

Transport, Energy and CO₂: Moving Toward Sustainability

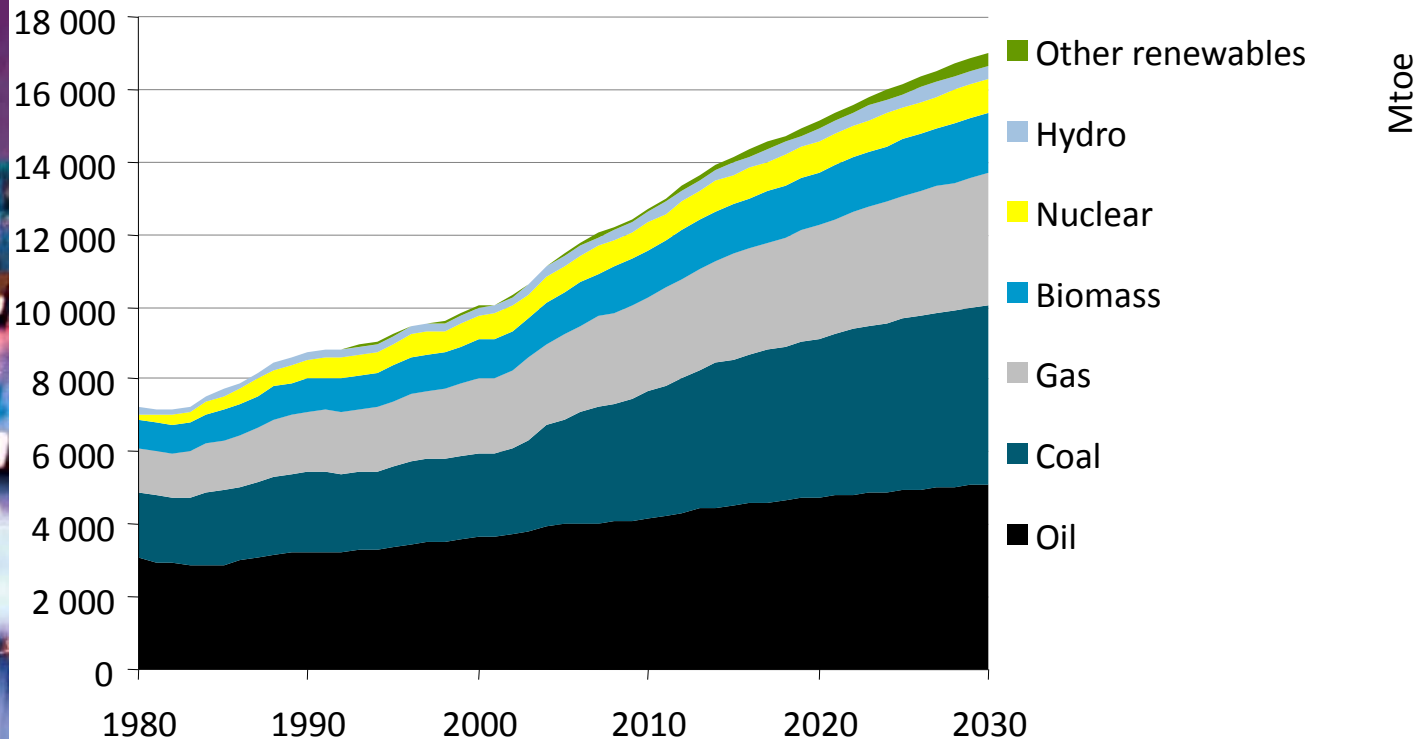
Lew Fulton, IEA
Asilomar Conference, 29 July 2009

Where are we headed? World Energy Outlook 2008

World Primary Energy Demand in the Reference Scenario: An Unsustainable Path

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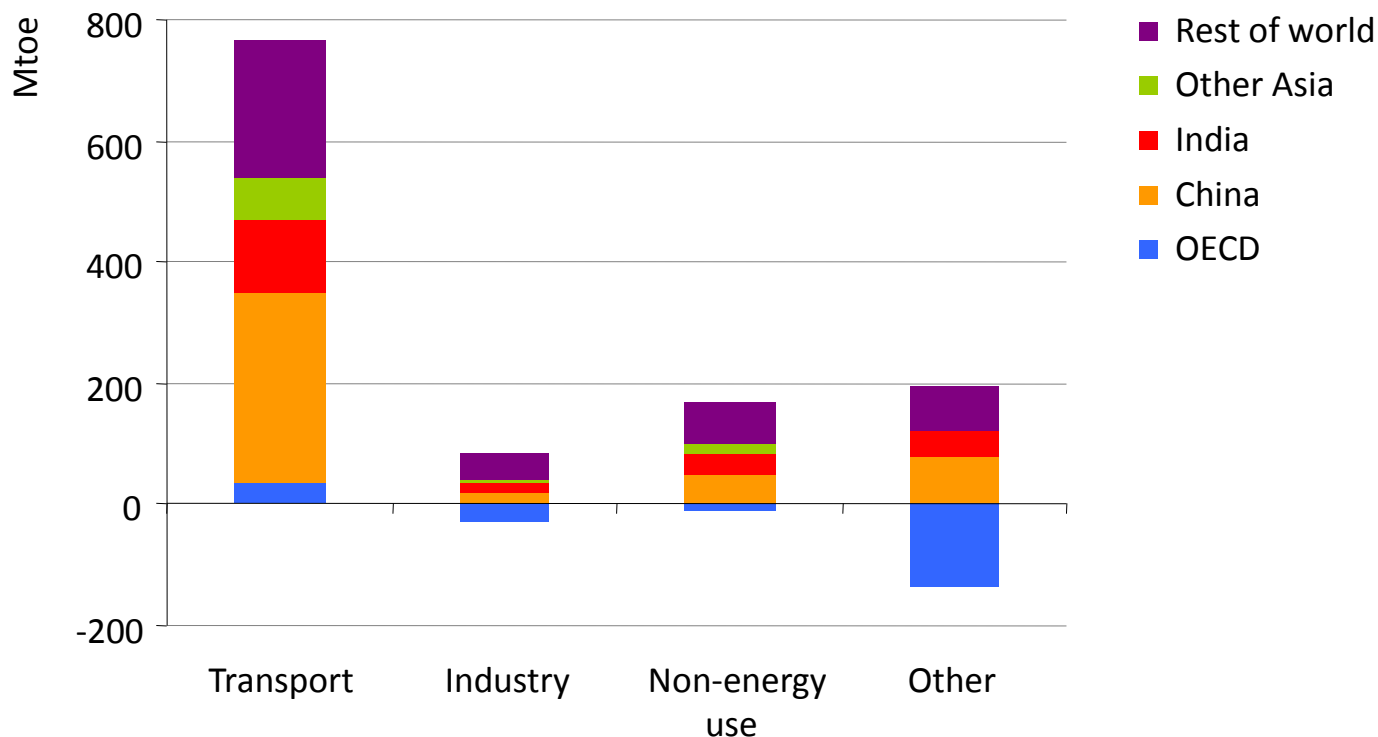


World energy demand expands by 45% between now and 2030 – an average rate of increase of 1.6% per year – with coal accounting for more than a third of the overall rise

WEO 2008 Reference Scenario: Incremental oil demand, 2006-2030

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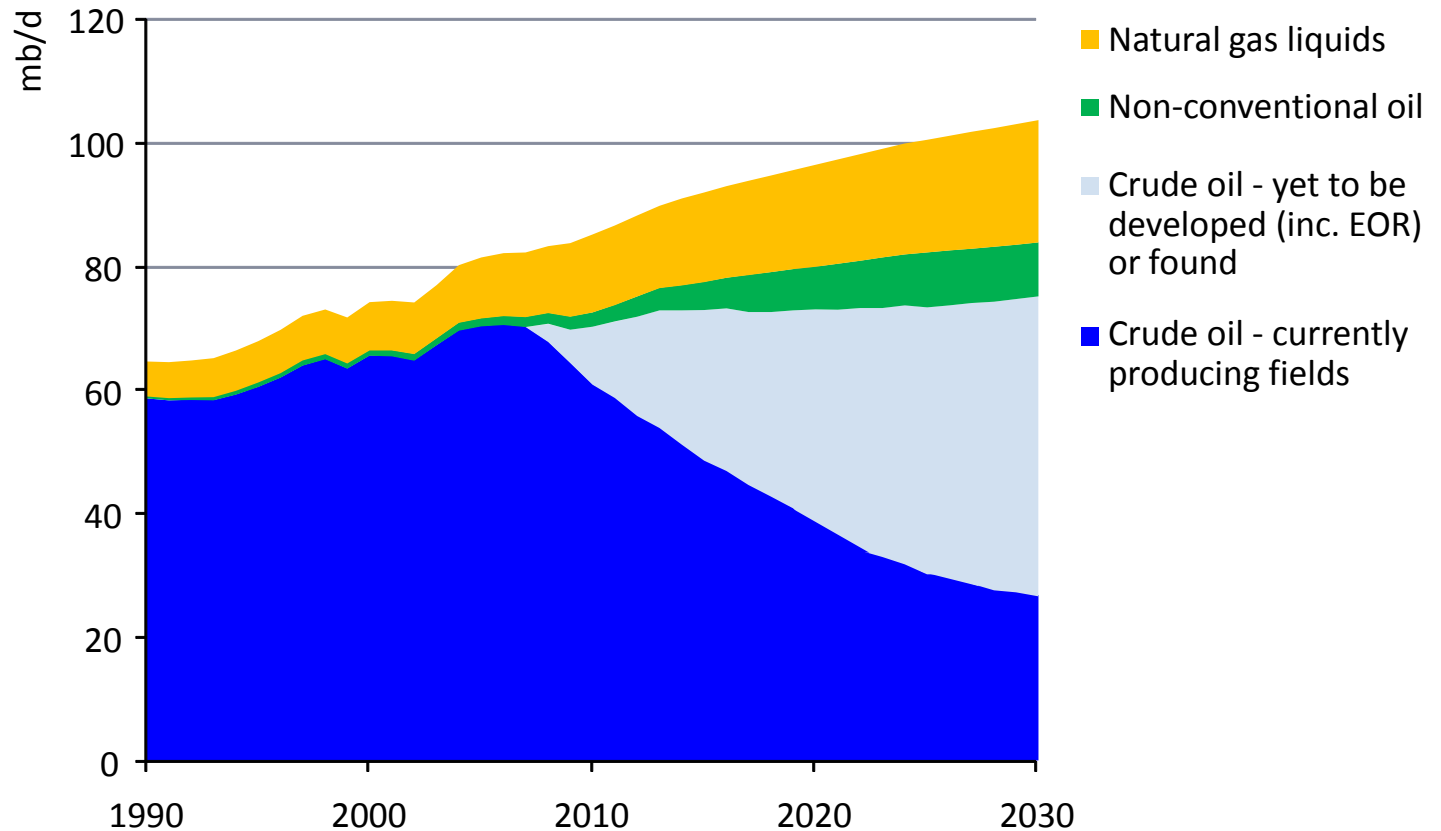


