

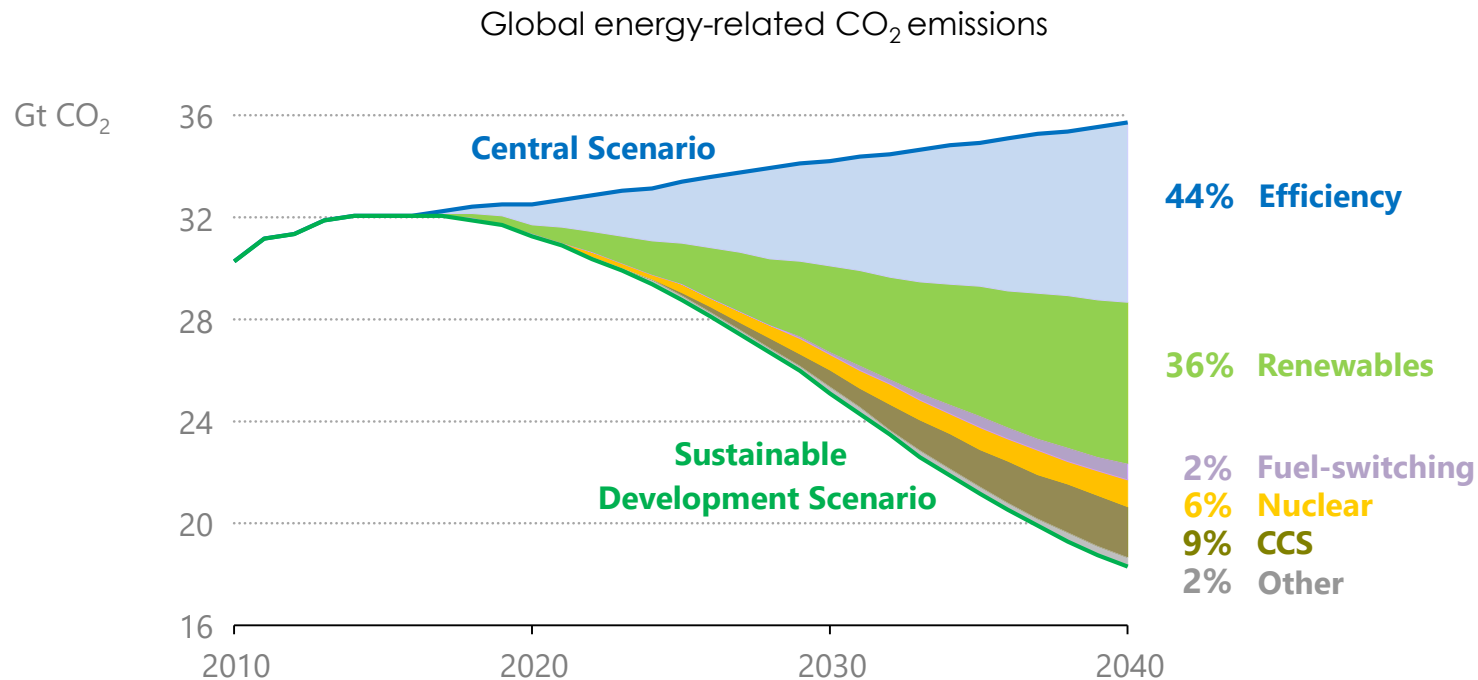


Cost-efficient ways for achieving a post-carbon European economy

Dave Turk, Acting Director, Sustainability, Technology and Outlooks
EU Strategy for Long-Term Emissions Reduction, 10 July 2018, Brussels



