INTERNATIONAL ENERGY AGENCY

Transport, Energy and CO_2: Moving Toward Sustainability

Lew Fulton, IEA

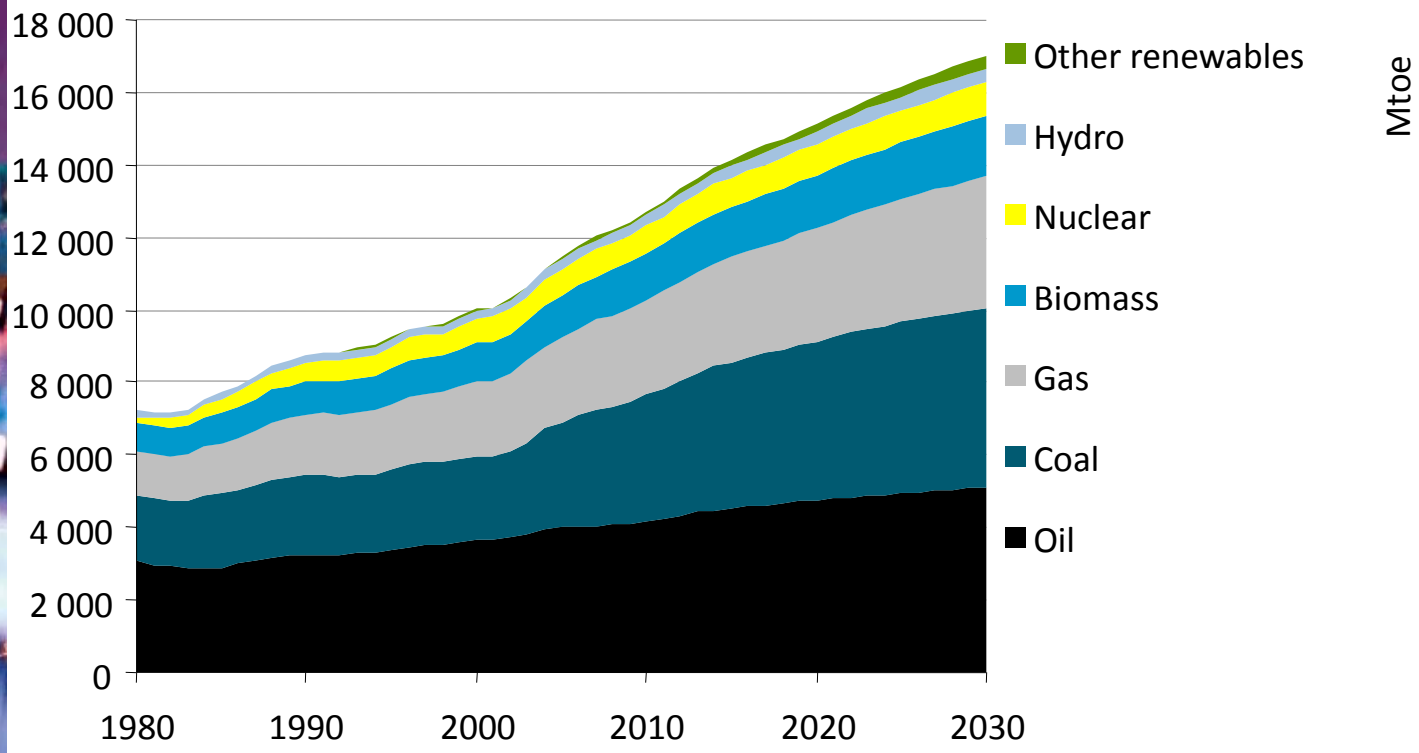
Asilomar Conference, 29 July 2009

Where are we headed? World Energy Outlook 2008

TRANSPORT, ENERGY AND CO_2

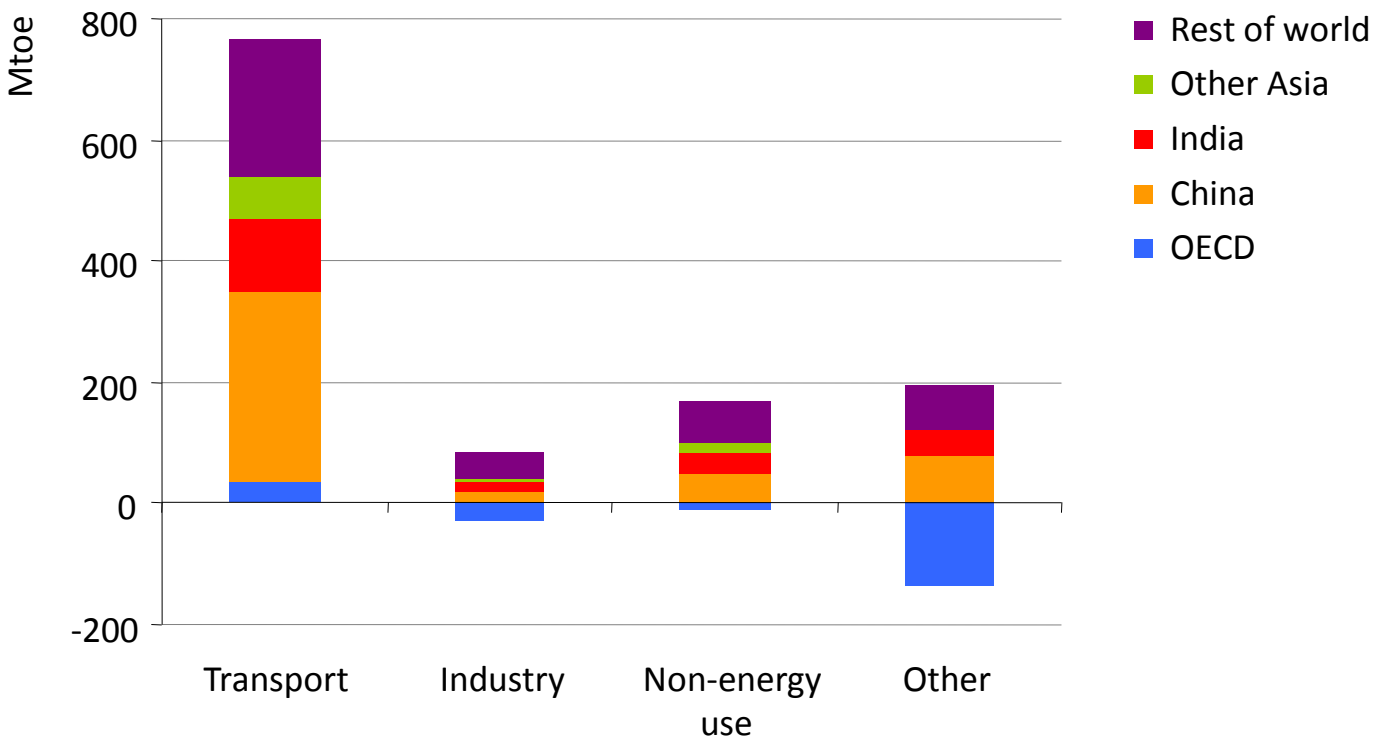
Moving Toward Sustainability

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



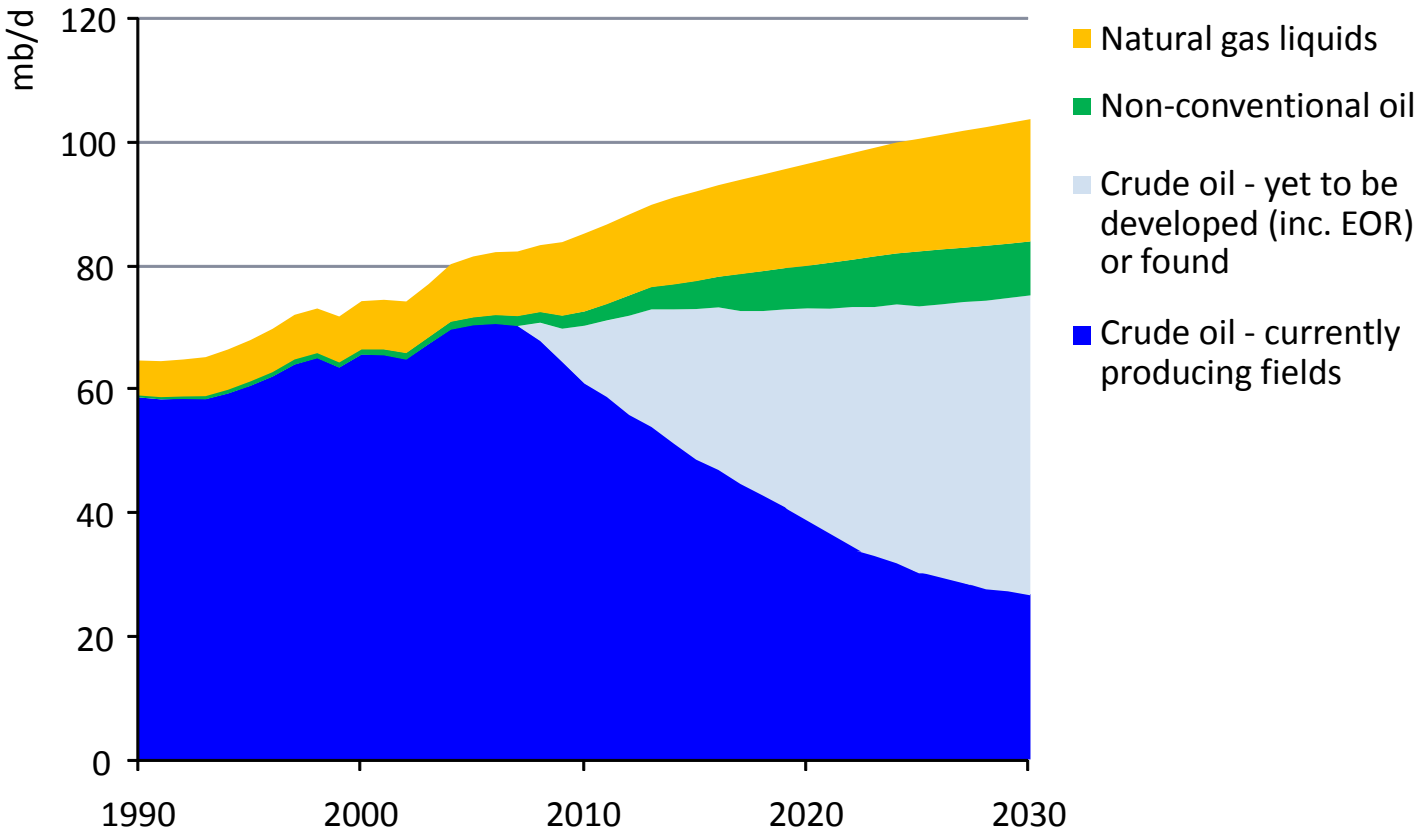
World energy demand expands by 45% between now and 2030 – an average rate of increase of 1.6% per year – with coal accounting for more than a third of the overall rise