***Around three-quarters of the projected increase in
oil demand comes from transportation***

World oil production by source in the Reference Scenario

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***64 mb/d of gross capacity needs to be installed between 2007 & 2030
– six times the current capacity of Saudi Arabia – to meet demand
growth & offset decline***

IEA's New Transport Publication

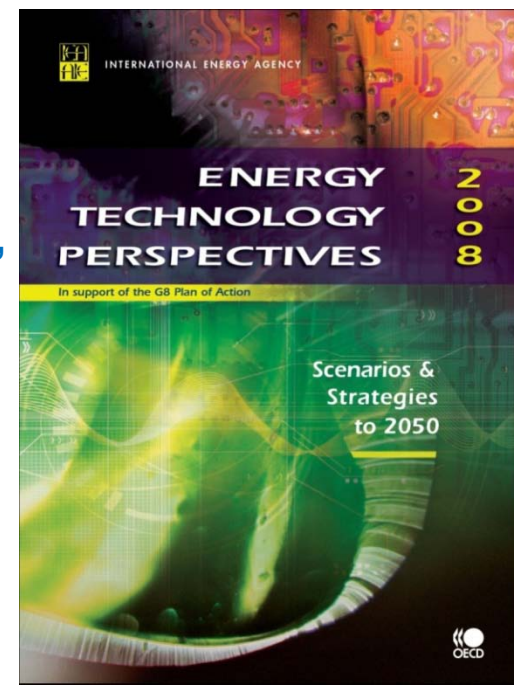
- For release September 2009
- Builds on ETP 2008, will feed into ETP 2010
- Transport analysis based on on-going development of IEA Mobility Model, supporting research
- Book features:
 - Indicator update and extension to more countries
 - Technology potential and cost updates
 - Fuel and Modal assessments (LDV, truck, aviation, shipping)
 - Detailed scenario analysis with regional detail – Baseline, High Baseline, Modal Shift, BLUE technology scenarios
 - Role of future technologies, modal shift
 - More regional detail than in ETP
 - Continuing development of CO2 mitigation cost analysis
 - Policy considerations

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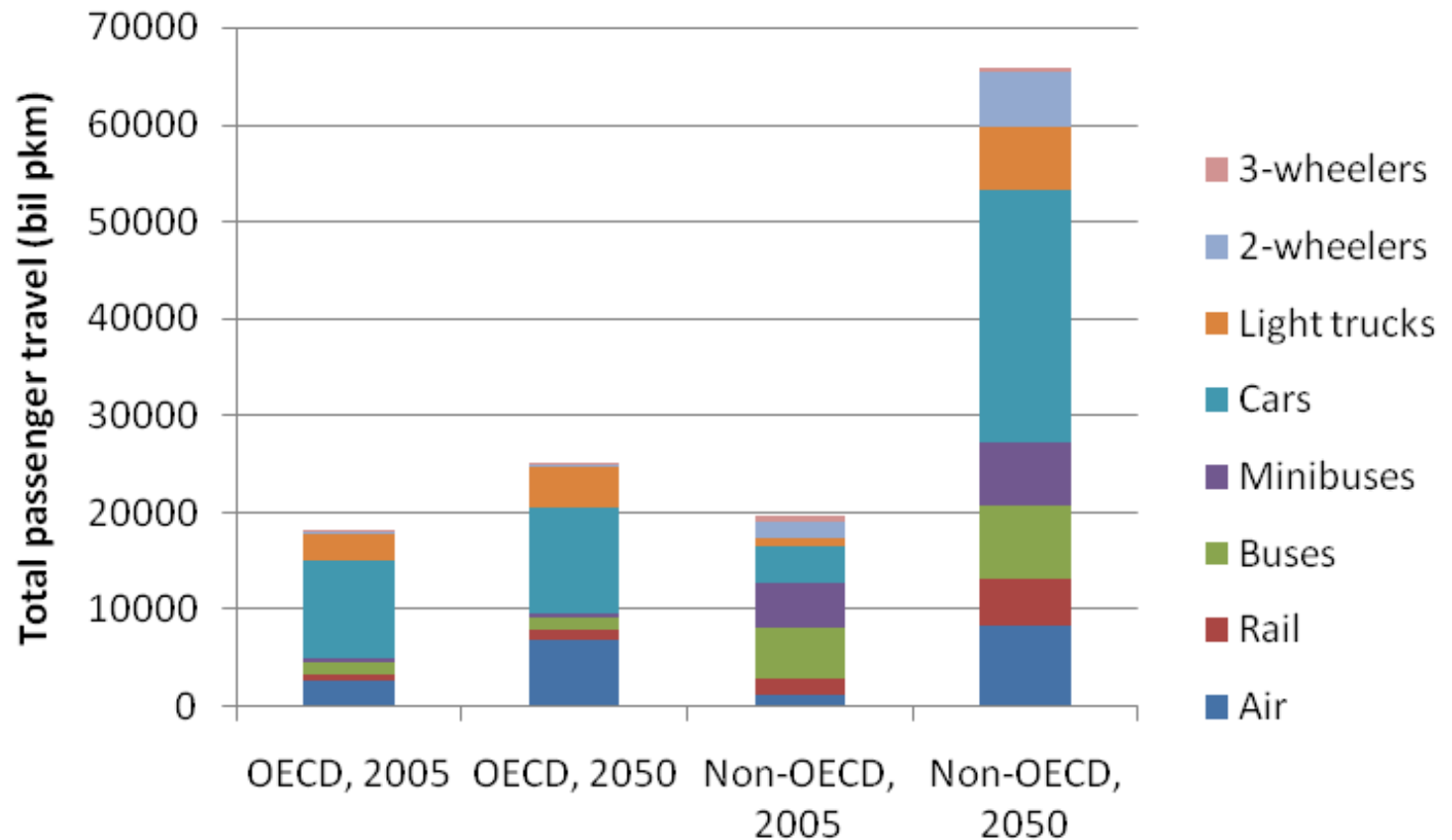
Passenger travel by mode and region, Baseline scenario

Non-OECD is where the growth happens, though from a far lower base per capita than OECD

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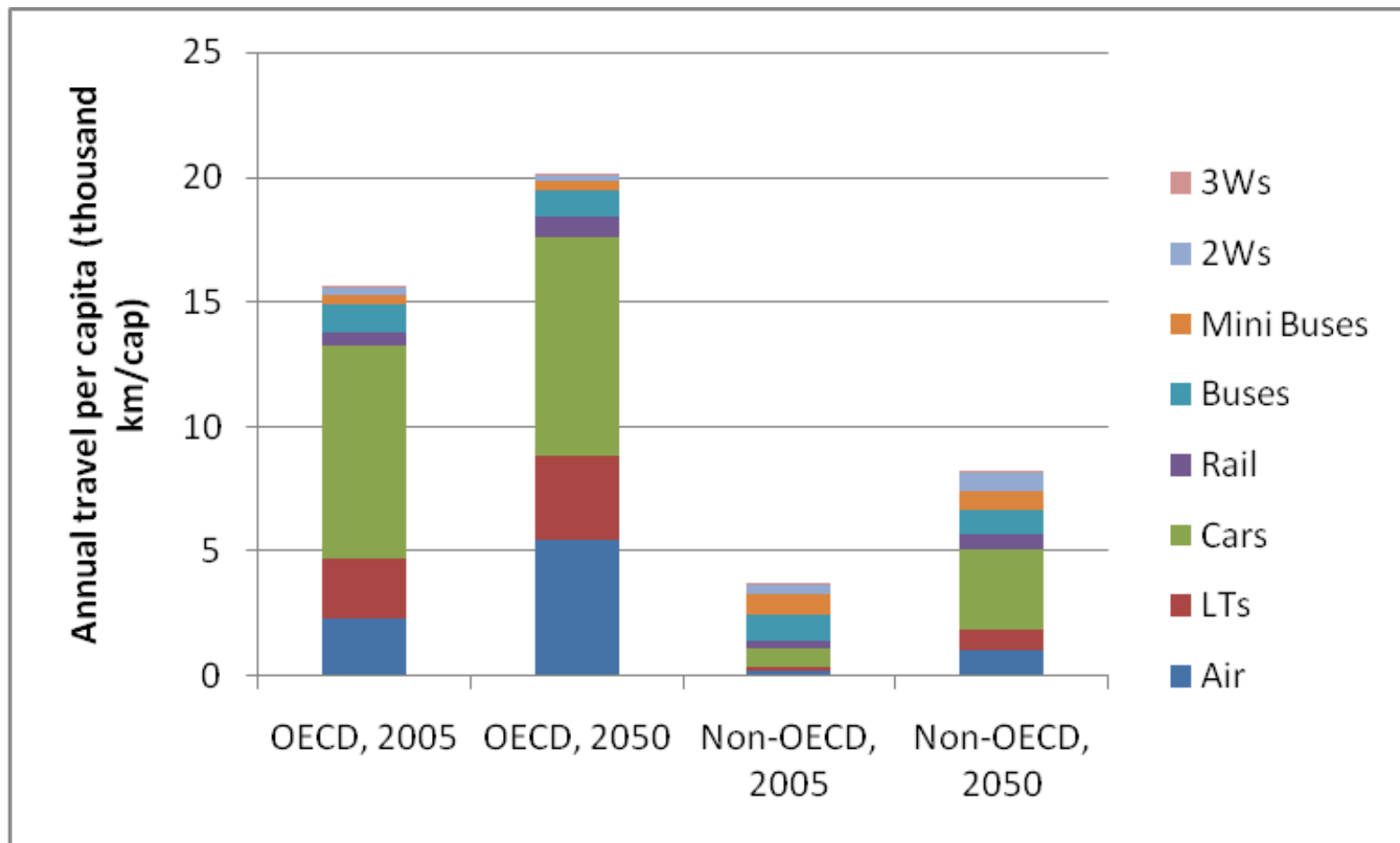
Total



