Smart energy systems and resource efficiency

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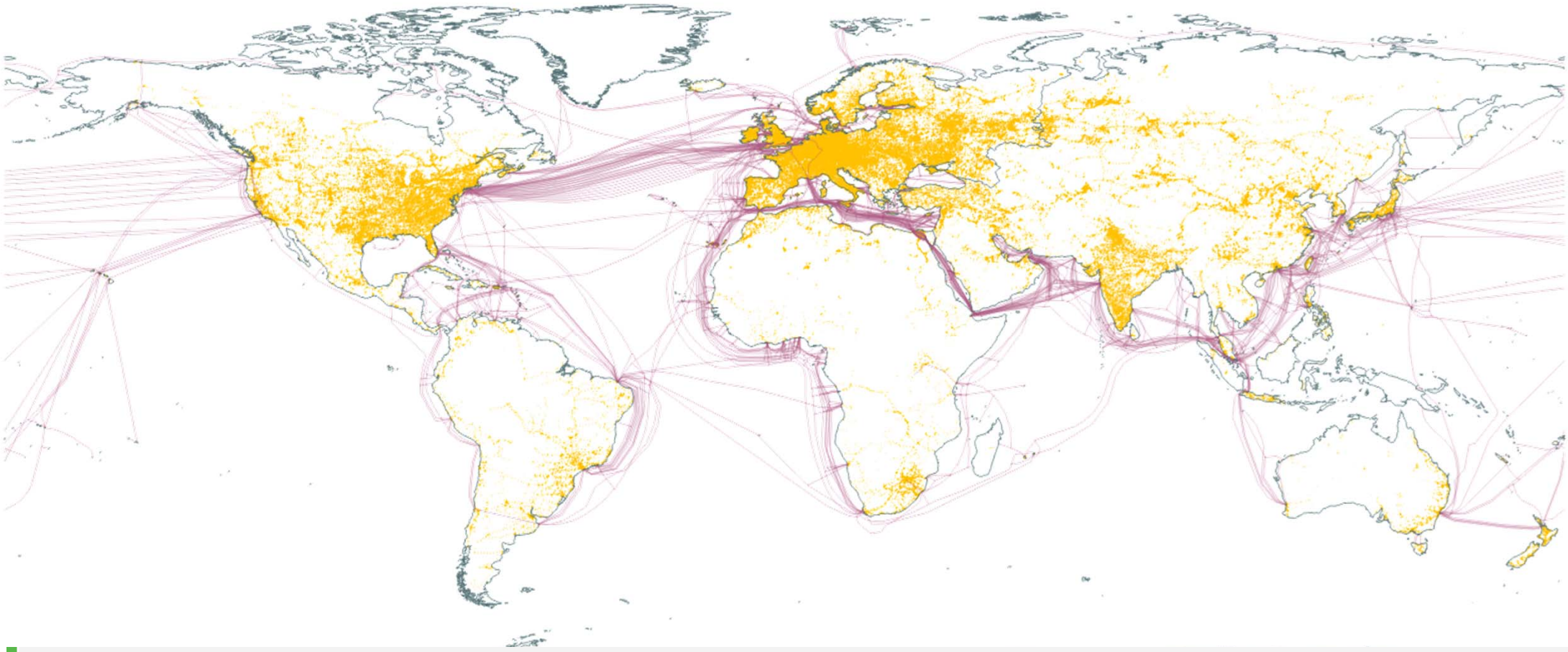
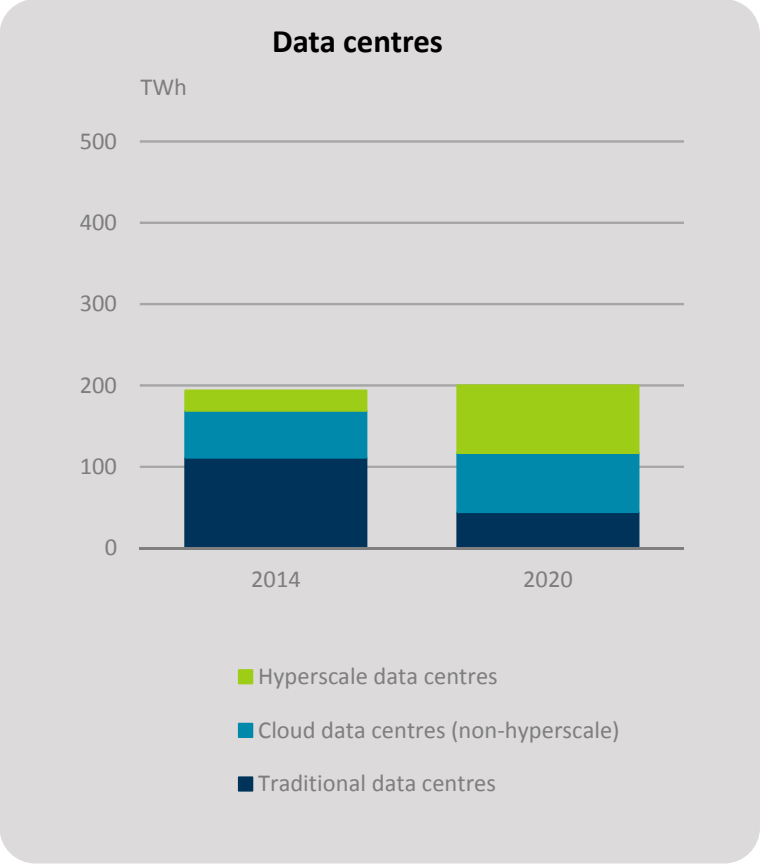
IEA

