



**IEA Technology  
Collaboration Programme  
on Energy Efficient  
End-Use Equipment (4E)**

**ANNUAL REPORT 2017**



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# Chair's Statement

2017 has been my first full year as Chair of 4E and I continue to be astounded at the scope and depth of its activities, as well as by the dedication of all the people that contribute.

Just as importantly, I was very pleased to receive similar feedback from everyone I met at the International Energy Agency (IEA) on my visit to Paris in October. With the increasing emphasis given to energy efficiency within the work of the IEA, I would like to see 4E playing a critical role alongside other Technology Collaboration Programs (TCPs).

Certainly, our association with the IEA is highly valued by all members of 4E – something that came out strongly during our mid-term review discussions this year. We intend to grow this linkage and it was therefore gratifying to provide a major input to both the 'Energy Efficiency Market' and 'Digitalisation and Energy' reports.

While the IEA is a very important partner, we have worked hard this year to strengthen many other strategic linkages, not least with a range of organisations from industry. This year we have been involved in more dialogues with industries involved in motor systems, lighting and connected devices than ever before. As always, this has helped to build mutual understanding and respect, and lead to better policy advice.

As you will see in this Annual Report, throughout 2017 4E has continued to develop a range of information and tools to assist governments to develop better energy efficiency policies for appliance and equipment. A recent survey showed that almost all members have used 4E materials in their national (or regional) policy development processes, which I consider an indication that we are both effective and influential.

As we move in 2018 and begin to prepare for the next phase of 4E from 2019, my aim is to ensure that we continue to harness 4E's unique resources to serve the policy needs of our member and other governments.

**Michelle Croker**  
Chair 4E



Assistant Secretary  
Appliance and Building Energy Efficiency Branch  
Government of Australia



“  
This year we have been involved in more dialogues with industries involved in motor systems, lighting and connected devices than ever before.”

## PRIORITY ACTIVITIES

- SOLID STATE LIGHTING
- ELECTRONIC DEVICES & NETWORKS
- STANDBY POWER
- POWER ELECTRONIC CONVERSION / TECHNOLOGY
- MAPPING & BENCHMARKING
- POLICY SUPPORT
- ROADMAPS
- OUTREACH TO NONMEMBER COUNTRIES
- CAPACITY BUILDING / TRAINING



Encouraging Intellectual Study of Policy Opportunities

MARCH 2017



4E Energy Efficient End-use Equipment International Energy Agency IEA EFFICIENCY POLICY BRIEF

## Voluntary Agreements



### Observations for Policy Makers

- Since 2000 the majority of VAs studied have been implemented in Europe, the United States and Switzerland.
- To implement minimum performance levels for communications technology (ICT). These include Canada and Australia, covering products such as networked equipment, imaging equipment, etc.
  - To establish the voluntary labelling of equipment for energy conditioning, commercial refrigeration, motor equipment, etc.
- Our analysis shows that:
- In general, the VAs studied appear to have resulted in energy savings, however the level of ambition varies.
  - VAs usually take 1-2 years to come into force, where the level of ambition is raised, with increasing participation in the process.
  - Where all parties agree, VAs can be modified to cover product types or functionalities.
  - For product categories where there is limited technological potential, VAs can enable both parties to improve their understanding.



## Energy Efficiency of Electric Vehicle Supply Equipment - EVSE

A Scoping Study

DECEMBER 2017



# Key 4E achievements in 2017

### FEBRUARY



#### REPORT

Domestic gas and electric, storage, instantaneous and heat pump water heaters

### MARCH



#### WORKSHOP

G20 CDA Networked Devices, Berlin

### APRIL



REPORT  
Policy Options to Encourage Intelligent Efficiency

### JUNE



REPORT  
Lessons Learnt Bringing LEDs to Market

### SEPTEMBER



WORKSHOP  
EEMODS, Italy

### OCTOBER



REPORT  
IEA Energy Efficiency 2017

### NOVEMBER



WORKSHOP  
International Motors Conference China

### DECEMBER



REPORT  
The Effectiveness of Voluntary Agreements



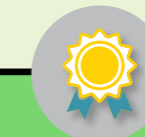
CAPACITY BUILDING  
2017 Interlaboratory Comparison of Goniophotometer Measurements



WORKSHOP  
Digitalization of the Energy Sector to Enhance Energy Productivity & Renewable Integration, Clean Energy Ministerial, Beijing