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



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

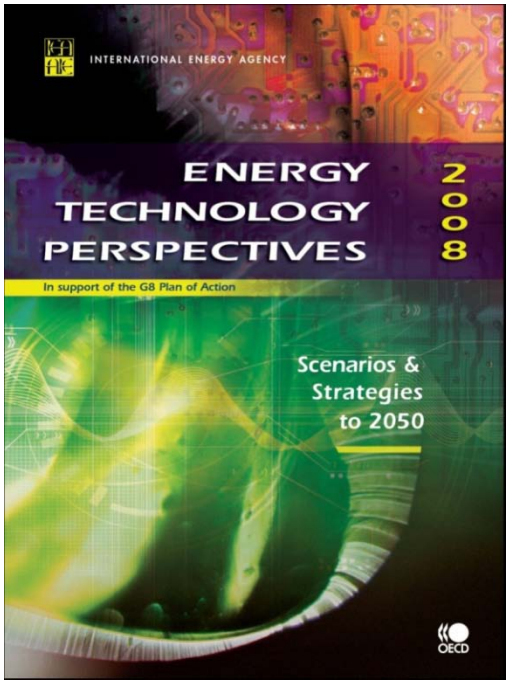
World oil production by source in the Reference Scenario



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

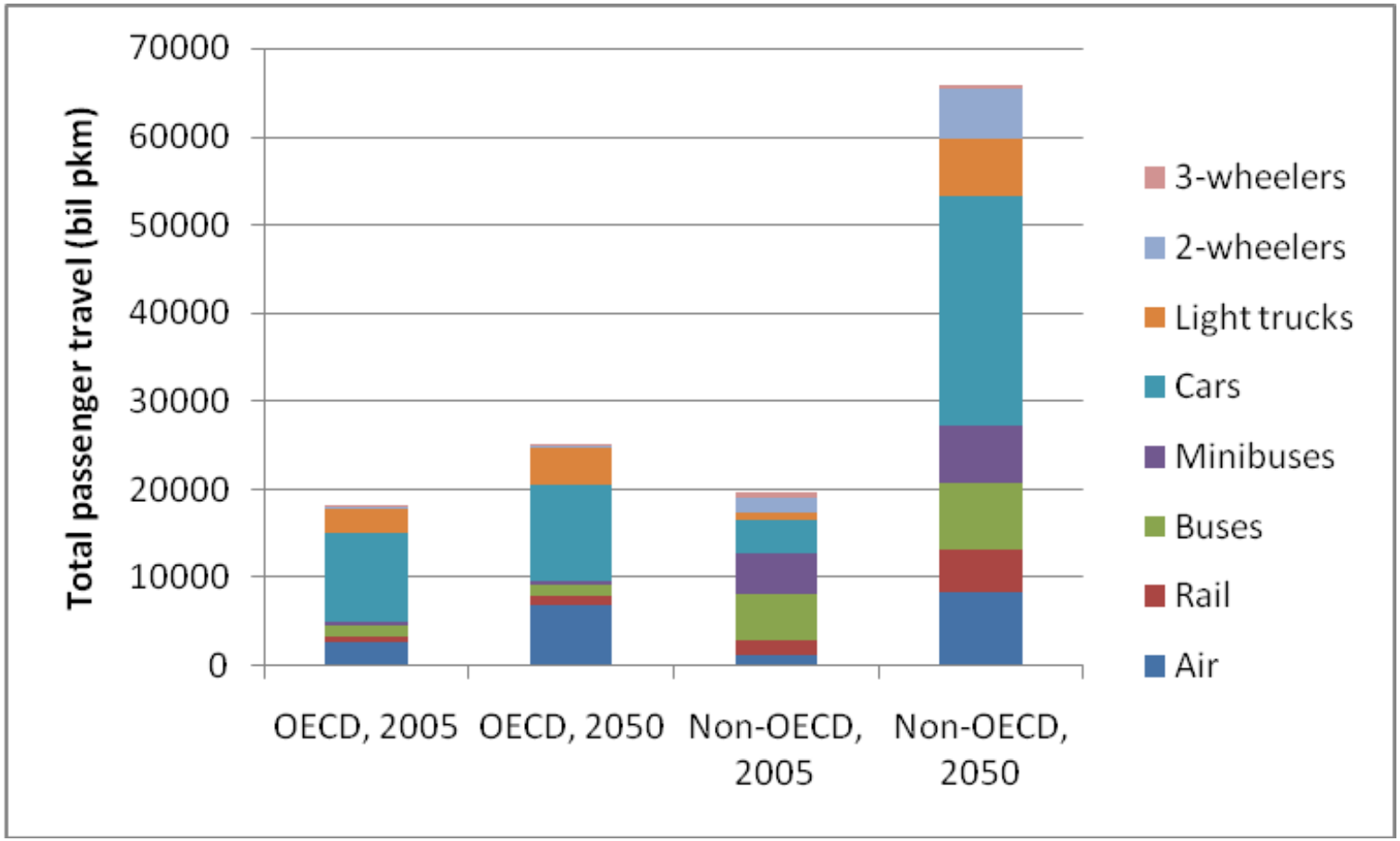
- For release September 2009
- Builds on ETP 2008, will feed into ETP 2010
- Transport analysis based on on-going development of IEA Mobility Model, supporting research
- Book features:
  - Indicator update and extension to more countries
  - Technology potential and cost updates
  - Fuel and Modal assessments (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



