ACCELERATING ENERGY EFFICIENCY PROGRESS IN G20 ECONOMIES

Final report
June 2019
# Table of contents

**Executive Summary** ................................................................................................................. 2  

**1- Introduction** ......................................................................................................................... 4  
  
  *G20 priorities under Japan’s Presidency* ....................................................................................... 4  

**2- Progress update on the implementation of the G20 Energy Efficiency Leading Programme** ............................................................................................................. 5  
  
  1. Super-efficient Equipment and Appliances Deployment initiative (SEAD) .... 5  
  2. Networked Devices Task Group/Connected Devices Alliance (NDTG/CDA) ...... 6  
  4. High-Efficiency Low-Emissions Task Group (HELE) .................................................. 8  
  5. Transport Task Group (TTG) ......................................................................................... 9  
  6. Energy Management Action Network (EMAK) ............................................................ 10  
  8. Energy Efficiency Finance Task Group (EEFTG) .......................................................... 12  
  9. Top Ten Energy Efficiency Best Available Technologies (BATs) and Best Practices (BPs) Task Group (TOP TENs) ............................................................... 14  
  10. Energy End Use Data and Energy Efficiency Metrics (EUDEEM) ............................. 15  
  11. New initiatives .............................................................................................................. 16  

  *District Energy Systems (DES)* ............................................................................................... 16  

  *Energy Efficiency Knowledge Sharing Framework (KSF)* .................................................. 16  

**3- Conclusions and next steps** ................................................................................................. 17  

**Annex A** ................................................................................................................................. 18  
  
  1. G20 economies participation in the Task Groups of the G20 Energy Efficiency Leading Programme ....................................................................................... 18  

**Annex B** ................................................................................................................................... 18  
  
  1. Key messages from the ‘Scoping Workshop: Behaviour Change for Energy Efficiency - Opportunities for International Cooperation in the G20 and Beyond’ .................................................................................................................. 18
Executive Summary

The energy agenda under the G20 Presidency of Japan focuses on the theme of “accelerating the virtuous circle of environmental protection and economic growth by innovation”. Through the Energy Transitions Working Group (ETWG) and Environment Senior Officials Meeting, G20 countries are working together to progress energy transitions that achieve “3E+S”: energy security, economic efficiency, and environmental safety. In this context, energy efficiency represents a crucial pillar to the G20’s efforts in facilitating these transitions, in particular in securing a more sustainable energy future in a cost-effective manner.

Five years ago, in 2014, under the Australia’s G20 Presidency, the G20 made the decision to place energy efficiency on the G20 agenda. As a result, the **G20 Energy Efficiency Action Plan (EEAP)** was adopted. In 2016, under China’s G20 Presidency, this collaboration was reinforced in the **G20 Energy Efficiency Leading Programme (G20 EELP)** – the G20’s first long-term plan for energy efficiency up to 2030.

The on-going implementation of the G20 EELP plays an essential role in accelerating G20 countries’ joint work to support and advance the design, acceleration and enactment of national energy efficiency policies and programmes – boosting their productivity, growth, and prosperity. This solid foundation provided by the G20 EELP led to the endorsement by most G20 members of the 2017 G20 Action Plan on Climate and Energy for Growth under Germany’s G20 Presidency, containing the G20 Energy Efficiency Investment Toolkit. Argentina’s G20 Presidency in 2018 further consolidated the accumulated accomplishments by bringing crucial elements to the G20 agenda that will contribute to the success of energy efficiency policies, in particular behaviour change initiatives.

Over the past five years, the energy efficiency initiatives under the G20 (called ‘Task Groups’), coordinated by the International Partnership for Energy Efficiency Cooperation (IPEEC), have been tackling a diverse range of energy efficiency challenges that are of global importance while demonstrating the value of international cooperation. These initiatives focus on the following topics that are a priority for energy efficiency improvement:

- Developing innovative solutions to the challenge of rapidly increasing energy consumption by networked devices.
- Developing effective energy efficiency policies in the buildings sector, with a core focus on building rating systems and building codes.
- Implementing world-class policies to improve energy, climate, and health outcomes of transportation, in particular for HDVs given their disproportionate emissions impacts.
- Supporting energy efficiency improvements in conventional electricity generation by encouraging the understanding and dissemination of High Efficiency Low Emissions (HELE) technologies.
- Encouraging greater energy efficiency uptake in industry by sharing best practices and technical resources to promote Energy Management Systems (EnMS) and the implementation of the ISO 50001 EnMS standard by sharing tools and best practices on the use of EnMS.
- Accelerating the deployment of highly efficient products that are driving global electricity demand.

---

1 This document has been produced by IPEEC at the request - and under the close guidance - of Japan’s G20 Presidency 2019.
- Enhancing robust, investment-grade policy frameworks in G20 countries to significantly increase energy efficiency investments as required by the global energy transition and broadening overall G20 engagement with private sector financial institutions on energy efficiency.
- Compiling energy efficiency best practices (BPs) and best available technologies (BATs), for use by policy-makers and businesses, to help accelerate the widespread application of these and further technological innovations.
- Sharing technical information, enhancing communication, outreach, training and capacity building on the issue of energy end-use data and energy efficiency metrics that are required for good policy development, implementation and evaluation.

G20 economies are encouraged to sustain the progress on behaviour change made under the G20 Presidency of Argentina in 2018 and to explore more innovative social approaches to improve energy efficiency across various sectors. The potential of adopting socio-economic approaches and emerging behavioural science and behavioural economics theories to lower energy demand, GHG, and other emissions continues to be substantial.

Japan’s G20 Presidency continues to support these collective efforts at the global and regional levels. Since energy transitions thrive on a virtuous circle of environmental protection and economic growth, G20 members are continuously encouraged to give further impetus to innovation that is required at many levels such as the product, business model and societal levels. In addition, public and private research and investments in innovation need to be scaled-up to enable economic growth within the constraints of the environment, and the cost effective delivery of the global energy transition.