REPORT  
IEA Digitalisation and Energy




AWARD  
SEAD Connected Efficiency Awards



WORKSHOP  
Meeting Energy Efficiency Goals through Digitalisation, Canberra



REPORT  
Energy Efficiency of Electric Vehicle Supply Equipment



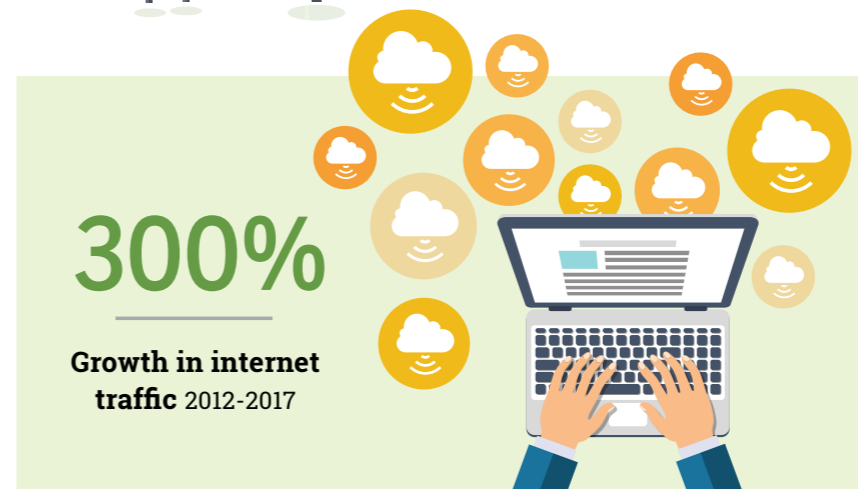
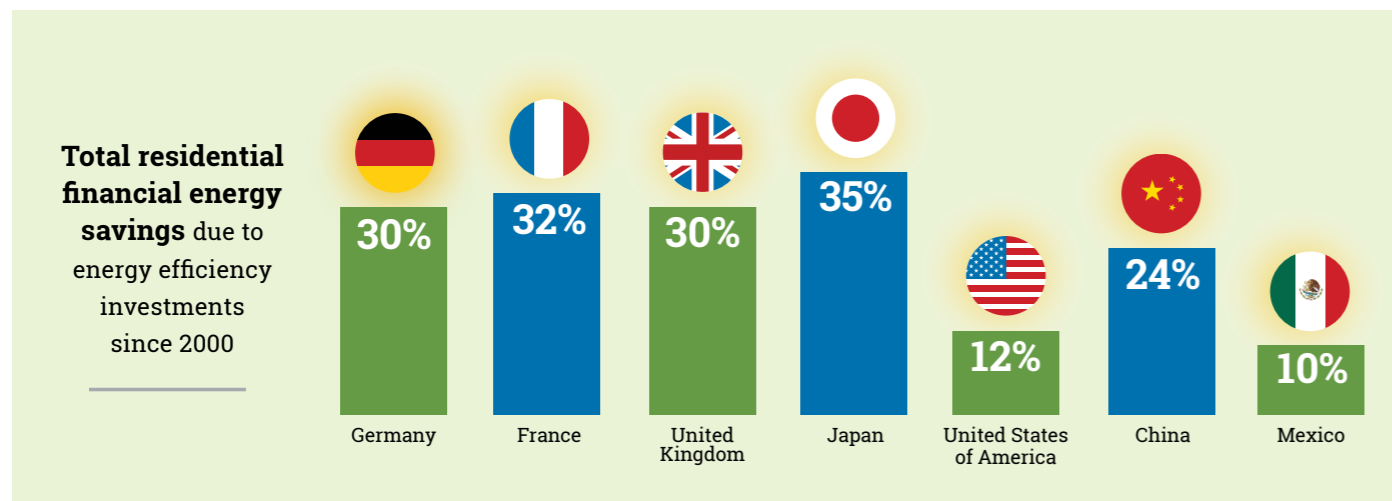
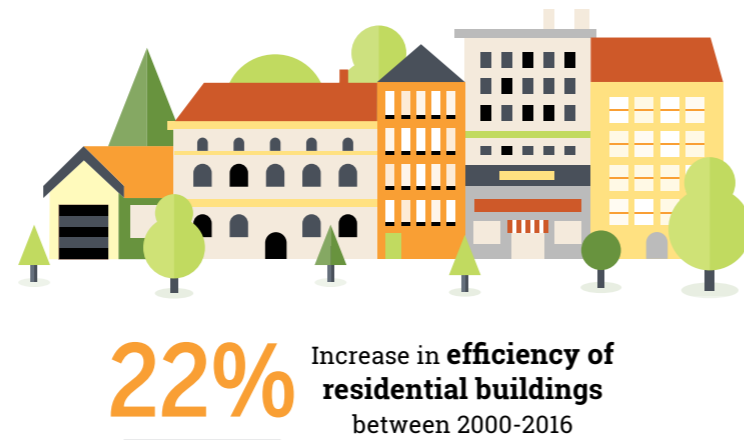
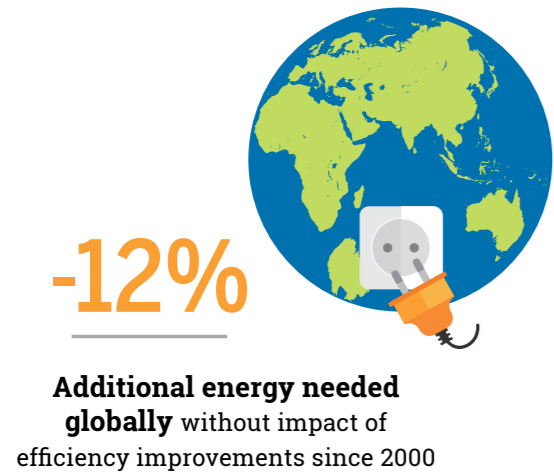
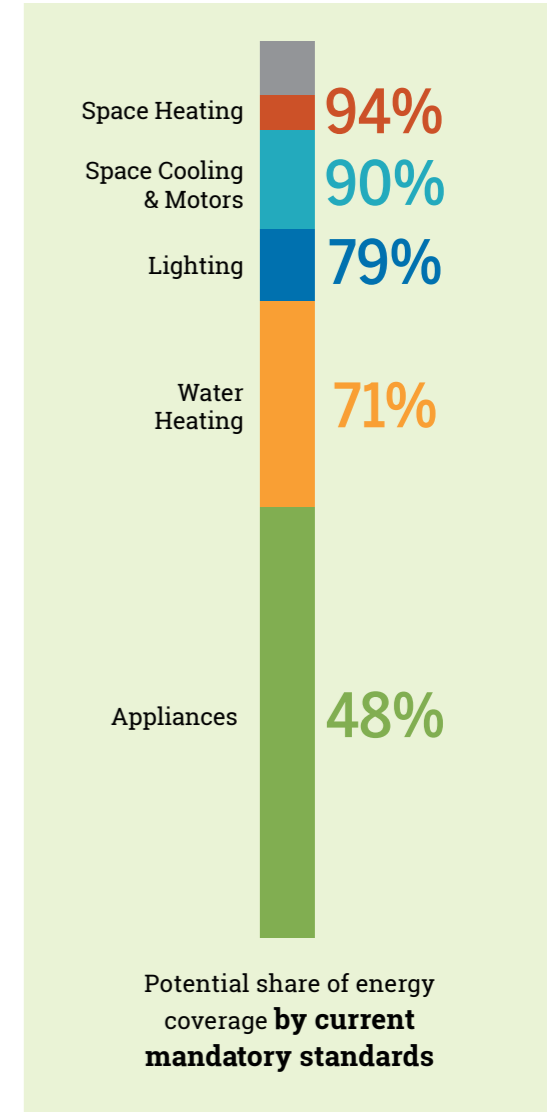
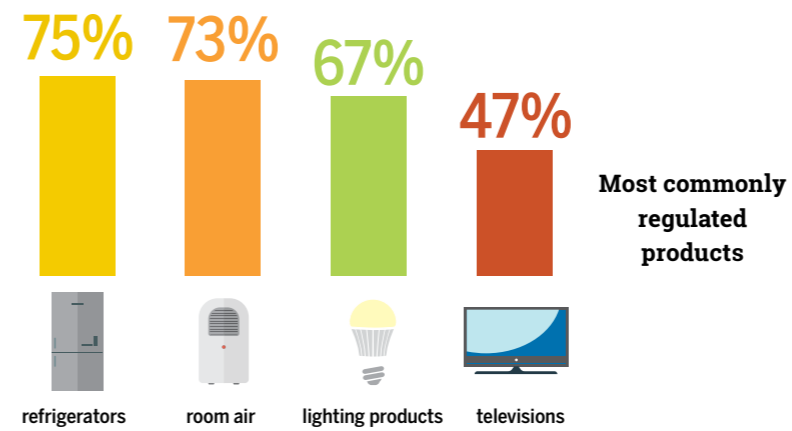
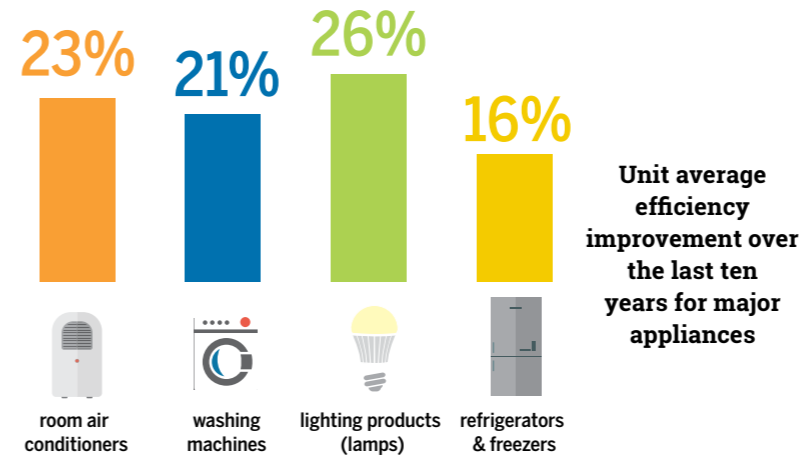
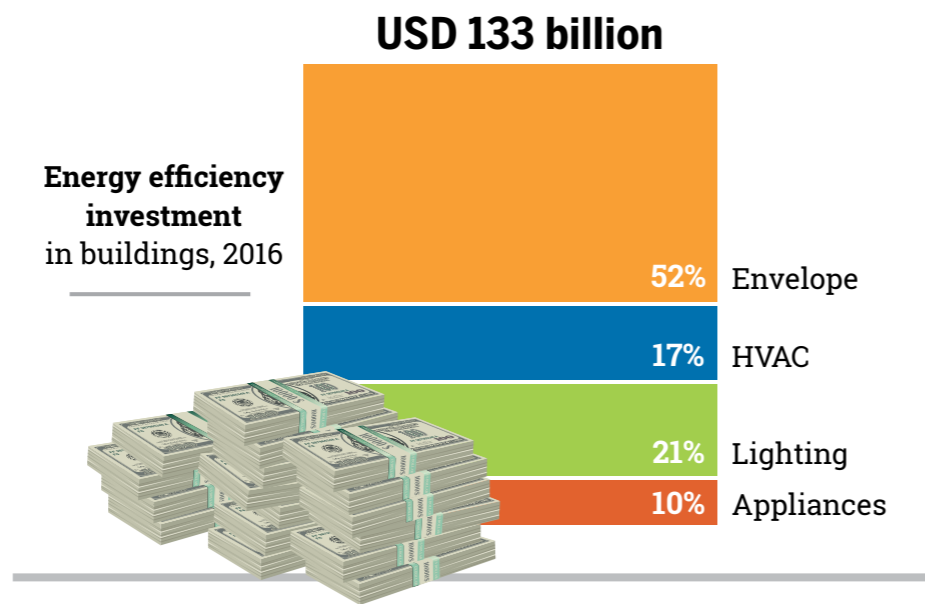
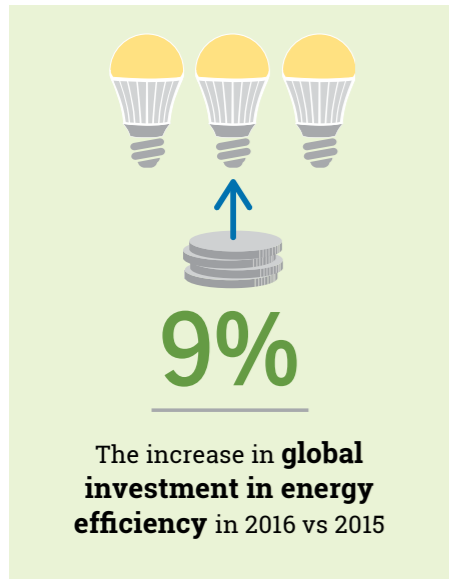
## The Technology Collaboration Programme on Energy Efficient End-Use Equipment (4E)

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“Technological innovation is creating new opportunities for progress on efficiency. Digitalization is beginning to have a significant impact on the energy sector and energy efficiency is emerging as a key arena for innovation.

*IEA Energy Efficiency Report, 2017*

# The world of Energy Efficient Equipment, Appliances and Lighting (EAL)



Global stock of installed smart meters, 2016

## The role played by 4E

Through international collaboration, 4E enables national energy efficiency programmes to be consistently evaluated and improved so that they are ambitious, internationally aligned and effective. The 4E platform provides the means to achieve this at least cost to member governments through the pooling of resources.

Working together through 4E, governments can grow the impact of energy efficiency policies substantially, through:

- ▶ Setting policies that reflect changes in technology and market conditions.
- ▶ Expanding the scope of policies to cover more appliances and equipment.
- ▶ Improving implementation and compliance through learning from the experience of others.

4E's international comparisons of appliance performance levels are used by policy makers to set national thresholds which enable their citizens to access the best performing products, now and into the future.

The 4E platform encourages countries to quickly expand their programme coverage by leveraging off the work of other members. Similarly, the comparison of different implementation and administrative approaches enables countries to better understand and copy from strengths of other programmes.

As economies increasingly seek the opportunities to meet future energy demand through the more efficient use of current energy resources, there is huge potential to learn from the experiences of others and to collectively explore some of the technological and policy challenges ahead. This is particularly evident in the field of appliances and equipment, a large proportion of which are internationally traded. Since 2008, 4E has enabled the twelve member governments to develop collaborations and co-ordinate activities to strengthen and grow their own national programmes.



**Energy efficiency is not a slogan, it is one of the most cost effective ways to support the transition to a low carbon economy and a key policy to implement the Paris Agreement. Besides, it is also an effective way to create investment opportunities, growth and employment domestically. According to our estimates, the 30% energy efficiency target will increase Europe's GDP of €70 billion, create about 400,000 new jobs – especially among SMEs - and reduce our gas imports by 12% by 2030.**

*Miguel Arias Cañete, European Commission Climate Action and Energy Commissioner, Brussels, June 2017*



## Overview of 4E Structure and Activities

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**“In 2016, the world would have used 12% more energy had it not been for energy efficiency improvements since 2000 – equivalent to adding another European Union to the global energy market.**

