Key demand-side issues: An IEA perspective

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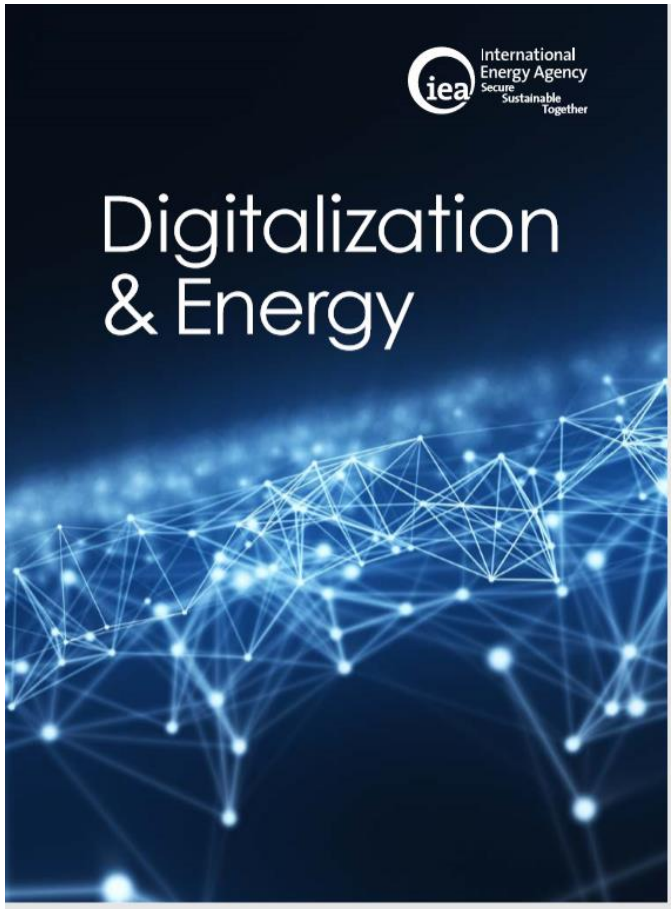
IEA

The Context: The 3 “Ds”

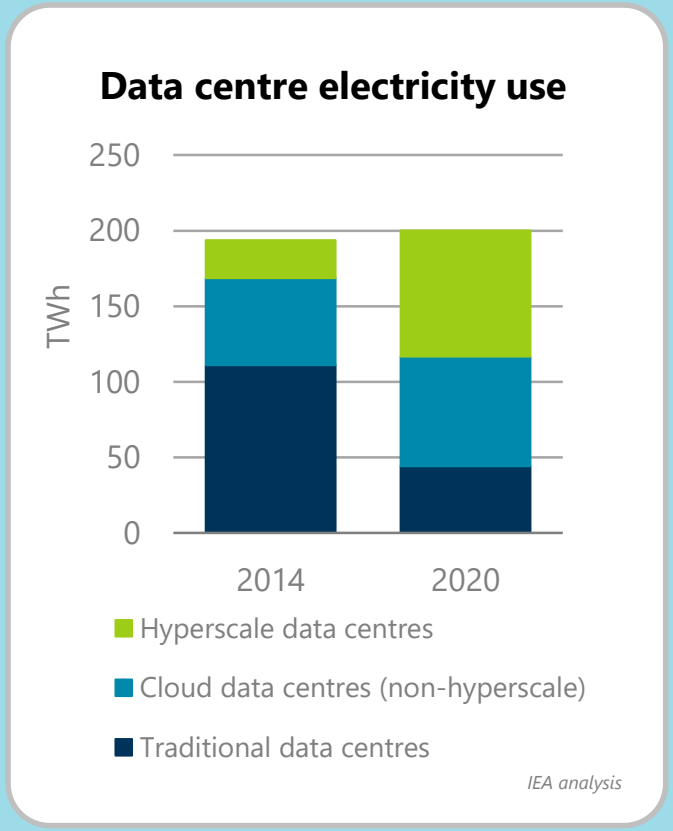
Digitalisation, Decentralisation and Decarbonisation

