Chair’s Statement

Any summary of achievements in 2019 should start by acknowledging the International Energy Agency’s approval of 4E’s extension for a third five-year term to 2024. Our exciting 2019-2024 strategy has been jointly developed by all 4E Members, whose continued commitment to 4E demonstrates how much they value 4E’s contribution to their local policy processes. It is extremely gratifying to see so much of 4E’s work used directly in the energy efficiency policies implemented by governments, and I look forward to seeing more examples over the forthcoming years.

4E Members particularly value the opportunity to share information and expertise amongst one another, and the addition of the European Commission and New Zealand to the 13 existing Members of 4E in 2019 will strengthen these opportunities. It is noteworthy that policies implemented by 4E Members directly impact about one-third of the world’s population.

During 2019, 4E continued to tackle a range of topical issues related to the challenges of digitalisation, capacity building and standardisation. Digitalisation is perhaps unique in offering both the potential for large future energy savings, as well as drivers for future increases in energy consumption. It has been very pleasing to see 4E at the forefront of global discussions in shaping the policy environment needed to ensure that the digital world is also a more energy-efficient world. The work undertaken by EDNA has been especially important in 2019, and I look forward to the additional contributions in the lighting, motors, and power electronics fields by the SSL, EMSA, and PECTA annexes, respectively.

The ability to test products accurately is the cornerstone of most energy efficiency policies implemented by 4E Members. This requires precise test procedures and laboratories with the equipment, staff, and expertise to conduct them. The international round-robin projects managed by the SSL and EMSA annexes, involving laboratories spread around the globe, will greatly improve the capacity of laboratories to test LEDs and motor converters, enabling governments to implement more effective policies.

Similarly, the 4E project in 2019 to closely examine test methods for residential air conditioners amongst 4E Members has identified many opportunities for improvement. As the global consumption of air conditioners grows rapidly, such practical steps to ensure that our policies result in real energy savings are vitally important on many fronts.

Of course, these are only a few highlights from a year packed full of activities which are described in the following Annual Report. On a personal note I would like to add my thanks to all 4E Members, whose devotion of time and energy ensures the work of 4E remains focussed on the support of national policy agendas. Most notably, our sincere thanks go to Michelle Croker whose leadership has guided 4E through to its third term before she moved on to other fields in 2019.

John Cymbalsky
Acting Chair 4E
February 2020
### Key 4E achievements in 2019

The world must quickly implement massive energy efficiency and conservation practices and must replace fossil fuels with low-carbon renewables.


<table>
<thead>
<tr>
<th>MONTH</th>
<th>EVENT</th>
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<tr>
<td>JANUARY</td>
<td>4E POLICY BRIEF: Policy Guidelines for Pumps,Fans and Compressors</td>
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<tr>
<td>MARCH</td>
<td>4E REPORT: 4E 2018 Annual Report</td>
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<tr>
<td>MAY</td>
<td>IEA REPORT: Tracking Clean Energy Progress 2019</td>
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<td>JUNE</td>
<td>EMSA REPORT: Round Robin of Converter Losses (Phase 1)</td>
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<td>JUNE</td>
<td>Launch of PECTA</td>
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<td>JULY</td>
<td>Efficient Electric Motors and Motor Systems</td>
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<tr>
<td>JULY</td>
<td>EMSA WEBINAR: Certification, Standards &amp; Requirements of Solid State Lighting</td>
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<tr>
<td>AUGUST</td>
<td>New Zealand joins 4E</td>
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<td>AUGUST</td>
<td>IEA REPORT: Measuring Network Standby Power</td>
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<td>SEPTEMBER</td>
<td>EDNA REPORT: Bridging the Network Standby Gap between Mobile and Mains-Powered Products</td>
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<td>SEPTEMBER</td>
<td>EMSA CAPACITY BUILDING: Launch of DTI-HydraCalc</td>
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<tr>
<td>SEPTEMBER</td>
<td>EDNA WEBINAR: Key Role of Internet-Connected Devices</td>
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<td>OCTOBER</td>
<td>EMSA PRESENTATION: Five papers delivered to EEMODS'19</td>
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<tr>
<td>NOVEMBER</td>
<td>SSL WORKSHOP: Certification, Standards &amp; Requirements of Solid State Lighting</td>
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<td>DECEMBER</td>
<td>SSL NEWSLETTER</td>
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### Key Role of Internet-Connected Devices

Austrian IEA National event of 2019

European Commission joins 4E

New Zealand joins 4E

EDNA REPORT: Total Energy Model for Connected Devices

EDNA REPORT: Bridging the Network Standby Gap between Mobile and Mains-Powered Products

EDNA WORKSHOP: Network Zero

EDNA NEWSLETTER

IEA REPORT: Tracking Clean Energy Progress 2019

EMSA REPORT: Round Robin of Converter Losses (Phase 1)

4E REPORT: 4E 2018 Annual Report

4E POLICY BRIEF: Policy Guidelines for Pumps, Fans and Compressors

New Zealand joins 4E

Efficient Electric Motors and Motor Systems

Certification, Standards & Requirements of Solid State Lighting

Launch of PECTA

Total Energy Model for Connected Devices

Bridging the Network Standby Gap between Mobile and Mains-Powered Products

Five papers delivered to EEMODS’19

IEA REPORT: Tracking Clean Energy Progress 2019

EMSA REPORT: Round Robin of Converter Losses (Phase 1)

4E REPORT: 4E 2018 Annual Report

4E POLICY BRIEF: Policy Guidelines for Pumps, Fans and Compressors
Enabling policies are crucial to strengthening energy efficiency. A combination of regulations, market-based instruments, incentives, capacity building and information provision have a proven capacity to deliver large-scale energy efficiency improvements.

IEA Energy Efficiency Market Report 2019
THE TECHNOLOGY COLLABORATION PROGRAMME ON ENERGY EFFICIENT END-USE EQUIPMENT (4E)

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

Source: IEA Energy Efficiency 2019

Energy efficiency achievements

- 3.5 GtCO₂ saved in emissions due to energy efficiency improvements in IEA countries, 2000-18
- USD 600 billion saved energy costs due to energy efficiency improvements in IEA countries, 2000-18
- USD 1.6 trillion GDP added due to energy intensity improvement, 2018
- USD 240 billion investment in energy efficiency, 2018
- 2% increased energy demand
- 3% potential energy intensity improvement using existing technologies
- 1.2% increase in primary energy intensity, 2018
- 0.7% cut in emissions due to energy efficiency improvements, 2015-18

Policies

- 0.4% increased stringency of all mandatory policies, 2018 vs 2017
- 35% coverage of total energy use by all mandatory policies, 2018
- 1.2% increased stringency of all mandatory policies, 2018 vs 2017

Appliances and Equipment

- USD 139 billion energy efficiency investment in buildings, 2018
- 13% annual increase in demand for household cooling in China
- 1.1% global annual increase in population
- 8% global annual increase in digital devices
- 12% number of smart meters installed in China, 2017
- 50 TWh energy consumed by data centres and data transmission networks, 2018 (2% of global electricity)
- 460 TWh energy consumed by Bitcoin mining, 2018
- 150 GW increase in demand response capacity by 2040
- 50 TWh number of smart meters installed in China, 2017
- Green bonds issued, 2018
- 3% green bond share of global debt security issued, 2018
- USD 165 billion green bonds issued, 2018
- USD 12 billion expenditure on national financial incentives for energy efficiency, 2018 (17 countries)
- 19x growth in internet traffic over previous decade

Source: IEA Energy Efficiency 2019
The role played by 4E

4E aims to promote energy efficiency as the key to ensuring safe, reliable, affordable and sustainable energy systems.

As an international platform for collaboration between governments, the 4E TCP provides policy guidance to its members and other governments concerning energy using equipment and systems. The 4E TCP prioritises technologies and applications with significant energy consumption and energy saving potential within the residential, commercial and industrial sectors (not including transport).

