Employment Impacts of Electric Vehicles

Overview of the main results of the recent literature

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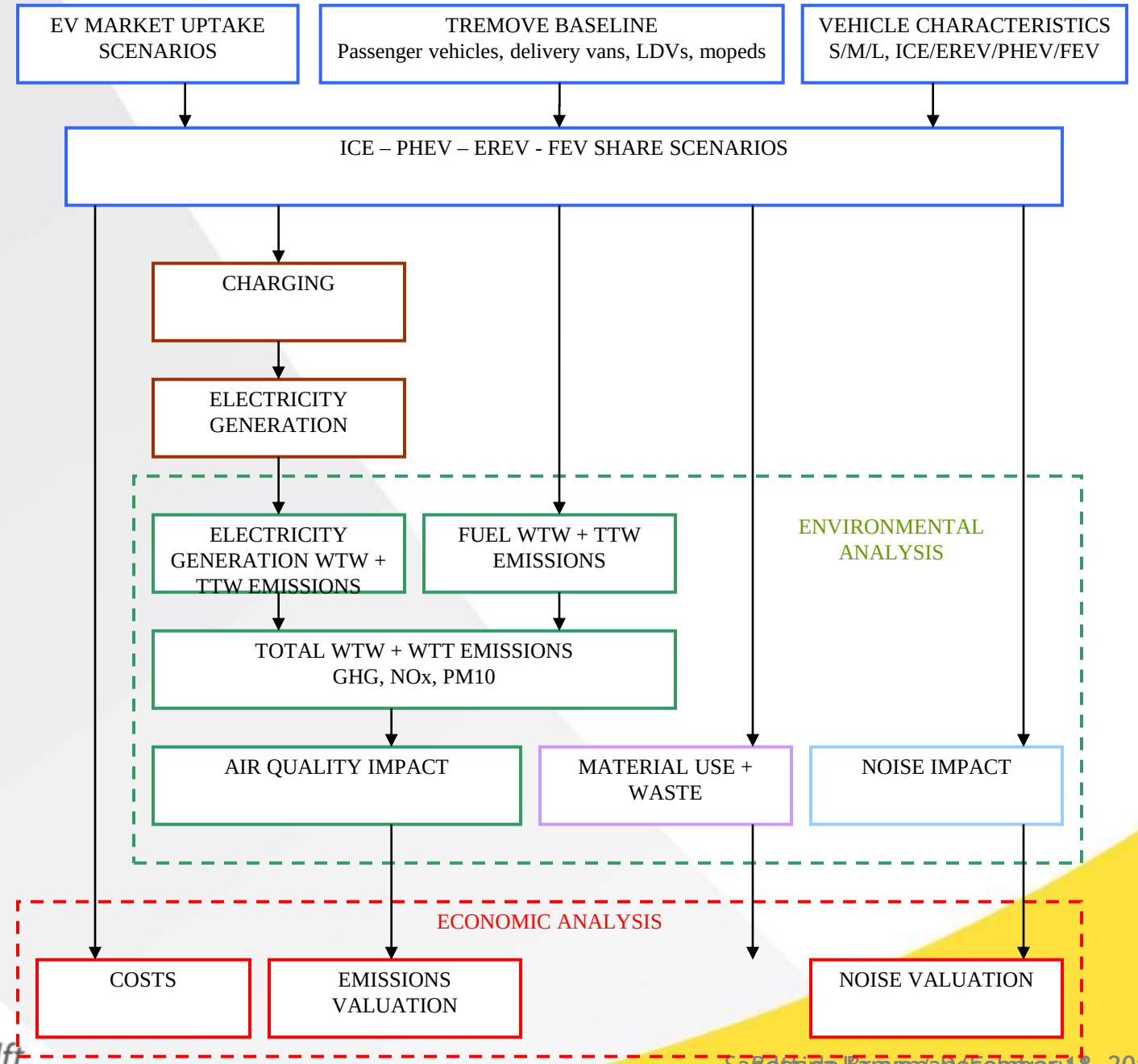
Presentation overview