Passenger travel by mode and region, Baseline scenario

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Per capita

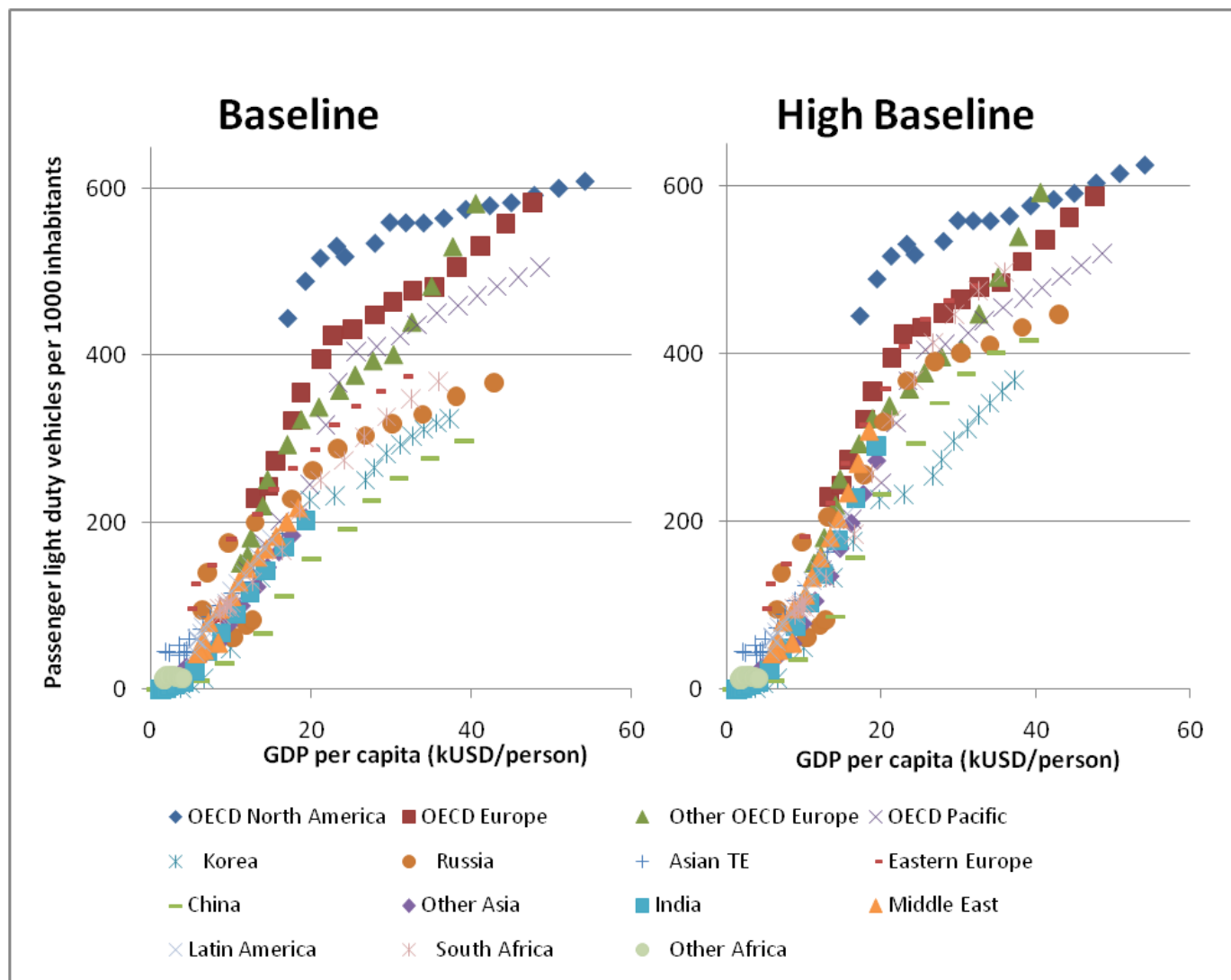


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Car ownership projections

The difference between 2 and 3 billion cars in 2050...



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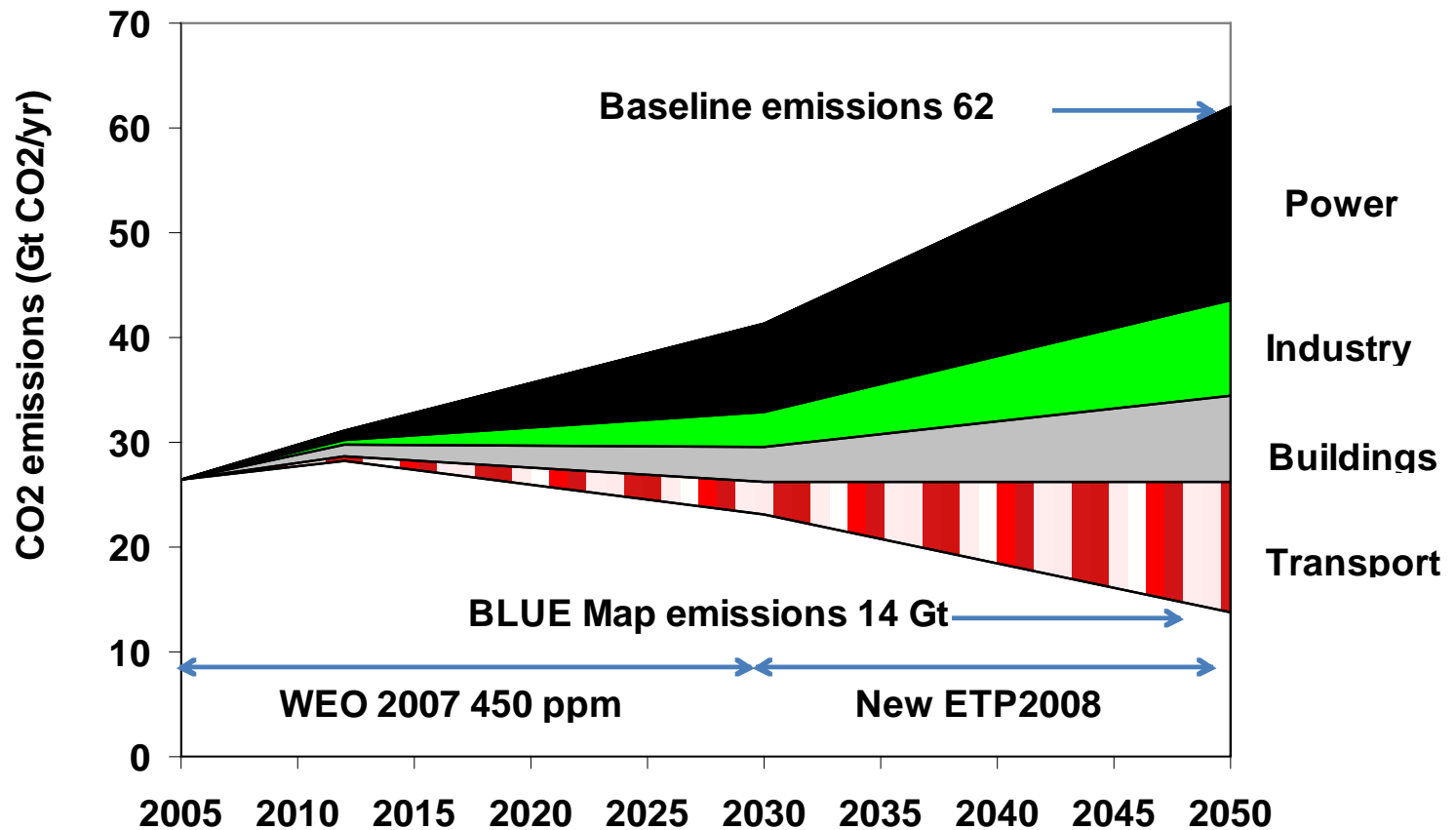
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We need at least a 50% CO₂ cut globally by 2050