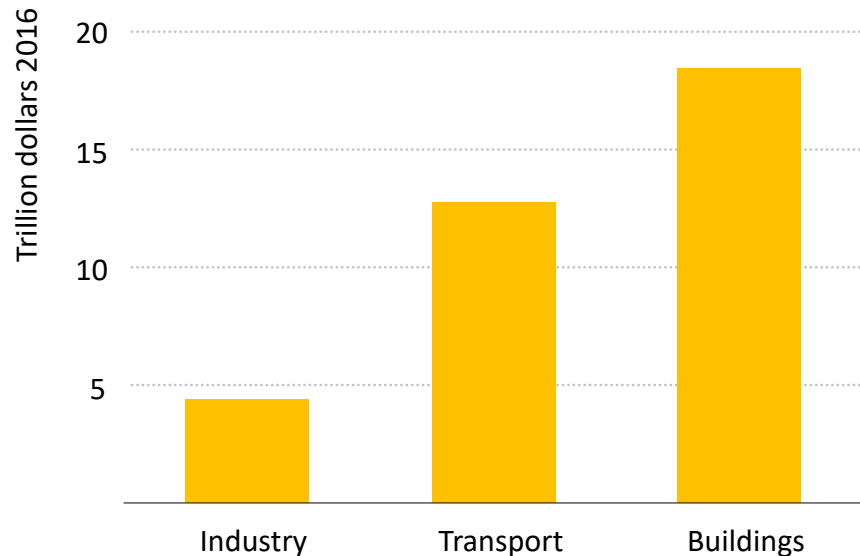
Where do we want to go?



A wide variety of technologies are necessary to meet goals, with energy efficiency and renewables playing lead roles

Efficiency – fuel cost savings outweigh investment needs by a factor of three

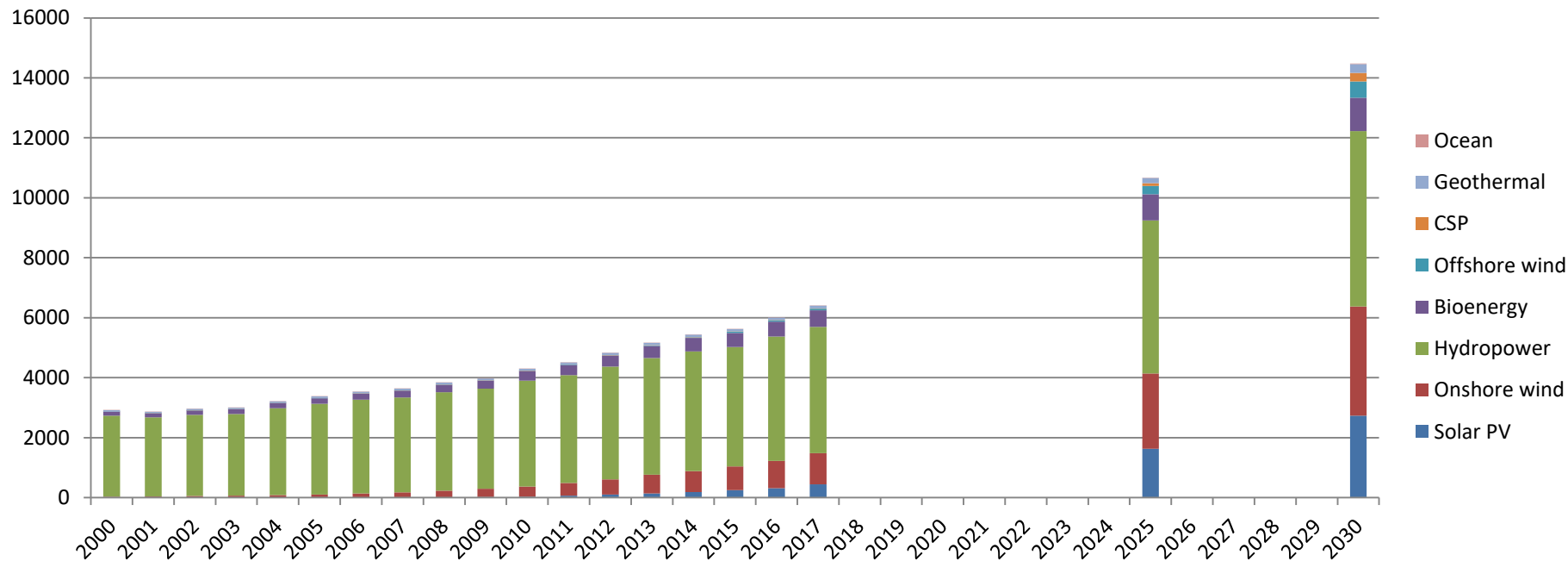
Cumulative investments needs in energy efficiency in a clean energy transition scenario, 2017-2050