*IEA Energy Efficiency 2017*



19th ExCo meeting in Vienna, Austria



20th ExCo meeting in Canberra, Australia



## Executive Committee

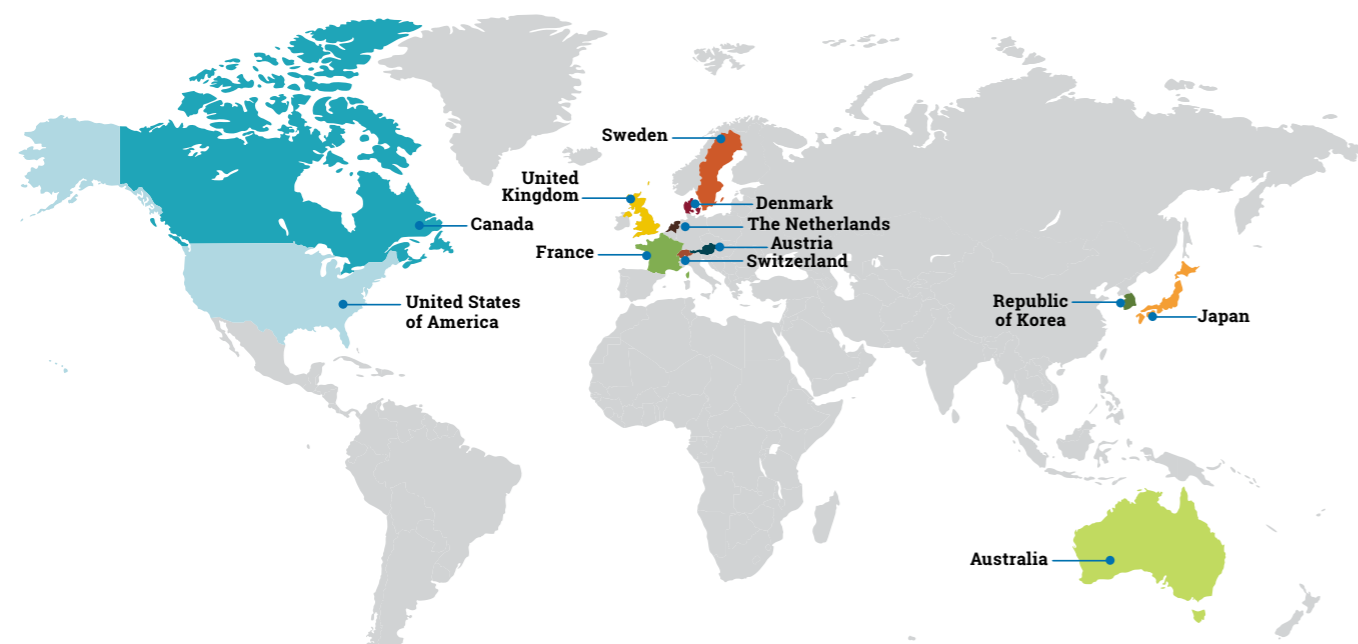
4E is managed by an Executive Committee (ExCo) comprising one voting delegate from each participating country. Like all IEA Technology Collaboration Programmes, participation is open to all countries. The executive group meets twice yearly to manage the work programme of 4E, including the dissemination of 4E's research results. Secretariat functions for the ExCo are provided by the Operating Agent, funded by annual membership fees.

During 2017, 4E office-bearers included:

- ▶ **Chair of 4E:** Michelle Croker (Australia)
- ▶ **Vice-chairs of 4E:** Katherine Delves (Canada); Hans-Paul Siderius (Netherlands)

The 19th and 20th meetings of the Executive Committee (ExCo) were held in Vienna, Austria (28 April 2017) and Canberra, Australia (16 November 2017). Attendance at these meetings is shown in Table 1. A list of the members of the ExCo during 2017 is shown in Attachment 1.

### 2017 ExCo Members



### Future ExCo meetings will be as follows:

- ▶ **21st ExCo:** 31 May 2018, Schaffhausen, Switzerland
- ▶ **22nd ExCo:** 29 November 2018, Stockholm, Sweden.

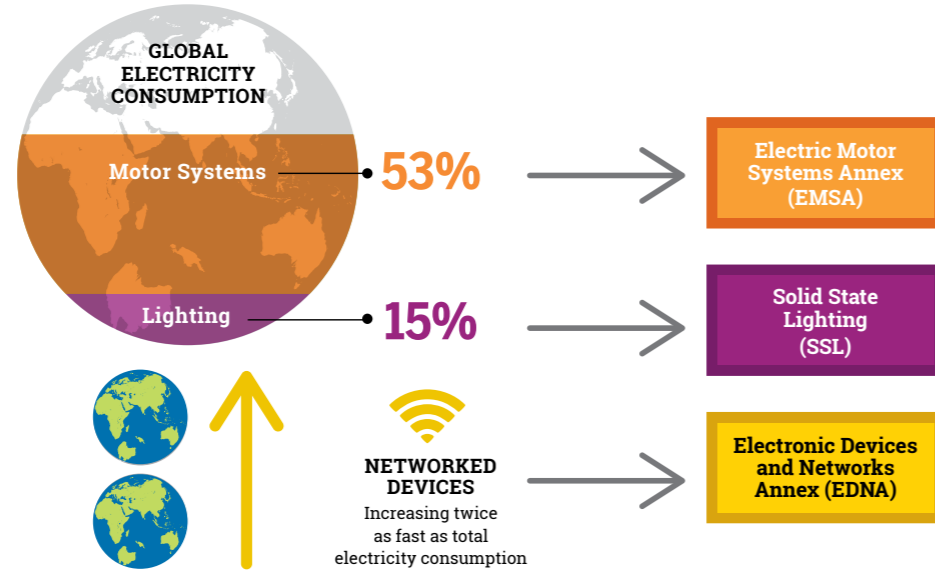
Table 1: Attendance at 2017 ExCo meetings

Contracting Party	19th Exco - Vienna	20th Exco - Canberra
Australia	✓	✓
Austria	✓	✓
Canada	✓	✓
Denmark	✓	A
France	✓	A
Japan	✓	✓
Republic of Korea	✓	✓
Netherlands	✓	✓
Sweden	✓	✓
Switzerland	✓	✓
United Kingdom	✓	✓
United States of America	✓	✓
Observers	IEA, EC, SEAD	IEA, China, New Zealand



# Annexes

Targeted collaborative research and development activities under 4E are undertaken within our Annexes, each of which has a particular focus and agreed work plan. These work plans, and their respective budgets, are typically negotiated amongst the participating countries for a 3-5 year period and are updated annually.

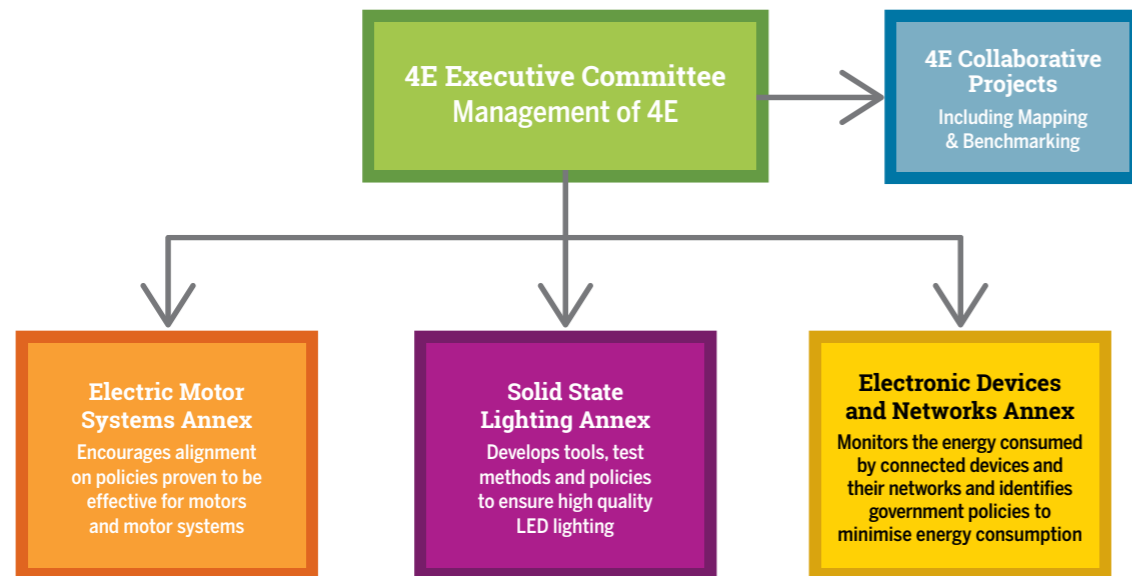


The 4E structure is shown in Figure 3, and this highlights the three active Annexes:

- ▶ **Electric Motor Systems Annex (EMSA)**, launched in October 2008 and chaired by Switzerland.
- ▶ **Solid State Lighting (SSL) Annex**, launched in June 2010 and chaired by Sweden.
- ▶ **Electronic Devices and Networks Annex (EDNA)**, launched in 2014 and chaired by Canada and the Netherlands in 2017.

Reports on all Annexes are included later in this report.

Figure 3: 4E Structure



# 4E Projects

4E members initiate projects into areas of research relevant to policies for efficient end-use equipment. These may be special one-off activities or potentially lead to the development of an Annex or other avenues for pursuing more in-depth consideration.

Active projects in 2017 included:

- ▶ Mapping & Benchmarking
- ▶ Policy Guidelines for Motor Driven Units
- ▶ The Effectiveness of Voluntary Agreements
- ▶ G20 Connected Devices Alliance
- ▶ G20 EELP Product Best Practice Policy Exchange Forum
- ▶ IEA Energy Efficiency Market Report 2017
- ▶ Monitoring, Verification and Enforcement

## Mapping & Benchmarking

International benchmarking enables governments to compare the performance of appliances and equipment in different regions, and better understand the potential for improvement.

Participating 4E countries supply energy/performance data, such as from registration databases, which is then analysed to allow the comparative benchmarking of products over time. The results are reviewed alongside information on government policies and cultural variables in each of the markets. Any lessons learned from the best performing countries are highlighted to help improve product performance elsewhere.

Since 2010, 4E has completed international benchmarking projects for 16 products, as shown in Table 2. In 2017, a report on Domestic Water Heaters was published, covering storage, instantaneous and heat pump technologies, and for the first time, both electric and gas-fired equipment.

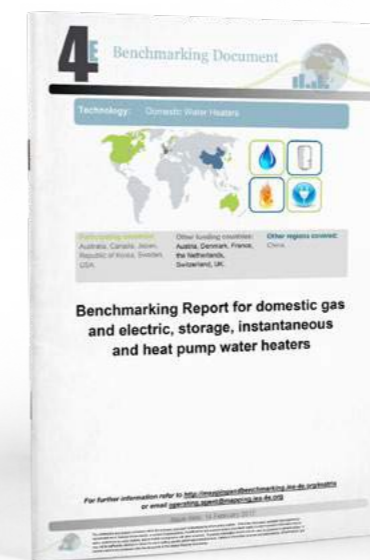


Table 2: Completed international benchmarking projects

Domestic refrigerated appliances
Televisions
Residential split & unitary air conditioners
Domestic lighting
Washing machines
Laundry dryers
Notebook computers
Standby power
Vending machines
Retail display cabinets
Dishwashers
Set-top boxes
Distribution transformers
Electric Motors
Packaged Liquid Chillers
Water heaters



**The global annual energy consumption of pumps, fans and compressors is larger than the total electricity consumption of China.**

### Policy Guidelines for Motor Driven Units

This two-part project examines the options for harmonising technical standards and regulations for Motor Driven Units (MDUs), focusing on pumps, fans and compressors.