In order to stimulate internationally accepted approaches that promote energy efficient equipment, 4E harnesses the expertise of governments, industry, experts and other TCPs to:

1. Collect data, analyse information, share expertise and pool resources.
2. Support and strengthen government policy and regulation.
3. Disseminate information to develop greater understanding and promote government actions that encourage the uptake of energy efficient equipment.

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.

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, sharing the learnings 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.

“New ways of policy thinking that move beyond traditional approaches are required, particularly to maximise the potential efficiency gains from digitalisation.”

IEA Energy Efficiency Market Report 2019
Overview of 4E
Structure and Activities

“Energy efficiency alone could enable energy sector greenhouse gas emissions to peak before 2020, achieving the energy efficiency target in the Sustainable Development Goals. Unfortunately, data from 2018 reveal that the world is veering away from this pathway.

Dr. Fatih Birol, Executive Director, International Energy Agency
IEA Energy Efficiency Market Report 2019
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 2019, the 4E office-bearers comprised:

- **Chair of 4E:** Michelle Croker (Australia) – retired August 2019
- **Vice-chairs of 4E:** Hans-Paul Siderius (Netherlands), John Cymbalsky (USA), Katherine Delves (Canada) - retired June 2019

The 23rd and 24th meetings of the Executive Committee (ExCo) were held in Beijing, China (27-28 March 2019) and Brussels, Belgium (14 November 2019). Attendance at these meetings is shown in the table on the right.

During 2019, New Zealand and the European Commission join 4E, joining the 13 existing Members of 4E. A full list of the Members of the ExCo during 2019 is shown in Attachment 1.

### 2019 ExCo members

- Australia
- Austria
- Canada
- China
- Denmark
- European Commission
- France
- Japan
- Korea
- Netherlands
- New Zealand
- Norway
- Sweden
- Switzerland
- United Kingdom
- United States of America
- Observers

### Attendance at 2019 ExCo meetings

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<thead>
<tr>
<th>Contracting Party</th>
<th>23rd ExCo - Beijing</th>
<th>24th ExCo - Brussels</th>
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<td>Observers</td>
<td>IEA</td>
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### Future ExCo meetings

- **25th ExCo:** 7 May 2020, Teleconference
- **26th ExCo:** November 2020, New Orleans, United States
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 set for a three year period and are negotiated amongst the participating countries.

The 4E structure is shown alongside, and this highlights the three existing Annexes and one new Annex launched in 2019:

- Electric Motor Systems Annex (EMSA), launched in October 2008 and chaired by Switzerland.
- Electronic Devices and Networks Annex (EDNA), launched in 2014 and chaired by the Netherlands in 2019.
- Power electronic Conversion Technology Annex, (PECTA), launched in 2019 and Chaired by Sweden and then Switzerland.

Reports on all currently operating Annexes are included later in this report.
4E Projects

4E members initiate projects into topics to support policies for efficient end-use equipment.

These may be special one-off activities or potentially lead to the development of a 4E Annex or other avenues for pursuing more in-depth consideration.

Active projects in 2019 included:

- Product Energy Efficiency Trends
- Policies for Energy Efficient Systems
- Monitoring, Verification and Enforcement
- Domestic Air Conditioner Test Standards and Harmonization
- IEA Publications

Product Energy Efficiency Trends (PEET)

In 2019, 4E initiated a major new project to collate data on product energy efficiency trends and the potential for future technologies, as well as progress with policies and test methods for major equipment types. In addition to sourcing and analysis of data from members, the project harnesses the expertise of Annexes for their market and technology developments.

The PEET project is designed to assist 4E Members in assessing the performance improvement of products within their market compared to those in other economies, and identify future policy opportunities.

Policies for Energy Efficient Systems

4E research into policies for energy-using systems continued during 2019 with the appointment of specialist consultants to lead the research. Building on the existing expertise within the EMSA the SSL Annex and EDNA, 4E is investigating how energy efficiency policies can be expanded beyond individual appliances and equipment to cover energy-using systems in order to deliver greater energy savings and increased flexibility.

System policies pose many challenges, for example how can regulators accurately verify the performance of equipment that needs to be assembled on-site before it can function, and who might be legally responsible for compliance?

The starting point for this 4E project is tackling the definitions for different types of energy systems in a manner that is appropriate for regulation. Building on this, the project seeks to identify systems that might be most suitable for the next generation of energy efficiency regulation.

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. Building on the considerable experience of 4E Members and their national MV&E programmes, 4E provides a unique mechanism for regulators to raise issues of concern and share approaches to market surveillance and enforcement in confidence.

4E provides a unique forum for regulators to meet face-to-face alongside each ExCo to share information on topical issues relating to compliance and enforcement.

Policy Domestic Air Conditioner Test Standards and Harmonization

Energy consumed by air conditioning systems has tripled since 1990: no other building end-use is growing as fast. Air conditioning not only makes a significant and growing share of energy consumption, it is also the primary contributor to peak demand in many geographies.

Across the globe there are numerous governing bodies that currently regulate and test air conditioners (ACs) and more than 60 countries have regulatory requirements on the energy performance. These proven, cost-effective strategies for slowing the growth of energy consumption and reducing peak demand on electrical systems around the world rely upon accurate and repeatable test procedures.

However, the test procedures and metrics established by these different countries often vary, making it difficult to compare the energy performance of ACs across jurisdictions. This can confuse consumers, provide inappropriate drivers for product developers, and increase the testing burden on manufacturers attempting to comply with many different regulatory schemes.

This 4E project undertook a detailed examination of current test procedures and metrics across its Member countries. The resulting publication identified several recommendations to improve international alignment and noted the work underway in several regions to develop new methods for testing variable capacity air conditioners. The report highlighted the significant challenges for manufacturers and regulators in accurately testing these products and indicated the role of international round robin testing as a means to better understand and align any differences in these test methods.

4E will publish the report early in 2020, when it will also hold a workshop/webinar to discuss the findings.
IEA Publications

4E works closely with the IEA on topics of common interest, and provides expert input to many reports, including combining on joint publications and events. This gives high level visibility to much of 4E’s research work. Some examples of this collaboration are shown below.

4E makes a significant contribution to the Appliance & Equipment sections of the Energy Efficiency Market Report, the IEA’s flagship publication on energy efficiency, including in 2019. This quantifies the latest trends, tracks global progress, and examines key drivers and market issues.

4E EDNA presented the third in a series of IEA Webinars on Digitalisation and Energy in September 2019. Titled: ‘The Key Role of Internet-Connected Devices’, the talk explained how connecting everyday, internet-connected devices can have profound implications for energy use. Connected devices can participate in new kinds of digital ecosystems: systems of connected devices can be managed intelligently to save energy, within a building or even within a city. Within an electricity grid, connected devices can be controlled to match the variable loads generated by renewables. However, good policy is required to derive the best outcomes, and to ensure that the “energy cost” of connectivity is minimised.

4E also made substantial contributions to ‘Tracking Clean Energy Progress’, published in May 2019. The IEA’s Tracking Clean Energy Progress (TCEP) reports assess the status of 45 critical energy technologies and sectors and provides recommendations on how they can get ‘on track’ with the Sustainable Development Scenario (SDS). The SDS offers a pathway for the global energy system to reach three strategic goals: the Paris Agreement’s well below 2°C climate goal, universal energy access and substantially reducing air pollution.

In 2018, mandatory policy coverage increased in line with recent trends but over 95% of the growth in coverage was due to existing policies. The strength of mandatory policies increased by over 0.4%. Although this increase was slightly higher than in the previous two years, it was still below the five-year historical average, indicating more can be done to ensure mandatory policies are effective. There was also little change in the coverage and strength of energy efficiency obligation programmes, the main market-based instrument tracked by the IEA.

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Growth in energy use by household appliances shows no signs of decelerating, having reached more than 3,000 TWh in 2018, or nearly 15% of global final electricity demand. Only one-third of appliance energy use today is covered by mandatory performance standards, and coverage is poor in markets that are expected to grow rapidly in the next decade.

