



International
Energy Agency

Energy Technology Perspectives 2010

Lew Fulton

Low CVP Conference

Twickenham England, 14 July 2010

The context

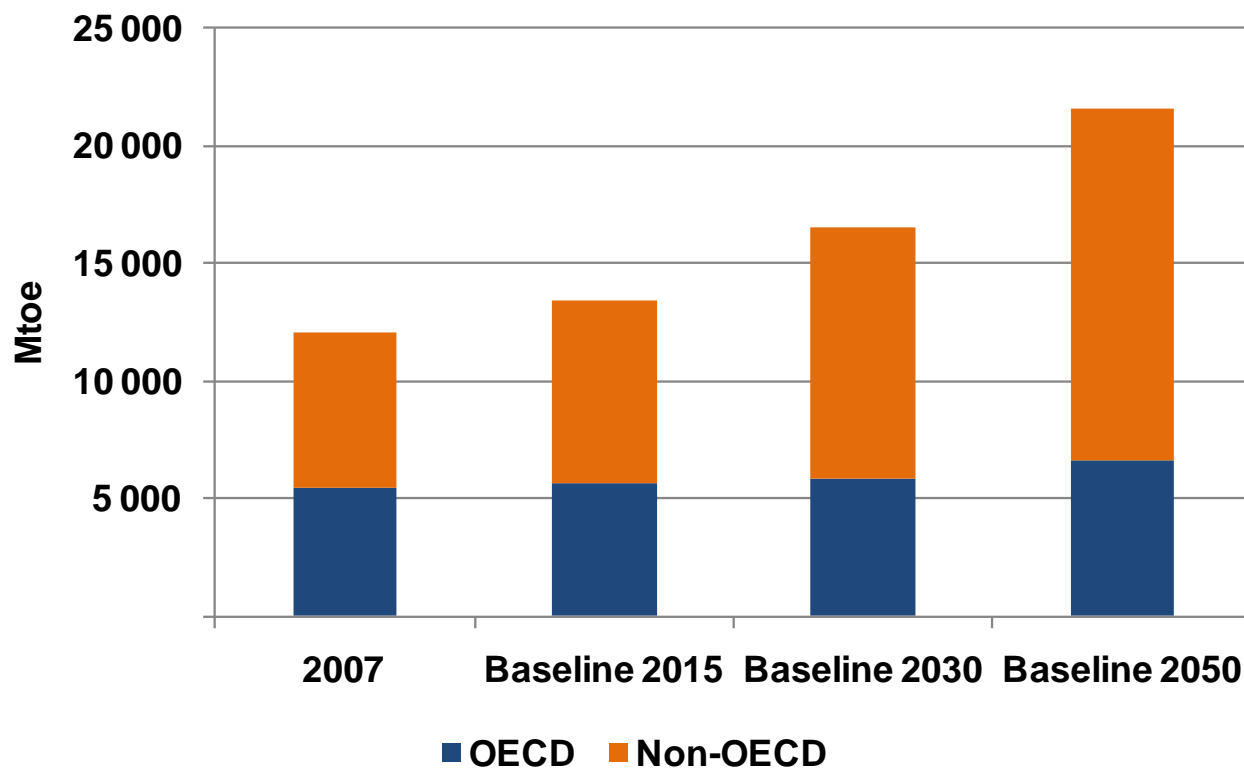
- We need a global energy technology revolution to meet climate change and energy security challenges.
- Some early signs of progress, but much more needs to be done.
 - Which technologies can play a role?
 - What are the costs and benefits?
 - What policies are needed?

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TECHNOLOGY
PERSPECTIVES
2010

Scenarios &
Strategies
to 2050



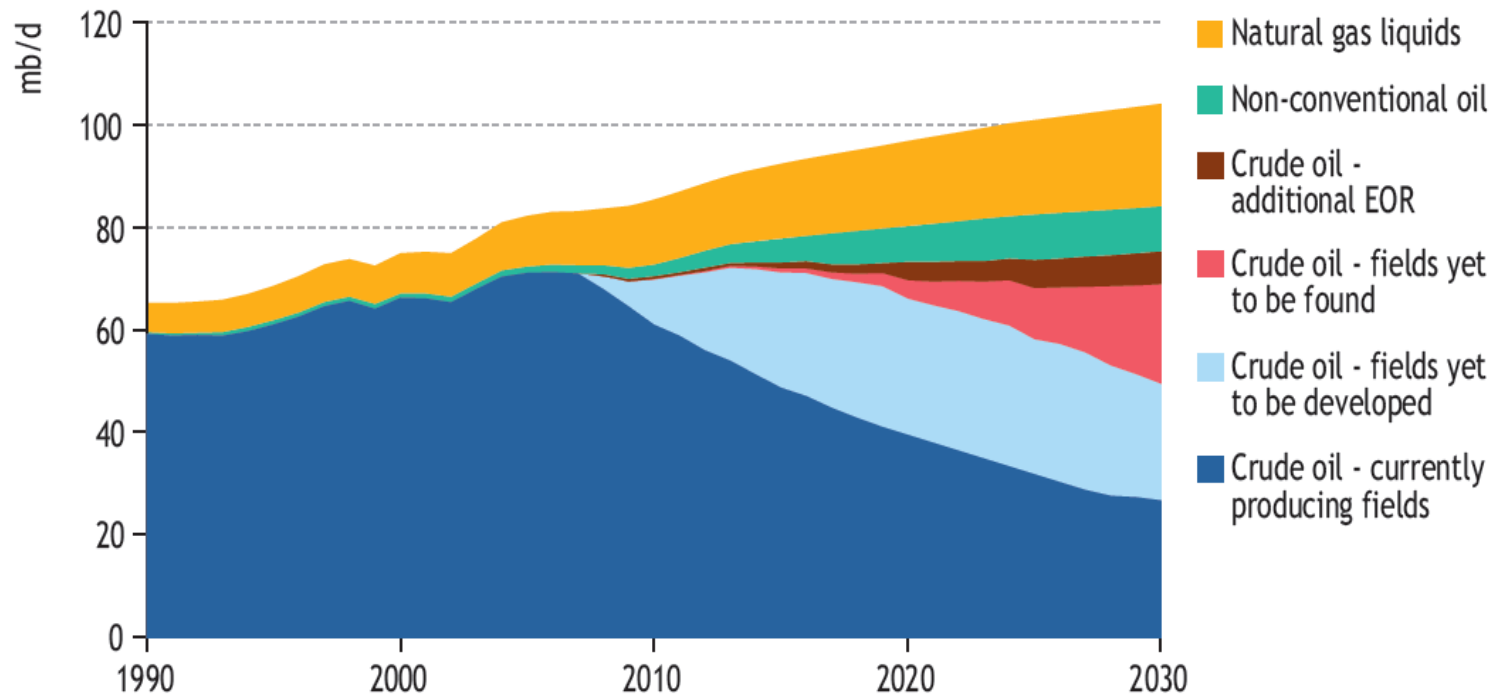
OECD and non-OECD primary energy demand in the Baseline scenario



Primary energy demand in non-OECD countries is projected to increase much faster than in OECD countries in the Baseline scenario.