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

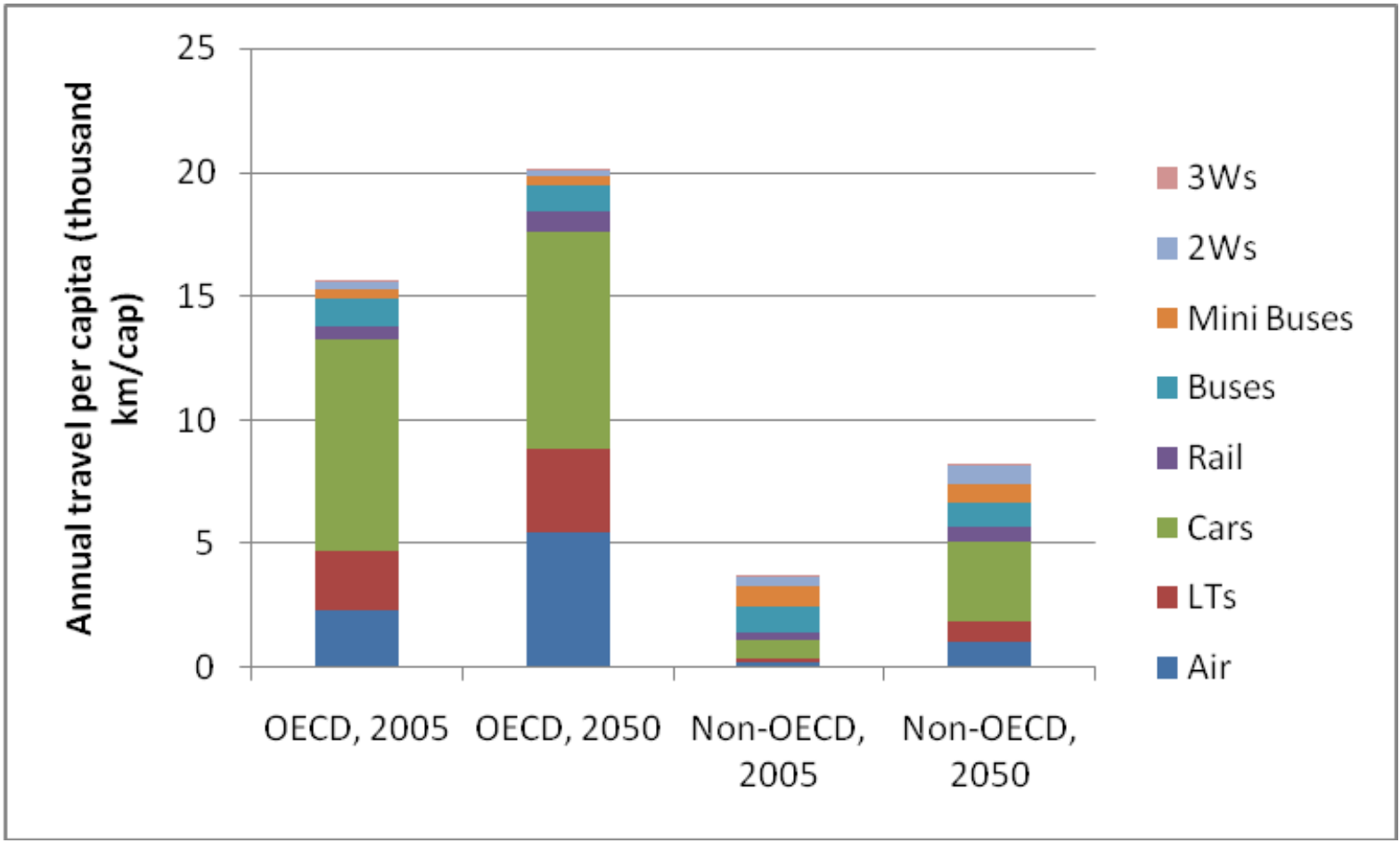
Total



Passenger travel by mode and region, Baseline scenario

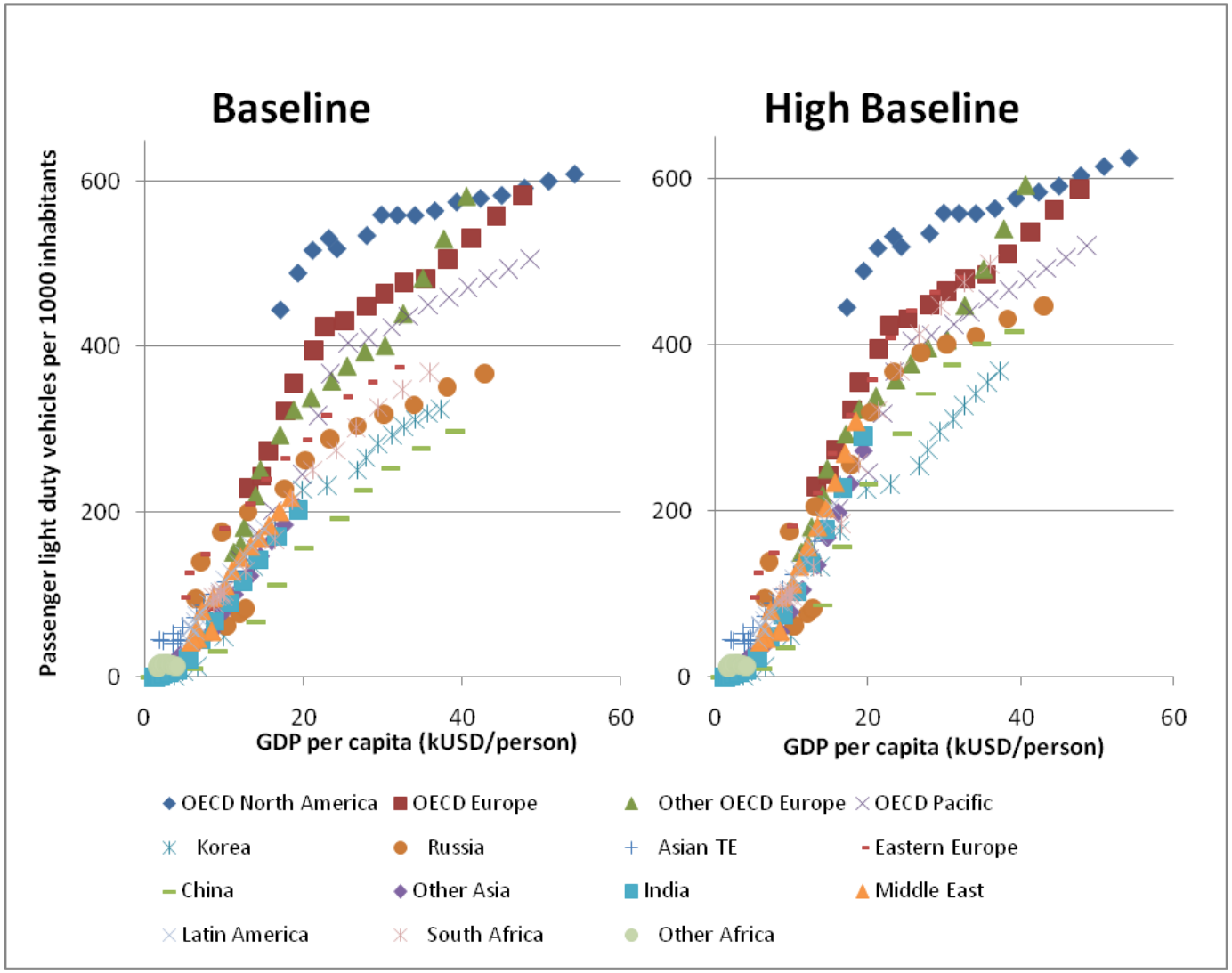
Non-OECD is where the growth happens, though from a far lower base per capita than OECD