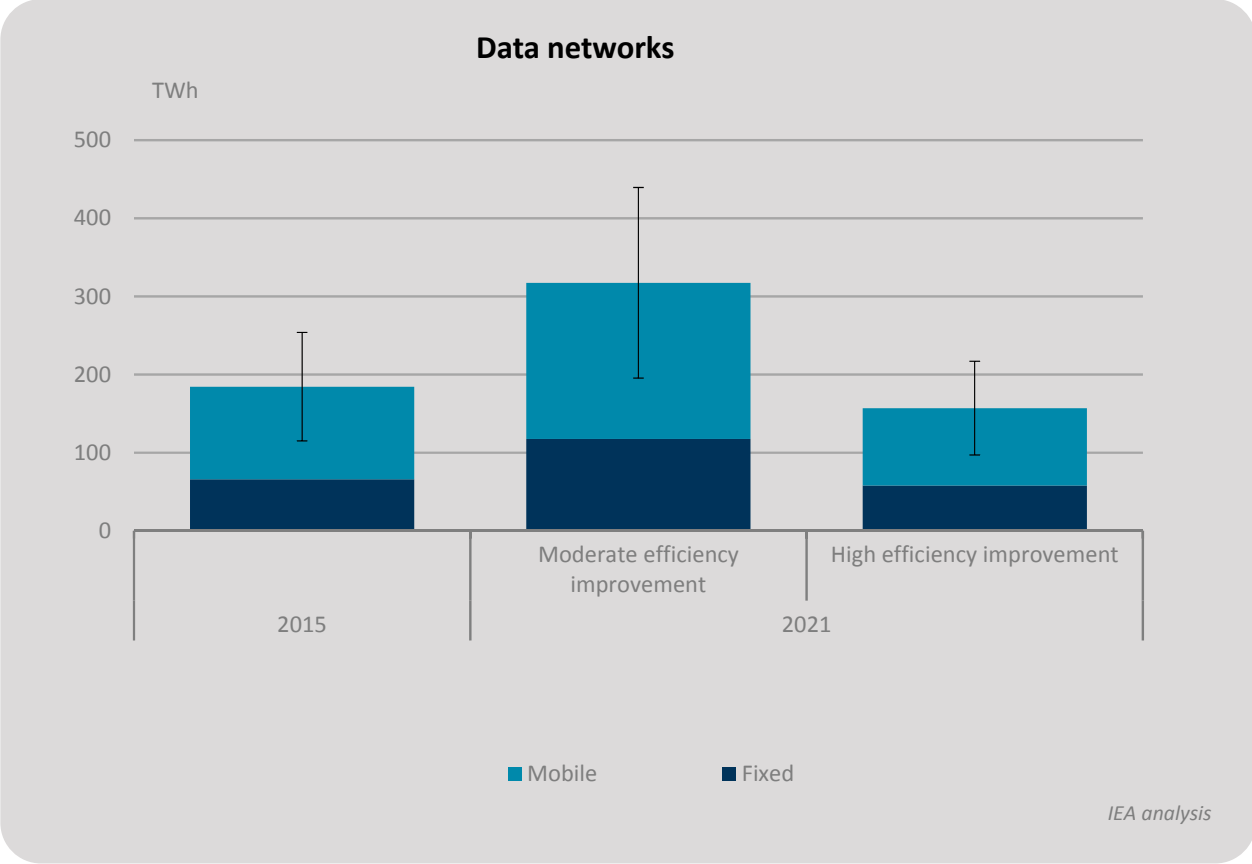
Global electricity and internet backbone grids



