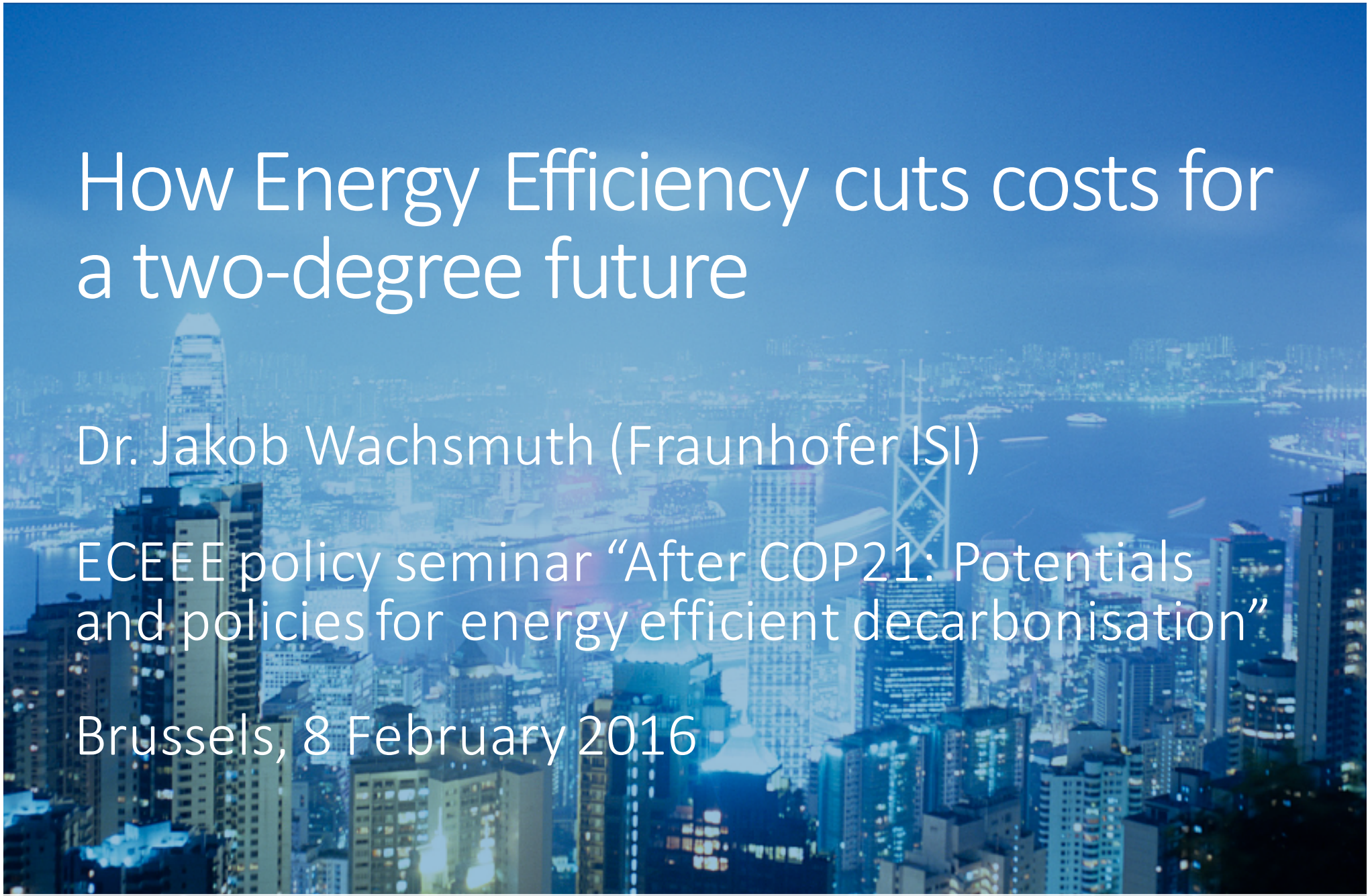


How Energy Efficiency cuts costs for a two-degree future

Dr. Jakob Wachsmuth (Fraunhofer ISI)

ECEEE policy seminar "After COP21: Potentials and policies for energy efficient decarbonisation"

