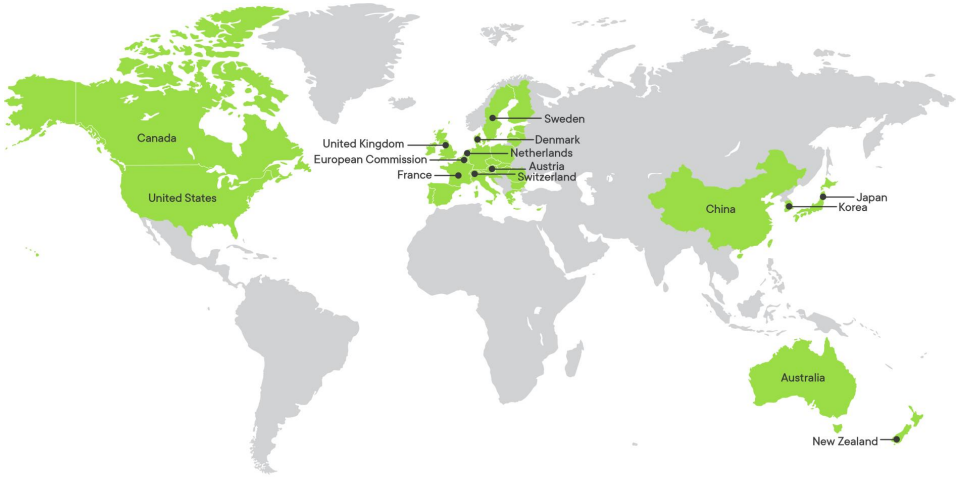
Best Practice Policies for energy-efficient appliances

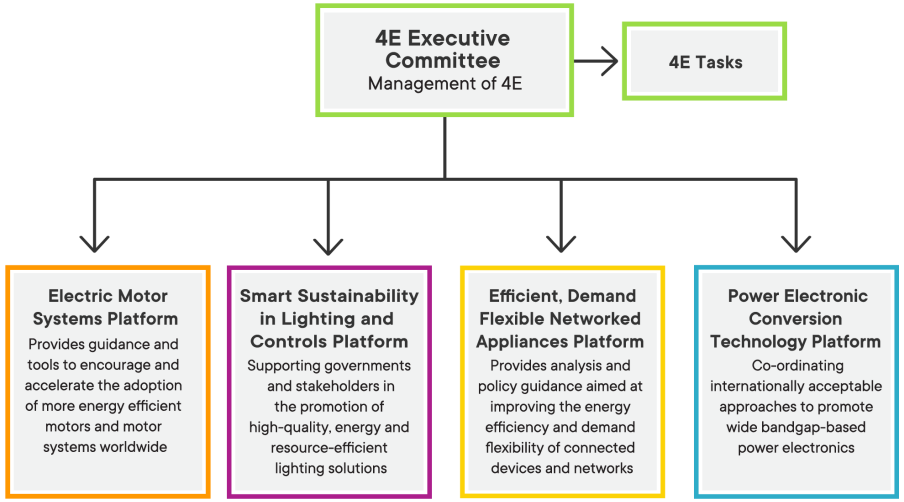
Kevin Lane, 4E TCP Programme Manager

Seoul, 18 November 2025

4E TCP overview

- An international platform for governments to collaborate on policy measures for energy efficient end-use equipment
- 15 members actively participate, including seven APEC members.





- Most 4E Members are represented by government agencies responsible for product policy.
- Strategic collaboration and partnerships:
  - IEA, other TCPs, coordination groups
  - Energy Efficiency Hub, DWG, SEAD, EnR

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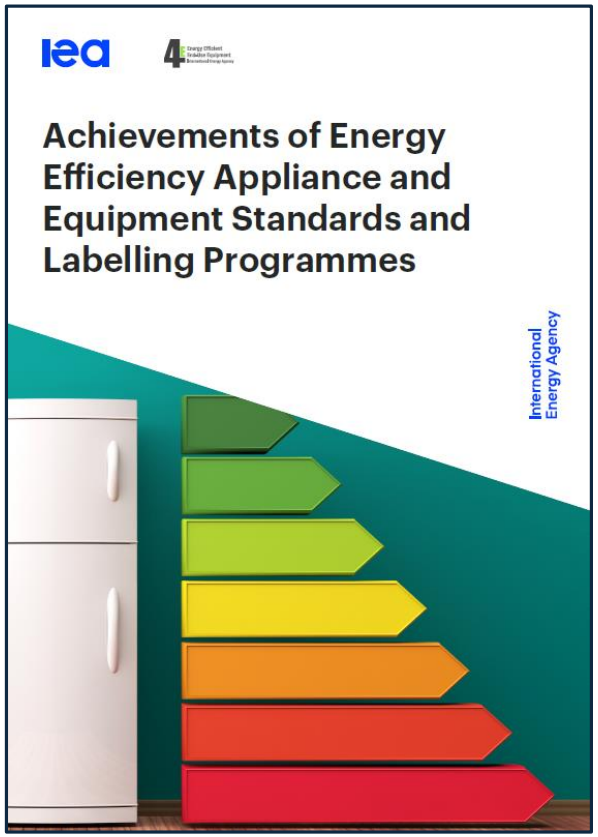
Governments - MEPS, labels and other measures

- Key Government-related policy
  - **MEPS** – Mandatory minimum energy efficiency performance standards, barring the most inefficient from the market
  - **Mandatory labels**. Regulated labels so consumers have information on the efficiency of appliances
  - **Endorsement labels**, voluntary, and sometimes paid for (such as Energy Star)
  - **Incentives** – such as rebates to purchase more efficient appliances. Include social dimension
- Supporting measuring performance. Underlying testing procedures required
  - National standards, usually based on international one (e.g. IEC, ISO)
- Monitoring and verification - compliance with regulations