Enough power lines are in place today to cover the distance to Mars – but the full potential from linking energy and digital infrastructure is yet untapped

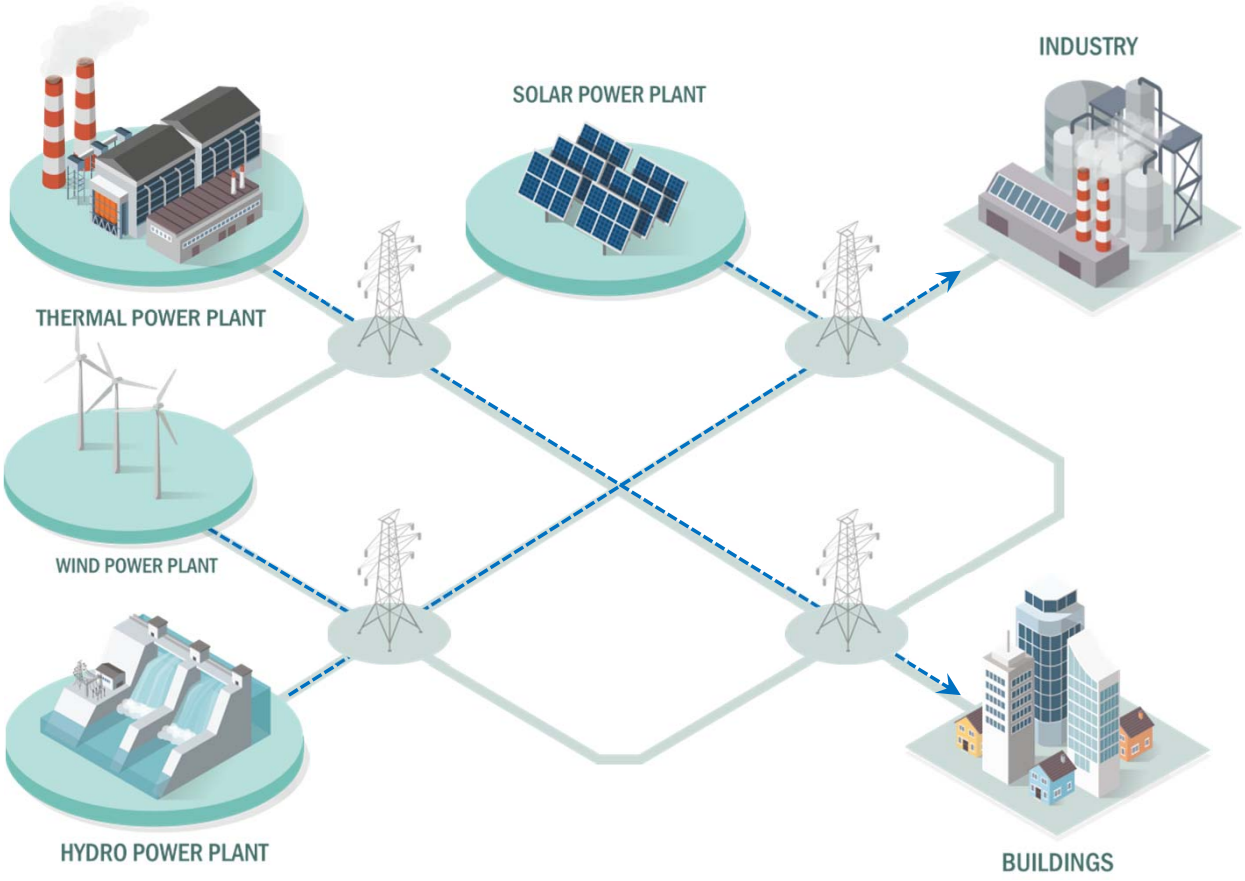
Electricity use by data centres and networks