All motor systems are responsible for 53% of global electricity consumption; while the global annual energy consumption of pumps, fans and compressors is estimated at 6,560 TWh, which is larger than the total electricity consumption of China.

The first report, published in 2016, describes existing standards and regulations for MDUs in Australia, Brazil, Canada, China, European Union, India, Japan, Korea, Mexico, New Zealand, Russia, Saudi Arabia, South Africa and USA.

It found that the variation in terminology and definitions related to MDUs across regions makes it difficult to compare standards and regulations applied in different countries and can lead to confusion. Furthermore, differences in regulated performance requirements across regions impairs the international trade of products.

During 2017, work was completed on the second report into opportunities to improve global alignment in both technical standards and policies for MDUs. This major 4E report will be published in 2018

### The Effectiveness of Voluntary Agreements

Many jurisdictions look to Voluntary Agreements (VAs) as an alternative mechanism to regulations to reach similar policy objectives. Amongst the claimed attributes of VAs are that they place a lower regulatory burden on industry, may be quicker to initiate and more adaptable to rapid changes in technology. VAs have a long and varied history.

Completed in 2017, this project provides an authoritative overview of the effectiveness of VAs in improving the energy efficiency of appliances and equipment.

It describes international experiences, evaluates their effectiveness in meeting policy objectives, summarises the essential elements of the more successful voluntary agreements and identifies lessons learned.

#### The key elements of successful VAs include:

- ▶ The inclusion within the agreement of a significant majority of the market. This may be facilitated by a strong institutional framework, such as capable industry associations, or a limited number of private companies;
- ▶ The ability to agree on workable definitions of the target products, their energy performance and how they are tested;
- ▶ Technology improvements are available that can be introduced at modest costs, which suppliers can pass on to their customers;
- ▶ There is a credible threat of government intervention, to drive parties to increase the level of ambition and avoid setting requirements that quickly lose relevance;
- ▶ Signatories agree to regularly compile and share information relating to the implementation and impact of the VA, so that its on-going effectiveness can be tracked by government partners;
- ▶ There is a robust compliance regime with an independent auditor, who has the mandate to verify data and test products from individual signatories and who reports to a body representing all parties involved.

**4E Policy Brief: Voluntary Agreements, October 2017**



## G20 Connected Devices Alliance (CDA)

During 2017, 4E continued to provide the Secretariat for the Connected Devices Alliance (CDA), a network of 350 government and industry participants launched in 2014 as one of six key energy efficiency initiatives under the G20.



Led by the United Kingdom and IEA, the CDA provides a unique forum for dialogue between industry and government representatives on this rapidly growing issue of global significance.

In 2017 the CDA's work was applauded and its mandate extended under the G20 Presidency of Argentina.



During 2017, the CDA collaborated with the Super-efficient Equipment and Appliance (SEAD) initiative to mount the first ever award for energy efficient communication protocols – called the **SEAD Connected Efficiency Award**.

With the aim to identify energy efficient protocols in the market, increase their use in mains-powered connected devices, and spur innovation among protocols developers, five protocols were officially recognized in November 2017.

Additional CDA activities in 2017 included:

- ▶ A workshop to further dialogue between industry and governments, held in Berlin, March 2017.
- ▶ Major contribution to the organisation and preparation for the roundtable on 'Digitalization of the Energy Sector to Enhance Energy Productivity & Renewable Integration' at the Clean Energy Ministerial in Beijing (June).
- ▶ The promotion of the CDA Voluntary Principles for Energy Efficiency Connected Devices to relevant companies and associations, which provide guidelines for product for designers, manufacturers and policy-makers.
- ▶ The population of the CDA Centre of Excellence, to provide governments and industry with an accessible source of information on best practices and energy savings opportunities in networked devices and networks.
- ▶ Research projects into Energy Aware Devices, Energy use by IoT devices and potential policy responses, undertaken with 4E EDNA.



**Management of vampire loads:**  
The standby energy use required to ensure hundreds of billions of new networked devices stay connected is potentially massive. While intelligent efficiency can manage energy usage and lead to substantial energy savings, governments in most cases are not implementing actions to ensure these devices are not increasing the energy used to stay connected.

*Communique from Clean Energy Ministerial, June 2017*

## G20 EELP Product Best Practice Policy Exchange Forum

Launched under the Chinese Presidency of the G20 in 2016, the Energy Efficiency Leading Program (EELP) includes the Product Best Practice Policy Exchange Forum, co-hosted by the IEA, SEAD and 4E.

Designed to engage efficient product experts from across G20 countries and beyond to share experiences and further understanding on policies to stimulate improvements in the efficiency of appliances and equipment, the Forum includes a series of virtual and face-to-face workshops.

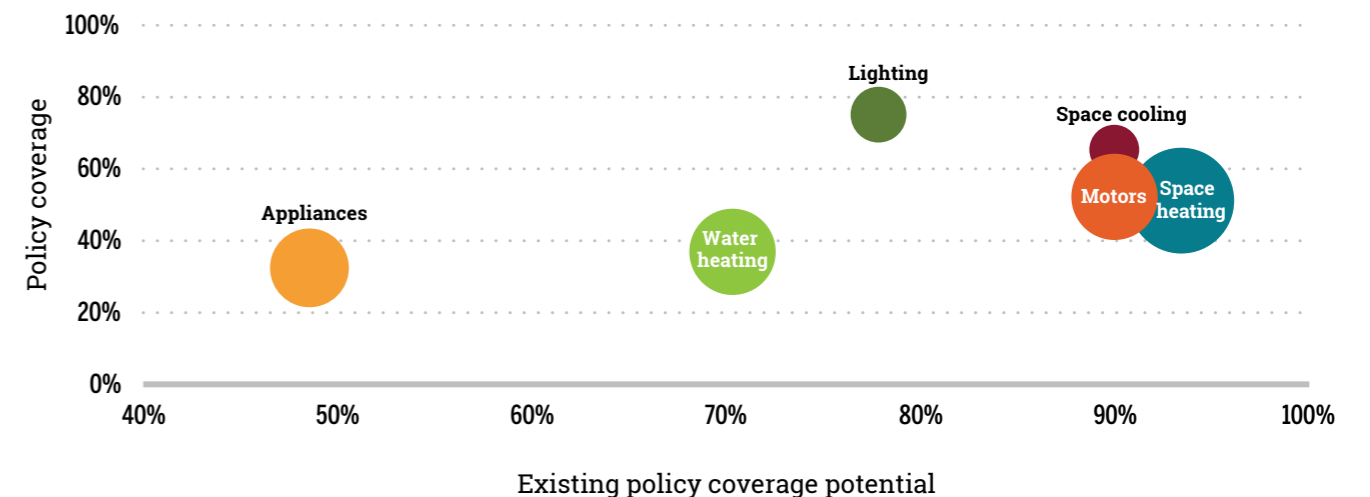
Building on workshop in November 2016 in Ottawa that focussed on Energy Labelling and High Efficiency Programs, 4E's second workshop in this series was held in April 2017 in Vienna. This highly interactive day featured a thorough exploration of Voluntary Agreements and their role as an energy efficiency policy option.

## IEA Energy Efficiency 2017

Energy Efficiency 2017 is the IEA's flagship publication on this topic which quantifies the latest trends, tracks global progress, and examines key drivers and market issues.

In 2017, the sections on appliances, equipment and lighting drew on a range of 4E technical and policy experts to undertake analysis and draft key findings, representing an effective collaboration between the IEA Secretariat and 4E.

**Figure 4:** Policy coverage and coverage potential of existing mandatory codes and standards by end-use, 2016 (size of bubble indicates share of global final energy consumption)



Source: EA Energy Efficiency 2017

## Regulators Forum on Monitoring, Verification and Enforcement (MV&E)

MV&E is a vital component of regulatory policies to ensure that expected energy efficiency gains are realised in practice. 4E provides a unique forum for energy efficiency regulators to raise issues of common concern and share approaches to market surveillance and enforcement. In the wake of the defeat software in the automotive sector (Volkswagen case), work done by this group on 'defeat devices' shows the need to better understand the issues and for on-going vigilance in order to maximise savings from energy efficiency programs.

## Co-ordination with other organisations

As one of 40 Technology Collaboration Programmes established under the framework of the International Energy Agency (IEA), 4E has a particularly close relationship with the IEA Secretariat and provides expert input to many IEA publications on end-use energy efficiency. During 2017, 4E made significant contributions to the Energy Efficiency 2017 and Digitalisation and Energy reports as well as lesser roles in several other publications.

4E also provides regular progress reports to IEA member governments and liaises with other Technology Collaboration Programmes. The IEA's Energy Efficiency Division provides a report to each 4E ExCo meeting, and is often represented at these meetings.

Through the two G20 initiatives identified in earlier sections, 4E is also working with the International Partnership on Energy Efficiency Co-operation (IPEEC), and the Clean Energy Ministerial (CEM).

During 2017 relationship with the Super Efficient Appliance Deployment (SEAD) initiative has continued, particularly through a collaboration on the Connected Efficiency Award (see previous section).

In addition, 4E regularly liaises with a range of public and private sector groups with an interest in end-use energy efficiency, including APEC, the World Bank, the World Economic Forum, Sustainable Energy for All, United for Efficiency, international standards organisations and industry groups. Recognising the unique contribution that each is playing in the development of public policy, 4E continues to engage these organisations to promote a better understanding of issues relating to the efficiency of end-use equipment.

4E also engages with many industry sectors through the work of our Annexes and the CDA



## Annex Achievements in 2017

“Let us remain resolute in our call to achieve the more ambitious target of limiting the rise in global temperature to within 1.5 degrees.

*COP23 High-Level Champion Inia Seruiratu's remarks at the Climate Action Pacific Partnership (CAPP) Technical Expert Meeting in Suva, Fiji on 15 March 2018*

## Electric Motor Systems Annex (EMSA)

The Electric Motor Systems Annex (EMSA) focuses on improving the efficiency of electric motor systems. Electric motors drive pumps, fans, compressors, industrial production machinery and any auxiliary components to which they may be attached, including variable speed drives, gears, transmission belts and brakes. Motor systems are responsible for over 53% of global electricity use with a savings potential of 20% to 30%.

