

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

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 focussed 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:

1 DIGITALISATION: connected devices can assist the digitalisation of the energy system by creating new ways to save energy and support renewables.

2 WASTED ENERGY: connected devices can waste considerable energy in (networked) standby mode.

3 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 topic – Digitalisation.



Observations for Policy Makers

Everyday consumer devices such as appliances, water heaters and lights are becoming connected to the internet. Almost 50 billion devices will be connected by 2030.

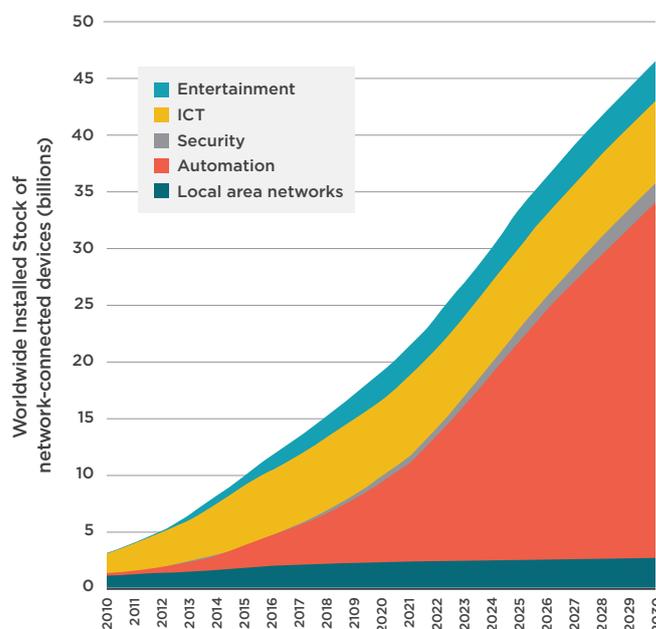
Not all connected devices are “smart” and not all smart devices can save energy. A smart, energy-saving device is able to act *independently* in order to:

- **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.

Stock of network-connected devices by category 2010-2030



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

Key Findings



What is intelligent efficiency?

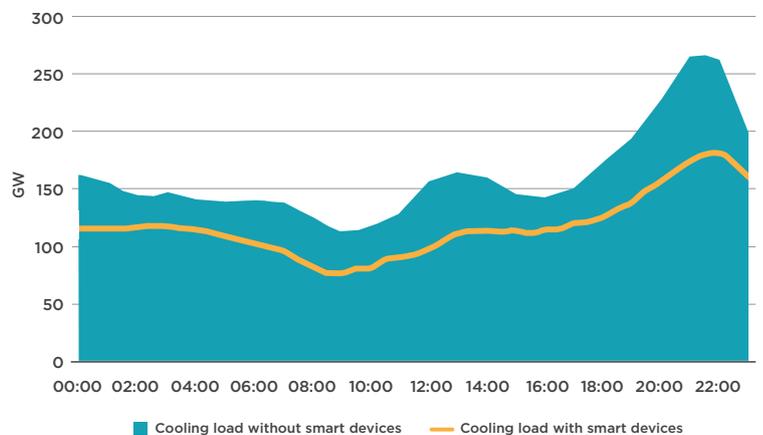
When systems of connected devices adapt automatically to save energy, this is called intelligent efficiency. For example, a smart thermostat can control heating, cooling and lighting systems based on sensors for occupancy and temperature. It uses sophisticated, predictive algorithms and artificial intelligence.

What is demand flexibility?

Demand flexibility is the ability of connected devices to respond to:

- Variable energy supply from renewable energy sources such as wind and solar. At times of low generation (no sun/wind) it is better if devices operate in a lower power mode. At times of high generation it can be advantageous for devices to operate at full power.
- Electricity system constraints, for example when transmission infrastructure is fully loaded.

China weekday cooling profile in 2030



Barriers to uptake

There is a long way to go to truly reap the energy benefits offered by connected devices, although many small-scale examples of intelligent efficiency and demand flexibility exist. Uptake is hampered because consumers are not aware of the benefits, disbelieve claimed benefits, or are simply not interested. These new technologies are also inherently complex, can be difficult to operate and often devices from different manufacturers are not interoperable.

Consumers, businesses and governments are also concerned about the data privacy and security of connected devices.

Policy Approaches

Examples of appropriate policies to address barriers, as part of a cohesive strategy include:

- Demonstration projects.
- Methodologies to measure benefits and provide transparent and comparable information to consumers.
- Consumer information, including labels, to alleviate unfavourable consumer perceptions.
- Ensuring that privacy policies are clearly stated and understood by consumers.
- Security standards to protect consumer data.
- Promotion of open protocols to ensure device interoperability.
- Creation of markets which support new business models for energy services, which in turn lead to consumer engagement and uptake of connected devices which operate efficiently and deliver demand flexibility.