Transition to Sustainable Buildings: Strategies and Roadmaps to 2050

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International Energy Agency

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Transition to Sustainable Buildings

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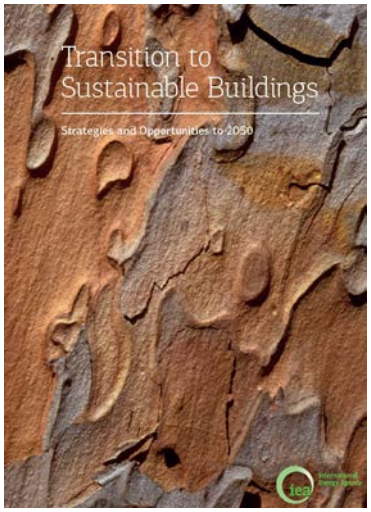


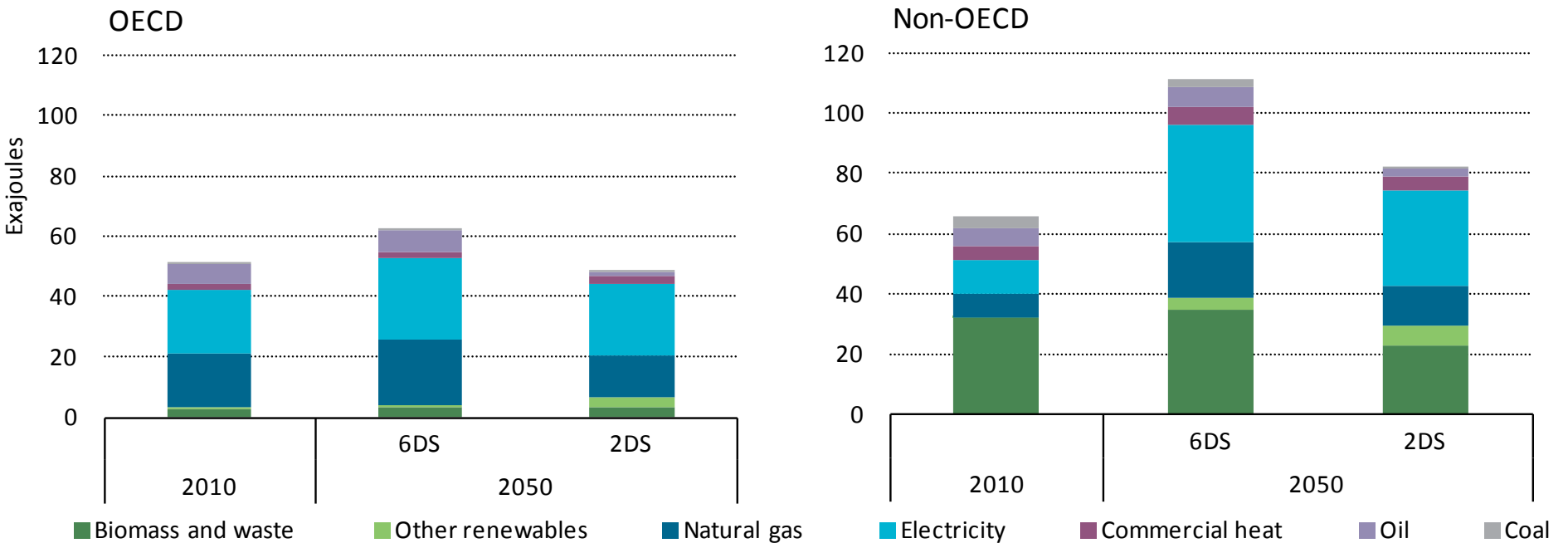
Key messages:

- Energy in buildings set to rise 50% by 2050
- 40 exajoules energy savings potential
  - Equivalent to 2010 energy use in India and Russia
- Majority of technologies already commercially available in many countries: need to make available globally
- Stringent codes needed for all new buildings
- Aggressive measures to encourage renovation key
  - 50% of existing buildings will still be standing in 2050
  - 75%-90% of OECD stock still in service by 2050

