



Digitalisation opportunities for energy efficiency

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Bangkok, 2 April 2019



IEA #energyefficientworld

Overview of the appliance and equipment training sessions



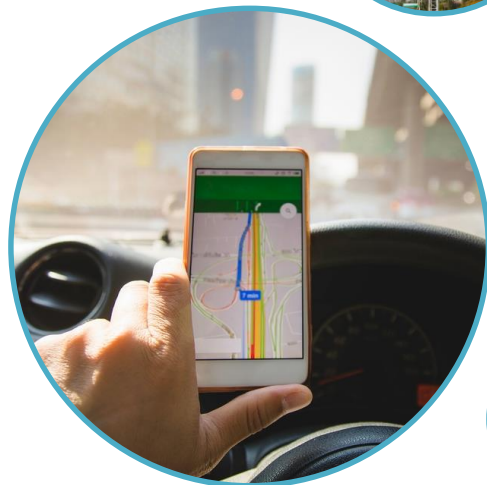
#	Session	
0	Introduction and roundtable	<input checked="" type="checkbox"/>
1	Planning energy efficiency programmes	<input checked="" type="checkbox"/>
2	Selecting products for MEPS and Labelling programmes	<input checked="" type="checkbox"/>
3	Assessing efficiency performance and setting MEPS	<input checked="" type="checkbox"/>
4	Industry transformation	<input checked="" type="checkbox"/>
5	Stakeholder involvement and communication	<input checked="" type="checkbox"/>
6	The relationship between product efficiency and price	<input checked="" type="checkbox"/>
7	Modernising energy efficiency through digitalisation	<input type="checkbox"/>
8	Insights into energy labels	<input type="checkbox"/>
9	Monitoring, verification and enforcement	<input type="checkbox"/>
10	Monitoring and evaluating policies and programmes	<input type="checkbox"/>
11	Roundtable discussion, review and report back	<input type="checkbox"/>

There are special grants available to government departments for 'smart' initiatives that lead to reduced costs for business.

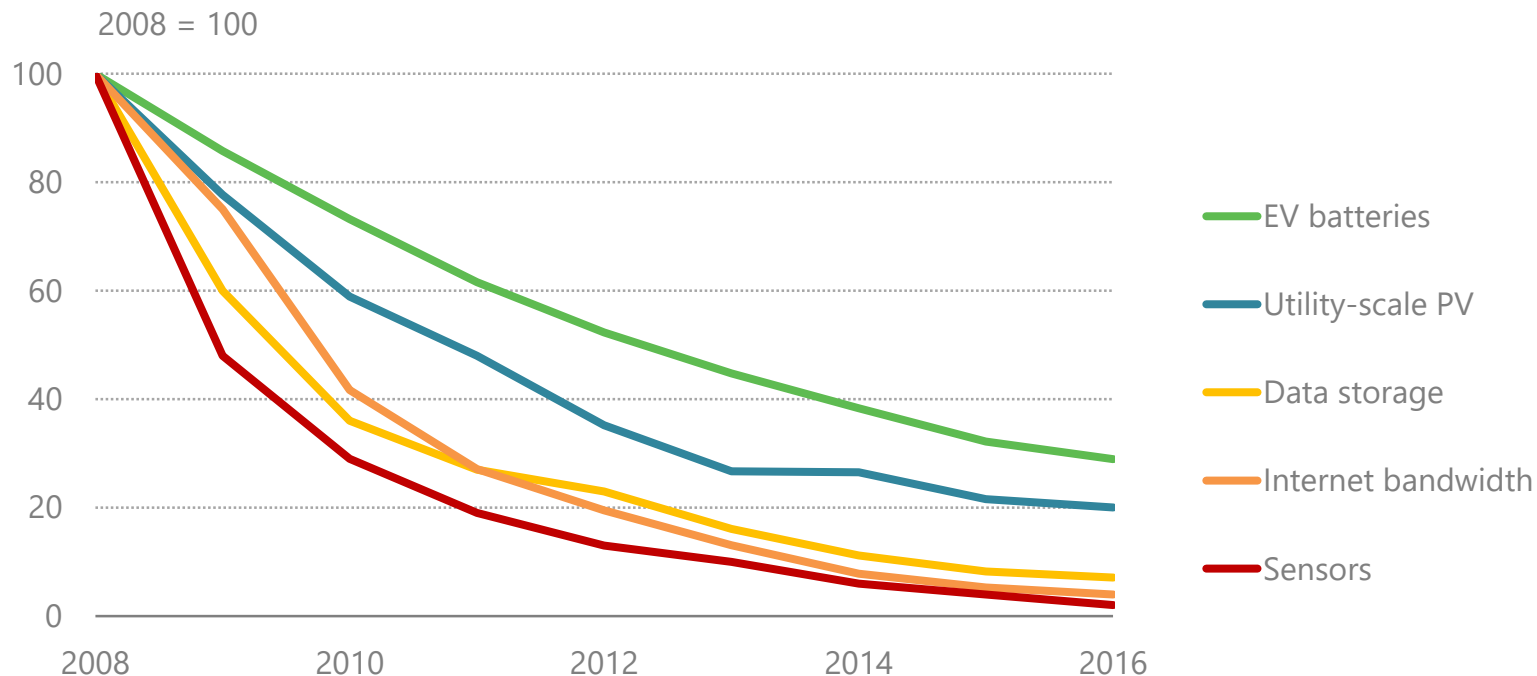
Which projects would you put forward?



Digital technologies are everywhere....



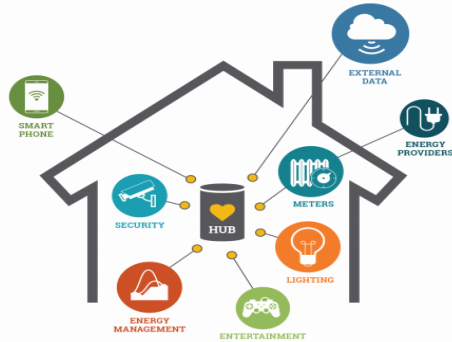
Drivers of digitalization: data, analytics, and connectivity



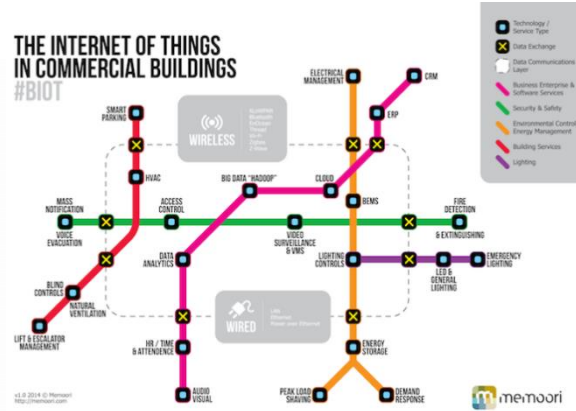
Sources: Based on BNEF (2017), Utilities, Smart Thermostats and the Connected Home Opportunity; Holdowsky et al. (2015), Inside the Internet of Things; IEA (2017), Renewables; Tracking Clean Energy Progress; World Energy Investment; Navigant Research (2017), Market data: Demand Response. Global Capacity, Sites, Spending and Revenue Forecasts.