EMSA:

- ▶ Helps governments to design and implement successful policies for motor system
- ▶ Investigates possibilities for the international alignment of technical standards and regulation
- ▶ Supports the development of sufficiently robust international standards to support policy implementation

EMSA plays a unique role in assisting the development and implementation of policies for electric motor systems:

- ▶ The co-operation and exchange between EMSA countries reduces the costs of designing motor system policies and increases the chances of successful implementation. Through its outreach and publications, EMSA makes governments around the world aware of policy opportunities and the latest motor system policy developments in different region
- ▶ EMSA's involvement in the international standards development process helps to ensure that technical standards are sufficiently robust to support replication and enforcement. This is complemented by work to build testing capacity and performance amongst EMSA's network of public and private laboratories around the world
- ▶ EMSA's work encourages both manufacturers and end users of motor systems, to direct more attention to the issue of motor systems efficiency. Efficient motor systems not only save energy but also reduce the risks and costs of production through optimizing processes and improving equipment performance.
- ▶ EMSA's work encourages industry, both manufacturers and end users of motor systems, to direct more attention to the issue of motor systems efficiency. Efficient motor systems not only save energy but also reduce the risks and costs of production through optimizing processes and improving equipment performance.



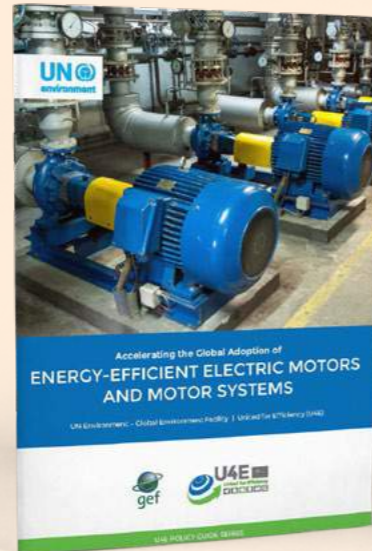
**Congratulations  
for the interesting  
and useful job  
you are all doing  
within EMSA.**

*Ronald Piers de Raveschoot,  
Policy Officer Energy Efficiency,  
European Commission:*

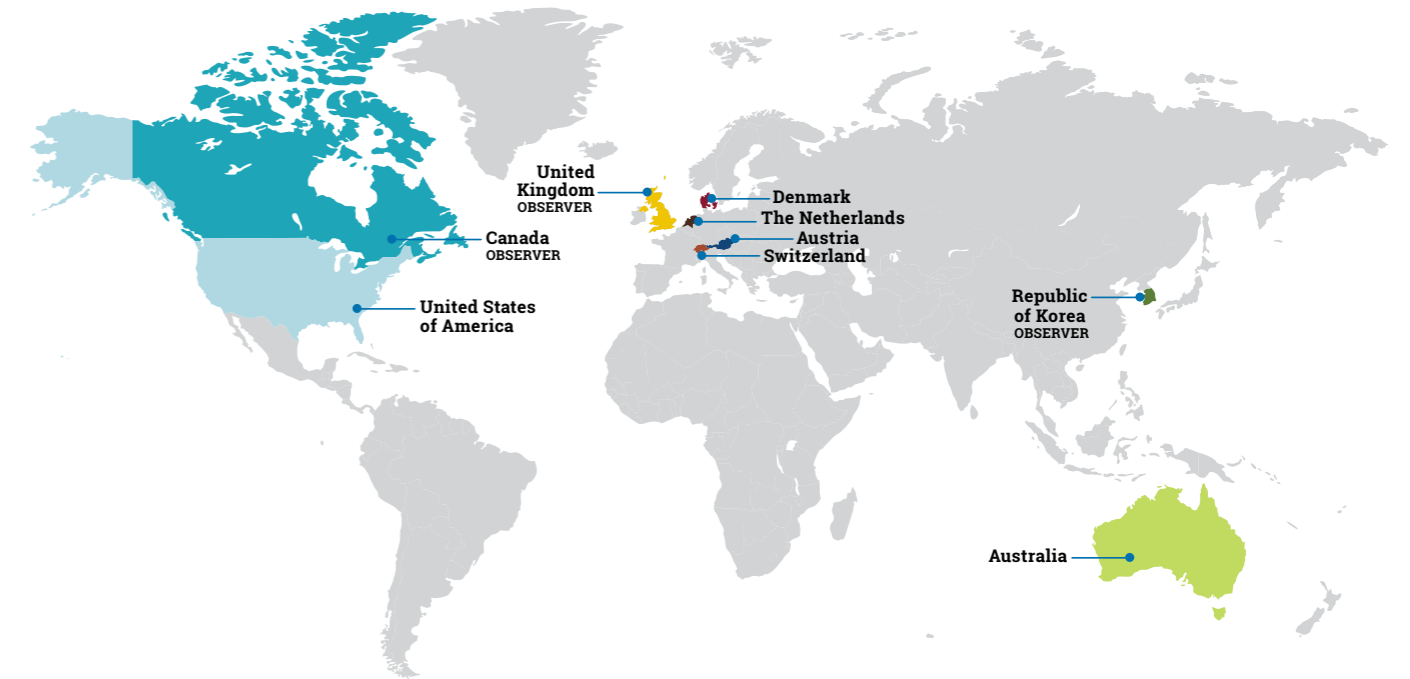


## Major Achievements During 2017

- ▶ EMSA members contributed nine presentations and a plenary closing speech at the international conference on Energy Efficiency in Motor Driven Systems (EEMODS) in September 2017 in Rome, Italy. Through this they raised the level of global debate amongst key policy makers, standards developers, research, academia and industry on the efficiency of electric motor systems and possible market transformation avenues.
- ▶ EMSA representatives from Australia, Switzerland and Denmark made substantial contributions to the development of international standards at the International Electrotechnical Commission (IEC). This work is supported by the results of independent testing.
- ▶ In September 2017, 4E EMSA was asked to undertake the project leadership and the organization of the a Round Robin for Converters in cooperation with IEC SC22G WG18.
- ▶ 4E EMSA worked on a major study analysing potentials for international alignment of technical standards and regulations for Motor Driven Units, focusing pumps, fans and compressors in the EU, China and USA.
- ▶ Through the IEC Advisory Committee on Energy Efficiency (ACEE), EMSA representatives have sought to coordinate approaches for Motor Driven Units between IEC and the International Organization for Standardization (ISO).
- ▶ EMSA representatives advised the European Commission on the revision of regulations for water pumps, fans and motors, with the latter supported by testing evidence from Denmark.
- ▶ EMSA participated in a National conference on motor systems on 26 April 2017 in Vienna, Austria.
- ▶ EMSA participated in the UNEP-GEF Expert Taskforce on Electric Motors, which delivered a Policy Guide for regulators and policymakers in developing countries and emerging economies. The Guide has been published in 2017.
- ▶ EMSA presented some key outcomes during a side-event for policy makers on the COP23 in Bonn in November 2017.



## Annex Participants



A complete record of the EMSA activities in 2017 and participants are included in Attachment 4.

**EMSA's involvement in the international standards development process helps to ensure that technical standards are sufficiently robust to support replication and enforcement.**





## Solid State Lighting (SSL) Annex

The IEA 4E SSL Annex continues to serve as a hub for information exchange and coordination of research into topics relating to solid state lighting. Member governments who are actively engaged in developing policies addressing the quality and performance of LED lighting make use of the SSL Annex research and expert resources to support their policy outcomes. For example, Australia used the quality and performance tiers in their draft national lighting MEPS proposal. Australia and European member representatives and experts are actively engaged in information exchange on flicker and various regulatory parameters of importance both for the current Australian and European regulatory processes. The ongoing interlaboratory comparison (IC 2017) for luminaires and directional lamps will provide input to regulatory updates in many of the participating member countries.

The SSL Annex Experts meet twice yearly and discuss the various joint activities underway, which include: test method assessment, accelerated lifetime testing, laboratory accreditation, best practices in market transformation and market surveillance, quality and performance tiers, standby-power of smart lighting and benchmarking and product database management.

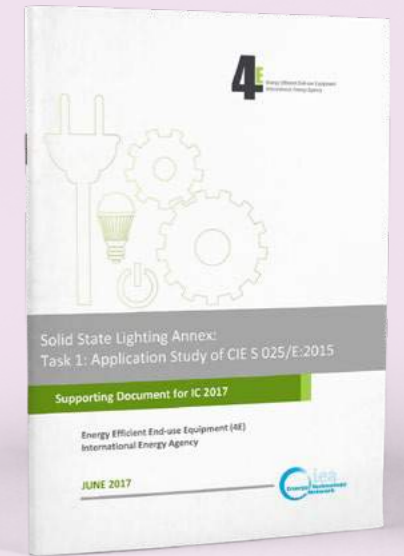
The SSL Annex provides its expertise and publications in support of several global initiatives, including the Global Lighting Challenge, the SEAD Global Efficiency Medal and the UNEP United for Efficiency (U4E) programme. The SSL Annex also engages with industry to keep them informed of our work and invited them to provide direct input to our activities.



