# Harnessing Smart and Dumb Devices for Energy Benefits

EDNA18

The Efficient, Demand Flexible Networked Appliances (EDNA) platform of the 4E TCP provides analysis and policy guidance to members and other governments aimed at improving the energy efficiency and demand flexibility of connected devices and networks.

This briefing summarises the key findings of two EDNA reports: *Harnessing IoT for Energy Benefits* and *Retrofitting Connectivity.* The first report deals with harnessing energy benefits from the 'Internet of Things' (IoT). It examines the landscape of residential IoT products and the functions within those products that can be leveraged to yield energy benefits, as well as the appropriateness of incorporating new functions to achieve additional energy outcomes. The report concerns policies to make new IoT products capable of saving energy and being demand flexible.
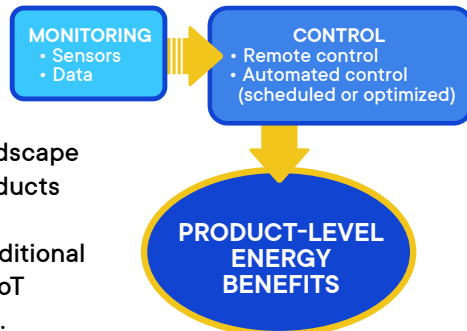
The second EDNA report addresses 'dumb' products – unconnected devices that are already installed. The vast majority of the global installed stock of existing residential products are in this category. For these devices, retrofit connectivity solutions can be deployed at a fraction of the cost of replacing a dumb device with a connected one. In this report retrofit solutions are examined in order to identify those that could be leveraged to achieve energy benefits in otherwise unconnected residential products.

MONITORING
• Sensors
• Data

CONTROL
• Remote control
• Automated control (scheduled or optimized)

PRODUCT-LEVEL ENERGY BENEFITS

Observations for Policy Makers

■ The efficiency of the electricity system can be greatly improved by smart and 'demand flexible' appliances. For example, the energy consumption of a building can be reduced if the equipment is controlled by sensors and smart algorithms. Importantly, demand flexible appliances can also respond to variations in the supply of electricity from renewable energy sources or the electricity grid.

■ The devices with the best potential for energy savings and demand flexibility are listed in the table below.

		HVAC	WATER HEATERS	WHITEGOODS	POOL PUMPS	ELECTRIC VEHICLE CHARGERS
		PRODUCT CATEGORY				
ENERGY BENEFIT POTENTIAL	ENERGY SAVINGS	HIGH	HIGH	MODERATE	LOW	LOW
	DEMAND FLEXIBILITY	HIGH	HIGH	MODERATE	HIGH	HIGH

■ Policy makers should focus their efforts on encouraging the adoption of connectivity and energy functionality, rather than just encouraging connectivity for the sake of it.

■ There is a large number of retrofit gadgets that can be fitted to existing dumb devices, in order to turn them into connected devices that can save energy or make the device demand flexible.

■ Barriers to adoption of retrofit solutions include lack of consumer knowledge, lack of willingness to spend money on a device that might be approaching the end of its life, incompatibility of some retrofit solutions, interoperability with smart home ecosystems and perceived cybersecurity risks.

Technology Collaboration Programme
by iea

Key Findings

Missed opportunities in IoT devices

Many IoT devices utilise connectivity for functions such as convenience and security (and this increased functionality can also increase energy consumption). Although connectivity may enable some products to save energy, for example by receiving external signals from sensors, this is not always the focus. A coordinated and systematic effort is warranted, encouraging connectivity where it provides tangible energy benefits, whilst requiring connectivity to be efficient whenever implemented.

Examples of retrofit solutions for dumb devices

The table on the right lists a range of retrofit solutions that can turn dumb devices into smart devices. In addition to these solutions, a home energy management system (HEMS) can also be used to adapt many kinds of devices.

END USE CATEGORY		RETROFIT SOLUTION
HVAC		➔ Connected thermostat ➔ Room HVAC control ➔ Radiator control ➔ Vent control
Water Heating		➔ Water heater control
Plug Load / Lighting		➔ Smart plug or strip ➔ Automatic button pusher
Whitegoods		➔ Clothes dryer sensor ➔ Cooking thermometer
Lighting		➔ Smart bulb socket ➔ Smart switch plate
Window Coverings		➔ Window covering control

ENERGY STAR connected criteria

For new household devices, the United States' ENERGY STAR® programme requires 'connected' products to report energy consumption and operational status, and have the capability to be controlled remotely by energy management systems or other user-authorised entities.

For retrofit solutions, ENERGY STAR's Smart Home Energy Management Systems (SHEMS) specification encourages energy benefits in products such as connected thermostats, smart wall outlets and smart plug strips. The specifications require some energy-based functionality as well as open connectivity.