

● SHARED READS

A culture of sharing experiences and information is a prerequisite for the worldwide development of renewable energy. With this in mind, “Masen Explores” regularly highlights reports published by major players in the renewables sector.

DIGITALIZATION & ENERGY

In its first “Digitalization & Energy” report, The International Energy Agency (IEA) examines the growing correlation between energy and digitalization by focusing on how this is transforming energy systems.

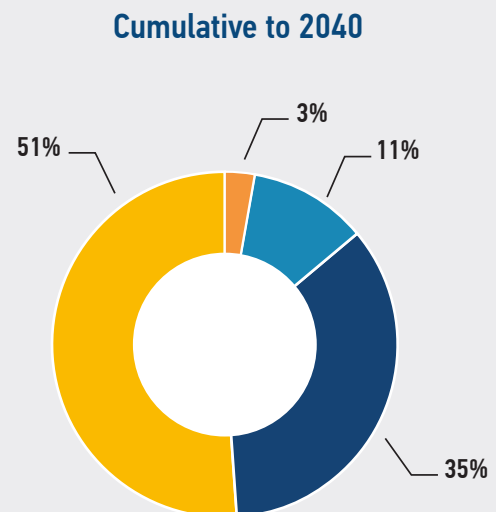
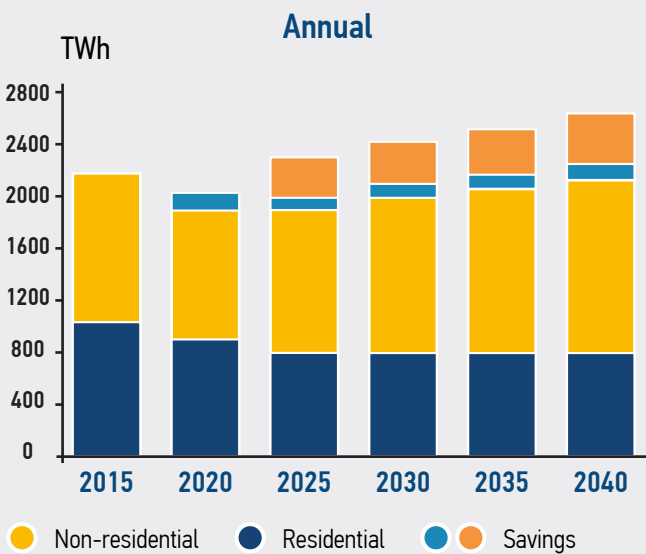
Digital technologies are changing how, where and when energy is consumed. One of the major aspects discussed in the report is how prevalent digitalization will affect energy demand and consumption, primarily in the three energy-intensive sectors of construction, transportation and industry. In these sectors, digitalization is already widely used and could help boost energy efficiency to optimize energy consumption.

THE SMART HOME

Overall, buildings are responsible for more than one-third of global energy consumption. Thanks to emerging connected devices (domestic appliances, smart lighting and electronic equipment), especially smart meters¹, the IEA predicts a decrease of 10% in energy consumption between 2017 and 2040 through real-time data collection. More than 1 billion households and 11 billion smart appliances could actively participate in interconnected electrical systems by 2040. This would enable these households to make a more efficient use of the grid-stemmed energy.

DEMAND RESPONSE² IN THE CONSTRUCTION, INDUSTRY AND TRANSPORTATION SECTORS COULD ALLOW A FLEXIBILITY TO THE GRID UP TO 185 GW AND SAVE USD 270 BILLION OF INVESTMENT IN NEW ELECTRICITY INFRASTRUCTURE BY 2040.