Accelerating innovation and investment in clean technologies is critical to bridge the existing gaps that have been identified between current policies and future policies. It is essential for ensuring environmental sustainability in a timely way. For G20 economies, greater investments in low-carbon technologies and disruptive innovation are key elements that can enable the significant scale-up of energy efficiency and will further increase the impact of the G20’s work under the G20 EELP. In addition, these innovative investments can be earmarked to help improve the transparency of their contribution to the sustainable development goals, enhance overall economic resilience and increase financial flows, and strengthen the competitiveness of companies operating in the environmentally-conscious economy of the 21 century.
1- Introduction

In recent years, energy efficiency has gained tremendous importance and visibility globally. As a result, energy efficiency has emerged as a cornerstone of the energy transition. Governments are increasingly aware of the enormous potential of energy efficiency to reduce pressure on energy supply systems, deliver cost savings to people and businesses, and reduce emissions associated with energy production and use, especially in progressing towards their domestic and global energy goals. Aside from economic and environmental gains from energy efficiency, additional benefits include energy productivity, energy security, capital optimisation, improved health and employment. It can also increase power system flexibility and help integrate intermittent supplies of renewable energy.

While the benefits of energy efficiency are gaining ever greater attention, the room for improvement remains considerable. The challenges to accelerating energy efficiency deployment include, among other elements, low understanding and insufficient investment. A global transition that supports universal access to modern energy services while also achieving the necessary emissions reductions implies the need for action in the following areas: decoupling, decarbonisation, decentralisation and digitalisation. International collaboration in these areas through the G20 is key to overcoming these challenges. It encourages G20 economies to share experiences, learn from each other, work together towards finding innovative solutions, and demonstrate leadership as the world’s largest economies.

This report captures the recent developments on the implementation of the G20 EELP and outlines opportunities for a set of G20 voluntary actions aimed at raising awareness on the importance of ‘innovation’, i.e. accelerating the virtuous circle of environmental protection and economic growth by innovation.

G20 priorities under Japan’s Presidency

In 2019, the G20 Presidency is held by Japan. Energy efficiency is a key domestic priority for Japan. A Strategic Energy Plan has recently been approved to form the basis of Japan's new energy policy towards 2030 and further towards 2050. The plan promotes energy efficiency and conservation, introduction of renewable energy, and establishment of efficient thermal power plants.

The 2019 G20 Presidency has offered many opportunities for deepening and strengthening international collaboration on the myriad issues facing the international community, including the transition to innovative, flexible, transparent and cleaner energy systems. Energy efficiency has featured prominently on the agenda, as has the continued implementation of the G20 Energy Efficiency Leading Programme (G20 EELP), which was adopted in 2016 as the forum’s first long-term plan for international cooperation on energy efficiency.

Delivering reliable and affordable energy sources for all consumers is crucial to promoting economic growth and strengthening national security while achieving energy access. Technological innovation and breakthroughs are expected to bring beneficial changes to encourage the research, development, dissemination and transfer of environmentally sound technologies, including achieving greater energy efficiency, renewable energy and cleaner use of conventional energy sources. At the same time, on the energy demand side, socio-economic approaches, innovation (e.g. ‘sharing economy’, ‘digitalisation’) and the emergence of behavioural science and behavioural economics are gathering momentum due to their potential to lower energy demand, greenhouse gases and other emissions. Such approaches will ensure that energy efficiency is treated as a priority while building prosperous societies in sectors ranging from industry and buildings to appliances and transport worldwide.
2- Progress update on the implementation of the G20 Energy Efficiency Leading Programme

Under the G20 Energy Efficiency Leading Programme, Task Groups have made remarkable progress to help G20 economies advance in their domestic energy efficiency policies and programmes in the period since June 2018, when a previous implementation report was presented to the G20 at the G20 Energy Ministerial held in Bariloche, Argentina. A brief description of Task Groups’ latest progress and activities, as well as their leadership and country participation (see Annex A), is presented in the following section to serve as an implementation update to the G20.

Super-efficient Equipment and Appliances Deployment initiative (SEAD)²

Global electricity consumption is expected to grow by 60% by 2030, driven in part by the expanding use of appliances, equipment, lighting and other devices that contribute to improve material comfort and quality of life. The associated rise in energy consumption poses challenges to G20 economies that have to balance out economic growth, adverse environmental impacts, and grid overload, or even power outages. Energy efficiency policies for appliances, such as minimum energy performance standards (MEPS), are proven and cost-effective methods for lowering energy costs for consumers and increasing the resilience of economies, while at the same time driving innovation and reducing greenhouse gas emissions from electricity production.

If all SEAD member governments were to adopt current policy best practices for product energy efficiency standards, the energy equivalent of 650 mid-sized power plants could be saved in 2030. Due to the nature of these traded goods, collaboration among G20 economies on these products and their efficiency performances can yield significant results. Canada, the European Commission, India, the United States and the United Kingdom are the country co-leads for SEAD, with the support of CLASP and the Lawrence Berkley National Lab (LBNL).

Implementation progress

SEAD continued to advance energy efficiency in the appliances sector. Notably, the Task Group has:

- Concluded a study on Baseline Evaluation and Policy Implications for Air Conditioners in Indonesia to help increase energy savings from the country’s standards and labelling (S&L) programme.
- Delivered the SEAD Policy Exchange (SPEx) Forum, ‘The Road to Low-Carbon Heating Systems: Key Barriers to Overcome’, as well as a webinar on efficient electric motors and motor systems to support dissemination of best practices for policy and compliance approaches.
- Announced the successful accomplishment of the Global Lighting Challenge, exceeding the campaign goal to deploy 10 billion energy efficient lighting products worldwide. The success of the campaign and its retirement were announced by the Swedish Energy Minister at the 9th Clean Energy Ministerial.
- Increased emphasis on member-led, project-based work and greater member engagement by exploring cooling research and collaboration opportunities, both internally and under the One Planet Lab initiative.

² SEAD is a G20 Task Group, as well as an initiative of the Clean Energy Ministerial.
Executed the Global Appliance Testing Costs Analysis project to help stakeholders understand product-testing costs, prepare comprehensive plans and determine appropriate resource allocation for compliance programmes (see Box 1 below).