IEA ETP 2008: Where reductions come from

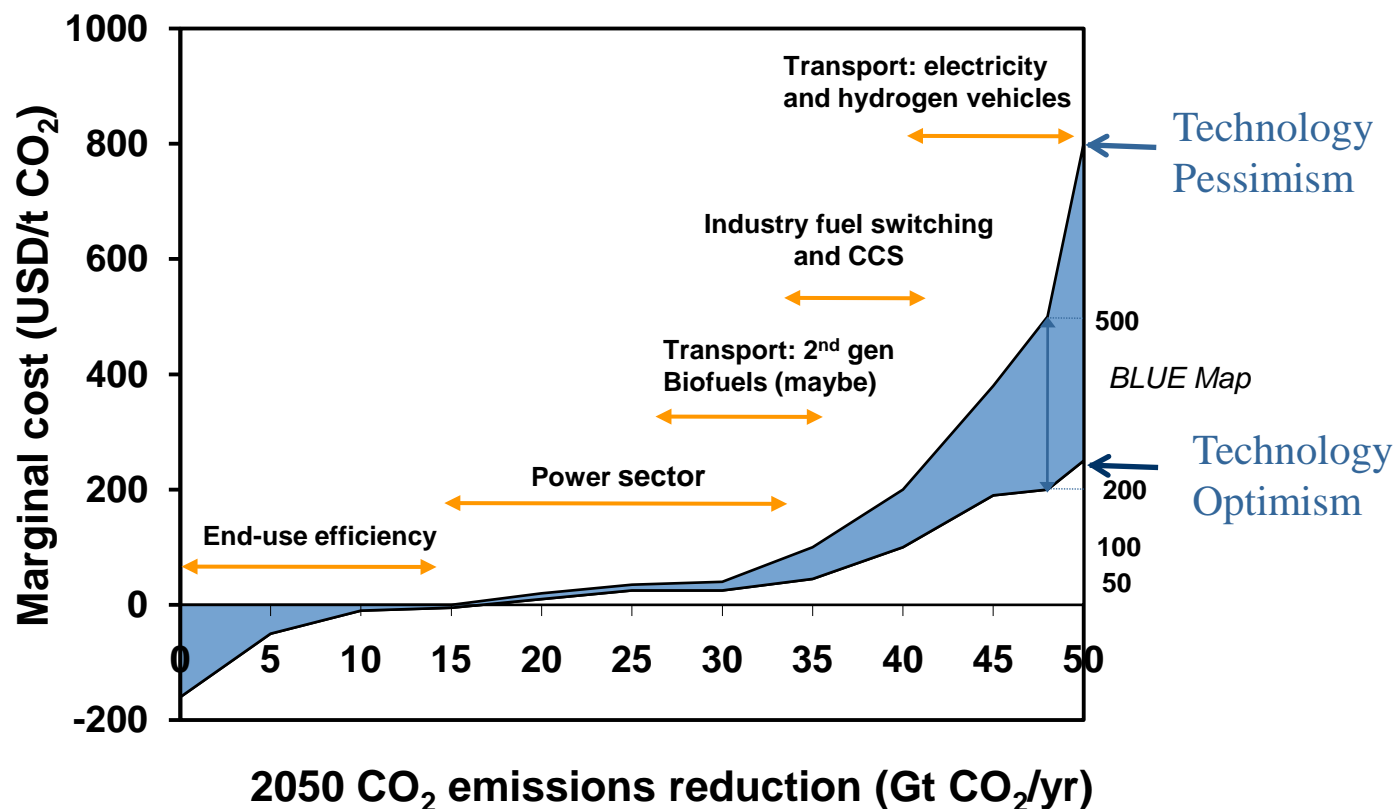
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A New Energy Revolution?

ETP 2008 Cost Curve



Reducing emissions by 50% would require options with a cost up to USD 200/t, possibly even up to USD 500/t CO₂

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Key Findings

- **Baseline (WEO Reference Case) transport fuel use 80% higher by 2050; a new High Baseline reaches 25% higher energy use in 2050**
 - **Mainly dependent on car sales projections and freight sensitivity to economic growth**
- **Fuel economy improvement remains among most cost-effective measures**
 - **Can reach 50% improvement for LDVs and 30-50% for other modes by 2050 or before**
- **Alt fuels still critical, though biofuels concerns growing; electrification may be key**
 - **Biofuels still important but concerns about sustainability are growing; a roadmap for achieving 2050 levels in BLUE is needed**
 - **Costs for batteries and fuel cells are dropping; EVs may reach commercial production very soon**
 - **PHEVs appear to be a promising transition strategy**

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Key Findings (cont.)

- Additional reductions can come from changes in the nature of travel
 - Modal shift analysis suggests that a 25% reduction from 2050 Baseline is feasible (almost 50% compared to High Baseline), though more work is needed on the costs and policies to get there
 - Technologies such as Bus Rapid Transit will be important, but ultimately its about land use planning and a comprehensive approach to travel policies.
- Together modal shift, efficiency improvements and alt fuels could cut transport CO2 by 70% compared to baseline in 2050 (40% below 2005)
 - More technology cost work is needed for aviation and shipping, but initial assessment suggests that many relatively low cost opportunities may be available.
 - For LDVs, 80% reduction in CO2 by 2050 at under 200 USD/tonne in that year

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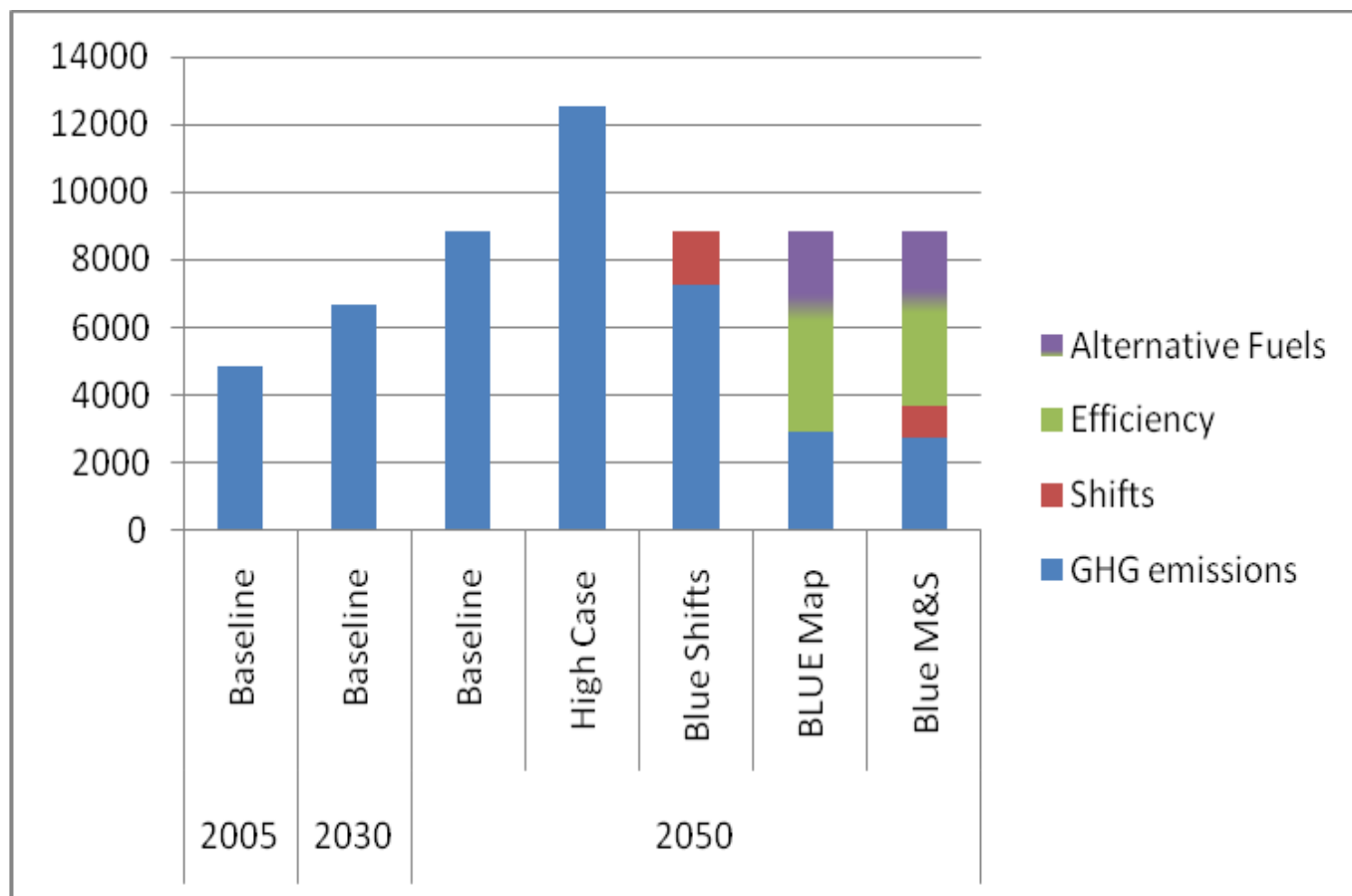
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Passenger Transport CO₂ and reductions by scenario

