

Introduction to IEA-4E / EDNA



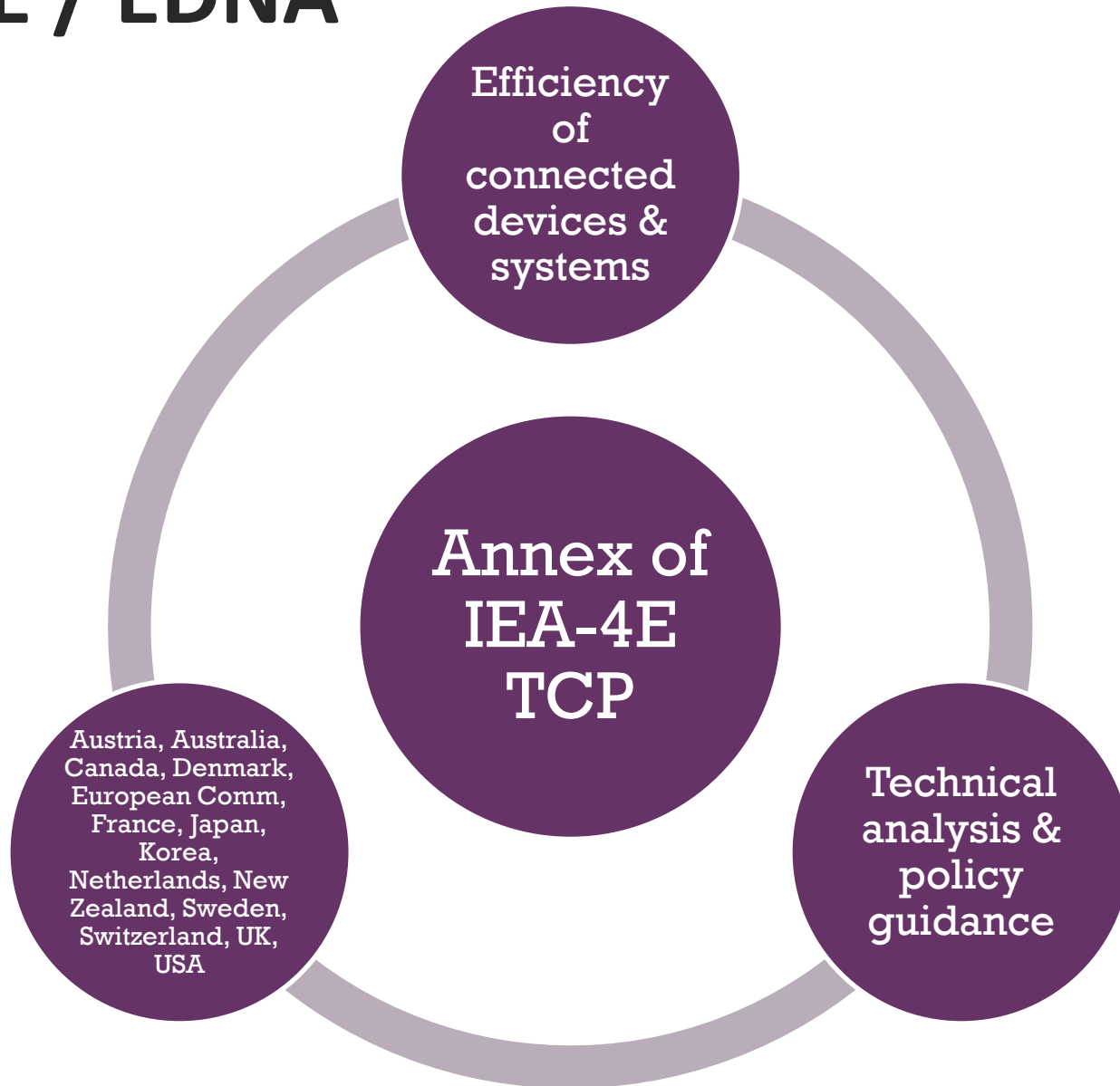
Hans-Paul Siderius, Netherlands Enterprise Agency

Webinar hosted by the International Energy Agency

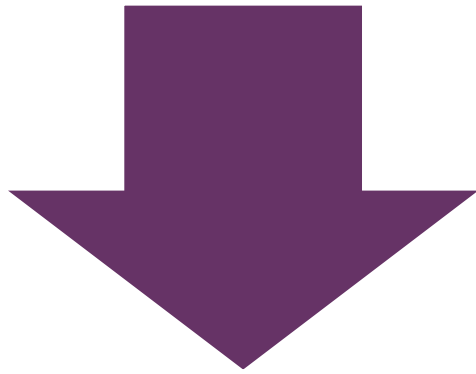
Interoperability - Connecting the Dots in a Fragmented Digital Energy Landscape