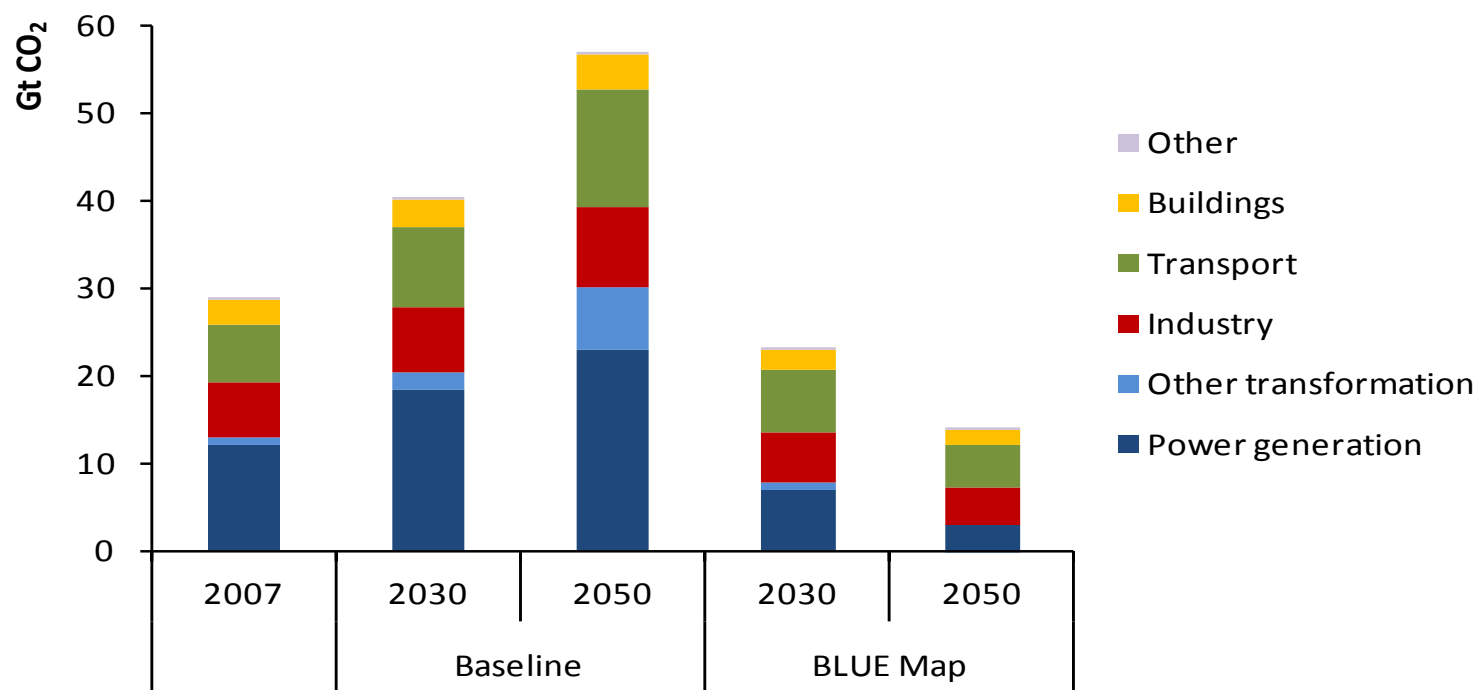
Let's not forget oil security!

World oil production in the WEO 2009 Reference Scenario



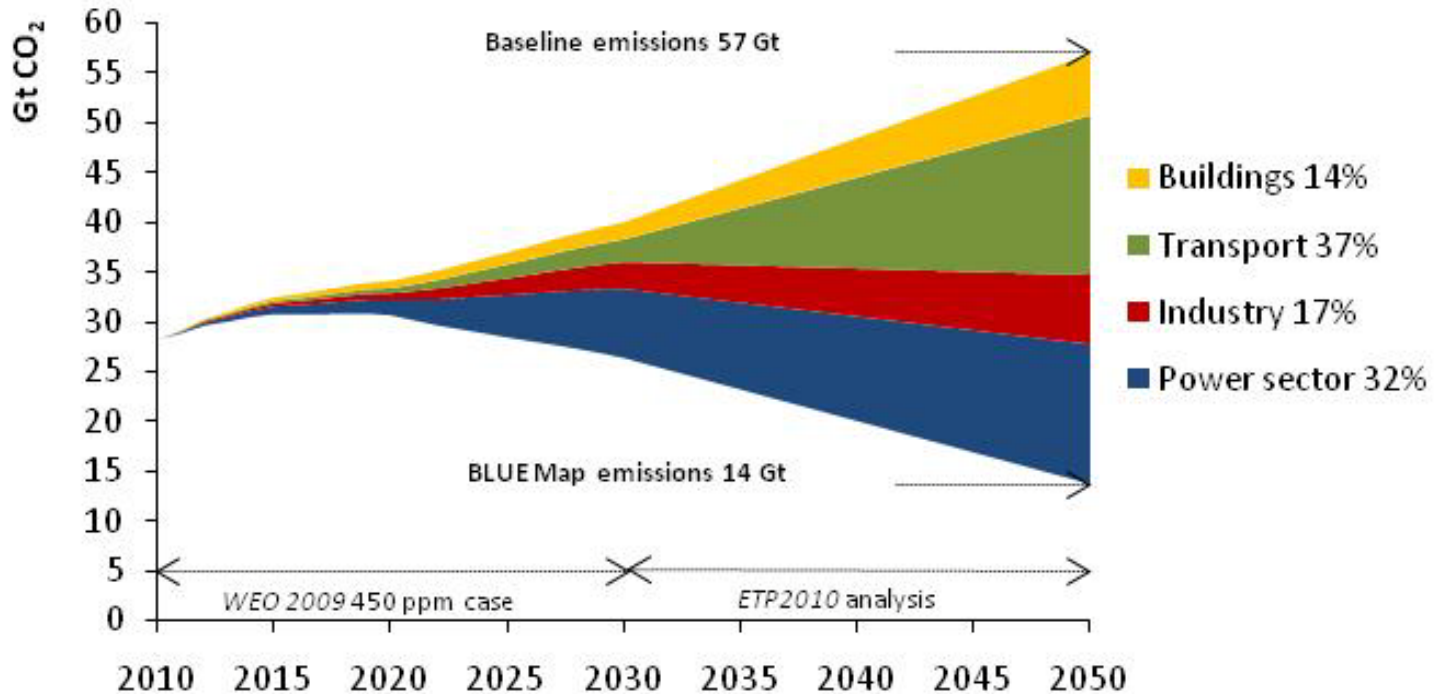
64 mb/d of gross capacity needs to be installed between 2007 & 2030 – six times the current capacity of Saudi Arabia – to meet demand growth & offset decline

Global energy-related CO₂ emissions in the Baseline and BLUE Map scenarios



Global CO₂ emissions double in the Baseline, but in the BLUE Map scenario abatement across all sectors reduces emissions to half 2005 levels by 2050.