**Box 1: Addressing the high cost of assessing high-impact appliances**

By May 2019, SEAD completed the Global Appliance Testing Costs Analysis project by gathering information on and analysing global appliance testing costs for high-impact appliances – including the costs of building and operating a testing laboratory and testing products. Understanding product testing costs helped policy makers and compliance authorities prepare comprehensive testing plans and determine the best solutions for where to conduct testing. Information published within this project aimed to demystify the full testing costs, thereby empowering governments and compliance authorities to prepare appropriate compliance policies and programmes.

**Networked Devices Task Group/Connected Devices Alliance (NDTG/CDA)**

The growing trend towards network-connected technologies such as the ‘Internet of Things’ is rapidly transforming the world in which we live, creating new services and benefits that can permeate all areas of society. It is predicted that in the future almost all electrical devices will be connected to the internet. While those electrical devices have the potential to improve the way we manage energy, they also consume additional energy in order to remain connected 24/7 – this is known as “network standby”.

To address this issue, the Networked Devices Task Group (NDTG) was set up in 2015 to provide a platform for the international cooperation between governments, experts and industry to develop innovative solutions. To widen its reach to the industry sector, this group conceived the Connected Devices Alliance (CDA), which consists of more than 350 governments and industry participants that have come together to work on the energy efficiency opportunities provided by connected devices. The United Kingdom, Canada, Sweden, the Netherlands and the International Energy Agency (IEA) lead this work, with financial support and direction from the Electronic Devices and Networks Annex (EDNA) of the IEA’s Energy Efficient End-Use Equipment Technology Collaboration Programme (IEA 4E TCP).

**Implementation progress**

The CDA encouraged international collaboration on connected devices through:

- Organising an industry/government workshop in November 2018 in Stockholm, together with the IEA 4E TCP and Swedish Energy Agency, to initiate a dialogue on the potential for “Network Zero” policies that could lead to connected devices using zero energy to maintain network connectivity (see Box 2 below).
- Continued promotion of the CDA Voluntary Principles for Energy Efficient Connected Devices.
- Expanding the CDA Centre of Excellence, an online library that provides free access to in-depth, expert papers on ways to develop energy-efficient smart devices.
- Contributing to several technical reports by the IEA and the IEA 4E TCP concerning the energy use of connected devices.
- Regularly distributing newsletters to the over 350 CDA membership base, outlining the work of the CDA.
Box 2: “Network Zero” Devices for an Energy Efficient World

To minimise network standby energy, the IEA 4E TCP initiated the concept of “Network Zero” devices - devices which use zero energy for connectivity. To discuss the potential for “Network Zero” devices, 4E and the Swedish Energy Agency hosted a workshop in November 2018. The workshop was attended by more than 50 experts from industry, government and academia. Several presenters highlighted the opportunity to introduce drivers for technology innovation in coming years. Participants discussed a range of barriers to achieving “Network Zero” along with potential long-term solutions. This work will continue in 2019 with the development of a scoping paper and possible second workshop in November 2019 in Brussels.

Buildings Energy Efficiency Task Group (BEET)

Buildings have a significant energy impact and already represent 30% of global final energy consumption. If new policies and regulations are not substantially and quickly implemented, the energy consumption of buildings will continue to grow steadily through 2060 - making it one of the largest sources of energy consumption worldwide. In recent years, there has been a positive trend towards a decoupling of buildings energy use and national economic growth - in part driven by technology progress and regulatory advances. International collaboration can accelerate this trend and facilitate the exchange of information among countries. The Buildings Energy Efficiency Task Group fills this purpose by acting as a collaborative platform for countries to research, inform and support the development and implementation of effective building energy efficiency policies, with a core focus on building rating systems and building codes.

With a strong emphasis on comparing international policies and approaches on a wide range of building energy efficiency issues, and examining the practical implementation aspects of these approaches, BEET strengthens networks and expands knowledge at a pragmatic level. Australia and United States are lead members.

Implementation progress

BEET continues to research and develop resources and tools to help countries at different levels of development and ambition to apply specific recommendations to advance building energy policy.

- BEET is working to publish its eighth report, BEET8 on Energy Efficiency Obligation Schemes and Energy Efficiency in Building in the summer of 2019. This work will assess the potential for market-based instruments to deliver deeper reform in the building sector. A further report on the performance gap in buildings (BEET 9) will be published following this report.
- In 2018, BEET published a report on Zero-Energy Building Definitions and Policy Activity: An International Review (BEET 7) to serve as a key reference for future government policy activity in the sector. This report provided an overview of relevant definitions covering all types of zero-energy buildings (ZEB); describes regulatory policies and implementation approaches; and highlights sector-wide market progress. It also summarises lessons learned from G20 member countries and other leading national and subnational governments; offered energy and building policy makers an easy way to better understand and navigate the many definitions on standards for measuring building energy consumption, and thus make the most appropriate policy choices; and emphasised the importance of supporting and incentivising ZEB policies at all levels of government in order to achieve desired growth and progress (see Box 3 below).
Box 3: Accelerating policy activities for ZEBs

As Zero Energy Buildings (ZEB), policies and initiatives have been rolled out by G20 member countries and other national and subnational governments, several challenges have emerged. The wide range of ZEB definitions, regulated loads included/addressed, and boundaries for energy consumption or emissions undermine efforts to design a global framework for ZEBs – as well as supporting tools and innovative solutions. Recognising the value of drawing lessons from international practices to accelerate policy activities, Chapter 4 of the BEET 7 report summarises leading ZEB policies and initiatives. The BEET 7 report serves as an important resource for policy makers looking to promote zero buildings energy or emissions. The BEET reports are amongst the most widely consulted among publications produced by G20 EELP Task Groups.

High-Efficiency Low-Emissions Task Group (HELE)

Coal currently accounts for about 37% of global electricity generation and its capacity may grow in coming decades, in particular in emerging economies where it is considered an affordable, stable and abundant source of energy. In countries where coal is used as the primary energy source, greater deployment of HELE technologies can support the transition to a low carbon future. For example, a 1% improvement of the efficiency of global thermal power generation would reduce CO₂ emissions by 340 M.

