IEA Technology Collaboration Programme on Energy Efficient End-use Equipment (4E TCP)

End-of-Term Report 2014-2019

Energy Efficient End-use Equipment
International Energy Agency

1 Summary of Achievements

During its second term, the Technology Collaboration Programme on Energy Efficient End-use Equipment (4E TCP) has provided a highly effective international platform for governments to collaborate on the development of policy measures designed to stimulate the uptake of energy efficient end-use technologies.

1.1 Outputs

Between March 2014 and December 2017, the 4E TCP published over 120 reports, and hosted over 50 events for governments, industry and other experts (see **Error! Reference source not found.**1). For further details see the RfE Questionnaire.

Table 1: Summary of 4E TCP outputs, March 2014-December 2017

Output	Count	Output	Count
Analysis		**Events**	
Reports	68	Meetings	44
Policy Briefs	24	Scientific/policy exchanges	30
National technology/ policy mapping reports	23	Presentations	18
International benchmarking reports	8	Workshops	17
Raising awareness		Webinars	8
Newsletters	48	**Other**	
Promotional Materials	3	Software tools	1

1.2 Cost-effectiveness

Participation in the 4E TCP continues to represent high value. Results of a recent survey of Contracting Parties (CPs) show that 100% consider participation to be cost-effective. In addition, 82% of CPs found that participation reduced or avoided national research costs; and 55% reduced expenditures for developing national policies as a result of their participation in the 4E TCP. For example, results of the SSL Annex, EMSA and EDNA and international benchmarking were used by Denmark, the Netherlands, Sweden and the UK to inform their input to European product policies. 2014-2019 the annual membership fee remained at €20,000 per annum, with costs for administration comprising less than 10% of the total annual budget.

1.3 Impacts

1.3.1 Policy Development

4E TCP materials have been instrumental in the formation of national or regional policies (EU) by nine 4E TCP member countries, China and the California Energy Commission. For example, Australia recognizes that 4E TCP work has helped to identify products worthy of further investigation for energy efficiency regulation e.g. motor systems. Information from other countries has helped formulate local program approaches and has facilitated policy implementation, while dialogue has helped to foster collaborative approaches for some cross-cutting issues.

1.3.2 Standardisation

Through active participation in technical committees for the International Electrochemical Commission (IEC) the Electric Motor Systems Annex (EMSA) refined international standards for motors, variable speed drives and motor systems (IEC standards 60034 and 61800).

The Solid-State Lighting (SSL) Annex 2013 inter-laboratory comparison testing program for light-emitting diode (LED) lights assisted in the development of the international test standard CIE S025, the first international measurement standard for LED Lamps, LED Luminaires and LED Modules.

In addition, laboratory testing undertaken by both EMSA and the SSL Annex are used to improve test methods and make them practically applicable worldwide.

1.3.3 Input to international initiatives

During 2014-2019, the 4E TCP has actively contributed to a number of IEA activities and has lent expertise to several multilateral initiatives:

IEA:

- Publications: Digitalisation and Energy (2018), Energy Technology Perspectives (three editions), Energy Efficiency Market Reports (four editions), the World Energy Outlook (2016), World Energy Investment Outlook (2017), and More Data, Less Energy (2014).
- Workshops: '21st Century Energy Efficiency Standards and Labelling Programmes', 'G20 Energy Efficiency Action Plan: Networked Devices' (x4), G20 Energy Efficiency Leading Program Product Best Practice Policy Exchange Series (x2), 'Maximising the impact of IEA TCPs: opportunities of collaboration under MI', Energy Efficiency in Emerging Economies (E4) Training Week (x4).

Multilateral initiatives

- Super-efficient Equipment and Appliance Deployment (SEAD) initiative Global Competition Awards for Industrial Motors and Street Lighting and the SEAD Connected Efficiency Award: The 4E TCP contributed technical advice on the criteria used to assess the awards.
- UN Environment Program initiative United for Efficiency (U4E) Policy Guides: The 4E TCP contributed technical advice on lighting and motors.
- Climate Bonds Initiative: The 4E TCP contributed technical advice on the criteria for lighting.
- Clean Energy Ministerial roundtable on digitalization (CEM8): The 4E TCP assisted in the organisation, preparation of the discussion document and summary output document.

2 Support for the IEA Medium-term Strategy for Energy Research and Technology (2013-2017)

The 4E TCP's Programme of Work was strongly aligned to this strategy, providing practical effect to many of its key elements, as follows.

2.1 Enhance and expand analysis to provide strategic energy technology policy guidance

2.1.1 Ensure continuous and easy access to quantitative and qualitative assessments of the role of available supply and demand energy technologies.