Potential electricity savings from smart lighting in buildings to 2040



Key message : Smart lighting could cut global electricity needs for lighting in buildings by more than 20% in 2040

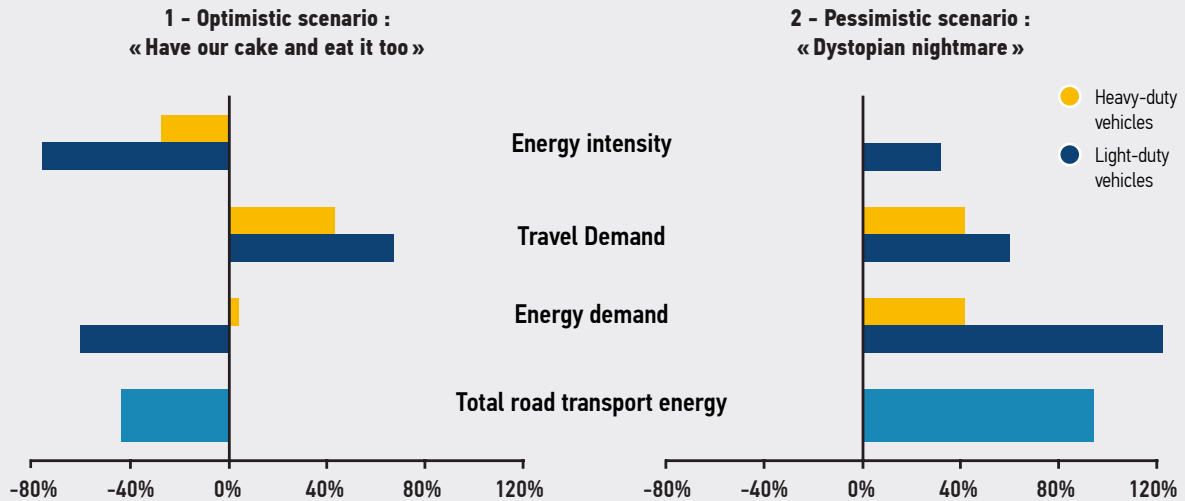
Note : The electricity savings potential from smart lighting, including sensors and digital controls, is calculated as the energy use reductions beyond the estimated savings from expected deployment of LEDlighting already estimated in the IEA Central Scenario.

¹Smart meters or smart thermostats are energy meters that can provide a detailed and accurate picture of energy consumption, often in real time.
²Demand response is the energy consumer’s participation in reducing consumption, generating electricity and creating flexibility within the grid.

SMART MOBILITY

Cars, trucks, trains and airplanes are now increasingly smarter and more connected, and improve the efficiency and safety of the transportation system. In the latter case, digitalization means the development of smart systems that use sensors to gather data or even communications tools that enable it to be remotely controlled. Self-driving vehicles will have a massive impact on both the transportation system and its energy consumption.