Digitalization & Energy – A key reference



Digitalization trends are truly astounding

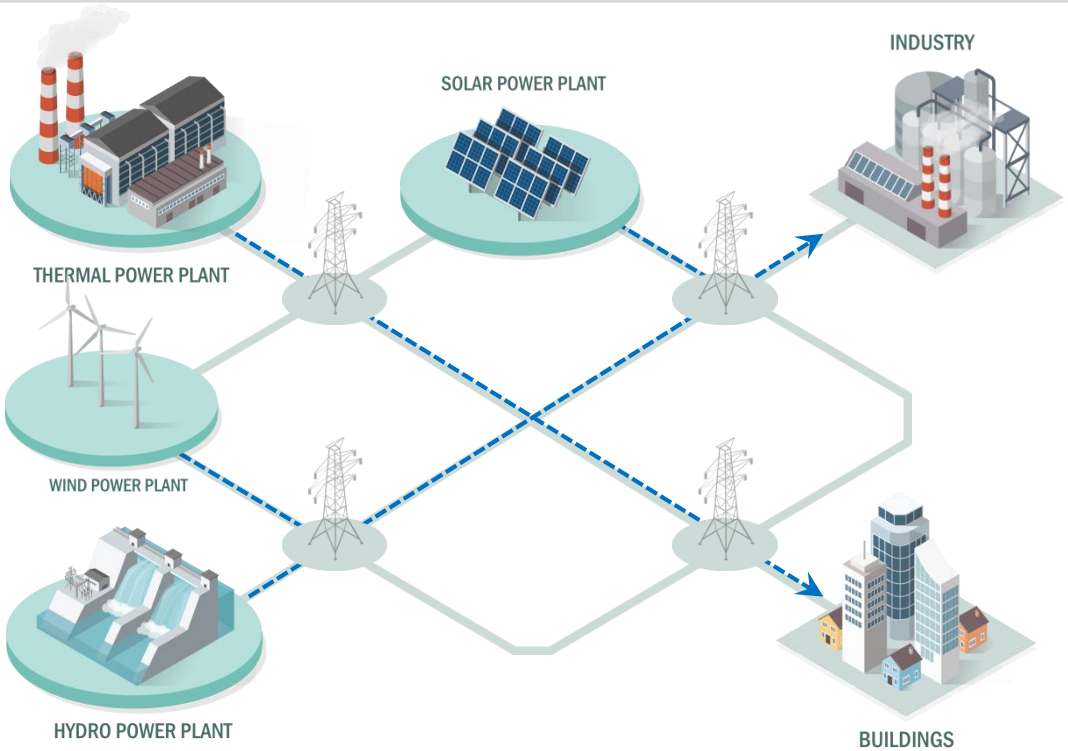
KB	kilobyte	10^3 bytes
MB	megabyte	10^6 bytes
GB	gigabyte	10^9 bytes
TB	terabyte	10^{12} bytes
PB	petabyte	10^{15} bytes
EB	exabyte	10^{18} bytes
ZB	zettabyte	10^{21} bytes
YB	yottabyte	10^{24} bytes



Sources: Cisco (2017). The Zettabyte Era: Trends and Analysis June 2017; Cisco (2015). The History and Future of Internet Traffic.

