



Smart Meters, first step toward the 3D Energy System

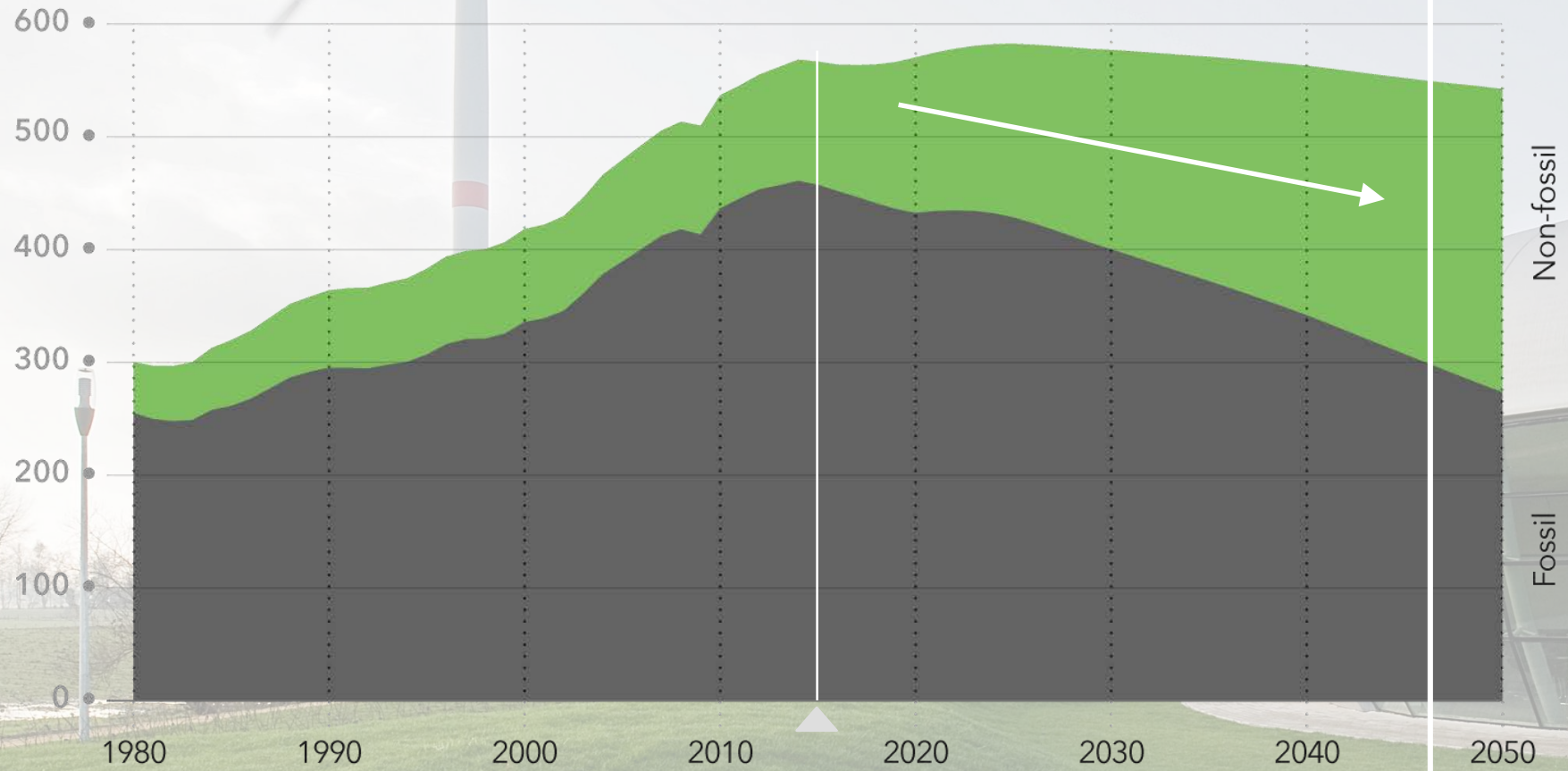


A global and regional forecast of the Energy Transition to 2050