Consumer electronics, connected devices and other small plug-loads, which are proliferating rapidly, continue to be unregulated in most countries. Expanded policy coverage and increased stringency are needed in all countries to get on track with the SDS.

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.

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.

As the Secretariat for the G20 Networked Devices Task Force, 4E worked with the International Partnership on Energy Efficiency Co-operation (IPEEC) and the Clean Energy Ministerial (CEM) in 2019. Under this initiative, 4E continued to fund the Connected Devices Alliance (CDA) through the support of EDNA. Led by the United Kingdom, the IEA, Canada and The Netherlands, the CDA provides a unique forum for dialogue between industry and government representatives on an issue that is rapidly gaining global significance.

In addition, 4E regularly liaises with a range of public and private sector groups with an interest in end-use energy efficiency, including SEAD, APEC, the World Bank, the World Economic Forum, Sustainable Energy for All, 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.

To gain input from relevant industry sectors to 4E’s work, we run regular workshops and meetings in most regions. Depending on the topic, we may also seek industry comments on our published materials or conduct formal consultation processes.

“
The greenest watt is the one that doesn’t have to be produced."
Digitalisation could reduce global buildings sector demand by up to 10% between 2017 and 2040. Digitalisation could also increase demand response capacity more than ten-fold, by unlocking new sources of flexible load in the buildings and transport sectors. However, the exact scale of these impacts is uncertain, and depends on policy responses, which also need to consider the risk of increased energy demand from the growth of digital devices.

IEA Energy Efficiency Market Report 2019
Electric Motor Systems Annex (EMSA)

The 4E Electric Motor Systems Annex (EMSA) promotes opportunities for energy efficiency in motor systems by disseminating best practice information worldwide.

It supports the development of internationally aligned technical standards and the implementation of national policies to improve the energy performance of new and existing motor systems.

EMSA provides a platform for in-depth technical and policy exchange between members and is a vehicle for collaborative projects.

In 2019, EMSA has contributed to gaining more scientific evidence about Variable Frequency Drives and their energy performance through the international Round Robin. This work will inform the relevant standards development process by the International Electrotechnical Commission (IEC).

In 2019 the IEC ACEE CAISEMS project (Coordination and Alignment of Standards for Energy Efficient Electric Motor Driven Systems) kicked off with active participation by EMSA, which aims to connect the different elements of a motor system, including their standardisation by ISO and IEC.

EMSA’s work currently focuses on international standards, digitalisation of motor systems and the dissemination of the EMSA tools (Motor Systems Tool, DTI-Hydracalc).

Annex Participants

A complete record of EMSA Annex activities in 2019 and participants is included in Attachment 4.

Major Achievements During 2019

- EMSA welcomed Sweden as new member in the group. A joint group was formed by Austria, Netherlands and Sweden to work on the topic of digitalization and energy efficient motor systems in industry within EMSA.
- Phase 1 of the international Round Robin testing program for converters losses, launched by EMSA in cooperation with IEC, was concluded and the report published. Currently phase 2 is ongoing with the participation of 10 test labs worldwide. The goal of this Round Robin is to inform the revision of IEC 61800-9-2.
- EMSA actively contributed to starting the IEC ACEE CAISEMS project: Coordination and Alignment of Standards for Energy Efficient Electric Motor Driven Systems. The goal is to coordinate and align efficiency classification and testing standards for Motor Driven Systems between IEC and ISO to lower market barriers for energy efficiency.
- The independent DTI-Hydracalc Tool was published, which is the latest addition to the family of (motor systems) tools by EMSA. It evaluates all possible control strategies for a cyclic hydraulic installation and calculates the best solution in terms of motor & pump sizing for the best efficiency possible.
- EMSA members stimulated the global debate of policy makers, standards developers, research, academia and industry concerning the efficiency of electric motor systems and possible market transformation avenues at the international conference on Energy Efficiency in Motor Driven Systems (EEMODS) on 17-19 September 2019 in Tokyo Japan, with a number of presentations.
Solid State Lighting (SSL) Annex

In February 2019, the Solid-State Lighting (SSL) Annex’s Management Committee adopted its new workplan and initiated its third term, planned to run from 2019 to 2024.

Now in our tenth year, the SSL Annex Member governments continue to actively engage with each other and exchange research and analysis to support SSL policies and programmes. The new workplan sets out an ambitious agenda which spans four critical areas of cooperation:

I. SSL product quality and performance;
II. SSL testing, metrics and standards;
III. Public health, productivity and environmental impacts; and
IV. Smart lighting, digitisation and connectivity.

These areas were selected following a careful review of the policy framework surrounding activities on lighting as well identifying the gaps that needed to be addressed. The strength of the Annex is its ability to cover all key areas related to member governments’ duties in relation to SSL technologies: regulation, advice and market enforcement. The body of work is carried out by member countries in-kind contributions through researchers, analysts and lab capacity. In addition, part of the work is contracted to experts and researchers, analysts and lab capacity. In

One of these gaps was the lack of peer-reviewed public literature on the threshold values associated with people’s perception of temporal light modulation – commonly known as ‘flicker’, but also other health aspects are also of importance. The Annex is not focusing on health aspects of lighting per se, but when assessing and recommending performance parameters on energy efficiency, it is important that health and quality-of-light aspects are not compromised in order to secure user acceptance.

Testing continues to be important and the SSL Annex also continued our work conducting the world’s largest interlaboratory comparison for goniophotometers, including over 40 instruments from all over the globe. The final report and recommendations for the standardisation community are expected in 2020. A new interlaboratory comparison of methods to test light modulation is now being planned.

The performance of products remains important, and the publication of updated performance tiers is expected in 2020. To support this work, the SSL Annex continues the development of a robust, secure lighting product database for member governments only.

In 2019, the SSL Annex had some major milestones and achievements which derived directly from the strength of cooperation between the member governments of the SSL Annex:

- **Stroboscopic Visibility Measure (SVM) Detection Study** – this lighting and health study was jointly conducted by researchers in Canada and France, aiming to address an important gap in the literature on the measurement of levels of Temporal Light Modulation (TLM) of light emitting diode (LED) light sources that may affect human health and productivity. This study tests the visibility of the stroboscopic effect for five levels of SVM using an experimental method similar to the previous research from which the metric was developed. The work was initiated in late 2018 with an interim report provided to the Annex. A peer-reviewed journal article was submitted by the researchers and a final report prepared. The journal article was published in mid-February 2020 and the final report is scheduled to be published in early March 2020. The work was funded by the SSL Annex’s common fund as well as through additional contributions from Australia, Canada, Denmark, France, Sweden and UK.

**Major Achievements During 2019**

**New Lifetime Test Method Adopted in Europe** – several SSL Annex governments, including Australia, Denmark, Sweden and the UK – worked together to design and trial a lifetime test method for SSL products that combines switching cycles and lumen maintenance. This new test was found to be effective in differentiating between good and poor quality lighting products, and was adopted by the European Commission as its lifetime test method for all LED lighting products on 5 December 2019.

**Two technical seminars organised** – the SSL Annex held one-day technical seminars in 2019, one in Seoul, South Korea and one in Roskilde, Denmark. These two events had several SSL Annex Experts and all slides were made public on our website.

**Annex Participants**

A complete record of SSL Annex activities in 2019 and participants is included in Attachment 5.
The Electronic Devices and Networks Annex (EDNA)

The EDNA Annex continues to fulfil an important role for energy efficiency policy makers – at the nexus between energy-using devices and systems.

EDNA is focused on devices connected to the internet, as well as the systems in which they operate, such as a buildings, electricity networks and ICT systems.

Connecting devices to the internet increases energy use. The device itself can waste considerable energy when in “network standby” mode – maintaining communications but not providing any primary functions. Device communications can also increase energy use “upstream” from the device – in routers, mobile telephone or fixed access networks, and in the internet itself including data centres.