Major Energy Savings Potential

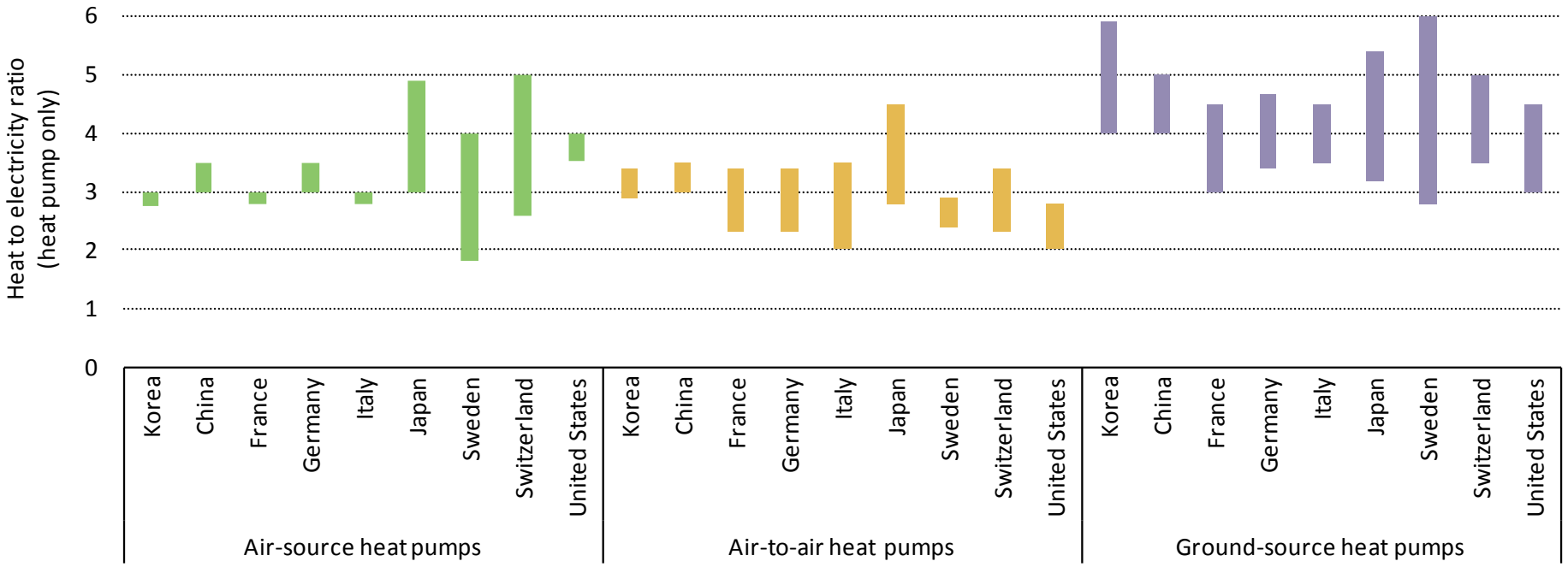
6 degree scenario (business as usual)

2 degree scenario (assertive policies)