Thus, some countries’ advanced experience and wealth of knowledge can benefit other countries and the purpose of the HELE Task Group, under the leadership of Japan, is to support such policy and technical expertise among participants.

Implementation progress

HELE has been focusing on boosting recognition on the potential of HELE technologies by increasing public awareness. HELE continued to secure wider recognition by society regarding the role of HELE technologies in the energy transition that is vital to the Japanese G20 Presidency. The HELE Task Group achieved this by:

- Hosting the HELE Working Group meeting in September 2018 in Tokyo, Japan, that examined how HELE technologies can support the low-carbon energy transition and reduce GHG emissions, particularly in countries that seek to use large coal resources. Topics covered during the meeting included (see also Box 4):
  - Updates on coal-related energy policies and the position of coal in the energy mix plans of different countries.
  - Briefings on outcomes of the 27th Clean Coal Day International Symposium (September 2018, Japan), followed by the exchange of opinions among members on the role of HELE technologies.
  - Discussion on next steps of the HELE Task Group.
- Circulating a chairman’s summary of the workshop, noting participants’ recognition of: the important role of HELE technologies, the role of thermal power in energy transitions, and the need for wider public awareness and acceptance.
- Publishing a policy report [in spring 2019] that examines the role of coal-fired power plants in meeting the United Nations Sustainable Development Goals; role of clean coal technology in reducing environmental loads; and role of coal for optimising overall energy systems. The
report [will support] further discussions on the important role of HELE technologies to jointly realise economic growth and GHG emissions reductions in G20 countries at G20 meetings under Japan’s Presidency.

- Expanding communication and outreach efforts and encouraging further collaboration to overcome technical and financial barriers to greater uptake of HELE plants.

**Box 4: Securing a future for HELE technologies**

The HELE Task Group recognises that international co-operation is important to increase public awareness of technologies that can improve efficiency and reduce GHG emissions at thermal power plants. At the workshop in September 2018, participants from eight countries (Australia, China, Indonesia, Japan, Russia, South Africa, Turkey and the United States) deliberated on ways to convey the role of HELE technologies during the energy transition. Besides improved efficiency and reduced emissions, HELE technologies can provide flexible backup generation to intermittent renewables, thereby helping to stabilise power systems – a key role as more energy demand is shifted to electricity (e.g. electric vehicles, electric home heating).

**Transport Task Group (TTG)**

The transport sector accounts for a quarter of global CO₂ emissions from fuel combustion.¹ In absolute terms, the transport sector emitted 10.4 billion tonnes of CO₂ in 2015,² and its emissions are projected to roughly double by 2050.³ Road transport accounts for three-quarters of transport CO₂ emissions. Heavy Duty Vehicles (HDVs), such as trucks and buses, account for less than 5% of the global on-road vehicle fleet but according to ICCT estimates, fuel lifecycle CO₂ emissions from heavy-duty vehicles are approximately 3.1 billion tonnes of CO₂ annually. In other words, heavy-duty vehicles contribute 38% of global road transport CO₂ emissions.

As G20 economies account for more than 80% of worldwide HDV sales, the standards set for HDV efficiency and emissions in G20 economies largely dictate how the global sector will evolve. However, as these standards are not uniform across the G20, there is an important opportunity to expand the adoption of world-class HDV standards.

The TTG seeks to accelerate the adoption of such standards in G20 economies through enhanced policy support and technical exchanges. The United States and the European Commission lead this work, with the support of the International Council on Clean Transportation (ICCT) and the Global Fuel Economy Initiative (GFEI).

**Implementation progress**

The TTG continued its efforts in facilitating knowledge sharing about policy and technical issues and building capacity to support wider adoption of world-class standards. Its most recent activities included:

- Continuing its project on HDV Efficiency Labelling and Standards. The second phase includes HDV coastdown testing in Argentina and proof-of-concept adaptation of the VECTO HDV simulation tool in India to support the development of HDV efficiency programs.

---


² Fuel lifecycle CO₂ emissions, including production, refining, distribution, and combustion.

• Conducting a webinar on ‘Behaviour Change principles and actions in transportation’ (February 2019) to share techniques on how to apply the scientific study of behaviour and psychology to promote pro-environmental behaviours among citizens and consumers.

• Carrying out knowledge exchanges via webinars on zero-emission vehicles (consumer perspective, monetary and non-monetary incentives, technology status, charging infrastructure and usage), European Union’s legislation on HDV CO₂ standards, Argentina’s HDV efficiency programmes and the United States’ HDV Phase 2 GHG standards.

• Convening its first in-person meeting to take stock of important progress made in improving the energy efficiency and environmental performance of HDVs in G20 economies, and to engage in strategic discussions on vision and activities for the coming years.

• Executing a ‘deep dive’ (an in-depth, focused policy project) on the measurement and certification of HDVs and their components to help countries develop HDV efficiency standards and labelling programmes (see Box 5).

---

**Box 5: Diving deep into Heavy Duty Vehicles HDV efficiency standards**

*In 2018, the TTG launched its project – called the Deep Dive – to help interested countries accelerate the development of robust HDV efficiency standards. Through a series of technical webinars and in-person workshops, participating countries are learning how to acquire and adapt existing tools, skills and methods required to define and certify minimum HDV standards while also building institutional capacity to oversee their implementation.*

---

**Energy Management Action Network (EMAK)**

EMAK aims to promote improvement of energy efficiency and energy savings in industry and commercial buildings. It is as a forum for participants to discuss policy issues related to energy management and share the best practices of each country, region and industry.

EMAK integrates two networks: one comprises policy makers responsible for promoting best practice policies for energy management; the other is made up of industry stakeholders focused on the real-world application of energy management systems (EnMS). The networks achieve their mission by supporting exchanges on proven and innovative practices and through capacity building. This work is led by Japan.