Brussels, 8 February 2016

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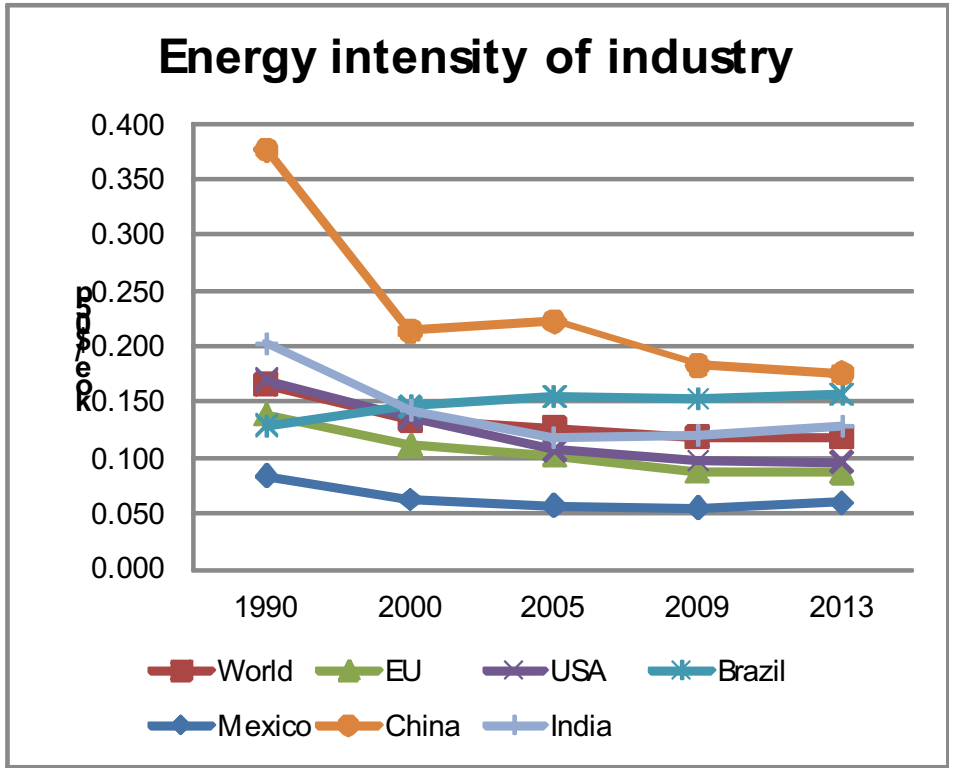
Background

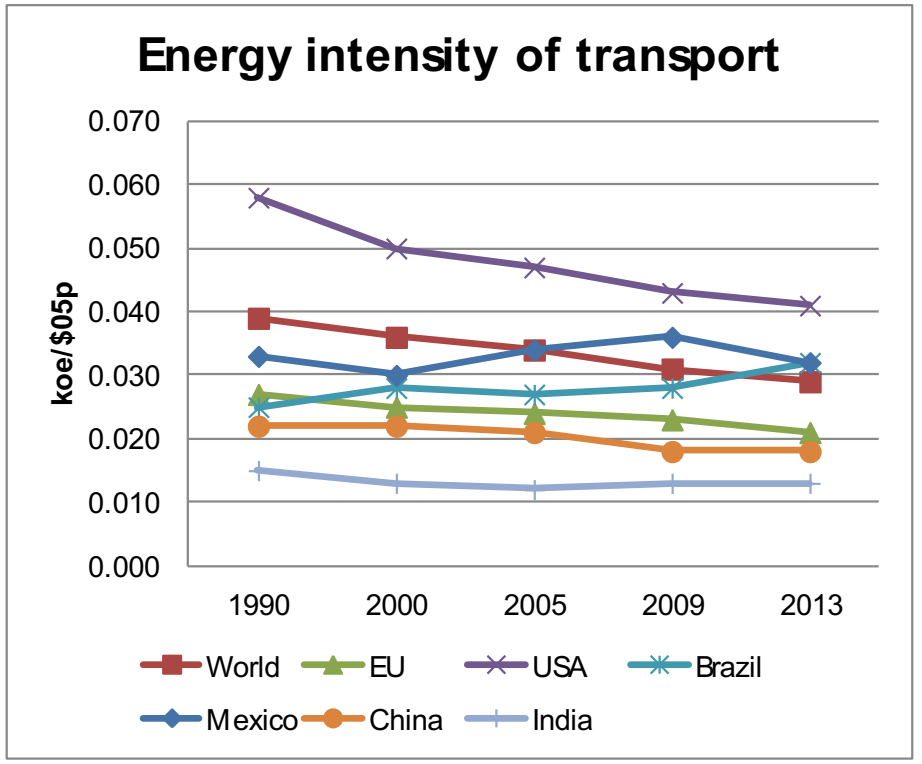
Energy Efficiency: A Cheaper path to a two-degree future

- Role of EE in decarbonization
- Why this study? Why now?
- What's new? – cost savings and policy focus
- Why regions matter?