<https://eto.dnvgl.com/2017/>

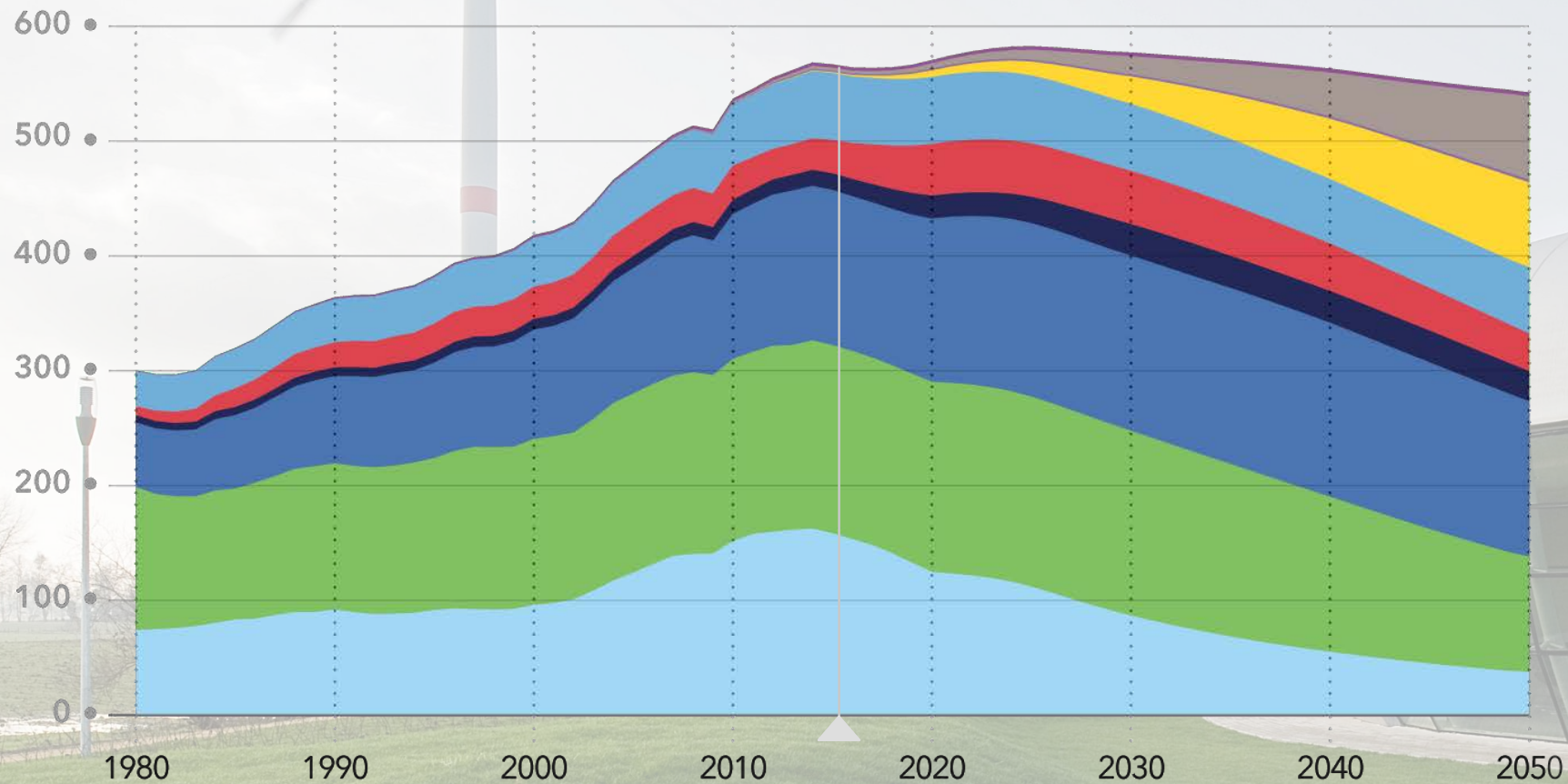
Forecast world primary energy supply

Units: EJ/yr



Forecast world primary energy supply by source