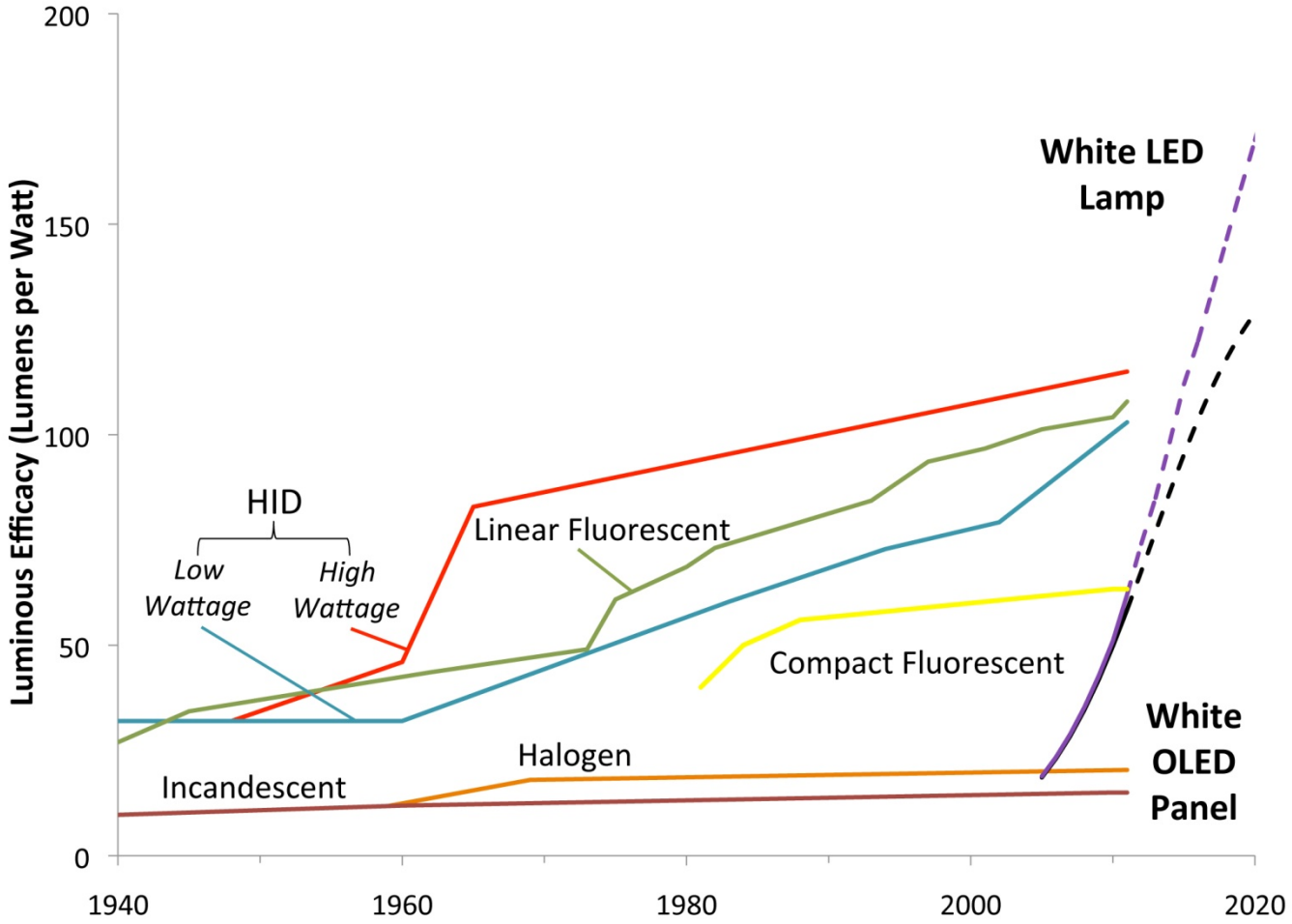
25% of energy demand growth could be cut by 2050!