Under the right circumstances, connected devices can assist in the digitalisation of the energy system. By virtue of their connectivity, they can create new ways to save energy and support the deployment of renewables. However, not all connected devices are “smart” and not all smart devices can save energy. A smart, energy-saving device is able to act independently in order to achieve one or more of the following:

❯ Operate more efficiently, by responding to changing conditions in the environment (also known as “intelligent efficiency”).
❯ Provide demand flexibility, by responding to signals from the grid to decrease or increase activity depending on the availability of energy supply.
❯ Provide operational information such as alerts for fault conditions and maintenance intervals.

In all of the areas mentioned above, EDNA works with international bodies to support policy development aimed at reducing wasted energy both within the device and upstream, and to ensure that devices achieve their potential in digitalising the energy system.

Major Achievements During 2019

❯ In 2019 EDNA published 4 research reports in the areas of device wasted energy. These covered test procedures for network standby, the energy used for wireless charging of devices, an evaluation of how devices might use zero energy for network standby, and an examination of the techniques used by battery-powered mobile devices to conserve network standby energy and how these practices might be adopted in mains-powered devices.

❯ Two research reports were published related to upstream energy consequences. The first report covered the results from the EDNA Total Energy Model, which models the global energy used by connected devices and the energy consequences upstream - in local area and wide area networks and in data centres. The second report was an assessment of the intelligent techniques that can be used to reduce upstream energy use.

❯ In 2019 EDNA also launched a number of new research tasks - on “smart ready” and “demand-flexible” devices, as well as a review of the IoT and digitalisation strategies of a range of EDNA member countries.

❯ Finally, in 2019 EDNA commenced an investigation of how currently-available IoT devices embody energy-saving features, and how conventional devices might be retrofitted with connectivity in order to save energy.

Annex Participants

A complete record of EDNA activities in 2019 and participants is included in Attachment 6.
The Power Electronic Conversion Technology Annex (PECTA)

The source of electricity for many applications needs to be converted, in order to supply devices that use electric power, which is the task of power electronic semiconductors and circuits.

PECTA investigates the efficiency potential of new semiconductor technologies in power electronic applications, in particular wide band gap semiconductors (WBG) based on silicon-carbide (SiC) and gallium nitride (GaN) materials. Due to their outstanding material characteristics, it is expected that WBG could overcome limitations faced by silicon (Si) applications. These components are commonly used in cell phones, laptops, electric vehicle chargers, and PV inverters, and therefore the energy savings potential is significant.

PECTA is a unique initiative bringing together international experts from industry, academia from countries all over the world, with government officials to explore the efficiency potential from the integration of existing and emerging WBG technology applications for different sectors, especially focusing on end-use equipment.

The initial work of PECTA has focussed on preparing an applications readiness map (ARM) for policymakers, which considers market potential in areas such as mobility, electrification, integration of renewable energy sources, and digitalization in industry. The ARM synthesises existing roadmaps and provides the basis to discuss the need and impact of policy intervention to stimulate adoption of WBG technologies. The nature and timing of such policies will be examined by PECTA during 2020 and beyond, especially focusing on standardization opportunities.

PECTA is focusing on a number of end-use applications of interest to 4E, so it introduces expertise from the emerging field of WBG technologies into the existing work and knowledge body of 4E concerning commercial, industrial and residential electric and electronic products. Technical insights from PECTA experts complement the policy perspectives and bridges the gap in communication and understanding between researchers, engineers and policy makers.

Major Achievements During 2019

- PECTA started as an official 4E Annex in March 2019 with the support from Austria, Switzerland and Sweden. Denmark has subsequently joined PECTA.
- An industry advisory group (IAG) was established to harness additional expertise.
- A fully functional PECTA website with information in public and secured areas is online. Relevant applications for wide band gap semiconductors have been mapped and described according to PECTA’s own areas of work and priorities.
- Data on potential energy savings estimates, based on a large review of power electronic applications are now available to PECTA experts and members. The fruitful cooperation with industry associations in the IAG has enable the exchange of strategic important information, such as WBG roadmaps.
- Policy roadmaps for WBG devices are underway.
- PECTA was officially presented at the National 2019 IEA event of the Austrian Federal Ministry of Technology Transport and Innovation (in Innsbruck, September, 2019).

The applications readiness maps synthesises existing roadmaps and provides the basis to discuss the need and impact of policy intervention to stimulate adoption of wide band gap semiconductor technologies.

Annex Participants

A complete record of PECTA activities in 2019 and participants is included in Attachment 7.
Between 2015 and 2018, the amount of energy demand required to produce a unit of GDP continued to improve, but the annual rate of improvement steadily declined from 2.9% to 1.2%, the lowest level since 2010.

IEA Energy Efficiency Market Report 2019
4E communication activities, 2008-19

Between 2008 and the end of 2019, 4E has published over 520 reports and newsletters; and run or participated in 390 workshops, webinars and policy exchanges.

- **249** REPORTS
- **115** POLICY BRIEFS
- **125** NEWSLETTERS
- **90** PRESENTATIONS
- **45** WORKSHOPS
- **108** SCIENTIFIC/POLICY EXCHANGES
- **152** MEETINGS
- **4** SOFTWARE TOOLS
- **7** PROMOTIONAL MATERIALS
- **29** OTHER

4E uses a wide range of channels to reach its target audience and 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. Visit the 4E site here.

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 and Brazil.

Between 2014–2019, the 4E TCP produced 4 short videos to explain the 4E TCP, the work of the SSL Annex, EDNA and the CDA.
4E Group Finances

All 4E membership fees have not altered since 2016 and are considered by existing Members to represent excellent value – often saving them money.

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 2019, the total cost of 4E activities is estimated to be €1.8 million, 7% lower than the previous year.

The annual fees and voluntary contributions of the 15 Members funded approximately 39% of the total expenditure.

77% of resources were directed towards research, while communication and outreach activities accounted for 16% of costs. The share of resources devoted to administration and financial management remained at only 7%.

Allocation of 4E resources in 2019

4E membership fees, 2019

While Annex membership fees can vary from year to year depending upon the agreed work programme, in fact all membership fees have not altered since 2016 and are considered by existing Members to represent excellent value – often saving them money.

EXECUTIVE COMMITTEE €20,000
ELECTRIC MOTOR SYSTEMS ANNEX (EMSA) €15,000
SOLID STATE LIGHTING ANNEX (SSL) €22,000
ELECTRONIC DEVICES AND NETWORKS ANNEX (EDNA) €15,000
POWER ELECTRONIC CONVERSION TECHNOLOGY ANNEX (PECTA) €20,000
Energy efficiency is the first fuel – the fuel you do not have to use – and in terms of supply, it is abundantly available and cheap to extract. But demand for the first fuel needs to grow, and that’s where policy action matters the most.

Brian Motherway, IEA Head of Energy Efficiency
Commentary — 19 December 2019
## Attachment 1: 4E Executive Committee Delegates*