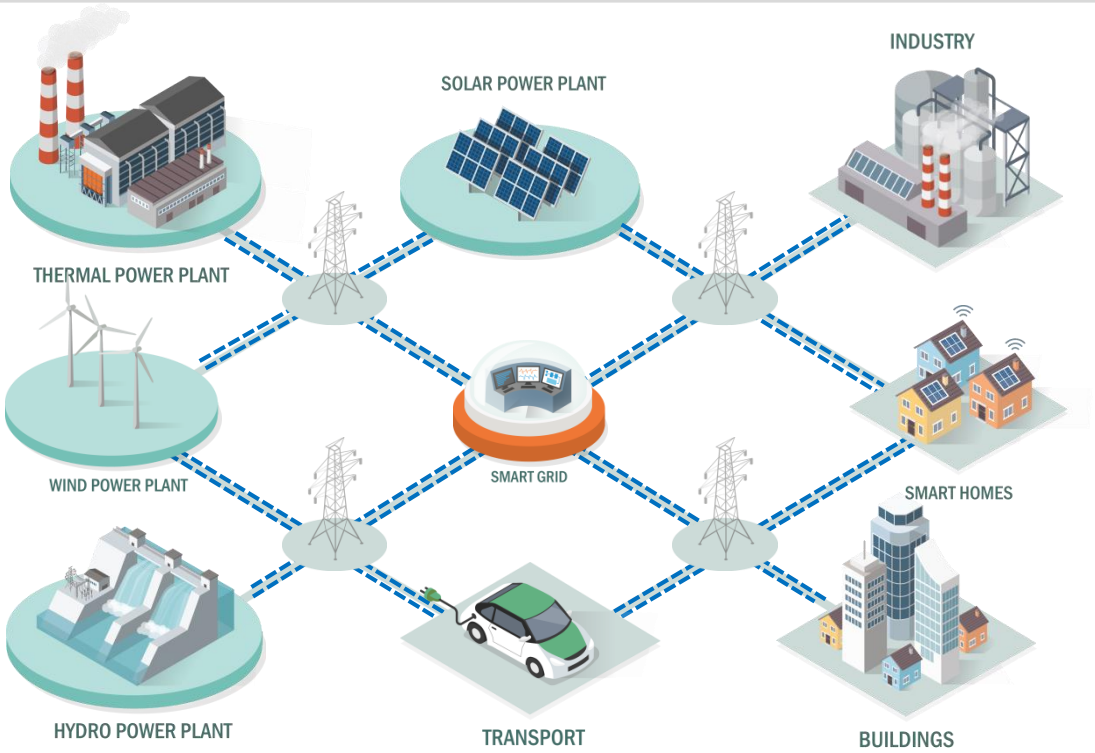
Sustained efficiency gains could keep energy demand largely in check over the next five years, despite exponential growth in demand for data centre and network services

The digital transformation of the energy system



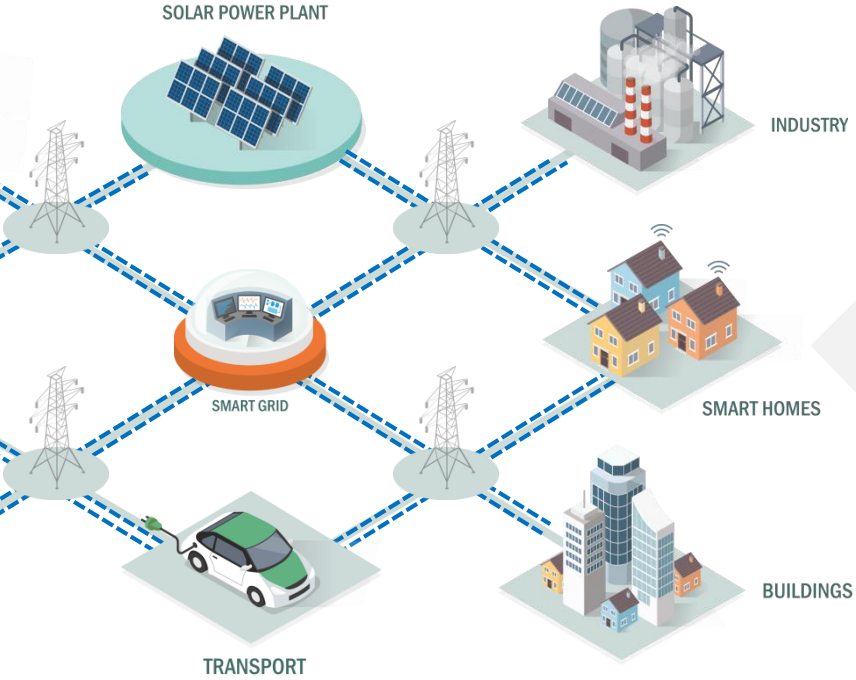
Pre-digital energy systems are defined by unidirectional flows and distinct roles

The digital transformation of the energy system



Digital technologies enable a multi-directional and highly integrated energy system