Energy efficiency investments needs in end-use sectors are large, but are outweighed by fuel cost savings; on average, each dollar invested saves three euros over technology lifetimes

Renewables growth is not fully on track for what is needed

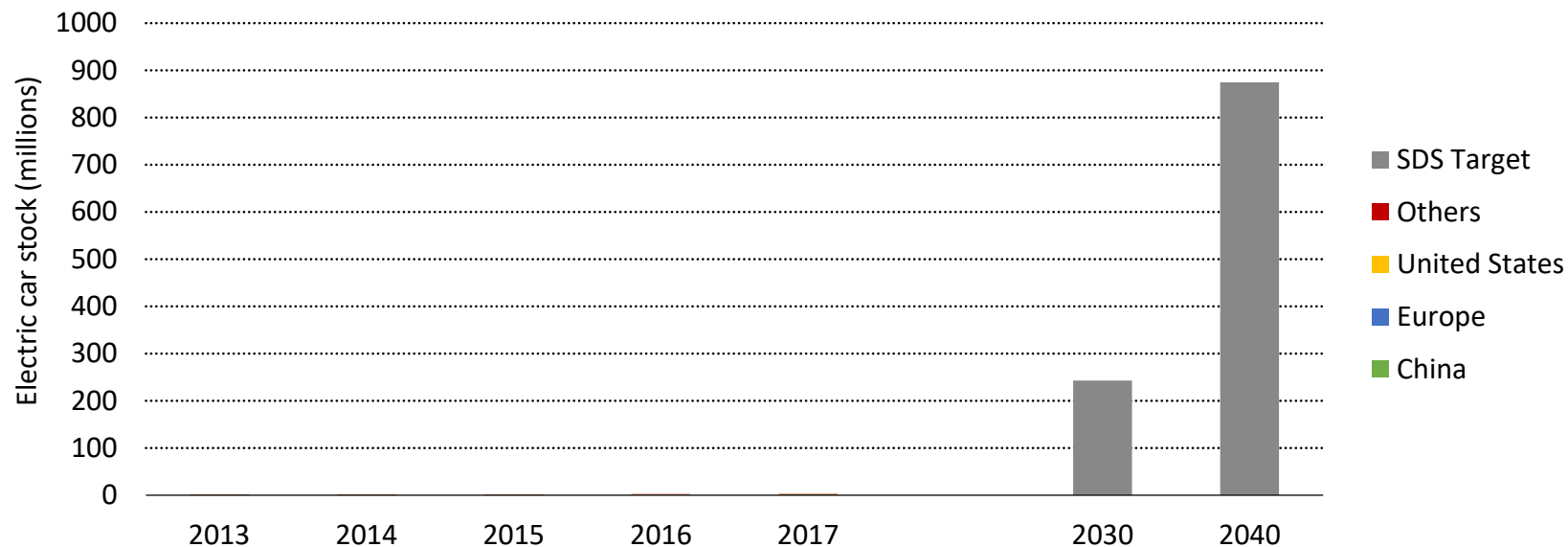
Renewables generation by technology



Renewables saw highest rate of generation growth among all energy sources in 2017, but deployment must further speed up to meet 2030 targets and beyond

EV's have grown rapidly; strong momentum needs to continue

Global electric car stock



The number of passenger electric cars on the road passed 3 million in 2017, but it needs to grow to 240 million by 2030 in SDS