Data collection, storage, and transmission costs have declined by over 90% since 2008

Smart homes, smart buildings, smart factories...



Source: IEA TCP 4E

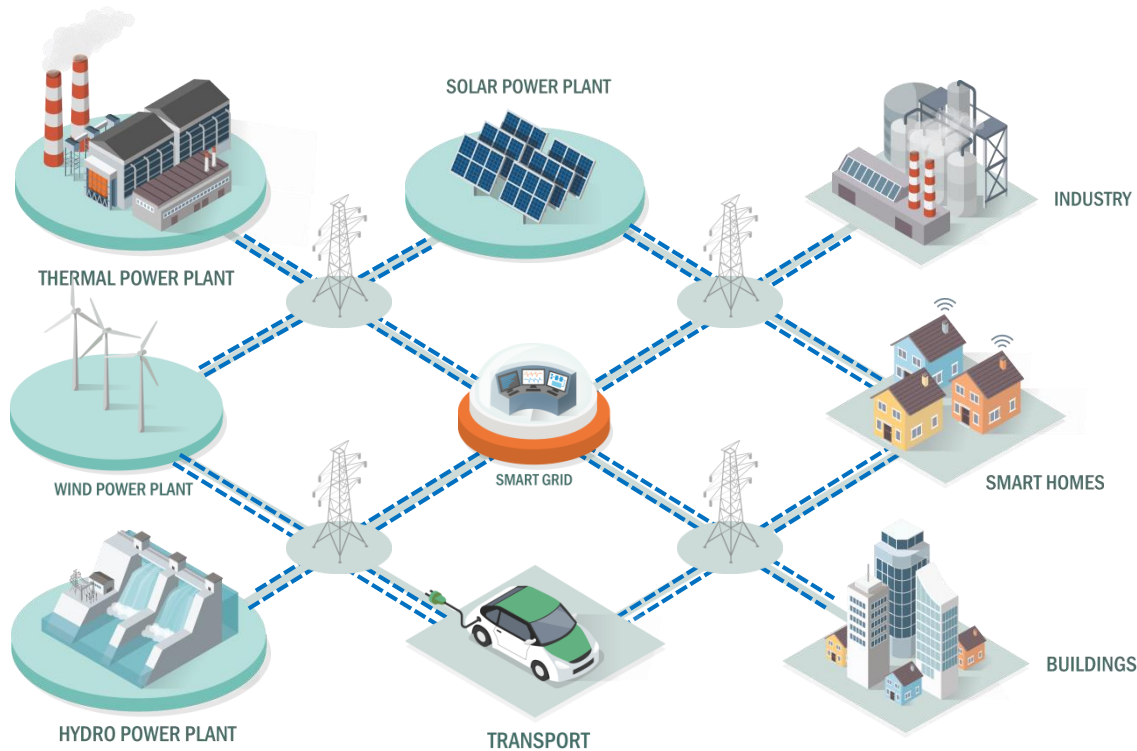


Source: Memori



Source: HAND

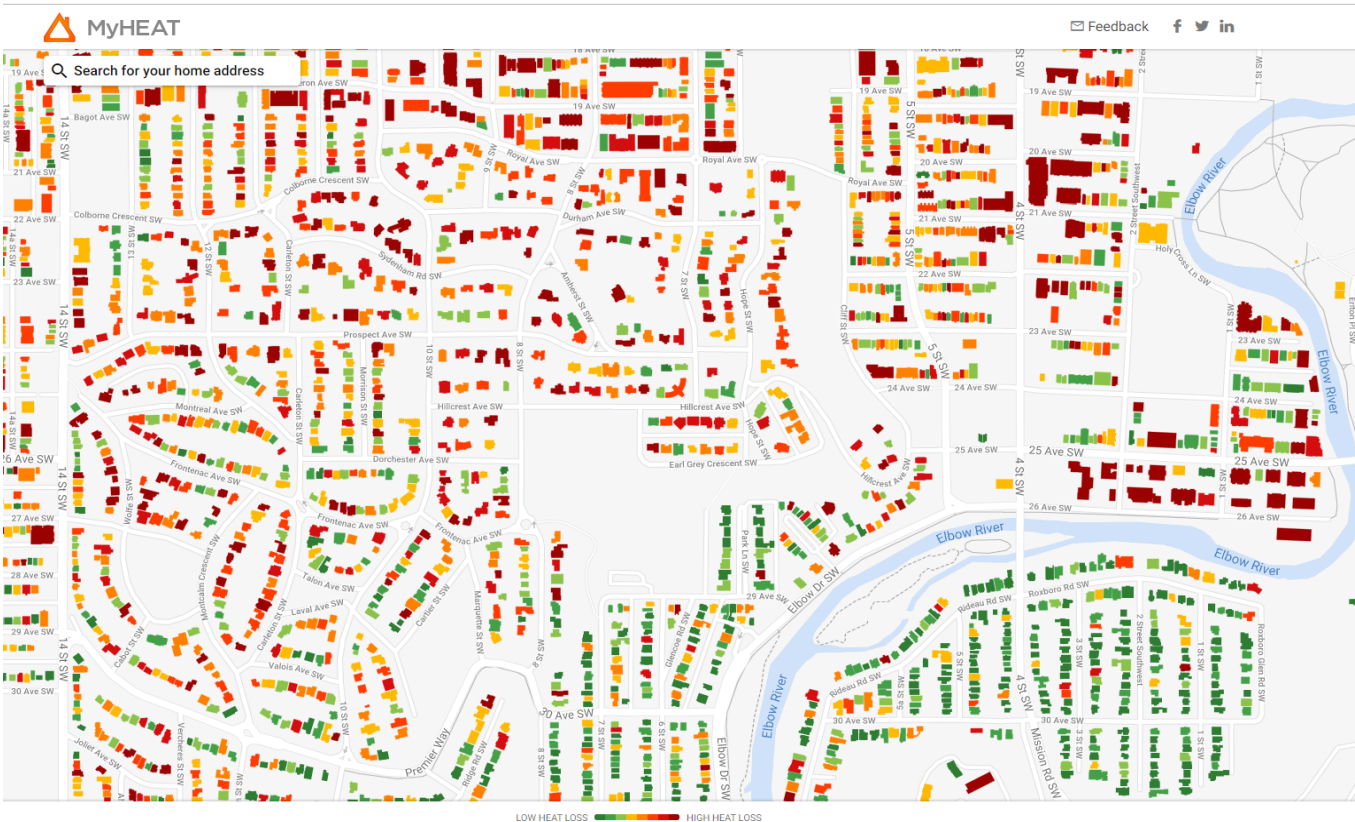
Irrespective of end-use, smart solutions are powered by data, analytics, control and automation



Digitalisation is enabling progress towards energy systems that are bidirectional, responsive and efficient

- Smart homes and buildings could reduce global buildings sector demand by 10% (home level reductions up to 30%, building reductions over 30%)
- Smart factories could reduce onsite energy demand by 20 – 30%
- Demand response programmes – in buildings, industry and transport - could provide 185 GW of flexibility, and avoid USD 270 billion of investment in new electricity infrastructure
- Smart grids and smart cities can completely transform how energy is generated and how it is used

Heat mapping to identify energy efficiency opportunities



From heat mapping to action



← Back to Map Feedback f t in

1500 7 ST SW
This building has high heat loss

HEAT Rating

Your Home	10
Beltline	8
Calgary	4

Low High

> HEAT Ratings rank a building's heat loss to others in the neighbourhood and city.

