

**2010 ITF-KOTI Joint Seminar  
on Green Growth in Transportation**



International  
Energy Agency

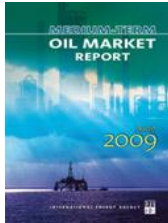
**Demand and supply of  
renewable energy in future  
transport scenarios: range  
of options**

**Lew Fulton  
International Energy Agency**

[www.iea.org](http://www.iea.org)

# IEA, transport and liquid fuels

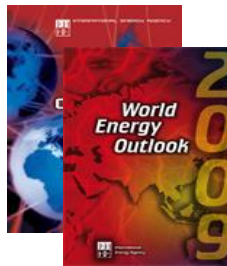
## Relevant publications



### ■ **Medium term Oil Market Report**

Horizon 2015, focus on oil

Scenarios currently based on two different GDP growth assumptions



### ■ **World Energy Outlook**

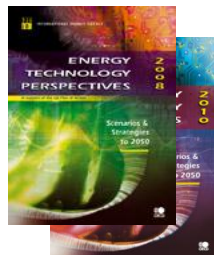
**(WEO)**

Horizon 2030, all energy sources

Scenarios depicting different developments on the basis of policy actions

One underlying assumption for GDP and population growth

Includes a thorough analysis on the oil supply availability



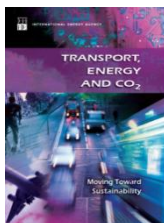
### ■ **Energy Technology Perspectives**

**(ETP)**

Horizon 2050, all energy sources

Scenarios that pay particular attention to the role of technology, especially on the demand side

One underlying assumption for GDP and population growth



### ■ **Transport, energy and CO<sub>2</sub>**

**(Transport book)**

### **Moving towards sustainability**

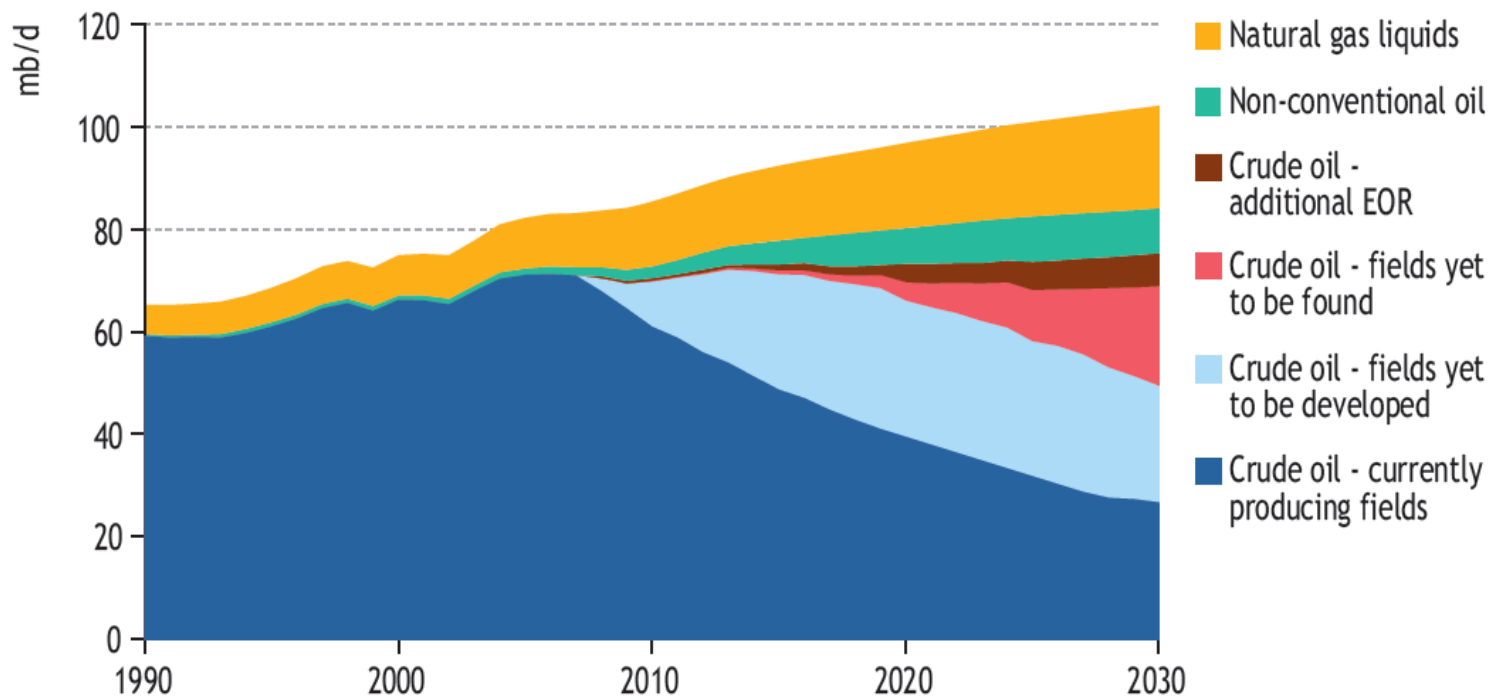
(Transport book)