**Implementation progress**

EMAK continued to fulfil its role as a high-level international forum for discussion, consultation and exchange of information on the role of EnMS in addressing energy efficiency challenges worldwide. The Task Group has:

• Published the *Action Guide on Electricity Peak Cuts and Savings* as an effective tool for demand management and demand response in the Brazilian context. This guide highlighted the potential of EnMS to support significant behaviour change in industrial and commercial buildings, and provides advice for both business operators and households on how to improve energy efficiency.

• Supported member countries in identifying and prioritising key challenges in the energy management sector, such as how to systematically achieve efficient energy use without
negative impacts on economic growth, and sharing recommendations on solutions to promote efficient EnMS.

- Explored opportunities to co-operate with other G20 EELP Task Groups, namely TOP TENs.
- Gathered stakeholders from diverse fields under the theme of ‘Sharing Energy Management Know-How and Good Practices’ to promote the uptake of EnMS and efficient technologies across industry and commercial buildings sectors at the ninth annual EMAK workshop in Brazil in November 2018 (see Box 6 below).

<table>
<thead>
<tr>
<th>Box 6: Facilitating information exchange within the energy management field</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EMA</strong>'s 2018 workshop (EMA<strong>K</strong>9), ‘Sharing Energy Management Know-How and Good Practices’, aimed to support the application of EnMS, particularly in the industry sector. With participants showcasing improvements in EnMS and sharing information on best practices in energy efficiency and energy savings, the event contributed to the overall propagation of knowledge on energy management best practices as well as to strengthening the network of participants from public and private organisations. The workshop also helped facilitate knowledge relating to the transfer of efficient technologies and capacity building in developing countries.</td>
</tr>
</tbody>
</table>

**Energy Management Working Group (EMWG)**

The EMWG aims to optimise global energy use and minimise emissions across industrial facilities and commercial, public sector and institutional buildings, largely by encouraging sector stakeholders to pursue continuous energy efficiency improvements through implementation of energy management systems (EnMS), such as the ISO 50001 standard.

The EMWG works with the private sector, NGOs, accreditation bodies, and international and regional programmes to strengthen and support cohesive national and regional energy and climate strategies. Given that G20 economies make up a large portion of the sector globally, exchanges through G20 EMWG members can have an important impact in spurring greater savings, worldwide. Canada and the United States lead the EMWG initiative with support from the United Nations Industrial Development Organization (UNIDO).

**Implementation progress**

With a strong focus on global ISO 50001 energy management system trends, the EMWG boosted global awareness of the benefits of EnMS and their potential to reduce costs, energy use and CO₂ emissions through several activities such as:

- Encouraging integration of latest technical developments and policy best practices in national programmes; launched Phase II of the North American Energy Management Pilot Programme, led by the Commission for Environmental Co-operation; and concluded the Asia-Pacific Economic Cooperation (APEC) project ‘Enhancing Regional Conformity Assessment to Ensure Successful ISO 50001 Standard Outcomes’.
- Initiated activity to promote a global database of ISO 50001 certifications, under development by the International Accreditation Forum.

---

6 The EMWG is a G20 Task Group as well as an initiative of the Clean Energy Ministerial.
7 U.S. leadership is under review.
• Helping countries estimate energy and emissions savings through the ISO 50001 Impact Estimator Tool developed by the EMWG’s ISO 50001 Global Impacts Research Network.
• Disseminating information on the ISO 50001 standard by publishing case studies, hosting webinars, training workshops and other events, and presenting at international conferences.
• Expanding worldwide delivery of the Energy Professionals International credentialing program for building the capacity for ISO 50001 Lead Auditors.
• Facilitating ongoing dialogue among member (and non-member) governments, the private sector, standards bodies, and other partners through member webinars and international events such as the Clean Energy Ministerial meeting, G20 events through IPEEC, and ISO Technical Committee 301 meetings.
• Executing an EMWG strategy review to evaluate member priorities on energy management and identify new areas of work for the Task Group.
• Evaluating and awarding the 2019 Energy Management Leadership Awards competition. Award of Excellence winners were recognised at the 10th Clean Energy Ministerial (CEM10) in May 2019 in Vancouver, Canada (see Box 7 below).

Box 7: Energy Management Leadership Awards deliver global recognition

Through the annual Energy Management Leadership Awards Programme, the EMWG recognises leaders in the industrial, commercial and institutional sectors for improving energy performance across their organisations by implementing ISO 50001. In 2019, the EMWG recognised 32 organisations across 19 countries or economies. Each organisation developed a case study that shared valuable insights on best practices, successes and other benefits achieved by meeting the ISO 50001 standard in one or more facilities. Collectively, they reported annual energy cost savings of USD 57 million and emissions reduction of 554 MtCO₂– equivalent to taking 7 million passenger vehicles off the road, demonstrating the strong benefits of implementing the ISO 50001 standard.

Energy Efficiency Finance Task Group (EEFTG)

According to a recent IEA analysis, global energy efficiency investments increased by 3% to USD 236 billion in 2016, from USD 231 billion in 2016, which represented an increase of 9% over 2015 levels. To maximise all available and cost-effective energy efficiency opportunities however, energy efficiency investment needs to continue to grow significantly and at a rate closer to 20% annually. Average annual energy efficiency investment needs to grow to over USD 584 billion between now and 2025, and then to nearly USD 1.3 trillion per year between 2026 and 2040.

The EEFTG’s objective is to enhance capital flows for energy efficiency investments in G20 economies by supporting countries to build robust, investment-grade policy and investment frameworks and by engaging with financial institutions to build their capacity, instruments and interest in energy efficiency. Since 2014, it has provided a forum for G20 policy makers and technical and financial experts to share best practices in policies and financial instruments through peer-to-peer workshops and direct engagement with members of the private and public finance community, industry, and international organisations.
The EEFTG is co-chaired by France and Mexico on behalf of fifteen G20 members and benefits from the support of the International Energy Agency, Organisation for Economic Co-operation and Development, the European Bank of Reconstruction and Development, United Nations Environment Programme Finance Initiative, Sustainable Energy for All initiative and CEM’s Clean Energy Solutions Center.