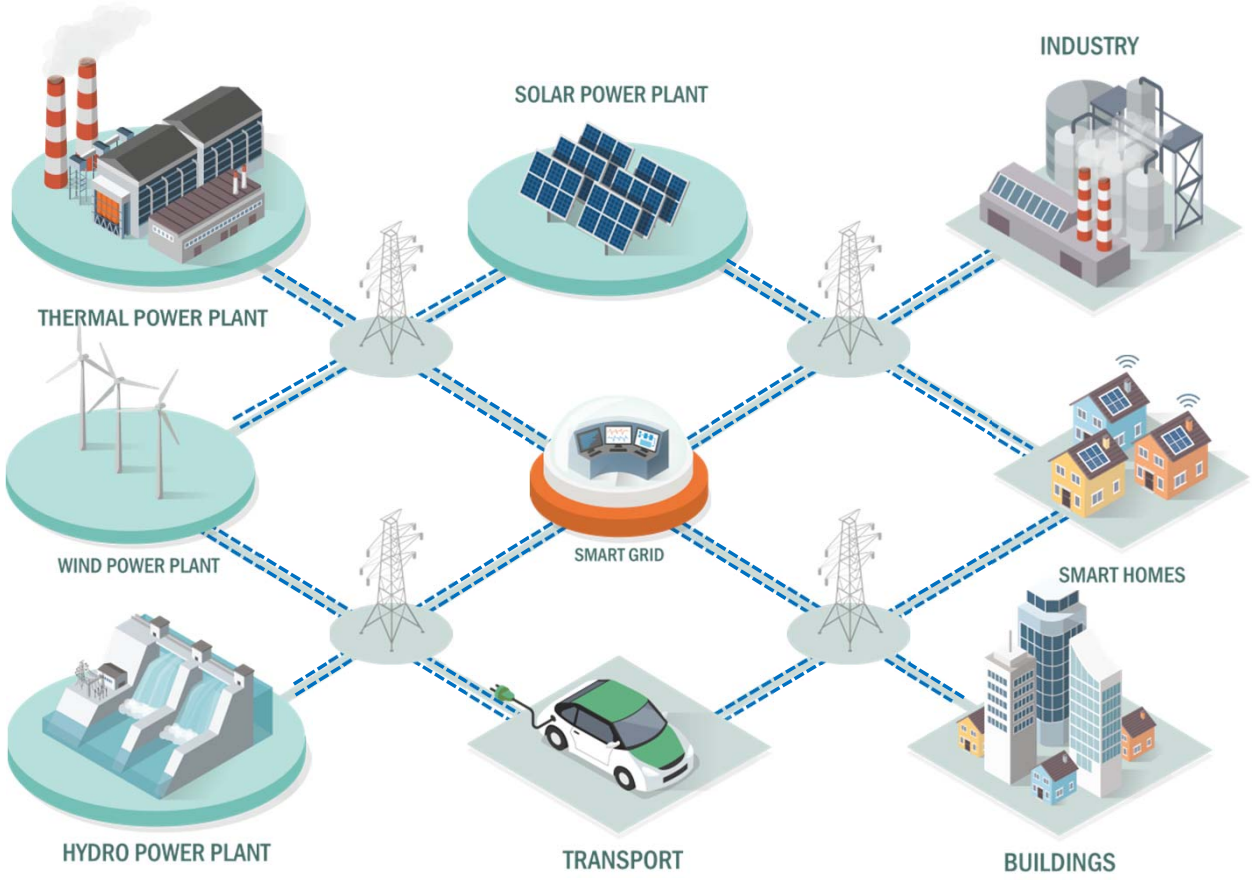
Sustained efficiency gains could keep energy demand largely in check over the next five years, despite exponential growth in demand for data centre and network services