Heat Pumps Offer Large Potential to Mitigate Water and Space Heating



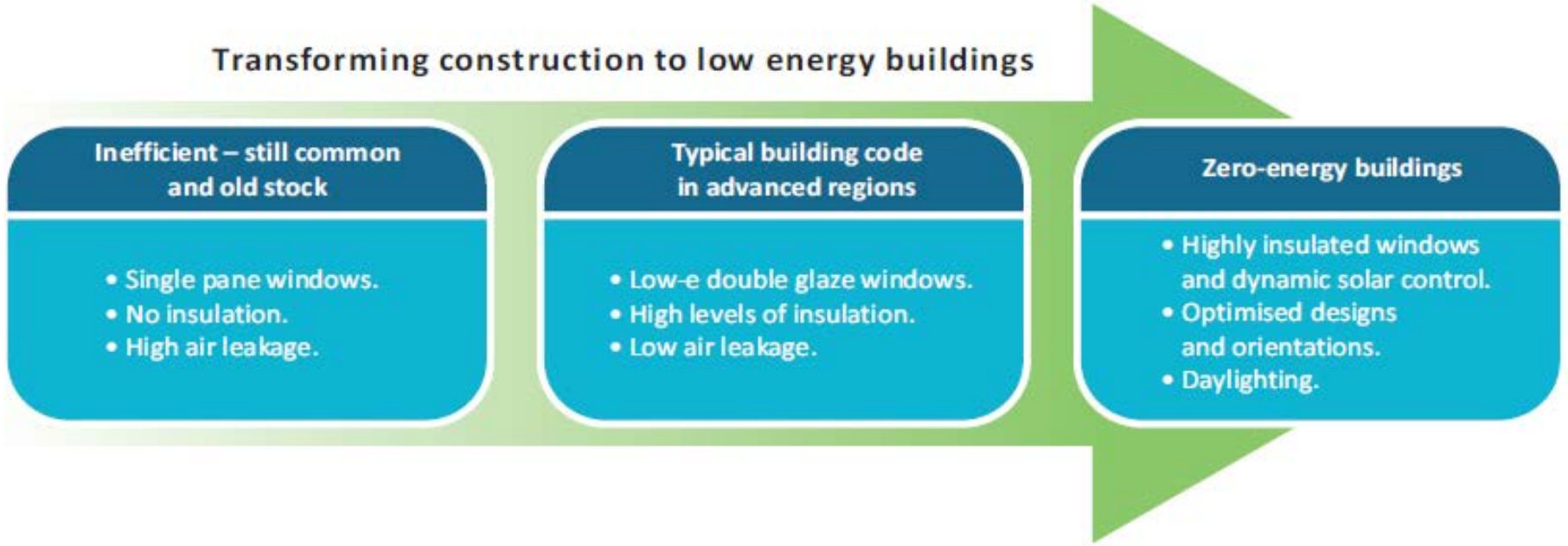
Heat pumps reduce energy consumption > 60%. Even countries with low carbon electricity (large shares of hydro or nuclear) should require them to free up electricity for other uses (e.g. electric vehicles).

Lighting Improvement Potential



Ban incandescent lighting and move towards CFL standards. Promote controls and sensors, and solid state lighting R&D.

Transition to Zero-Energy Buildings



KEY POINT: the world needs to shift from very old buildings to modern buildings, and then to low-energy or zero-energy buildings.

Energy Efficient Building Envelopes

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Key messages:

- Building envelopes will play a critical role in minimizing cooling and heating loads to achieve NZEBs and ZEBs
- Deep renovation in existing stock should be a high priority
- Integrated façade systems should become standard features in new buildings
- R&D is needed to bring advanced technologies to market with greater return on investments

