



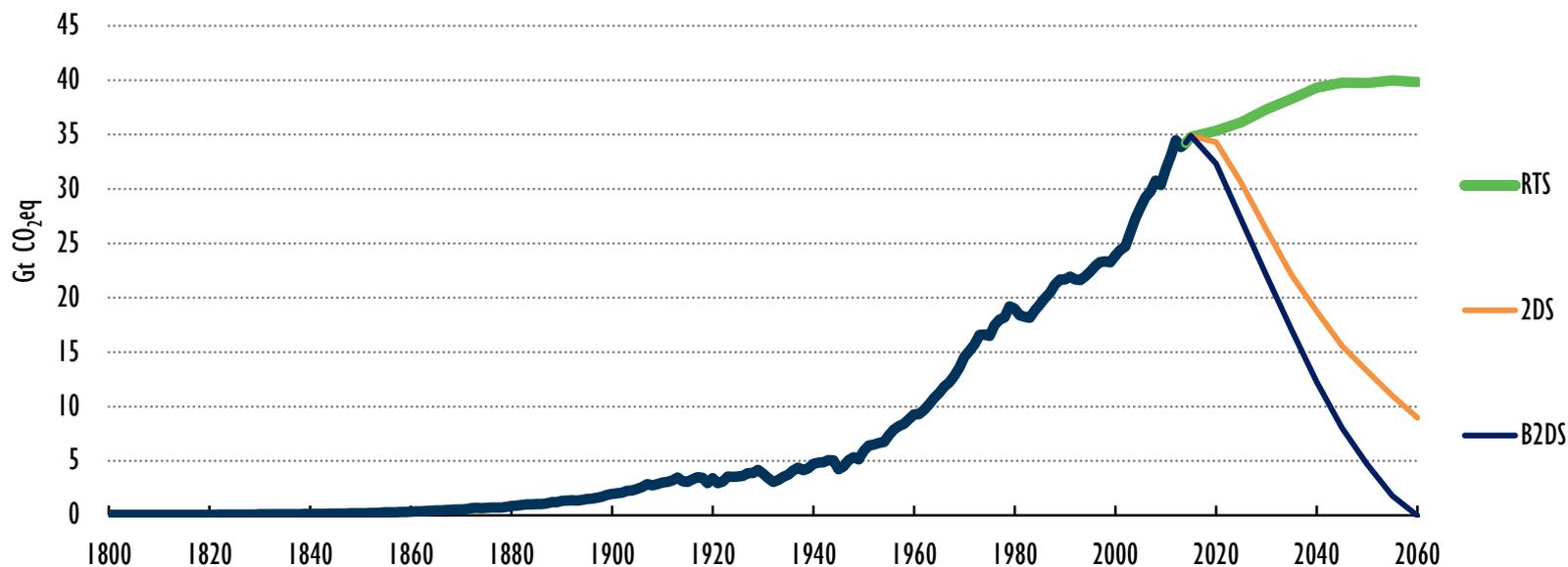
Future Buildings Forum 2017

Energy Technology Perspectives

Brian Dean, International Energy Agency

Singapore, October 2017

Global CO₂ emissions from fossil fuel combustion



Meeting global ambitions to meet 2°C or below will require a rapid reduction in CO₂ emissions.

Tracking Clean Energy Progress 2017



Buildings



Recommendation for 2017: Countries can take immediate action to put forward commitments for low-carbon and energy-efficient buildings to implement their NDCs as a first step and a clear signal to scale up actions across the global buildings sector.



Building envelopes



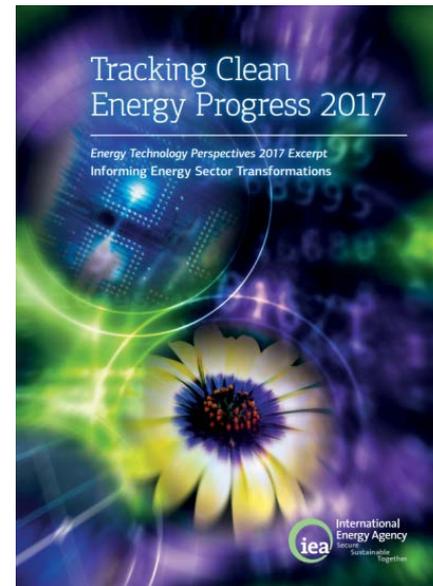
Recommendation for 2017: Global cooperation should seek to ensure that all countries implement and enforce building energy codes and standards for both new and existing buildings, with improvement in enforcement and verification of codes and standards to overcome barriers to their implementation.



Lighting, appliances and equipment

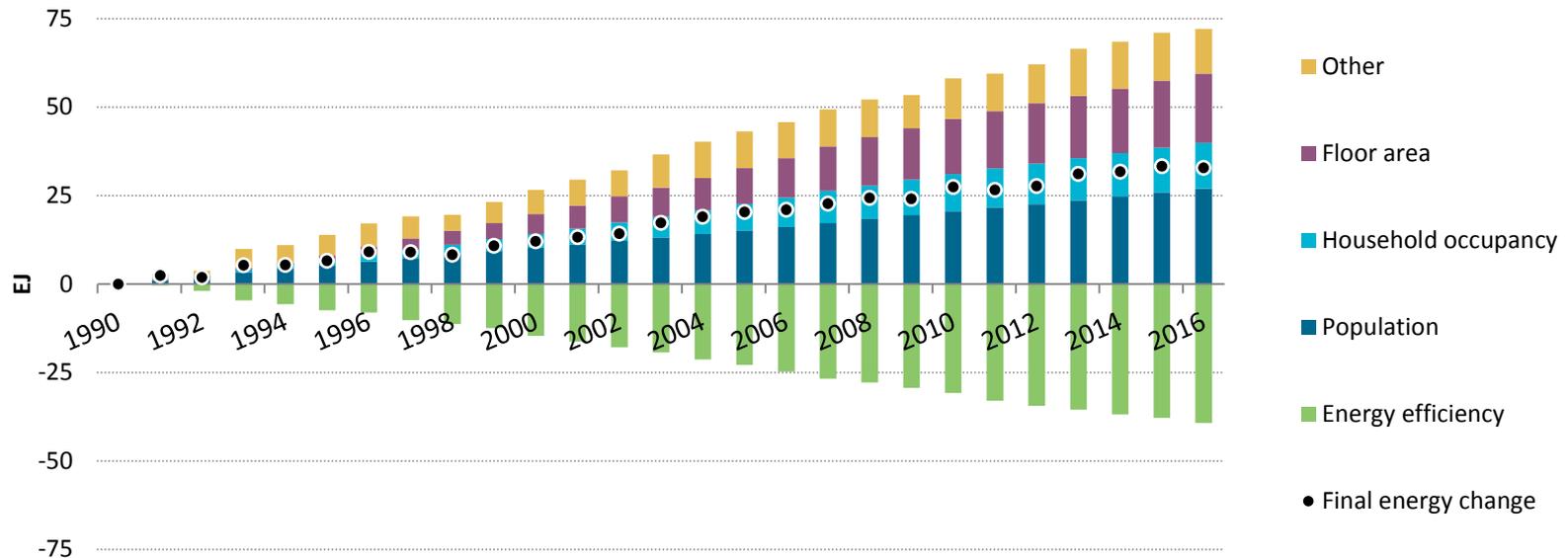


Recommendation for 2017: Countries should seize on momentum under the recent Kigali Agreement to rapidly move global markets for cooling equipment to much higher energy performances.