The digital transformation of the energy system



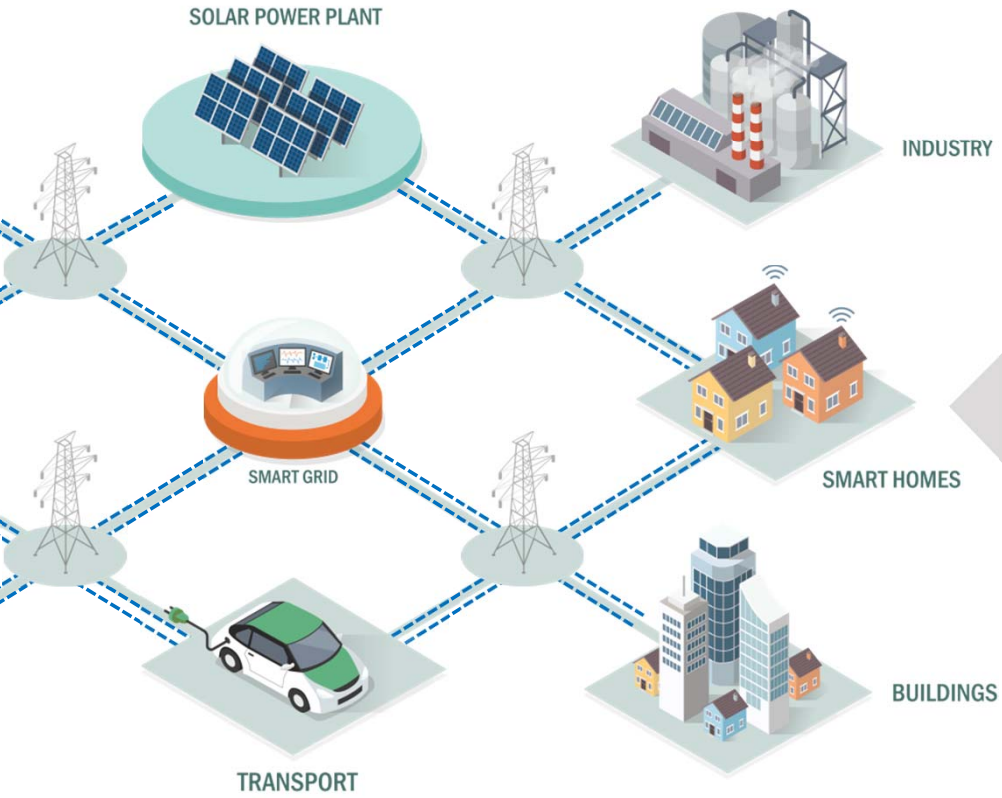
Pre-digital energy systems are defined by unidirectional flows and distinct roles

The digital transformation of the energy system



Pre-digital energy systems are defined by unidirectional flows and distinct roles, digital technologies enable a multi-directional and highly integrated energy system