Implementation progress

The G20 EELP called for a broadening and deepening of private sector engagement in energy efficiency investments in 2016. Since then, the EEFTG has hosted five specific events in G20 countries and presented its work at, and engaged in, a further 20 events, reaching an audience of over 3,000 experts globally. Over the past 12 months, the EEFTG has been developing new ways to boost investment in energy efficiency across all sectors and deliver energy transitions through various initiatives:

- Hosted the ‘G20 Global Summit on Financing Energy Efficiency, Innovation and Clean Technology’ in Tokyo on 12 June 2019 with leading country, financial and sector experts. This formal side event to the G20 Ministerial Meeting on Energy Transitions and Global Environment for Sustainable Growth provided insights on innovative financial mechanisms, such as the tagging of asset energy performance on bank balance sheets, and other best practices illustrated by leading financial institutions for debate among G20 country delegations. The event also offered an opportunity for leading financial institutions and G20 policy makers to perform a stock-take on the levels of energy efficiency and clean energy investments since the launch of the G20 Energy Efficiency Investment Toolkit in 2017 and address the pivotal role for innovation in supporting G20 economies’ objectives to achieve sustainable energy transitions.

- Held the first EEFTG Roundtable for Japanese private financial institutions in November 2018 in Tokyo, Japan, in preparation of the G20 Global Summit. This event gathered private banks, insurance companies and asset management firms and heard presentations of existing best practices for energy efficiency finance in Japan, Europe and the wider G20 which informed the agenda of the G20 Global Summit on Financing Energy Efficiency, Innovation and Clean Energy.

- Expanded co-operation with other international initiatives such as the Global Alliance for Buildings and Construction, the European Energy Efficiency Financial Institutions Group (EEFIG) and the United Nations Environment Programme – Finance Initiative (UNEP FI)’s Energy Efficiency Platform launched in 2019.

- Promoted and disseminated the findings from the G20 Energy Efficiency Investment Toolkit, which presents voluntary options to scale up energy efficiency investments, progress towards implementing G20 voluntary energy efficiency principles, and best-in-class approaches for investments from public and private financial institutions in participating G20 economies.

- Led the discussions on energy efficiency at the Clean Energy Investment Forum in May 2018 in Copenhagen, Denmark, as well as attending the High-Level Roundtable on Financing Energy Efficient Buildings, contributing key messages to Ministers and other bilateral meetings at the 9th Clean Energy Ministerial.

- Co-hosted and provided content to two side events at COP24 in December 2018 in Katowice, Poland (see Box 8 below), where EEFTG insights and conclusions were shared with attending experts.
Box 8: Demonstrating the value of tagging financial assets’ energy transition attributes

Different stakeholder groups have started to focus on better defining the taxonomy of energy efficiency investments. This ‘tagging’ or improved visibility of transition-related and environmental attributes can enable greater financial flows, clearer tracking and stronger policy and institutional frameworks allowing for improved feedback loops for policies and their impact across a number of sectors. The greater transparency provided by identifying transition and non-transition assets can amplify the ‘value of green’ to banks and financial regulators and also help de-risk portfolios to guard against potentially stranded assets.

Drawing on the expertise of its industry, finance and government stakeholders, and buildings on themes arising from a number of EFFTG events, the EFFTG identified a role for countries to provide greater capacity building for banks on such methods and help contribute to the evaluation criteria, market screening and market assessment tools linked to energy efficiency, which are often beyond the skill sets of bank staff. Such extra capacity and development will help build the collective body of knowledge developed by the EFFTG and also showcase the value of multiple stakeholder groups coming together to address common challenges. This was among the topics covered by the G20 Global Summit on Financing Energy Efficiency, Innovation and Clean Technology (Tokyo, Japan, June 2019) as an innovative approach that can be used to unlock the funding required to deliver the broadening and deepening of private sector engagement in energy efficiency investments identified by the G20 EELP.

Top Ten Energy Efficiency Best Available Technologies (BATs) and Best Practices (BPs) Task Group (TOP TENs)

Sharing information on existing energy efficiency environmental technologies and practices, which are recognised as ‘best-in-class’, can help accelerate their widespread application and further technological innovations. The TOP TENs Task Group, led by China and Australia, aims to achieve that by helping policy makers and businesses make informed decisions regarding the deployment of energy saving solutions that are practical, cost-effective and scalable. It does so by identifying, showcasing and promoting the best available technologies (BATs) and best practices (BPs) for energy efficiency in select sectors - at domestic and international levels.

Implementation progress

The use of energy-efficient technologies and implementation of energy-efficient practices is vital to reducing energy demand and related emissions, particularly in the large energy consuming sectors of buildings and industry. TOP TENs is informing policy makers and sector stakeholders on BATs and BPs, and fostering investment opportunities by initiatives such as:

- Launching the second round of the international TOP TENs lists for buildings and industry8.
- Organising expert panels to elaborate a strategy to assess and develop the second international BAT and BP lists.
- Developing the second round of domestic TOP TENs lists, documenting BATs and BPs in the participating countries of China, France, Japan and the United States. In each case, the lists were promoted through multiple media channels, including the websites of IPEEC and related government departments of each participating country, and various social media platforms.
- Implementing a communication strategy to establish brand awareness and accelerate deployment of featured BATs and BPs.

---

8 Pending release date.
- Facilitating integration of TOP TENs into the agenda of bilateral or multilateral energy efficiency co-operation by organising technical exchange activities and through high-level events.
- Contributing to the 12th China-Japan Comprehensive Forum on Energy Saving and Environmental Protection to present TOP TENs’ activities in November 2018 in Beijing, China (see Box 9 below).

**Box 9: Supporting China-Japan and China-Russia bilateral co-operation on energy efficiency**

The use of energy-efficient technologies and implementation of energy-efficient practices is vital to reducing energy demand and related emissions, particularly in the large energy consuming sectors of buildings and industry. TOP TENs aims to inform policy makers and sector stakeholders on BATs and BPs and to foster investment opportunities. To promote technology exchange between China and Japan, the second batch of China’s domestic TOP TENs lists were presented at the 12th China-Japan Comprehensive Forum on Energy Saving and Environmental Protection in Beijing in November 2018. This gave officials, researchers and enterprises from both countries a chance to showcase and discover recent innovations, and to discuss proposals on how to promote the lists.