Tuesday 29 November 2022

IEA-4E / EDNA



Energy Implications of Device Connectivity



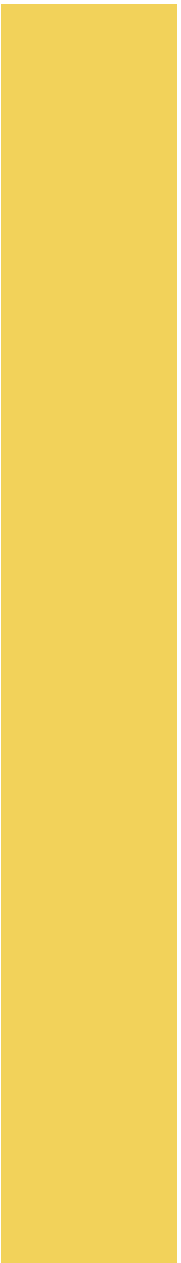
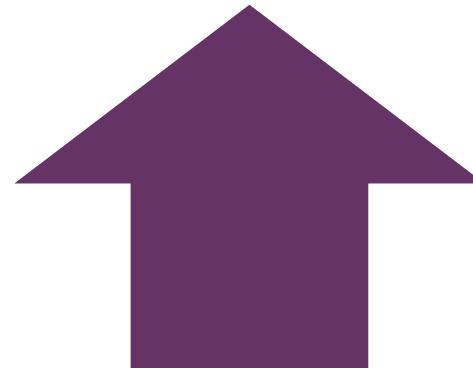
Digitalisation

- Intelligent efficiency
- Demand flexibility



Energy Costs

- Wasted energy
- Upstream energy

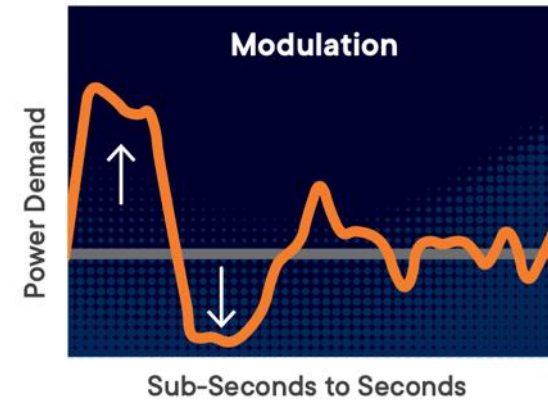
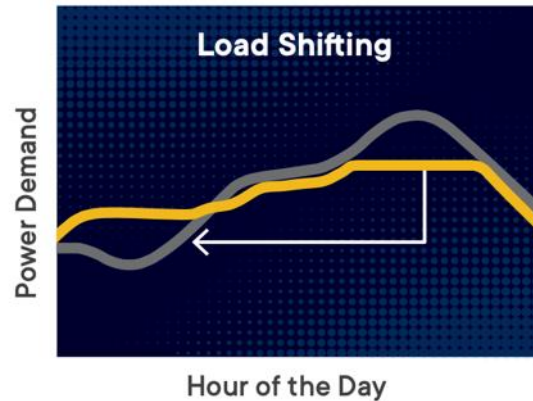
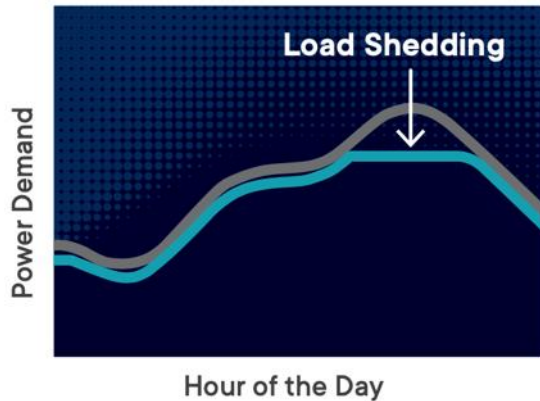


Intelligent Efficiency

- The deployment of network-connected ICT technologies to facilitate efficient operation of energy-using equipment, leading to energy savings
- IE typically operates at the system level, rather than at the device level, to optimise the operation of a system of equipment, leading to energy savings