Units: EJ/yr

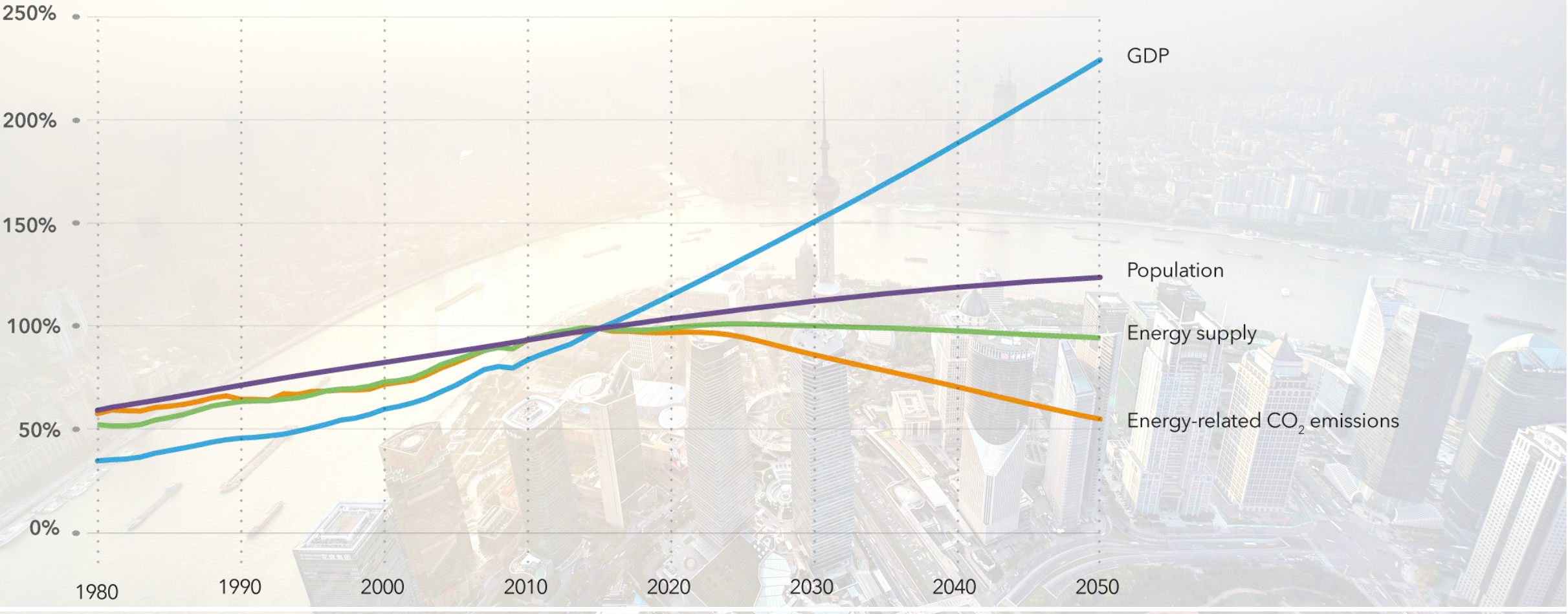


Energy source

- Geothermal
- Wind
- Solar thermal
- Solar PV
- Biomass
- Nuclear
- Hydro
- Gas
- Oil
- Coal