Horizon 2050, all energy sources

Builds and expands the work done on ETP

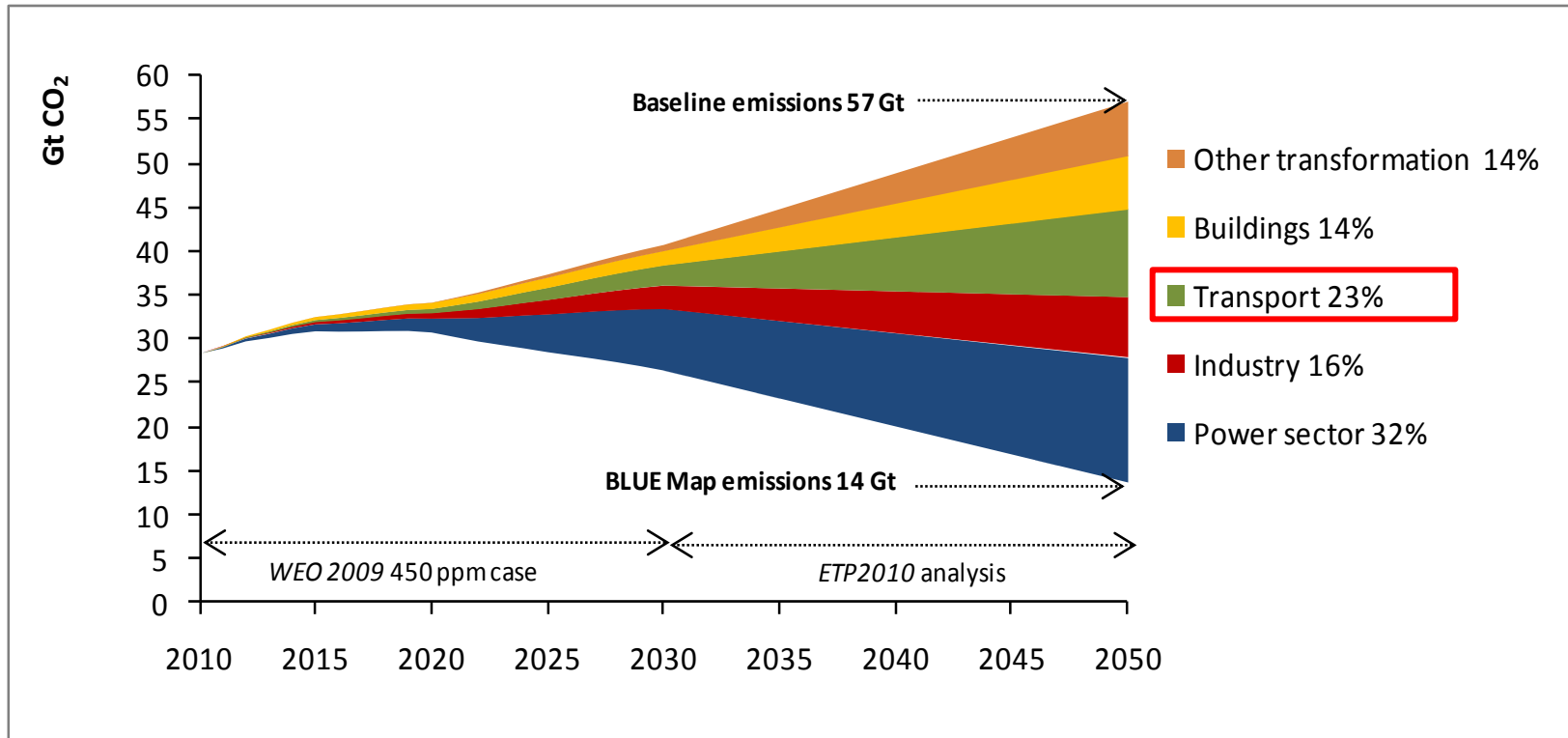
# Let's not forget oil security!