What are the benefits of MEPS and labelling

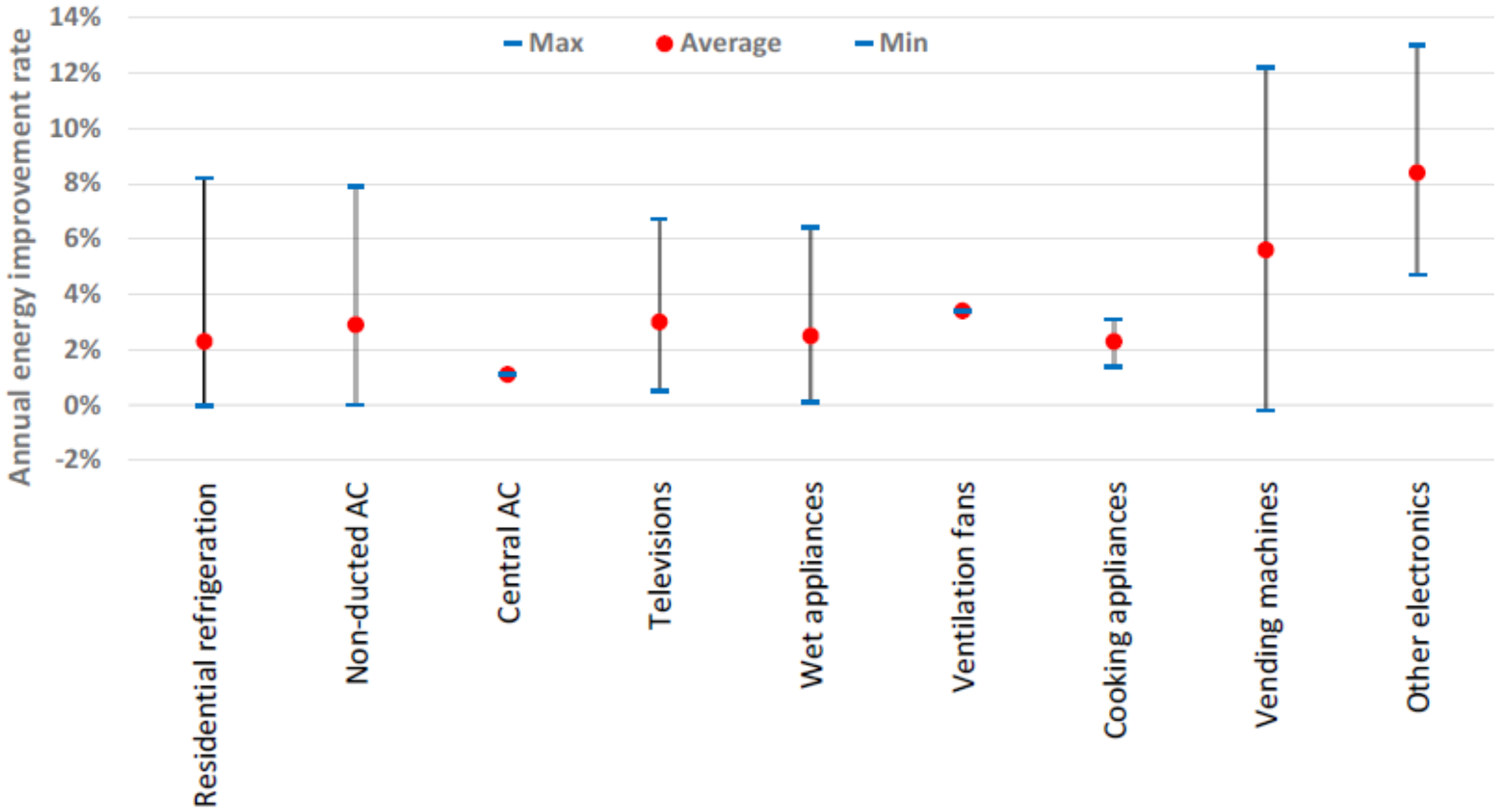
From review of ex-post evaluations by 4E:

- Over 120 countries use these policies
- Benefit of programmes exceed their costs by ratio of 4 to 1
- Generating employment, over 1 million direct jobs per year in the EU, 300 000 in USA due to spend on more efficient appliances
- Appliance prices falling, 2-3% pa, during period of increased efficiency
- Longest running programmes with economy savings of 15% of electricity consumption



Ex-post analysis highlights saving opportunities

Annual energy reduction in new-product energy consumption from EES&L programes



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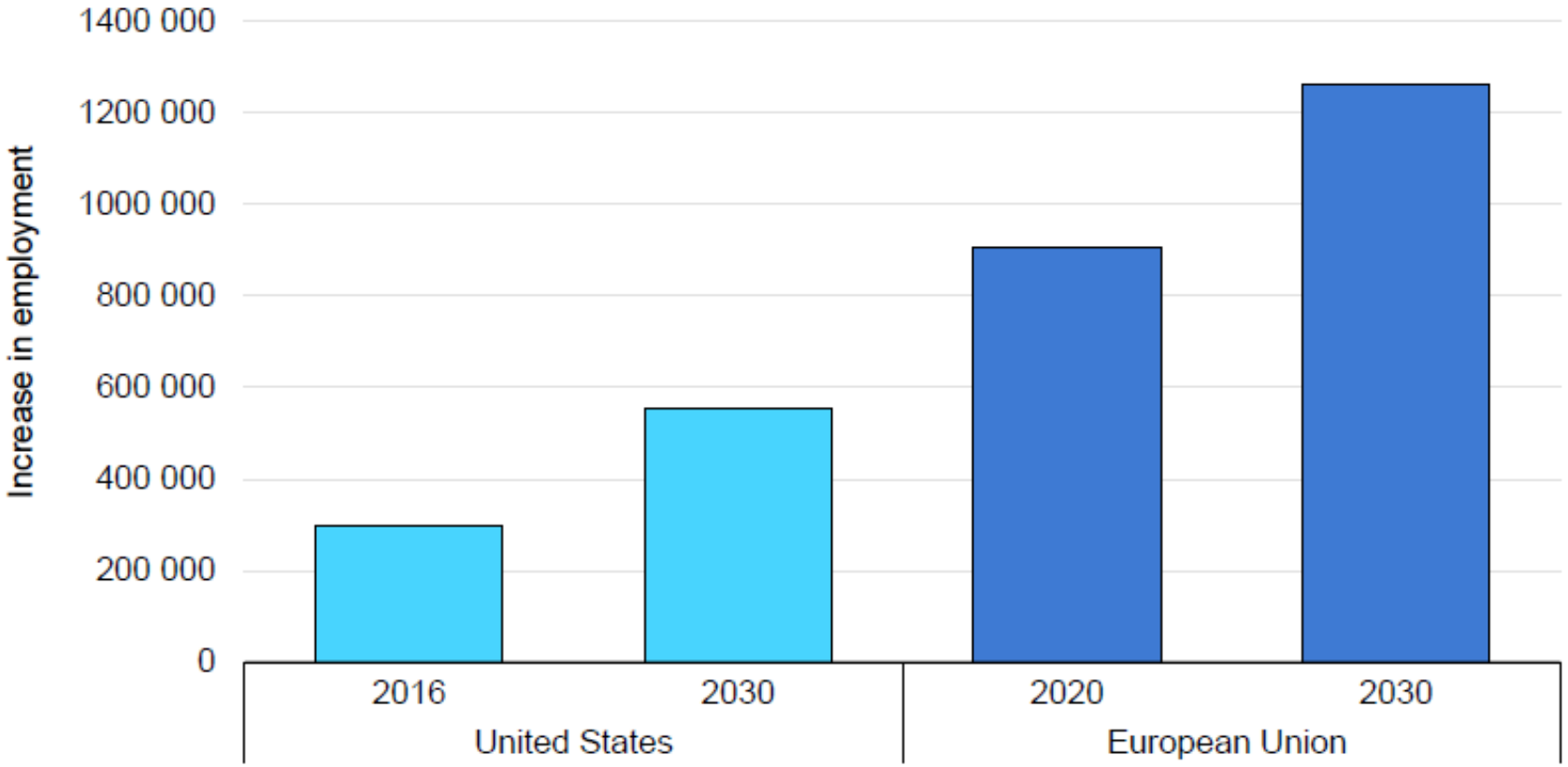
Direct employment effects of standards and labelling programmes



IEA/4E TCP (2021), Achievements of Energy Efficiency Appliance and Equipment Standards and Labelling Programmes, IEA, Paris (2021), License: Creative Commons Attribution CC BY-SA 3.0 IGO https://www.iea.org/reports/achievements-of-energy-efficiency-appliance-and-equipment-standards-and-labelling-programmes, Licence: CC BY 4.0