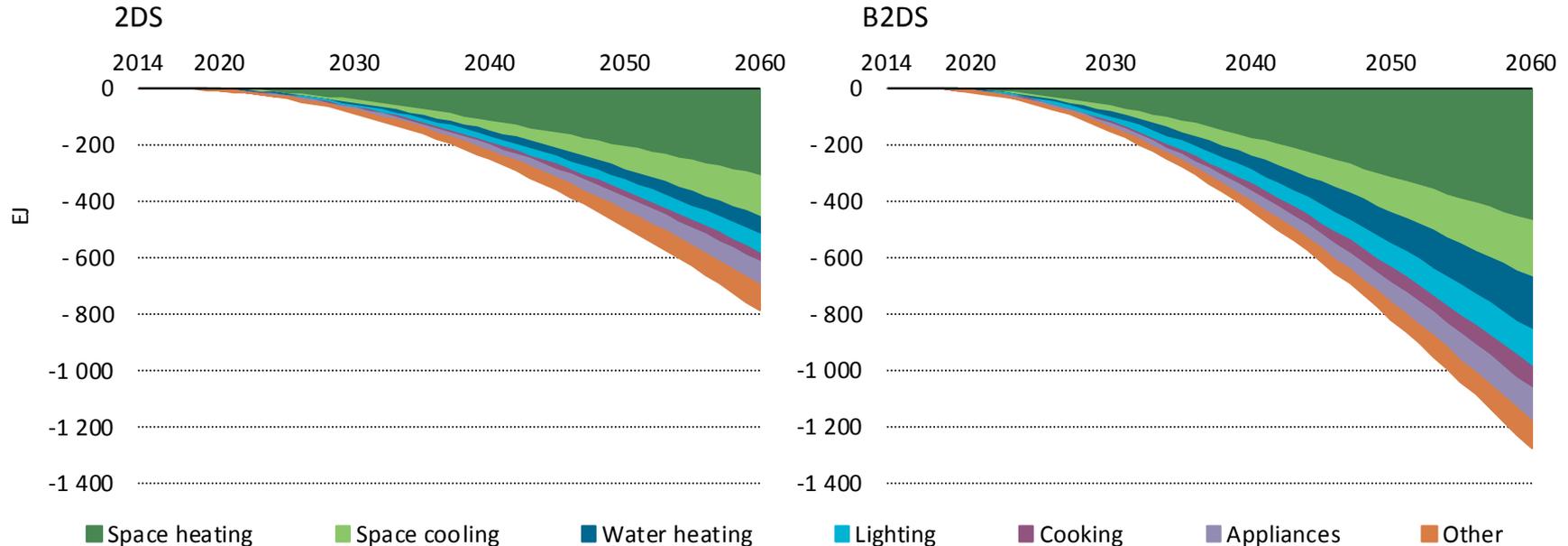
Despite some positive developments in the last two years, more assertive action is still needed to put the global buildings sector on track.

Decomposition of global final energy demand in buildings by key contribution



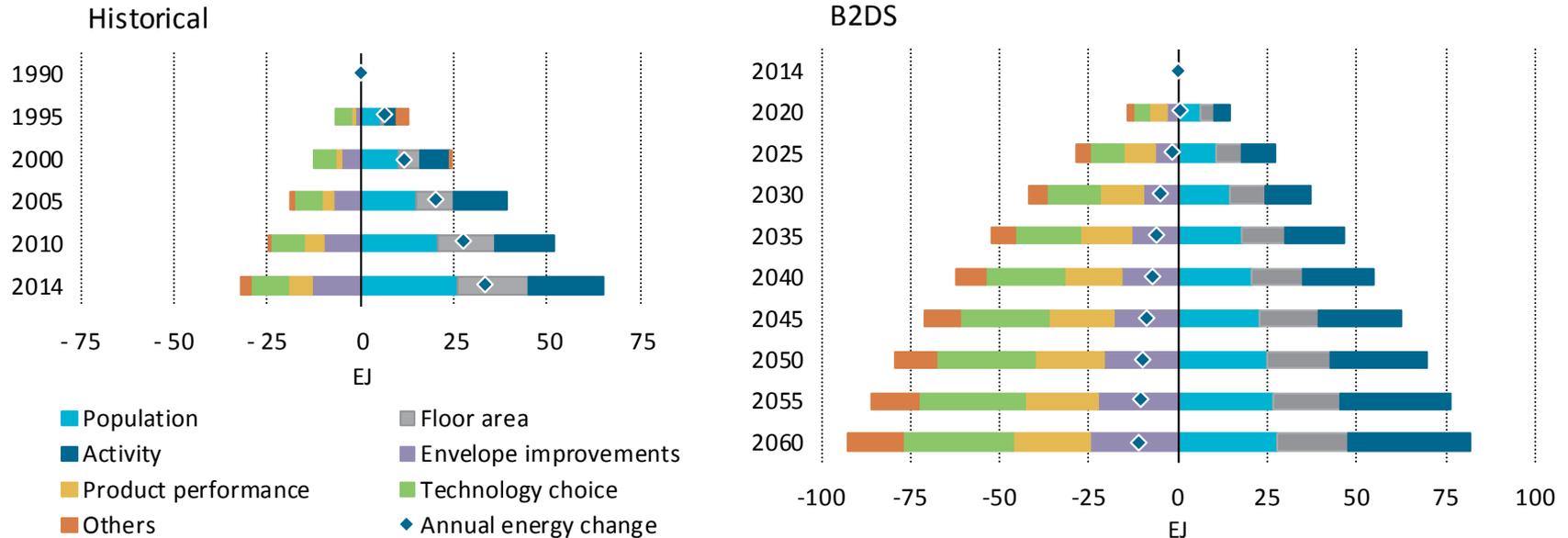
Energy efficiency in buildings is not keeping up with the impact of a growing and more prosperous global population, resulting in 425 EJ of cumulative energy demand growth since 1990.