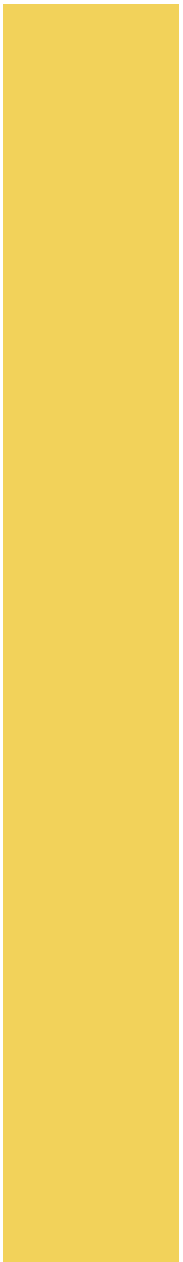
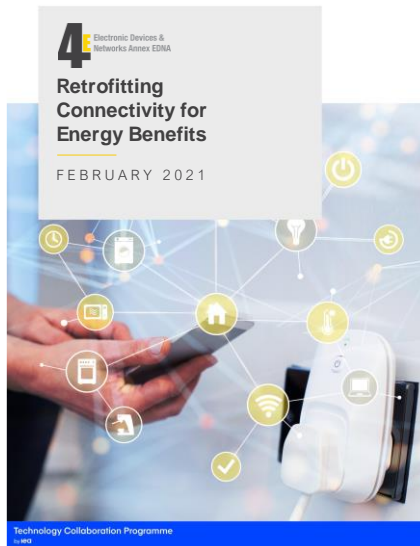
Demand Flexibility

True demand flexibility provides 3 main services



Demand flexibility can also provide ancillary services such as frequency regulation and voltage control

EDNA Studies on Demand Flexibility



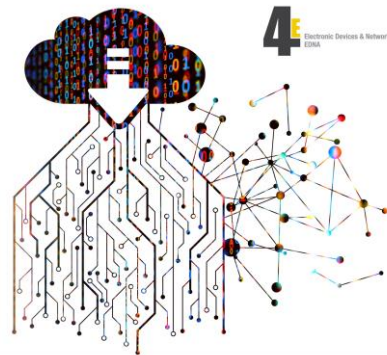


4^e Electronic Devices & Networks Annex
CDNA

Roadmap for Consumer Devices to Participate in Demand Flexibility

JUNE 2020

Technology Collaboration Programme
by IMQ



4^e Electronic Devices & Networks Annex
CDNA

Energy Applications Within IoT and Digitalisation Strategies

JUNE 2020

Technology Collaboration Programme
by IMQ



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Policy Guidance for Smart, Energy-Saving Consumer Devices

MAY 2020

Technology Collaboration Programme
by IMQ



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Energy Aware Devices Study of Policy Opportunities

OCTOBER 2016

cdan
connected devices
ALLIANCE



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Encouraging Intelligent Efficiency Study of Policy Opportunities

APRIL 2017

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Intelligent Efficiency A Case Study of Barriers and Solutions - Smart Homes

MARCH 2018

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connected devices
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Policy Briefs

4 ENERGY EFFICIENT END-USE EQUIPMENT
Automated Energy Agency

The Role of Connected Devices in the Digitalisation of the Energy System

EDNA7

The 4E Electronic Devices and Networks Annex (EDNA) provides policy guidance to members and other governments aimed at improving the energy efficiency of connected devices and the systems in which they operate. EDNA is focused on the increased energy consumption that results from devices becoming connected to the internet, and on the optimal operation of systems of devices to save energy. Connecting devices to the internet has profound implications for energy use, in three areas:

- DIGITALISATION:** connected devices can extend the distribution of the energy system by creating new ways to save energy and support renewables.
- WASTED ENERGY:** connected devices can waste considerable energy in idleness, standby modes.
- UPSTREAM CONSEQUENCES:** connected devices can result in increased data traffic, leading to increased energy use in the data network and data centres.

This policy brief covers the first point – Digitalisation.

Observations for Policy Makers

Everyday consumer devices such as appliances, water heaters and lights are becoming connected to the internet. Almost 10 billion devices will be connected by 2020.

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:

- 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 increase or decrease activity depending on the availability of energy supply.
- Report status,** by providing operational information, such as alerts for fault conditions and maintenance reminders.