Smart demand response

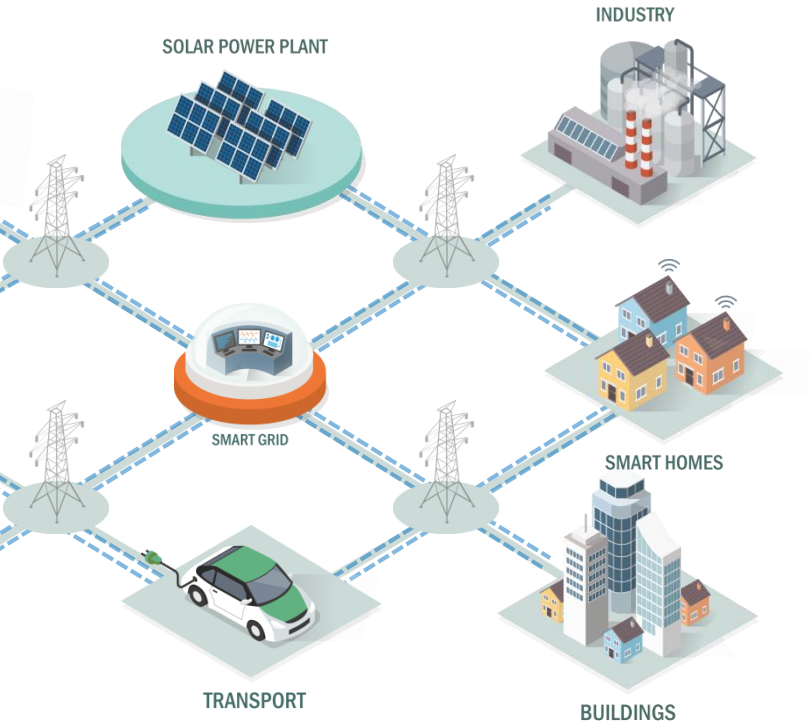


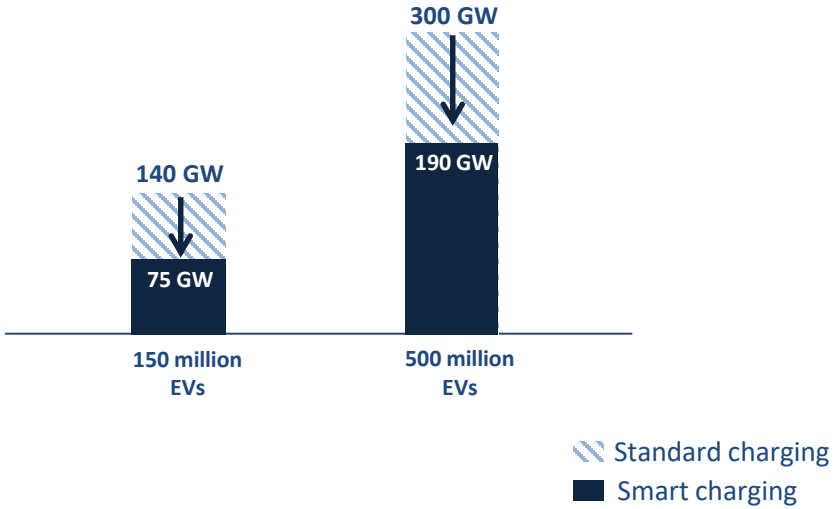
Residential sector

1 billion households and
11 billion smart appliances
could actively participate in interconnected electricity systems

Demand response programs – in buildings, industry and transport - could provide 185 GW of flexibility, and avoid USD 270 billion of investment in new electricity infrastructure