Per capita



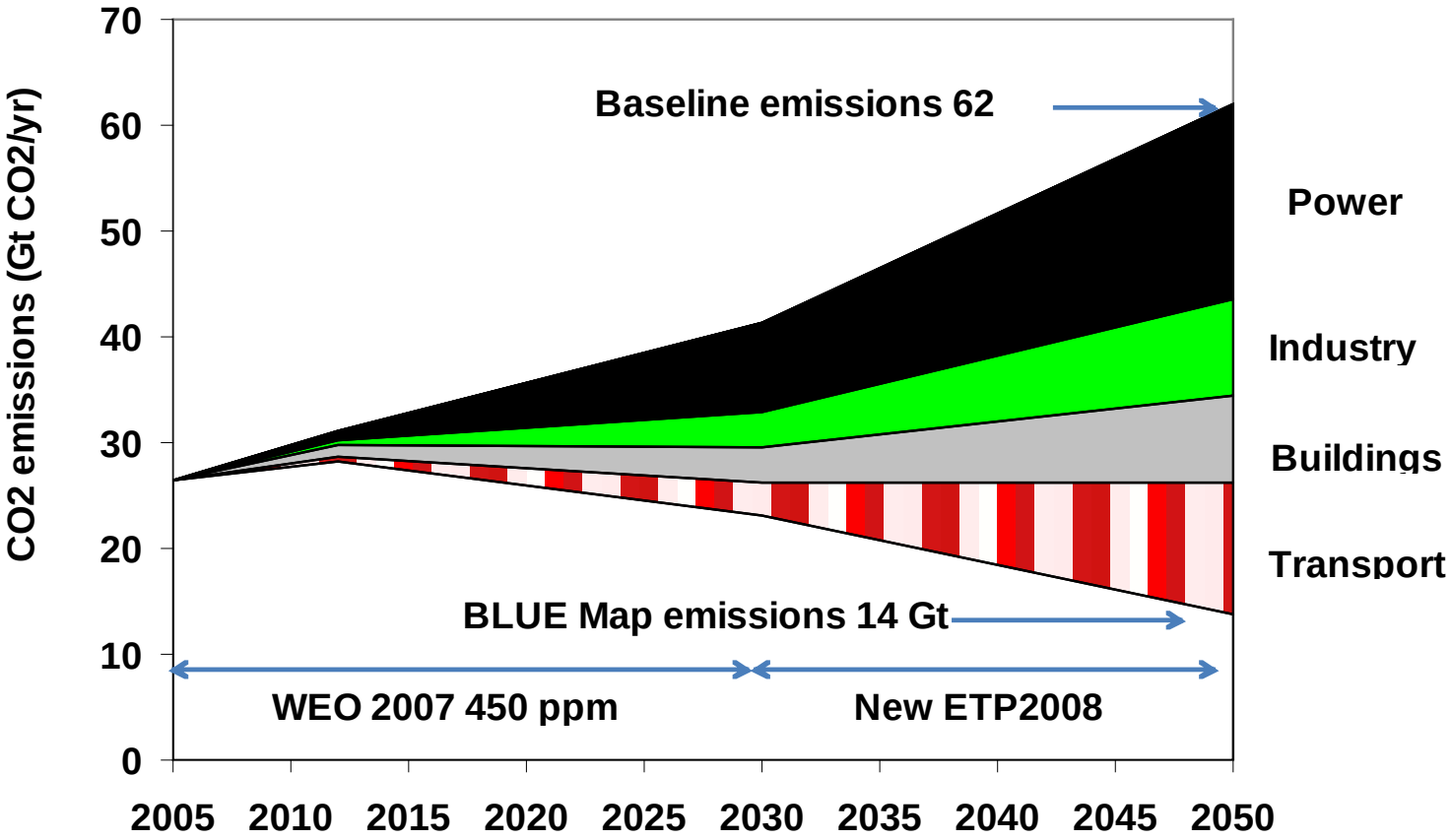
Car ownership projections

The difference between 2 and 3 billion cars in 2050…



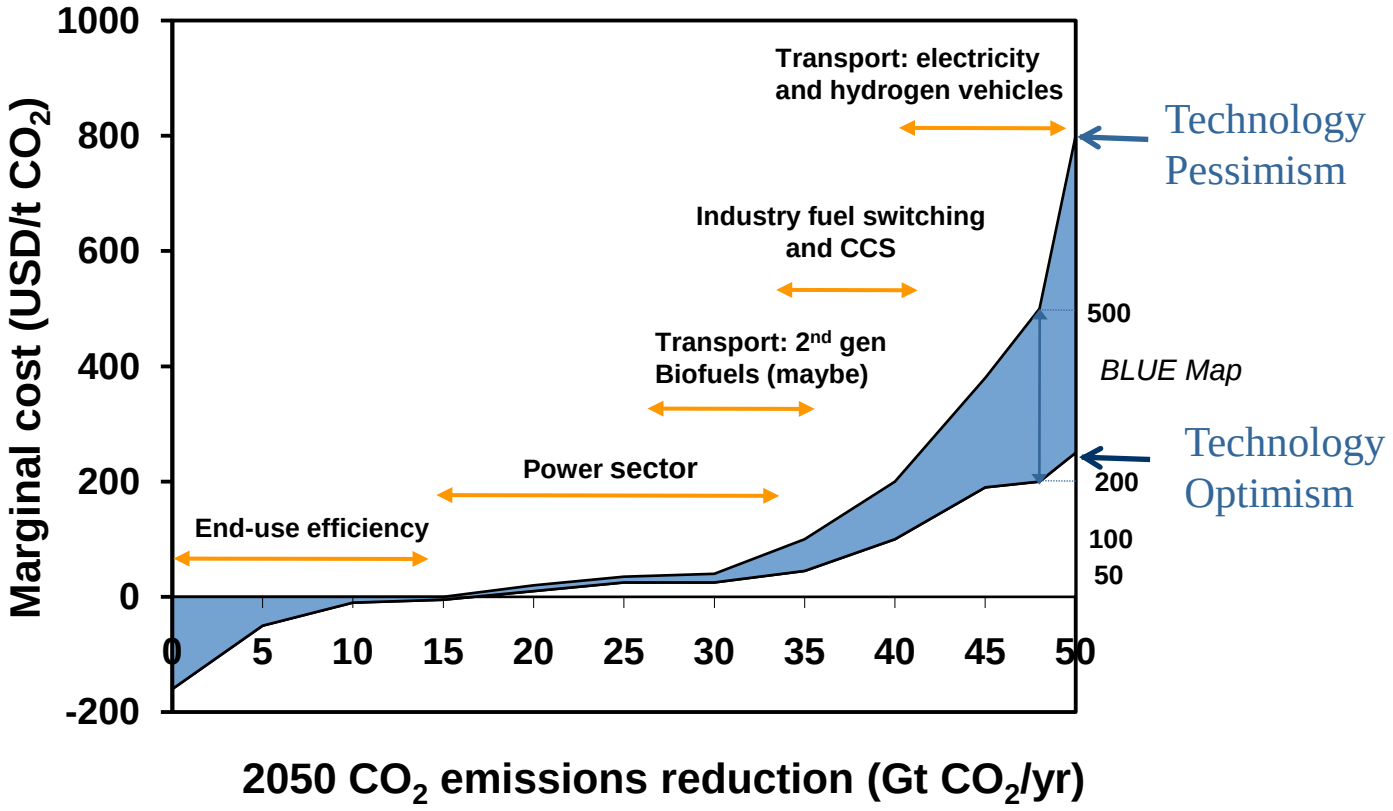
We need at least a 50% CO2 cut globally by 2050

IEA ETP 2008: Where reductions come from



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 CO_2

TRANSPORT, ENERGY AND CO_2

Moving Toward Sustainability

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

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.

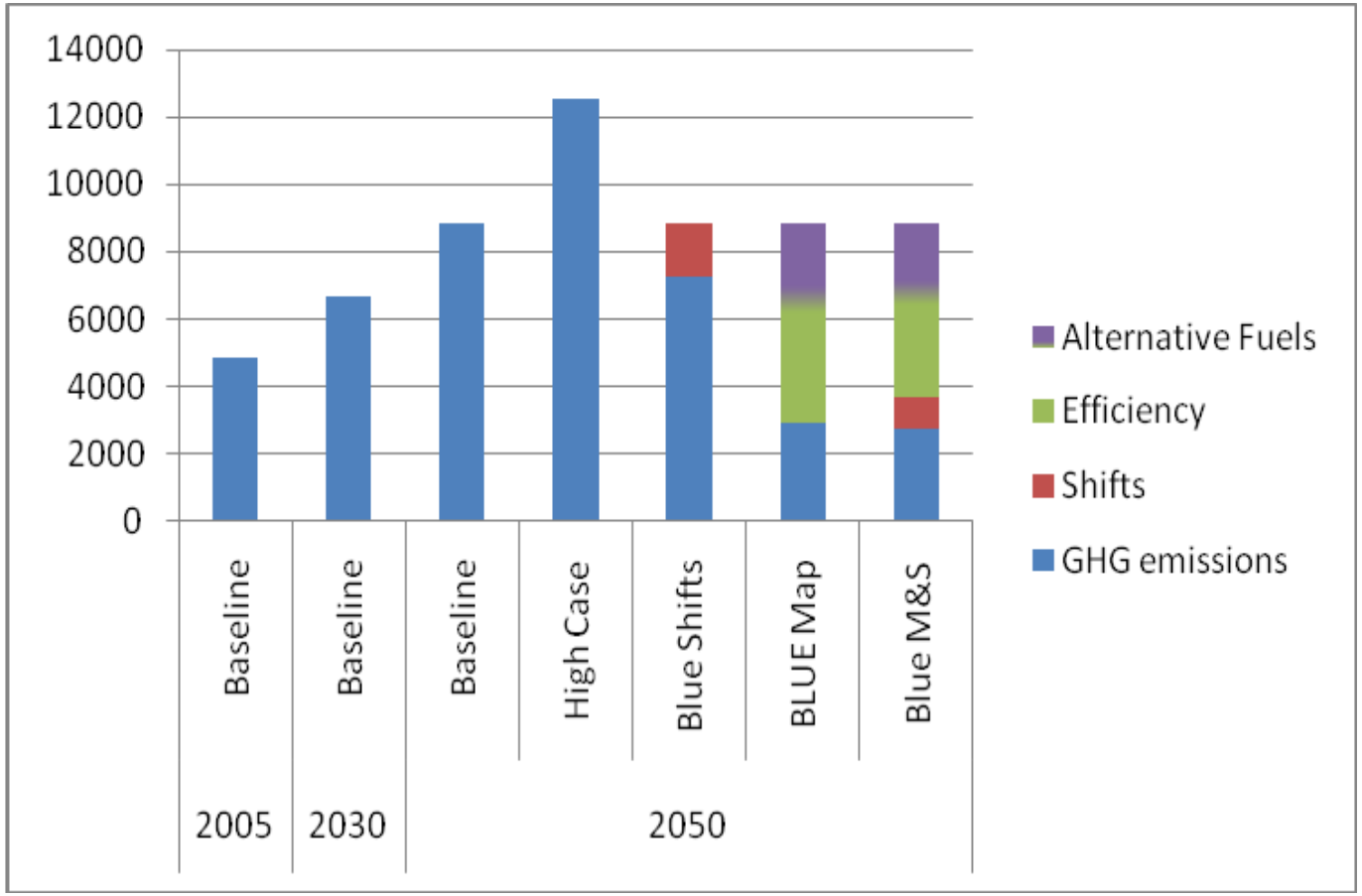
- Together modal shift, efficiency improvements and alt fuels could cut transport CO2 by 70% compared to baseline in 2050 (40% below 2005)
  - More technology cost work is needed for aviation and shipping, but initial assessment suggests that many relatively low cost opportunities may be available.
  - For LDVs, 80% reduction in CO2 by 2050 at under 200 USD/tonne in that year