Range of possible energy impacts from vehicle automation in the United States



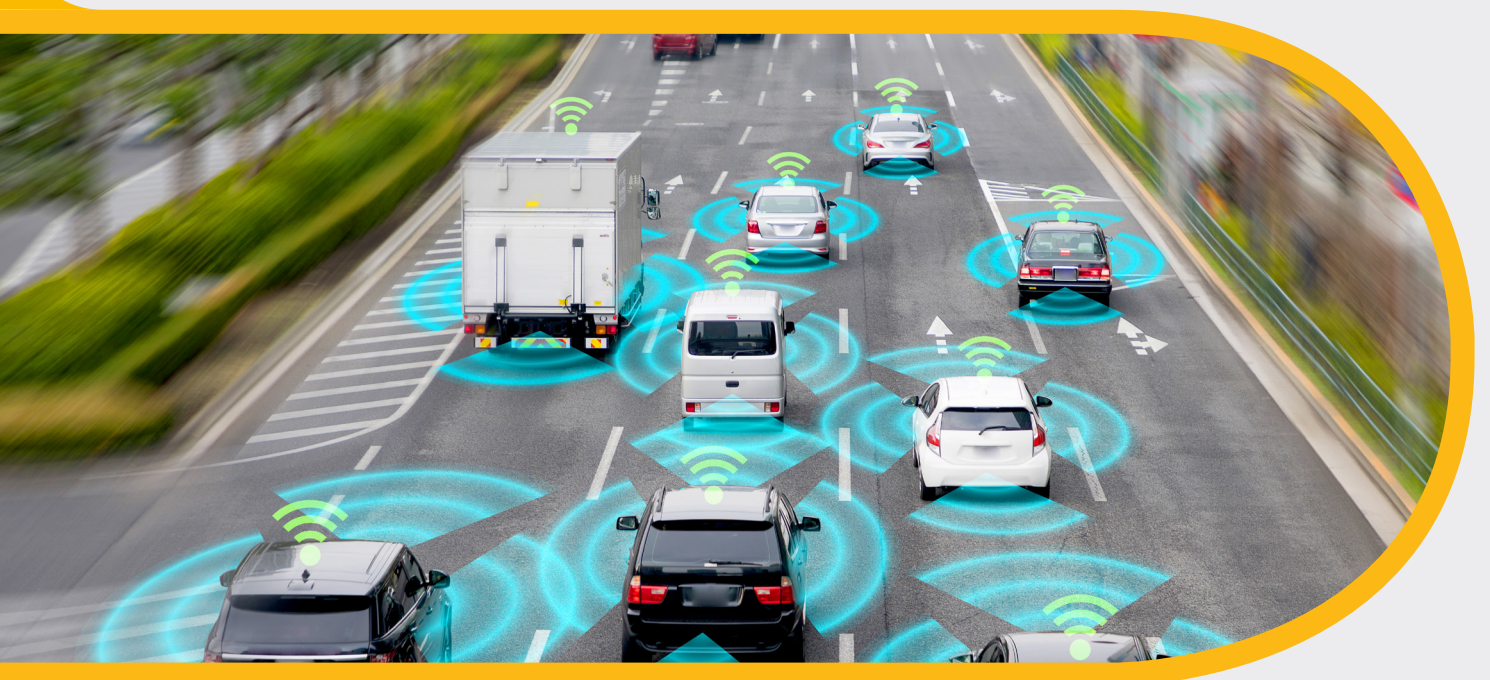
Key message : US road transport energy demand is reduced by almost half under an optimistic scenario, but more than doubles in a pessimistic scenario.

I - In this scenario, virtually all the potential benefits of automation are realised, including smoother traffic flow, fewer accidents (vehicles become smaller/lighter) and the widespread adoption of eco-driving and platooning.

II - In this scenario, broad adoption of higher levels of automation is coupled with strong increases in demand for travel, and no efficiency benefits materialise(e.g. no platooning or eco-driving).

Note : This figure only shows two of the four scenarios from the study. One of the other scenarios describes a world with limited automation and minimal impact on energy use, while the other assumes large improvement in fuel efficiency as well as increased travel demand, resulting in a moderate net reduction in energy use.