The higher the rating, the more heat is escaping.

HEAT Map

Low High

> HEAT Maps show potential heat loss for a building.

Red areas show high heat loss and blue areas show low heat loss.

Save Money and Energy

> Save \$300 on an energy evaluation and access funding for upgrades, including a \$1,000 bonus rebate.

[GET STARTED >](#)

> Purchase qualifying energy saving products and submit receipts online to claim your rebate!

[APPLY ONLINE](#)

PRESENTED IN PARTNERSHIP WITH



Understand home heat loss



Questions? We've got answers



How our technology works



Get in touch

Why is this relevant for appliance and equipment policy makers?

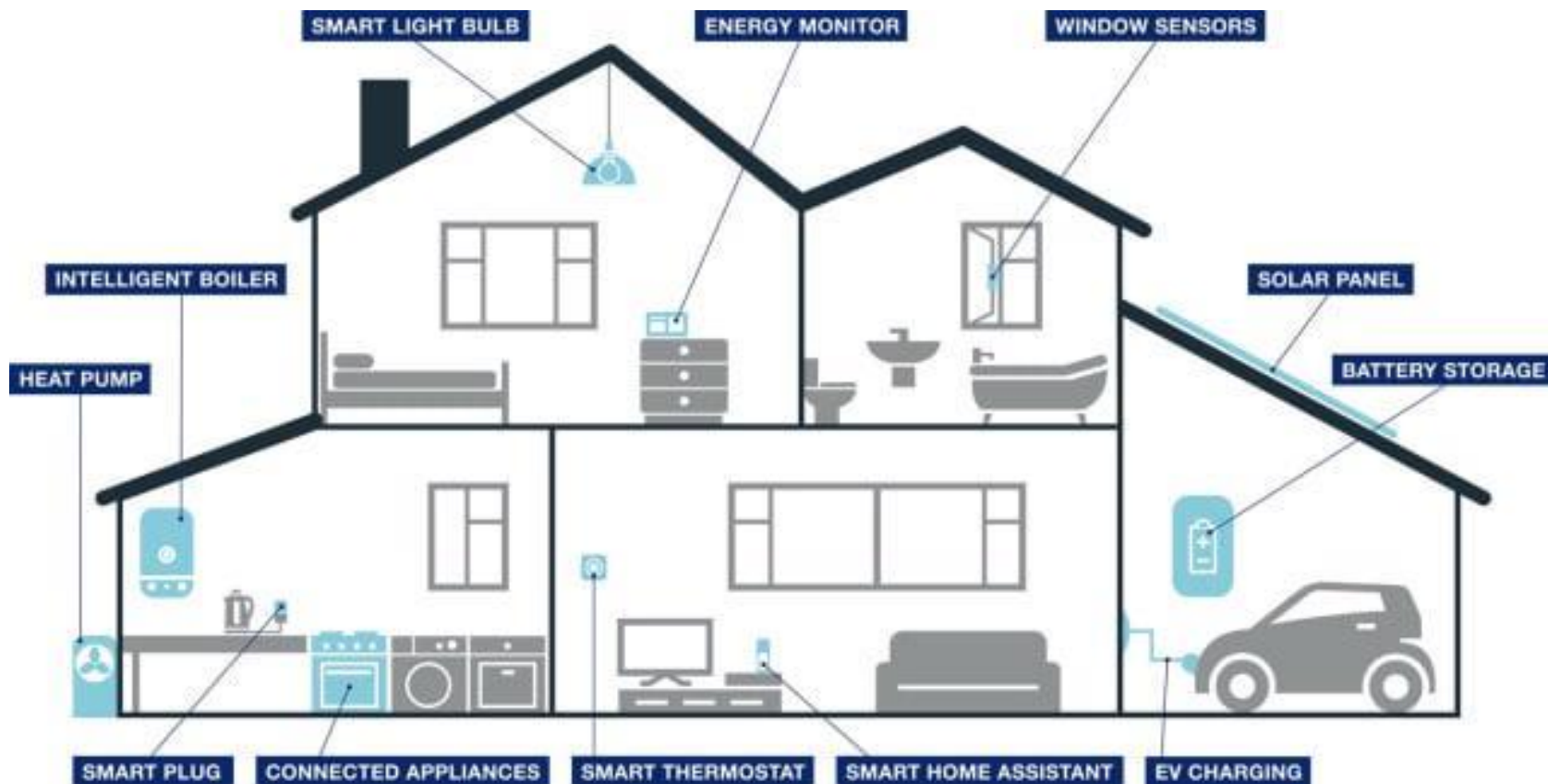


- Standards and labels will improve the efficiency of appliances and equipment but will not make sure they are **used efficiently**
- Digital solutions can help end users optimise their energy use and **cut energy waste**
- Smart homes, smart buildings, smart factories, smart energy systems, smart cities are enabled by smart **appliances and equipment**
- Energy efficiency policy makers can take a proactive role in stimulating the development of and the **market for smart efficient products**
- Energy efficiency policy makers can **enable demand response** by requirements for appliances and equipment

Accelerating smart energy efficiency

Policies are needed to accelerate uptake of smart solutions for energy efficiency

Smart homes



Source: Centrica

Opportunities in residential buildings

Technologies	Benefit	Savings range
Smart thermostats	Heating and cooling can be controlled remotely	5-20% of heating/cooling energy use
Smart zoning	Allows individual rooms or zones to be heated/cooled to specific temperatures at specific times	10% of heating/cooling energy use
Smart lighting	Adjusts in accordance to occupancy and/or light levels	1-10% of whole home energy use
Smart window control	Controls the amount of light and can block heat or cold	10-20% heating/cooling energy use + lighting energy use savings
Home energy monitoring system	Provides users with information about how energy is used and provides recommendations or prompts	4-7% of whole home energy use
Smart HEMS (Home energy management system)	Provides ability to control energy use (incl. remotely) and can optimise energy use on basis of behaviour	8-20% of whole home energy use
Smart home	Combination of smart home technologies that provide measurement, monitoring, displays, management, control automation, zoning etc.	Up to 30% of whole home energy use