TRANSPORT, ENERGY AND CO_2

Moving Toward Sustainability

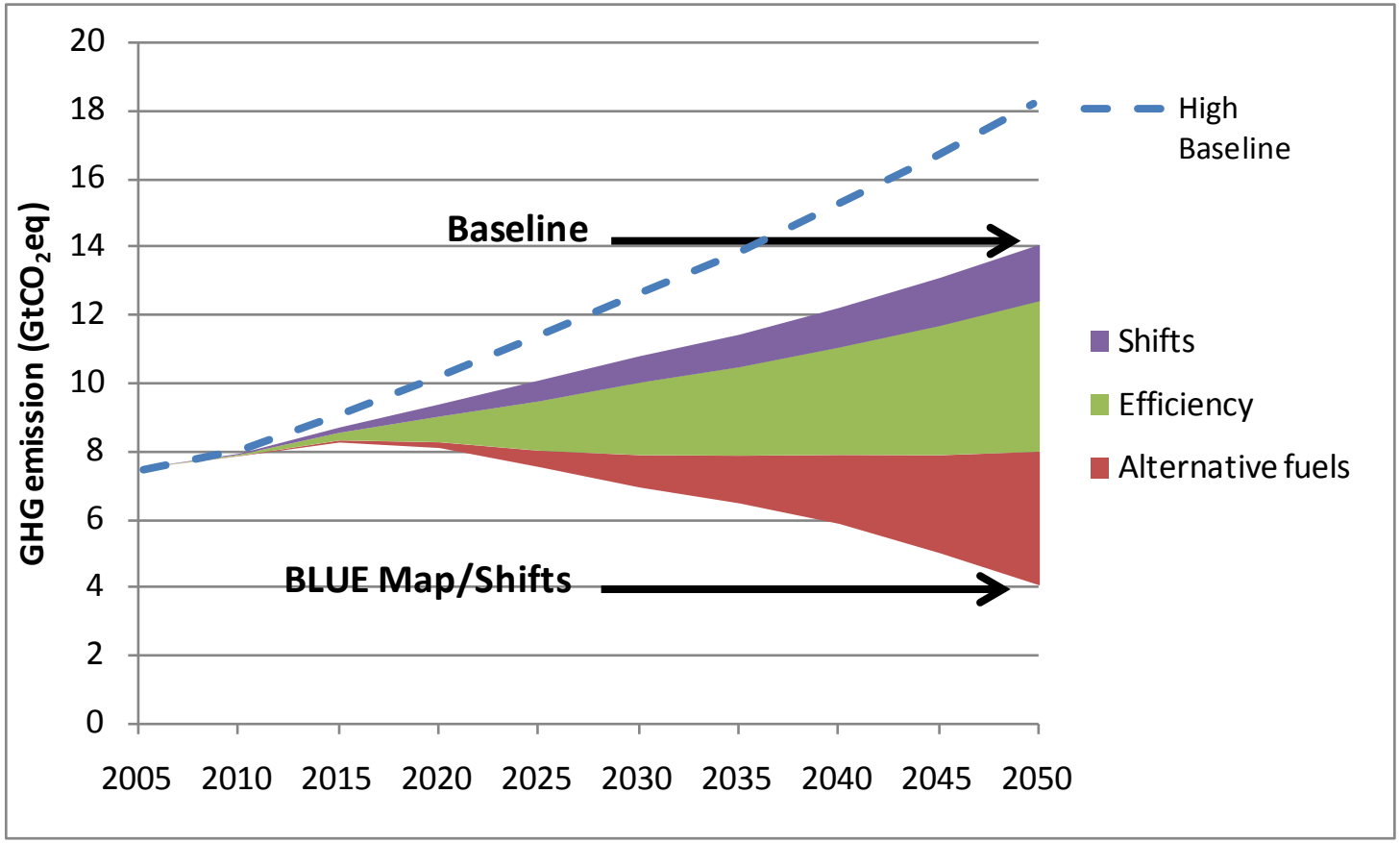
Passenger Transport CO2 and reductions by scenario