## 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***

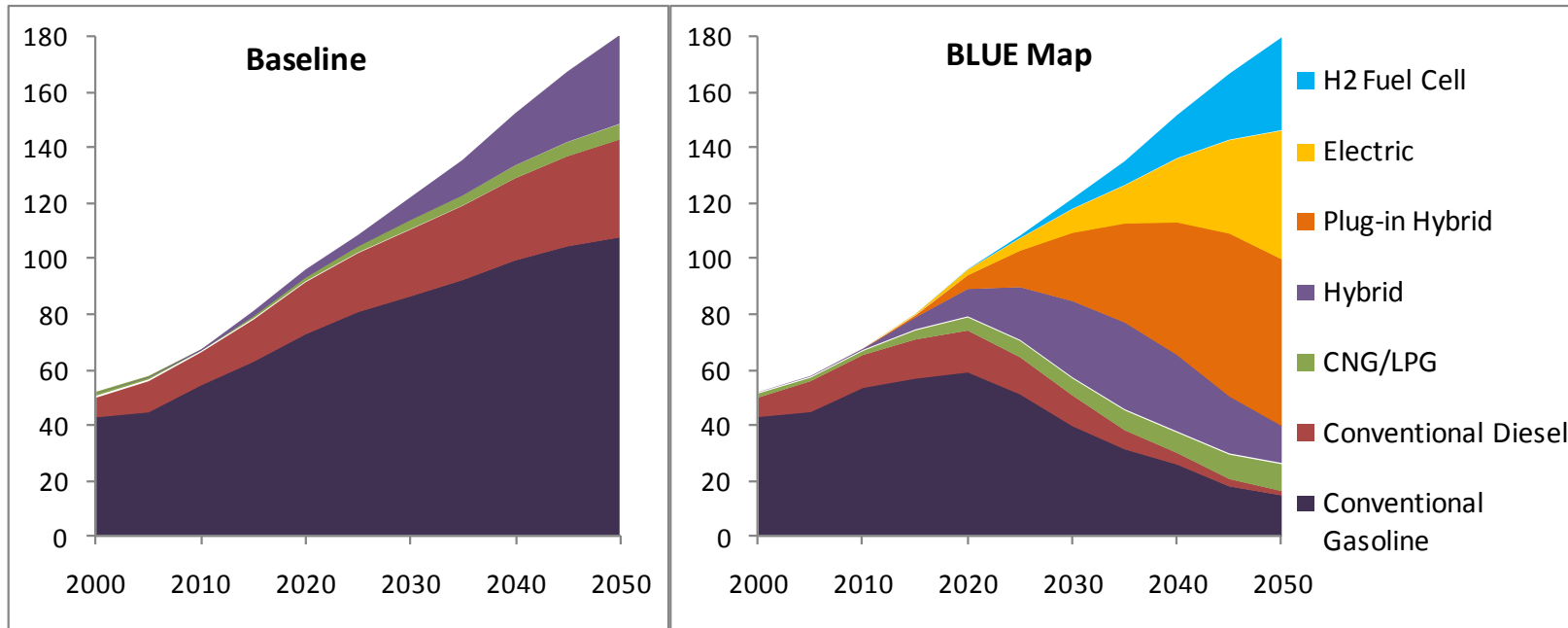
# World energy-related CO<sub>2</sub> emissions abatement by region



In the BLUE Map scenario, transport accounts for 23% of reductions. Additional savings accrue in "transformation", since less high-CO<sub>2</sub> fuels (such as coal-to-liquids) are produced for transport use.