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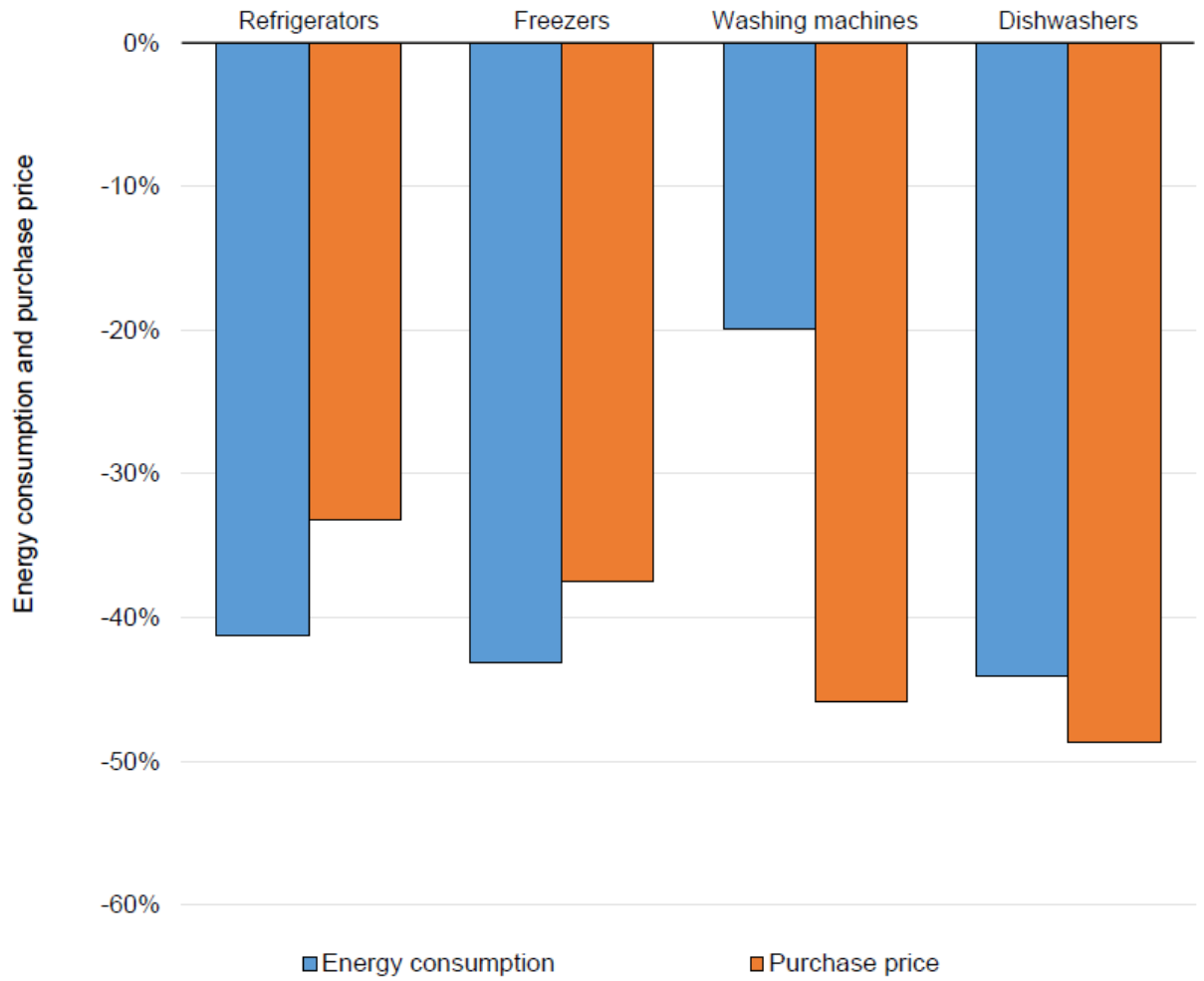
Changes in residential appliance prices and energy performance in Australia, 1993-2014



Appliance prices have fallen, whilst increased in energy efficiency and reduced energy consumption

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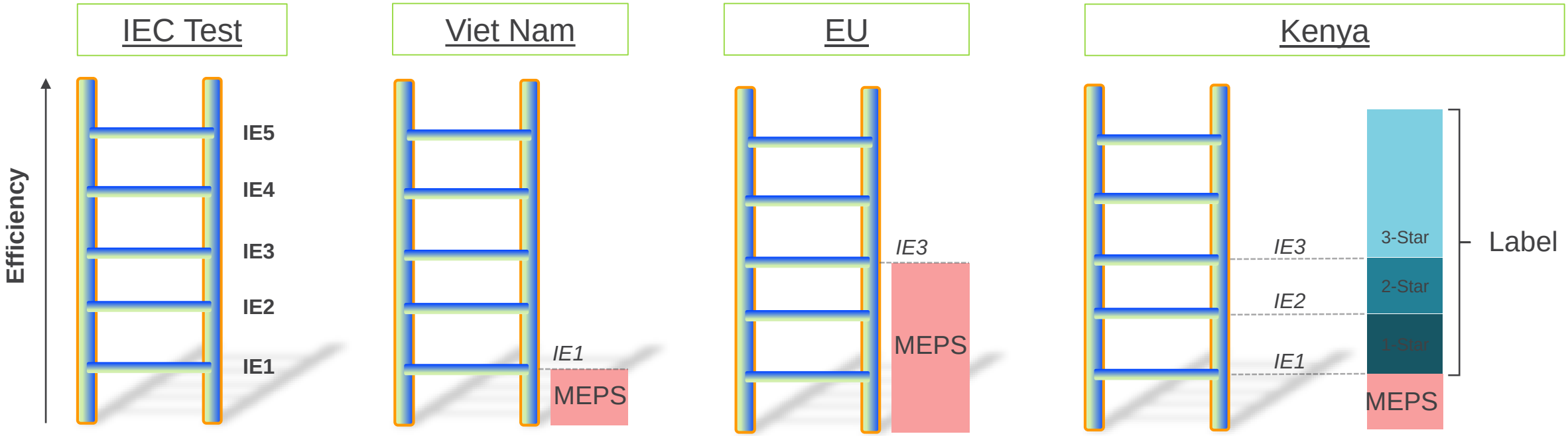
Success factors – overcoming challenges

- Signposting
  - provides time and clarity for stakeholders
- Engagement with stakeholders and consumers
- The role of data in MEPs setting
- Peer technical exchanges
- Compliance
  - Monitoring, verification and enforcement
- Harmonization
  - Lowers cost for all
  - Simpler to implement and comply

Example: Motors – All countries employ the same ladder



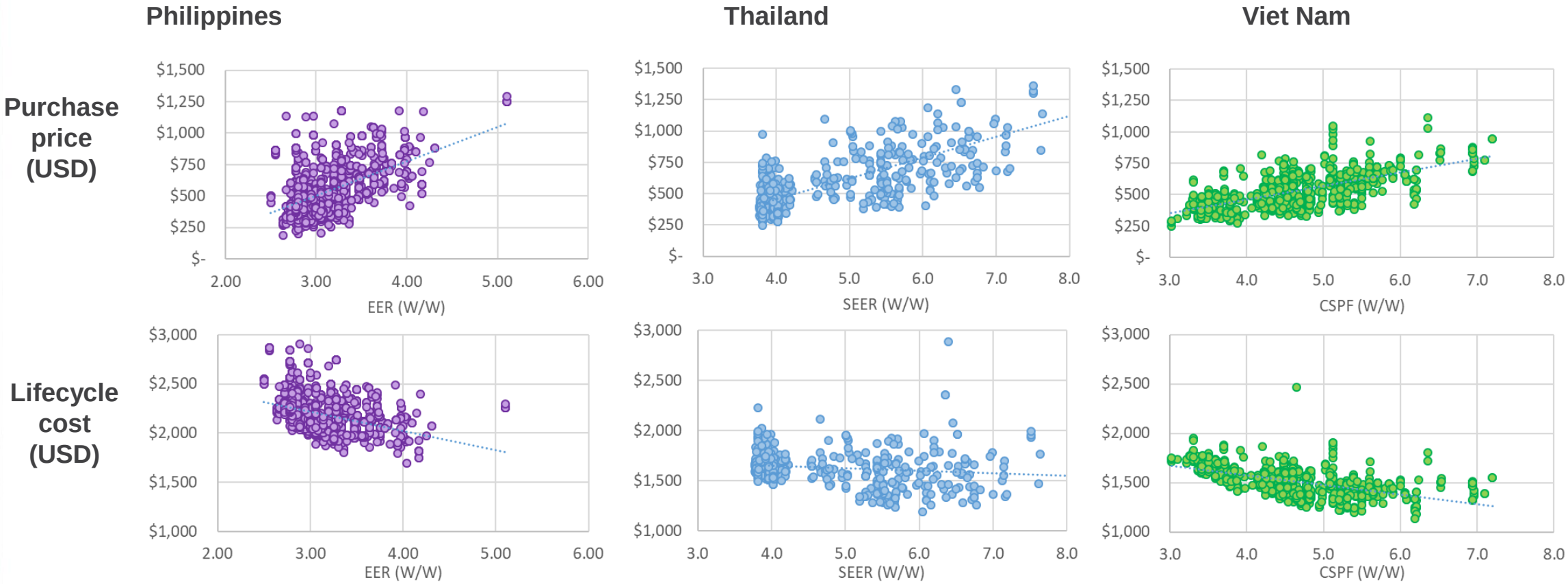
All countries can use the same ladder for their policy thresholds.