<table>
<thead>
<tr>
<th>Contracting Party</th>
<th>Nomination</th>
<th>Name &amp; Details</th>
<th>Email/Telephone</th>
</tr>
</thead>
</table>
| **AUSTRALIA**     | Primary    | Ms Catherine Zarger (from 21 October 2019)  
 Director, GEMS Policy & Legislation  
 Department of the Environment and Energy | Catharina.Zarger@environment.gov.au  
 Tel: +61 2 6275 9147  
 Ben.Costelloe@environment.gov.au  
 Tel: +61 2 6275 9213 |
|                   | Alternate  | Mr Ben Costelloe (from 15 April 2019)  
 Acting Director, GEMS Policy  
 Department of the Environment and Energy |  |
| **AUSTRIA**       | Primary    | Dr Adriana Diaz  
 Ecodesign Company GmbH  
 Engineering and Management Consultancy | diaz@ecodesign-company.com  
 Tel: +43 1 40 35 611-33  
 michael.huebner@bmiit.gv.at  
 Tel: +43 1 711 62 652922 |
|                   | Alternate  | Mr Michael Hübner  
 Federal Ministry for Transport,  
 Innovation and Technology |  |
| **CANADA**        | Primary    | Mr Jamie Hulan  
 Director, Equipment Division  
 Office of Energy Efficiency, Natural Resources Canada | Jamie.Hulan@canada.ca  
 Tel: +1 613 996-4359  
 Kimberly.Curran@canada.ca  
 Tel: +1 613 947 1207 |
|                   | Alternate  | Ms Kimberly Curran (from 4 September 2019)  
 Chief, Standards Development,  
 Office of Energy Efficiency, Natural Resources Canada |  |
| **CHINA**         | Primary    | Mr Lin Ling  
 Director of Resource and Environment  
 China National Institute of Standardization | linling@cnic.gov.cn  
 Tel: +86 10 58811737  
 liaoming@cnic.ac.cn  
 Tel: +86 10 58811128 |
|                   | Alternate  | Mr Liu Meng  
 Associate Researcher  
 China National Institute of Standardization |  |
| **DENMARK**       | Primary    | Mr Jesper Ditlefsen (from 31 October 2019)  
 Special Advisor  
 Danish Energy Agency | jdam@dans.dk  
 Tel: +45 33 95 58 15  
 ts@ans.dk  
 Tel: +45 33 92 77 04 |
|                   | Alternate  | Mr Thore Stenfeldt (from 31 October 2019)  
 Advisor  
 Danish Energy Agency |  |
| **EUROPEAN COMMISSION** | Primary | Mr Robert Nuij (from 24 June 2019)  
 Directorate-General for Energy  
 European Commission | robert.nuij@ec.europa.eu  
 Tel: +32 229 66183  
 muguruza-george.pauwels@ec.europa.eu  
 Tel: +32 229 52999 |
|                   | Alternate  | Mr George Paunescu (from 24 June 2019)  
 Directorate-General for Energy  
 European Commission |  |
| **FRANCE**        | Primary    | Mr Alain Anglade  
 Senior Expert, Building Department  
 ADEME | alain.anglade@ademe.fr  
 Tel: +33 493 957 935  
 thereze.kreitz@ademe.fr  
 Tel: +33 493 957 884 |
|                   | Alternate  | Ms Therese Kretz  
 Responsible for International Affairs  
 ADEME |  |
| **JAPAN**         | Primary    | Mr Masanori Kobayashi (from 24 December 2019)  
 Director, Head of International Project Group, Energy  
 Conservation Technology Department, NEDO | kobayashim@nedo.go.jp  
 Tel: +81 44 520 5284  
 minagawaek@nedo.go.jp  
 Tel: +81 44 520 5284 |
|                   | Alternate  | Ms Erika Minagawa  
 Chief Officer, Energy Conservation Technology  
 Department, NEDO |  |
| **REPUBLIC OF KOREA** | Primary | Mr Hyoong-Jung Kim  
 General Manager,  
 Korea Energy Agency |  |
|                   | Alternate  | Mr Kyung-Ho, Jo  
 Assistant Manager,  
 Korea Energy Agency |  |
| **NETHERLANDS**   | Primary    | Mr Hans-Paul Siderius (Vice-Chair)  
 Senior Expert  
 Netherlands Enterprise Agency | hans-paul.siderius@vso.nl  
 Tel: +31 88 602 2609  
 TBA |
|                   | Alternate  | Mr Justin Rosing  
 Ministry of Economic Affairs |  |
| **NEW ZEALAND**   | Primary    | Mr Brian Fitzgerald (from 10 April 2019)  
 Standards and Regulations  
 Energy Efficiency and Conservation Authority (EECA) | Brian.Fitzgerald@eeca.govt.nz  
 Tel: +64 4 470 2541  
 TBA |
|                   | Alternate  | Mr Carlos Lopes  
 Coordinator for Ecodesign and Energy Labelling  
 The Swedish Energy Agency, Testlab | carlos.lopes@energymynedbank.nesce.gov.se  
 Tel: +46 70 595 3430  
 TBA |
| **SWEDEN**        | Primary    | Dr Michael Moser  
 Scientific Advisor, Energy Research Section  
 Swiss Federal Office of Energy (SFOE) | michael.moser@ebs.admin.ch  
 Tel: +41 58 465 23  
 TBA |
|                   | Alternate  | Mr Roland Brüniger  
 R. Brüniger AG  
 Consultant, Swiss Federal Office of Energy (SFOE) | roland.brueniger@brueniger.swiss  
 Tel: +41 44 760 0066  
 TBA |
|                   | Alternate  | Mr Markus Bleuer  
 Appliance and Competitive Tenders Section  
 Swiss Federal Office of Energy (SFOE) | markus.bleuer@ebs.admin.ch  
 Tel: +41 58 462 69 24  
 TBA |
| **SWITZERLAND**   | Primary    | Dr Peter Bennich  
 Policy Officer, Energy Efficiency Department  
 The Swedish Energy Agency, Testlab | peter.bennich@energymynedbank.nesce.gov.se  
 Tel: +46 70 595 3430  
 TBA |
|                   | Alternate  | Mr Carlos Lopes  
 Coordinator for Ecodesign and Energy Labelling  
 The Swedish Energy Agency, Testlab | carlos.lopes@energymynedbank.nesce.gov.se  
 Tel: +46 70 595 3430  
 TBA |
| **UNITED KINGDOM** | Primary | Mr Sam Balch  
 Deputy Director, Home and Local Energy  
 Department for Business, Energy and Industrial Strategy | sam.balch@beis.gov.uk  
 Tel: +44 300 068 6661  
 TBA |
|                   | Alternate  | Ms Samuel Bassi  
 Policy Manager – Energy Using Products  
 Department for Business, Energy and Industrial Strategy | samuela.bassi@beis.gov.uk  
 Tel: +44 300 068 6661  
 TBA |
|                   | Alternate  | Mr Sukiman Faruqi  
 Senior Policy Advisor, Home and Local Energy  
 Department for Business, Energy and Industrial Strategy | sukiman.faruqi@beis.gov.uk  
 Tel: +44 2072 153 127  
 TBA |
| **USA**           | Primary    | Mr Jeremy Dommu  
 Electronic Products Manager  
 Building Technologies Office, US Department of Energy | jeremy.dommu@ebe.doe.gov  
 Tel: +1 202 586 9870  
 TBA |
|                   | Alternate  | Mr John Cymbalsky (acting Chair)  
 Building Technologies Office  
 US Department of Energy | john.cymbalsky@ebe.doe.gov  
 Tel: +1 202 287 1692  
 TBA |

* As at December 2019
## Attachment 2: All 4E publications, 2019

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<td>4E</td>
<td>Policy Brief: Policy Guidelines for Pumps, Fans and Compressors</td>
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<td>Presentations from KILT-SSL Annex International Seminar on Certification, Standards and Requirements</td>
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<td>MAY</td>
<td>4E</td>
<td>IEA Report: Tracking Clean Energy Progress 2019</td>
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<td>EDNA</td>
<td>Report: Intelligent Efficiency for Data Centres and Wide Area Networks</td>
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<td>Report: Total Energy Model for Connected Devices</td>
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<td>Report: Bridging the Network Standby Gap between Mobile and Mains-Powered Products</td>
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<td>Report: Global Forecast of Energy Use for Wireless Charging</td>
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# Attachment 3: 4E workshops, presentations and meetings

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### Record of Activities

**Publications in 2019**

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**Workshops & Conferences in 2019**

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<td>Industry, academia, policy makers, researchers</td>
<td>Webinar</td>
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<tr>
<td>September</td>
<td>IEC and ISO</td>
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<tr>
<td>November</td>
<td>Fan industry, policy makers</td>
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**Workshops: market monitoring & surveillance**

| May       | EMSA Members and guests | Brussels, Belgium |

**Management/Experts Meetings in 2019**

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<tr>
<th>May</th>
<th>EMSA Members</th>
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**Workshops & Conferences Planned for 2020**

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**Management/Experts Meetings Planned for 2020**

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<tbody>
<tr>
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<td>EMSA Members</td>
<td>Zurich, Switzerland</td>
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</tbody>
</table>