# Passenger LDV sales by technology type and scenario: BLUE Map will be VERY challenging

*Million sales / year*

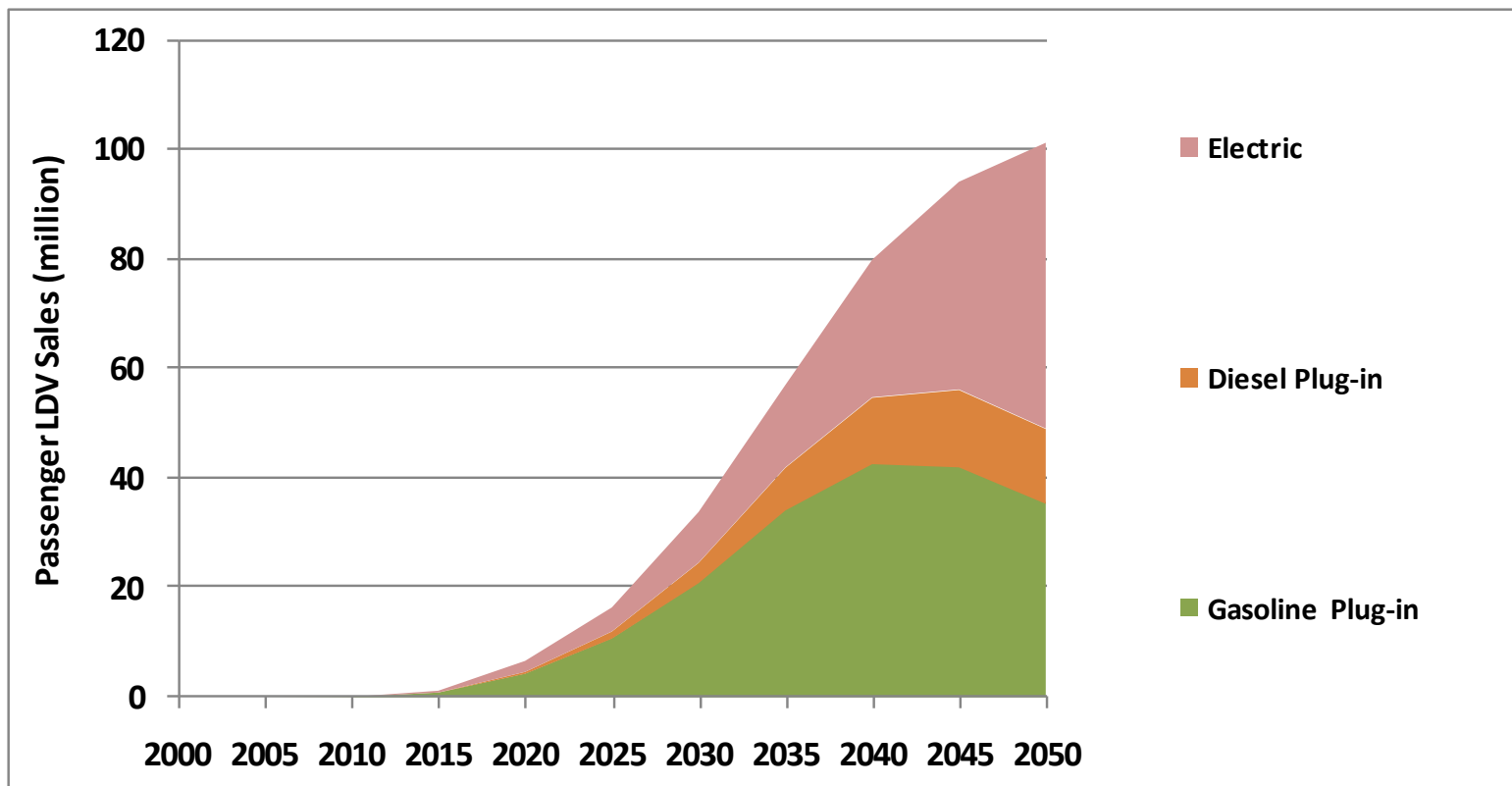


In the ETP Baseline, sales are mainly conventional vehicles through 2050; hybrids reach about 20% of sales

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 two-thirds of all sales.