Viet Nam (IE1) and the EU (IE3) use different levels for Minimum Energy Performance Standards (MEPS).

Whilst, Kenya currently uses (IE) tiers for its 3-star energy labelling of new electric motors.

Residential ACs – Cost vs

- Purchase price and lifecycle cost vs. efficiency in selected ASEAN markets in 2019



Notes: ACs normalised to electricity consumption of 1,000 kWh/year and cooling capacity of 12,000 BTU/hr. Source: Based on IEA (2019). The Future of cooling in Southeast Asia.

- Despite higher purchase prices, more efficiency ACs can have lower lifecycle costs
- thanks to lower energy running costs

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Peer technical exchanges

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Electric Motor Systems Platform - EMSA

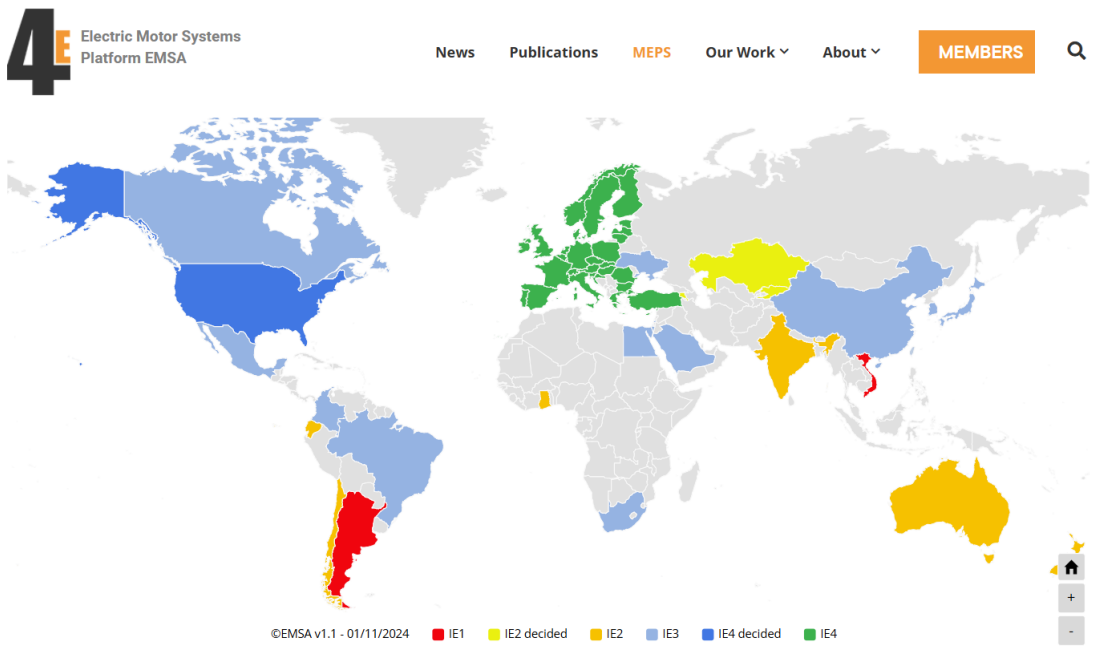
Electric motors consume over half the world's electricity

Potential to reduce demand by 20-30% with good policy.

Recent work include:

- Demand Flexibility and Digitalisation
- Testing standards, international standards
- Motor systems tool
- Mapping policy developments (especially MEPS)
- Outreach, policy research

Special collaboration area for 4E members



The colour reflects the highest requirement for electric motors in a country. The categories 'IE2 decided' and 'IE4 decided' mean a regulation to apply IE2 or IE4 respectively has been adopted and the requirement will be applicable from a future date.
Disclaimer: This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Sustainability in Lighting and Controls Platform (SSLC)

- New lighting technologies, including controls, offer to reduce global electricity use of lighting by 50%
- Convening governments, industry experts, and academia.
- Analysis to transform markets, improving efficiency and quality
- Recent work includes:
  - Product performance
  - Testing, laboratory comparison
  - Overview of health effects
  - Policy developments

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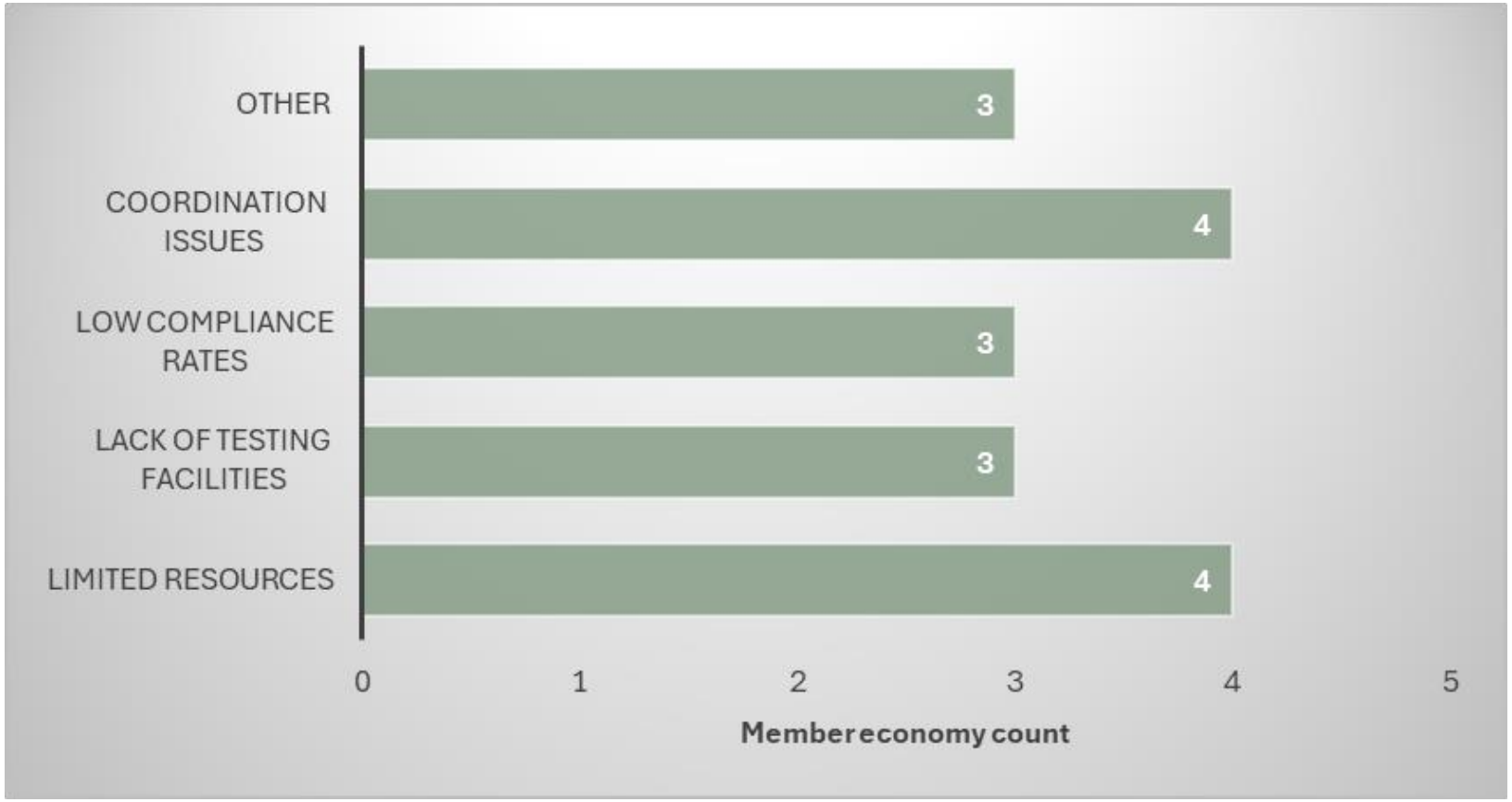
Compliance challenges