History shows hope and challenges

- Most countries are producing increasingly more from each unit of energy consumed
- Stricter fuel economy standards have decoupled consumption in the transport sector from economic growth but total consumption is still increasing

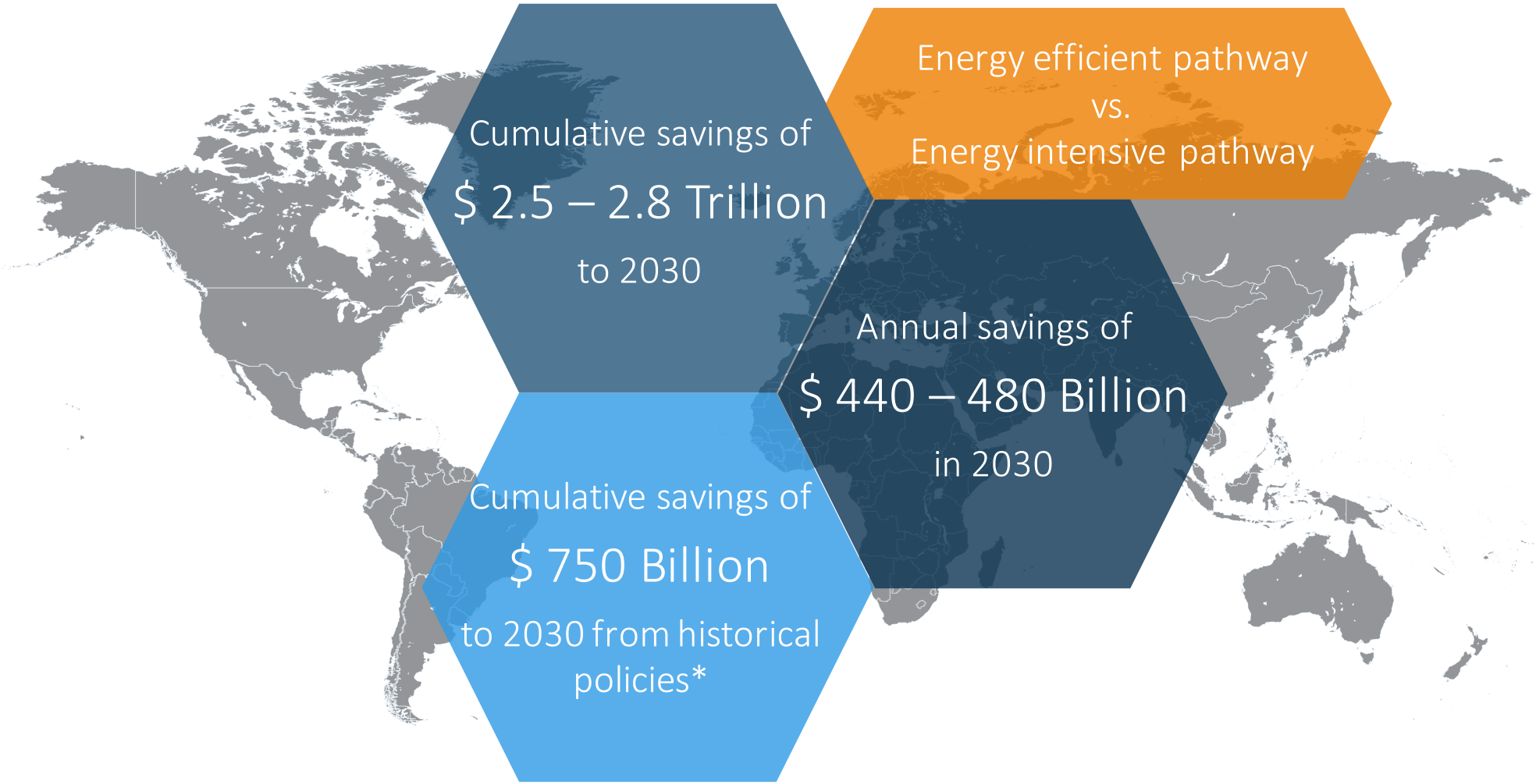




Source: own representation based on the Enerdata database

Global savings and climate stabilization

Aggressive efficiency policies in buildings, transport, industry key to achieving 2 degree target; cheapest carbon abatement in most nations.