megatonnes per year

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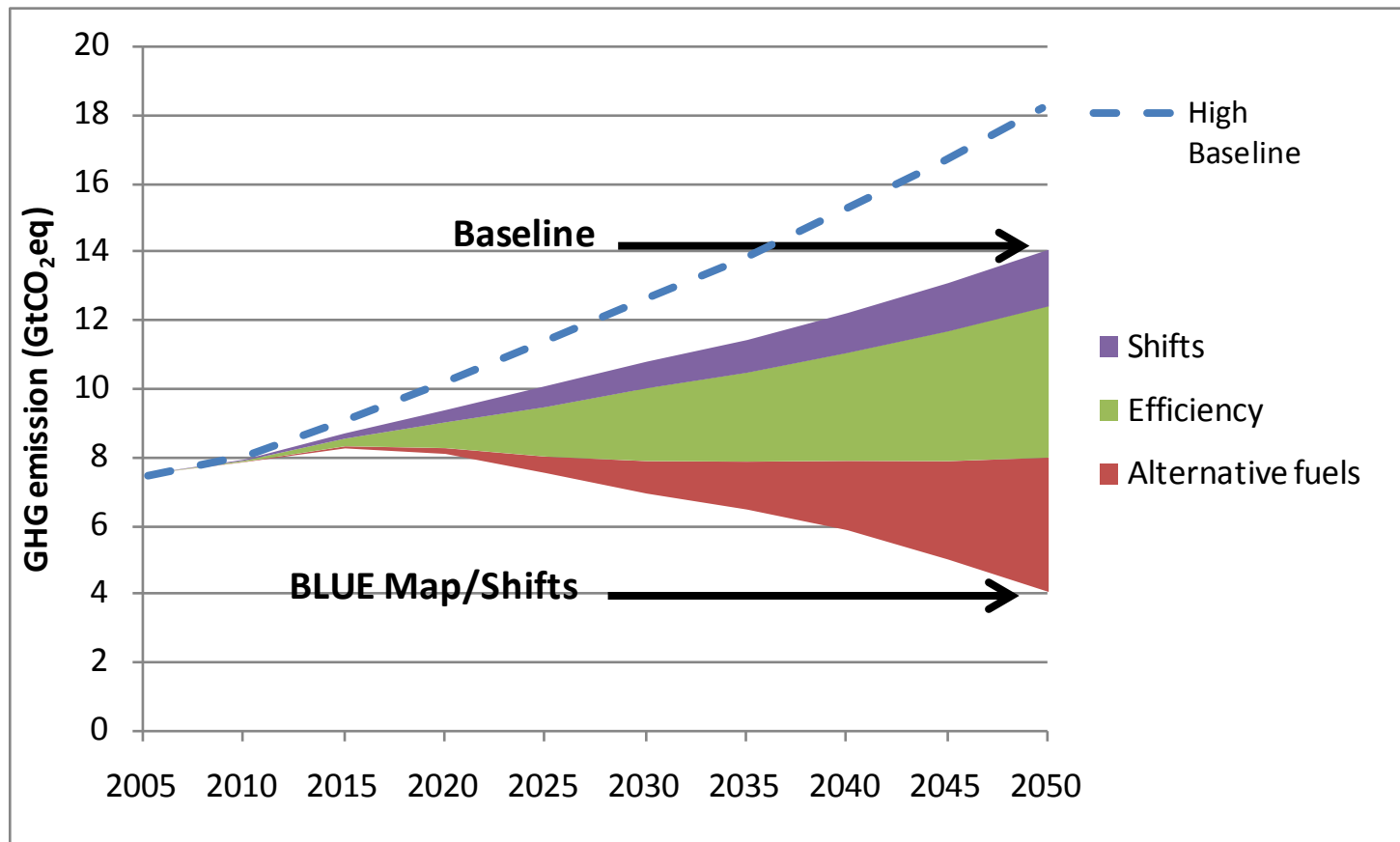


Transport CO₂ reductions in BLUE Map/Shifts

A 3-part evolution...

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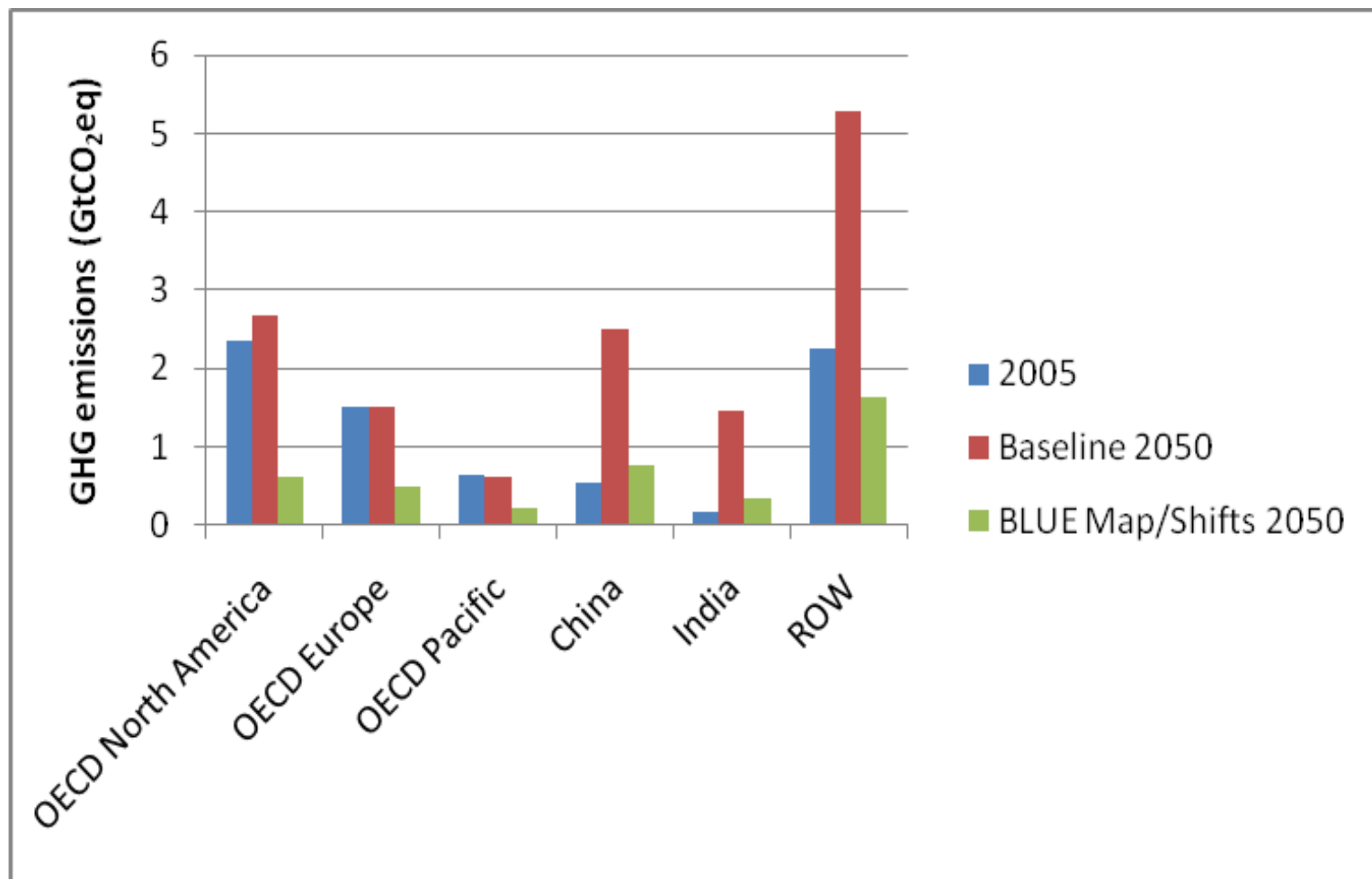
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GHG Emissions by Region and Scenario

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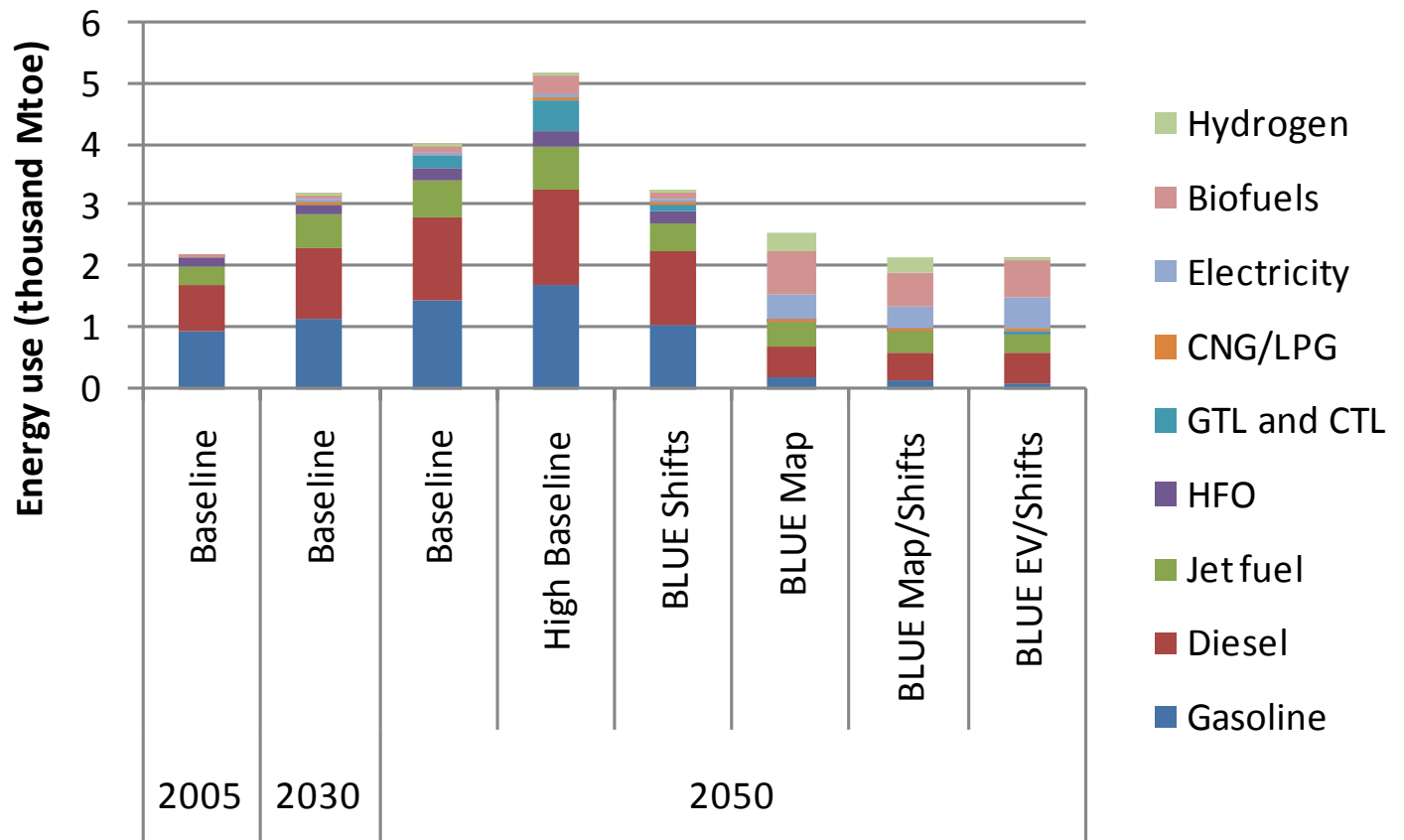