Involving consumers in energy system operations

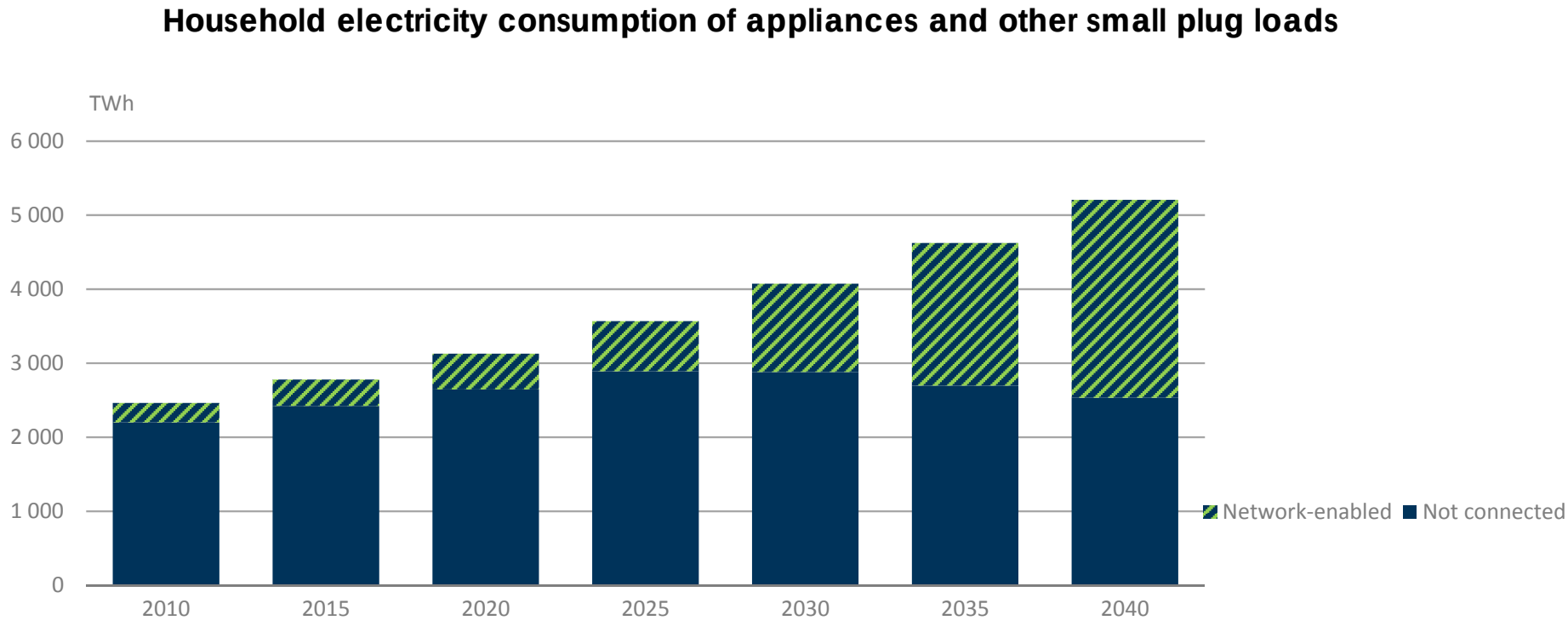


Residential sector

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

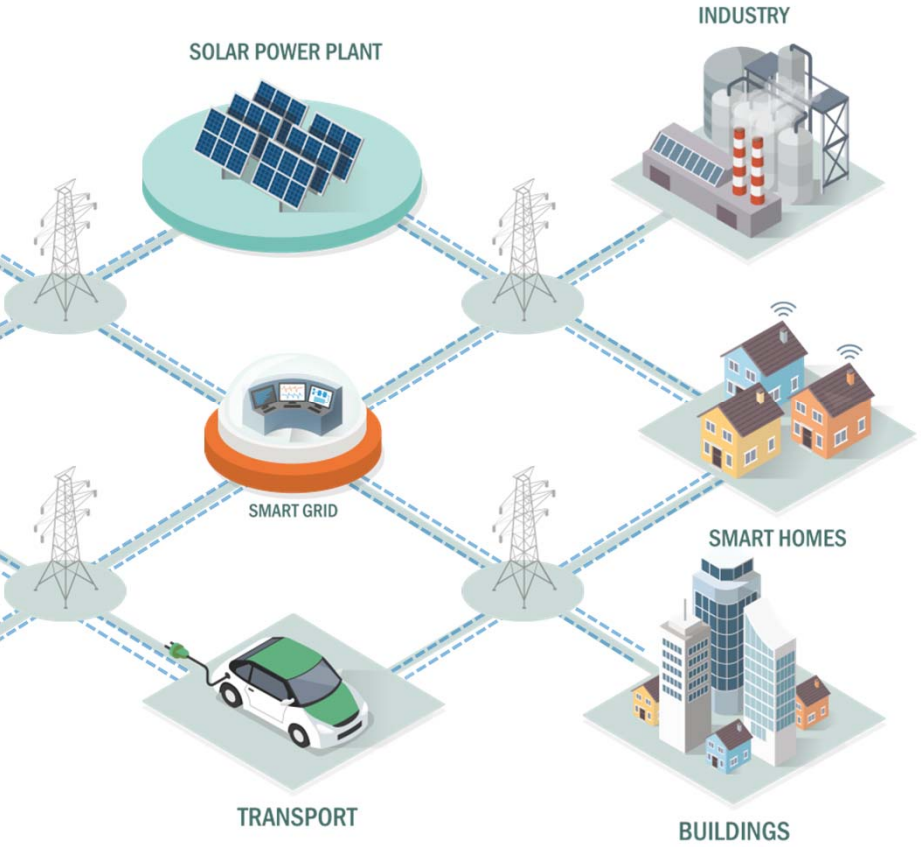
Demand response programs – in buildings, industry and transport - could provide 185 GW of flexibility, and avoid USD 270 billion of investment in new electricity infrastructure