www.iea.org/publications/freepublications/publication/name,45205,en.html

Envelope Savings Potential

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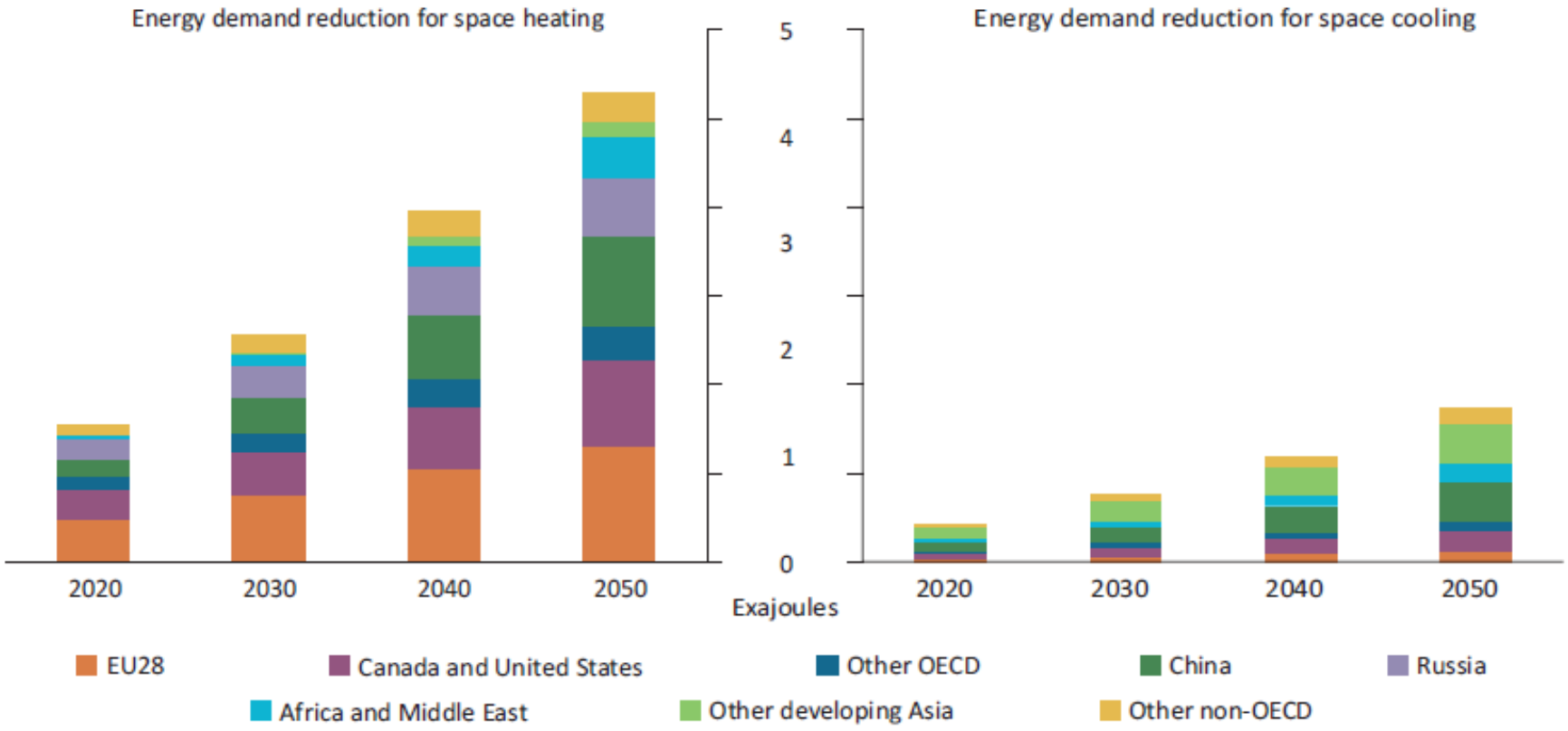
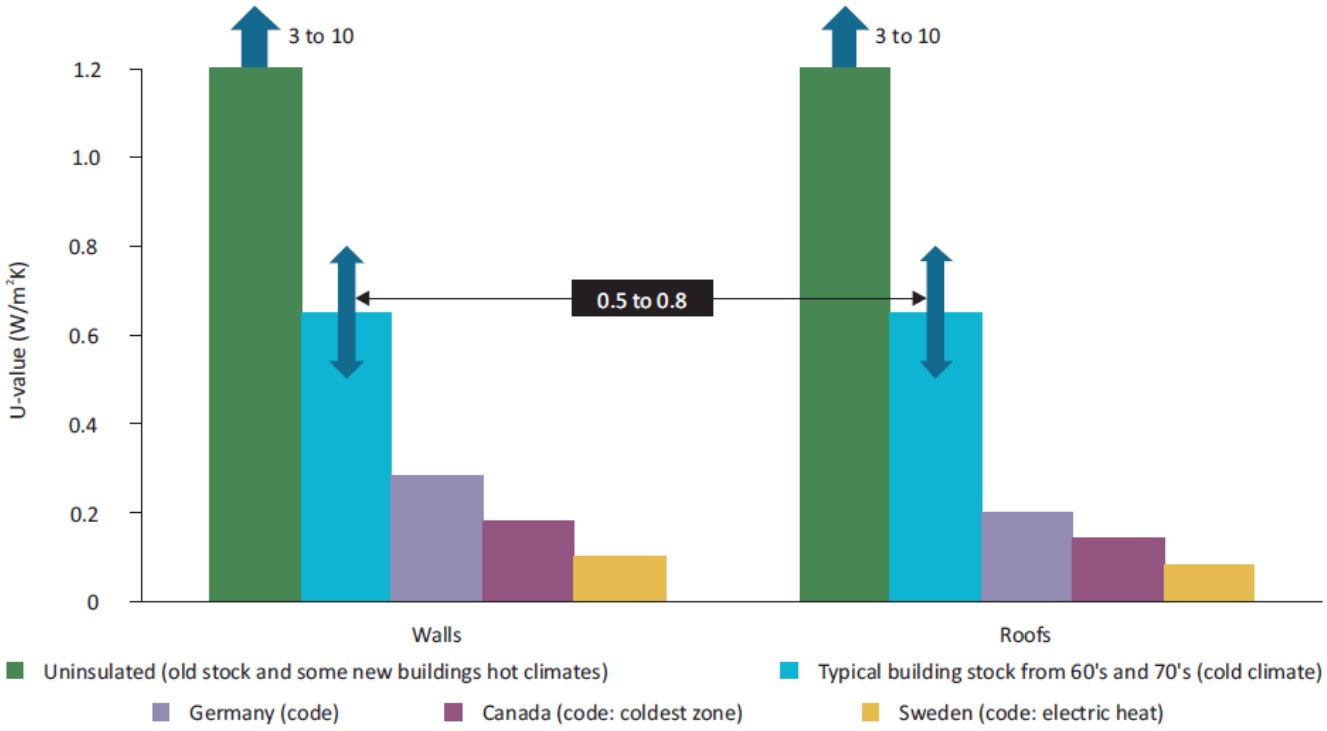
Figure 8: Energy reductions from improvement in building envelopes between the 6DS and 2DS