Smart charging of electric vehicles

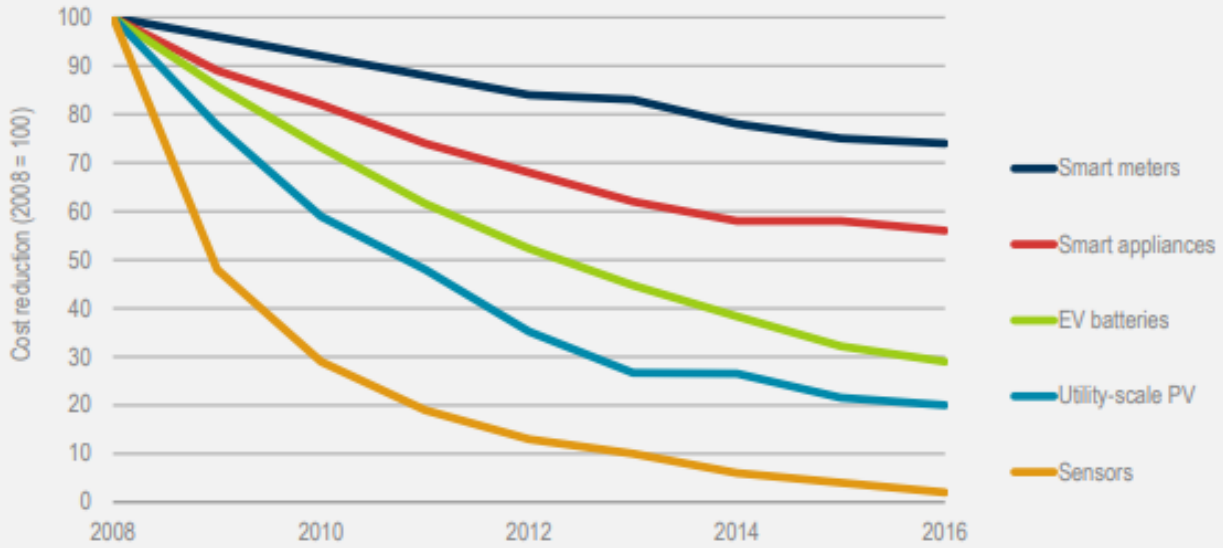




EVs smart charging would provide further flexibility to the grid saving between USD 100-280 billion investment in new electricity infrastructure

Technology costs reductions are enabling the digital transformation

Figure 4.4 Unit costs of key emerging electricity technologies

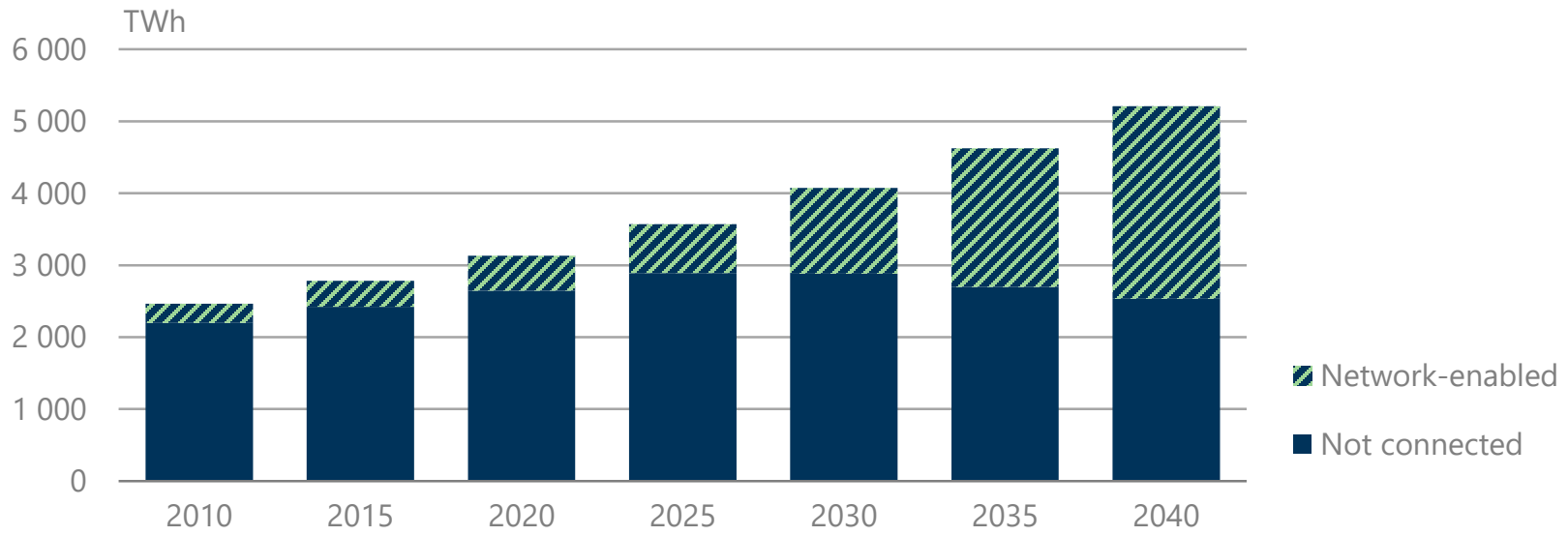


Key message: Technology cost reduction is a key driver enhancing connectivity throughout the electricity sector.