Cumulative energy savings by end use relative to the RTS



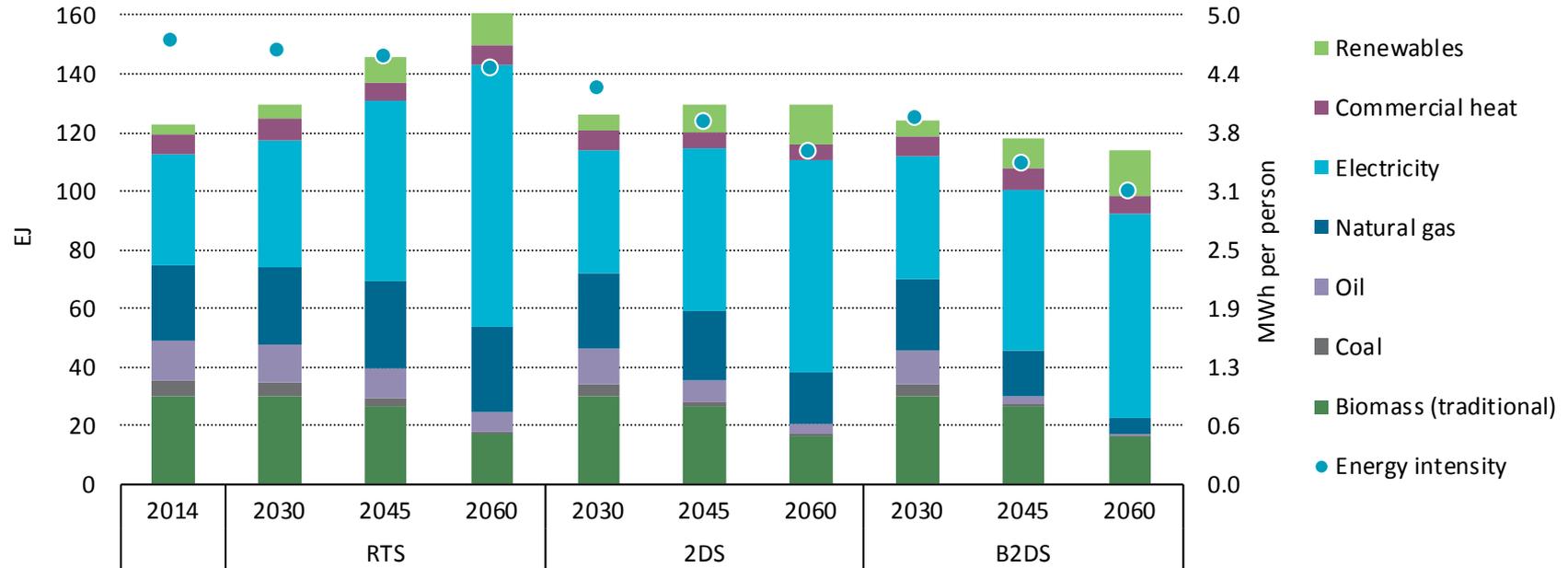
Rapid energy efficiency deployment, alongside shifts from fossil fuels to high-performance, renewable and integrated energy technologies, leads to cumulative energy savings of 1 275 EJ under the B2DS.

Decomposition of global final energy demand in buildings by key contribution



Energy efficiency measures under the B2DS reverse historical trends, offsetting the effect of an increasing global population, building activity drivers and growing floor area in buildings.

Buildings final energy consumption by scenario and fuel type



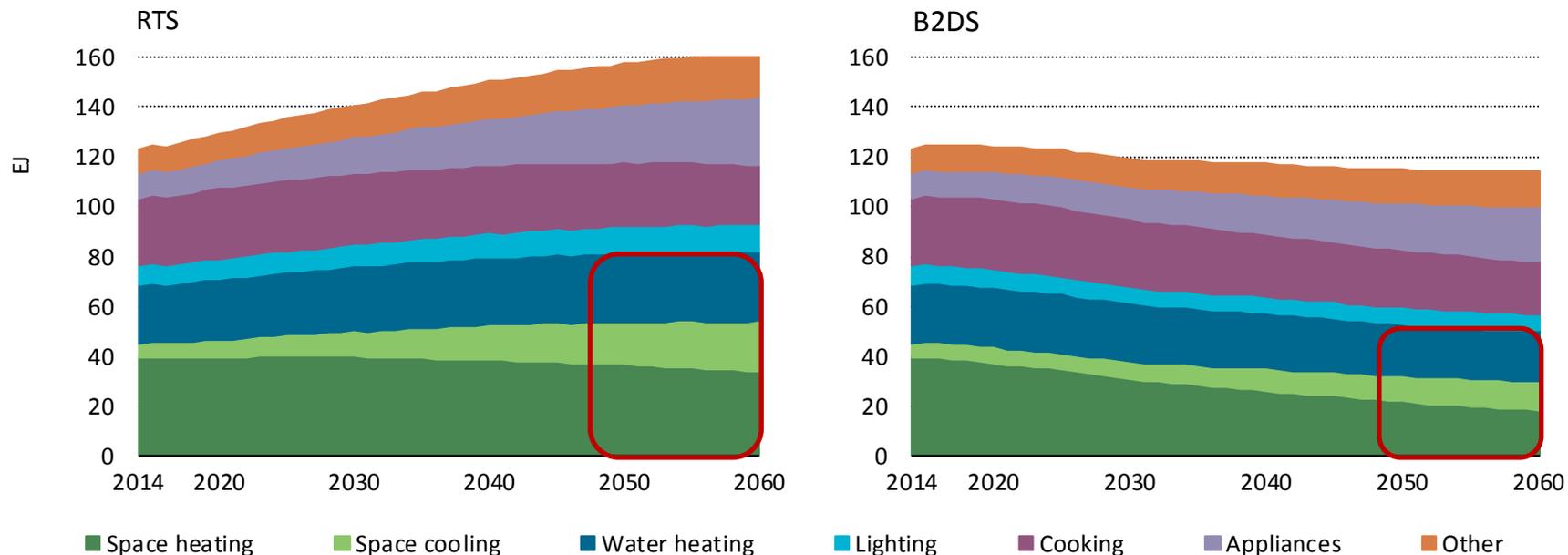
Going to B2DS would increase electrification and the use of renewables

Space Heating and Cooling

Mission Innovation challenge #7

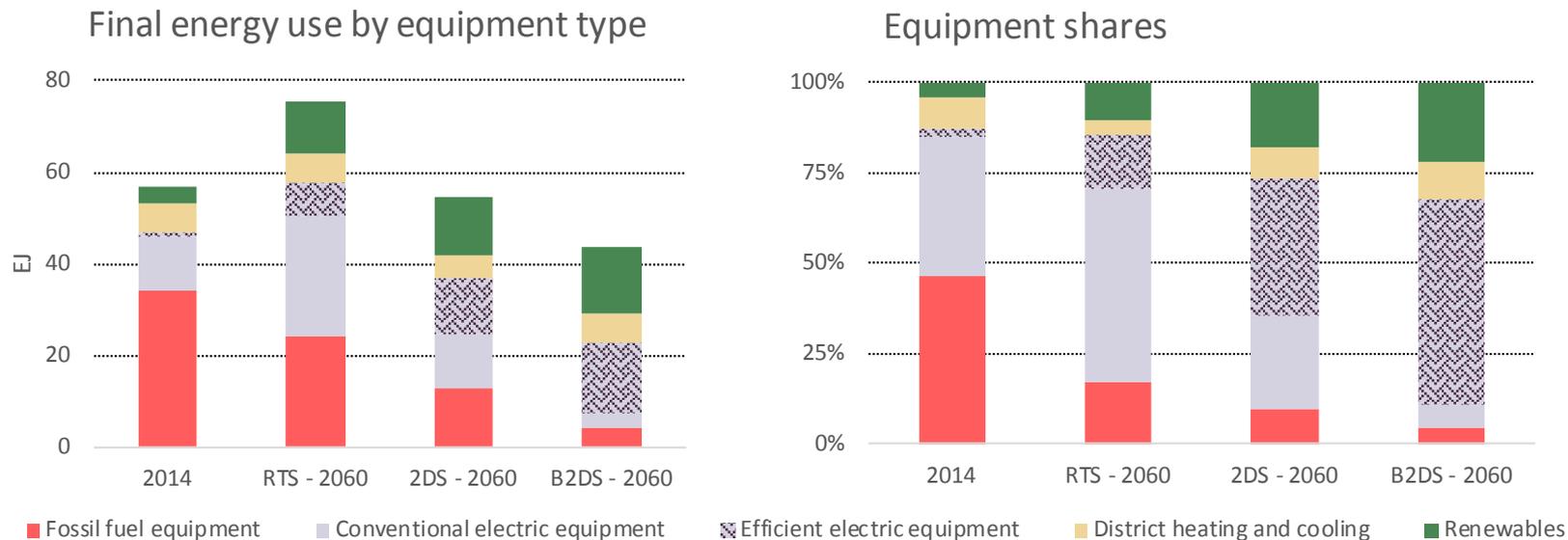
MI challenge #7 : affordable heating and cooling in buildings