World energy-related CO₂ emissions abatement by sector

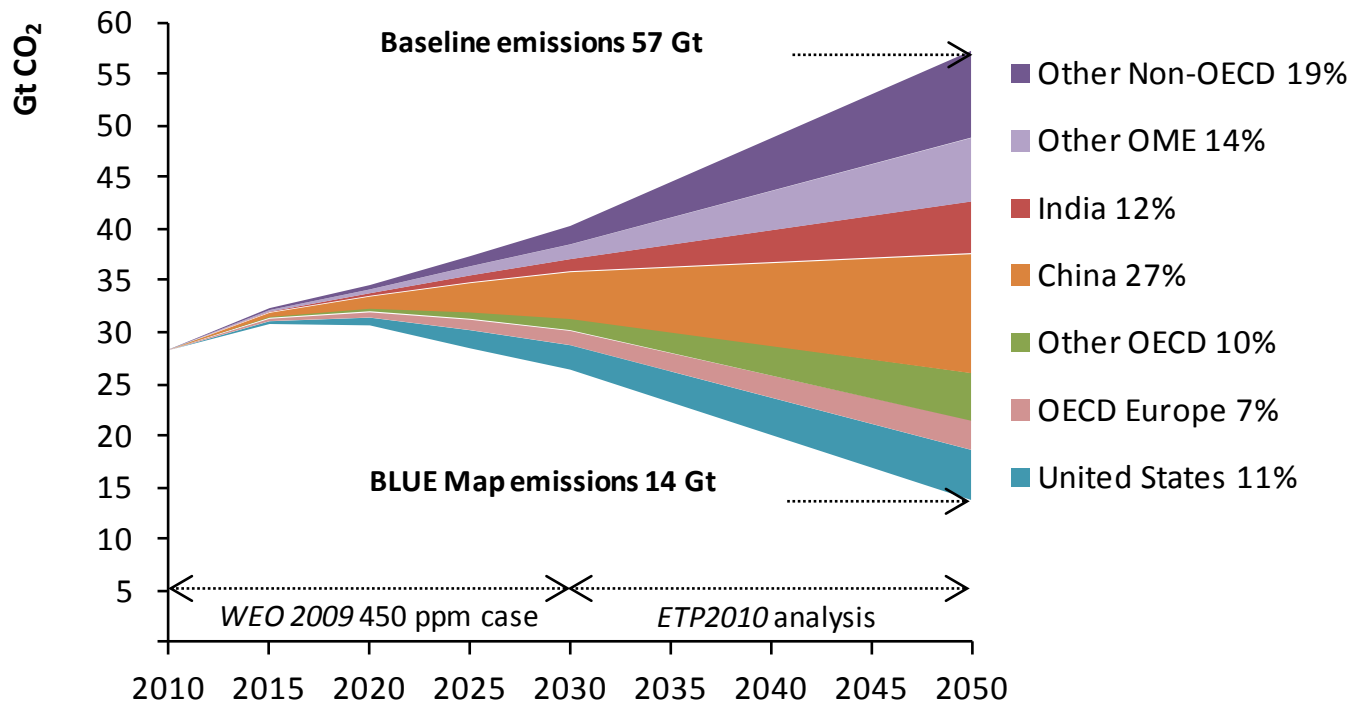


In the BLUE Map scenario, transport provides the largest CO₂ reductions of the 4 major sectors

World energy-related CO₂ emissions abatement by region

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TECHNOLOGY
PERSPECTIVES
2010

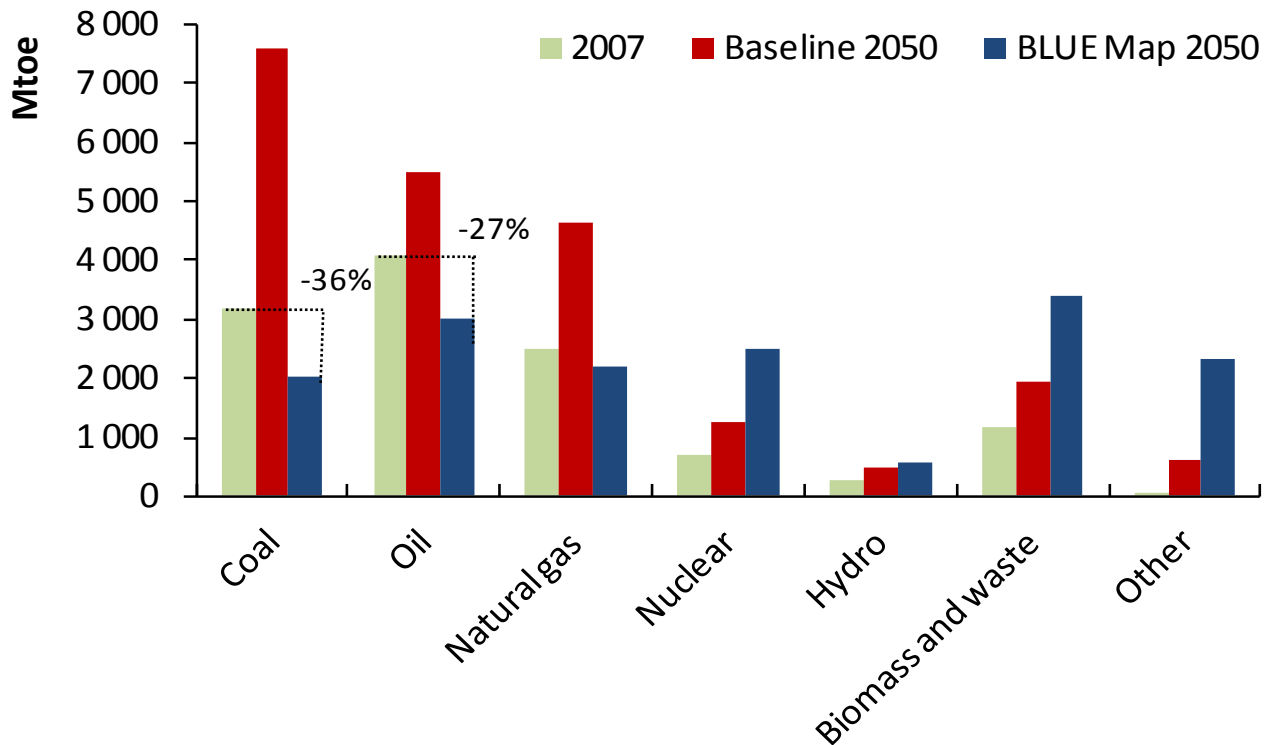
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Strategies
to 2050



In the BLUE Map scenario, most of the reductions in energy-related CO₂ emissions are in non-OECD countries.