megatonnes per year

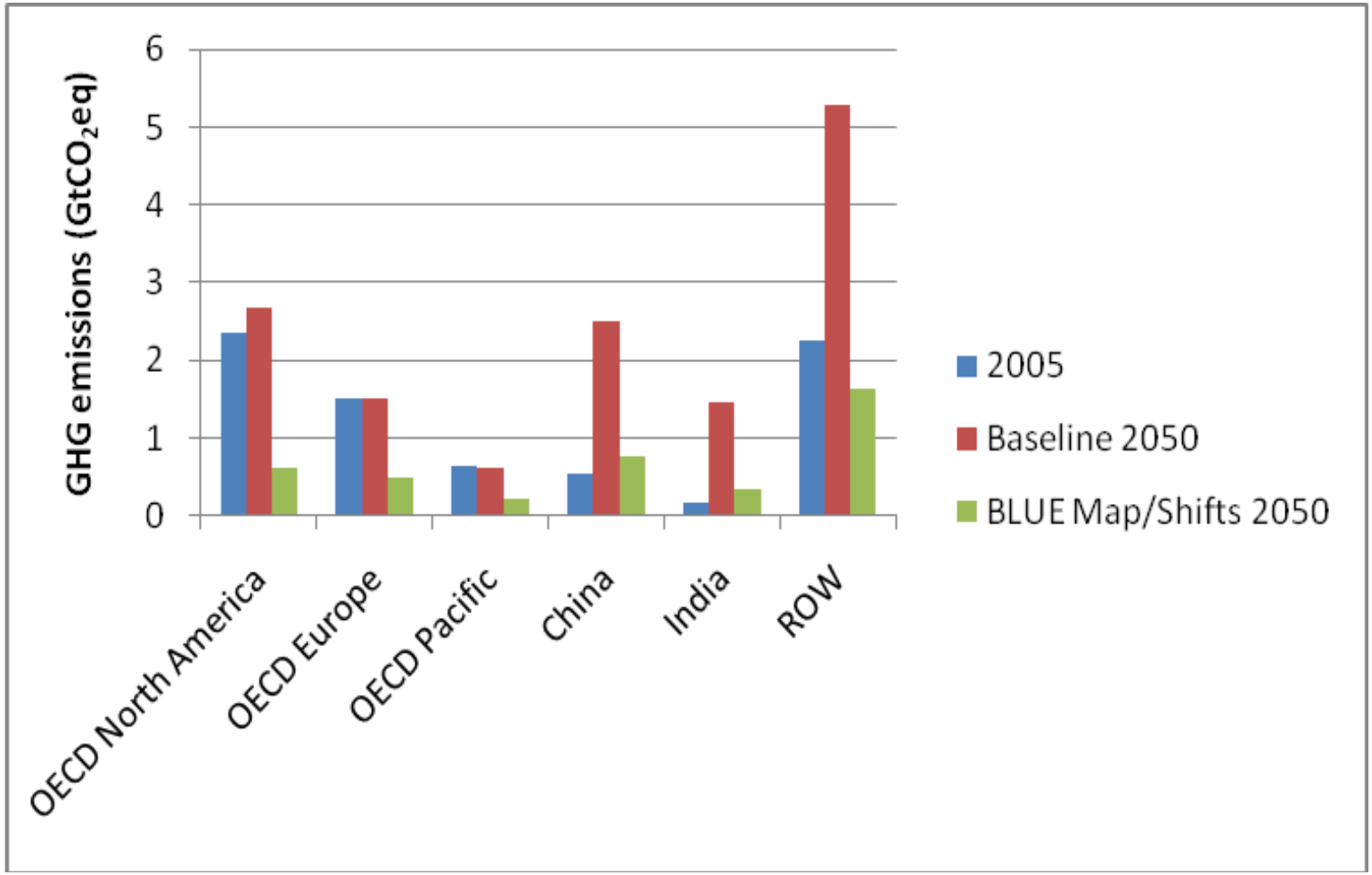


Transport CO2 reductions in BLUE Map / Shifts

A 3-part evolution…



GHG Emissions by Region and Scenario

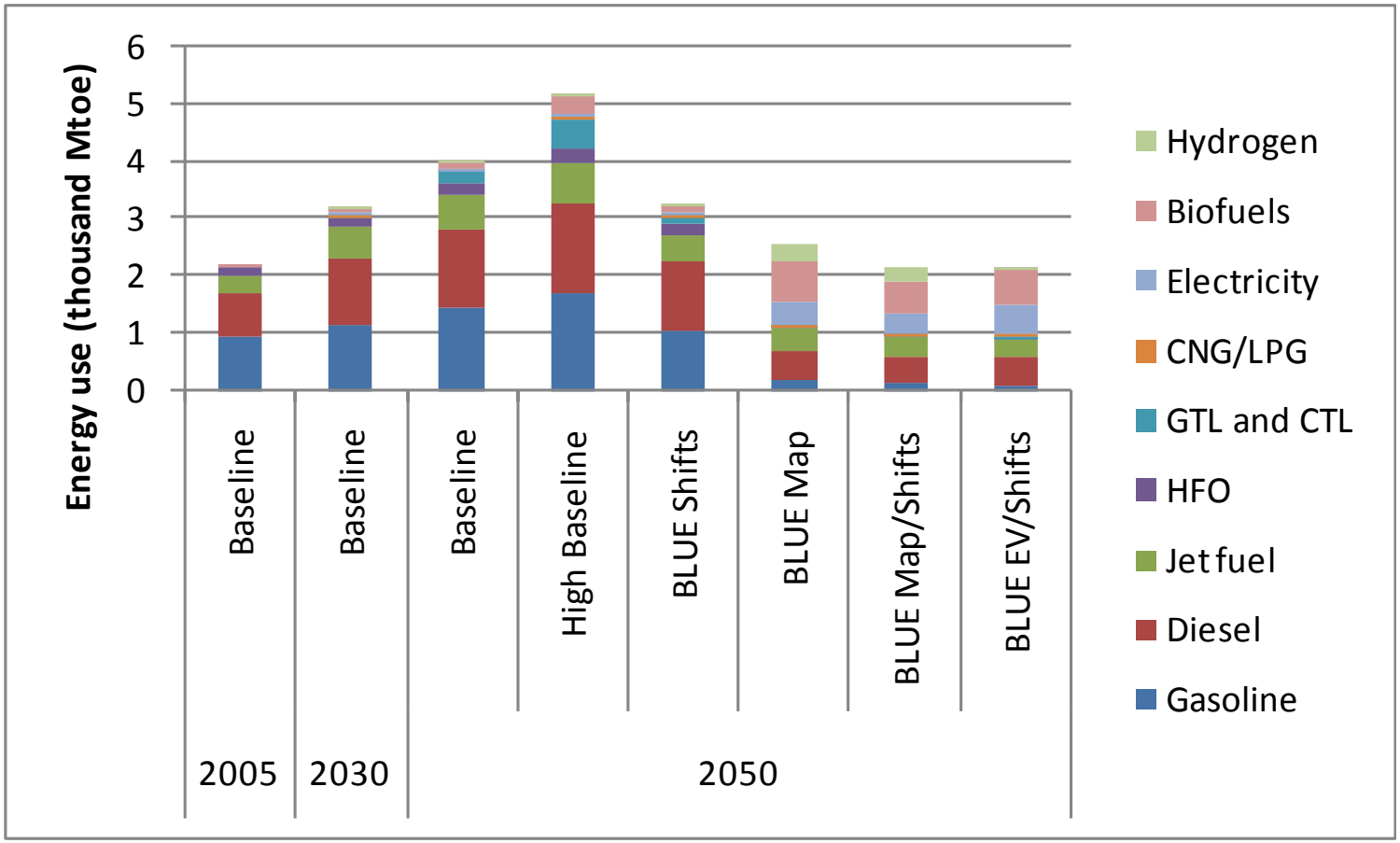


TRANSPORT, ENERGY AND CO_2

Moving Toward Sustainability

Energy use by scenario

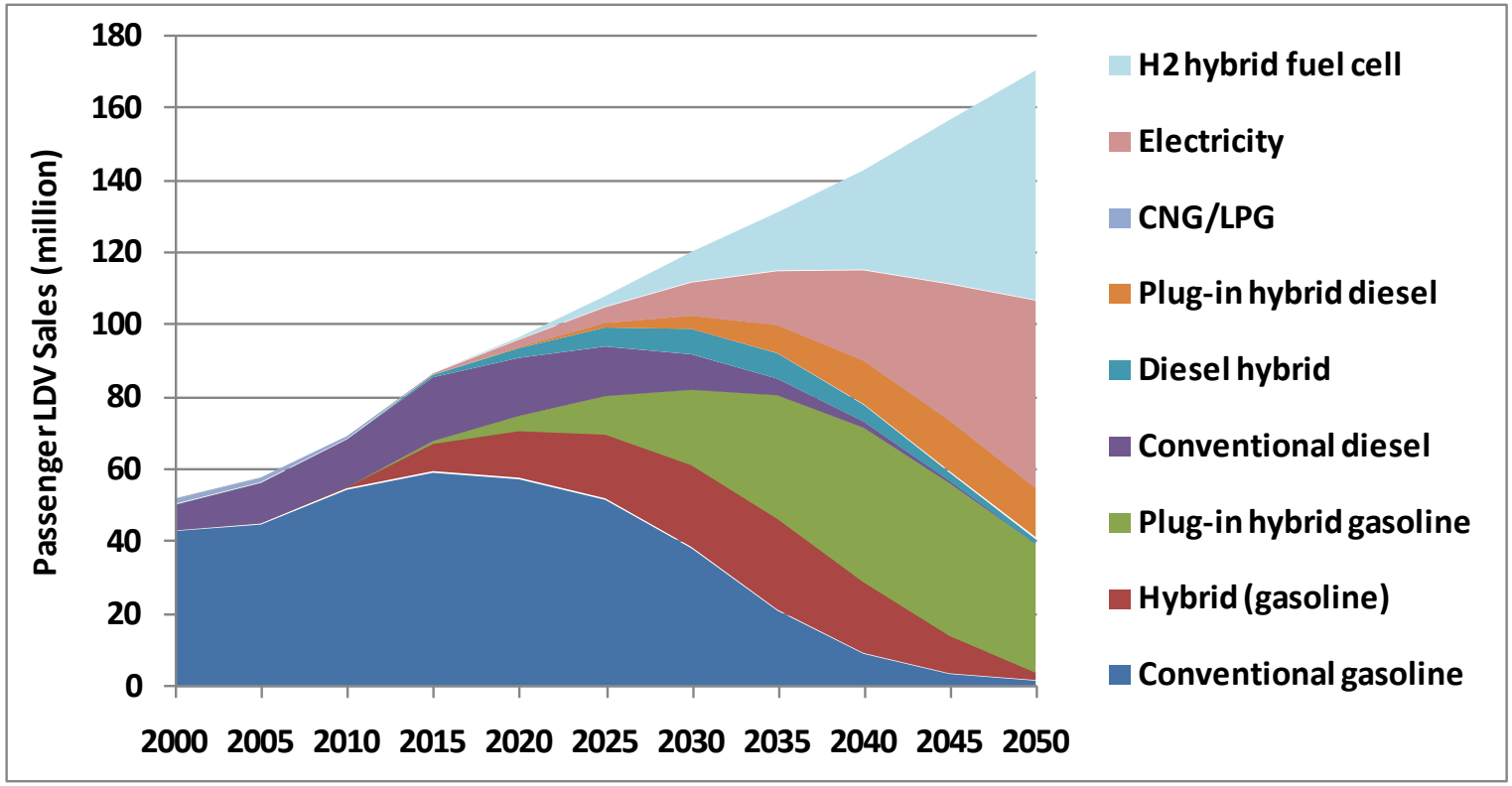
In BLUE Map/shifts, energy use returns to 2005 level, and with more than 50% very low CO2 fuels