The 4E TCP has published a wide range of reports providing detailed analysis on the role of end-use technologies, each of which are freely available and widely disseminated through our regularly updated website. Key publications such as the 2-page policy briefs, are available in multiple languages, including French, German, Japanese and Korean.

Member governments report that they regularly use the 4E TCP materials within their internal policy development processes, and to engage with national stakeholders.

Many of the 4E TCP's key findings are integrated within relevant IEA publications, for broader dissemination and impact, such as within the World Energy Outlook (WEO) and the Energy Efficiency Market Report series.

To engage with key stakeholders the 4E TCP also runs workshops, and participates in conferences, including with governments not currently members of the TCP, and with selected academics and industry.

2.1.2 Facilitate priority-setting, robust policy analysis and formulate technology policy recommendations adapted to the needs of the audience.

The 4E TCP's authoritative analysis in the fields of LED lighting and motors/motor systems have informed the development of voluntary performance tiers that are intended, and have been used, as a guide for national policy makers in formulating appropriate national thresholds.

The 4E TCP has developed a robust methodology to track appliance performance trends drawn from a unique dataset of national registration information. The resulting international benchmarking analysis has been used by countries to compare product performance with those in other major economies which in turn informs future policy objectives.

The 4E TCP *Achievements of Energy Efficiency Standards and Labelling* report (2015 and 2016) provides an authoritative evaluation of widely employed policy measures, drawing on a wide range of national results. These reports have been used extensively by Australia and Canada to support the maintenance and expansion of energy efficiency policy measures.

Voluntary Agreements (VA) have been considered by some as an alternative policy measure to stimulate the development of energy efficient products. To provide guidance, in 2016 the 4E TCP undertook the first ever analysis of the impact of VA programmes in a number of countries and regions, including a workshop with 4E TCP members and G20 governments.

2.1.3 Encourage and stimulate countries to foster technology deployment and implementation.

The 4E TCP platform provides many opportunities for the exchange of information between governments, and thereby encourages countries to expand their technology coverage by leveraging off the work of other members. Similarly, the comparison of different implementation and administrative approaches enables countries to understand and learn from strengths of other programmes.

The 4E TCP's programme of work results from detailed strategic planning with members, to ensure that it is relevant to their national policy objectives. This maximises the adoption of results and findings by member governments.

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

Working together through 4E TCP, governments increase the impact of energy efficiency policies substantially by:

- Setting policies that reflect changes in technology and market conditions;
- Reviewing and expanding the scope of policies to cover more equipment; and
- Improving implementation and compliance through learning from others' experience.

Through engagement in international standardization, the 4E TCP ensures that relevant technical standards embody the best technical know-how and suit the needs of energy efficiency regulators and policy makers. These international standards transfer this expertise globally and are used to underpin a wide range of appliance and equipment programmes.

2.1.4 Facilitate discussions on cross-cutting and emerging energy technology areas in order to better inform policy makers.

As 4E TCP's membership comprises governments in major economies, discussions enable a transfer of experiences between policy makers, allowing them to collectively explore some of the technological and policy challenges ahead. Since a large proportion of appliances and equipment is now internationally traded, these experiences are highly transferable. Examples of 4ETCP's work on emerging technologies and cross-cutting issues are described below.

The 4E TCP has been at the forefront of initiatives on the energy implications of connected devices. In addition to international workshops run by the Electronic Devices and Networks Annex (EDNA), the 4E TCP co-authored the joint IEA publication *More Data, Less Energy* that resulted in the G20 Connected Devices Task Force in 2014, led by the United Kingdom. This work has continued through the G20 Connected Devices Alliance (CDA) which links 350 relevant government and information and communications technology (ITC) industry experts. The 4E TCP has co-funded the CDA, provided the Secretariat and through EDNA undertakes several CDA projects.

The 4E TCP provides a unique forum for energy efficiency regulators to raise issues of common concern and share approaches to market surveillance and enforcement. 4E TCP has raised the issues 'defeat devices' and software downloads amongst members and highlighted the associated risks. Ongoing work provides important guidance on policy approaches to tackle these threats to the effectiveness of energy efficiency programs.

2.2 Engage with selected countries and relevant organisations

The 4E TCP has undertaken strategic engagement with a range of stakeholders throughout the second term, through geographically diverse workshops, meetings and the distribution and accessibility of its publications, as indicated below.