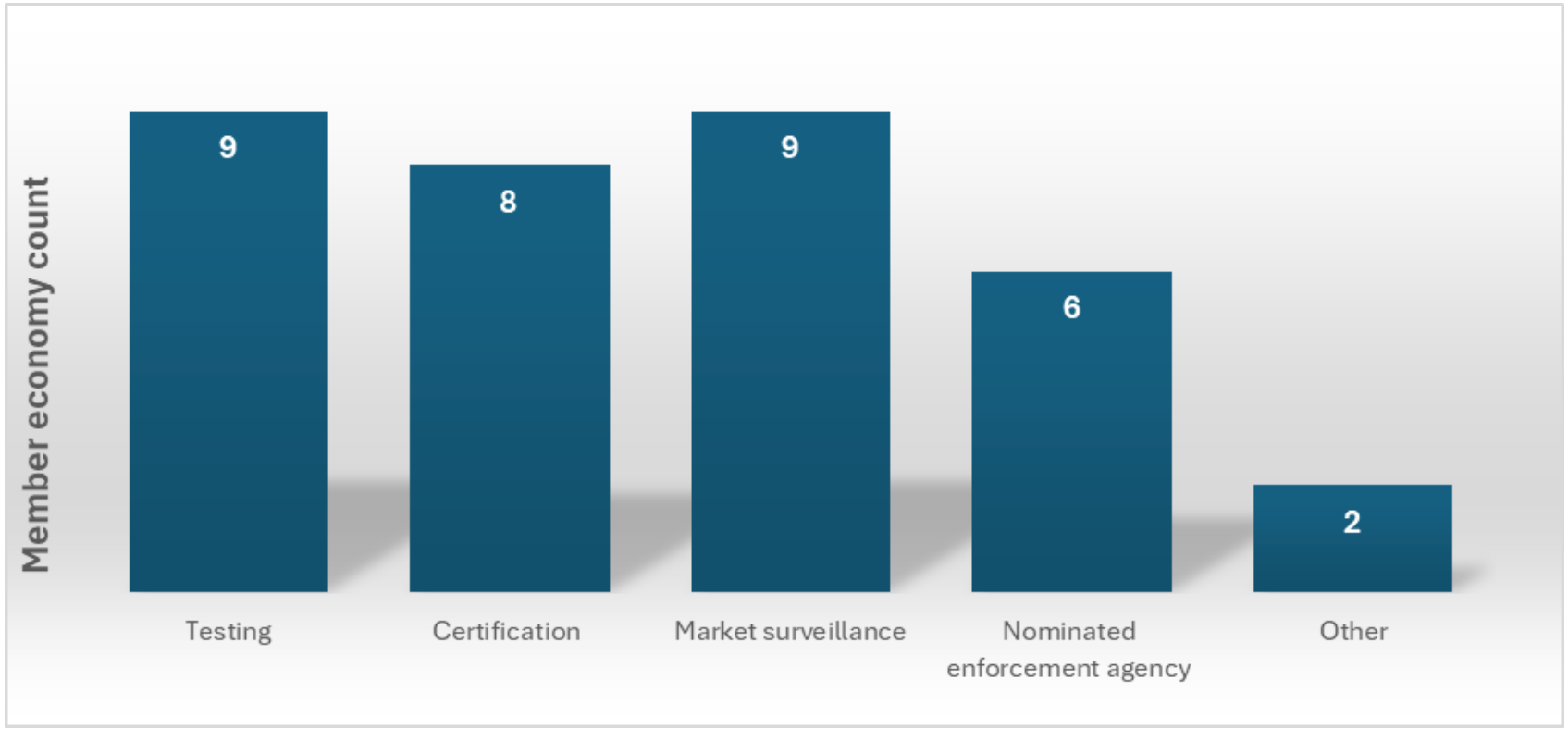
APEC Workshop Survey – What are the Key Enforcement Challenges for MEPs?
Interim Results – confidential – not for wider distribution



Source: APEC workshop survey results

Compliance processes

APEC Workshop Survey – What Processes Exist to Ensure Compliance with MEPs?
Interim Results – confidential – not for wider distribution



Source: APEC workshop survey results

Harmonization

- This includes several aspects
  - Testing procedures (support and reference IEC, etc.)
  - Performance levels (ideally similar thresholds)
- Other presentations today on this topic

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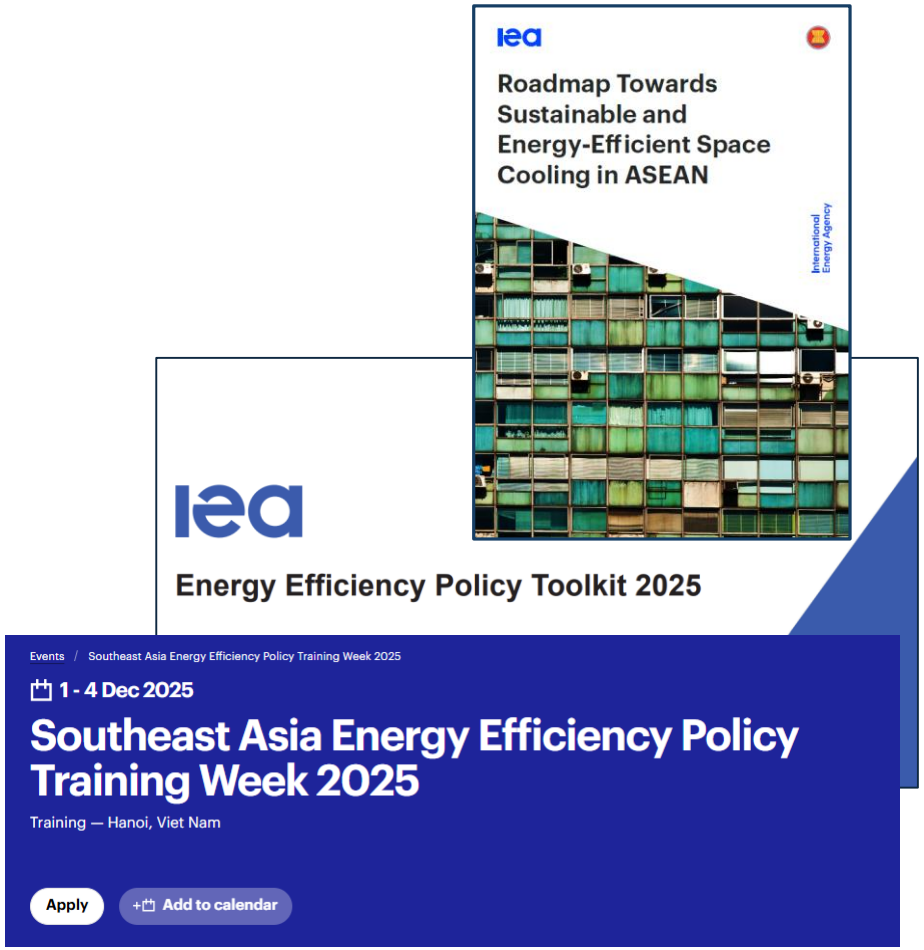
IEA