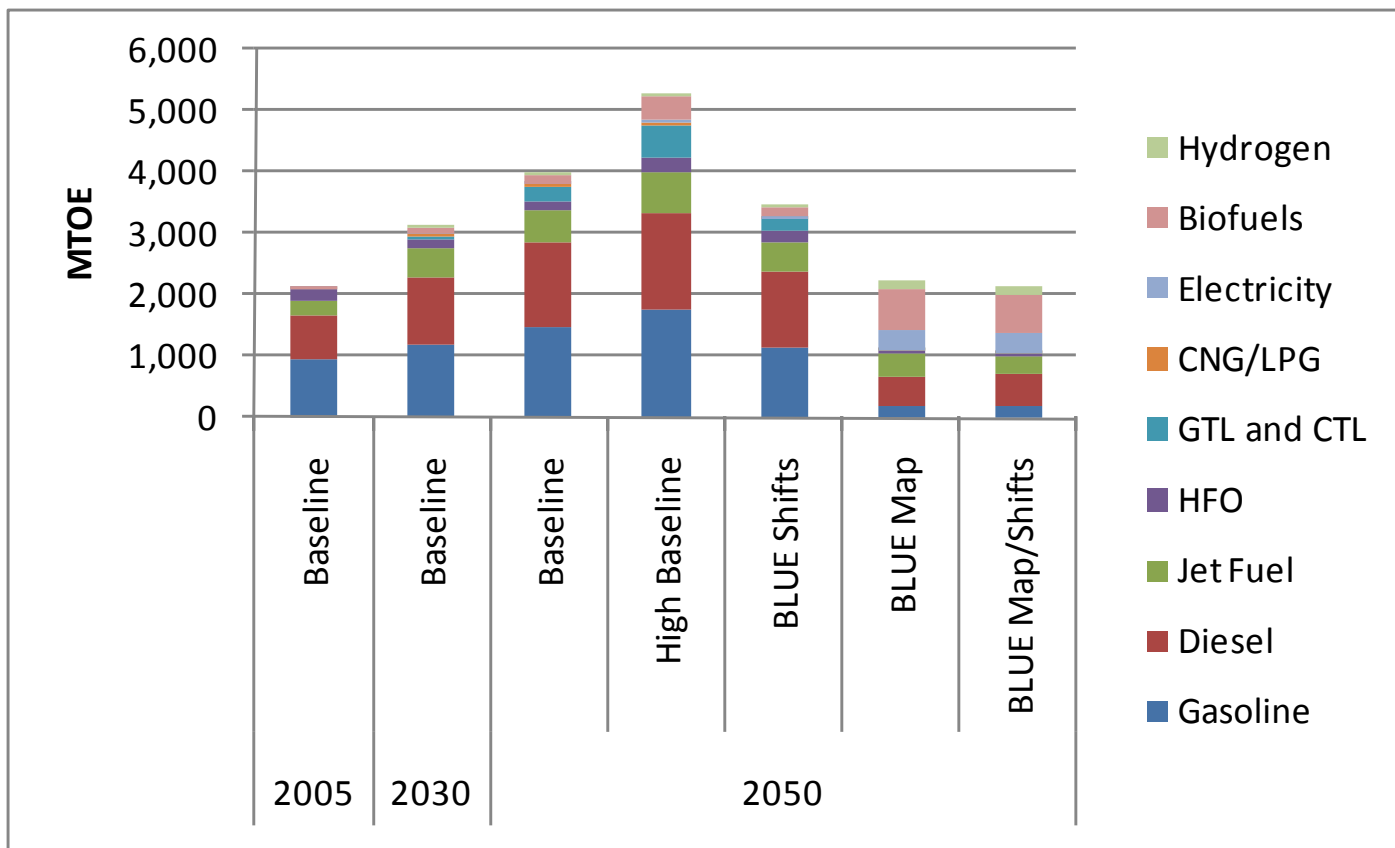


Primary energy demand by fuel and by scenario



By 2050, coal, oil and gas demand are all lower than today under the BLUE Map scenario.

Transport Energy Use by Scenario



*Global transport energy in Baseline doubles by 2050, increases by more than 2.5x in High Baseline
About a 20% reduction in BLUE Shifts relative to 2050 Baseline, 45% in BLUE Map, similar for Map/Shifts*