KEY POINT: building-envelope energy savings under the 2DS are significant, with heating savings around four times higher than cooling savings.

Insulation Opportunity

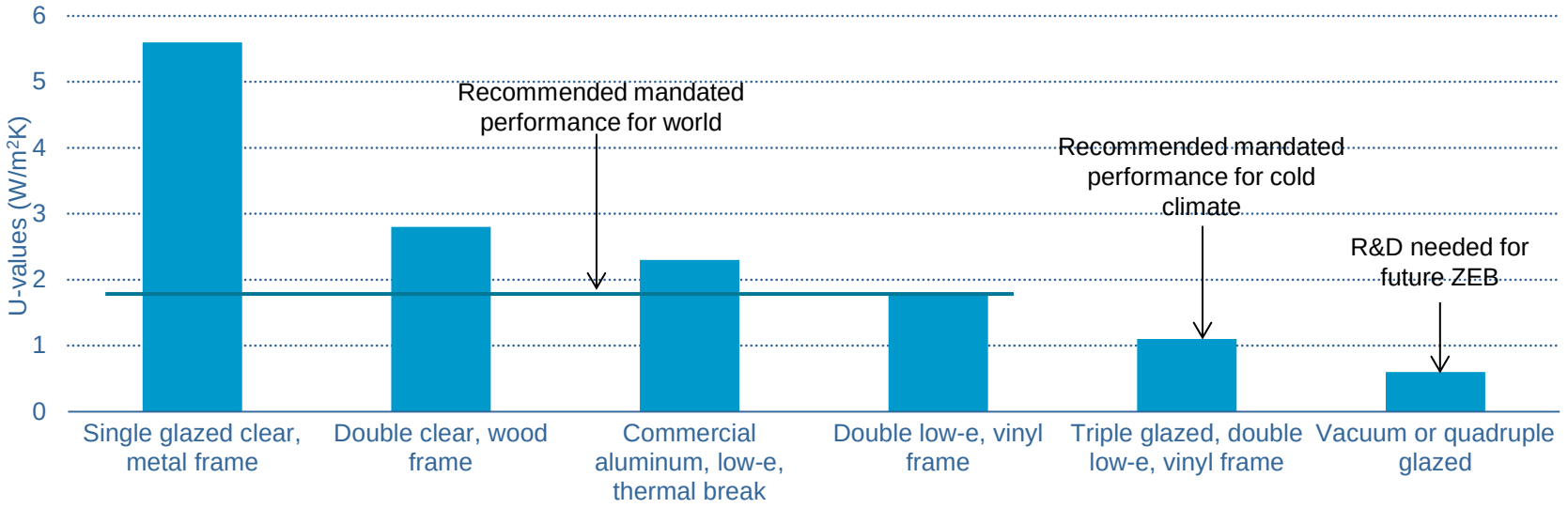
IEA recommending goal for average wall and roof U-values ≤ 0.15 W/m2K cold climate, ≤ 0.35 W/m^{2}K hot climate based on LCC



Source: Adapted from IEA (2013a), "Transition to Sustainable Buildings: Strategies and Opportunities to 2050", Organisation for Economic Co-operation and Development (OECD) Publishing, Paris.

KEY POINT: levels of insulation vary widely for the existing stock of buildings, as well as for new construction.

Window Recommendations – Deployment and R&D



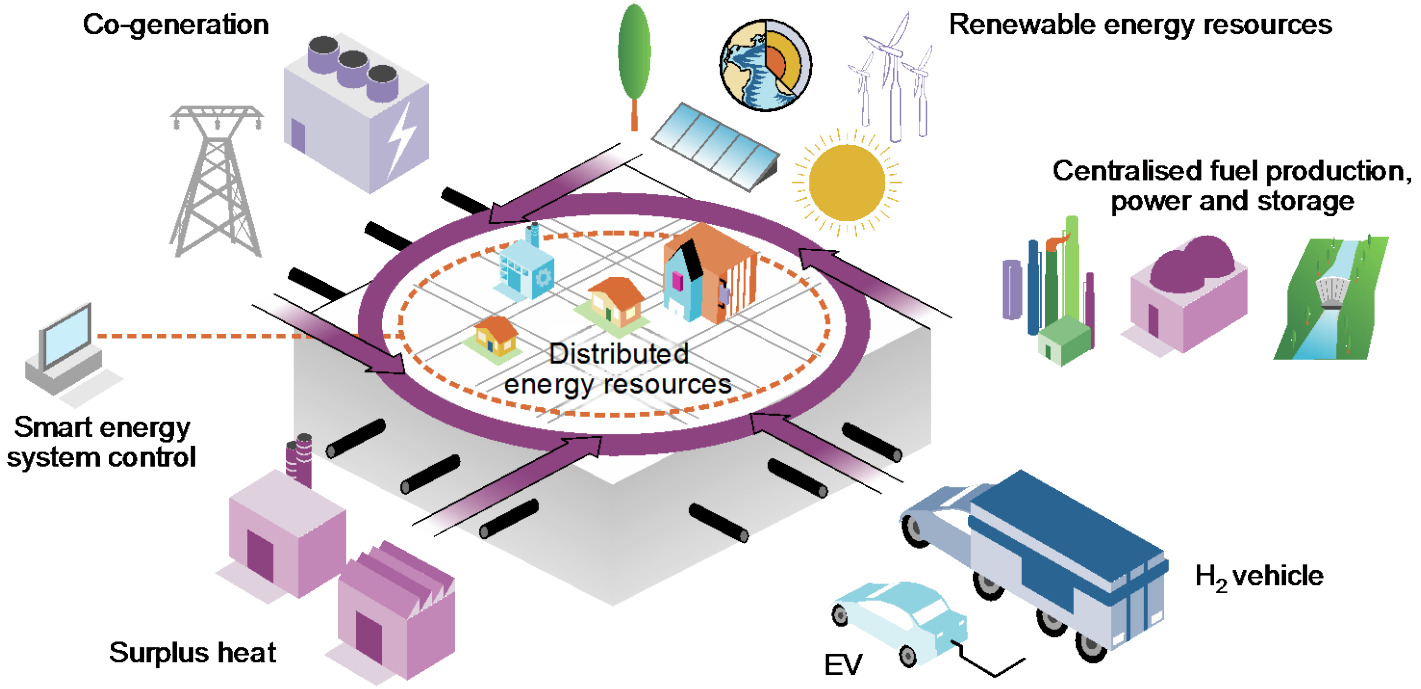
Need to promote low e windows and retrofit attachments for the world and highly insulating windows for cold climates.