- Word energy outlook, 2025
- Southeast Asia Energy Outlook 2024
- Policy database: Policy database – Data & Statistics
- Policy reviews. Data and statistics

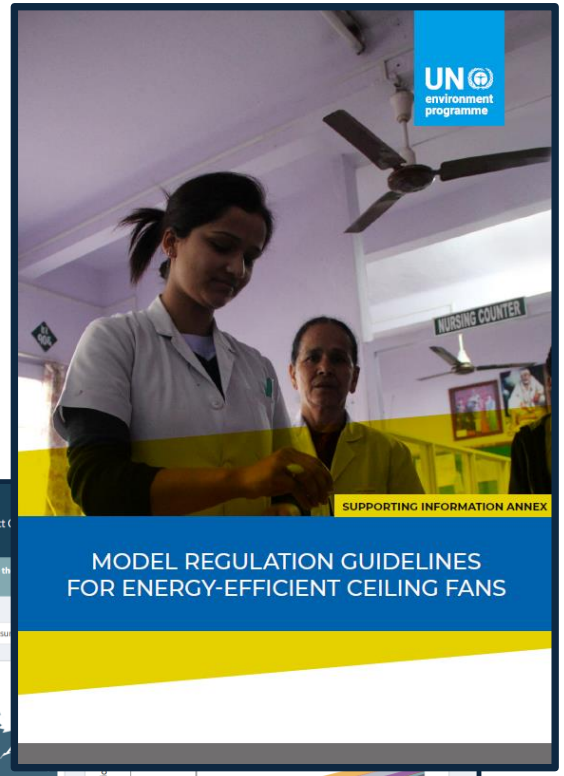
Office of Energy Efficiency and Inclusive Transitions

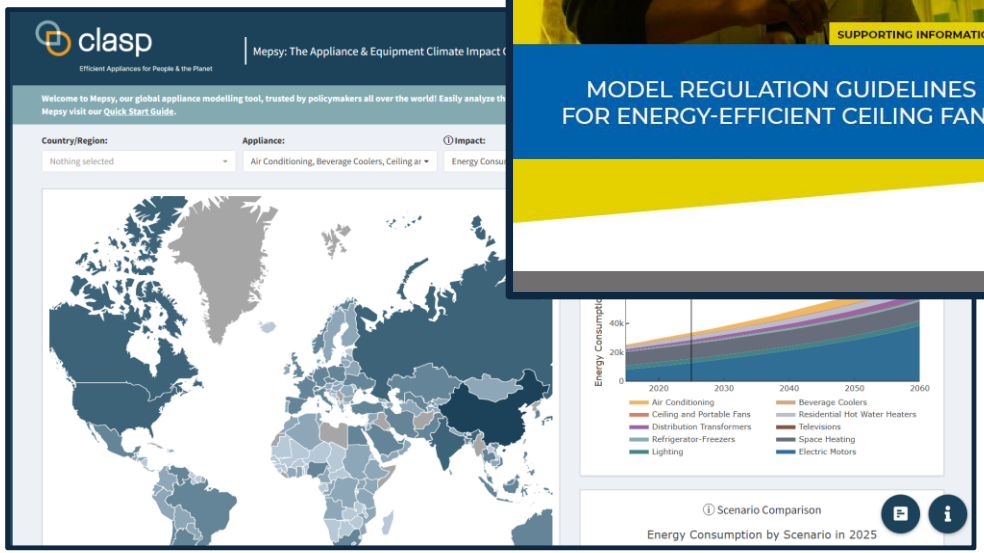
- Energy Efficiency Policy Toolkit: Case studies – Energy Efficiency Policy Toolkit 2025
- Multiple Benefits of Energy Efficiency
- Appliance – Energy Efficiency Policy Toolkit 2025
- Energy Efficiency Policy Training Week 2025
- On-line training course: Appliance Energy Efficiency Policy



Resources United for Efficiency, CLASP

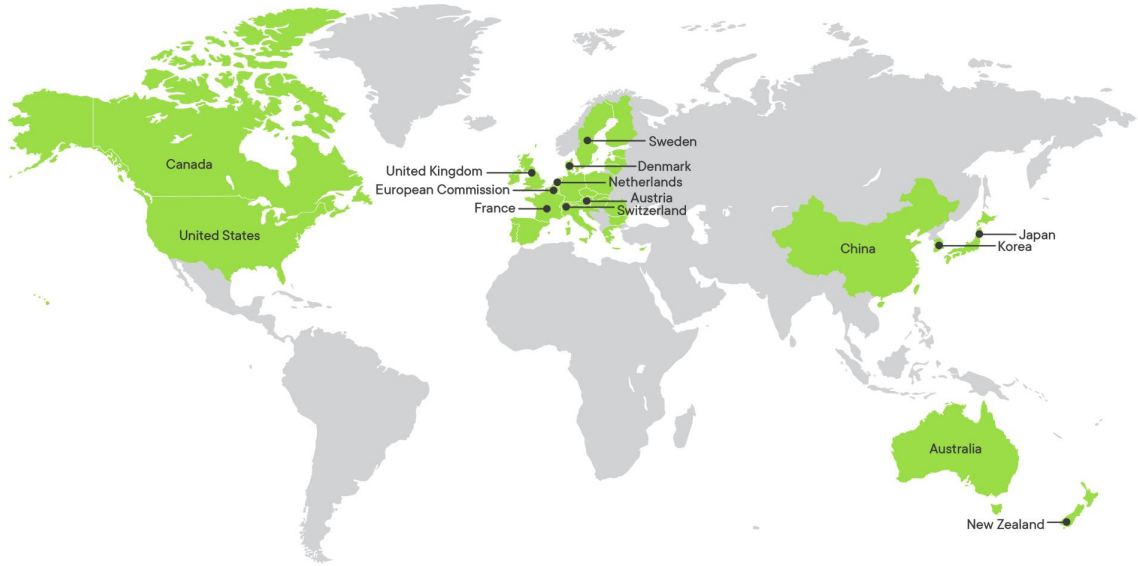
- UNEP, United for Efficiency (U4E)
  - Model regulations,
    - **Ceiling fans**, air conditioners, refrigerators, commercial refrigerators, industrial motors
  - Economy savings assessments
  - Registration systems
- CLASP
  - Policy database, best MEPS
  - MEPSY, off grid
- Energy Efficiency Hub, SEAD
  - Training, performance ladders
  - Double efficiency, COP 30





Contact and further 4E TCP information

- Website
  - https://www.iea-4e.org/
- Outputs
  - https://www.iea-4e.org/publications/
- Contact
  - Programme Manager: Kevin.Lane@iea-4e.org
  - Chair: Thore Stenfeldt (DEA)



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Additional Slides

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4E Overview

Standard slides

Energy Efficient End-use Equipment (4E)