Key Transport Results

■ BLUE Map

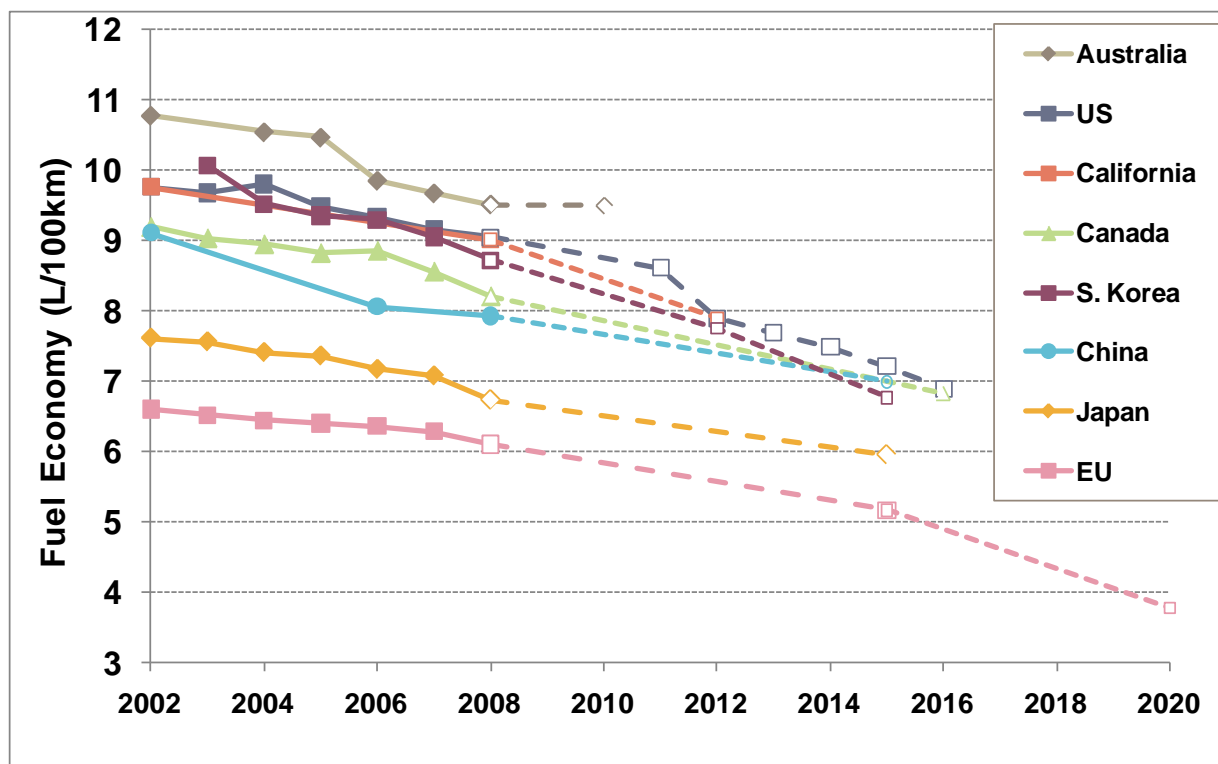
- 50% reduction in conventional new PLDV (car, SUV) fuel intensity by 2050
- 30-50% reduction in energy intensity for bus/truck/rail/ships/aircraft by 2050
- Strong uptake of advanced technology vehicles and Fuels
 - ◆ Plug-in Hybrids [PHEVs], starting in 2010-2015
 - ◆ Battery electric vehicles [BEVs], starting in 2010-2015
 - ◆ Fuel cell vehicles [FCVs], starting in 2025
 - ◆ Advanced, low-GHG Biofuels reach 12% of transport fuel use by 2030, 25% by 2050

■ BLUE Shifts

- 25% lower level of car and air travel in 2050 compared to Baseline
- Up to 2x travel by rail, bus (such as Bus Rapid Transit systems)
- Lower travel demand due to better land use planning, road pricing, telematic substitution

Transport market transformation is underway

Strong light-duty vehicle fuel economy standards in place in many major economies through 2015



Source: ICCT, 2010; fuel economy figures shown reflect each country's own test procedure; solid lanes show history; dashed lines show enacted standards; dotted lines show proposed standards

Through 2020, the standards shown here could save around 300 MTOE (over 2 billion barrels). This would increase further if standards continue to be tightened after 2015 and/or are extended to more countries.

The Global Fuel Economy Initiative (GFEI)

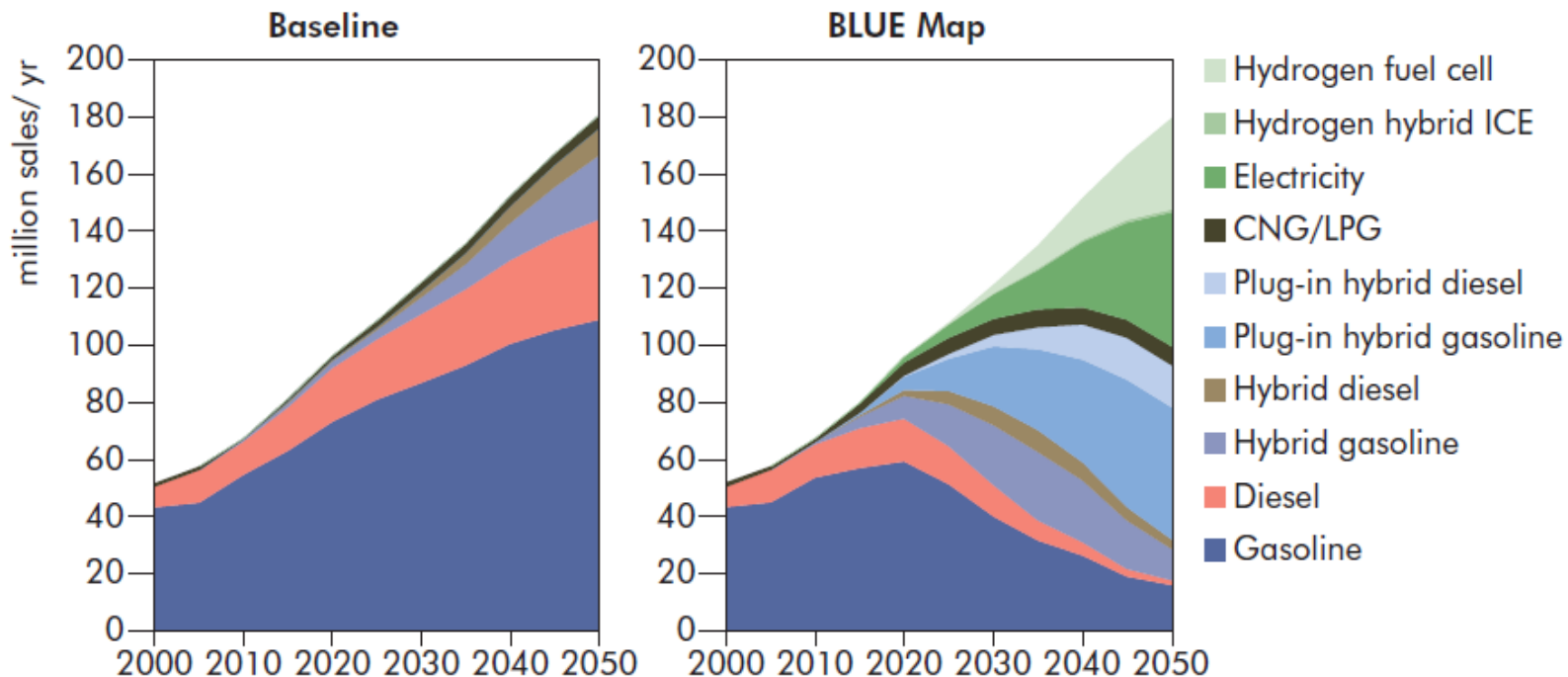
- Launched on 4 March 2009 in Geneva by IEA, ITF, UNEP, and the FIA Foundation