* Policies passed since 1990 in 3 Regions: China, European Union, United States

Methodology

Goal: Assess the impact of energy efficiency (EE) on the cost of decarbonization based on existing estimates of EE and alternative decarbonization measures

METHODOLOGY

1. Assessment of existing EE policies in the focus regions
2. Review of 2°C scenarios and the role of energy efficiency
3. Projection of cost reductions by EE policies until 2030
4. Conclusions reviewed by local experts

Contributors

A global team of energy efficiency experts

Project team

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Contributors

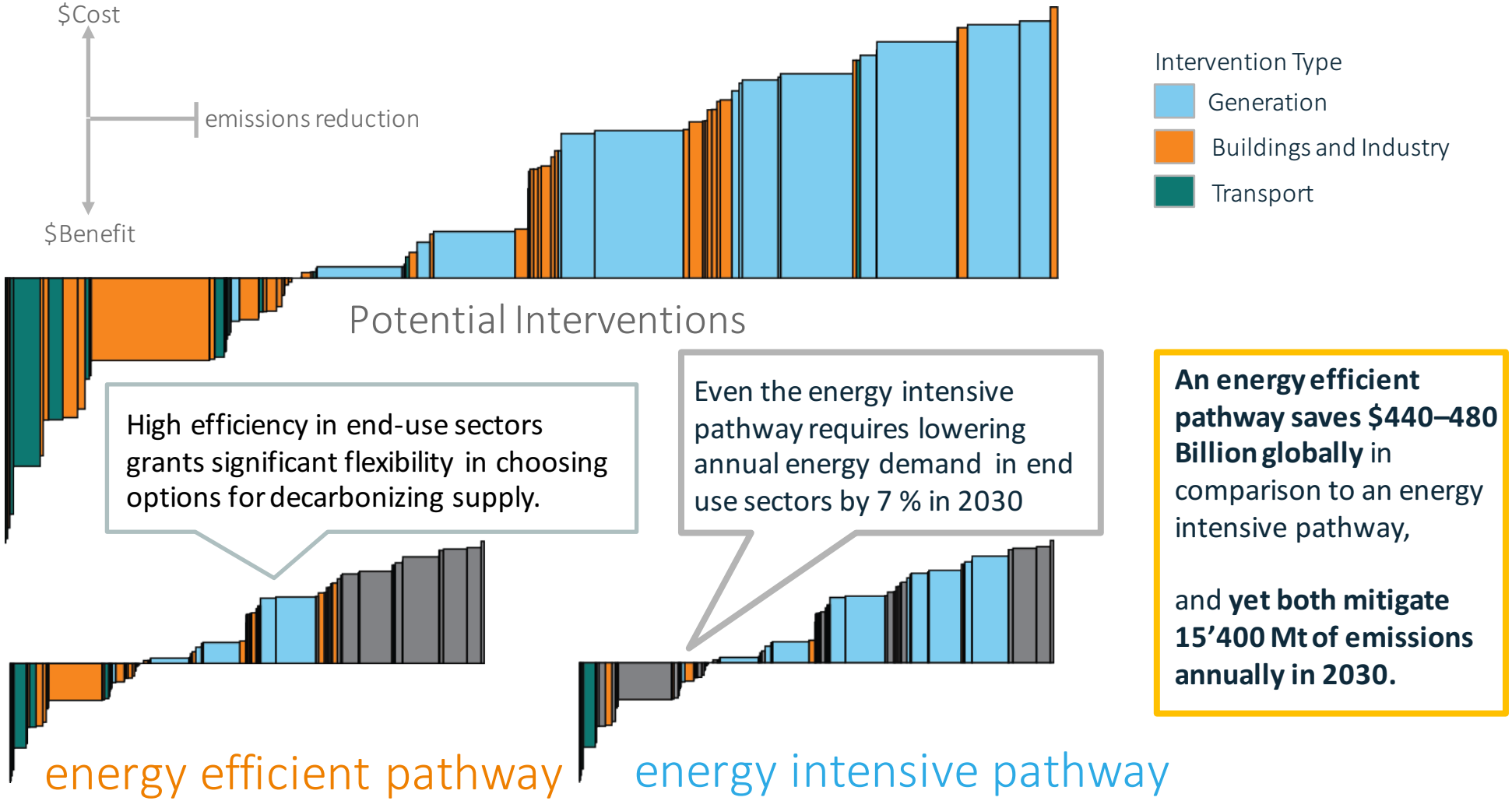
A global team of energy efficiency experts

Local experts

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- China: Chinese Academy of Sciences (CAS), Ying Fan and Jin-Hua Xu
- EU: Fraunhofer ISI, Wolfgang Eichhammer
- India: The Energy and Resources Institute India (TERI), Neha Pahuja
- Mexico: Comisión Nacional para el Uso Eficiente de la Energía, Juan Ignacio Navarrette Barbosa
- US: ACEEE, Steven Nadel + colleagues

Comparing Two Pathways

A focus on energy efficiency turns abatement costs into abatement benefits.