Building end-use energy to 2060



Rapid energy efficiency deployment, and a shift from fossil fuels to high-performance, renewable and integrated energy technologies, leads to most savings in heating and cooling under the B2DS.

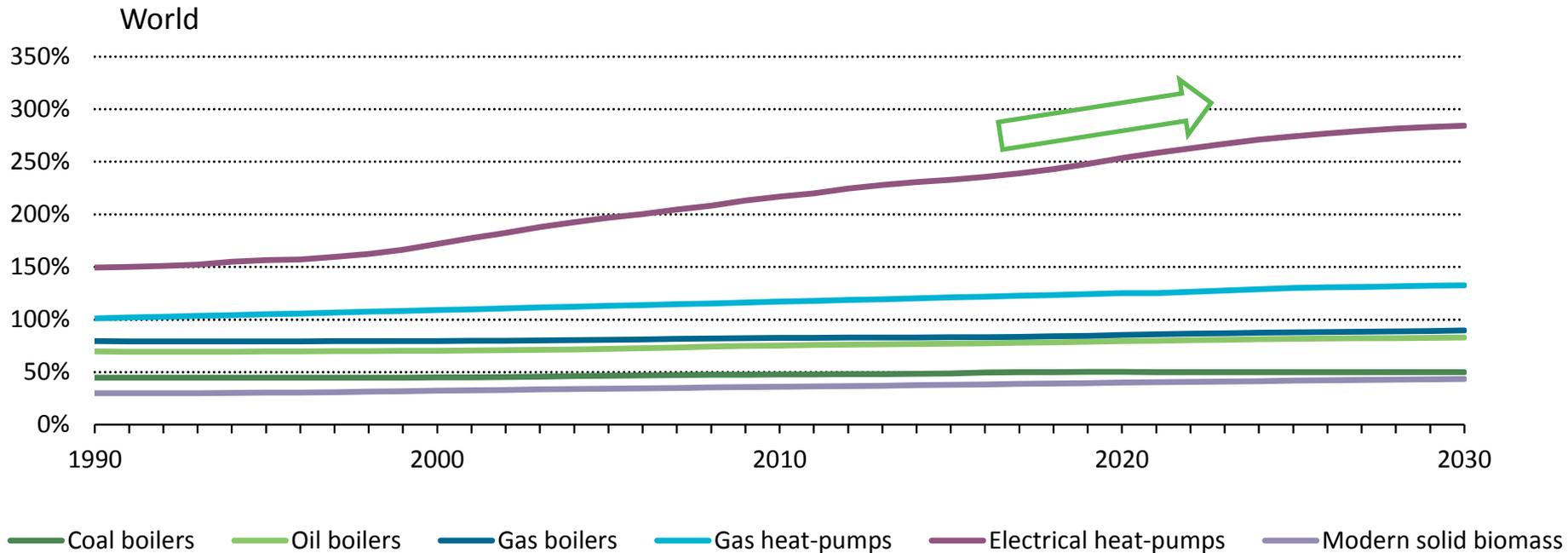
Heating and cooling final energy use and equipment stock shares by scenario



Strategic shifts to heat pumps, renewables and low-carbon & efficient district energy would cut final energy demand for heating and cooling by more than 40% in 2060.

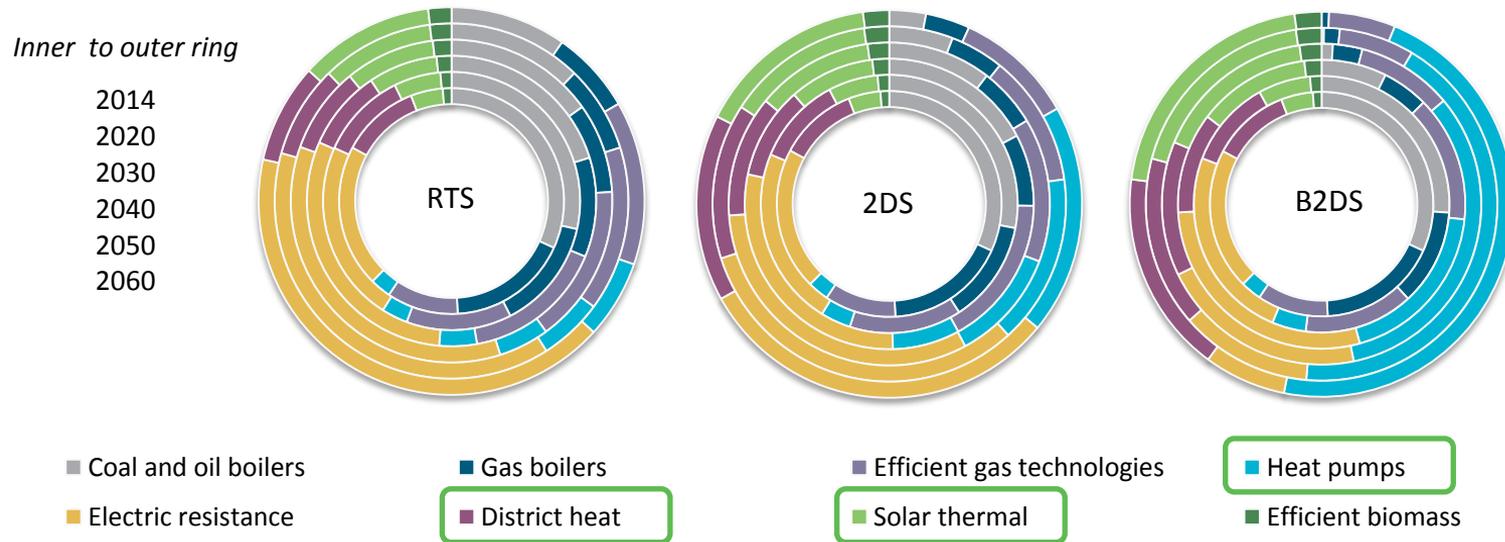
Heat-pumps can drive energy efficiency in buildings

Heating equipment energy efficiencies



Heat pump technologies continue to improve and can drive energy efficiency in buildings.