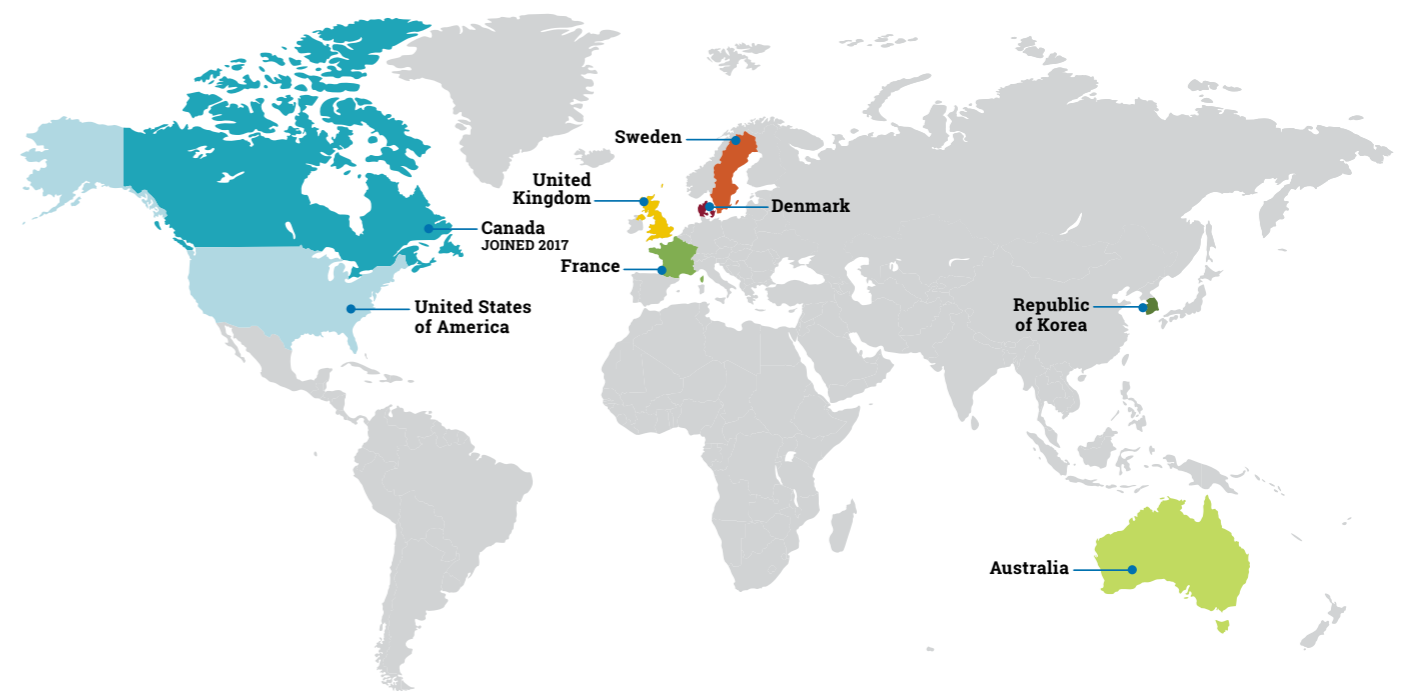
**Member governments who are actively engaged in developing policies addressing the quality and performance of LED lighting make use of the SSL Annex research and expert resources to support their policy outcomes.**

### Major Achievements During 2017

- ▶ Publication of an evaluation of the new International Commission on Illumination (CIE) standard for use by accreditation bodies, government policy makers and other key stakeholders as the basis for measuring quality and performance aspects of LED lighting products and equipment. This report is entitled "Application Study of CIE S 025/E:2015" and is an important foundation for the Interlaboratory Comparison (see below).
- ▶ Launch of the 2017 Interlaboratory Comparison for directional lighting products: a global interlaboratory comparison of goniophotometers using a set of artefacts including a directional lamp, a street light luminaire, a linear batten and a planar luminaire. The SSL Annex aims for this work to serve as a proficiency test for accreditation bodies around the world. IC 2017 has 43 registered laboratories as participants from 4E member countries and non-member countries.
- ▶ The Global Lighting Challenge selected the SSL Annex quality and performance tier criteria as the basis of a 'quality light' source<sup>1</sup>.
- ▶ The SEAD Global Efficiency Medal chose the SSL Annex quality performance tier criteria to ensure only quality light sources applied<sup>2</sup>.
- ▶ A mid-term revision of the work plan was finalised in April 2017 and approved by the MC and then the ExCo.



### Annex Participants



A complete record of the SSL Annex activities in 2017 and participants are included in Attachment 5.

<sup>1</sup> <http://www.globallightingchallenge.org/Choose.aspx>

<sup>2</sup> <http://www.superefficient.org/Global-Efficiency-Medal/Lighting-Awards>



“  
EDNA fills an important gap here - developing global policies to maximise the energy benefits and minimise the energy costs that connected devices bring.

## The Electronic Devices and Networks Annex (EDNA)

EDNA was created in 2014, born from the growing recognition by 4E member governments that the phenomenon of connecting everyday devices to the internet was growing rapidly and would continue to do so. EDNA fills an important gap here - developing global policies to maximise the *energy benefits* and minimise the *energy costs* that connected devices bring. Energy benefits arise from the ability of connected devices to participate in efficient systems of devices. However significant energy costs also arise - by 2020 more than 20 billion connected devices<sup>3</sup> may be set to increase global energy use as they consume “network standby power” to communicate 24/7.

The growing trend towards connected devices is a significant component of a larger shift towards the *digitalisation* of our society. Digitalisation is the application of ICT to all sectors of the economy, including energy systems, and this is being enabled by advances in data, analytics and connectivity. In 2017, EDNA provided significant input to the IEA report - *Digitalisation and Energy*. This report highlighted the importance of developing policies to guide energy aspects of digitalisation. Many governments now recognise this need and over the past 4 years EDNA has remained the sole think-tank for government policy development in this area. Its 12 members participate in collaborative policy ideation and look to the annex to guide their policy thinking.

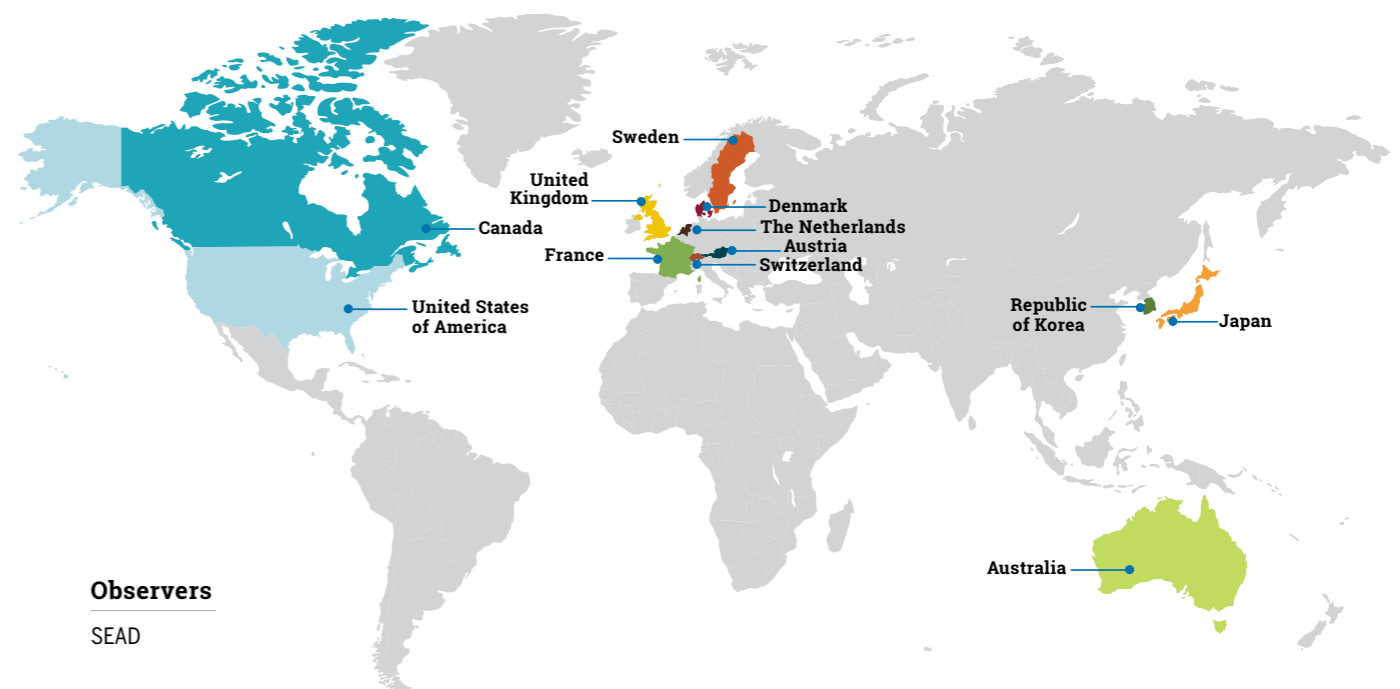
EDNA has also collaborated extensively with the Connected Devices Alliance (CDA), seeking CDA industry views on highly technical issues and delivering several CDA-derived initiatives. For example, EDNA was instrumental in guiding the development of the first ever awards for energy efficient communications protocols, an initiative which was conceived by the CDA.

<sup>3</sup> Digitalisation and Energy, IEA, 2017

### Major Achievements During 2017

- ▶ In 2017 EDNA completed the following activities:
  - » The EDNA study of Policy Opportunities for Intelligent Efficiency.
  - » This stimulated the preparation of a related case study of Home Energy Management Systems, due for publication in early 2018.
  - » EDNA's technical study: Network Standby Power Basics, which examines the primary factors that influence device network standby power draw (including in WiFi chipsets) and develops a framework for understanding the issues.
  - » A scoping study of the energy efficiency of electric vehicle charging equipment.
  - » EDNA provided significant Input to the design and implementation of the SEAD Connected Efficiency Award. This award culminated in the recognition of 5 leading communications protocols which aim to reduce the energy used by connected devices to communicate.
- ▶ During 2017 EDNA launched a number of new tasks which will continue throughout 2018:
  - » The development of a “policy case” for connected devices; a tool kit for governments wishing to implement policies for reducing network standby power.
  - » A Total Energy Model for Connected Devices, will quantify the energy use resulting from devices becoming network connected, including the additional energy use that results upstream of devices, in communications networks and data centres.
  - » An investigation of the introduction of cutting edge intelligent efficiency measures for communications networks and data centres.
- ▶ In 2017 EDNA also continued several of its longer-term initiatives:
  - » The study of “always-on” devices.
  - » An investigation of energy harvesting technologies
  - » The CDA Centre of Excellence library for policy papers.
  - » Ongoing collaboration with the 4E Solid State Lighting Annex, regarding network standby power of connected lighting products.
  - » Additional in-situ network standby power measurements for the Basket of Products testing regime.

### Annex Participants



A complete record of EDNA activities in 2017 and participants are included in Attachment 6.