Energy use by scenario

In BLUE Map/shifts, energy use returns to 2005 level, and with more than 50% very low CO₂ fuels

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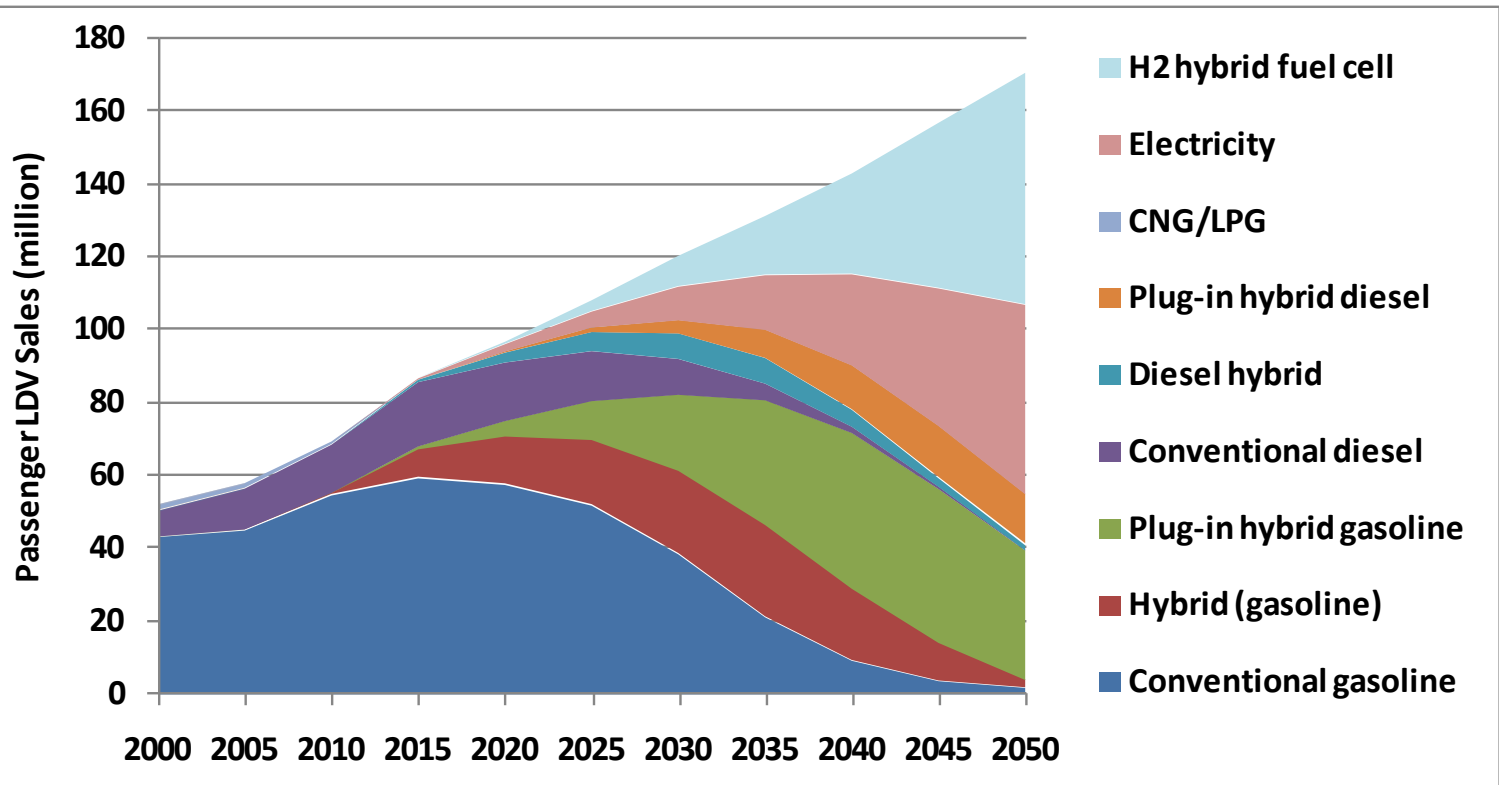


LDV sales profile to 2050 in the BLUE Map scenario

Unprecedented rates of change to advanced technologies

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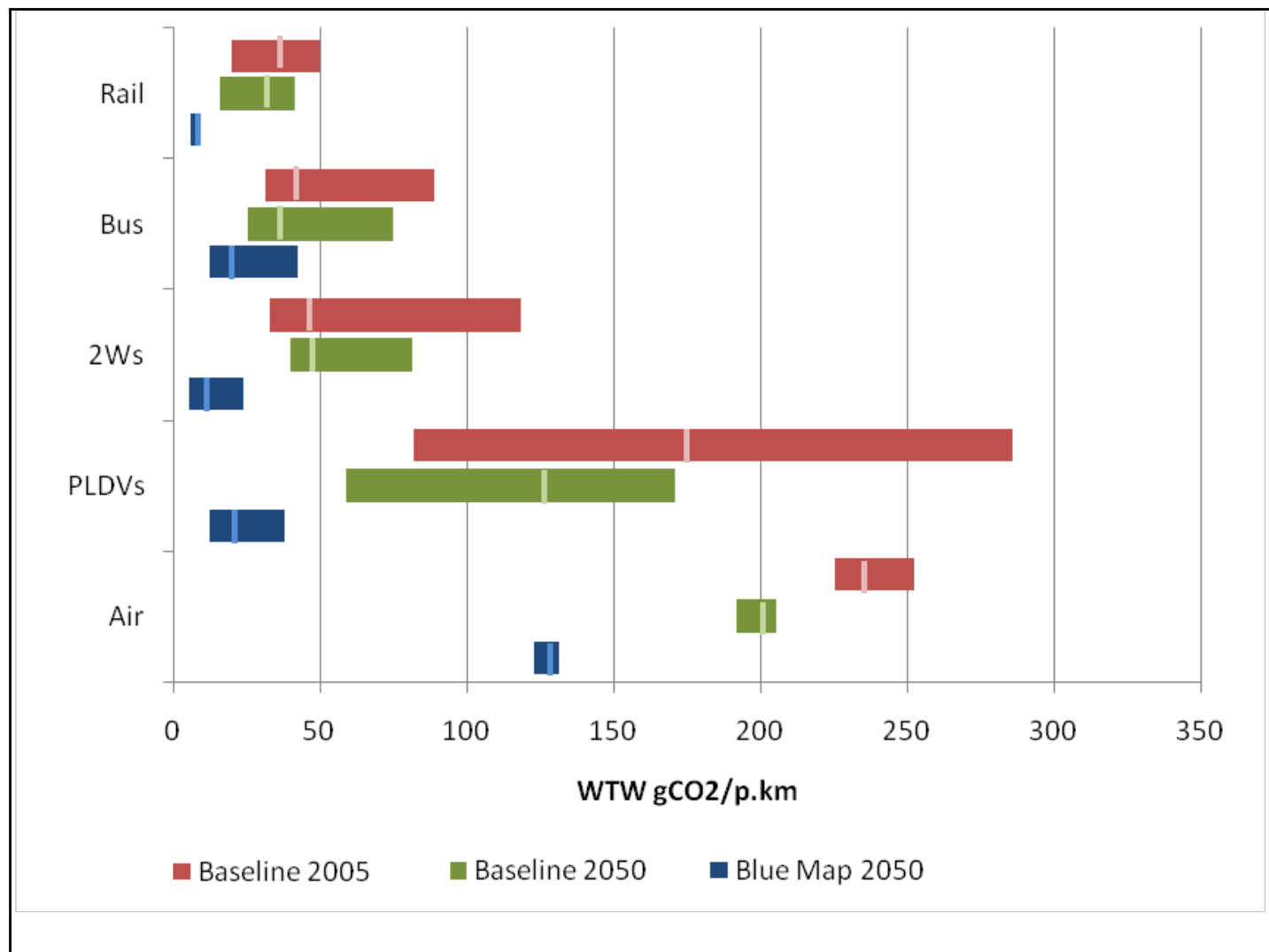


GHG intensity by mode and scenario

Through a combination of efficiency and fuel switching, surface modes become extremely low CO₂ by 2050 in BLUE

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IEA EV/PHEV Roadmapping Effort