2.2.1 Governments

While membership of 4E TCP is actively encouraged, 4E TCP provides numerous opportunities for non-member governments to participate in, and benefit from, the sharing of experiences:

- The 4E TCP interacts with a large number of governments including members and non-members, and intergovernmental organisations, through appropriate of channels.
- 4E TCP's twice yearly Executive Committee (ExCo) meetings provide the opportunity for national government delegates to interact and share information over several days. The value of this is indicated by the extremely high participation rates. These meetings have included observers from other governments, such as China, Germany, Mexico, the European Commission as well as intergovernmental organisations.
- Through the G20 Energy Efficiency Leading Programme (EELP) Product Best Practice Policy Exchange Forum, 4E TCP, IEA and SEAD have jointly managed a series of face-to-face and web-based seminars for G20 and other governments on strategically important topics.
- The 4E TCP's memorandum of understanding (MoU) with the IPEEC SEAD initiative has enabled delegates from developing and emerging economies to participate in ExCo meetings of the 4E TCP.
- To facilitate engagement, most of 4E TCP's recommendations are published in 2-page Policy Briefs, which are available in a number of languages; as are EMSA newsletters.

2.2.2 Industry

The 4E TCP engagement with industry occurs on many levels and has increased throughout the second term:

- EMSA plays a major role in the bi-annual Energy Efficiency in Motor Driven Systems conference, that provides a platform for policy makers and energy efficiency experts from industry, research labs, universities and standardisation organisations.
- Through extensive inter-laboratory comparison programmes, 4E TCP builds capacity in support of national and regional energy efficiency policies. In 2013-4, the 4E TCP SSL Annex conducted the world's largest testing program to improve the ability of laboratories to test the performance LED lights. In 2017-18, a similar program is underway, involving laboratories in 17 countries.
- Although 4E TCP liaison with industry is often informal, the SSL Annex formally consults with the lighting industry in the development of its voluntary performance tiers for LED lighting.
- The G20 CDA enables 4E TCP EDNA to engage on policy issues with a network of over 350 relevant ITC industry experts.

2.3 Strengthening the Energy Technology Network

The 4E TCP has considerably strengthened its role in the Energy Technology Network throughout the second term. For example:

- The 4E TCP has developed an extremely effective partnership with the IEA Secretariat, combining on successive *Energy Efficiency Market Reports (2015-17), More Data Less Energy,* and *Digitalisation and Energy.* In addition, 4E TCP has drawn on its own research and analysis to provide input to editions of the *World Energy Outlook* and *Energy Technology Perspectives*.
- Co-sponsorship of the *Product Best Practice Policy Exchange Series* under the G20 Energy Efficiency Leading Program, including a workshop on 'Innovation in Energy Labelling & High Efficiency Programs', 15 November 2016 in Ottawa.
- Co-sponsorship with IEA of workshop: "21st Century Energy Efficiency Standards and Labelling Programmes" (December 2015).
- The 4E TCP held the "Electric Vehicle Supply Equipment" workshop (September 2017, Switzerland), involving speakers from the IEA, Hybrid and Electric Vehicles (HEV TCP), the European Commission Joint Research Centre (EU JRC) and the University of Applied Sciences.
- EDNA collaborated with ISGAN over joint paper (to be published).
- The 4E TCP partnered with other TCPs - High-Temperature Superconductivity (HTS TCP), Smart Grids (ISGAN TCP) and Demand-Side Management (DSM TCP) - for a workshop on "Energy Efficiency in Future Electricity Systems: the invisible fuel" (February 2017).
- The 4E TCP has participated in all meetings of the EUWP Building Co-ordination Group during the term.
- The 4E TCP Chair, Michelle Croker, attended the CERT meeting in October 2017.
- The 4E TCP attended the first Universal TCP meeting (September 2015) and presented at the second (October 2017).
- The 4E TCP was featured 27 times in the *Open Bulletin* during the period.
- The 4E TCP provided input for *Technology Collaboration Programmes: Highlights and outcomes* 2015.

3 Structure and Management

The 4E TCP has developed a structure that enables excellent strategic and day-to-day management, while supporting an effective and on-going collaborative programme of work. At the same time, there is sufficient flexibility to meet the changing priorities of members. The key elements include the management committee meetings, ExCo meetings, and the programme of work.

3.1 Leadership

The 4E TCP Management Committee meets monthly via teleconference and comprises the 4E TCP Chair and Vice-chairs, together with the Annex Chairs. During the second term, the 4E TCP has benefited from a stable leadership team, with representation from several key regions.

Table 2: 4E TCP Chairs and Vice-chairs, 2014-18

Period	Chairs	Vice-Chairs
2014-16	Mike Walker (United Kingdom)	Katherine Delves (Canada) David Walker (Australia) Hans-Paul Siderius (Netherlands)
2016-18	Michelle Croker (Australia)	Katherine Delves (Canada) Hans-Paul Siderius (Netherlands) Ashley Armstrong (United States)

3.2 ExCo meetings

The ExCo meets twice yearly to manage the work programme of 4E TCP and facilitate liaison with the IEA Secretariat and prospective new members. These meetings are highly valued as source of information sharing, with a participation rate of 94%. Meetings are hosted in turn by the members. Secretariat functions for the ExCo are provided by the Operating Agent, funded by membership fees.