Sources: IEA analysis based on Bloomberg New Energy Finance (2017); Holdowsky et al. (2015); IEA (2017a; 2017b; 2017c); Navigant Research (2017).

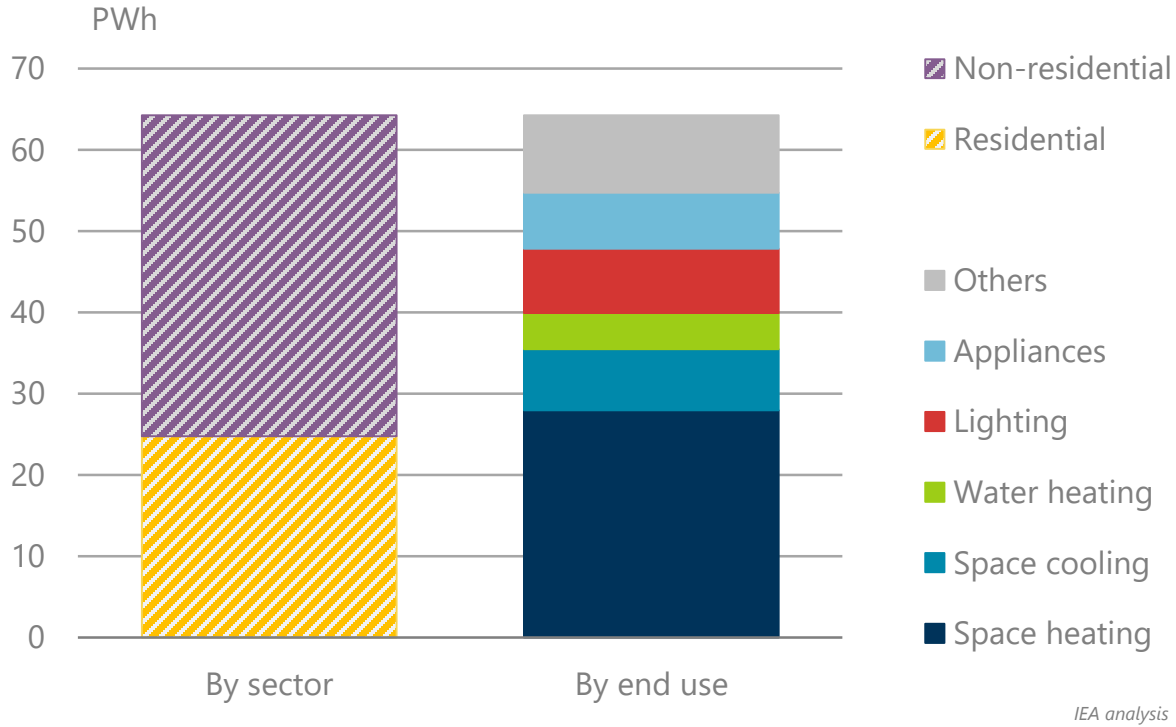
Growing number of appliances connected to a network