# 4E Outreach and Communication

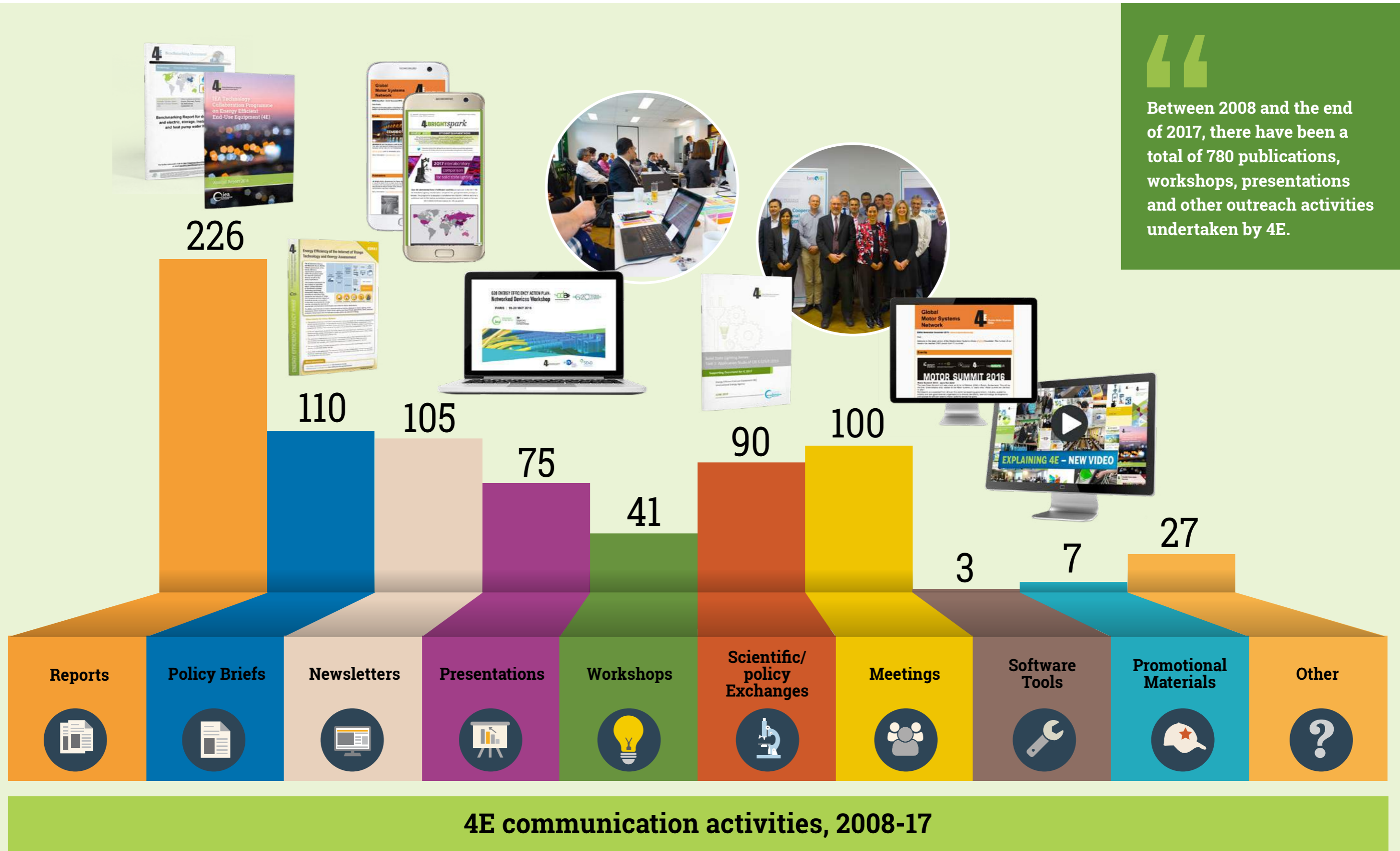
“Energy efficiency is the one energy resource that all countries possess in abundance.”

*Dr Fatih Birol, IEA Executive Director.*

4E operates a group of linked websites that are the hub of 4E's communication activities, providing access to all 4E publications and notice of forthcoming events.

**The location of 4E's site traffic is extremely geographically diverse, with visitors from around 150 separate countries. 50% of website traffic comes from countries that are not current members of 4E, with high usage by organisations based in India, Germany, Brazil and China.**

The majority of newsletters and Policy Briefs have been published in several languages, including Japanese, Korean, German, French and Chinese.



“

Between 2008 and the end of 2017, there have been a total of 780 publications, workshops, presentations and other outreach activities undertaken by 4E.

# 4E Group Finances

“Over 75% of resources were directed towards research.”

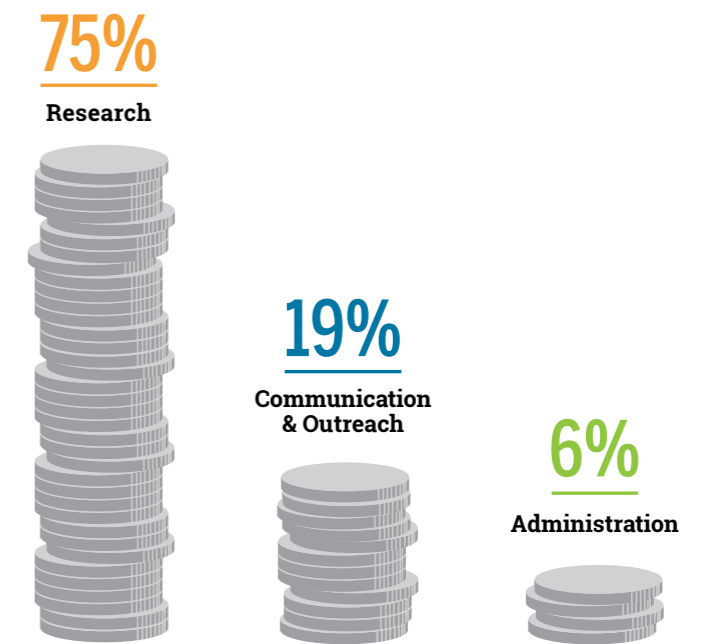
4E activities are made possible through the contributions of member countries: taking the form of annual fees and substantial in-kind work by national experts.

In 2017, the total cost of 4E activities is estimated to be €2.2 million, 12% higher than in 2016. Approximately 40% of this was funded through the annual fees and voluntary contributions of the 12 member countries.

The annual fees and voluntary contributions of the 12 member countries and SEAD funded approximately 40%.

75% of resources were directed towards research, while expenditure on communication and outreach activities accounted for 19%. The share of resources devoted to administration and financial management has fallen compared to 2016 to only 6% of total costs.

## Allocation of 4E resources in 2017



## 4E membership fees, 2017

While Annex membership fees can vary from year to year depending upon the agreed work programme, all membership fees are the same in 2017 as they were in 2016.

EXECUTIVE COMMITTEE	€20,000
ELECTRIC MOTOR SYSTEMS ANNEX (EMSA)	€15,000
SOLID STATE LIGHTING ANNEX (SSL)	€22,000
ELECTRONIC DEVICES AND NETWORKS ANNEX (DNA)	€15,000



## Attachments

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**“I continue to be astounded at the scope and depth of its activities, as well as by the dedication of all the people that contribute.**

*Michelle Croker, Chair 4E  
Assistant Secretary, Appliance and Building Energy Efficiency  
Branch, Government of Australia*

## Attachment 1: 4E Executive Committee Delegates

Contracting Party	Nomination	Name & Details	Email/Telephone
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	Alternate	<b>Mr Rick Miles</b> Appliance Energy Efficiency Branch Department of the Environment and Energy	rick.miles@environment.gov.au <b>Tel:</b> +61 2 6275 9070
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	Alternate	<b>Mr Michael Hübner</b> Federal Ministry for Transport, Innovation and Technology	michael.huebner@bmvit.gv.at <b>Tel:</b> +43 1 711 62 652922
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	Alternate	<b>Ms Katherine Delves (Vice-Chair)</b> Chief, Standards Development Office of Energy Efficiency Natural Resources Canada	Katherine.Delves@canada.ca <b>Tel:</b> +1 613 947 1207
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REPUBLIC OF KOREA	Primary	<b>Mr Hyeong-Jung Kim (from 12 March 2018)</b> General Manager Korea Energy Agency	jakekim@energy.or.kr <b>Tel:</b> +82 31 260 4240
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Contracting Party	Nomination	Name & Details	Email/Telephone
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SWEDEN	Primary	<b>Dr Peter Bennich</b> Policy Officer, Energy Efficiency Department The Swedish Energy Agency, Testlab	peter.bennich@energimyndigheten.se <b>Tel:</b> +46 73 625 6782
	Alternate	<b>Mr Carlos Lopes</b> Coordinator for Ecodesign and Energy Labelling The Swedish Energy Agency, Testlab	carlos.lopes@energimyndigheten.se <b>Tel:</b> +46 70 550 3430
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## Attachment 2: All 4E publications, 2017

Date	Source	Title
January	SSL	Announcement of Australia's use of SSL Annex performance tiers
February	4E	Mapping for water heaters for Australia, Canada, China, Japan, Korea, Sweden and the USA
	4E	Benchmarking Report: Domestic gas and electric, storage, instantaneous and heat pump water heaters
April	4E	2016 Annual Report
		"Bright Spark" Issue 12
	EDNA	Standby Consumption Measurements
	EDNA	Encouraging Intelligent Efficiency - Study of Policy Opportunities
June	EMSA	Newsletter
	SSL	Evaluation of CIE International Test Method for Solid State Lighting
		Lessons Learnt Bringing LEDs to Market
		Launch of IEA 4E SSL Annex 2017 Interlaboratory Comparison of Goniophotometer Measurements (IC 2017)
July	4E	Launch of Connected Efficiency Award
September	4E	Voluntary Agreements
	EMSA	Launch of new version of the Motor Systems Tool in German and French
October	4E	"Bright Spark" Issue 13
November	EDNA	IEA Digitalisation and Energy
		SEAD Connected Efficiency Awards - announcement of winning communications protocols
December	EDNA	Energy Efficiency of Electric Vehicle Supply Equipment - Scoping Study
	4E	The Effectiveness of Voluntary Agreements

## Attachment 3: Workshops, Conferences and Meetings, 2017

Date	Source	Title	Location
March	EMSA	Presentation at Motors Policy Workshop ECI	Brussels
	4E	G20 CDA Workshop	Berlin
April	EMSA	Presentation National Conference on Motor Systems	Vienna
June	SSL	14th Expert Meeting	Sweden
September	EDNA	Energy Efficiency of Electric Vehicle Supply Equipment (EVSE) Workshop	Vienna, Austria
	EMSA	EEMODS '17	Rome, Italy
October	SSL	Presentation at CIE 2017 Lighting Technical Conference	Jeju Island, Republic of Korea
November	SSL	15th Experts Meeting	Sydney, Australia
		Technical Workshop for the Lighting Industry	Sydney, Australia
	EMSA	EMSA presentation to International Motors Conference China	ShaoXing, China
		EMSA participation at COP23 side-event	Bonn
December	SSL	Forum LED Europe 2017	Paris, France
	4E	Meeting Energy Efficiency Goals through Digitalisation	Canberra, Australia