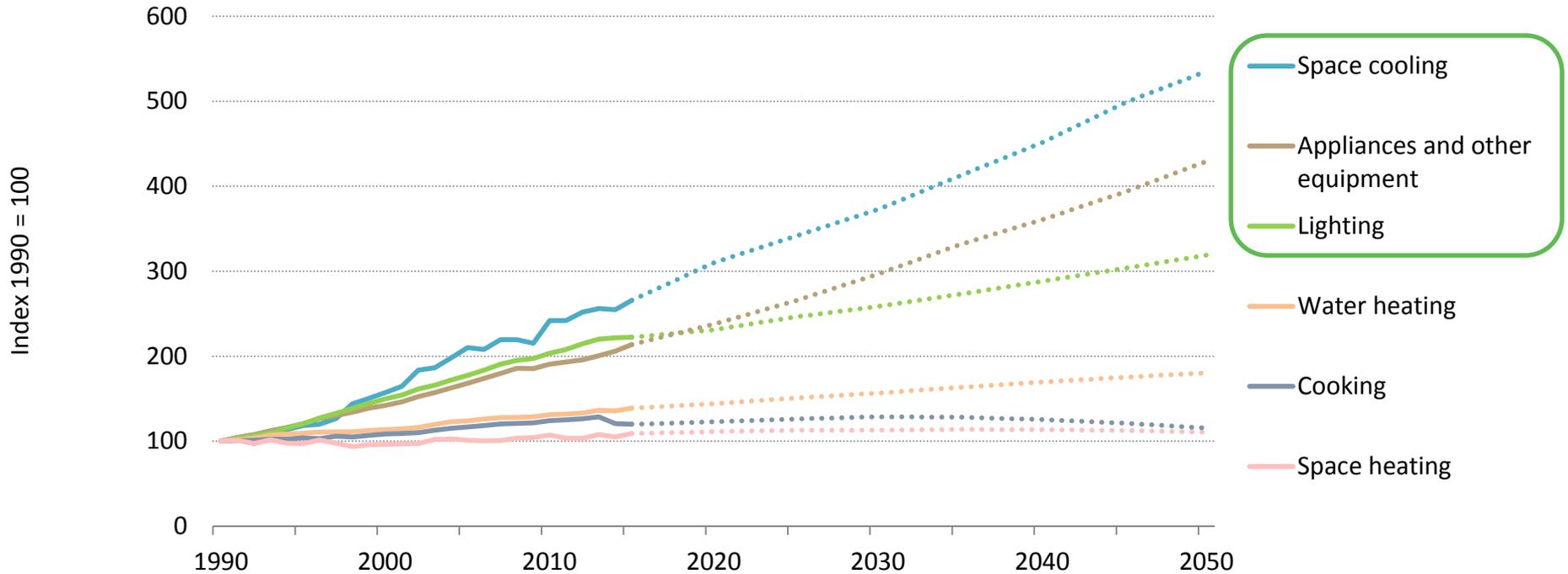
Evolution of heating equipment in buildings to 2060



Heat pumps, solar thermal and district heat is key to B2DS

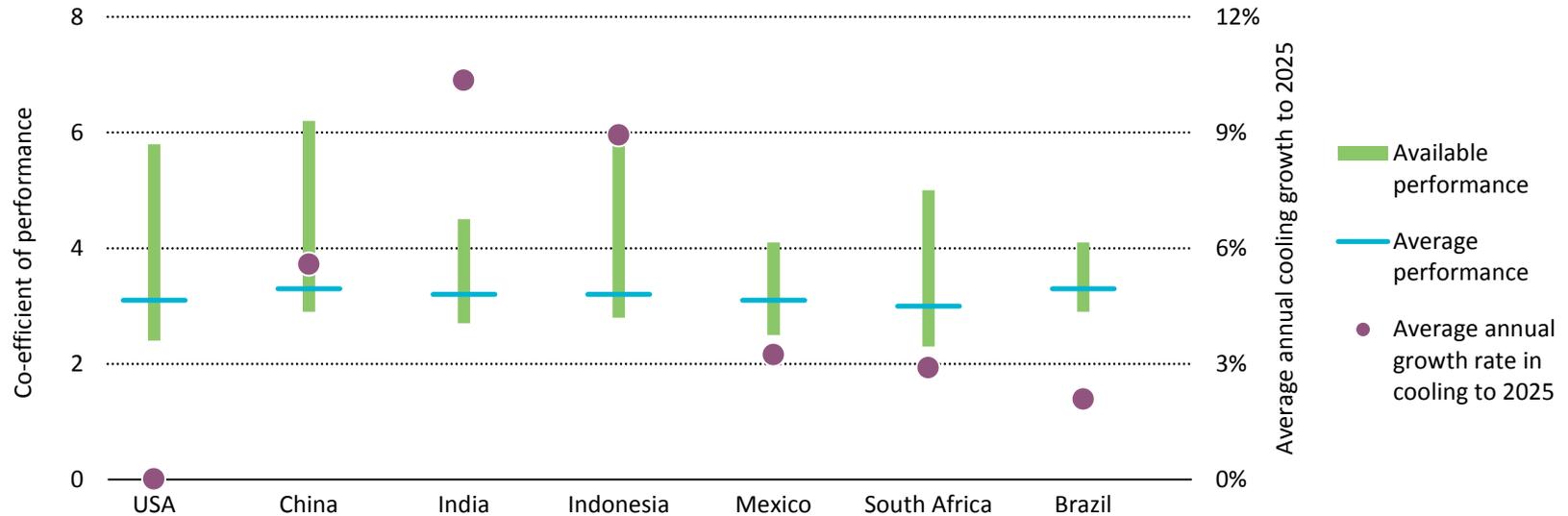
Demand for space cooling is heating up

Global energy consumption by building end-use, 1990-2050



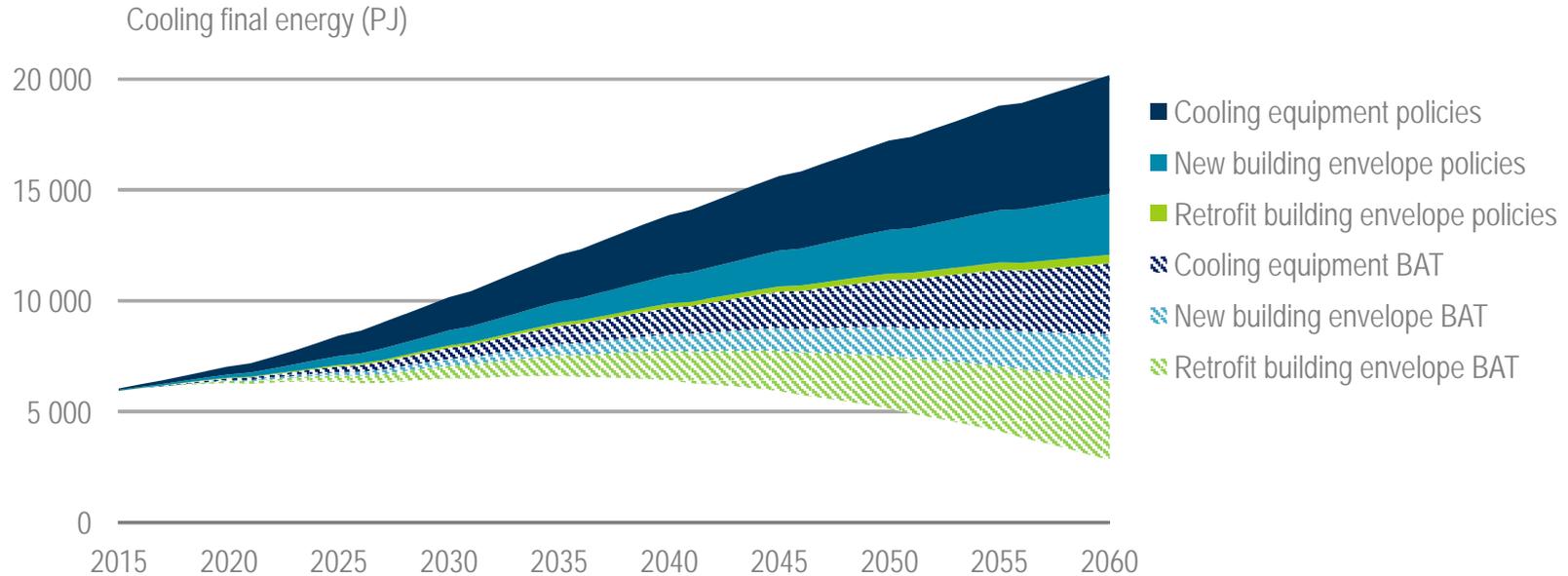
Space cooling (along with appliances and lighting) is expected to have significant growth.