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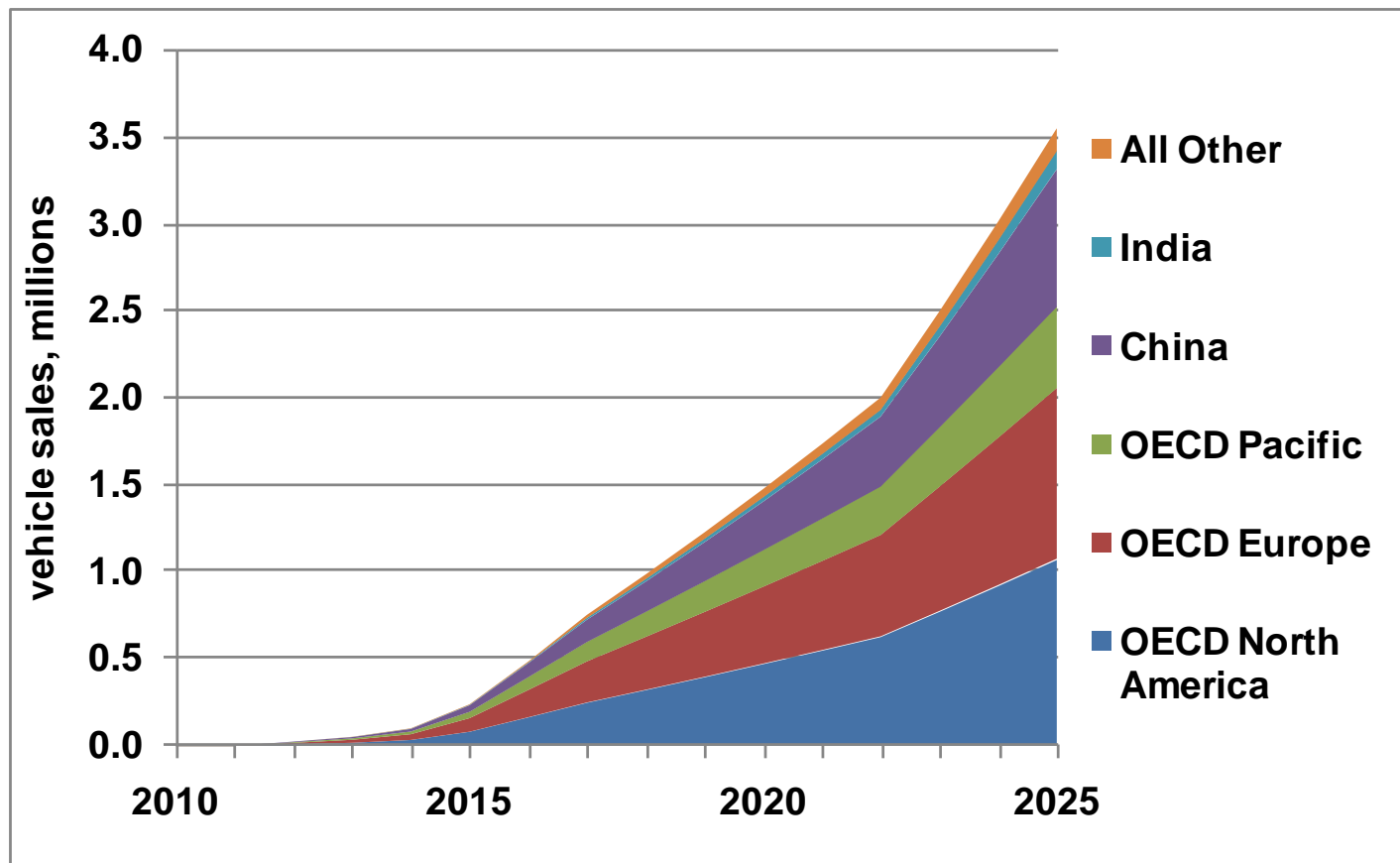
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- Develop a common view on how an EV/PHEV “roll-out” could occur over next 10-20 years
- Identify key actions for governments, stakeholders
- Understand where international collaboration/coordination is needed
- Cover R&D, vehicle deployment infrastructure, investment requirements
- Workshop held in January 2009; draft report by end of June; publication of report by October

Possible EV Sales trajectory to 2025 – can we do this?

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2015: 250,000: 10 models selling 25,000 each?

2020: 1.5 million: 20 models selling 75,000 each?

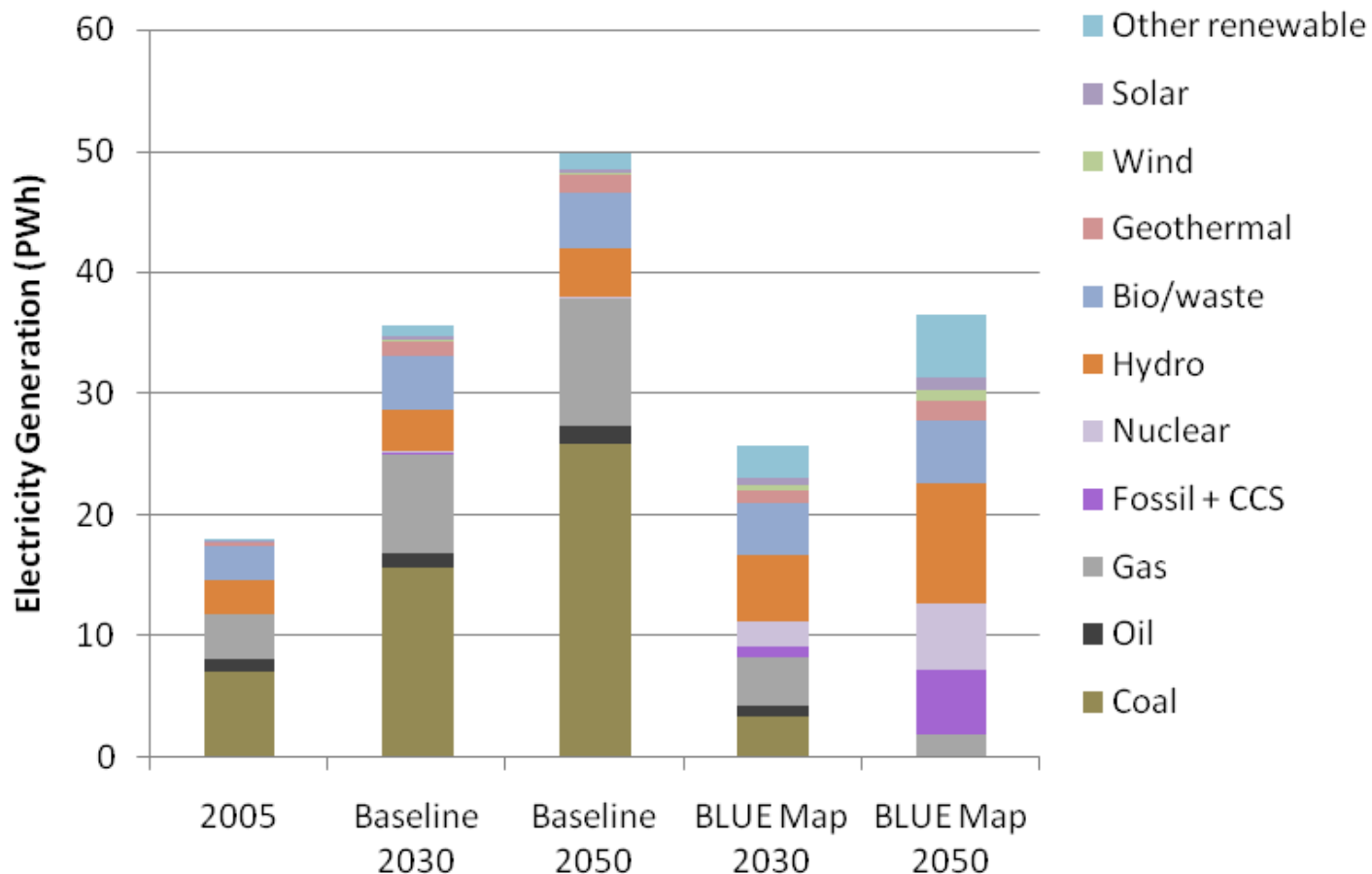
2025: 3.6 million: 30 models selling 120,000 each?

Electricity generation worldwide, by scenario and year

BLUE Map lower than Baseline in 2050 despite strong shift toward electricity, including EVs

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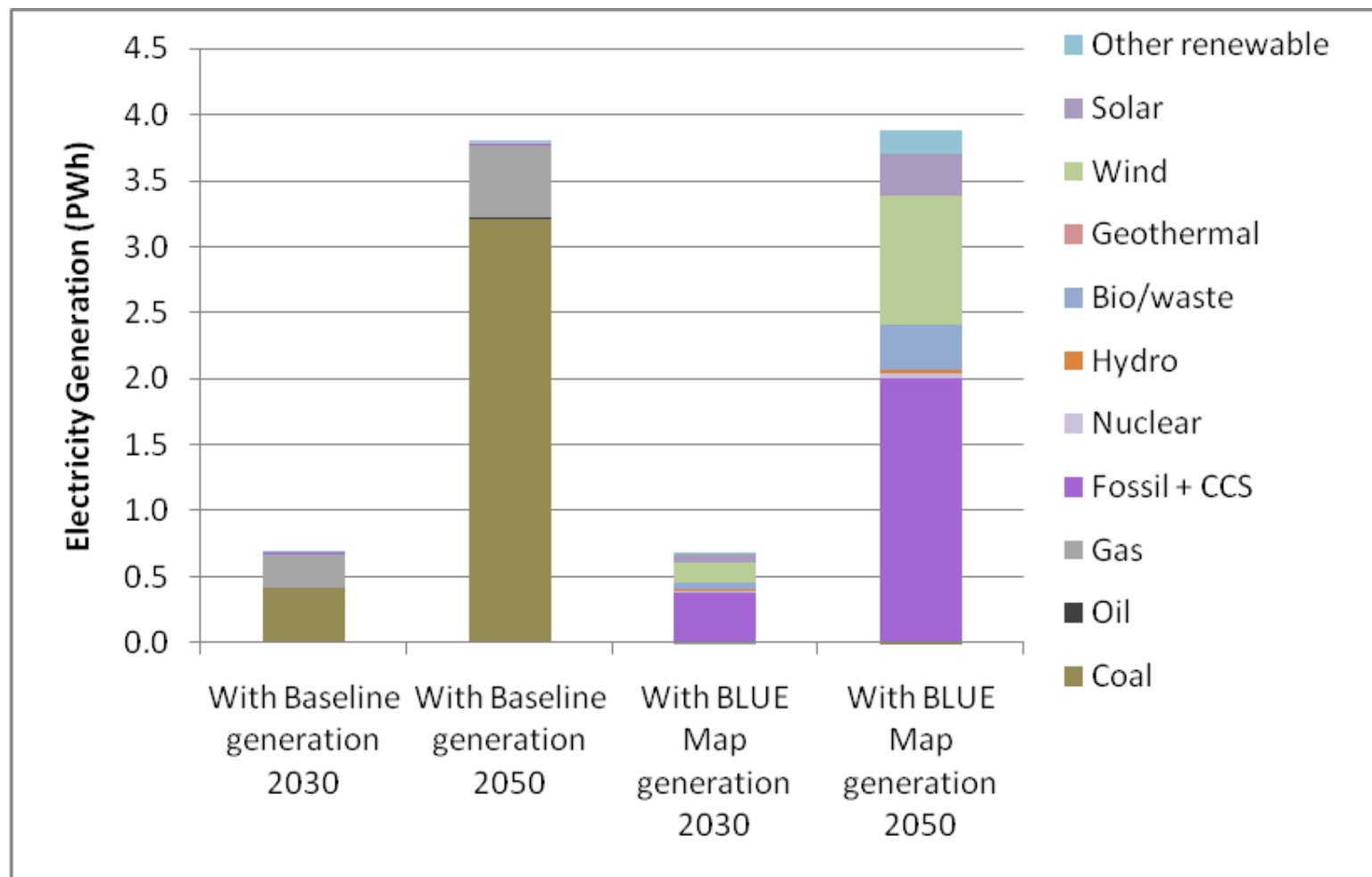


Incremental electricity generation for EVs and PHEVs in BLUE Map

Requires 7-10% more generation, but what kind will we get?