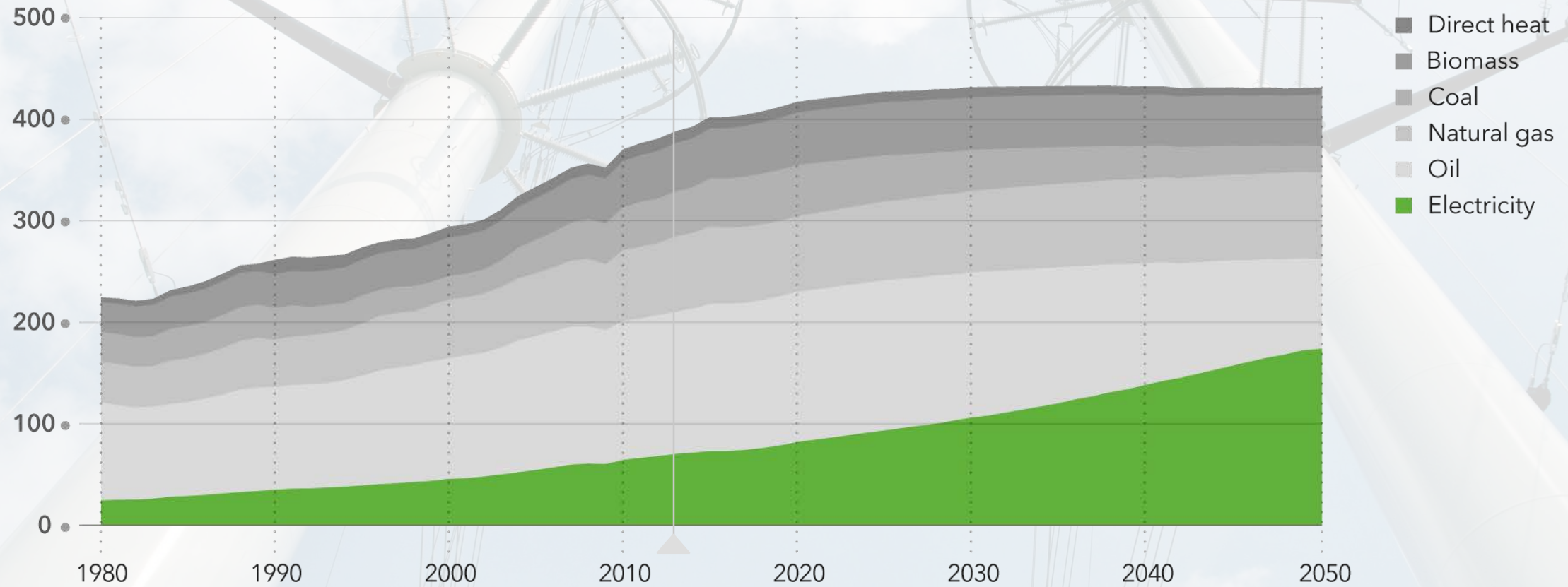
Economic growth vs. energy efficiency growth

Units: Percentage of 2015 level



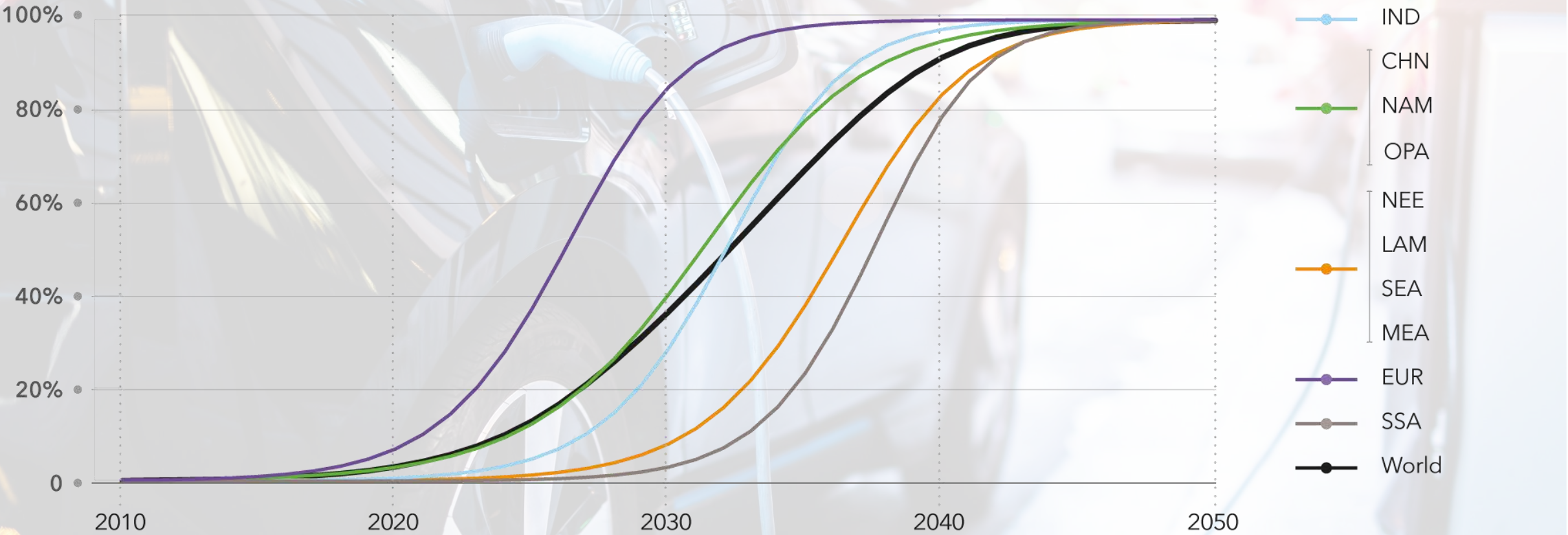
World final energy demand by energy carrier