Typical energy efficiency ratios of split-package air conditioners in 2015



Cooling demand could increase as much as tenfold in some countries over the next 40 years, and average equipment performance is far from its energy efficiency potential.

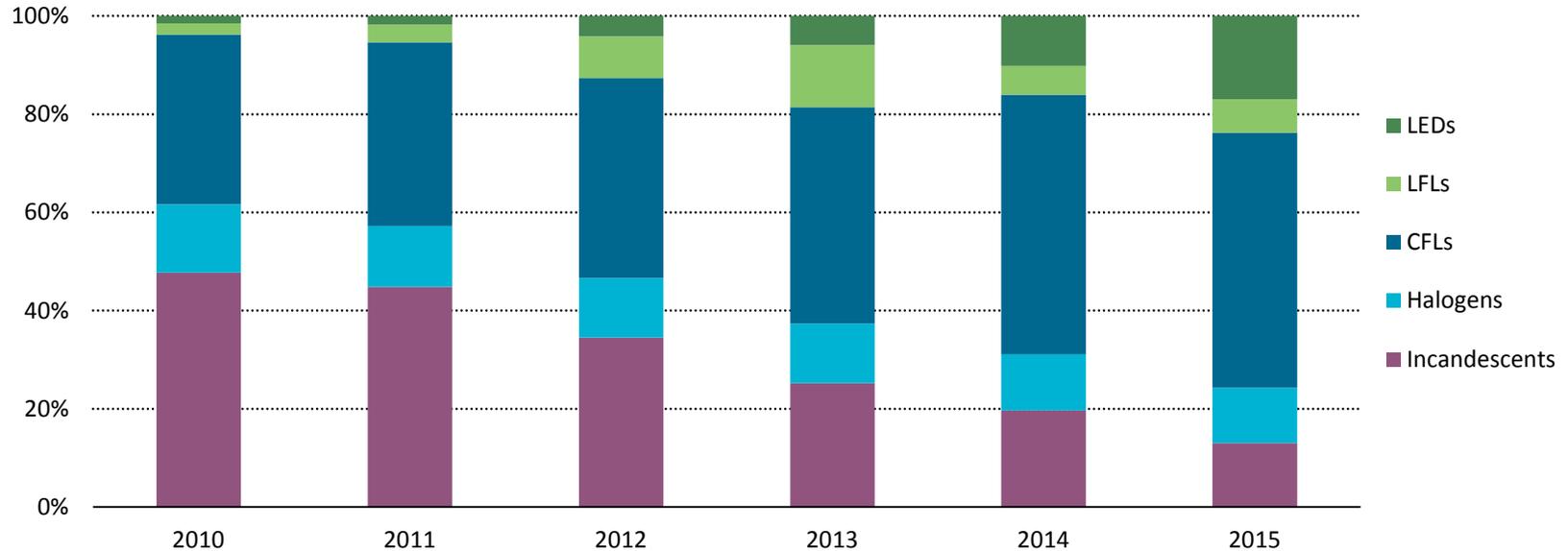
Cooling final energy savings potential, 2015-2060



Space cooling energy use could plateau by 2060 with improved policies or decrease with the implementation of best available technology

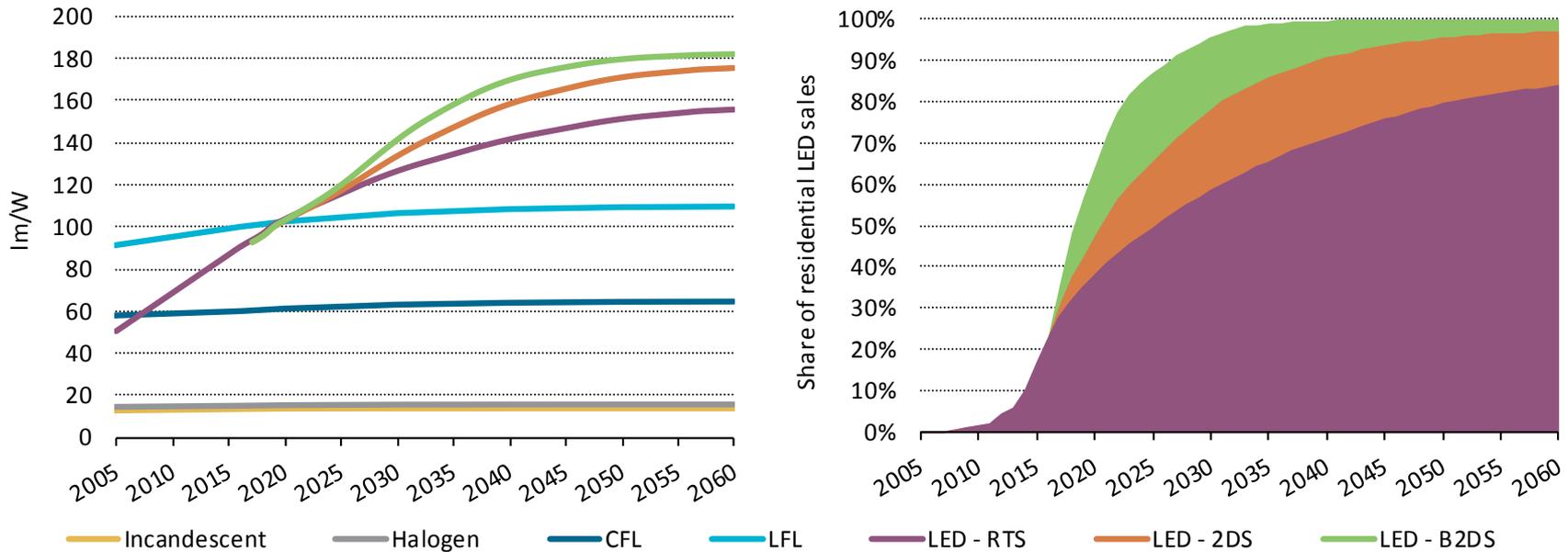
Lighting

Residential lighting sales share by technology type



LED market share in residential lamp sales overtook incandescents in 2015 and reached nearly 30% of the lighting market in 2016.