# BLUE Map EV/PHEV global sales trajectory to 2050

*How can we achieve this?*



## Annual sales targets:

**2020: 7 million: e.g. 70 models selling 100,000 each**

**2030: 30 million: e.g. 150 models selling 200,000 each**

**2050: 100 million: e.g. 400 models selling 250,000 each**

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

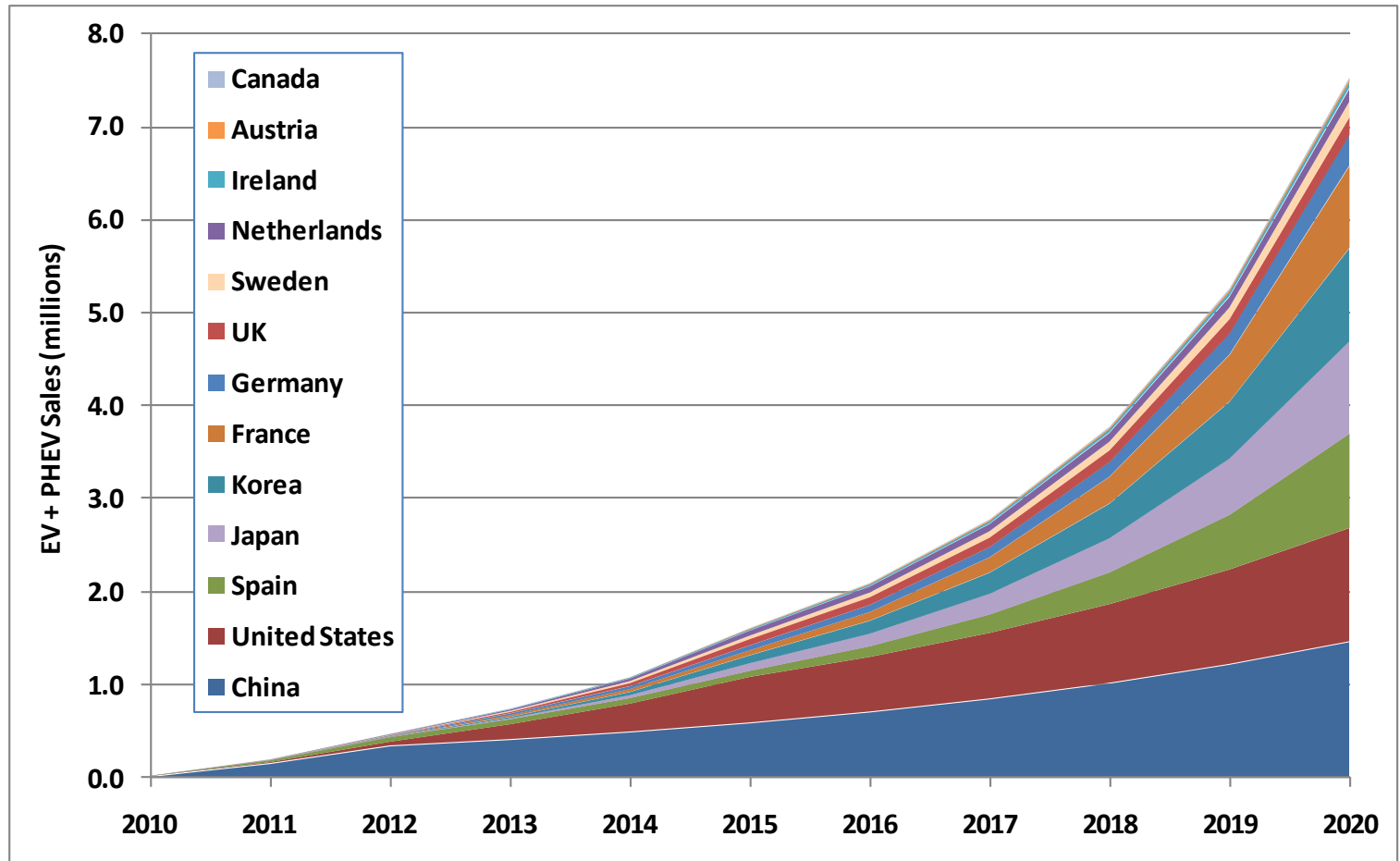


Figure based on announced national sales and stock targets, with assumed 20% annual sales growth after target is met, if target is before 2020 (e.g. China's target is for end of 2011).

**EV / PHEV sales could reach seven million by 2020**

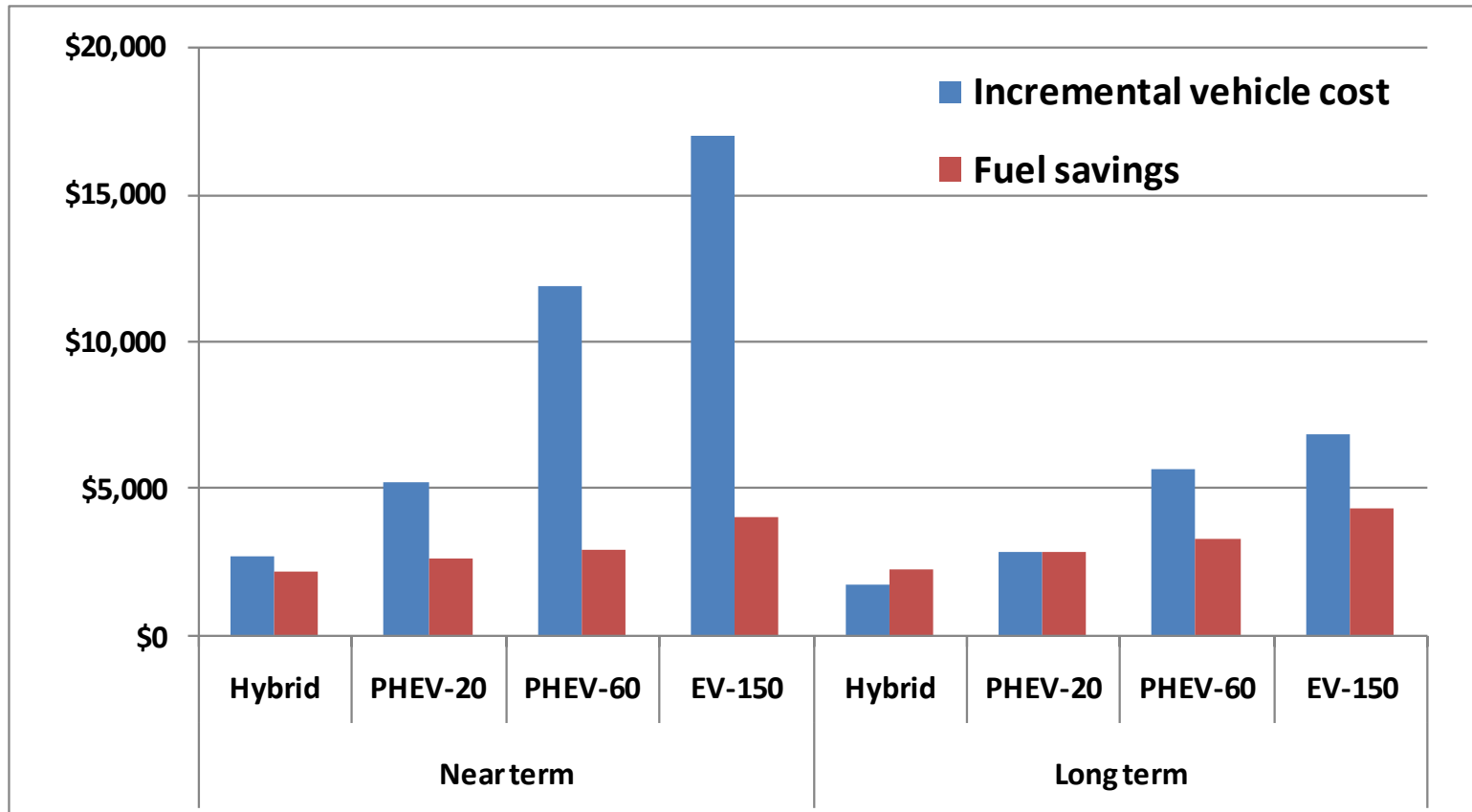
# Roadmap: some technical findings

- **EV incremental costs could be high unless all of these targets are met:**
  - Battery costs drop to \$300/kWh (target for 2015)
  - Vehicle range on batteries is limited (*e.g.* 150 km)
  - Batteries last nearly the life of vehicles (*e.g.* 15 years) and are amortized over this time frame
  