Opportunities in commercial and public buildings



Technologies	Benefit	Savings range
Smart plugs	Reduces power to appliances when not required for use	25- 60% of plug load use
Smart lighting	Adjusts in accordance to occupancy and/or light levels	Up to 45% of lighting energy use
Occupancy based wireless thermostats	Adjusts heating or cooling in accordance to occupancy	5-10%
Smart shading or smart windows	Reduces heat, glare, enables more optimal use of lighting	19-26% on cooling 48-67% on lighting
HVAC control	Adjusts in accordance to temperature (and occupancy)	24-32% of HVAC
Smart BEMS (Building energy management system)	Collects data on end-uses, provides information for building manager and enables automation	13-66% (whole building) average 23%

Technologies	Benefit	Savings range
Smart auxiliary processes (lighting, heating, cooling, ventilation)	Control in accordance to needs, occupancy, other relevant parameters	Up to 10% of total energy use
Smart motors	Data-driven control, load sensing, application optimisation	Up to 50% of motor system energy use
Smart process control	Data, control, optimisation, automation	Around 20% energy demand of process
Smart Energy Management System	Collects data on end-uses, provides information for manager and enables optimisation and automation	Up to 30% of total energy use

Note: significant variations in achievable savings depending on size and sector

How does smart energy management work?

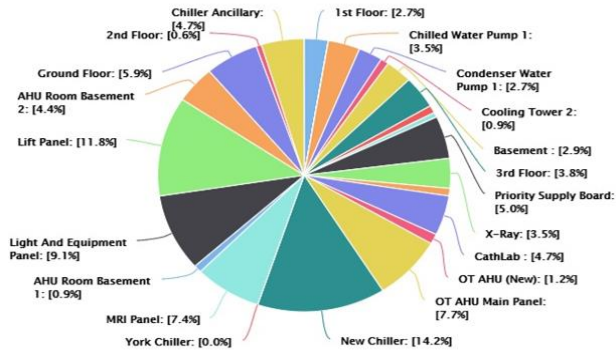


Example: Indian company Smart Joules

Saving Outcomes

Last Hour Last 24 Hour Last Week Last Month Custom

Total Consumption - 339 kWh



Equipment Details



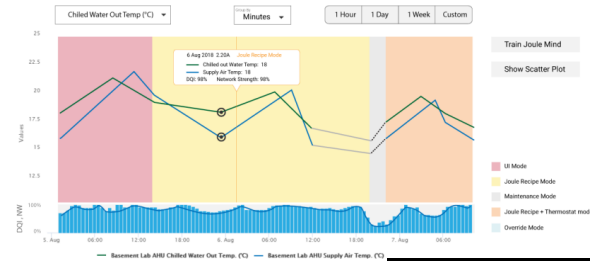
Operational Intelligence

Intelligence

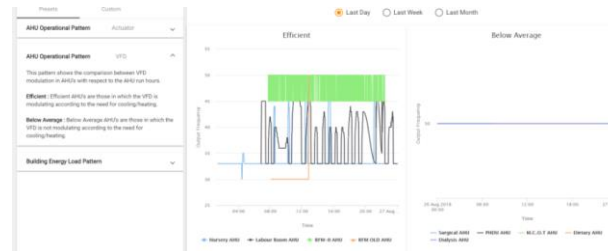
Overloaded Chiller Operation: Apparent Power above 150 kVA	11 Sep 2018 04:28 PM	!
350 TR New Chiller is Started	11 Sep 2018 04:24 PM	!
350 TR New Chiller is Started	11 Sep 2018 04:22 PM	!
Chilled Water Pump 1 SetFrequency is 40	11 Sep 2018 04:21 PM	!
350 TR New Chiller is Stopped	11 Sep 2018 04:20 PM	!
Chilled Water Pump 1 SetFrequency is 40		!

Self Perf. Diagnostics

Energy Analytics

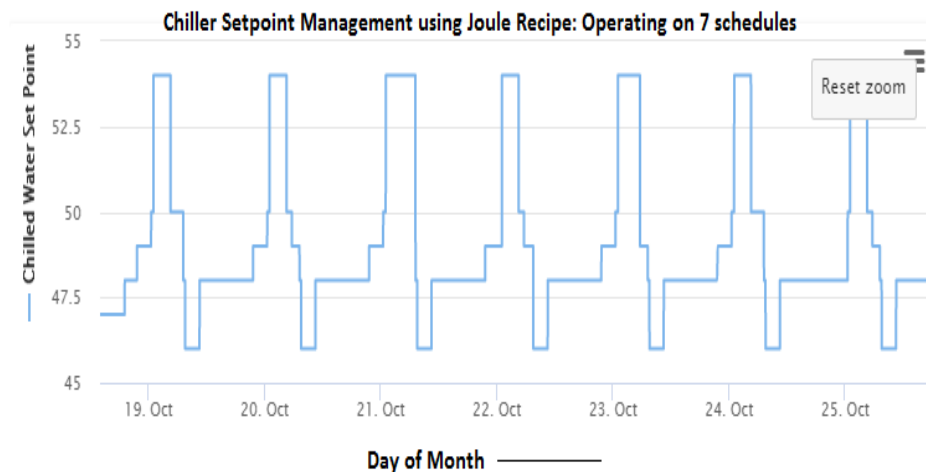
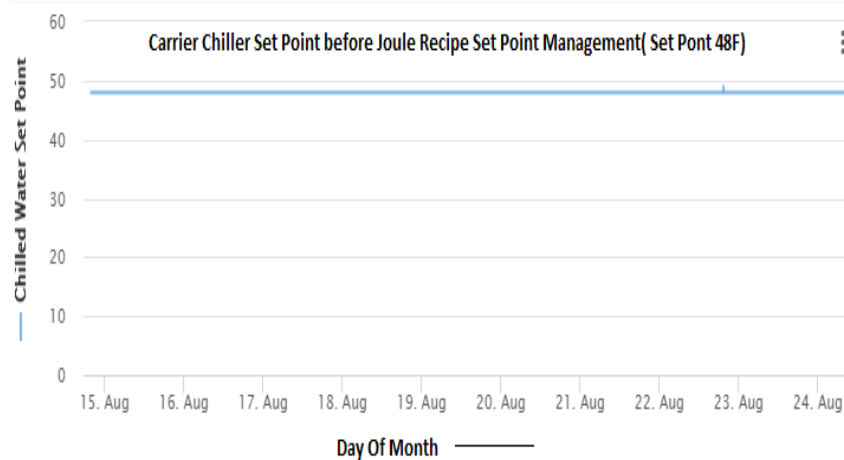