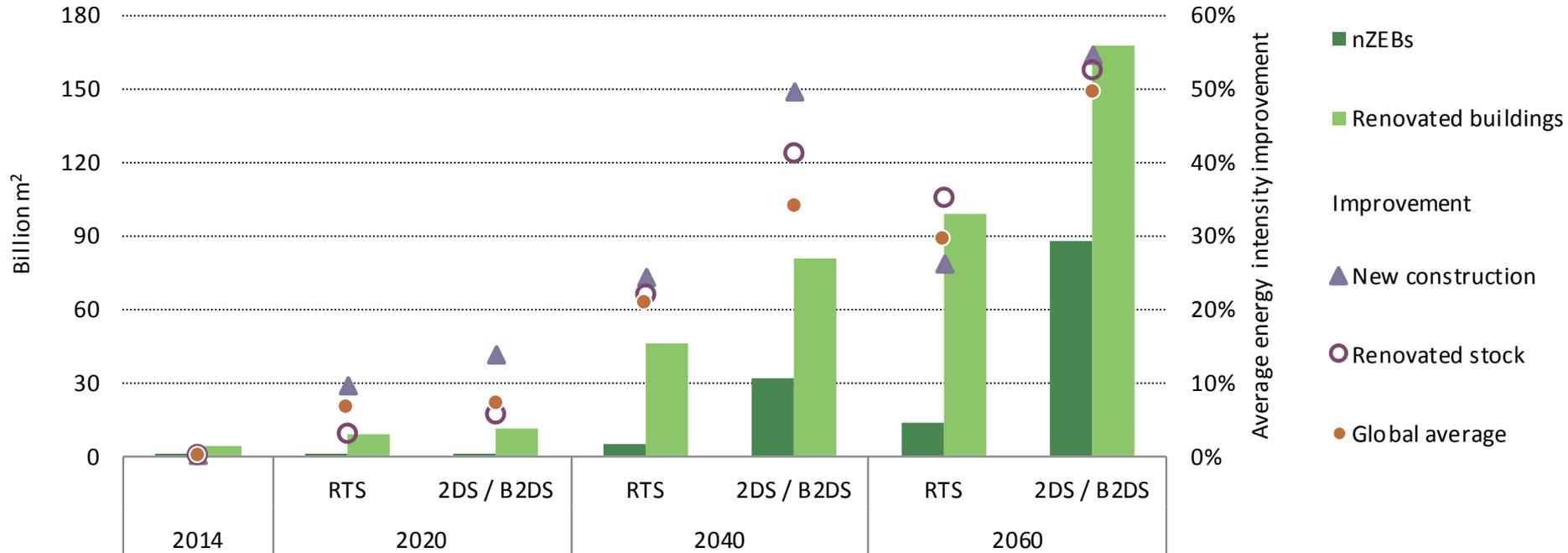
Lighting equipment performance and residential LED sales share to 2060



Rapid deployment of energy-efficient technologies will create critical mass in the market, helping to lower technology costs and drive R&D for greater energy performance.

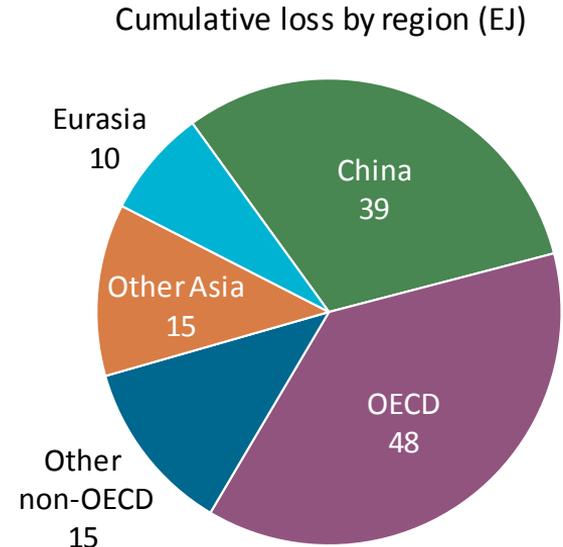
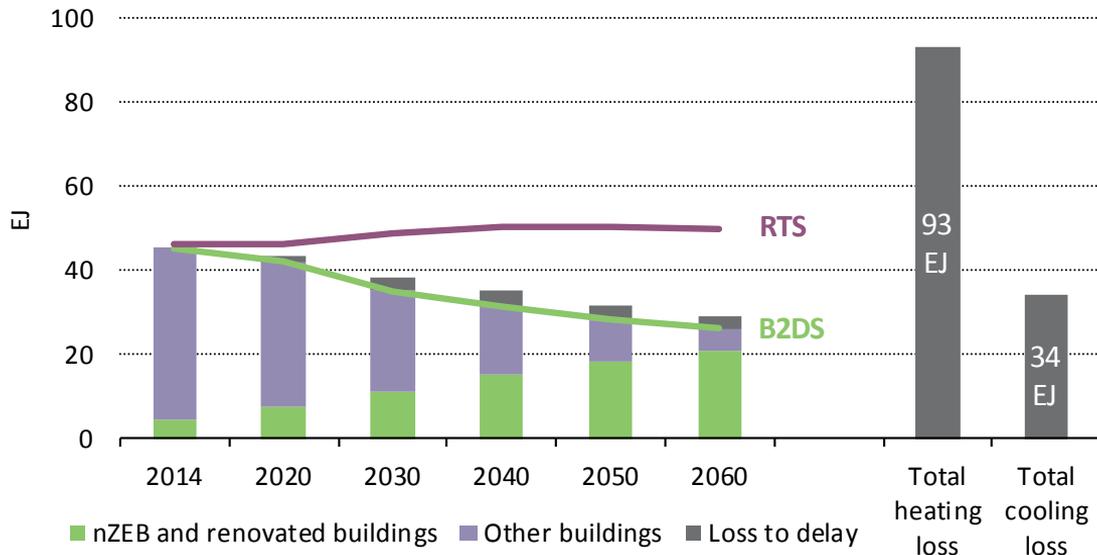
Building envelope

Changes in global residential building stock and energy intensity to 2060



High-performance building construction and deep energy renovations of existing buildings play a critical role in reducing buildings sector energy demand.