Consumer uncertainty about the benefits, concerns about data privacy and security, and the complexity of these new technologies are key barriers, along with a lack of financial incentives.

Connected devices also use energy 24/7, to stay connected. This will be the focus of a future EDNA policy brief in this series that will cover "wasted energy" and how to reduce it.

More Information

Further information is available from <https://edna.iea-4e.org> and by contacting the EDNA operating agent at info@edna.iea-4e.org

Published January 2020

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Energy Aware Devices

EDNA2

The 4E Electronic Devices and Networks Annex (EDNA) informs governments of the energy implications – both costs and benefits – resulting from the growing market for network-connected devices.

This briefing summarises the key findings of the report *Energy Aware Devices: Study of Policy Opportunities*, which outlines why and how network-connected devices can be cost-effectively harnessed to support their own, residential energy consumption.

It highlights the costs and various benefits of "energy aware" devices and provides guidance to policy makers who wish to stimulate this device functionality. It covers all types of electrical and electronic devices and equipment, particularly those which are network-connected.

Observations for Policy Makers

- Until recently, the cost of identifying the energy being used by individual devices and appliances, in situ, has hindered energy saving opportunities. New technology, in the form of connected devices, now provides the potential for "energy aware" devices to estimate (or measure) their own energy consumption and communicate this to users.
- Energy estimation can be incorporated into devices for a small or negligible cost, e.g. within a device's own firmware.
- Energy aware devices can:
 - Facilitate efficient use behaviour** by providing actual energy use information.
 - Improve monitoring, verification and evaluation**, by comparing actual energy use to estimates and by highlighting conservation technologies.
 - Enable better policy making and program evaluation** through collecting large quantities of device energy data.
- Governments can encourage the growth of energy aware devices through existing policy instruments and should take steps to guide technology and device appropriate performance and communications standards.
- Policies to encourage energy aware devices already exist in the US ENERGY STAR and Korea and EU energy label programs. Voluntary industry agreements and NEPCU could also be used to further stimulate the uptake of energy awareness amongst device manufacturers.
- Policy makers should be cognizant of privacy concerns by ensuring that any transmission of data remains under the control of the user.

More Information

The EDNA report and further information is available from <https://edna.iea-4e.org/techno/lead> and by contacting the EDNA operating agent at info@edna.iea-4e.org

Published February 2018

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Intelligent Efficiency: Smart Homes

EDNA3

The 4E Electronic Devices and Networks Annex (EDNA) provides technical analysis and policy guidance to 4E Members and other governments aimed at improving the energy efficiency of connected devices and the systems in which they operate. EDNA is focused on the increased energy consumption that results from devices becoming connected to the internet, and on the optimal operation of systems of devices to save energy.

This briefing summarises the key findings of the EDNA report *Intelligent Efficiency: A Case Study of Smart Homes and Solutions*. In this case study, Smart Homes allow network connectivity to manage and automate services such as lighting, heating/cooling and washing in order to reduce energy consumption and running costs.

What can Policy Makers do?

Energy efficiency policy makers need to better understand the energy implications of intelligent efficiency, the internet of things, smart homes and smart grids, together with the policy actions available to ensure energy efficiency opportunities are taken on. There is a strong case for international cooperation to pool resources, develop digital approaches and engage in high-level dialogue.

Policy makers can improve the smart homes value proposition through the following measures:

- Demonstrating costs and benefits by implementing field studies and trials.
- Developing methodologies to standardise the measurement of costs and benefits.
- Communicating costs and benefits to consumers.
- Informing consumers about product performance e.g. through better labelling.
- Developing guidelines for data privacy and security.
- Encouraging interoperability between devices.
- Developing improved market conditions for smart grids and smart appliances and dynamic energy pricing.
- Developing supportive financial mechanisms.

More Information

The EDNA report and further information is available from <https://edna.iea-4e.org/techno/lead> and by contacting the EDNA operating agent at info@edna.iea-4e.org

Published July 2018

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Energy Applications within IoT and Digitalisation Strategies

EDNA12

The 4E Electronic Devices and Networks Annex (EDNA) provides policy guidance to members and other governments aimed at improving the energy efficiency of connected devices and the systems in which they operate. EDNA is focused on the increased energy consumption that results from devices becoming connected to the internet, and on the optimal operation of systems of devices to save energy.