Asset Performance



Aligning energy use to actual needs

Example: Indian company Smart Joules



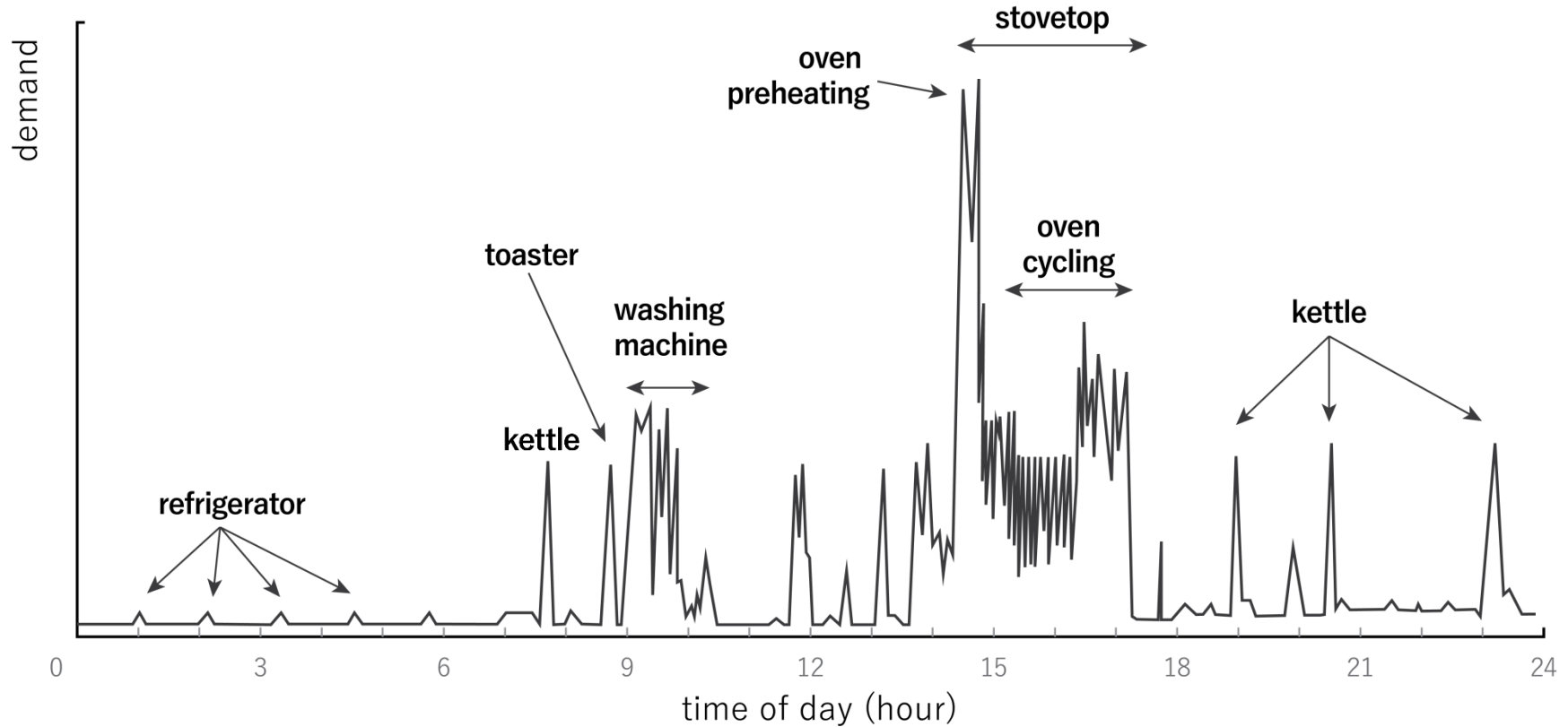
What are some of the policy options?

- Raise awareness
- Capacity building (retailers, technicians, installers, energy service companies)
- Promote international standardisation and interoperability
- Lead by example (e.g. smart & energy efficient public buildings)
- Make sure that energy efficiency is a priority in “smart projects” e.g. smart cities
- Provide incentives for energy management
- Require energy management (via e.g. building codes)

Enabling demand response and smart energy systems

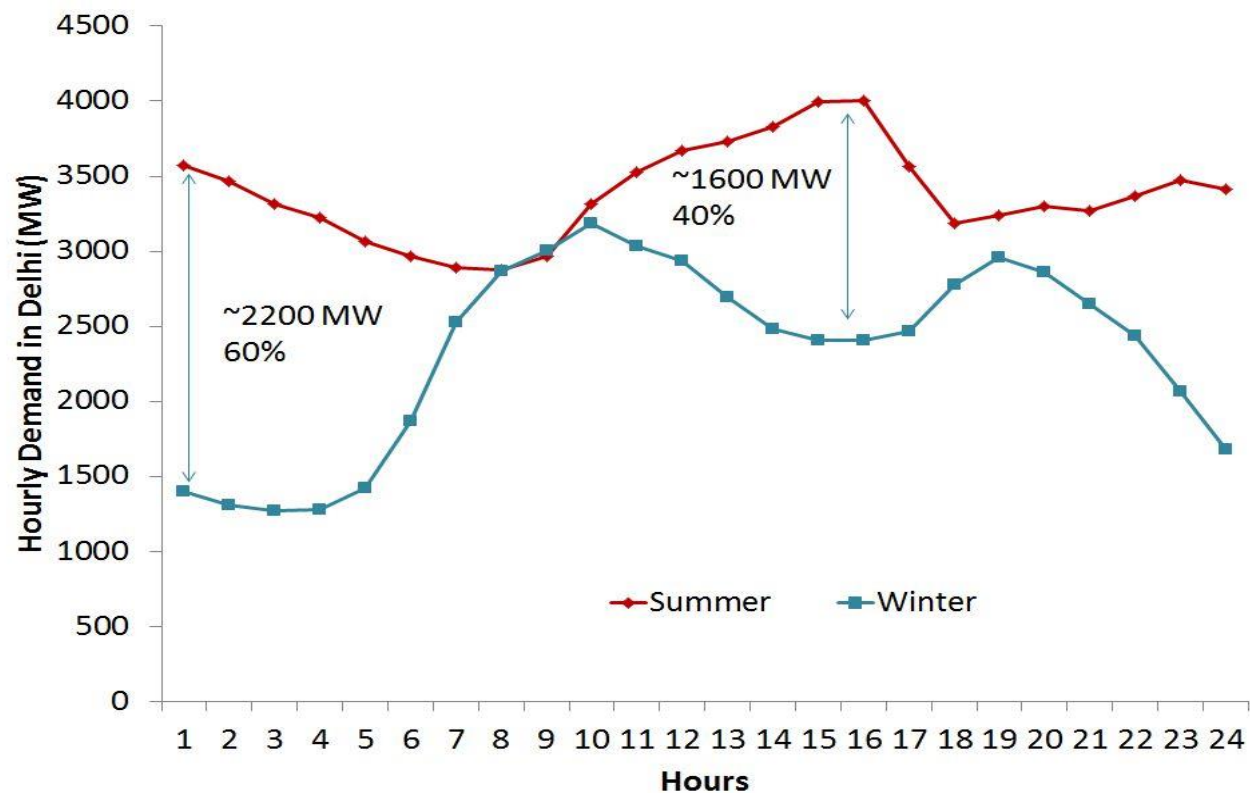
Policies are needed to make sure that consumers, appliances and equipment can participate in demand response and smart energy systems