*in English, Chinese, Japanese, Spanish

---

### Country Delegates

**Country** | **Name** | **Organisation** | **Email** | **Phone**
---|---|---|---|---
**AUSTRALIA** | Simon Newman | Department of the Environment and Energy | simon.newman@environment.gov.au | +61 262759352 |
**AUSTRIA** | Konstantin Kulterer | Austrian Energy Agency | konstantin.kulterer@energyagency.at | +43 1 586 15 24 - 114 |
**DENMARK** | Jasper Ditteansen | Danish Energy Agency | bjfl@lems.dk | +45 33 95 58 15 |
| | Sandie B. Nielsen | Danish Technological Institute | abn@teknologisk.dk |        |
**NETHERLANDS** | Frank Hartkamp | Netherlands Enterprise Agency | frank.hartkamp@nrvo.nl | +31 6 2290 7809 |
| | Hans-Paul Siderius | | hans-paul.siderius@nrvo.nl | +31 6 1588 6304 |
**SWEDEN** | Glenn Widerström | Swedish Energy Agency | glenn.widerstrom@energimyndigheten.se | +46 165 44 2062 |
| | Maja Dahlgren | | maja.dahlgren@energimyndigheten.se | +46 165 44 2408 |
**SWITZERLAND** | Michael Moser | Swiss Federal Office of Energy | michael.moser@ble.admin.ch | +41 44 760 0066 |
| | Roland Brüniger | | roland.brueniger@brueniger.swiss | +41 44 226 20 10 |
**USA** | John Cymbalsky | Department of Energy | john.cymbalsky@hq.doe.gov | |
| | Jeremy Dommu | | Jeremy.dommu@ee.doe.gov | |
| | Sanaee Iyama | | ssiyama@lbl.gov | +510-486-6604 |

---

**Lead Country**

**Switzerland**

**Annex Chair**

Roland Brüniger

Swiss Federal Office of Energy
c/o R. Brüniger AG, Engineering & Consulting
Zwillikonstrasse 8, CH-8913 Ottenbach Switzerland
Email: roland.brueniger@brueniger-ag.ch
Tel: +41 44 765 00 66

**Annex Chair**

Frank Hartkamp

Netherlands Enterprise Agency
Croeselaan 15, 3521 BJ Utrecht, The Netherlands
Email: frank.hartkamp@nrvo.nl
Tel: +31 6 2290 7809

**Operating Agent**

Maarten van Werkhoven

TPA advisors
Genenaal Winkelmanlaan 31 2111 WV Aardenhout The Netherlands
Email: mvanwerkoven@tpavb.vl
Tel: +31 23 536 80 90

**EMSA Coordinator**

Rita Verle

Impact Energy Inc.
Gassenratherstrasse 38a, CH-8001 Zurich Switzerland
Email: rita.verle@impact-energy.ch
Tel: +41 44 226 20 10
## RECORD OF ACTIVITIES

<table>
<thead>
<tr>
<th>PUBLICATIONS IN 2019</th>
<th>Date</th>
<th>Intended Audience</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentations from KILT-SSL Annex International Seminar on Certification, Standards and Requirements</td>
<td>April</td>
<td>Lighting industry, policy makers, testing certification experts</td>
<td></td>
</tr>
<tr>
<td>Interlaboratory Comparison 2017 (IC 2017) Nucleus Laboratory Comparison Report</td>
<td>September</td>
<td>Standardisation organisations, lighting metrologists, test laboratories, policy makers</td>
<td></td>
</tr>
<tr>
<td>Presentations from DTU-SSL Annex Seminar on Recent Research on LED Quality Metrics and Regulations</td>
<td>October</td>
<td>Lighting industry manufacturers, designers, researchers</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WORKSHOPS &amp; CONFERENCES IN 2019</th>
<th>Date</th>
<th>Intended Audience</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>International Seminar on Certification, Standards &amp; Requirements of Solid State Lighting</td>
<td>April</td>
<td>Lighting industry, policymakers, testing certification</td>
<td>Seoul, Korea</td>
</tr>
<tr>
<td>Recent International Research on LED Quality</td>
<td>March</td>
<td>SSL Members &amp; Experts</td>
<td>Toulouse, France</td>
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</table>

<table>
<thead>
<tr>
<th>MANAGEMENT/EXPERTS MEETINGS IN 2019</th>
<th>Date</th>
<th>Intended Audience</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management Committee meeting</td>
<td>January</td>
<td>SSL Annex Members</td>
<td>Teleconference</td>
</tr>
<tr>
<td>18th Experts Meeting</td>
<td>April</td>
<td>Invited SSL Experts</td>
<td>Seoul, Korea</td>
</tr>
<tr>
<td>Management Committee meeting</td>
<td>April</td>
<td>SSL Annex Members</td>
<td>Teleconference</td>
</tr>
<tr>
<td>Management Committee meeting</td>
<td>June</td>
<td>SSL Annex Members</td>
<td>Teleconference</td>
</tr>
<tr>
<td>19th Experts Meeting</td>
<td>October</td>
<td>Invited SSL Experts</td>
<td>Copenhagen, Denmark</td>
</tr>
<tr>
<td>Management Committee meeting</td>
<td>October</td>
<td>SSL Annex Members</td>
<td>Teleconference</td>
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<table>
<thead>
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<th>WORKSHOPS &amp; CONFERENCES PLANNED FOR 2020</th>
<th>Date</th>
<th>Intended Audience</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>Lighting &amp; Health Workshop</td>
<td>April</td>
<td>Manufacturers, Researchers, Health Authorities</td>
<td>London, UK</td>
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<table>
<thead>
<tr>
<th>MANAGEMENT/EXPERTS MEETINGS PLANNED FOR 2020</th>
<th>Date</th>
<th>Intended Audience</th>
<th>Location</th>
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<tbody>
<tr>
<td>Management Committee meeting</td>
<td>February</td>
<td>SSL Annex Members</td>
<td>Teleconference</td>
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<tr>
<td>20th Experts Meeting</td>
<td>March-April</td>
<td>Invited SSL Experts</td>
<td>London, UK</td>
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<td>Management Committee meeting</td>
<td>April</td>
<td>SSL Annex Members</td>
<td>Teleconference</td>
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<tr>
<td>Management Committee meeting</td>
<td>June</td>
<td>SSL Annex Members</td>
<td>Teleconference</td>
</tr>
<tr>
<td>Management Committee meeting</td>
<td>October</td>
<td>SSL Annex Members</td>
<td>Teleconference</td>
</tr>
<tr>
<td>21st Experts Meeting</td>
<td>October – November</td>
<td>Invited SSL Experts</td>
<td>Canberra, Australia</td>
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### COUNTRY DELEGATES

<table>
<thead>
<tr>
<th>Country</th>
<th>Name</th>
<th>Organisation</th>
<th>Email</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUSTRALIA</td>
<td>David Boughey</td>
<td>Department of Industry, Science, Energy and Resources</td>
<td><a href="mailto:david.boughey@industry.gov.au">david.boughey@industry.gov.au</a></td>
<td>+61 2 6243 7014</td>
</tr>
<tr>
<td>CANADA</td>
<td>Jamie Hulan</td>
<td>Natural Resources Canada</td>
<td><a href="mailto:jamie.hulan@canada.ca">jamie.hulan@canada.ca</a></td>
<td>+1 613-996-4359</td>
</tr>
<tr>
<td>DENMARK</td>
<td>Casper Kofod</td>
<td>Energy Piano (Acting MC for Denmark)</td>
<td><a href="mailto:cd@energypiano.dk">cd@energypiano.dk</a></td>
<td>+45 40 45 98 76</td>
</tr>
<tr>
<td>FRANCE</td>
<td>Bruno Lafitte</td>
<td>ADEME</td>
<td><a href="mailto:Bruno.Lafitte@ademe.fr">Bruno.Lafitte@ademe.fr</a></td>
<td>+33 4 93 95 72 56</td>
</tr>
<tr>
<td>REPUBLIC OF KOREA</td>
<td>Ji-eun Choi</td>
<td>Korea Energy Agency</td>
<td><a href="mailto:jeunchoi@energy.or.kr">jeunchoi@energy.or.kr</a></td>
<td>+82-52-930-0452</td>
</tr>
<tr>
<td>SWEDEN</td>
<td>Peter Bennich</td>
<td>Swedish Energy Agency</td>
<td><a href="mailto:Peter.Bennich@energimyndigheten.se">Peter.Bennich@energimyndigheten.se</a></td>
<td>+46 16 544 22 78</td>
</tr>
<tr>
<td>UNITED KINGDOM</td>
<td>Suleiman Faruqi</td>
<td>Department for Business, Energy &amp; Industrial Strategy</td>
<td><a href="mailto:Suleiman.faruqi@beis.gov.uk">Suleiman.faruqi@beis.gov.uk</a></td>
<td>+44 207 215 3127</td>
</tr>
</tbody>
</table>