Advanced Facades

- Integrated solution increase daylight and passive heating harvesting
- Large lighting savings potential, reduced cooling loads, and peak electricity demand reduction – optimised performance

Source: Sage Electrochromics (St Gobain)

Future Integrated Systems



Sector integration needed to meet future clean energy supply and demand systems.

Tracking and Next Steps

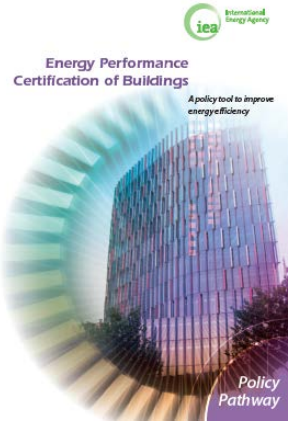
- Much more data is needed
  - e.g. market share of techologies, adoption rates, performance metrics, zero-energy building share
- More specific performance criteria needed, even for most advanced regions
  - e.g. EU specifications for renovation in public buildings
- Increased collaboration
  - Mature to developing markets
  - IEA energy technology partnerships for policy assessment and energy modelling

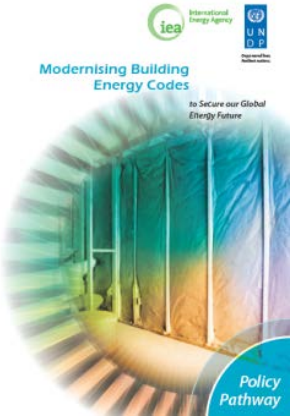
Key Focus for Action

- Greater deployment of proven technologies
- Introduction of mature products and technologies in developing markets
  - Transfer of knowledge and establishment of key infrastructure (skill training, product ratings, product availability, etc)
- R&D to improve performance, reduce costs and provide greater return on investment
  - e.g. highly insulated windows with U values $\leq$ 0.6 W/m^{2}K for ZEB, high performance 'thin' insulation

IEA Building Related Activities

- Technology Roadmaps
  - www.iea.org/roadmaps
- Policy Pathways
  - www.iea.org/publications/policypathwaysseries
- *ETP* series
  - 2014: building sector forecasts with electricity power sector as core focus





Access and Questions

Transition to Sustainable Buildings

www.iea.org/etp/buildings

Executive Summary and Table of Contents are available as free downloads.

Energy Efficient Building Envelopes

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