This policy brief summarises the key findings of the EDNA report *Energy Applications within IoT and Digitalisation Strategies*. The term "internet of things (IoT)" describes the widespread proliferation of internet-connected devices. These devices are becoming increasingly common and are predicted to be everywhere in years to come.

IoT is a key part of the digital transformation of our society. Digitalisation involves the transition from an industrial age, characterised by analogue technologies, to an age of information and knowledge, characterised by digital technologies and digital business innovation.

Many countries and regions have developed strategies aimed at stimulating IoT or digitalisation. However not all specifically include the opportunities for a digitised energy system. The purpose of the EDNA report is to provide guiding principles to policy makers for the development of digitalisation strategies that incorporate demand flexibility and intelligent efficiency applications as key objectives.

Observations for Policy Makers

- IoT and digitalisation are complex topics, and new acting strategies are required in order to take advantage of the opportunities and benefits on offer.
- Demand flexibility and intelligent efficiency should be the primary focuses of any IoT or digitalisation strategy, and it may be advantageous to develop standalone strategies targeting these applications.
- An effective strategy should address issues such as R&D, infrastructure development, interoperability standards, cybersecurity/privacy measures, as well as increasing digital literacy.
- A strategy should have clear objectives and measurable deliverables, but must remain flexible so as to adapt to rapid technology innovation, with in-built processes for monitoring and review.
- National or regional government should lead the development of any strategy in this area, but should involve a wide range of stakeholders in the process.

More Information

The EDNA report and further information is available from the EDNA website and by contacting the EDNA operating agent at info@edna.iea-4e.org

Published September 2020

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Automated Energy Agency

Roadmap for Consumer Devices to Participate in Demand Flexibility

EDNA11

The 4E Electronic Devices and Networks Annex (EDNA) provides policy guidance to members and other governments aimed at improving the energy efficiency of connected devices and the systems in which they operate. EDNA is focused on the increased energy consumption that results from devices becoming connected to the internet, and on the optimal operation of systems of devices to save energy.

This policy brief summarises the key findings of the EDNA report *Roadmap for Consumer Devices to Participate in Demand Flexibility*. Demand flexibility is the ultimate evolution of demand response. Demand flexible loads can be shed, shifted and modulated in response to the real-time needs of the electricity system. The EDNA report examines the issues and sets out a guide for the development of country roadmaps for consumer device demand flexibility.

Observations for Policy Makers

- The overall efficiency of the electricity system can be greatly improved by demand flexible consumer devices. For example, they can help to support the variable nature of energy supplied from sources such as wind and solar.
- Although initial steps have been taken in some countries towards demand flexibility, much progress still needs to be made.
- For consumer devices to become demand flexible, a number of steps are required:

- Markets need to be created for demand flexibility, such that energy utilities will pay for this service.
- Regulators need to have the ability to facilitate the creation of energy utilities and ensure that their flexibility to energy utilities.
- Consumers need to be provided to consumers so that they allow their devices to participate by:
 - enabling device manufacturers, providers of this automation (IoT).
 - Communications standards need to be internationalised, to allow high numbers of devices to connect from many countries to the flexibility.
 - Consumer device needs to be easy to install, configure and control, and consumer device needs to be secure and reliable.
- Communications and data need to be secure and consumer privacy needs to be assured.

More Information

The EDNA report and further information is available from the EDNA website and by contacting the EDNA operating agent at info@edna.iea-4e.org

Published September 2020

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Automated Energy Agency

Policy Guidance for Energy Smart Digital Devices

EDNA10

The 4E Electronic Devices and Networks Annex (EDNA) provides policy guidance to members and other governments aimed at improving the energy efficiency of connected devices and the systems in which they operate. EDNA is focused on the increased energy consumption that results from devices becoming connected to the internet, and on the optimal operation of systems of devices to save energy.

This policy brief summarises the key findings of the EDNA report *Policy Guidance for Smart, Energy-Saving Consumer Devices*. Devices are increasingly being sold with the ability to connect to the internet. However, not all connected devices are "smart" and not all can harness their connectivity to save energy and provide demand flexibility to the local energy system. The objective of the EDNA report is to provide policy guidance for encouraging the development of consumer devices which are capable of these functions – Energy smart digital devices.