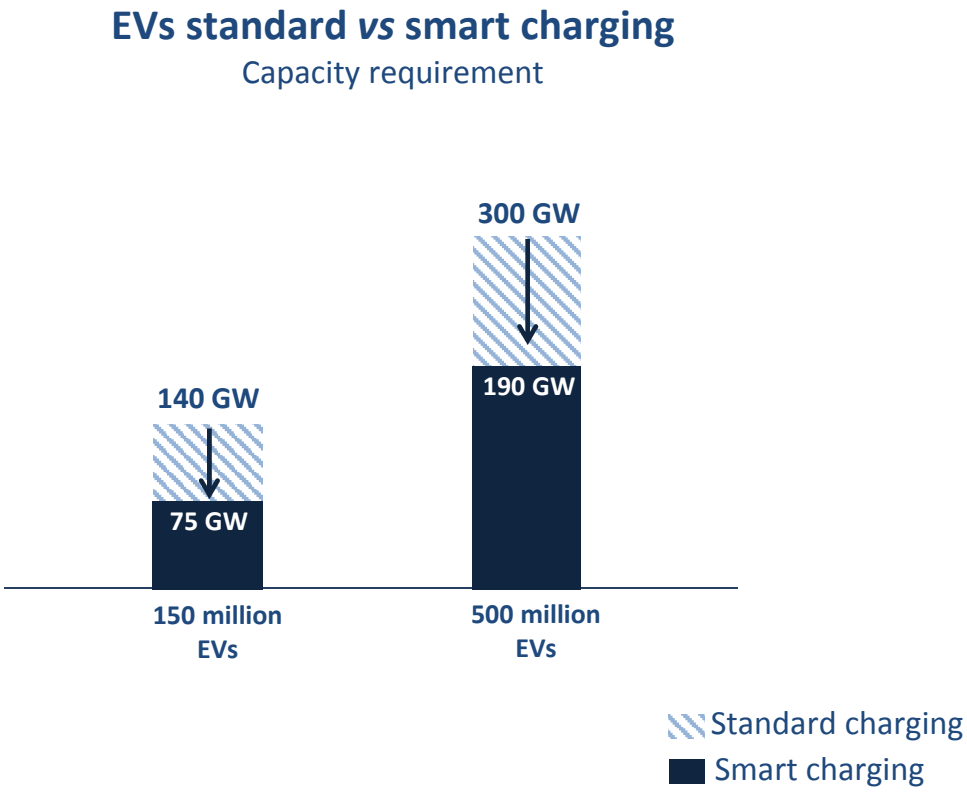
Growth of IoT and connected devices



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

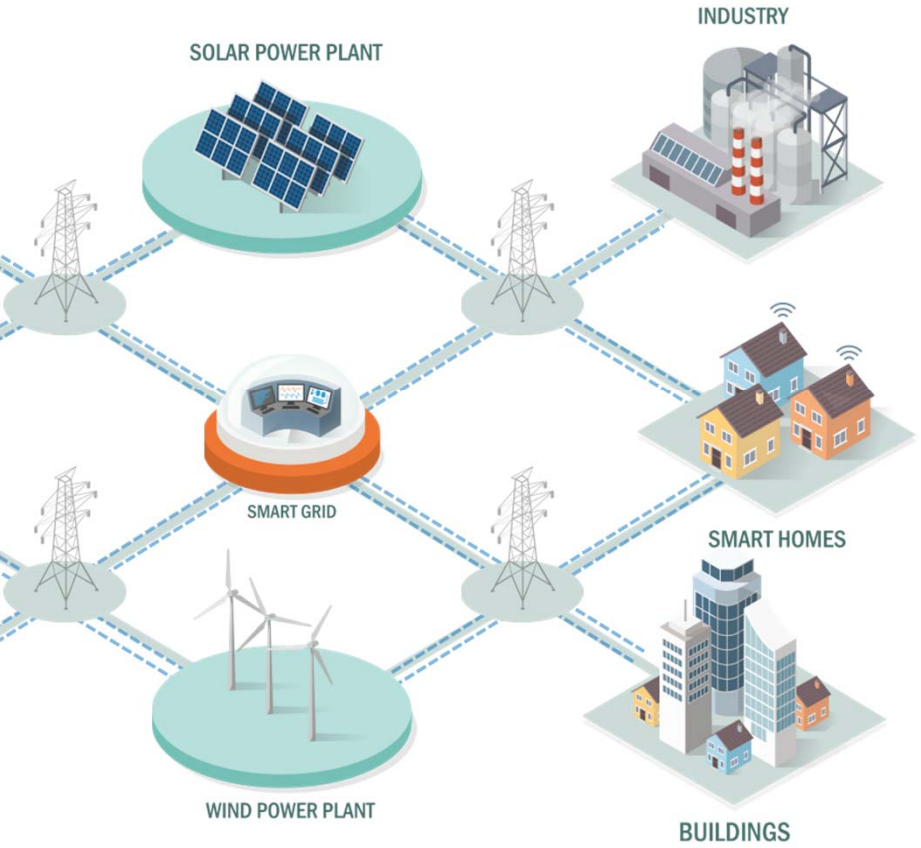
Smart charging of electric vehicles

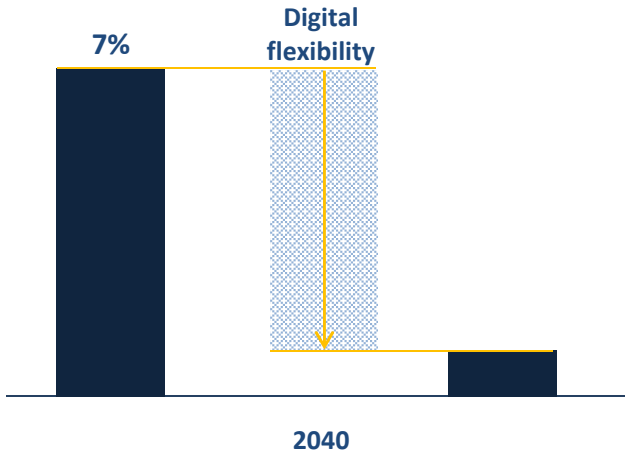




EVs smart charging would provide further flexibility to the grid saving between USD 100-280 billion investment in new electricity infrastructure