The 4E TCP

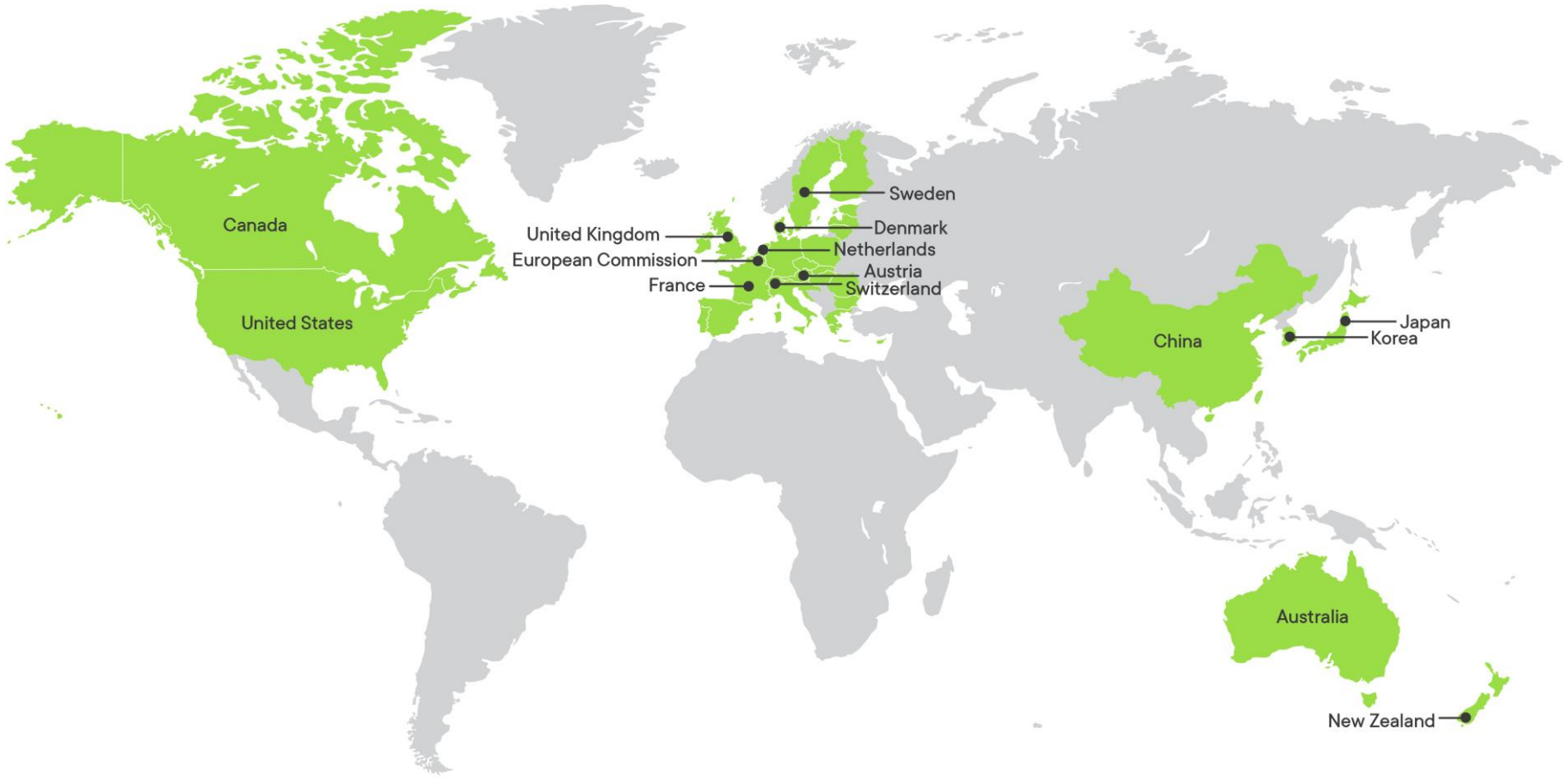
- The 4E Technology Collaboration Programme (4E TCP) is a multilateral mechanism established by the International Energy Agency (IEA) with a belief that the future of energy security and sustainability starts with global collaboration.
- The 4E TCP is made up of many of experts across 15 governments, academia and industry dedicated to advancing common research and the application of specific energy efficient technologies.

Disclaimer

- The 4E TCP is organised under the auspices of the International Energy Agency (IEA) but is functionally and legally autonomous. Views, findings and publications of the 4E TCP and its Platforms (EDNA, EMSA, PECTA, SSLC) do not necessarily represent the views or policies of the IEA Secretariat or its individual member countries.

Strategic partnerships and collaboration

Governments of the 4E TCP



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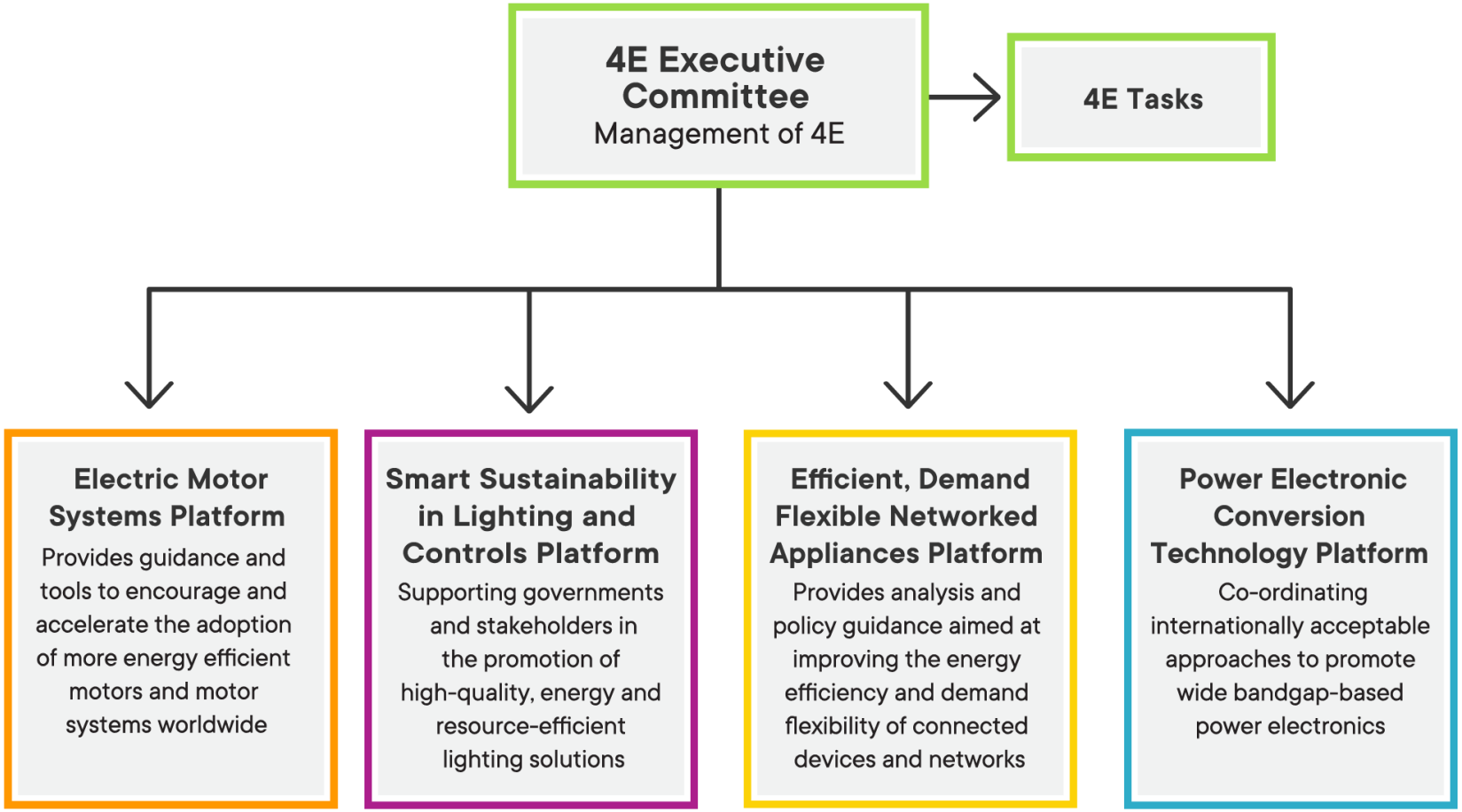
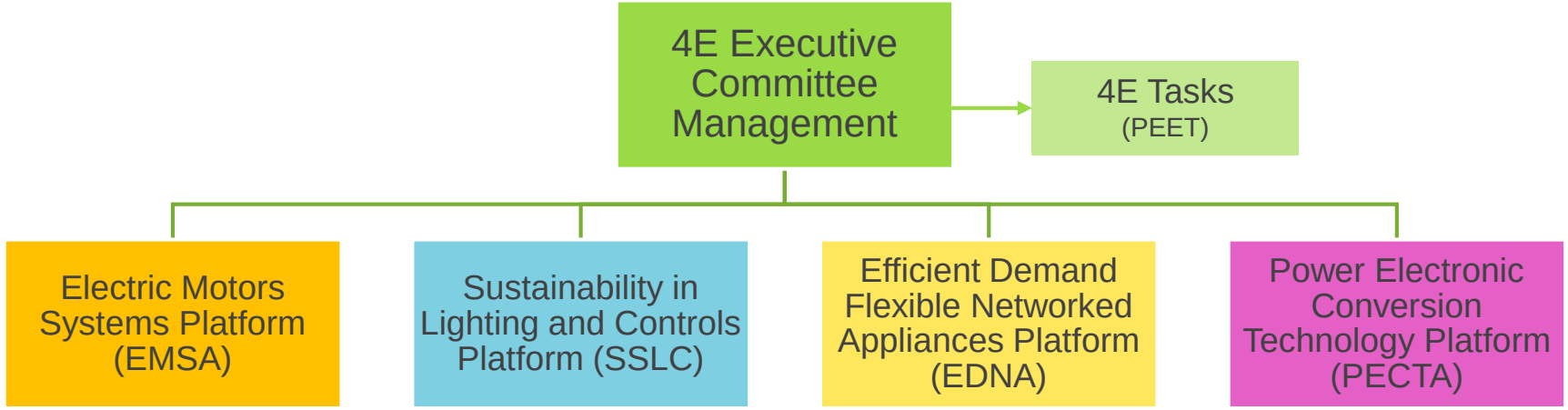
4E Organisational structure