Observations for Policy Makers

- A digitised energy system should allow systems of devices to provide demand flexibility and also to save energy (Intelligent efficiency).
- Many so-called smart devices marketed today are not able to deliver either demand flexibility or intelligent efficiency.
- Energy smart digital devices should have the capability to receive external inputs, process those inputs and independently take action, for the purpose of one or more of demand flexibility, intelligent efficiency or data reporting (of energy consumption, fault conditions, etc.).
- There are already product policies which encourage energy smart digital devices, such as the ENERGY STAR connected criteria and the German Smart Grid Ready heat pump label.
- Potential policy types which could be used to encourage energy smart digital devices include mandating the required energy functionalities (e.g. for all devices or perhaps only for internet-connected devices), consumer labelling (e.g. ENERGY STAR) connected criteria, financial incentives and requiring the use of open communications protocols.
- The EDNA report deals only with end-use devices. Other policies are required to ensure that a digital energy system is able to maximise the opportunities to increase efficiency.

More Information

The EDNA report and further information is available from the EDNA website and by contacting the EDNA operating agent at info@edna.iea-4e.org

Published September 2020

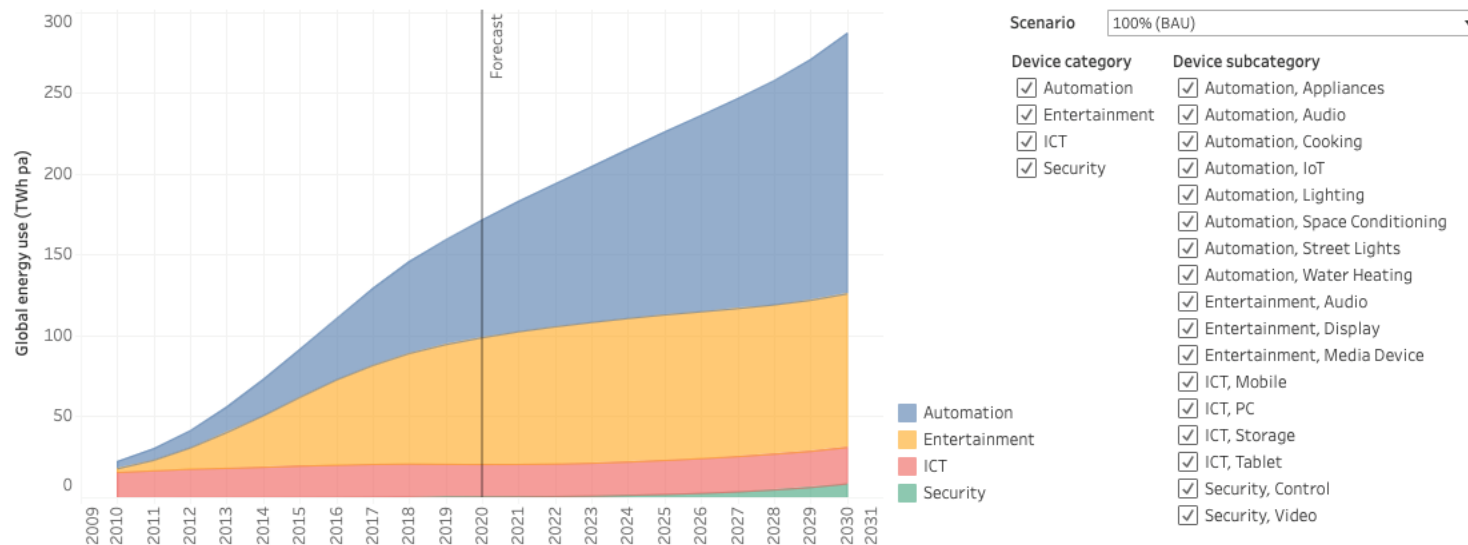
EDNA Studies on the Energy Costs

- 20+ studies on this topic
- ‘Network zero’ devices
- Total energy model

Edge Devices, Network Standby Power

The graph below depicts the energy used by connected “edge” devices, in the network standby condition. The average network standby power of devices can be varied up or down, and different product types can also be selected.

The dropdown menu to the right is used to select the network standby power of connected edge devices, as a percentage of their estimated business-as-usual (BAU) network standby power. For example, in the 75% scenario, the edge devices entering the stock (from 2021 onwards) would have a network standby power which is 75% of the projected BAU network standby power. This 75% is applied (not cumulatively) to the projected BAU network standby power for each of the years 2021-2030.



More Information

- Website

- <https://www.iea-4e.org/edna/>

- Total energy model

- <https://www.iea-4e.org/edna/tem/>

- Studies and policy briefs

- <https://www.iea-4e.org/edna/publications/>

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