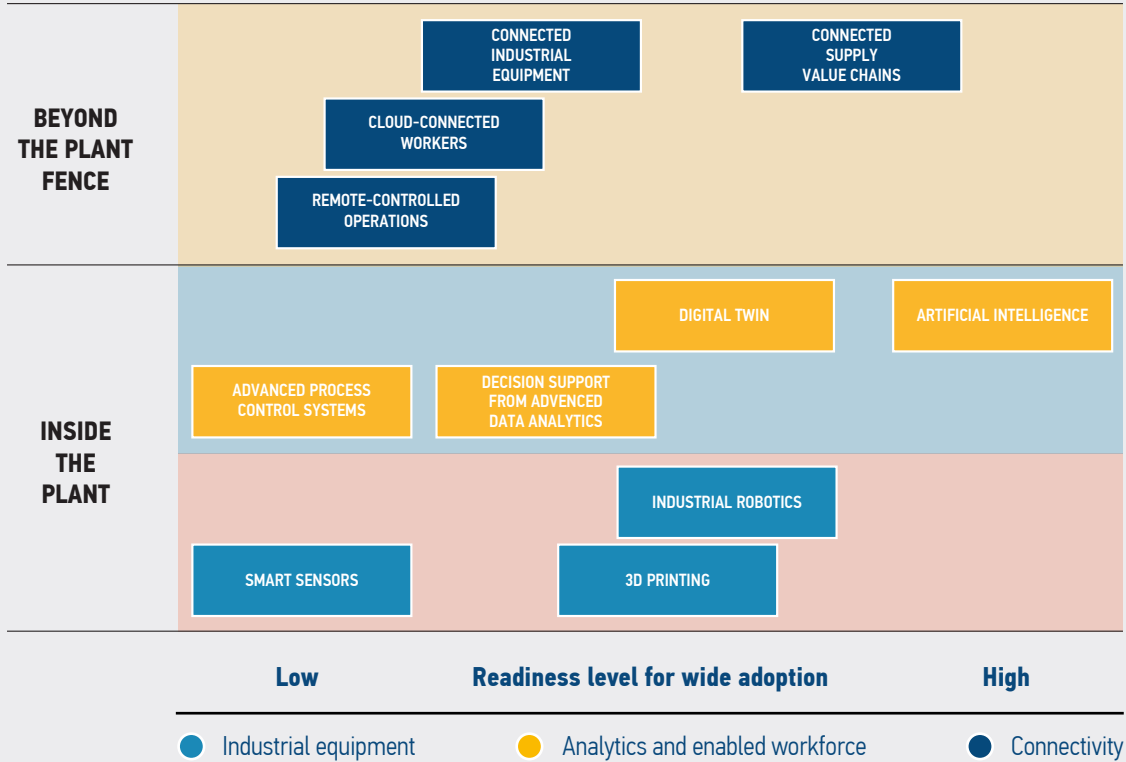
Source : Wadud, MacKenzie and Leiby (2016), « Help or hindrance ? The travel, energy and carbon impacts of highly automated vehicles ».



DIGITALIZED INDUSTRY

The digital transformation is also affecting how energy is produced – from smart oilfields to interconnected grids and, increasingly, renewable energies. For power plants, digitalization is helping drive genuine improvements to preventive maintenance, enabling the plant to operate better and for longer. Furthermore, the IEA has identified significant cost reductions, especially through 3D printing, Artificial Intelligence (AI) and robotics. These three advancements unfold significant transformation when it comes to the intertwinement of energy use, productivity and production. This brings about power plants savings of around 80 billion dollars (USD) per year.

Application of digital technologies and strategies in industry



Key message : Digitalization in industry can take diverse forms, ranging from automated equipment to connecting industrial operations based in different locations.

Notes : A digital twin results from virtually replicating a real industrial plant ; enabled workforce refers to the enhancement of workers’ skills through the use of digital technologies.

Source : Based on World Economic Forum(2017a), Digital Transformation Initiative :Chemistry and Advanced Materials Industry, and World Economic Forum (2017b), Digital Transformation Initiative : Mining and Metals Industry.