Digital solutions enable us to understand demand



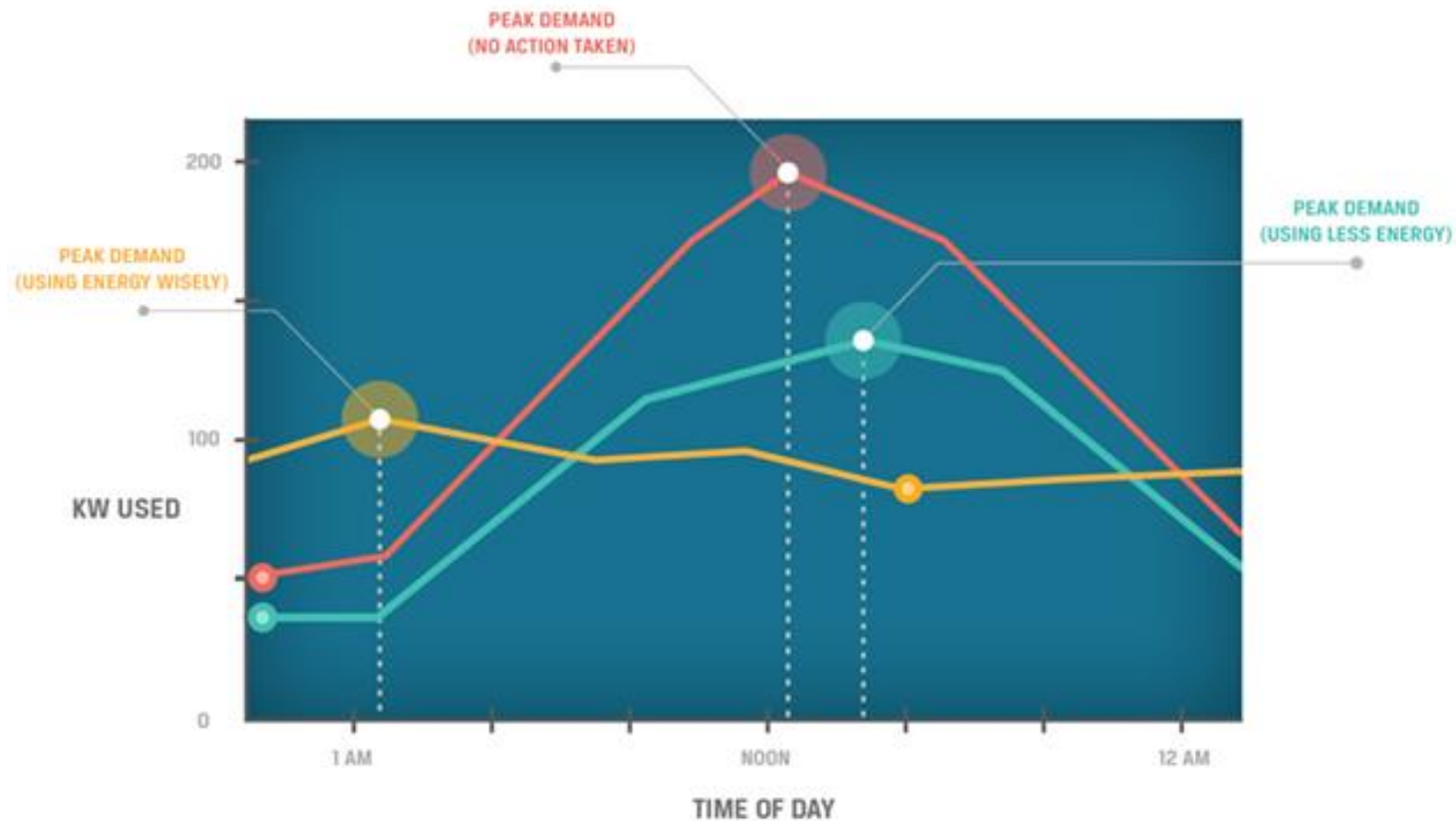
Source: Newborough and Augood (1999), "Demand-side management opportunities for the UK domestic sector" (reproduced courtesy of the Institution of Engineering and Technology).

Aggregating data into demand curves



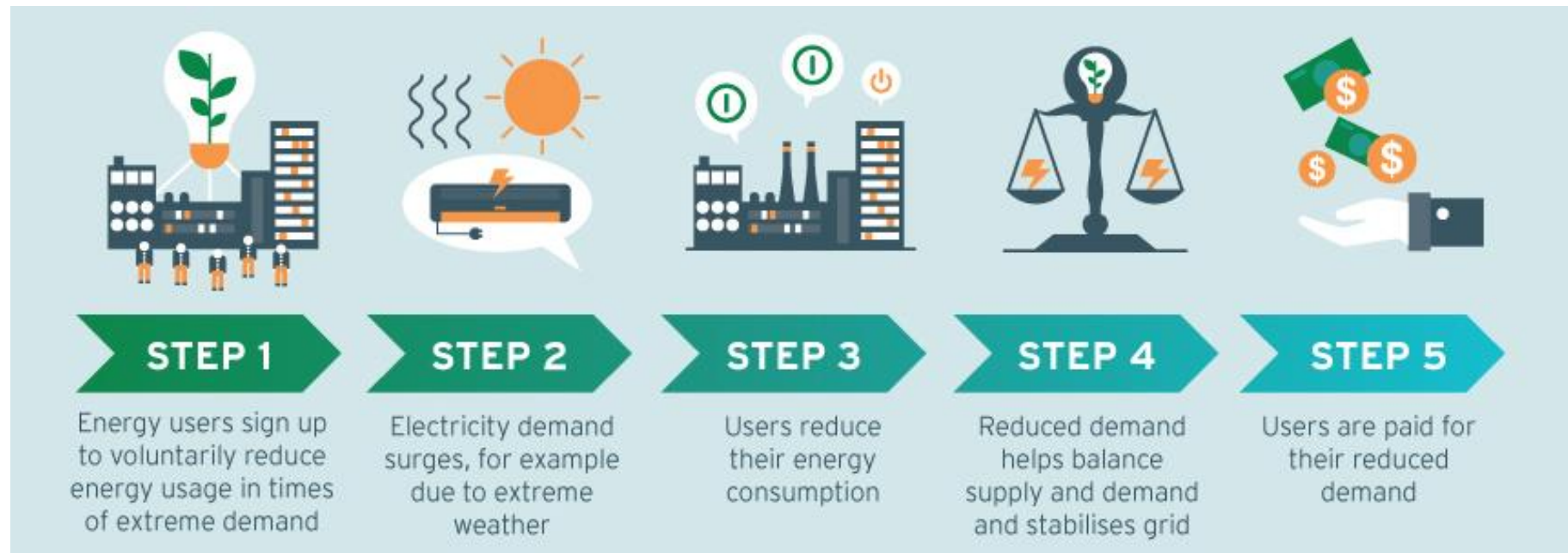
Source: DSLDC

Tackling peak demand

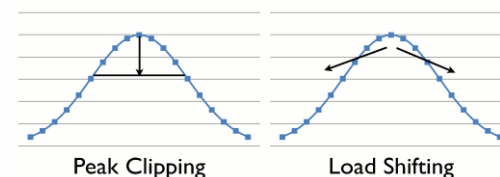


Source: PSE&G

What is demand response?