3.3 Programme of work

Targeted collaborative research and development activities are undertaken within our Annexes, each of which with a particular focus and agreed work plan. During the second term, the following Annexes were active:

- Electric Motor Systems Annex (EMSA), launched in October 2008.
- Solid State Lighting (SSL) Annex, launched in June 2010.
- Electronic Devices and Networks Annex (EDNA), launched in 2014.

4E TCP members also 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. During 2014-19, the following projects were undertaken:

- Mapping & Benchmarking (several products).
- G20 Connected Devices Alliance.

- G20 EELP Product Best Practice Policy Exchange Forum.
- IEA *Energy Efficiency Market Report*.
- Policy Guidelines for Motor Driven Units.
- *Achievements of Energy Efficiency Standards and Labelling Programmes – a Global Assessment*.
- *The Role of Voluntary Agreements*.
- Regulators Monitoring, Verification and Enforcement (MV&E) Forum.

3.4 Membership

As shown in Table 3, the 4E TCP comprises 13 CPs, with China joining in 2018. South Africa (South Africa National Energy Development Agency, or SANEDI) joined in 2014 and withdrew in 2016 due to a lack of resources (annual fees, travel to ExCo/annex meetings). The European Commission has been a regular observer at the ExCo and is expects to join 4E TCP in 2019. The ExCo is also in dialogue with further potential members: Germany (Bundesanstalt für Materialforschung und -prüfung), and New Zealand (Energy Efficiency and Conservation Authority). The ExCo is seeking to restart earlier discussions with Mexico (CONUEE). In addition, under an MoU with the SEAD initiative, SEAD representatives regularly attended 4E TCP ExCo meetings.

Table 3: Membership in the 4E TCP

Country	Contracting Party	Since
China	China National Institute of Standardization	2018
Japan	New Energy and Industrial Technology Development Organisation (NEDO)	2011
Sweden	Swedish Energy Agency	2011
United Kingdom	Department for Business, Energy & Industrial Strategy (BEIS)	2009
Australia	Department of the Environment and Energy	2008
Austria	Ministry for Transport, Innovation and Technology (BMVIT)	2008
Canada	Natural Resources Canada (NRCan)	2008
Denmark	Danish Energy Agency	2008
France	French Environment and Energy Management Agency (ADEME)	2008
Korea	Korea Energy Agency (KEA)	2008
Netherlands	Netherlands Enterprise Agency (RVO.nl)	2008
Switzerland	Swiss Federal Office of Energy (SFOE)	2008
United States	Department of Energy (DOE)	2008

3.5 Dissemination

4E TCP's overall communications approach is governed by the Communications Strategy 2014-19, which provides a framework that highlights the most important priorities, in terms of the development of materials and activities, in order for 4E TCP to meet its objectives. It draws on previous experience and defines the key communication tasks, target audiences, responsibilities and the budget. In order to address changing circumstances, funding and opportunities, the ExCo regularly reviews the Communications Strategy.

The 4E TCP websites provide the hub for the TCP's communication activities, providing an attractive and accessible source of news, information on the current and historical range of 4E activities, their aims and progress, all public reports and events. The content is regularly kept updated. The main 4E TCP website acts as a portal to the Annex and Project sites, and all sites include a members-only section for the sharing of confidential information. During 2016, the sites were redesigned to improve readability, navigation and to be read on mobile technologies.

Many of 4E's reports are summarized in a two-page 'Policy Brief' to highlight the main findings and policy observations. These are available in English, French, German, Japanese and Korean. 4E CPs report that these have been used in internal briefings and to their stakeholders.

Between 2014-19, the 4E TCP produced 4 short videos to explain the 4E TCP, the work of the SSL Annex, EDNA and the CDA.

Key dissemination activities between 2014-19 include (see Table 1 and RFE):

- Events provide an opportunity to actively engage with targeted audiences comprising other policy makers, industry representatives and experts: 4E TCP hosted 17 workshops and 8 webinars, took part in a further 30 scientific /policy exchanges, made 18 presentations and held an additional 44 meetings.
- Newsletters (Bright Spark and EMSA newsletter): approximately five are distributed annually and read by about 5,000 interested parties globally, with links to current TCP activities, reports and events.
- Member national networks: CPs are encouraged to use 4E TCP materials to reach out to their local networks via events and newsletters to provide greater visibility for 4E TCP's activities. For example, Australia regularly includes information on 4E TCP in its newsletter. Many government energy efficiency agencies contain links to the 4E TCP website.
- Industry groups and other stakeholders: In addition to the above, Annexes target relevant industry groups for consultation, briefings and meetings to update on activities and gain input to key research activities. Many industry groups include information on 4E TCP within their newsletters to members.