Units: EJ/yr



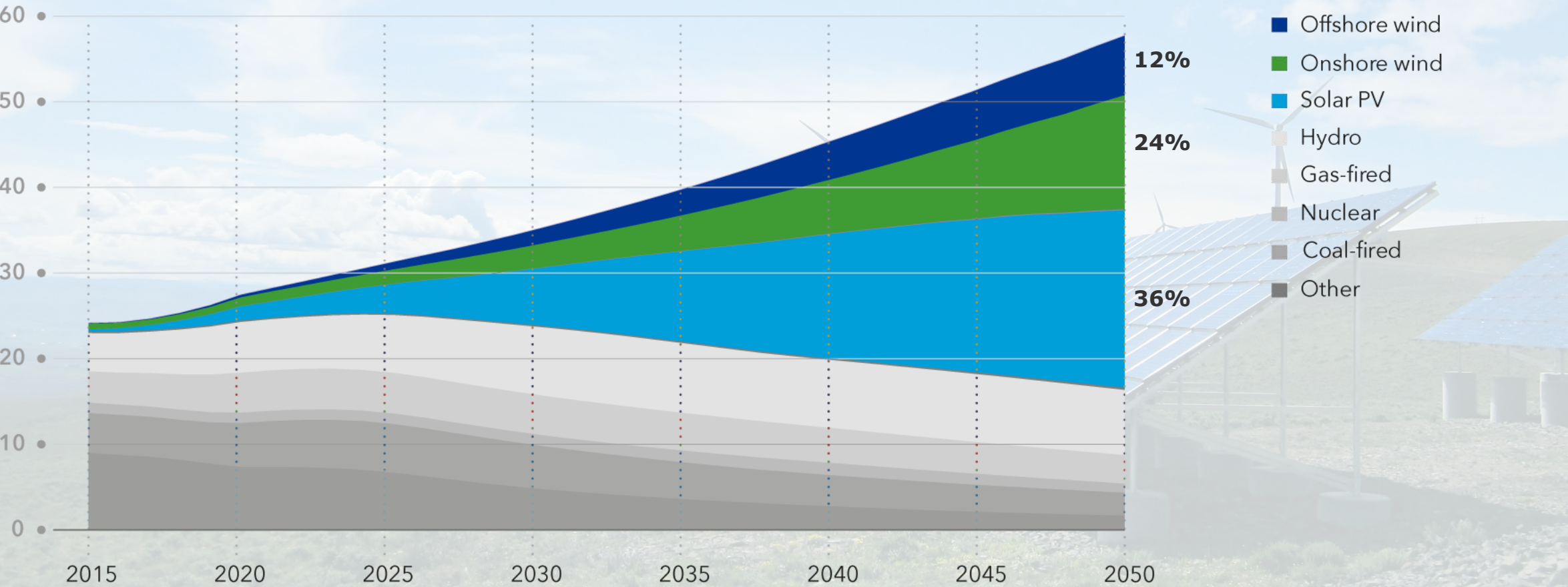
Market share of electric vehicles in new light vehicle sales