4E TCP – structure and strategic importance

- Technology Collaboration Programme (TCP) by IEA, since 2008
- Areas of strategic importance, 2024-2029
  - Demand flexibility of appliances and equipment
  - Energy-using systems
  - Deployment of emerging technologies
  - Cross cutting topics (e.g. MV&E)



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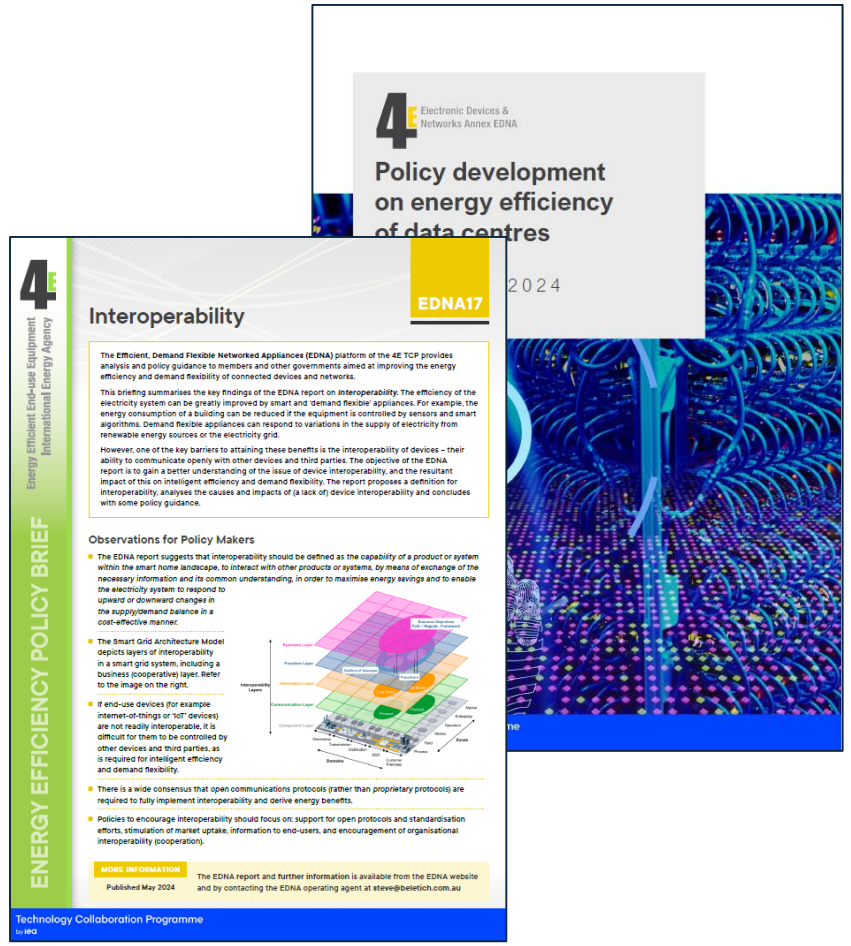
4E Platforms

Demand Flexible Networked Appliances Platform (EDNA)

- Analysis and policy guidance to improve efficiency and demand flexibility of connected devices and networks.
- Analysis to transform markets, improving efficiency and quality
- 4E EDNA convening governments, industry experts, and academia.
- Recent work include:
  - New battery technologies
  - Energy management protocols
  - Interoperability
  - Demand flexibility
  - Data centres energy consumption



Partner organizations of APEC economies

APEC Code	APEC Economy	IEA full member	IEA Accession economy	IEA Association economy	IEA E4 economy	4E TCP membership	EE Hub membership	SEAD membership	ASEAN member
AUS	Australia	1				1	1	1	
BD	Brunei Darussalam								1
CDA	Canada	1				1	1	1	
CHL	Chile		1					1	
PRC	China			1	1	1	1	1	
HKC	Hong Kong, China								
INA	Indonesia			1	1			1	1
JPN	Japan	1				1	1	1	
ROK	Republic of Korea	1				1	1	1	
MAS	Malaysia								1
MEX	Mexico	1			1			1	
NZ	New Zealand	1				1			
PNG	Papua New Guinea								
PH	The Republic of the Philippines								1
RUS	The Russian Federation						1	1	
SGP	Singapore			1					1
CT	Chinese Taipei								
THA	Thailand			1					1
US	United States	1				1	1	1	
VN	Viet Nam								1
PE	Peru								
COUNT	**21**	**7**	**1**	**4**	**3**	**7**	**7**	**10**	**7**

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Power Electronic Conversion Technology Platform (PECTA)

Information and analysis about new wide band gap (WBG) based power electronic devices.

Uptake of WBG technology could avoid up to 120 TWh/year.

Power conversion application technology opportunities include:

- PV inverters (largest)
- Low voltage drives in motor systems
- EV charging

Latest developments:

- Application Readiness Maps
- 4E PECTA Ecodesign workshop, 26 November 2024, Grenoble.