- GOAL: reduction in fuel consumption per km of 50% by 2050 (for the vehicle stock) compared to 2005
- Roughly equivalent to an implementation of a 50% improvement by 2030 for new sales, worldwide
- Four main activity areas:
 - Analysis of global fuel economy trends and potential
 - Outreach to governments, assistance in policy development
 - Outreach to stakeholders, dialogue to improve coordination
 - Information campaigns



Passenger LDV sales by technology type and scenario

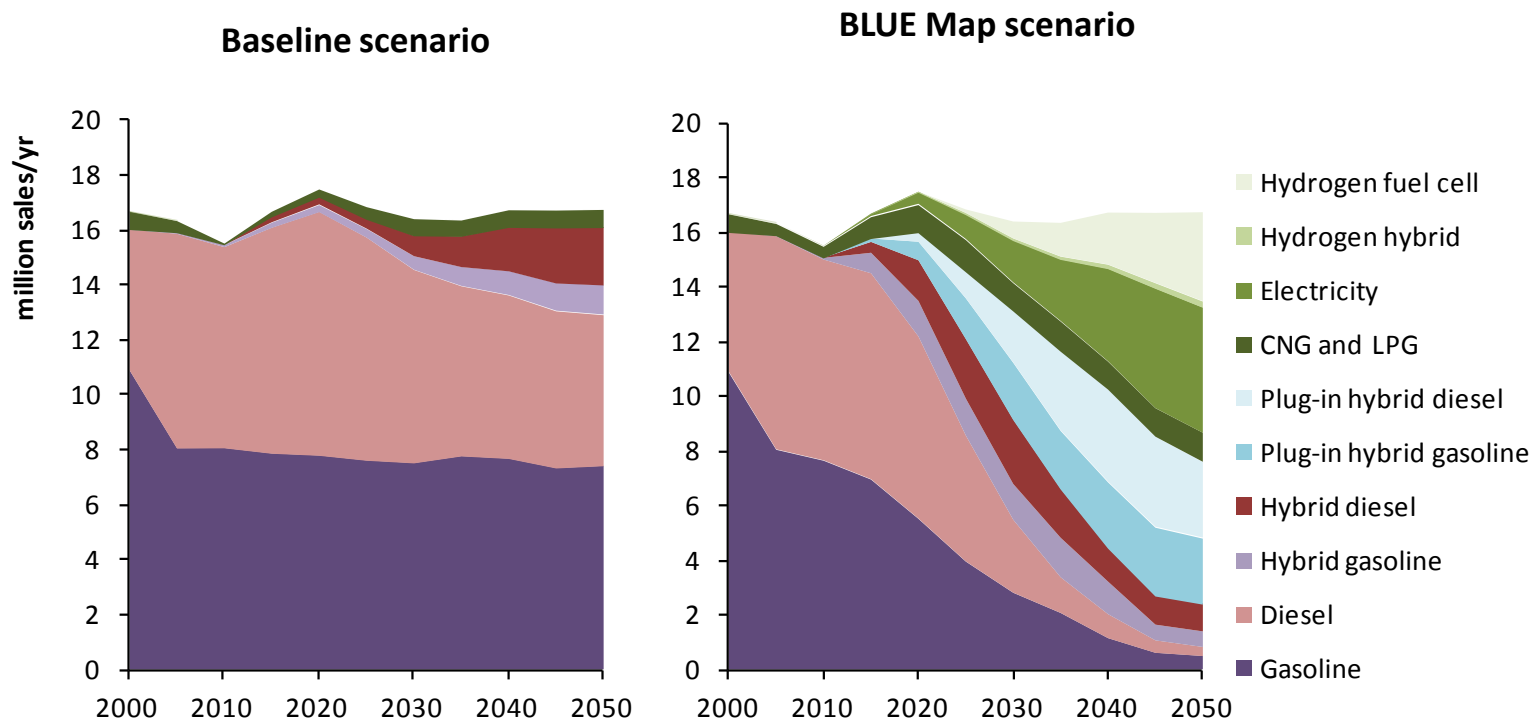


- In the Baseline, sales are mainly conventional gasoline and diesel vehicles through 2050; hybrids reach about 20% of sales
- In BLUE Map, strong penetration of hybrids by 2015, PHEVs and EVs by 2020, FCVs after 2025. By 2050, plug-in vehicles account for more than half of all sales.

Passenger light-duty vehicles sales by technology in OECD Europe in the Baseline and BLUE Map scenarios

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TECHNOLOGY
PERSPECTIVES
2010

Scenarios &
Strategies
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A wide range of new LDV technologies contribute to emissions reductions under the BLUE scenario.



Projected electric and plug-in hybrid vehicle sales through 2020, based on national targets