### Lead Country

**ACTING ANNEX CHAIR**

David Boughey  
Assistant Manager – Lighting Efficiency, Residential Energy Efficiency Branch  
Department of Industry, Science, Energy and Resources, Canberra, Australia  
Email: david.boughey@industry.gov.au  
Tel: +61 2 6243 7014

**OPERATING AGENT**

Nils Borg  
Borg & Co. AB  
Sveavägen 98, 4 tr, 113 50 Stockholm, Sweden.  
Email: nils@borgco.se  
Tel: +46 70 585 31 74

**OPERATING AGENT SUPPORT**

Michael Scholand, LC  
MOS2 Energy Ltd.  
7 Green Bank, London, N12 8AS, United Kingdom  
Email: ssl.annex@gmail.com  
Tel: +44 7931 701 568
Attachment 6: Electronic Devices and Networks Annex (EDNA)  
2019 Record of Activities & Delegates

**RECORD OF ACTIVITIES**

<table>
<thead>
<tr>
<th>Date</th>
<th>Intended Audience</th>
<th>Location</th>
<th>Title</th>
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<tbody>
<tr>
<td>May</td>
<td>Public</td>
<td></td>
<td>Intelligent Efficiency for Data Centres and Wide Area Networks</td>
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<tr>
<td>June</td>
<td>Public</td>
<td></td>
<td>Getting to Zero: An Evaluation of Zero Network Standby Power</td>
</tr>
<tr>
<td>June</td>
<td>Public</td>
<td></td>
<td>Total Energy Model for Connected Devices</td>
</tr>
<tr>
<td>July</td>
<td>Public</td>
<td></td>
<td>Global Forecast of Energy Use for Wireless Charging</td>
</tr>
<tr>
<td>July</td>
<td>Public</td>
<td></td>
<td>Bridging the Network Standby Gap between Mobile and Mains-Powered Products</td>
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**WORKSHOPS & CONFERENCES IN 2019**

<table>
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<tr>
<th>Date</th>
<th>Intended Audience</th>
<th>Location</th>
<th>Title</th>
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<tr>
<td>November</td>
<td>4E Members</td>
<td>Brussels</td>
<td>Network Zero Workshop</td>
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**MANAGEMENT/EXPERTS MEETINGS HELD IN 2019**

<table>
<thead>
<tr>
<th>Date</th>
<th>Intended Audience</th>
<th>Location</th>
<th>Title</th>
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<tbody>
<tr>
<td>January</td>
<td>EDNA Members</td>
<td>Teleconference</td>
<td>22nd Management Committee meeting</td>
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<tr>
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<td>EDNA Members</td>
<td>Teleconference</td>
<td>23th Management Committee meeting</td>
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<tr>
<td>March</td>
<td>EDNA Members</td>
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<td>11th Annex Meeting</td>
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<tr>
<td>May</td>
<td>EDNA Members</td>
<td>Teleconference</td>
<td>24th Management Committee meeting</td>
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<td>June</td>
<td>EDNA Members</td>
<td>Teleconference</td>
<td>25th Management Committee meeting</td>
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<td>EDNA Members</td>
<td>Teleconference</td>
<td>26th Management Committee meeting</td>
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<td>September</td>
<td>EDNA Members</td>
<td>Teleconference</td>
<td>27th Management Committee meeting</td>
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<tr>
<td>November</td>
<td>EDNA Members</td>
<td>Brussels, Belgium</td>
<td>12th Annex Meeting</td>
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**MANAGEMENT/EXPERTS MEETINGS PLANNED FOR 2020**

<table>
<thead>
<tr>
<th>Date</th>
<th>Intended Audience</th>
<th>Location</th>
<th>Title</th>
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<tbody>
<tr>
<td>May</td>
<td>EDNA Members</td>
<td>Utrecht, Netherlands</td>
<td>13th Annex Meeting</td>
</tr>
<tr>
<td>November</td>
<td>EDNA Members</td>
<td>New Orleans, USA</td>
<td>14th Annex Meeting</td>
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</tbody>
</table>

**COUNTRY DELEGATES**

<table>
<thead>
<tr>
<th>Country</th>
<th>Name</th>
<th>Organisation</th>
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<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUSTRALIA</td>
<td>Catherine Zerger</td>
<td>Dept of Industry, Science, Energy and Resources</td>
<td><a href="mailto:catherine.zerger@industry.gov.au">catherine.zerger@industry.gov.au</a></td>
<td>+61 2 6243 7123</td>
</tr>
<tr>
<td>AUSTRIA</td>
<td>Adriana Diaz</td>
<td>EcoDesign Company</td>
<td><a href="mailto:diaz@ecodesign-company.com">diaz@ecodesign-company.com</a></td>
<td>+43 1 40 35 611 33</td>
</tr>
<tr>
<td>CANADA</td>
<td>Jamie Hulan</td>
<td>Natural Resources Canada</td>
<td><a href="mailto:jamie.hulan@canada.ca">jamie.hulan@canada.ca</a></td>
<td>+1 613 947 1207</td>
</tr>
<tr>
<td>DENMARK</td>
<td>Thore Sørenfeldt</td>
<td>Danish Energy Agency</td>
<td><a href="mailto:tso@energistyrelsen.dk">tso@energistyrelsen.dk</a></td>
<td>+45 3392 7704</td>
</tr>
<tr>
<td>FRANCE</td>
<td>Bruno Lafitte</td>
<td>ADEME</td>
<td><a href="mailto:bruno.lafitte@ademe.fr">bruno.lafitte@ademe.fr</a></td>
<td>+33 4 93 95 72 56</td>
</tr>
<tr>
<td>JAPAN</td>
<td>Masanori Kobayashi</td>
<td>NEDO</td>
<td><a href="mailto:kobayashimori@nedo.go.jp">kobayashimori@nedo.go.jp</a></td>
<td></td>
</tr>
<tr>
<td>REPUBLIC OF KOREA</td>
<td>Jeon Kwan Taek</td>
<td>Korea Energy Agency</td>
<td><a href="mailto:machocf@energy.or.kr">machocf@energy.or.kr</a></td>
<td>+82 31 260 4249</td>
</tr>
<tr>
<td>NETHERLANDS</td>
<td>Hans-Paul Siderius</td>
<td>Netherlands Enterprise Agency</td>
<td><a href="mailto:hans-paul.siderius@rvo.nl">hans-paul.siderius@rvo.nl</a></td>
<td>+31 88 602 2609</td>
</tr>
<tr>
<td>SWEDEN</td>
<td>Peter Bennich</td>
<td>Swedish Energy Agency</td>
<td><a href="mailto:peter.bennich@energimyndigheten.se">peter.bennich@energimyndigheten.se</a></td>
<td>+46 16 544 22 78</td>
</tr>
<tr>
<td>SWITZERLAND</td>
<td>Roland Brüniger</td>
<td>Swiss Federal Office of Energy</td>
<td><a href="mailto:roland.brueniger@rne-ag.ch">roland.brueniger@rne-ag.ch</a></td>
<td>+41 44 760 00 66</td>
</tr>
<tr>
<td>UNITED KINGDOM</td>
<td>Suleiman Faruqi</td>
<td>Dept for Business, Energy and Industrial Strategy</td>
<td><a href="mailto:Suleiman.Faruqi@bais.gov.uk">Suleiman.Faruqi@bais.gov.uk</a></td>
<td>+44 2072 153 127</td>
</tr>
<tr>
<td>USA</td>
<td>Jeremy Dommu</td>
<td>Dept of Energy</td>
<td><a href="mailto:jeremy.dommu@REE.DOE.Gov">jeremy.dommu@REE.DOE.Gov</a></td>
<td>+1 202 586 9870</td>
</tr>
</tbody>
</table>