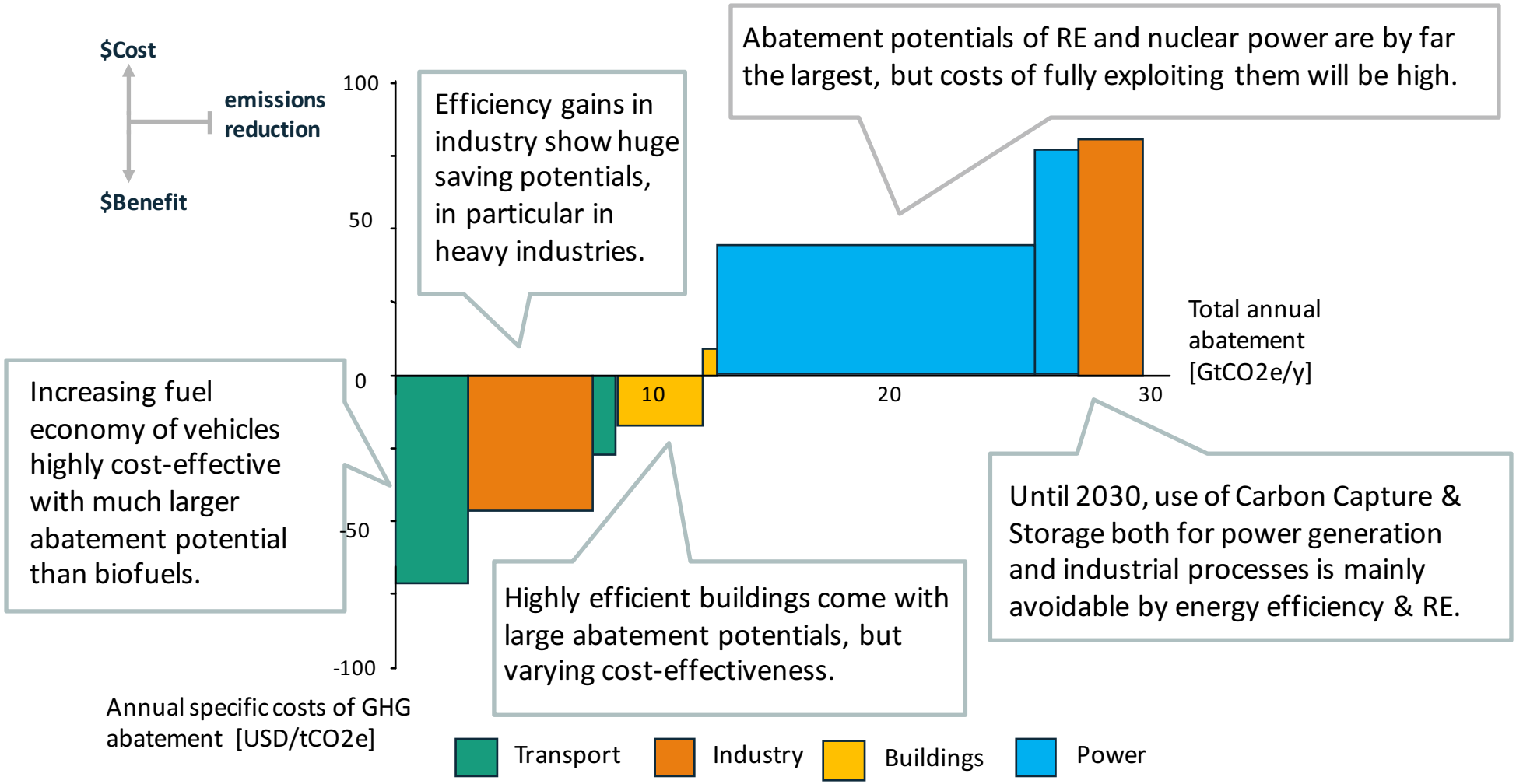


An energy efficient pathway saves $440–480 Billion globally in comparison to an energy intensive pathway,