TRANSPORT, ENERGY AND CO_2

LDV sales profile to 2050 in the BLUE Map scenario

Unprecedented rates of change to advanced technologies

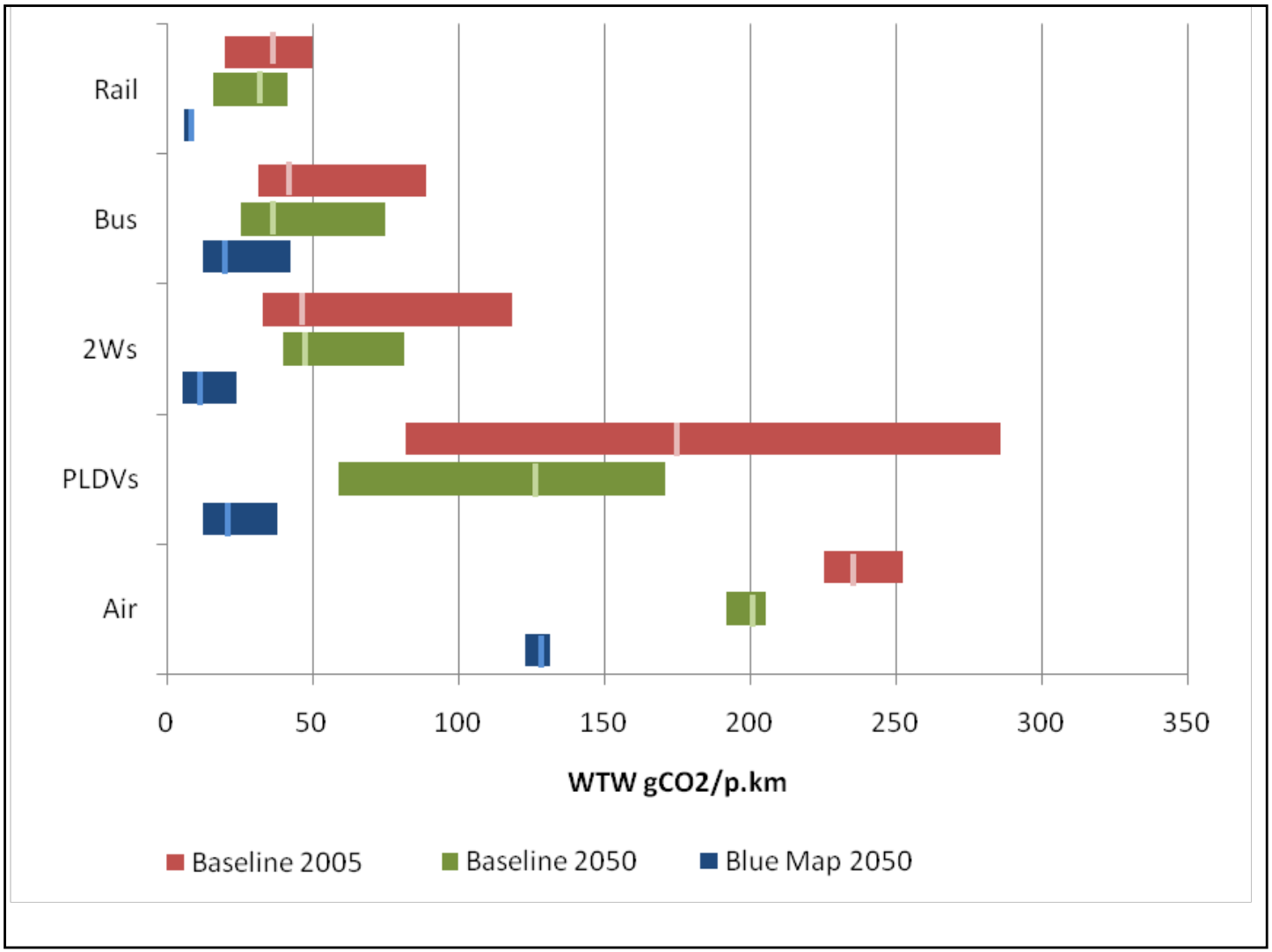


TRANSPORT, ENERGY AND CO_2

Moving Toward Sustainability

GHG intensity by mode and scenario

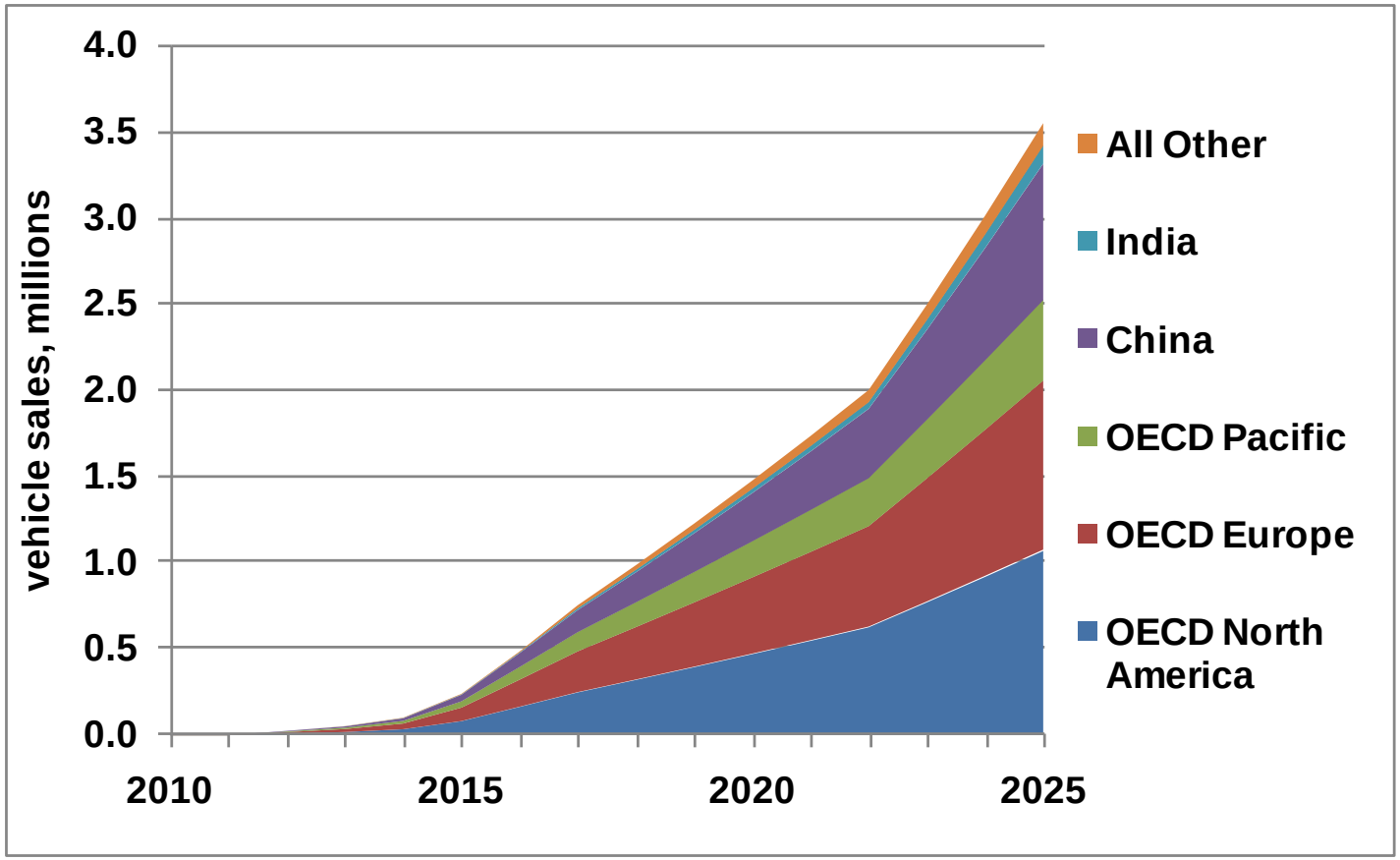
Through a combination of efficiency and fuel switching, surface modes become extremely low CO2 by 2050 in BLUE



IEA EV/PHEV Roadmapping Effort

- 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

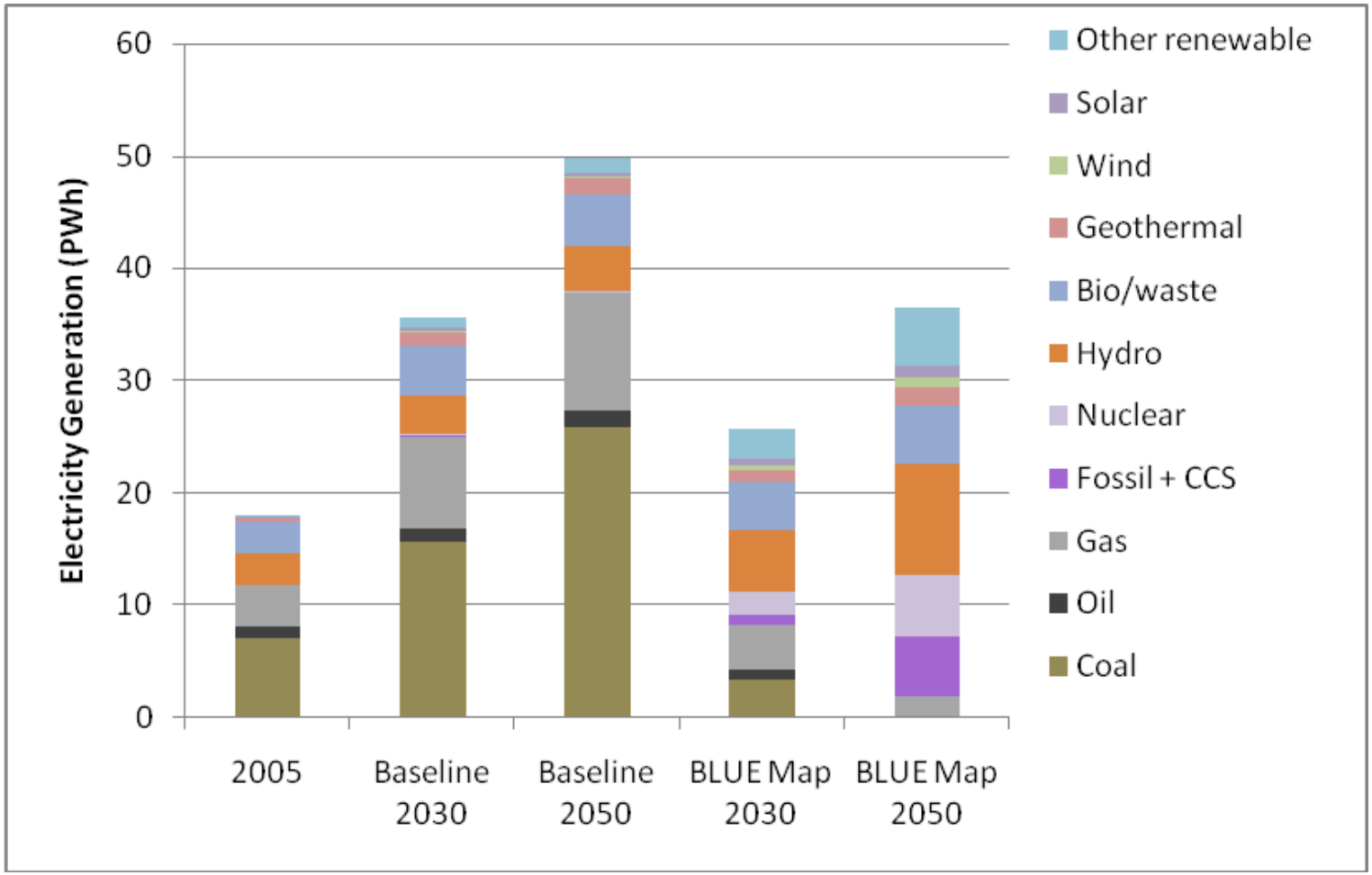
Possible EV Sales trajectory to 2025 – can we do this?



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?

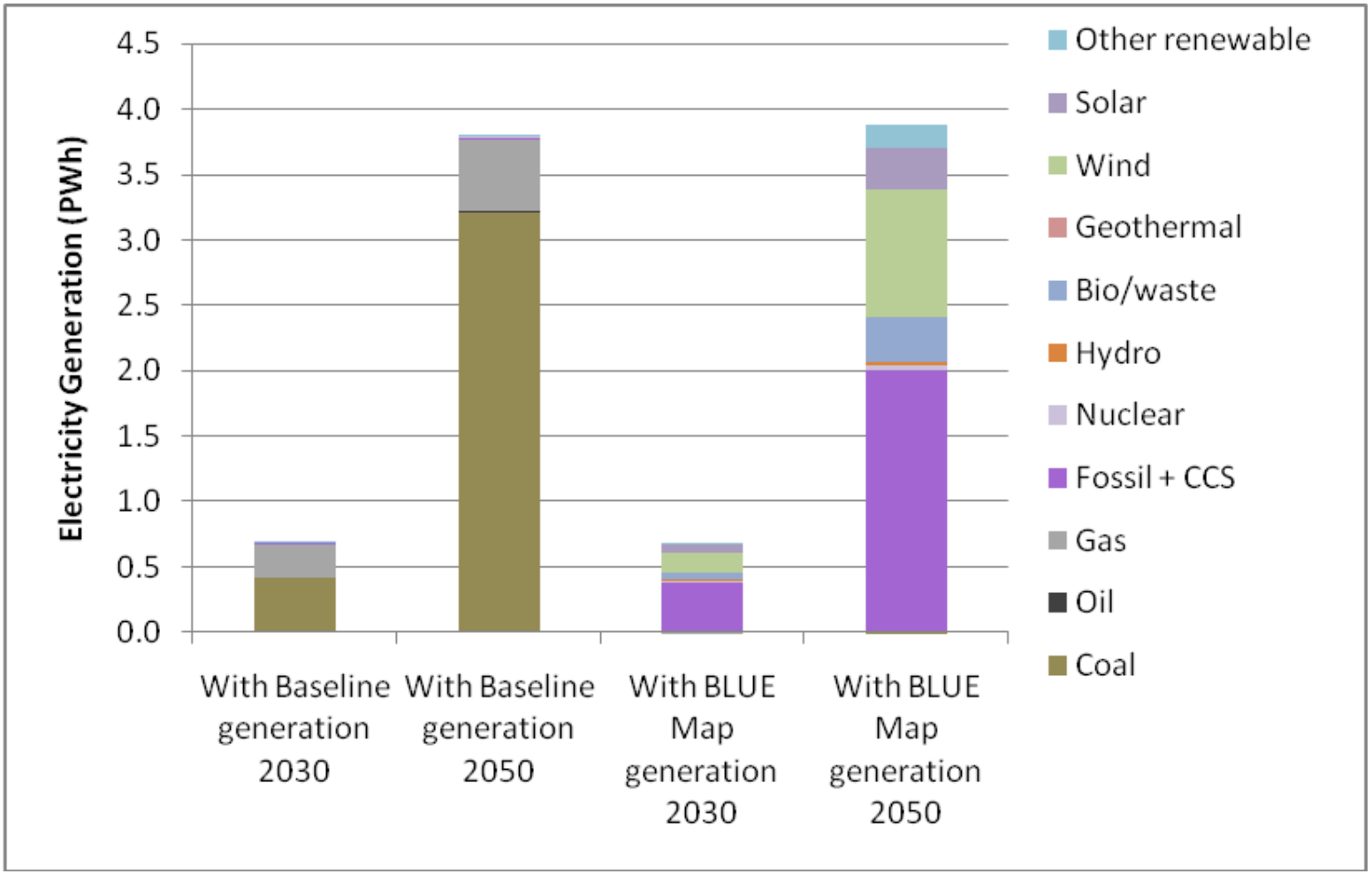
Electricity generation worldwide, by scenario and year