Units: Percentages

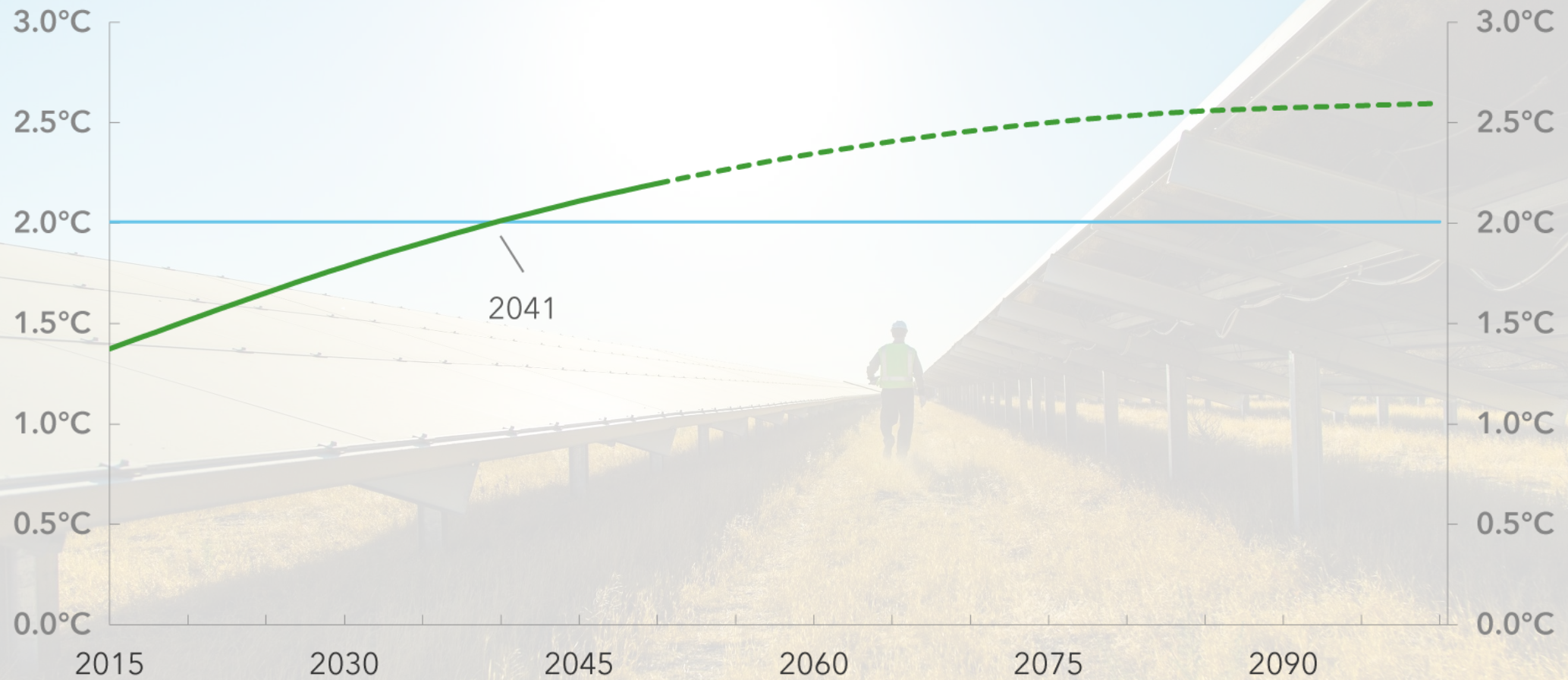


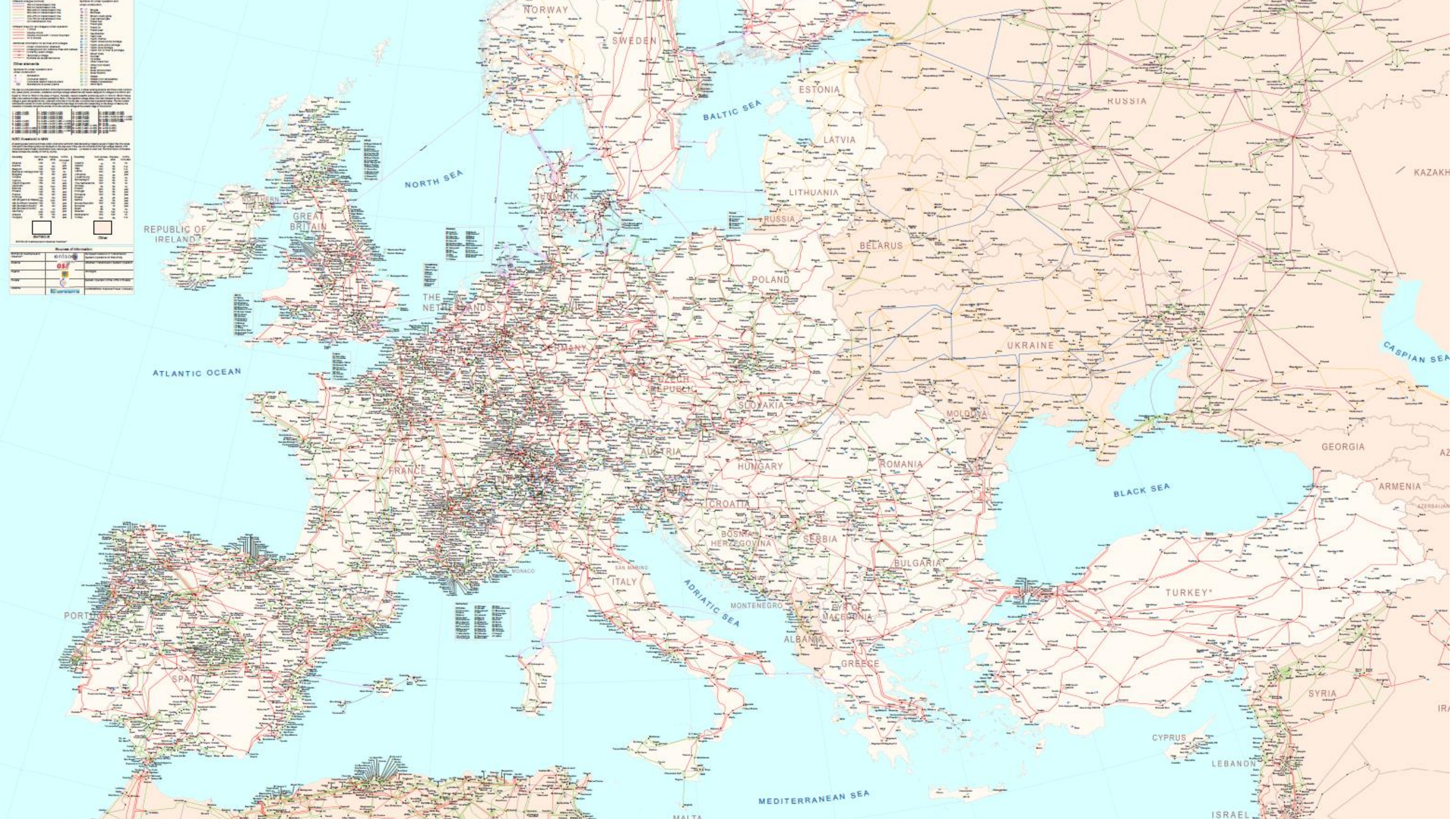
Growth of Solar PV and wind by 2050

Units: PWh/yr

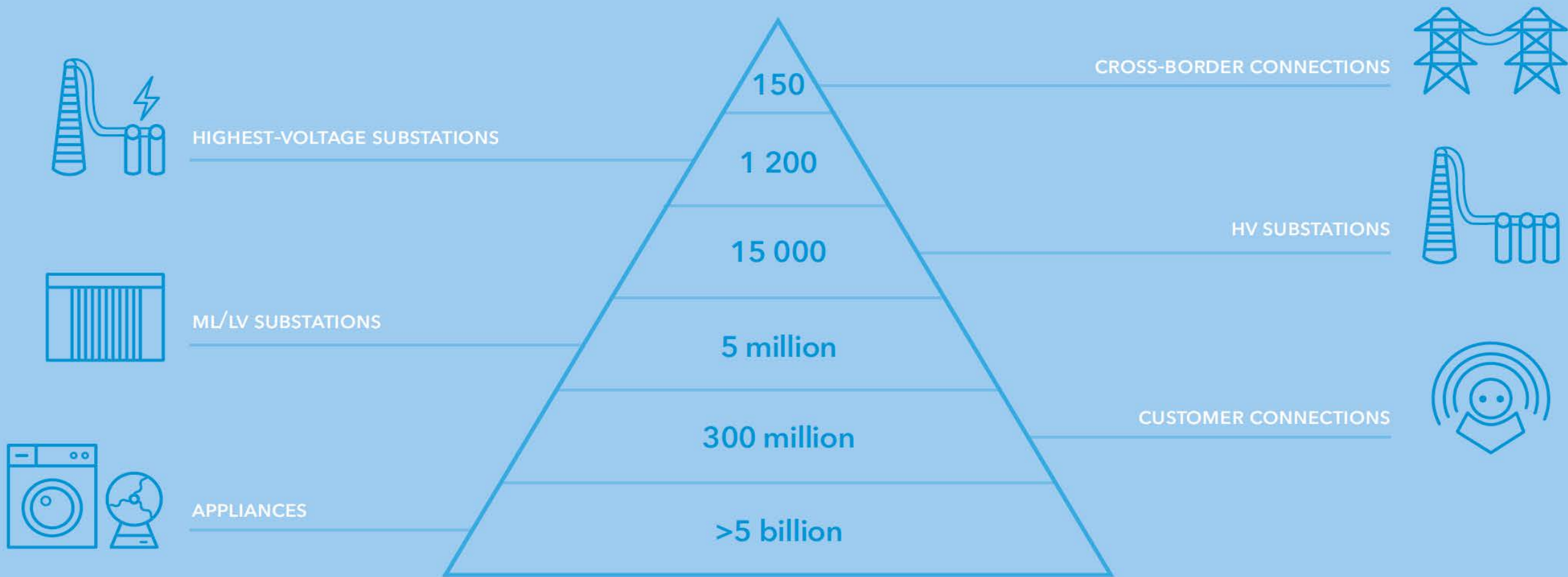


Global warming and carbon budget





TRANSMISSION AND DISTRIBUTION SYSTEM ELEMENTS IN EUROPE (FIGURE 4-10)

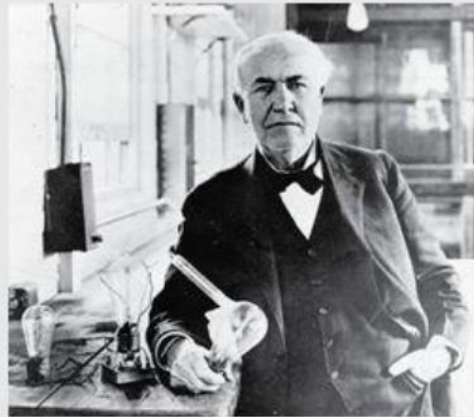


Source: DNV GL



Edison vs. Bell

- If Alexander Graham Bell were somehow transported to the 21st century, he would not begin to recognize the components of modern telephony – cell phones, texting, cell towers, PDAs, etc. –
- Thomas Edison, one of the grid's key early architects, would be **totally familiar with the grid!**



The background image shows a landscape with several high-voltage electrical transmission towers and power lines stretching across the frame. In the distance, several wind turbines are visible on a green field. The sky is filled with large, white and grey clouds. Three semi-transparent blue rectangular boxes are overlaid on the image, each containing white text.