Consequences of a ten-year delay in achieving building envelope objectives

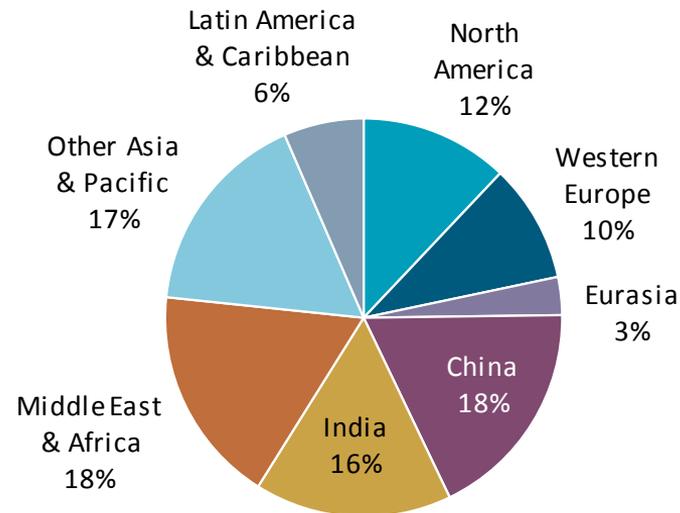
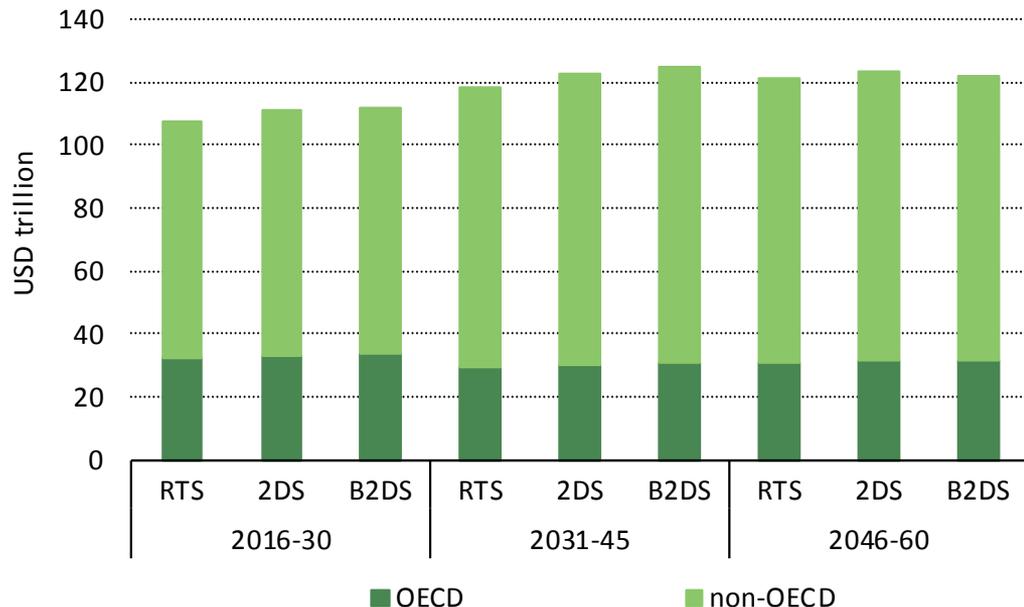


Delaying building envelope measures would result in the equivalent of three years of additional energy consumption for heating and cooling in the buildings sector.

A call to action



Building investment to 2060 and share of total B2DS investment by key region



Continued R&D and larger economies of scale can help to drive down the costs for high-performance, energy-efficient and renewable technologies to 2060.

Whole building

- High-performance envelope components and whole building packages
- nZEB(+) building construction across all countries
- Low-cost deep energy renovation solutions
- Zero-carbon building energy communities

Heating and cooling equipment

- Improved thermal distribution and control
- High-performance heat pumps and solar thermal solutions
- Responsive and affordable thermal energy storage
- Integrated, flexible district energy solutions

Lighting and appliances

- High-performance, lower cost solid state lighting
- Integrated design and control for lighting service
- High-efficiency appliance technologies
- Performance standards for plug loads and smarter use of connected devices

Cooking and energy access

- Clean, affordable cooking solutions for developing countries
- Low-cost solar thermal and storage solutions
- Efficient, low-polluting biomass solutions

Building construction & renovation

- Mandatory building energy codes for new *and* existing buildings
- Capacity building and training
- Financing and market incentives
- Cooperation and knowledge sharing

Transition to zero-carbon buildings

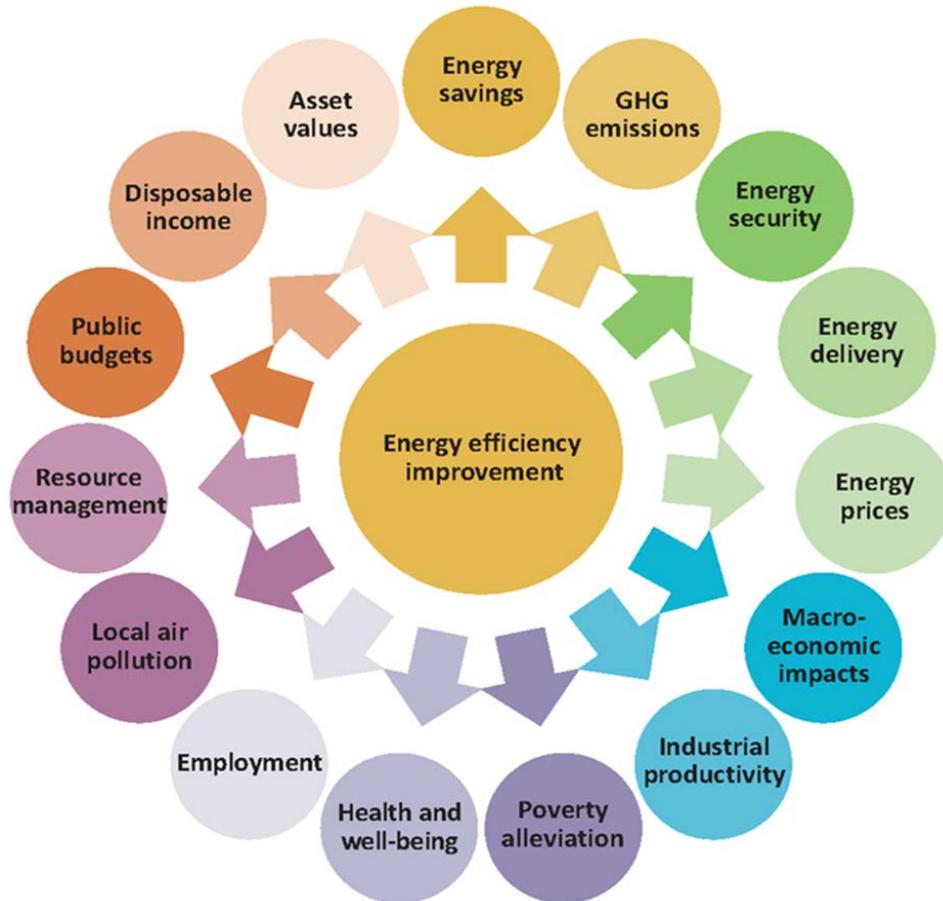
- Long-term, strategic vision for energy transition
- Phase-out of fossil fuel subsidies and other perverse incentives
- Assertive market frameworks
- Integrated, flexible district energy solutions

Rapid energy efficiency deployment

- Minimum energy performance standards
- Labelling and awareness programmes
- Financing and market incentives
- Support for market scale (e.g. bulk procurement)

Technology innovation

- Supporting R&D beyond current BAT
- Cost reductions for critical technologies
- Integrated energy technology solutions
- Advances in clean energy technologies



Energy Efficient Prosperity

Energy efficiency
as a means to
support economic
and social
development.



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