- **Electricity demand does not look like a significant issue on a regional scale before 2030**
  - 200 tWh in 2025 v. 13,000 OECD-wide
  
- **But...**
  - Could become an issue in specific areas
  - Availability of low-CO<sub>2</sub> generation will be key
  - Load management; grid integration issues emerge
  - EV/PHEV share of world generation could reach 10% by 2050



# Some cost estimates

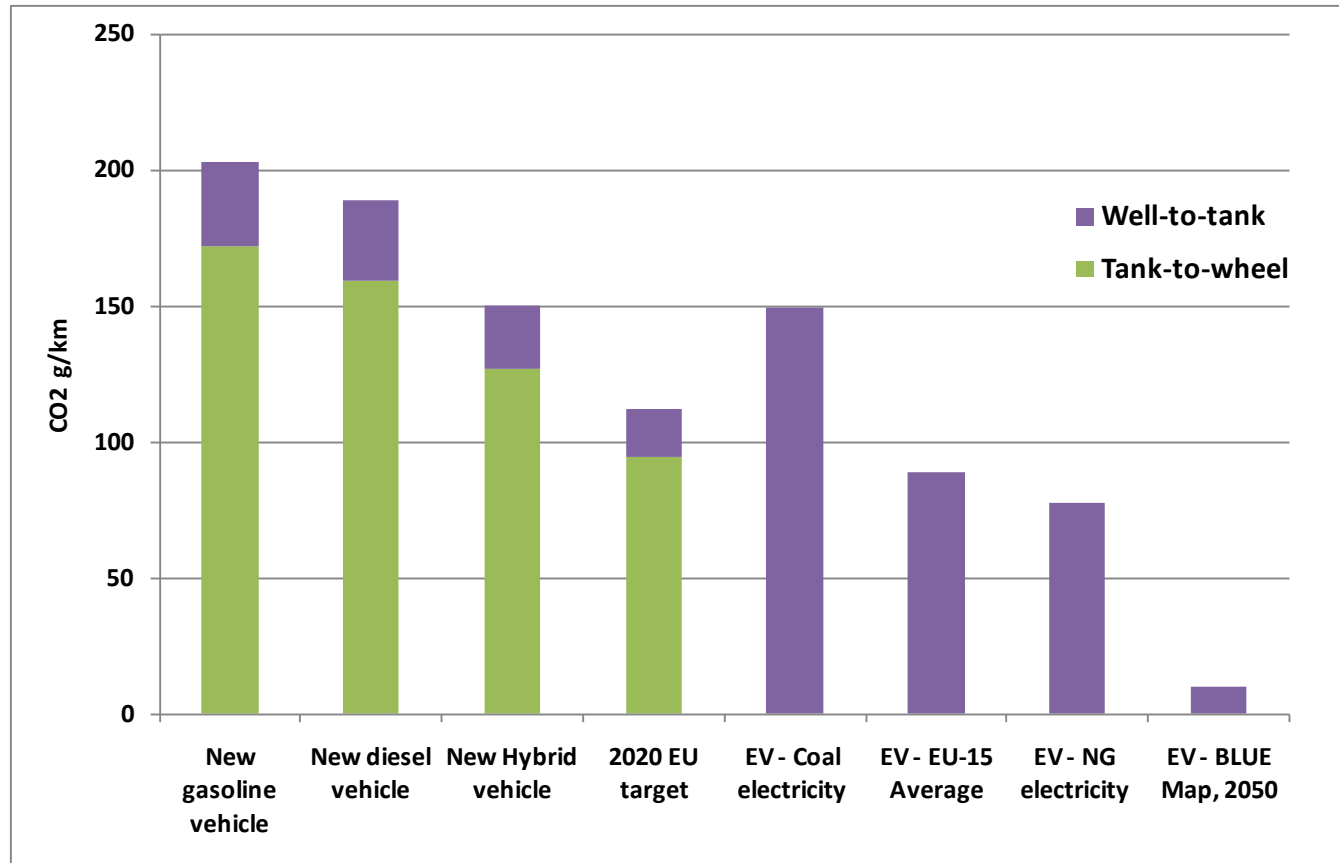
## Hybrids, PHEVs and EVs v. gasoline vehicle over time



Notes: PHEV-20= 20 km range, etc; fuel savings estimated over 160k kms of driving; base gasoline vehicle efficiency improves over time; oil prices \$80/bbl near term, \$120/bbl long term; battery costs decline over time from \$750 to about \$300/kWh