- Development up to 2030: Summary of study for DG Clima (2011)
- Does employment give policy rationale for accelerated uptake of EV?
- Overview of the literature so far on employment benefits
- A best guess of potential employment impacts
- Main conclusions

Study for DG Clima (2011)

- Carried out by CE Delft together with ICF and Ecologic
- Objective: Identify potential for market uptake of EV in cars in EU by 2030.
- Modelling car ownership, car use, electricity generation, environmental impact.


EV MARKET UPTAKE SCENARIOS
TREMOVE BASELINE
Passenger vehicles, delivery vans, LDVs, mopeds
VEHICLE CHARACTERISTICS
S/M/L, ICE/EREV/PHEV/FEV
ICE – PHEV – EREV - FEV SHARE SCENARIOS
CHARGING
ELECTRICITY GENERATION
ELECTRICITY GENERATION WTW + TTW EMISSIONS
FUEL WTW + TTW EMISSIONS
ENVIRONMENTAL ANALYSIS
TOTAL WTW + WTT EMISSIONS
GHG, NOx, PM10
AIR QUALITY IMPACT
MATERIAL USE + WASTE
NOISE IMPACT
ECONOMIC ANALYSIS
COSTS
EMISSIONS VALUATION
NOISE VALUATION

Scenarios

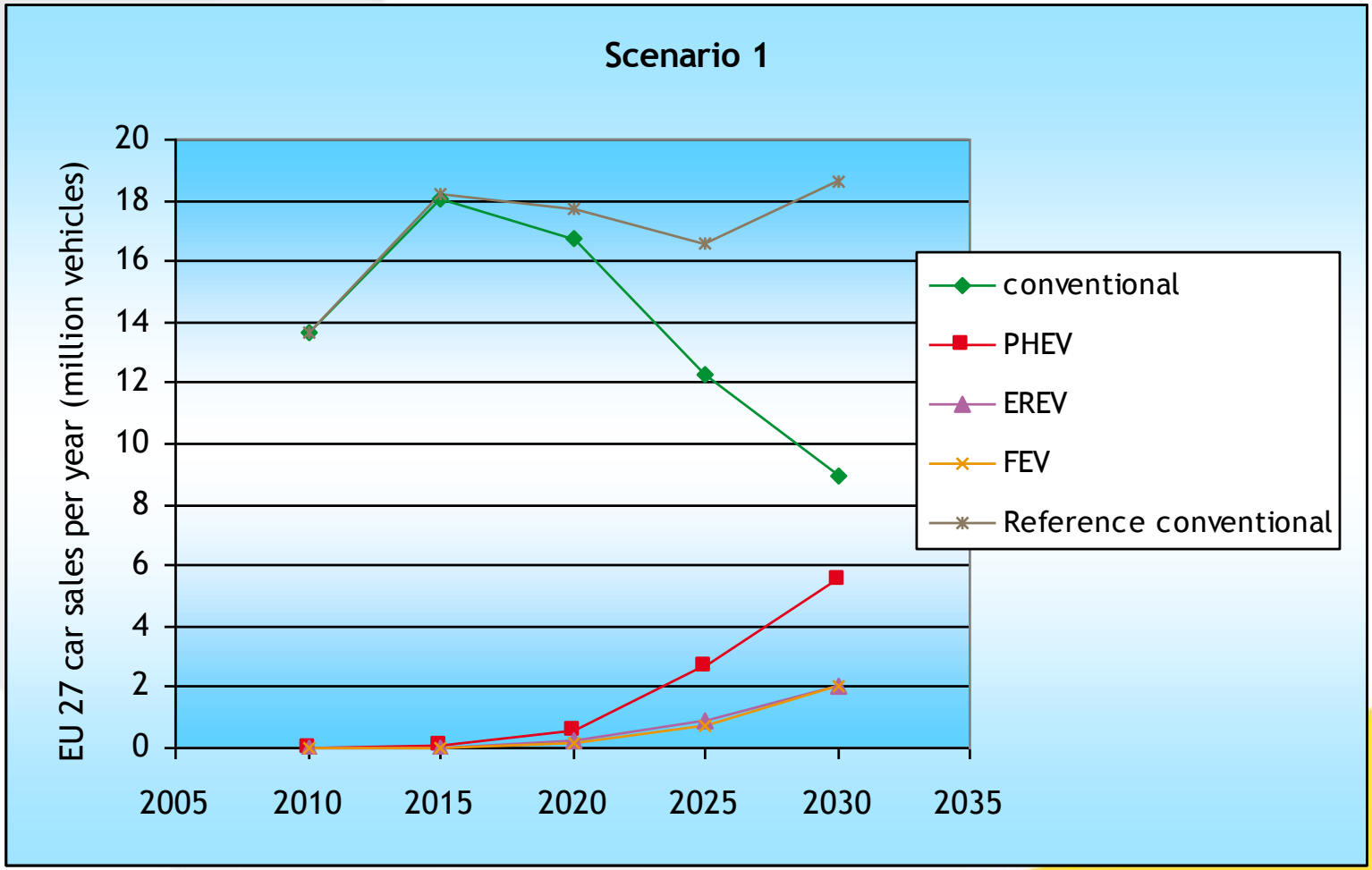
- Reference scenario: TREMOVE 3.3.1
  - Current policy measures implemented, no EVs
- EV scenario 1: ‘most realistic’
  - Input values: best estimates of modelling
- EV scenario 2: Limited EV uptake
  - High battery costs and limited incentives,
  - Fast ICE development
- EV scenario 3: Technological breakthrough EVs
  - 2015: Breakthrough in battery cost and performance