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



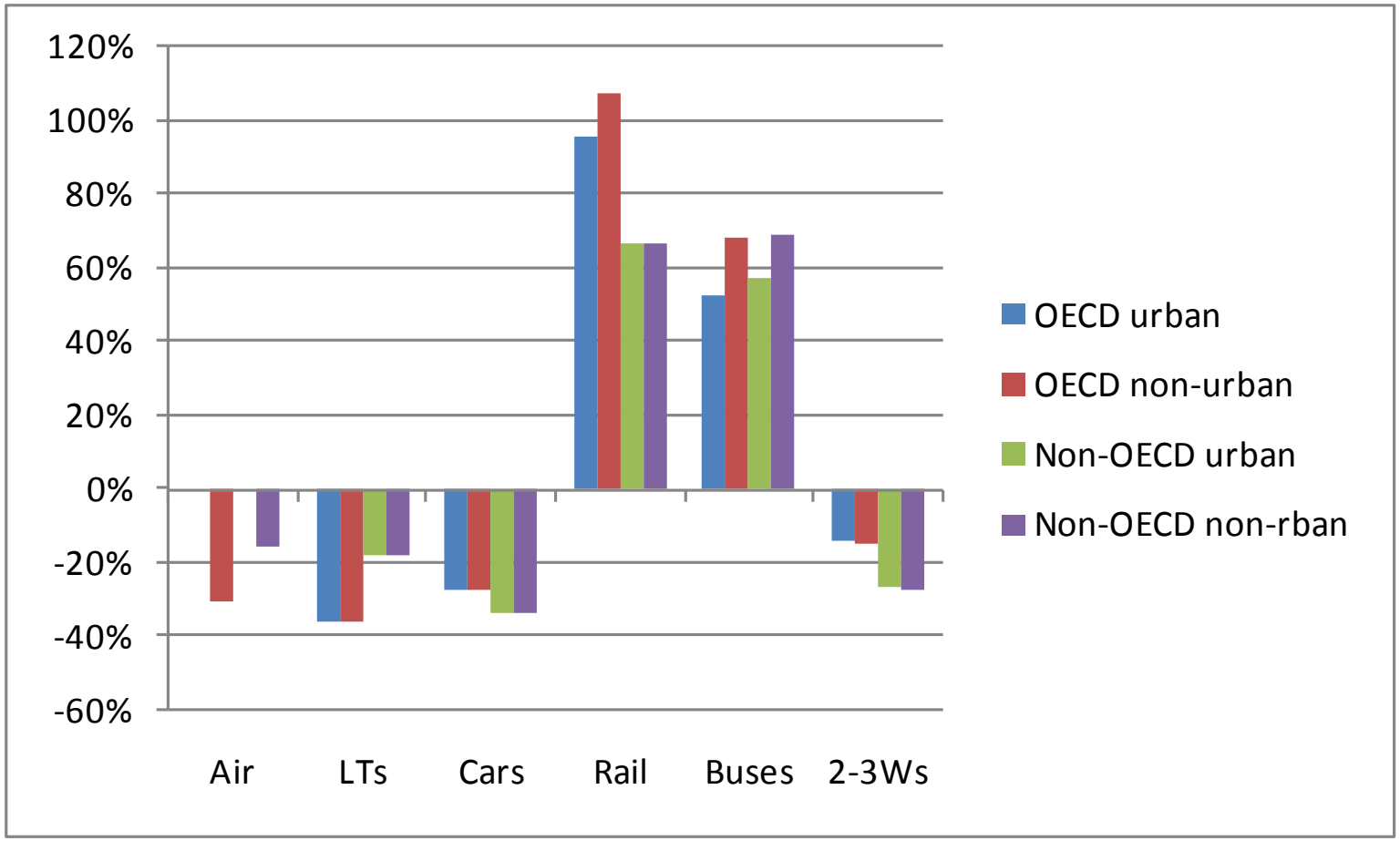
Incremental electricity generation for EVs and PHEVs in BLUE Map

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



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



TRANSPORT, ENERGY AND CO_2

Moving Toward Sustainability

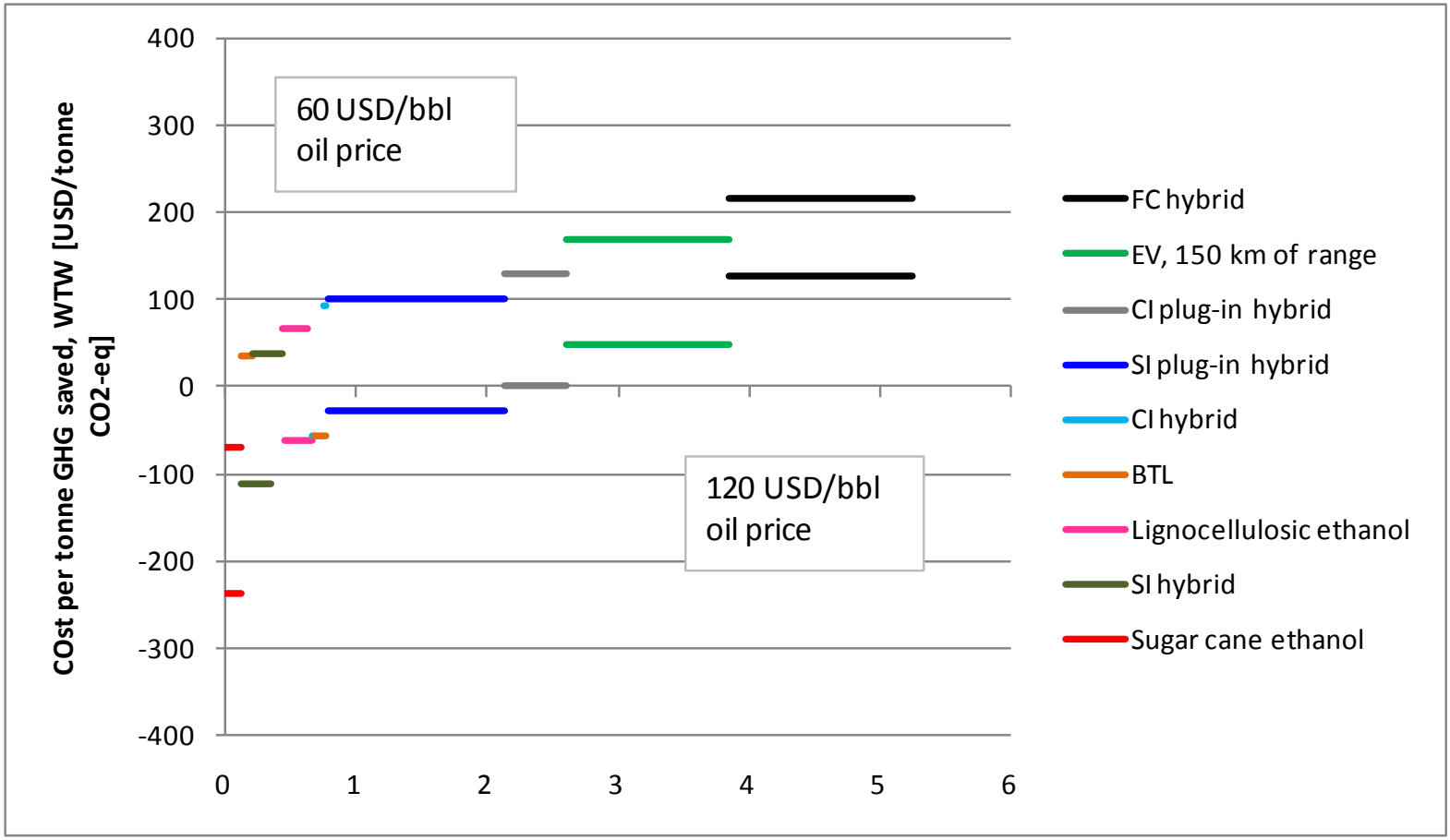
TRANSPORT, ENERGY AND CO_2

Moving Toward Sustainability

What will all this cost?

BLUE Map Cost Curves:

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



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)