# How do EV's compare?

## Life-cycle CO<sub>2</sub> emissions from EU light-duty vehicles

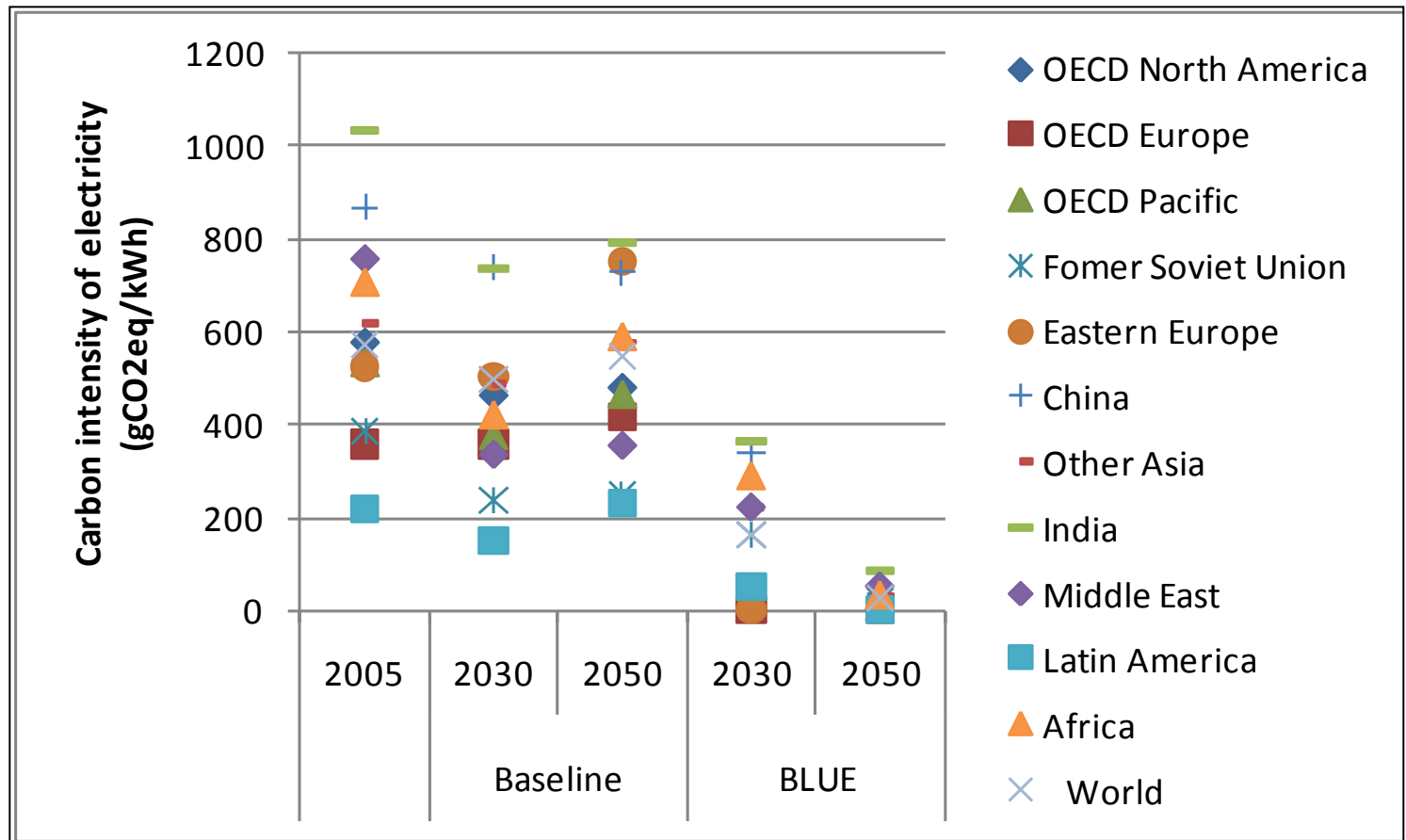


Based on EU average size, new LDVs for 2009 (except EU 2020 target); EV's assumed efficiency of about 0.2 kWh/km. Note that very efficient or small EVs would achieve lower CO<sub>2</sub> than shown here.