- Consumer decision based on TCO;

EV Scenario 1: 'Most realistic'

- Input parameters estimated using the results of modelling exercise5
- Government incentives: assumed to continue as currently in place.
- Most consumers are reluctant to switch to EVs.
  - Only 'innovators' (5%) interested as long as costs are high.
  - Urban drivers mainly interested in FEVs and EREVs, non-urban drivers in PHEVs and EREVs.
  - Non-innovators start buying EVs once their TCO can compete with that of ICEs.
- Sales are modelled using a price elasticity.
- Production capacity and charging opportunities will be limited at first, and increase over time.
- Smart charging will be implemented from 2018 onwards

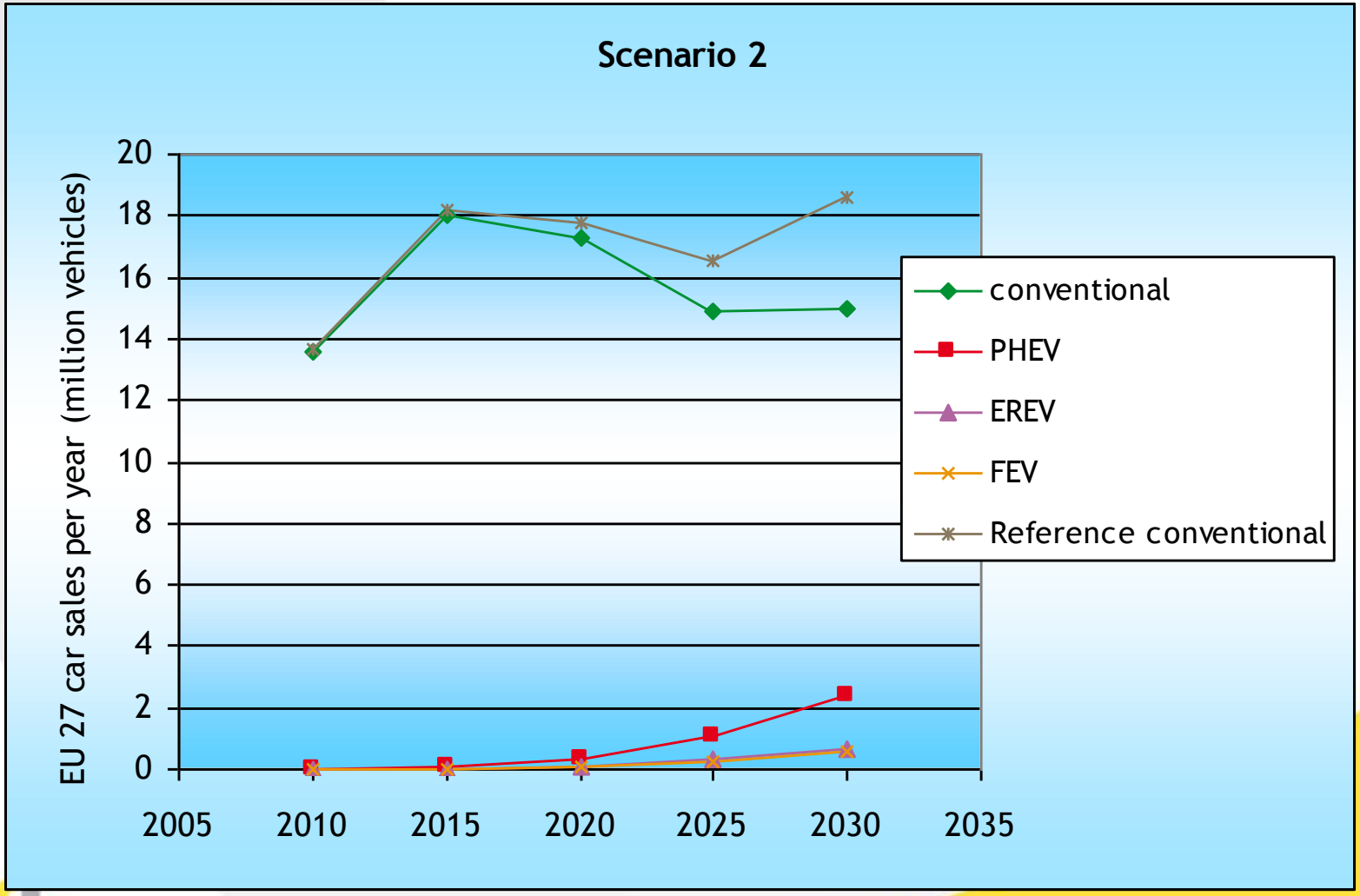
Vehicle sales scenario 1



EV scenario 2: Limited EV uptake

- Successful further development of ICEs
  - more optimistic estimates for costs and fuel efficiency
- Cost of batteries reduce less fast than in scenario 1.
- Government incentives reduce of time, insufficient to compensate high cost.
- Consumer interest remains limited to innovators and niche markets
- Charging possibilities remain limited
- FEVs: TCO remains high, resulting in a low market uptake
- PHEVs will successfully enter the market, but less fast than in scenario 1
  - their electric range remains limited
- EREVs: their market share remains limited
  - they remain expensive
- No or limited smart charging.