**Energy End Use Data and Energy Efficiency Metrics (EUDEEM)**

Energy efficiency policies are designed to focus on the final consumers of energy but can also include horizontal policies. However, the international agreed framework for the energy balance does not provide sufficient detail on final energy consumption and what drives it to design, monitor and quantify the impacts of single policies or policy packages. This implies that new methodologies and new practices need to be developed and shared among countries. The initiative mainly aims to provide a forum for G20 economies to share knowledge, methodologies and experience in collecting and using energy demand and energy efficiency data for policy making. The initiative is led by France with the support of the International Energy Agency. Other G20 economies that have expressed interest in the initiative through participation in workshops and consultations include Argentina, Brazil, China, Germany, Indonesia, Italy, Korea, Japan, Mexico, the United Kingdom, and the United States.

**Implementation progress**

Countries held a second workshop of the initiative in February 2018 in Buenos Aires, Argentina, in the margins of the first meeting of the Energy Transitions Working Group. At this workshop, participating countries (Argentina, France, Mexico, the UK, Brazil, Germany, Italy; plus, China, Korea and the United States) expressed strong interest in a knowledge-exchange platform around end-use energy data and energy efficiency metrics, with the overall objective of enhancing data for energy efficiency policy. In addition, three international organisations (IEA, IPEEC, OLADE) took part in the discussion.

Participants presented recent developments in the end-use data collection and metrics work and shared their experiences on typical areas where information exchange would be beneficial, such as: data gaps identification; methodologies for end-use data collection; potential of emerging technologies for end-use data gathering; and methodologies for energy efficiency indicators. The workshop also discussed how enhanced regional collaboration involving G20 countries and beyond, such as through ECLAC and OLADE in Latin America, would be beneficial to the advancement of end-use data, globally.
Box 10: Using data in policy processes

EUDEEM provides a platform to G20 economies to ensure the processes for developing, implementing and evaluating new policies, and to draw the benefits of international collaboration, which is essential to making international comparisons, and tracking of global progress possible and meaningful.

The interest from major players from across the world proves that this multilateral initiative on data has a great potential to strengthen data knowledge across leading countries, despite their differing energy demand patterns and trends.

New initiatives

In addition to the above, other initiatives were introduced into the G20 EELP in 2016, including the District Energy Systems (DES) and the Energy Efficiency Knowledge Sharing Framework (KSF).

District Energy Systems (DES)

Cooling currently accounts for a large share of the electricity consumption in various G20 countries. Peak cooling demand is expected to continue on the path of high growth, creating a major strain. When certain conditions are met (in particular, high cooling load and density, and diversity of end-uses), district cooling (DC) is a proven cost-effective solution to reduce energy consumption and peak load demand. The same applies to district heating (DH). The DES initiative aims to facilitate collaboration between countries on understanding how the issue of district cooling and heating can help achieve greater energy savings. Its objective is to encourage DC/DH deployment, focusing on countries’ experiences in DC/DH (institutional framework, regulation, barriers and options to greater DC/DH deployment, national strategies, public procurement practices). The work will be co-led by Kingdom of Saudi Arabia, China and Russia, as G20 Members, with close support of Singapore, as a permanent guest of the G20.

Energy Efficiency Knowledge Sharing Framework (KSF)

Given the wealth of energy efficiency experience among G20 members, the G20 proposes a framework for a platform that facilitates knowledge sharing on energy efficiency policies, best practices and national experiences with policies, technologies, and innovation on both the supply and demand sides - an Energy Efficiency Knowledge Sharing Framework that would be hosted under the International Energy Forum (IEF) and led by Saudi Arabia. The KSF aims to facilitate policy exchanges between countries on a range of energy efficiency supply and demand topics. The KSF was discussed during the 7th Asian Ministerial meeting of the International Energy Forum (IEF) in November 2017 and the 16th International Energy Forum Ministerial hosted by India in April 2018. Ministers encouraged stakeholders to pool efforts in globally integrated frameworks to accelerate energy efficiency gains across the full energy sector spectrum and leverage the IEF Energy Efficiency KSF in close collaboration with governance platforms in Asia, and international organisations to further enhance energy productivity in Asia and the wider world economy. It was suggested that the KSF could also be based on the successful model of collaboration on energy data transparency by the Joint Organisations Data Initiative (JODI). In the meantime, the IEF is advancing dialogue on energy efficiency in its programme including in meetings with the European Union and other key organisations.
The DES and KSF are both in the process of being established.

3- Conclusions and next steps

The Task Groups of the G20 EELP continue to play a central role in accelerating energy efficiency policies and programmes in major G20 economies. By advancing their existing activities and consolidating their work, they help to deepen technical collaboration among G20 economies on the implementation of best practices; provide technical assistance to interested economies for the development of policy frameworks and roadmaps; and also facilitate ongoing dialogue between governments, industry and other key stakeholders.

In the coming years, combined efforts to reduce energy demand to achieve energy transitions that support ‘energy security, economic efficiency, and environmental safety’ (‘3E+S’) will be crucial and much needed for sustainable development. Thus, support needs to be strengthened for the continued collaboration under the G20 EELP as well as for particular efforts such as gathering reliable energy efficiency data. Furthermore, the role of finance and investment in promoting innovation in, clean technology and energy efficiency, including technological and social approaches, needs to be well-understood and its benefits in addressing energy transition challenges further highlighted.