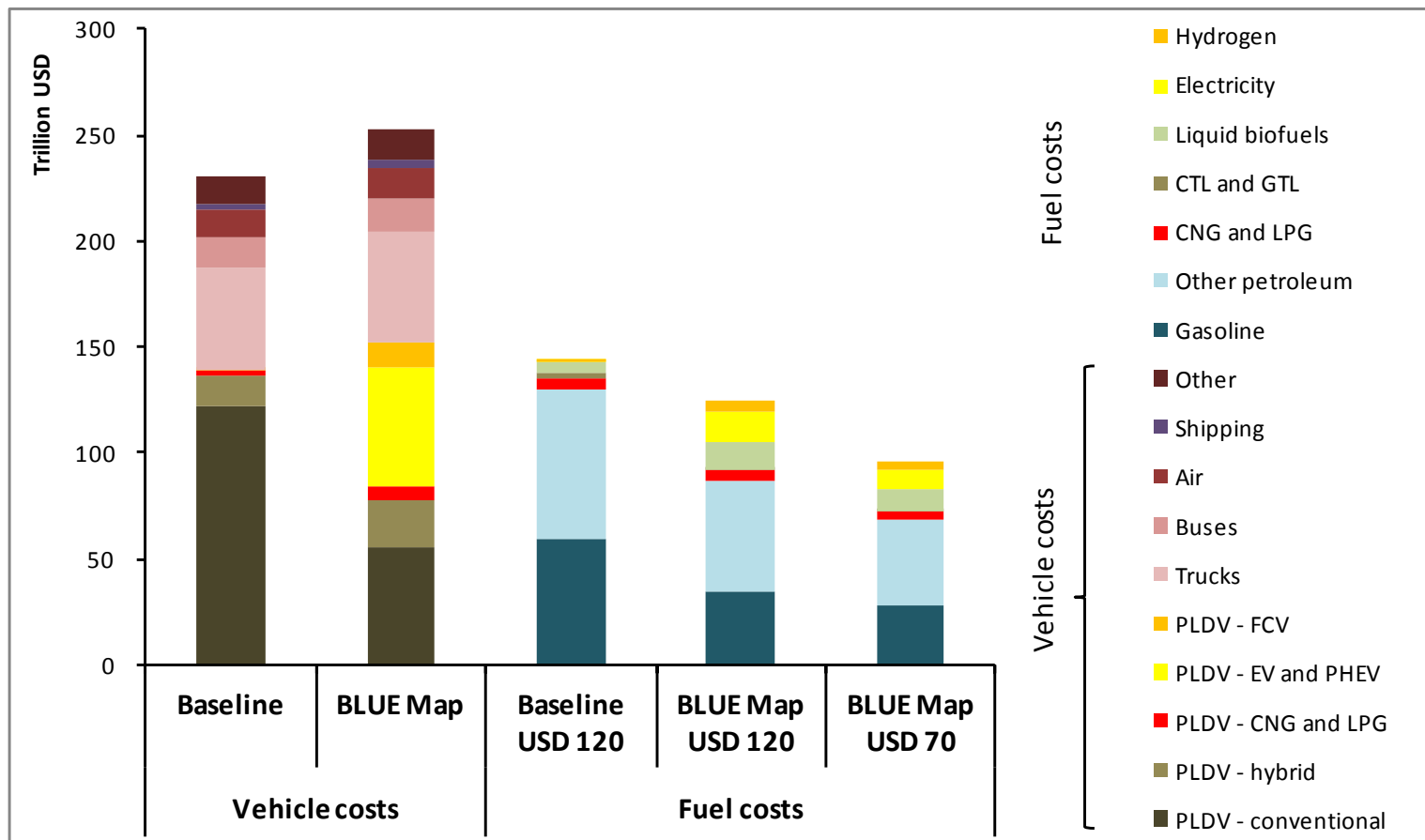
**EVs generally cut CO<sub>2</sub> emissions today, though not in all comparisons; but in a BLUE Map future they will approach zero CO<sub>2</sub>.**

# GHG intensity of electricity production

By 2050, electricity generation radically decarbonised in BLUE Map – but not in Baseline

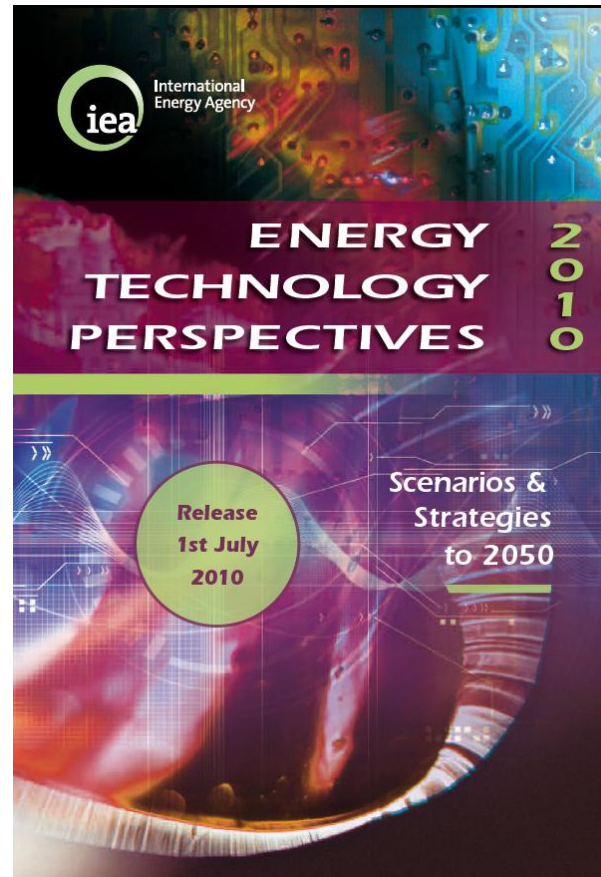


# Global Vehicle and Fuel Costs, 2010-2050 by ETP Scenario



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**



**Thank You**

[www.iea.org/techno/etp/index.asp](http://www.iea.org/techno/etp/index.asp)