**Lead Country**

Netherlands

**ANNEX CHAIR**

Hans-Paul Siderius  
Netherlands Enterprise Agency  
Netherlands  
Email: hans-paul.siderius@rvo.nl  
Tel: +31 88 602 2609

**OPERATING AGENT**

Steven Beletich  
Beletich Associates  
PO Box 56  
Northbridge, NSW 2063, Australia  
Email: info@edna.iea-4e.org  
Tel: +61 2 9967 5809
Attachment 7: Power Electronics Convertor Technology Annex (PECTA) 2019 Record of Activities & Delegates

**RECORD OF ACTIVITIES**

**WORKSHOPS & CONFERENCES IN 2019**

<table>
<thead>
<tr>
<th>Date</th>
<th>Intended Audience</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>September</td>
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<td>Innsbruck, Austria</td>
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**MANAGEMENT/EXPERTS MEETINGS HELD IN 2019**

<table>
<thead>
<tr>
<th>Meeting Type</th>
<th>Date</th>
<th>Intended Audience</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>1st Management Committee meeting</td>
<td>January</td>
<td>PECTA Members</td>
<td>Teleconference</td>
</tr>
<tr>
<td>2nd Management Committee meeting</td>
<td>February</td>
<td>PECTA Members</td>
<td>Teleconference</td>
</tr>
<tr>
<td>3rd Management Committee meeting</td>
<td>February</td>
<td>PECTA Members</td>
<td>Teleconference</td>
</tr>
<tr>
<td>4th Management Committee meeting</td>
<td>March</td>
<td>PECTA Members</td>
<td>Teleconference</td>
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<tr>
<td>5th Management Committee meeting</td>
<td>April</td>
<td>PECTA Members</td>
<td>Teleconference</td>
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<td>6th Management Committee meeting</td>
<td>May</td>
<td>PECTA Members</td>
<td>Teleconference</td>
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<td>7th Management Committee meeting</td>
<td>June</td>
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<td>8th Management Committee meeting</td>
<td>June</td>
<td>PECTA Members</td>
<td>Teleconference</td>
</tr>
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<td>9th Management Committee meeting</td>
<td>August</td>
<td>PECTA Members</td>
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</tr>
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<td>10th Management Committee meeting</td>
<td>September</td>
<td>PECTA Members</td>
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<td>11th Management Committee meeting</td>
<td>October</td>
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<td>Teleconference</td>
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<td>12th Management Committee meeting</td>
<td>October</td>
<td>PECTA Members</td>
<td>Teleconference</td>
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<tr>
<td>1st Annex meeting</td>
<td>November</td>
<td>PECTA Members</td>
<td>Brussels, Belgium</td>
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<tr>
<td>2nd Experts meeting</td>
<td>November</td>
<td>Invited experts</td>
<td>Brussels, Belgium</td>
</tr>
<tr>
<td>13th Management Committee meeting</td>
<td>December</td>
<td>PECTA Members</td>
<td>Teleconference</td>
</tr>
<tr>
<td>14th Management Committee meeting</td>
<td>December</td>
<td>PECTA Members</td>
<td>Teleconference</td>
</tr>
</tbody>
</table>

**WORKSHOPS & CONFERENCES PLANNED FOR 2020**

- Workshop: November, PECTA Members and invites from USA, New Orleans, USA

**MANAGEMENT/EXPERTS MEETINGS PLANNED FOR 2020**

<table>
<thead>
<tr>
<th>Meeting Type</th>
<th>Date</th>
<th>Intended Audience</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd Experts Meeting</td>
<td>March</td>
<td>Invited experts</td>
<td>Vienna, Austria</td>
</tr>
<tr>
<td>4th Experts Meeting</td>
<td>September</td>
<td>Invited experts</td>
<td>Lyon, France</td>
</tr>
<tr>
<td>2nd Annex Meeting</td>
<td>November</td>
<td>PECTA Members</td>
<td>New Orleans, USA</td>
</tr>
</tbody>
</table>

**COUNTRY DELEGATES**

<table>
<thead>
<tr>
<th>Country</th>
<th>Name</th>
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<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>Adriana Diaz</td>
<td>ECODESIGNcompany GmbH</td>
<td><a href="mailto:diaz@ecodesign-company.com">diaz@ecodesign-company.com</a></td>
<td>+43 1 40 35 611 33</td>
</tr>
<tr>
<td>Denmark</td>
<td>Jakob Wulff Andersen</td>
<td>Danish Energy Agency</td>
<td><a href="mailto:jbwa@ens.dk">jbwa@ens.dk</a></td>
<td>+1 613 947 1207</td>
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<tr>
<td>Sweden</td>
<td>Peter Bennich</td>
<td>Swedish Energy Agency</td>
<td><a href="mailto:Peter.bennich@energimyndigheten.se">Peter.bennich@energimyndigheten.se</a></td>
<td>+46 16 544 22 78</td>
</tr>
<tr>
<td>Switzerland</td>
<td>Roland Brüniger</td>
<td>Bundesamt für Energie</td>
<td><a href="mailto:Roland.brueniger@brueningerb.ch">Roland.brueniger@brueningerb.ch</a></td>
<td>+33 493 957 935</td>
</tr>
</tbody>
</table>

**Lead Country**

- Switzerland

**ANNEX CHAIR**

- Roland Brüniger
- Swiss Federal Office of Energy
- c/o R. Brüniger AG, Engineering & Consulting
- Zwillikenstr. 8, CH-8913 Ottenbach Switzerland
- Email: roland.brueniger@r-brueniger-ag.ch
- Tel: +41 44 760 00 66

**OPERATING AGENT**

- Markus Makoschitz
- AIT Austrian Institute of Technology GmbH
- Giefinggasse 2
- 1210 Vienna
- Austria
- Email: markus.makoschitz@ait.ac.at
- Tel: +43 50550-6317
About the IEA

The TCPs are organised under the auspices of the International Energy Agency (IEA), but the TCPs are functionally and legally autonomous.

About the International Energy Agency (IEA)

The IEA is at the heart of global dialogue on energy, providing authoritative analysis, data, policy recommendations, and real-world solutions to help countries provide secure and sustainable energy for all.

The IEA was created in 1974 to help co-ordinate a collective response to major disruptions in the supply of oil. While oil security this remains a key aspect of our work, the IEA has evolved and expanded significantly since its foundation.

Taking an all-fuels, all-technology approach, the IEA advocates policies that enhance the reliability, affordability and sustainability of energy. It examines the full spectrum issues including renewables, oil, gas and coal supply and demand, energy efficiency, clean energy technologies, electricity systems and markets, access to energy, demand-side management, and much more.

Since 2015, the IEA has opened its doors to major emerging countries to expand its global impact, and deepen cooperation in energy security, data and statistics, energy policy analysis, energy efficiency, and the growing use of clean energy technologies.

IEA Technology Collaboration Programmes

The Technology Collaboration Programme supports the work of independent, international groups of experts that enable governments and industries from around the world to lead programmes and projects on a wide range of energy technologies and related issues. The experts in these collaborations work to advance the research, development and commercialisation of energy technologies. The scope and strategy of each collaboration is in keeping with the IEA Shared Goals of energy security, environmental protection and economic growth, as well as engagement worldwide.

The breadth of the analytical expertise in the Technology Collaboration Programme is a unique asset to the global transition to a cleaner energy future.

These collaborations involve over 6,000 experts worldwide who represent nearly 300 public and private organisations located in 55 countries, including many from IEA Association countries such as China, India and Brazil.