DECARBONIZED

DISTRIBUTED

DIGITAL



The rise of digital power systems has increased complexity and exposure leaving critical industries vulnerable to cyber attack

A photograph of a modern office interior. Two men are standing near a desk on the right side of the frame. The man on the left is wearing a white shirt and black trousers, and the man on the right is wearing a green polo shirt. They are looking at a computer monitor. The desk is cluttered with various electronic equipment, including a laptop, a monitor, and several power supplies. In the background, there are large windows that look out onto a city street. The text "Spanish Smart Meter Roll Out" is overlaid in blue at the top left.

Spanish Smart Meter Roll Out

**28 million of Smart Meters
(+90% installed and integrated)**

+200 k Secondary Substations monitored

Dynamic Tariff (PVPC) implementation



The dream



The reality

Smart Meters

Art 51: Tasks of the EU DSO entity 1.

The tasks of the EU DSO entity shall be the following:

- a) coordinated operation and planning of transmission and distribution networks;**
- b) integration of renewable energy resources, distributed generation and other resources embedded in the distribution network such as energy storage;**
- c) development of demand response;**
- d) digitalisation of distribution networks including deployment of smart grids and intelligent metering systems;**
- e) data management, cyber security and data protection;**

Distributed System Platforms: NY PSC



“Distributed energy resources will become integral tools in the planning, management, and operation of the electric system. The system values of distributed resources will be monetized in a market, placing DERs on a competitive par with centralized options.”

“New York’s utilities have a new role: to develop and operate the platform needed to empower customers and enable distributed energy markets or distributed system platforms (DSPs)”

Reforming the Energy Vision (REV), First Major Order,
New York Public Service Commission (PSC), 25-2-2015

Thank you



www.dnvgl.com

SAFER, SMARTER, GREENER