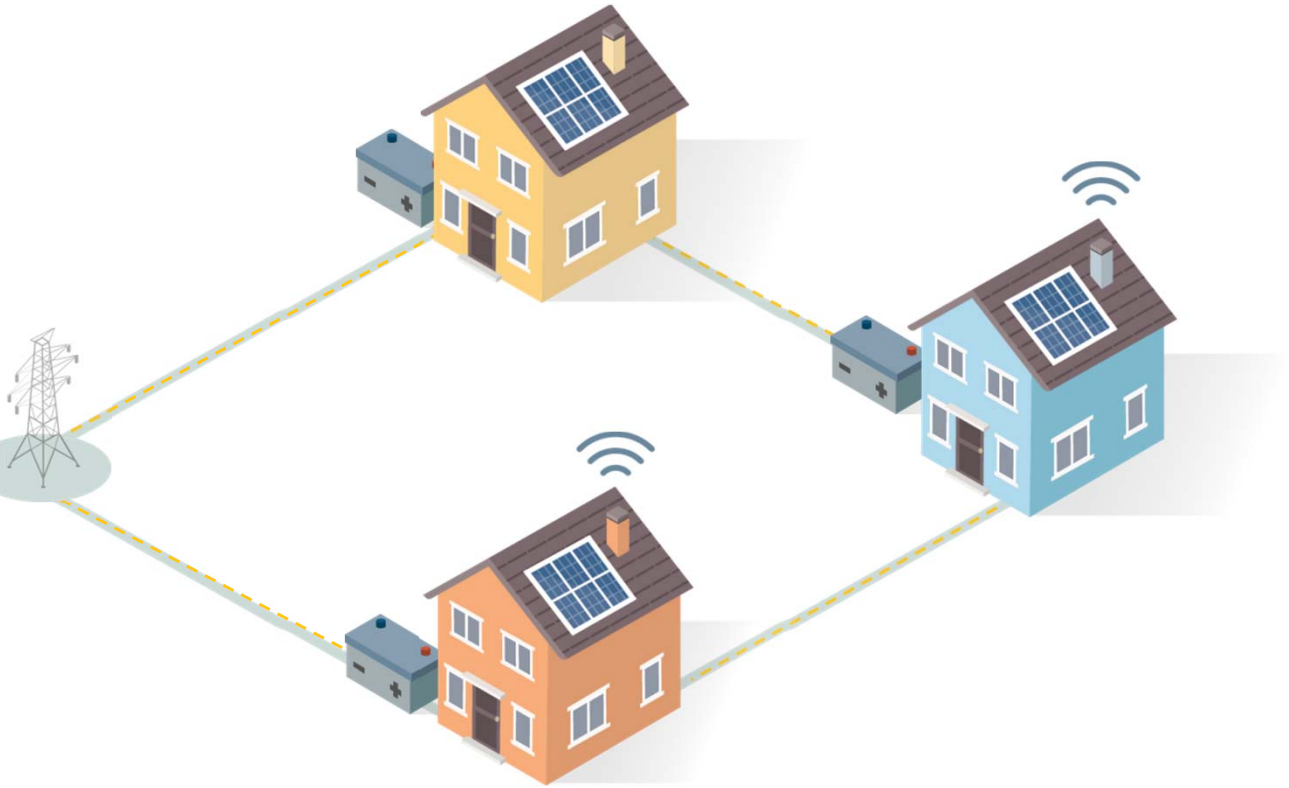
Integration of variable renewables





Digitalization can help integrate variable renewables by enabling grids to better match energy demand to times when the sun is shining and the wind is blowing.

Distributed energy resources



Blockchain could help to facilitate peer-to-peer electricity trade within local energy communities

Digitalization can facilitate the deployment of residential solar PV and storage, making it easier to store and sell surplus electricity to the grid or locally