## Attachment 4: Electric Motor Systems (EMSA) 2017 Record of Activities & Delegates

### RECORD OF ACTIVITIES

Contracting Party	Date	Intended Audience	Location
<b>PUBLICATIONS IN 2017</b>			
EMSA Newsletter 1/2017*	June/July	Subscribers & Public	
<b>OUTREACH IN 2017</b>			
EMSA participation at Motors Policy Workshop ECI	March	Invited experts	Brussels
EMSA participation at National conference on motor systems	April	Public	Vienna
EMSA participation at International Motors Conference China	November	Public	ShaoXing
EEMODS'17 – EMSA participation	September	Public	Rome
EMSA participation at COP23 side-event	November	Invited experts	Bonn
<b>MANAGEMENT/EXPERTS MEETINGS HELD IN 2017</b>			
17th EMSA meeting	April		Vienna
18th EMSA meeting	September		Rome
<b>OUTREACH PLANNED FOR 2018</b>			
Motor Summit 2018 Zurich	November	Public	Zurich
<b>MANAGEMENT/EXPERTS MEETINGS PLANNED FOR 2018</b>			
19th EMSA meeting	May		Schaffhausen, Switzerland
20th EMSA meeting	November		Zurich

\*The EMSA Newsletter has around 5,000 subscribers from over 70 different countries and is published in English, Chinese, Japanese, Spanish

### COUNTRY DELEGATES

Country	Name	Organisation	Email	Phone
AUSTRALIA	Michelle Croker	Department of the Environment and Energy	Michelle.Croker@environment.gov.au	+61 2 6275 9031
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	Konstantin Kulterer	Austrian Energy Agency	konstantin.kulterer@energyagency.at	+43 1 586 15 24 114
DENMARK	Bjarke Hansen	Danish Energy Agency	bjh@ens.dk	+45 3392 7588
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	Frank Hartkamp		frank.hartkamp@rvo.nl	
SWITZERLAND	Michael Moser	Swiss Federal Office of Energy	michael.moser@bfe.admin.ch	+41 44 760 0066
	Roland Brüniger		roland.brueiniger@brueniger.swiss	
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	Sanaee Iyama	LBNL	ssiyama@lbl.gov	+1 510-486 6604
	John Cymbalsky	Department of Energy	chad.gallinat@hq.doe.gov	+1 202 287 1692
<b>Lead Country</b>		<b>Switzerland</b>		
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<b>OPERATING AGENT</b>		<b>Maarten van Werkhoven</b> TPA advisors Generaal Winkelmanlaan 31 2111 WV Aerdenhout Netherlands Email: mvanwerkhoven@tpabv.nl Tel: +31 23 536 80 90		
<b>EMSA COORDINATOR</b>		<b>Rita Werle</b> Impact Energy Inc. Gessnerallee 38a, CH-8001 Zürich Switzerland Email: rita.werle@impact-energy.ch Tel: +41 44 226 20 10		

## Attachment 5: Solid State Lighting (SSL) 2017 Record of Activities & Delegates

### RECORD OF ACTIVITIES

Contracting Party	Date	Intended Audience	Location
<b>PUBLICATIONS IN 2017</b>			
Pre-Announcement IEA 4E SSL Annex 2017 Interlaboratory Comparison of Goniophotometer Measurements (IC 2017)	January	Laboratory Technicians, Industry, Researchers	
Solid State Lighting Annex: Midterm Review FINAL REVISED WORKPLAN	April	SSL Annex Members and IEA 4E ExCo	
Interlaboratory Comparison 2017 (IC 2017) Technical Protocol	June	Laboratory Technicians, Industry, Researchers	
Market Lessons Learned: Lessons learned from government policies bringing LEDs to market	June	Policy Makers, Researchers, Industry	
Application Study of CIE S 025/E:2015	June	Laboratory Technicians, Industry, Researchers	
<b>OUTREACH IN 2017</b>			
CIE 2017 Lighting Technical Conference (SSL Annex paper and presentation)	October	Academics, Researchers, Industry	Jeju Island, Republic of Korea
SSL Annex Technical Workshop for the Lighting Industry	November	Industry, Public, Lighting Designers	Sydney, Australia
Forum LED Europe 2017 (SSL Annex presentation)	December	Researchers, Industry, Public	Paris, France
<b>MANAGEMENT/EXPERTS MEETINGS HELD IN 2017</b>			
SSL Annex Management Committee	February		Teleconference
SSL Annex Management Committee	March		Teleconference
SSL Annex Management Committee	April		Teleconference
SSL Annex 14th Experts Meeting	May		Stockholm, Sweden
SSL Annex Management Committee	June		Teleconference
SSL Annex 15th Experts Meeting	November		Canberra, Australia
SSL Annex Management Committee	October		Teleconference
<b>MANAGEMENT/EXPERTS MEETINGS PLANNED FOR 2018</b>			
16th SSL Annex Experts Meeting	March		Toulouse, France
17th SSL Annex Experts Meeting	Oct/Nov		To Be Determined
4-6 Management Committee meetings expected	2018		Conference calls
Ad Hoc Expert meetings on IC 2017	2018		Conference calls

### COUNTRY DELEGATES

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FRANCE	Bruno Lafitte	ADEME	bruno.lafitte@ademe.fr	+33 4 93 95 72 56
REPUBLIC OF KOREA	Hyung Chanwoo	Korean Energy Agency	cuhyung@energy.or.kr	+82-31-260-4243
SWEDEN	Peter Bennich (Chair)	Swedish Energy Agency	peter.bennich@energimyndigheten.se	+46 16 544 22 78
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<b>Lead Country</b>		<b>Switzerland</b>		
<b>ANNEX CHAIR</b>		<b>Mr Peter Bennich</b> Coordinator for Lighting The Swedish Energy Agency, Testlab Sweden Email: peter.bennich@energimyndigheten.se Tel: +46 73 625 6782		
<b>OPERATING AGENT</b>		<b>Mr Nils Borg</b> Borg & Co. AB Sveavägen 98, 4 tr, 113 50 Stockholm, Sweden. Email: SSL.Annex@gmail.com Tel: +46 70 585 31 74		



## Attachment 6: Electronic Devices and Networks Annex (EDNA) 2017 Record of Activities & Delegates

### RECORD OF ACTIVITIES

Contracting Party	Date	Intended Audience	Location
<b>PUBLICATIONS IN 2017</b>			
Standby Consumption Measurements	April	Public	
Encouraging Intelligent Efficiency - Study of Policy Opportunities	April	Public	
SEAD Connected Efficiency Awards - announcement of winning communications protocols	November	Public	
Energy Efficiency of Electric Vehicle Supply Equipment - Scoping Study	December	Public	
<b>OUTREACH IN 2017</b>			
Workshop on Energy Efficiency of Electric Vehicle Supply Equipment	September	Policy Makers, Industry and invited experts	Vienna
<b>OUTREACH PLANNED FOR 2018</b>			
Approach to Energy Efficient Systems	April	Restricted to members	Vienna, Austria
(Joint EMSA-SSL-EDNA Meetings)	May	Restricted to members	Schaffhausen, Switzerland
<b>MANAGEMENT/EXPERTS MEETINGS HELD IN 2017</b>			
7th Annex Management Meeting	April	Restricted to members	Vienna, Austria
8th Annex Management Meeting	November	Restricted to members	Canberra, Australia
<b>MANAGEMENT/EXPERTS MEETINGS PLANNED FOR 2018</b>			
9th annex management meeting	May	Restricted to members	Schaffhausen, Switzerland
10th annex management meeting	??	Restricted to members	??

### COUNTRY DELEGATES

Country	Name	Organisation	Email	Phone
AUSTRALIA	Ms Michelle Croker	Department of the Environment and Energy	Michelle.Croker@environment.gov.au	+61 2 6275 9031
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## About the IEA

“The breadth and coverage of analytical expertise in the IEA Technology Collaboration Programmes (TCPs) are unique assets that underpin IEA efforts to support innovation for energy security, economic growth and environmental protection. The 38 TCPs operating today involve about 6,000 experts from government, industry and research organisations in more than 50 countries.

## About the International Energy Agency (IEA)

The International Energy Agency (IEA) is an autonomous organisation which works to ensure reliable, affordable and clean energy for its 29 member countries and beyond.



Founded in response to the 1973/4 oil crisis, the IEA's initial role was to help countries co-ordinate a collective response to major disruptions in oil supply through the release of emergency oil stocks to the markets.

While this continues to be a key aspect of its work, the IEA has evolved and expanded. It is at the heart of global dialogue on energy, providing authoritative statistics and analysis.

An autonomous organisation, the IEA examines the full spectrum of energy issues and advocates policies that will enhance the reliability, affordability and sustainability of energy in its 29 members countries and beyond.

The four main areas of IEA focus are:

- ▶ **Energy security:** Promoting diversity, efficiency and flexibility within all energy sectors;
- ▶ **Economic development:** Economic development: Ensuring the stable supply of energy to IEA member countries and promoting free markets to foster economic growth and eliminate energy poverty;
- ▶ **Environmental awareness:** Enhancing international knowledge of options for tackling climate change; and
- ▶ **Engagement worldwide:** Working closely with non-member countries, especially major producers and consumers, to find solutions to shared energy and environmental concerns.

## IEA Technology Collaboration Programmes

There are no quick fixes to long-term energy challenges. To find solutions, governments and industry benefit from sharing resources and accelerating results.

The IEA energy technology network is an ever-expanding, co-operative group of more than 6,000 experts that support and encourage global technology collaboration. At the core of the IEA energy technology network are a number of independent, multilateral energy technology initiatives – the IEA Technology Collaboration Programmes (TCPs) (formally known as Implementing Agreements).

Through these TCPs, of which there are currently more than forty including 4E, experts from governments, industries, businesses, and international and non-governmental organisations from both IEA member and non-member countries unite to address common technology challenges and share the results of their work.

Each Implementing Agreement has a unique scope and range of activities. Further information is available [here](#).

A video explaining the role of TCPs is can be viewed [here](#).

**The International Low-Carbon Energy Technology Platform (Technology Platform) is the IEA's chief tool for multilateral engagement on clean technologies among its member and partner countries, the business community and other international organisations.**