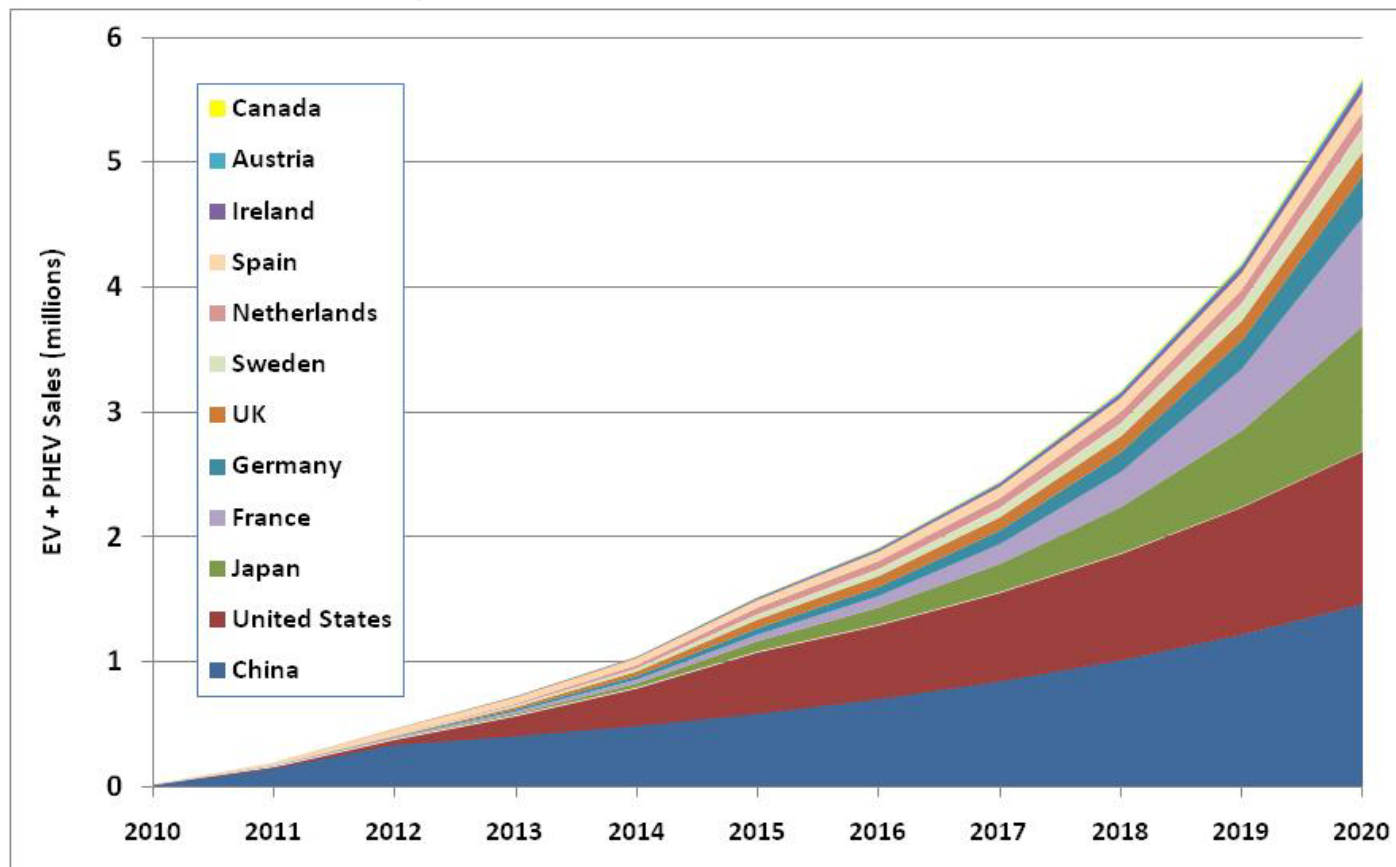


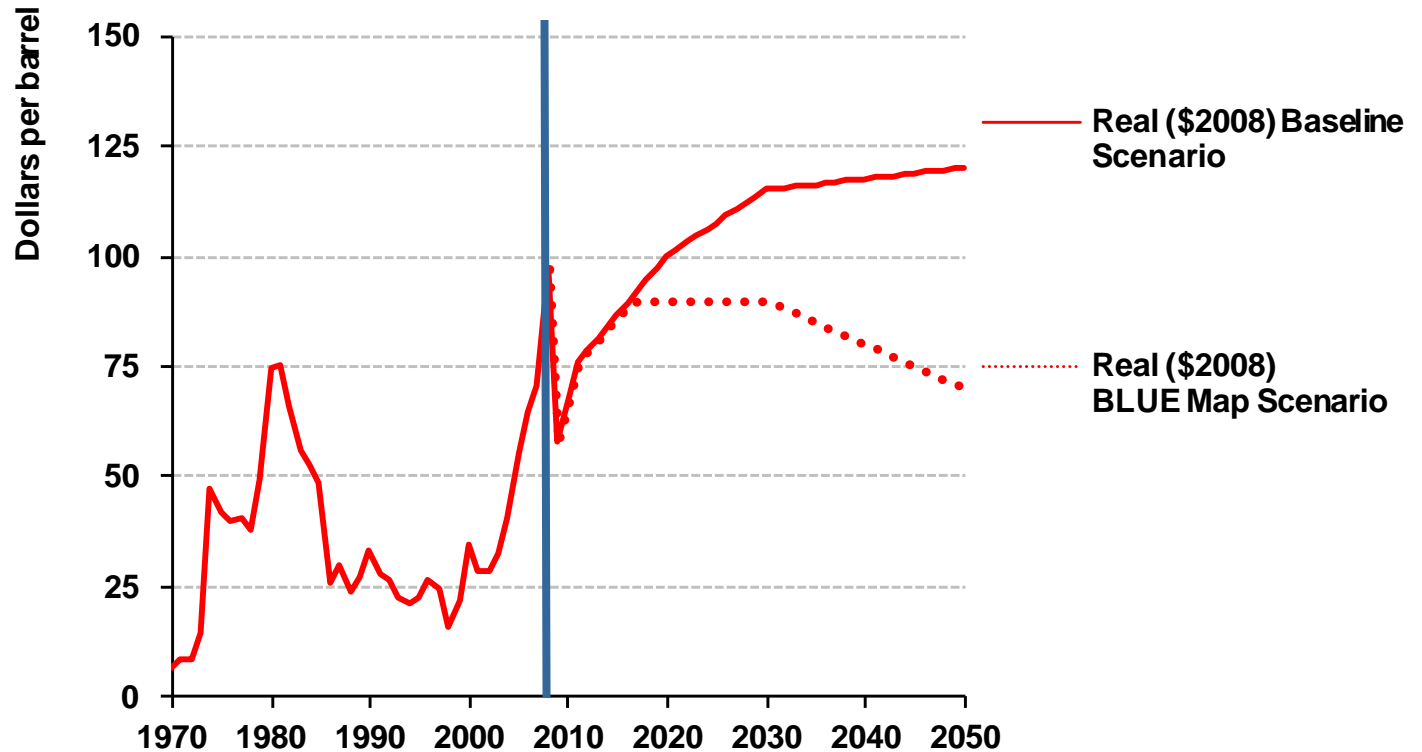
Figure based on announced national sales and stock targets, with assumed 20% annual sales growth after target is met, if target is before 2020 (e.g. China's target is for end of 2011).

EV / PHEV sales could reach nearly five million by 2020

Role of Biofuels

- In global baseline, biofuels now about 1.5%, reach 3% in 2030, 4% in 2050, mostly 1st gen
- BLUE Map, biofuels reach about 10% of transport fuels in 2030, 25% in 2050
 - In LAC, biofuels reach nearly 20% in 2030, 40% in 2050
- After 2030 main growth for trucks, ships aircraft
- After 2020, all new biofuels are 2nd generation (and cane)
 - 2nd gen Costs reach competitive levels with \$120/bbl oil by 2020-2025
 - Cane to ethanol (and eventually cane-biodiesel?) expected to play an important role
- We must “solve” the sustainable feedstock problem
 - With 50% of biomass from waste products, remainder can be produced on <5% of ag land, but unclear if even this share is sustainable