and **yet both mitigate 15’400 Mt of emissions annually in 2030.**

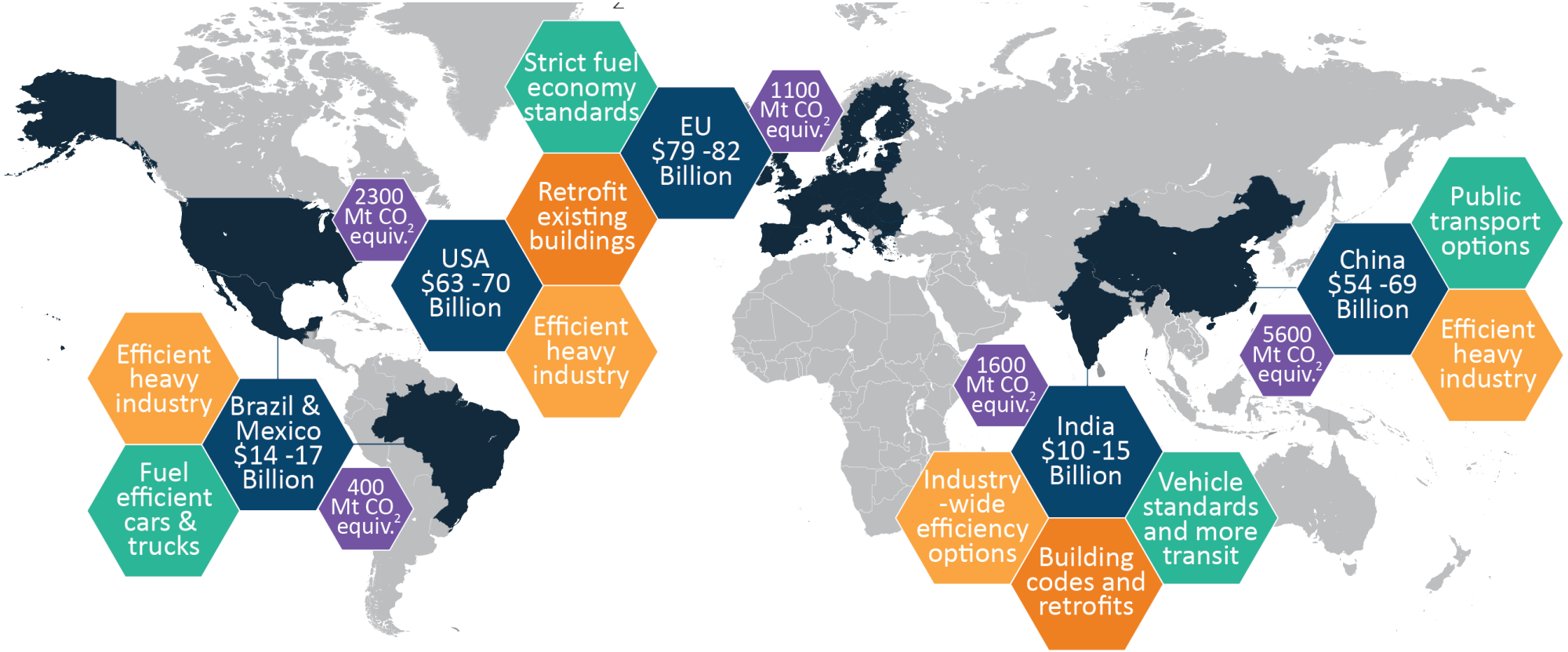
The energy efficient pathway

saves $440–480 Billion globally in comparison to an energy intensive pathway



Significant cost savings and emissions reduction in 2030

Results for the Energy Efficiency Pathway for six-regions include $220-250 Billion in annual savings and reductions of 11,000 Mt CO2 equivalent in 2030. Not only is this a significant amount of savings for these regions but it is a large share of the emissions reduction needed reach a two-degree pathway.



More than 85% of those savings occur in China, the European Union, and the United States

China in Focus



Energy Efficient vs. Energy Intensive Pathway:

- Compared to BAU, the Intensive Pathway reduces annual consumption by > 14 EJ until 2030. The Efficient Pathway achieves additional savings of 4.7 - 6.0 EJ.
- Realization of the Efficient Pathway would reduce the annual net costs by 54 - 69 billion USD (saving of 10 – 12 USD/tCO2e).

Current policies:

- historical EE policies, in particular in industry (TOP 1000 and TOP 10000 program), have already decreased the net costs by 52 – 64 billion USD per annum.
- significant unaddressed industrial potentials, especially in the chemical industry and the iron & steel sector, as well as in petroleum processing and coking.
- transport sector requires additional efforts to reduce fuel consumption, especially in HDVs, but also a modal shift in public and freight transport.

Brazil in Focus



Energy Efficient vs. Energy Intensive Pathway:

- Compared to BAU, the Intensive Pathway reduces annual consumption by 1.6 EJ until 2030. The Efficient Pathway achieves additional savings of 0.7 – 0.8 EJ.
- Realization of the Efficient Pathway would reduce the annual net costs by 13 billion USD (savings of 54 – 55 USD/tCO2e).