Power

- Renewable power
 - Solar PV
 - Onshore wind
 - Offshore wind
 - Hydropower
 - Bioenergy
- Nuclear power
- Natural gas-fired power
- Coal-fired power
- CCS in power
- Geothermal
- Concentrating solar power
- Ocean

Industry

- Cement
- Chemicals
- Steel
- Aluminum
- Pulp and paper
- CCS in industry

Transport

- Electric vehicles
- International shipping
- Fuel economy
- Trucks
- Transport biofuels
- Aviation
- Rail

Buildings

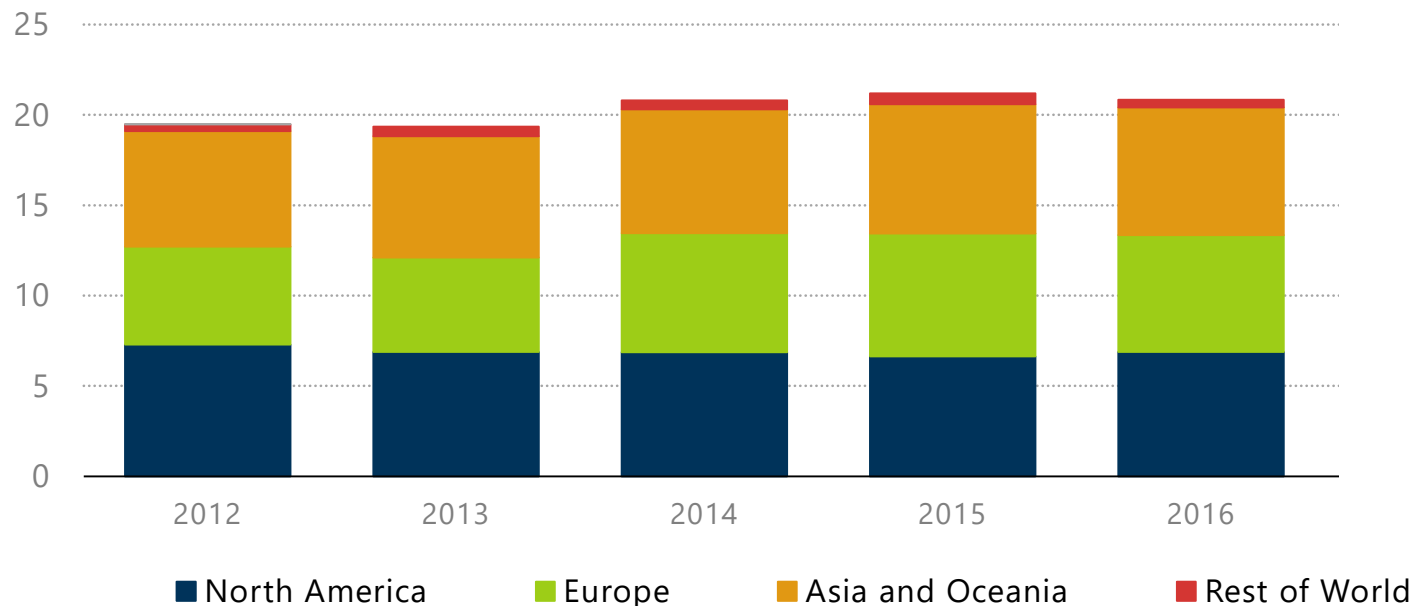
- Building codes
- Heating
- Cooling
- Lighting
- Appliances & equipment
- Data centres and networks

Energy Integration

- Energy storage
- Smart grids
- Demand response
- Digitalization
- Hydrogen
- Renewable heat

Clean energy R&D investment is finally on the rise...

Total public spending on clean energy technology RD&D (in billion USD)



**Investment in clean energy R&D rose in 2017, but more is needed;
Mission Innovation is having an impact**



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