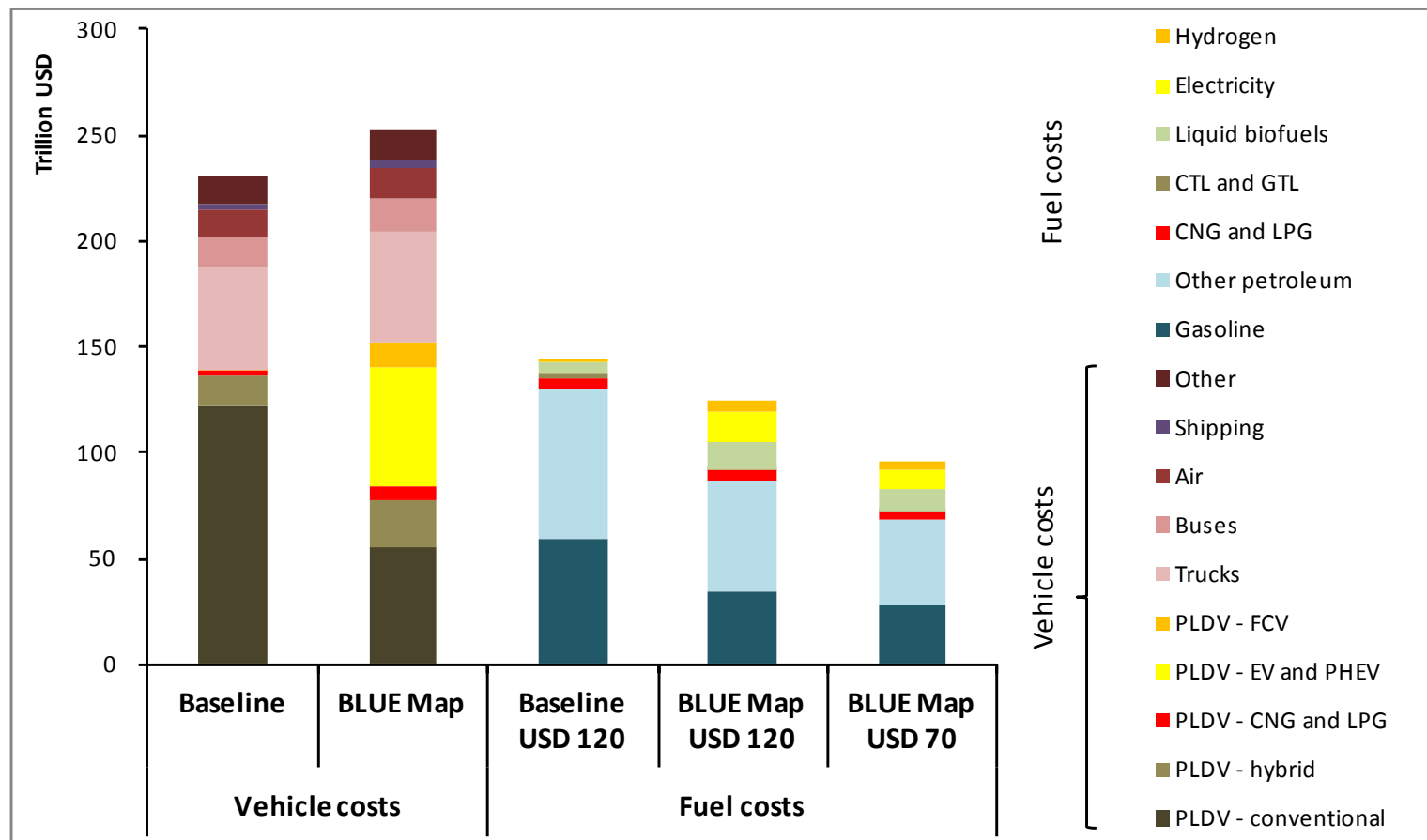
Crude oil and CO₂ price



Impact of CO₂ price on costs for crude oil:

2020	50 USD/t CO ₂	= 21 USD/bbl:	90+21 = 111 USD/bbl
2030	110 USD/t CO ₂	= 43 USD/bbl:	90+43 = 133 USD/bbl
2050	175 USD/t CO ₂	= 73 USD/bbl:	70+73 = 143 USD/bbl

Global Vehicle and Fuel Costs, 2010-2050 by ETP Scenario



PLDV=passenger light-duty vehicle; costs are in real \$2008, 0 discount rate.

Fuel cost savings mostly or fully offset the costs of advanced technology vehicles in BLUE Map

The first green shoots

of an energy technology revolution...

46 GW of PV
per year
until 2050

Over 1 billion plug-in
and electric vehicles
in 2050

Over 3 000 plants
operational by
2050

200 GW of solar
thermal added in
2050

Increase funding by
2 to 5 times
current levels

Investments

6 GW of PV
installed in 2009

5 million
hybrid and
electric vehicles
by 2020

50 large scale
integrated plants
being developed

20 GW of solar
thermal added
in 2007

1/3 funding
increase
between
2005 and 2008

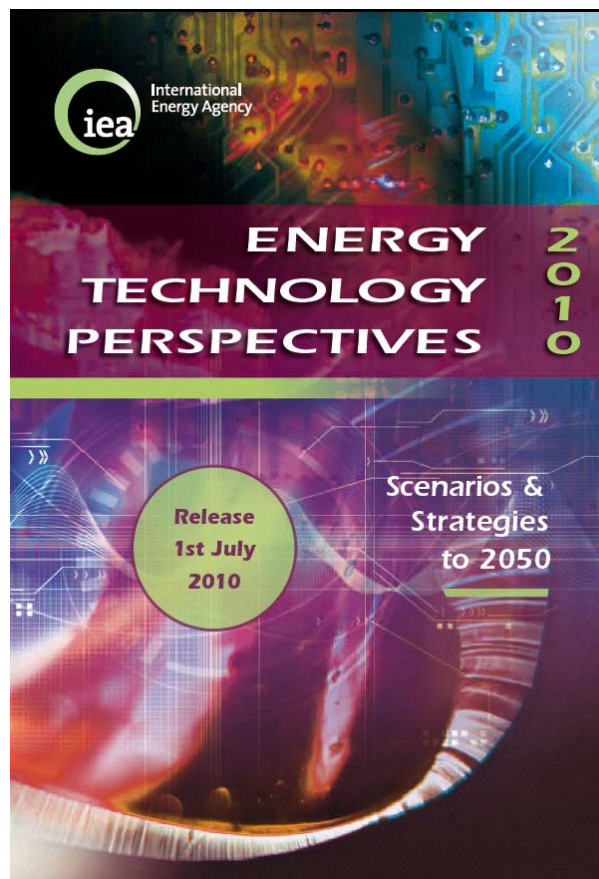
Renewables

Transport

Carbon capture
and storage

Energy
efficiency

Research and
development



Thank You

www.iea.org/techno/etp/index.asp