Global 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

Digitalization enabling building energy efficiency



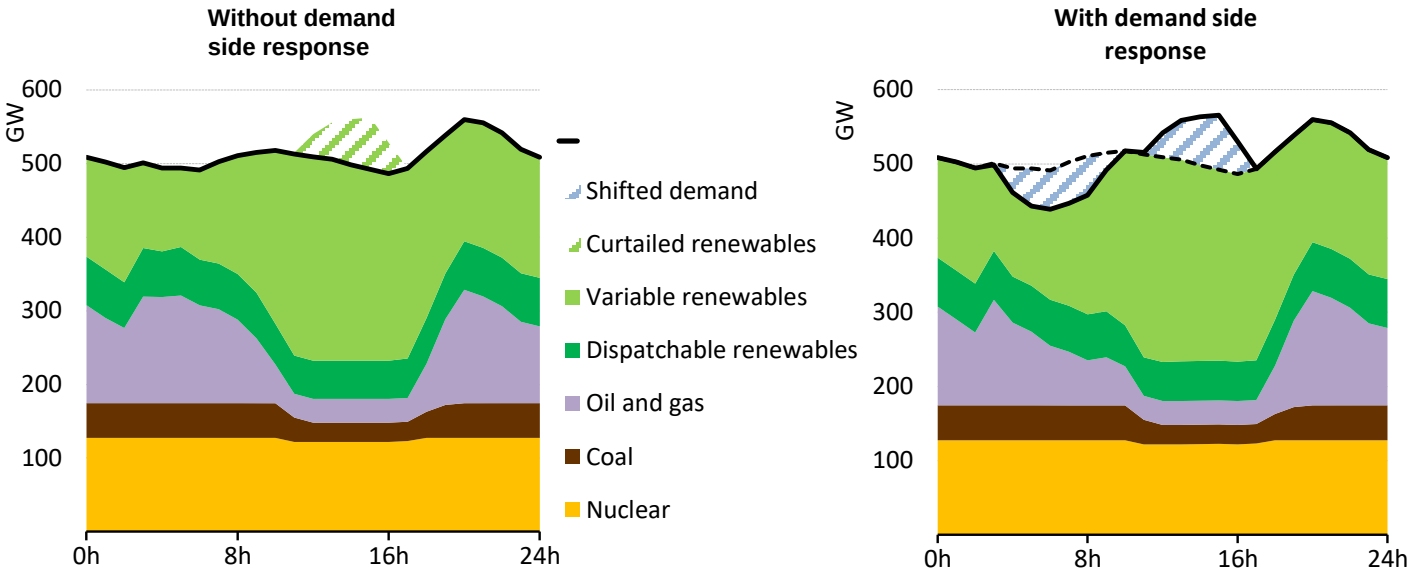
IEA analysis

Widespread deployment of smart building controls could reduce energy use by 10% to 2040

Demand response: Potential and challenges

- Global theoretical potential: Nearly 4,000 TWh per year, or more than 15% of total electricity demand (WEO 2017).
- Over 75% of the global potential in demand-side response lies in **buildings**
- Buildings DR is difficult to tap, especially residential buildings, where behaviour change may be necessary but economic benefits to individual households limited.
- As such, aggregation and automation of small scale demand-side response resources is often the most viable path to market for the residential sector.

Demand response and decarbonisation



Demand-side response reduces the need for curtailing renewables and expensive and carbon-intensive flexible sources of generation

Transport

Road freight

- Digital solutions for trucks and logistics could reduce energy use for road freight by 20-25%.
- Digital solutions include platooning, route optimisation, and data sharing across the supply chain

Road passenger

- Automation, connectivity, sharing, and electrification (ACES) to dramatically reshape road transport
- Impacts on energy demand difficult to predict
- Automation and connectivity could halve or double energy demand, depending on how technology, behavior, and policy evolve

Intelligent transport systems are improving safety and efficiency of all modes, with the most transformative impacts expected in road transport

2. Key questions for the IEA

Digitalization: Issues for consideration

- Goal: To better predict the impacts of digitalization, given **uncertainty in technology, policy and behaviour**

- Focus on high impact, high uncertainty areas:
  - Automation, connectivity, and electrification of transport
  - Electricity and smart energy systems
  - Digitalization and decarbonisation

- One example: Distributed ledgers
  - Peer-to-peer trading to incentivise prosumers/prosumagers. Could it help avoid expensive market reforms?
  - Potential for digital EPC labelling/building performance data in building sales?
  - Verified energy savings and digital white certificates?

Demand side response (DSR) in WEO 2018

- 2018 WEO Special Report on Electricity

- Seeking to improve modelling of DSR:
  - What is the technical potential for DSR in different end-uses?
  - What is the economic potential for DSR in different end-uses?
  - What retail electricity tariff structures are most effective for incentivising demand side response?
  - What are the best business models to capture most of DSR potential?
  - What are the key policy levers/barriers?

Key issues identified at the RE-EE Workshop

- **Efficiency first**
  - EE as prerequisite/enabler for deploying renewables cost effectively and at scale

- **EE and RE = Flexibility**
  - Integrating RE requires a flexible, responsive grid - demand side response (DSR) policies and technologies are critical

- A stronger focus on **heat**
- **Questions:**
  - What does a coherent and mutually supportive EE/RE policy framework look like?
  - Beyond TFC/TPES towards "final energy service"

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