Source: ARENA



Source: Stanford University

Example: PeakSmart



Get up to **\$200***
when you purchase
a PeakSmart air-con



What are the policy options?

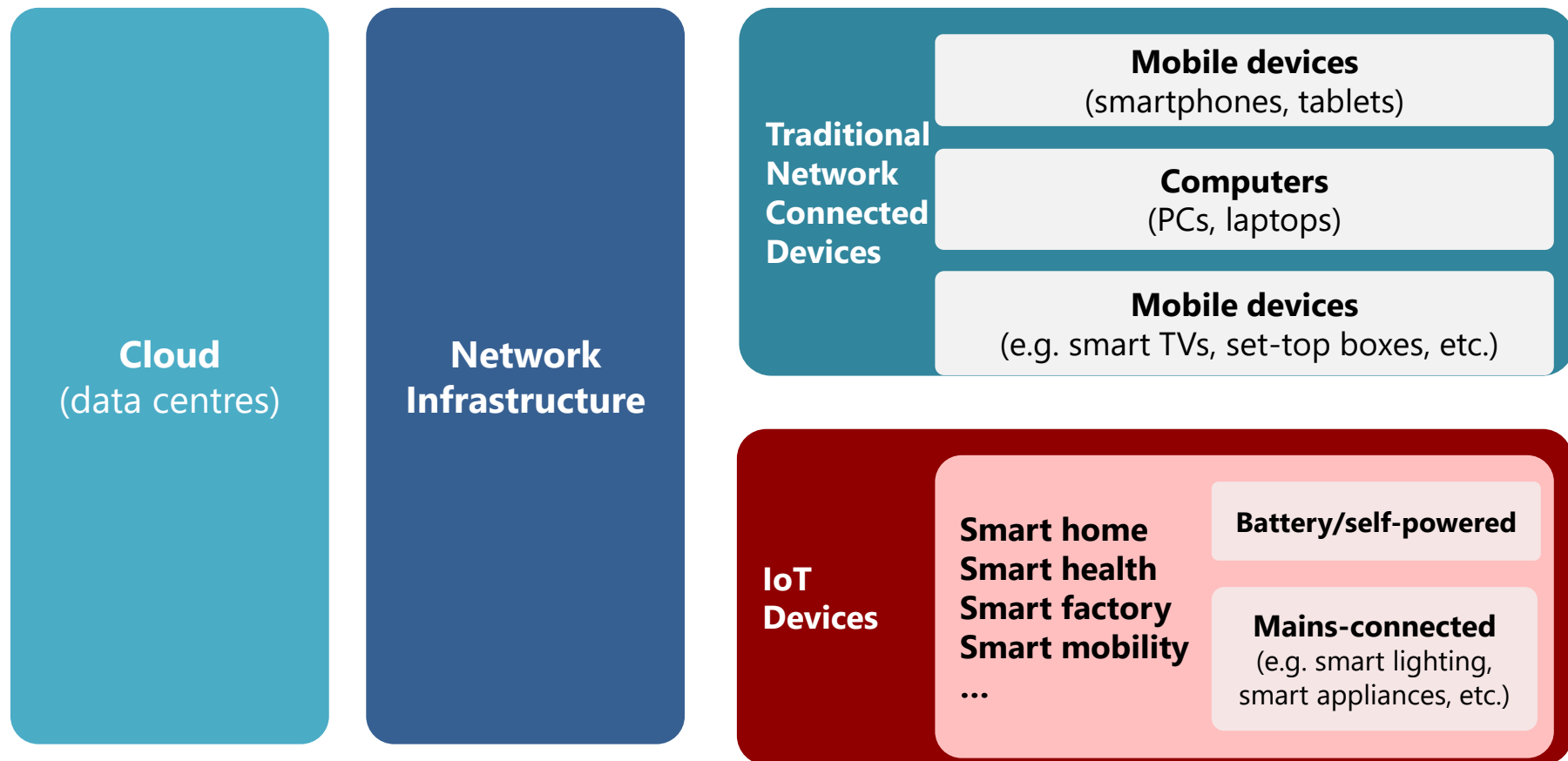
- Connect energy efficiency with demand response
- Awareness raising
- Promote standardisation and interoperability
- Promote capability and use labels
- Include smart capabilities and controllability in specifications or requirements,
- Offer subsidies, rebates or other incentives
- Incentives and technical assistance for consumers investing in energy management controls that also enable demand response



Digital solutions also use energy

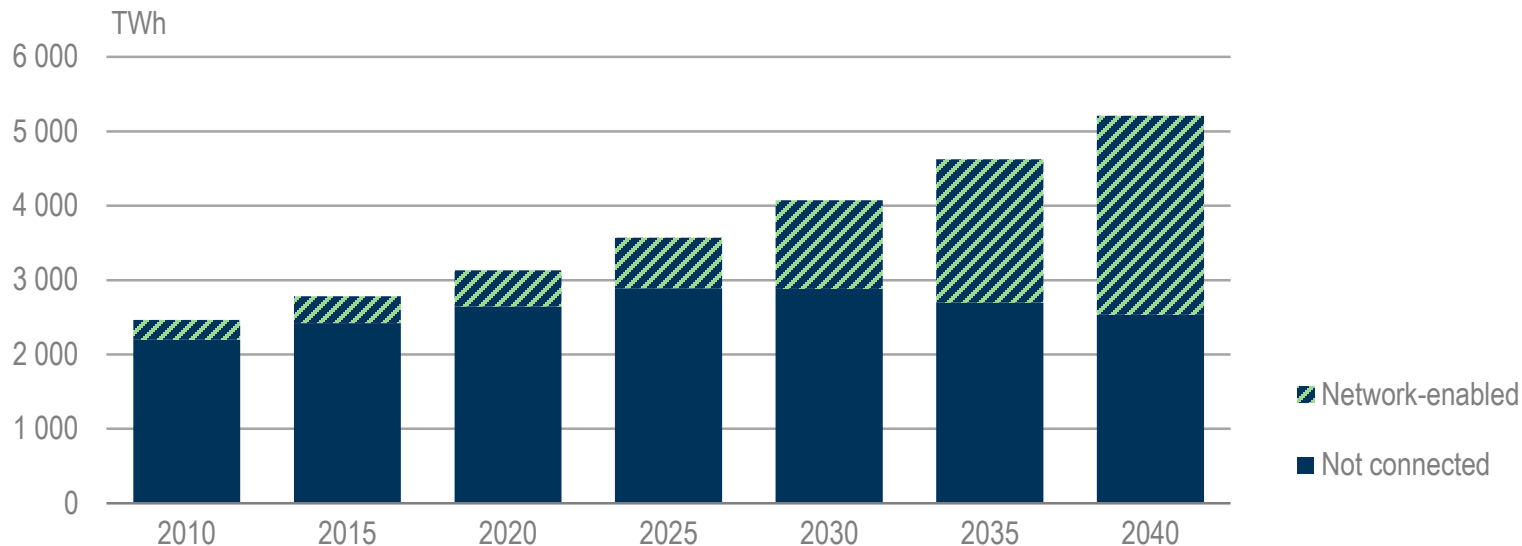
Policies are needed to ensure that they are as efficient as possible