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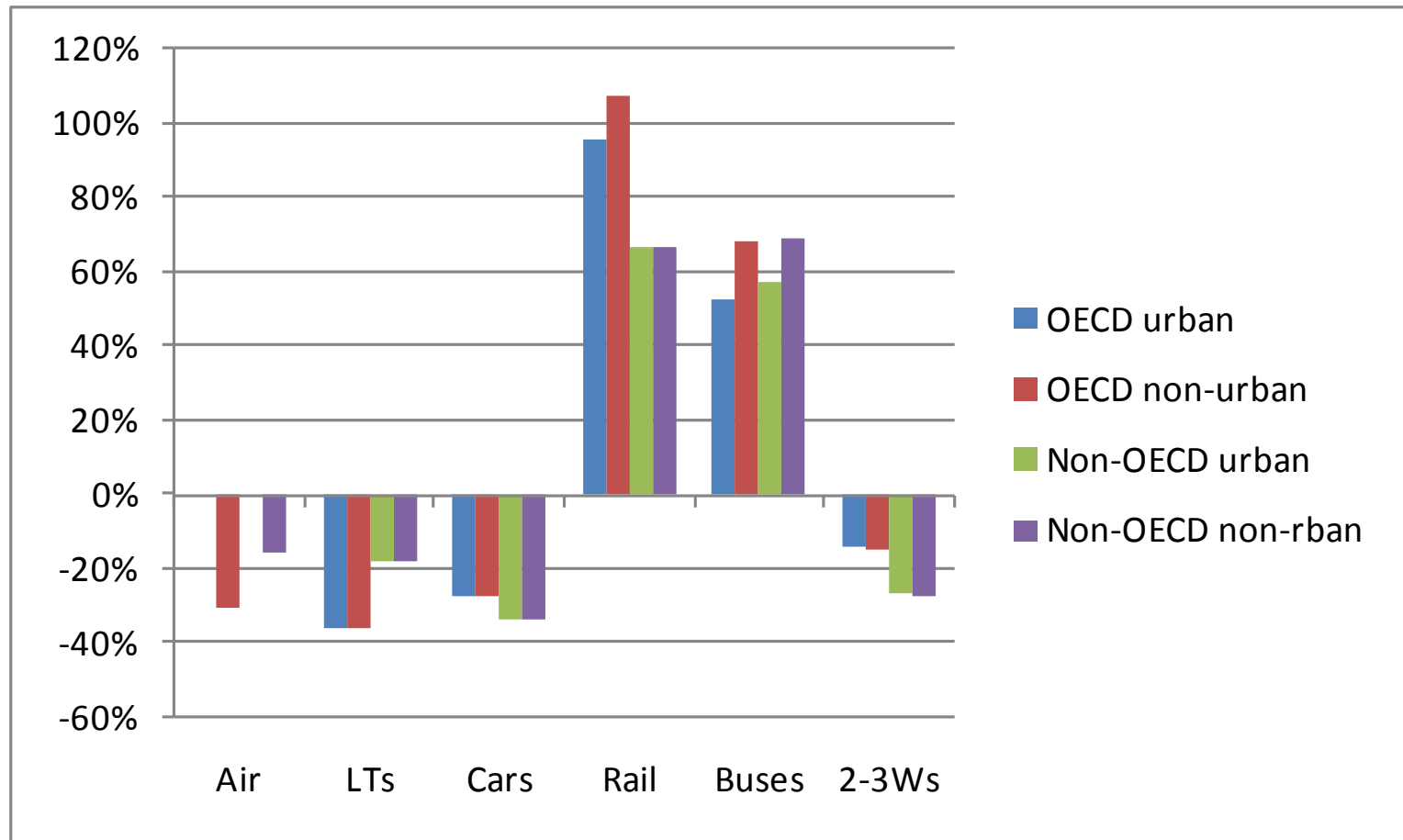


Changes from Baseline to BLUE Shifts case in 2050

Shifting 25% of LDV and air travel can cut total energy use by 20% in 2050

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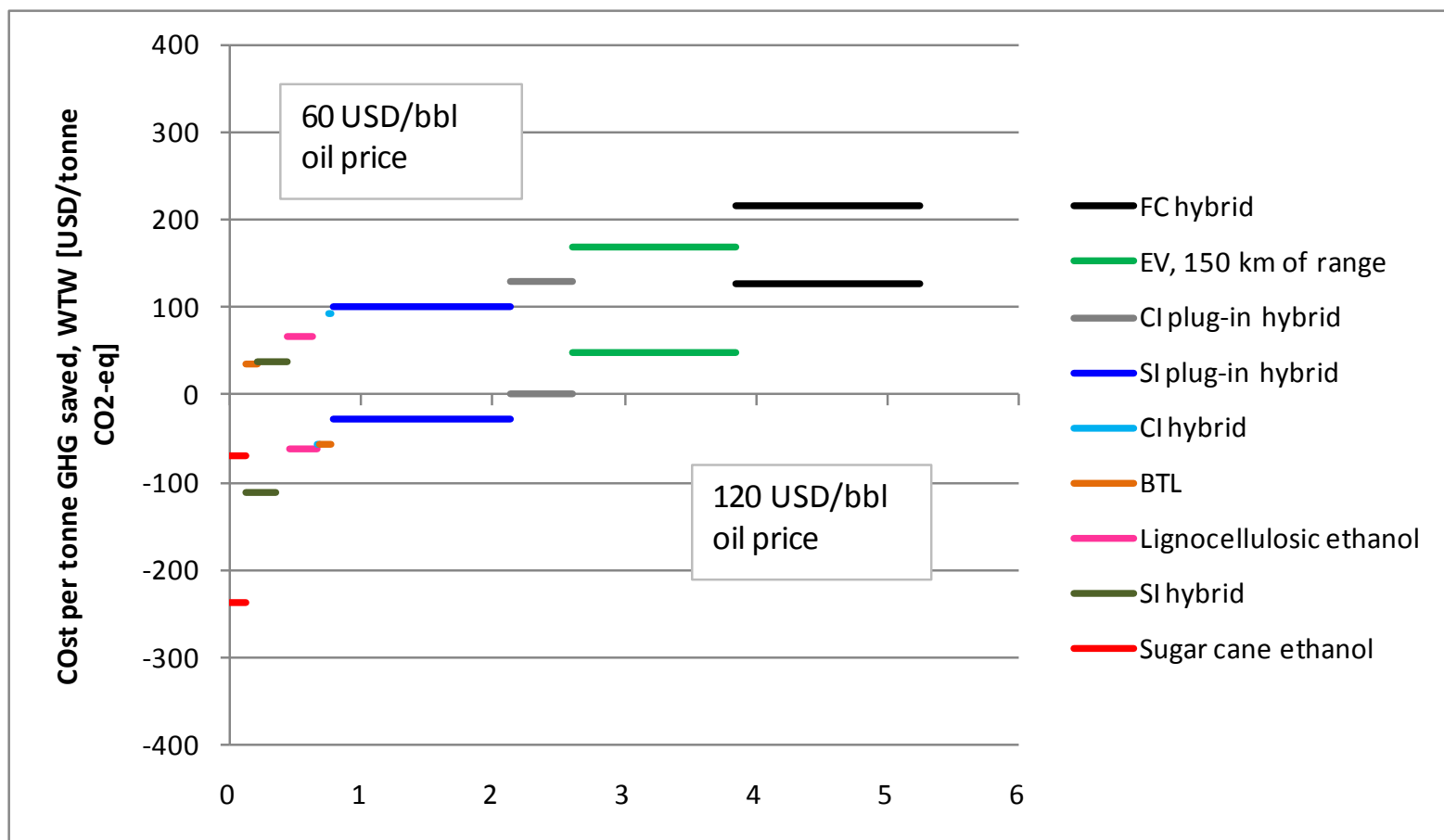
What will all this cost?

BLUE Map Cost Curves:

The price tag is very uncertain, but by 2050 it might be pretty affordable...

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Um, Policies?

- Clearly we will need strong policies both internationally and at national levels (and local!)
 - International framework especially critical for air and maritime transport
 - Carbon price, yes – but \$50/tonne is only \$0.12/litre for gasoline
- National measures should include:
 - Fuel economy standards on all types of vehicles – 30-50% reductions in energy intensity by 2050 seem possible for most
 - 2nd Gen Biofuels – yes – but we should not push this too fast! Low carbon fuel standards can help
 - EVs/FCVs but relatively high cost and massive infrastructure investments and coordination will be needed
 - ◆ PHEVs as an incremental approach
- Local level - land use/ modal shift policies (but national gov's can encourage)

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