Current policies:

- Historic savings not quantified due to data constraints but also marginal impacts.
- Significant potentials in buildings sector currently targeted, particularly within PROCEL, but retrofits of HVACs and air-conditioning call for additional measures.
- For transport, strict fuel economy standards and infrastructure for a modal shift seem to be necessary additions to the existing labeling of cars.
- Industry holds potential for numerous EE measures throughout all subsectors.

The EU in Focus



Energy Efficient vs. Energy Intensive Pathway:

- Compared to BAU, the Intensive Pathway reduces annual consumption by 4.1 – 4.5 EJ until 2030. The Efficient Pathway doubles the savings (8 – 9 EJ).
- Realisation of the Efficient Pathway would reduce the annual net costs by 79 – 82 billion USD in 2030 (saving of 72 – 75 USD/tCO2e).

Current policies:

- Historical EE policies have decreased future net costs by at least 8 – 10 bill. USD/a.
- Revision of EED with a concrete EE target for 2030 and 3rd NEEAPs drive EE. Ecodesign directive plays a relevant role for heating and electrical appliances .
- Realizing industrial potentials mainly depends on successful reform of the EU ETS.
- Moderate fuel economy standards for LDVs, absence of strong policies for HDVs, and lack of EU-wide standards for buildings retrofits leave room for improvements.

Conclusion – Global & Regional implications

A lot of levers with abatement benefits are not realized due to market barriers yet. A mix of measures targeting barriers and support for diffusion are particularly important.



EU

- Significant retrofit of existing buildings
- Stricter & extended fuel economy standards
- ETS reform to drive change in industry



USA

- Significant retrofit of existing buildings
- Reduce fuel consumption of heavy industry
- Modal shifts in freight & public transport



China

- Change in industrial processes (EAF in I&S, waste heat recovery for chemicals)
- Modal shifts in freight & public transport
- Retrofitting commercial buildings



India

- Low GWP in MVACs and modal shifts in public transport
- EAF in I&S sector
- Efficient new build and new & retrofit of cooling systems



Brazil & Mexico

- Fuel consumption standards for HDVs and MDVs and modal shift
- Large untapped potential remains in industry
- Efficient appliances and HVAC



Contact Information

Energy Efficiency:

A Cheaper path to a two-degree future

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USA in Focus



Energy Efficient vs. Energy Intensive Pathway:

- Compared to BAU, the Intensive Pathway reduces annual consumption by 3.8 EJ until 2030. The Efficient Pathway achieves additional savings of 6.0 – 6.3 EJ.
- Realization of the Efficient Pathway would reduce the annual net costs by 66 – 72 billion USD (savings of 29 – 33 USD/tCO2e).

Current policies:

- Historical EE policies have decreased future net costs by 40 – 43 bill. USD/a, mainly induced by CAFE standards for LDVs, appliance standards & building energy codes.
- Clean Power Plan, updates of CAFE standards and building energy codes are likely to boost energy efficiency throughout all sectors.
- Achieving significant retrofits of existing buildings biggest challenge for EE policy-making. Other challenges include reducing fuel intensity in heavy industries.

India in Focus



Energy Efficient vs. Energy Intensive Pathway:

- Compared to BAU, the Intensive Pathway reduces annual consumption by 3.9 EJ until 2030. The Efficient Pathway achieves additional savings of 1.1 – 1.3 EJ.
- Realization of the Efficient Pathway would reduce the annual net costs by 10 – 15 billion USD (savings of 6 – 9 USD/tCO2e).

Current policies:

- Historic savings not quantified due to data constraints but also marginal impacts.
- Only a limited number of EE measures is being implemented.
- Industry harbors saving potentials in iron & steel production, while transport has potential for reduced fuel consumption (mainly HDVs).
- Both efficient new-builds and replacing existing cooling systems offer large saving potentials in the buildings sector.

Mexico in Focus



Energy Efficient vs. Energy Intensive Pathway:

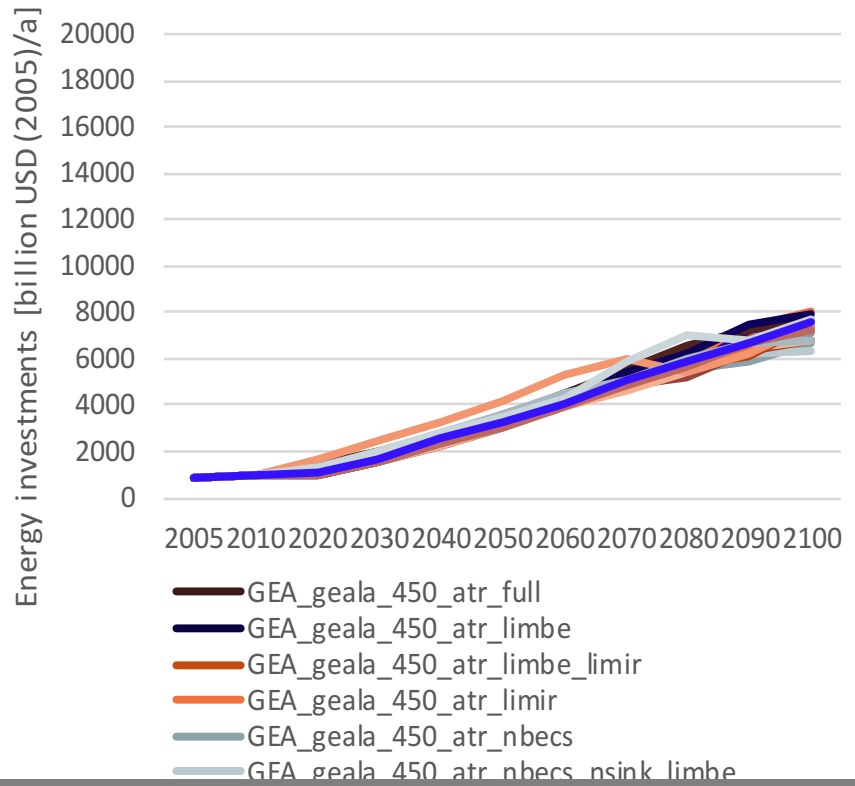
- Compared to BAU, the Intensive Pathway reduces annual consumption by 0.7 EJ until 2030. The Efficient Pathway achieves additional savings of 0.1 – 0.2 EJ.
- Realization of the Efficient Pathway would reduce the annual net costs by 1.9 – 2.6 billion USD (saving of 13 - 17 USD/tCO2e).

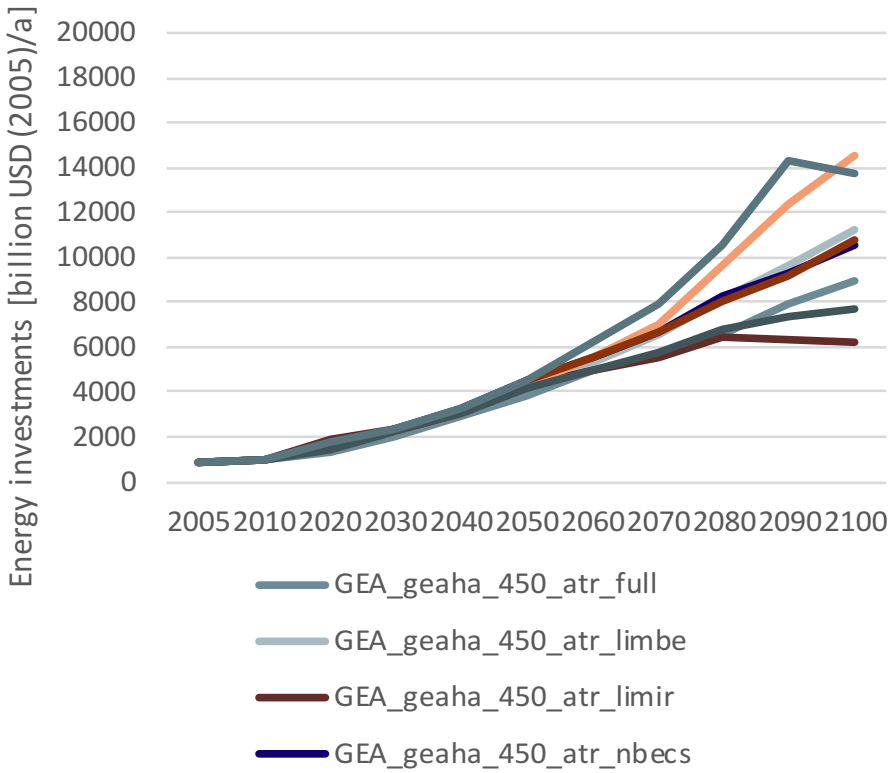
Current policies:

- Historic savings not quantified due to data constraints but also marginal impacts.
- While buildings sector is systematically targeted using norms and labeling, potentials in industry and transport sector addressed only to a minor extent.
- Additional measures debated within PRONASE 2013 – 2018, which holds huge potential to target numerous EE options in heavy industry and transport.

Review of the role of EE in 2°C scenarios

- Difficult to compare different models, but costs tend to be lower in scenarios with high efficiency when using the same model
- For most IAMs, EE measures not modeled but demand reduction is assumed
- **Investments (CAPEX & OPEX) in scenarios with high (left) and low efficiency (right):**





Source: representation by NewClimate Institute based on the GEA scenario database