Energy use by digital technologies - overview



A greater share of appliance electricity use is network-enabled

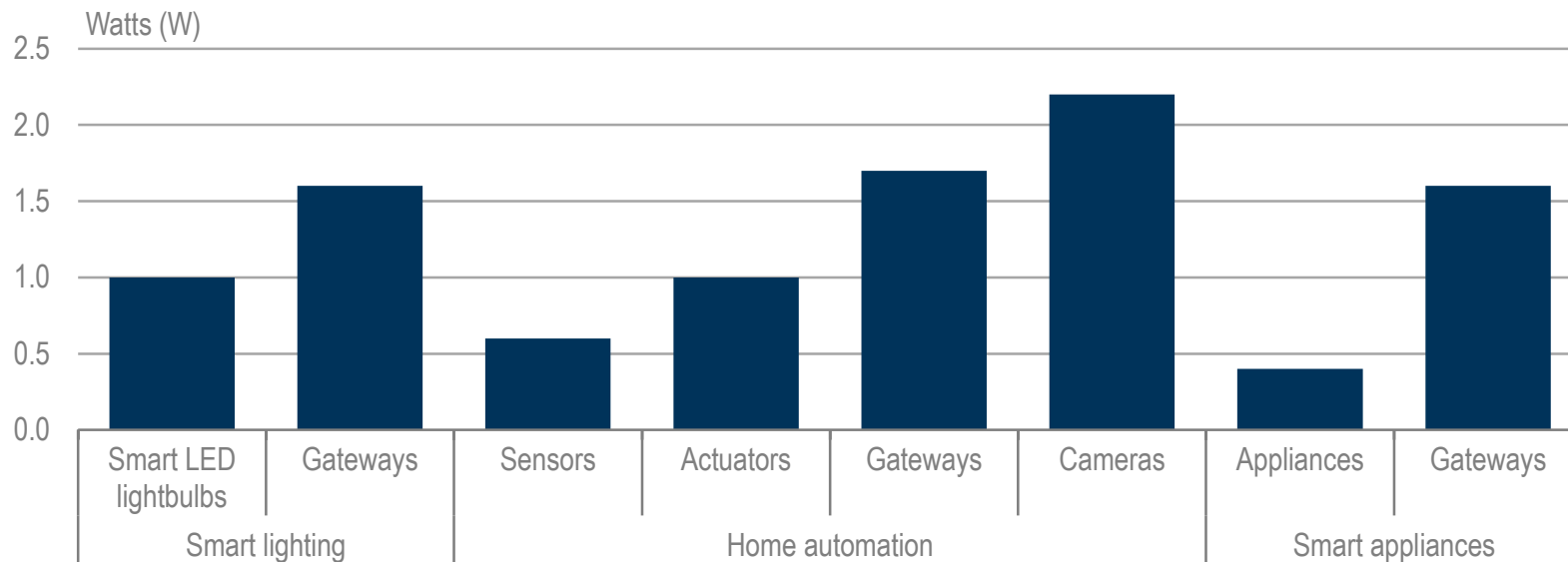
Household electricity consumption of appliances and other small plug loads



The growth in network-enabled devices presents opportunities for smart demand response but also increases needs for standby power

Connected devices come with a hidden energy price tag

Average standby power of household connected devices per unit

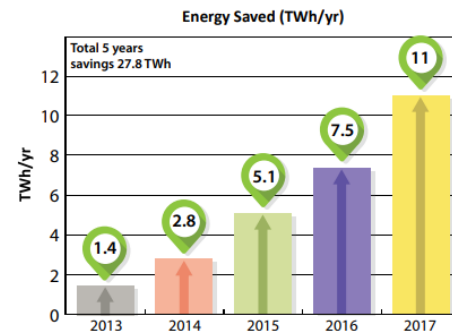


Networked standby, the energy used to maintain the device's connection to the wider network, is also often a connected device's biggest draw on power.

What are the policy options?

- Regulations:
 - European Union Ecodesign network standby
 - Korea e-standby program
- Voluntary approaches
 - US and Canada voluntary agreements
 - EU Codes of Conduct
 - CDA Voluntary Principles for Energy Efficient Connected Devices
- Research and development
 - Super efficient devices
 - Energy harvesting
- Awards
 - Super Efficient Appliance Deployment Initiative Connected Efficiency Award

Annual energy saved by US voluntary set top box agreement



Source: D+R International



Source: University of Washington



IEA resources

<https://www.iea.org/digital/>

IEA Technology Collaboration Platforms

<https://www.iea.org/tcp/>

IEA Technology Collaboration Platform Electronic Devices & Networks

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

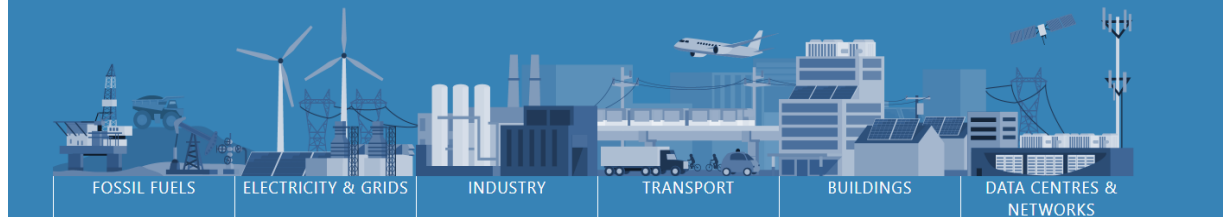
Connected Device Alliance

<https://cda.iea-4e.org/>



What does **digitalization** mean for **the energy system**?

Click on an energy system sector below to find out more.





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THAILAND 2019

ADVANCING PARTNERSHIP
FOR SUSTAINABILITY



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