Since energy transitions thrive on a virtuous circle of environmental protection and economic growth, G20 members are continuously encouraged to give further impetus to innovation that is core to delivering the economy-wide decarbonisation strategies required to deliver optimal net zero pathways and the maximum societal benefits of the energy transition. In order to support the low energy demand scenario for meeting climate and sustainable development goals, G20 members are encouraged to continue the strong support for promoting energy efficiency steadily.
Annex A

G20 economies participation in the Task Groups of the G20 Energy Efficiency Leading Programme

<table>
<thead>
<tr>
<th>G20 countries</th>
<th>SEAD</th>
<th>NDGT/CDA</th>
<th>BEEF</th>
<th>HELE</th>
<th>TTG</th>
<th>FMAX</th>
<th>FMWG</th>
<th>HIPTG</th>
<th>TOPTEN</th>
<th>EUD</th>
<th>FM</th>
<th>DFS</th>
<th>KSF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>European union</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indonesia</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russian Federation</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Africa</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G20 guest countries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singapore</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*US participation and leadership are under review

Annex B

Key messages from the ‘Scoping Workshop: Behaviour Change for Energy Efficiency - Opportunities for International Cooperation in the G20 and Beyond’

The Argentinian Ministry of Energy (MEN), the International Partnership for Energy Efficiency Cooperation (IPEEC) and the International Energy Agency (IEA) convened a one-day scoping workshop on ‘Behaviour Change for Energy Efficiency: Opportunities for International Cooperation in the G20 and beyond’ on 12 September 2018 in Paris, France. This event invited participants from IPEEC, IEA and G20 economies – as well as other international organisations (IOs), research organisations, and advocacy bodies working in this field, to discuss how behavioural science can strengthen energy efficiency policies and to share country-specific experiences in addressing the related challenges and solutions across economic sectors. The objectives of the workshop were to:

- Introduce behaviour change for energy efficiency, covering: i) how behaviour change theory can be used to strengthen traditional energy efficiency policies (typically but not exclusively standards and labelling schemes); and ii) new policy interventions to encourage energy efficient behaviour.

- Explore the particular opportunities and challenges faced in encouraging behaviour change across sectors and in different country contexts; and

- Identify possible topics for future collaboration as well as potential mechanisms and resources
for collaboration, including the Task Groups under the G20 Energy Efficiency Leading Programme.

(1) Human behaviour is crucial for scaling up energy efficiency

Humans use energy through technologies to fulfil social functions. All technologies, business models and energy policies contain a model of human behaviour. All energy programmes contain a theory of behaviour change. Addressing these implicit models of behaviour can enable policies and programmes deliver better outcomes and lower social, economic, environmental and political cost. Sometimes small behaviour changes can lead to large changes in energy use. For example in Japan, the Cool Biz programme has improved energy efficiency by encouraging casual business attire, allowing workers to feel comfortable even when the room temperature is set to 28 degrees Celsius. In the transport sector, shared mobility has enabled increases in mobility while reducing energy costs, especially in developing countries.

(2) There are myriad ways to influence human behaviour underpinned by various theoretical approaches

Broadly speaking, human behaviour can be influenced at both the individual or societal levels. Theoretical frameworks for changing the behaviour of individuals include behavioural economics and psychology. Changing individuals’ behaviour requires providing them with the opportunity for change (e.g. by removing barriers to action), the motivation for change (e.g. by providing incentives or disincentives), and the capability to change (e.g. by improving individuals’ access to information, knowledge and skills). Changing the social structures within which individuals are situated is the second way of changing behaviour. Theoretical frameworks applied to achieving societal change include sociology, pedagogy and various design disciplines, amongst others. Approaches tend to be large-scale and require time, focussing on changes to an organisation or community group through education, rules and regulations or modifying the physical environment.

(3) Behavioural insights can complement conventional policy instruments and approaches to improve energy efficiency

Drawing on behavioural insights to design conventional policy instruments and approaches can improve the effectiveness of interventions. For example, integrating behavioural insights such as social norming (e.g. peer comparisons), loss aversion (people dislike losing more than they like winning) and choice architecture (help consumers make decisions by designing choices) in home energy reports, can effectively reduce residential energy consumption, as exemplified in the work of Japan’s Ministry of the Environment and Ireland’s Sustainable Energy Authority. Taking another example, behavioural insights indicate that people do not believe everything they are told by ‘authorities’. The delivery of information could therefore be made more effective by using trusted local intermediaries and social role models instead of conventional “official channels”.

(4) Digitalisation provides an opportunity to facilitate behaviour change

---

9 Presentation by Prof. David Shipworth, Behaviour and Energy Efficiency: Systems tell people how to act - people tell systems how to change
10 Presentation of Mr Masaomi Koyama and presentation of Mr Yoshihiro Mizutani and Mr Ken Haig, Behavioural Insights & Climate Change Countermeasures
11 Presentation of Mr Andrew Duvall, Behaviour Change and Transportation Research
12 ibid
13 Presentation of Mr Karl Purcell, Applying Behavioural Science at SEAI: What We’ve Learnt so Far...
The “digitalisation” of everyday life, facilitated by the increasing ownership of information technology, smart phones and other smart devices, brings new opportunities to scale up behaviour change interventions. For instance, the Metropia mobility app developed by the Advanced Research Projects Agency – Energy (ARPA-E) of the U.S. Department of Energy, helps travellers to optimise the efficiency of their travel by providing information on changes in departure time, routes, vehicle passenger load, and ways to avoid unnecessary trips. Oracle Japan has utilised digital engagement, leveraging Japanese consumers’ affinity for digital communications and wide adoption of smartphones and SNS mobile apps, to send behavioural pointers to consumers through the messaging platform ‘Line’. Saudi Arabia has conducted behaviour change campaigns via various social media platforms ranging from paper mediums to online channels, among which the most effective has been mobile applications, which have reached over 169 million users\(^\text{14}\).

(5) **There are several opportunities for international collaboration**

The key opportunities for international collaboration centre on information sharing and data collection. In terms of information and experience exchange, international partnerships could facilitate cooperative studies to capture best practices and case studies on successful business models, policies and programmes. Open discussions at the international level on the failures of interventions would also be valuable, providing opportunities for reflection and learning. Regarding data collection, international collaboration could help improve the comparability of end use data gathered through trials and evaluations, allowing for better comparisons of consumers’ behaviours across different jurisdictions. Moreover, international surveys could help to understand how different contexts (socio-cultural, economic, technological, etc.) influence behaviour change for energy efficiency in different regions, which could help inform the design of replicable behaviour change policies and programmes.

\(^{14}\) Presentation of Mr Mohammed Alkulaib, [Saudi Energy Efficiency Program](https://www.saudi.gov.sa/en/)