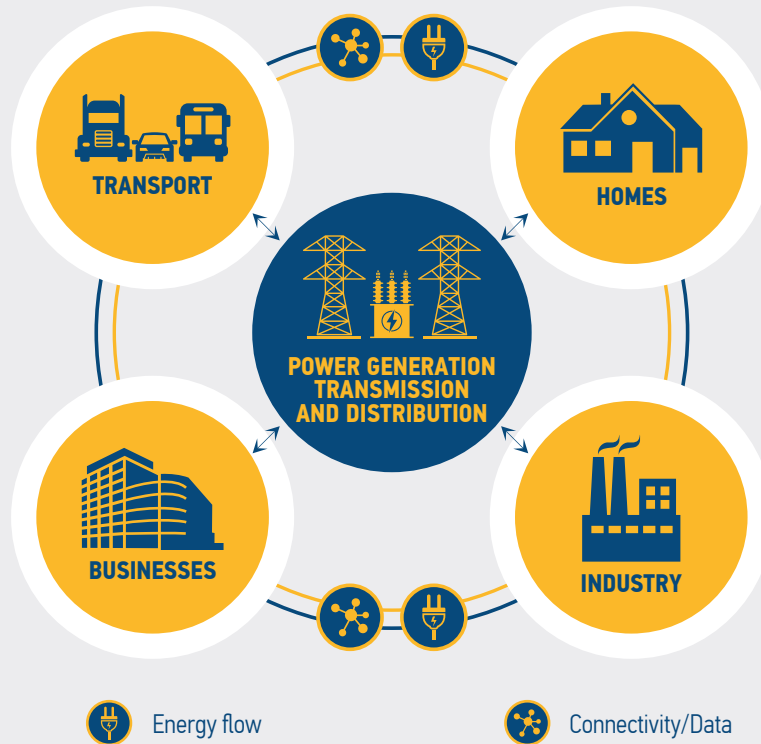
According to the IEA, digitalization could help reduce curtailment³. This would induce the energy sector to leverage productivity, efficiency and safety. This is especially true for solar PV and wind power as their production is highly variable. And as this bolsters the integration of a higher share of this renewable energy mix into the grid. The IEA alluded to this positive impact by estimating that digitalization could reduce curtailment of wind and solar plants in the European Union by 78%⁴.

Accordingly, digital technologies could help increase the share of renewables in grids by better matching energy demand to solar and wind power resources.



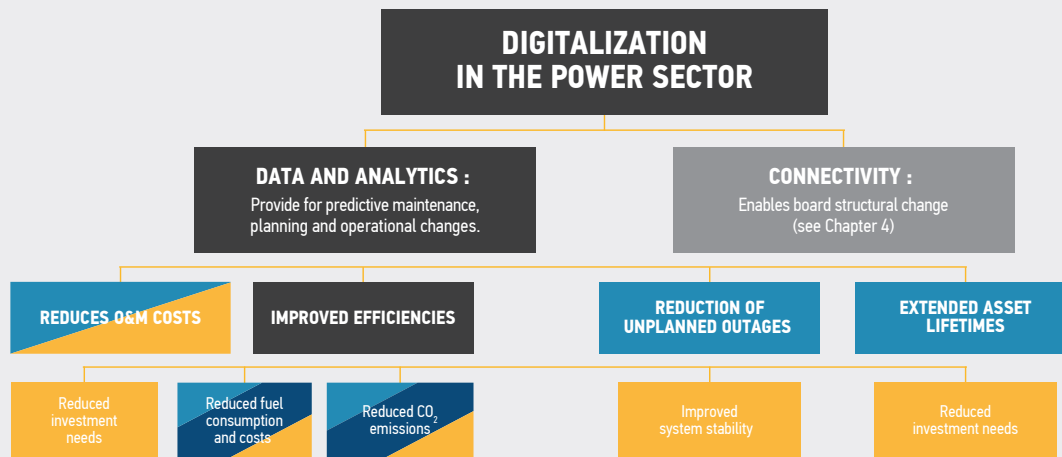
³Electrical curtailment is the practice of temporarily decreasing electricity supply to balance production and consumption in order to maintain the integrity of the electricity system.
⁴As a reference, Europe produces more than 400 TWh of electricity from wind and PV energy.

The role of digitalization in reshaping the electricity sector



Key message : Connectivity, combined with electrification and decentralisation, holds the potential to create a highly interconnected system, transforming the way electricity is supplied and consumed.

Impact of digitalization on electricity sector assets



Key message : Digitalization in the power sector has the potential to bring benefits to the owners of power sector assets, the wider electricity system, consumers and the environment.

Notes :

- Financial benefits for assets owner
- System benefits, consumer benefits
- Global environmental benefits

CO₂ : Carbon dioxide

Digitalization is set to transform the global energy system, with major implications for all of the sector's stakeholders. The opportunities that it creates could have a beneficial impact across sectors. The impact it has will depend entirely on the public policies put in place and on human behaviour.