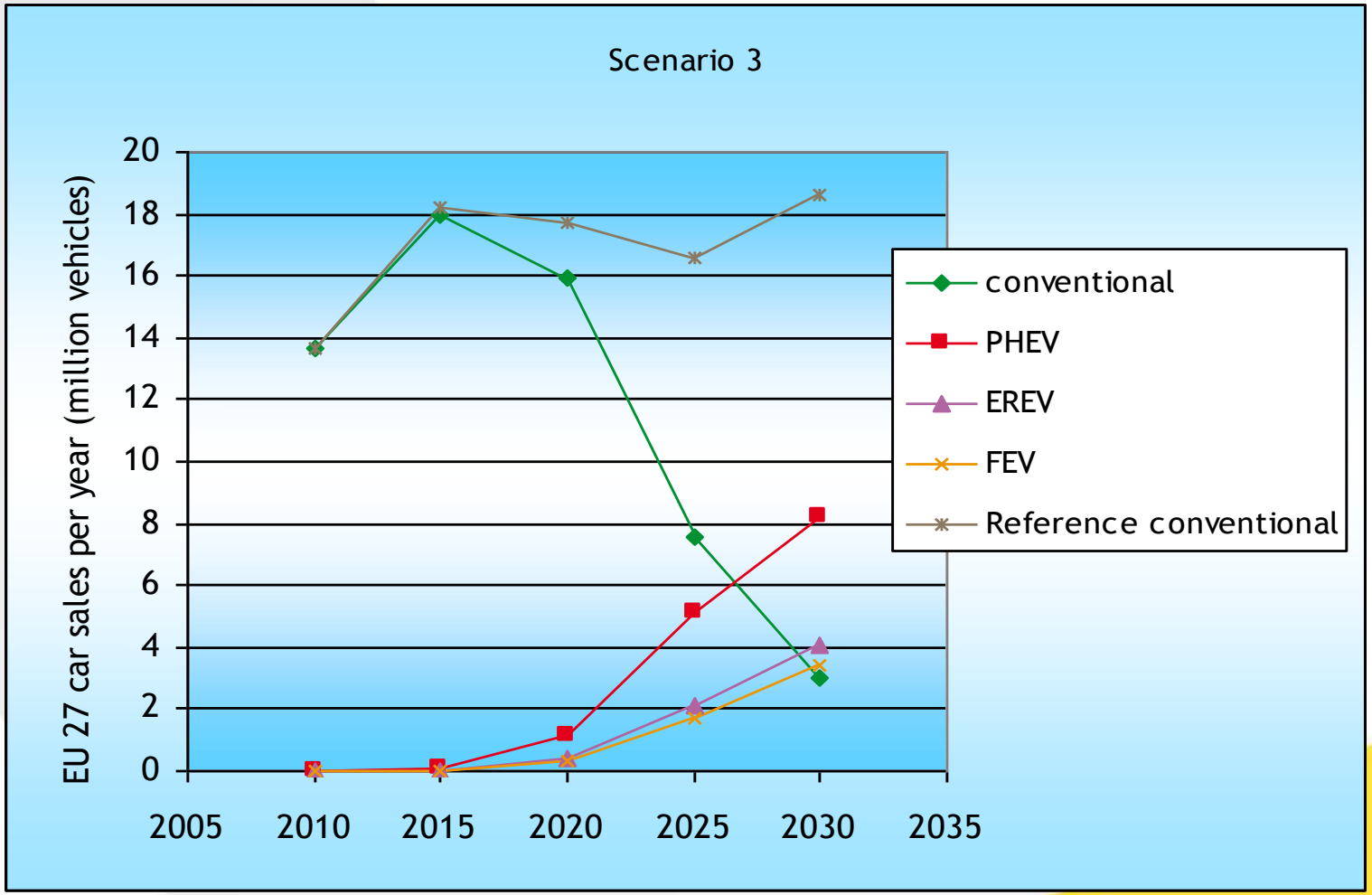
Vehicle sales scenario 2



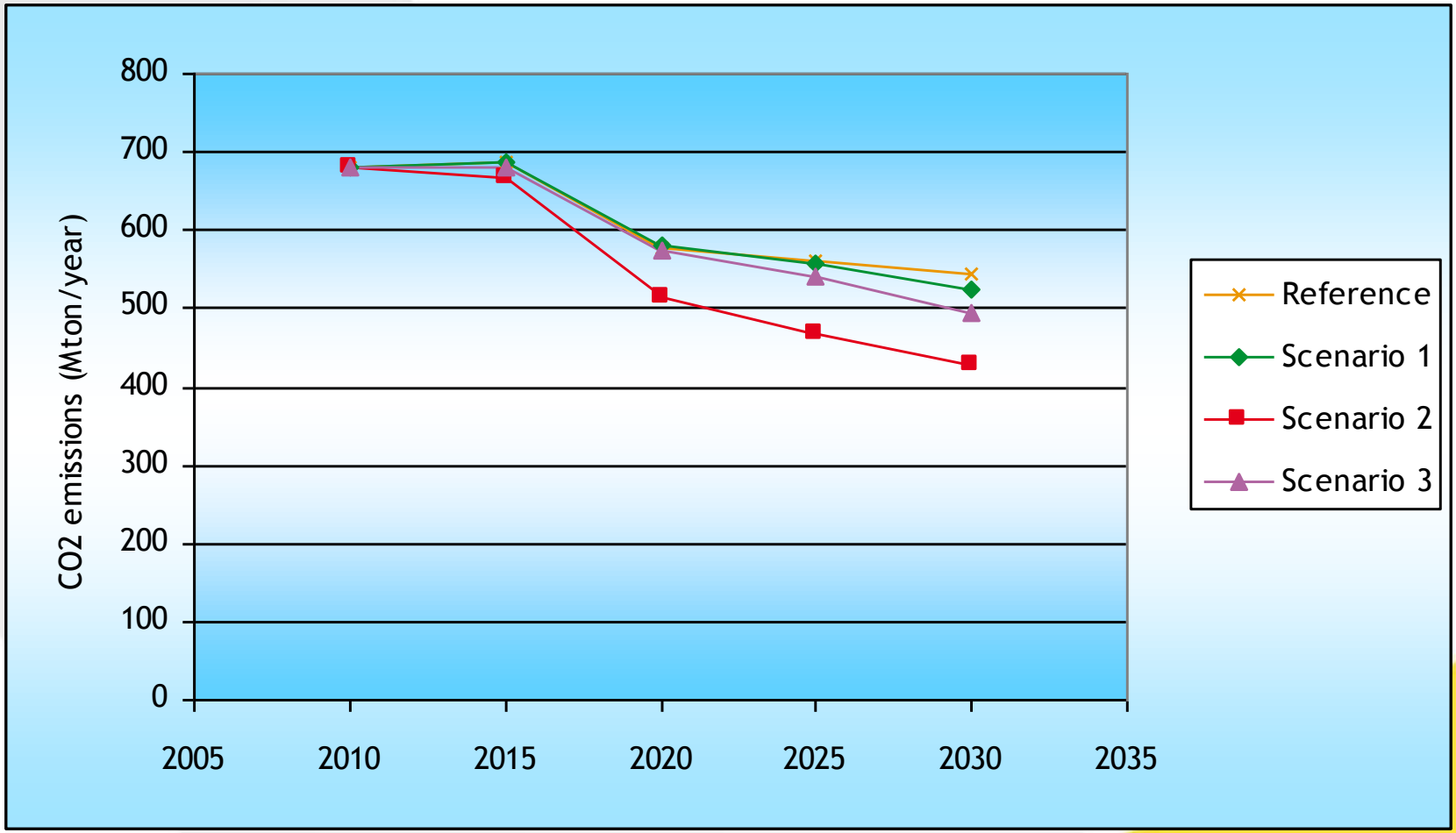
EV scenario 3: EV breakthrough

- Rapid decrease of battery cost, from 2015 onwards.
- Effects:
  - PHEVs almost competitive with ICEs in part of urban and non-urban transport; their e-range increases.
  - FEVs become competitive, at first in the small vehicle segment and urban transport. After 2020, ranges increase and cost reduce further.
  - In the larger vehicle market and non-urban, PHEV and EREVs gain rapid market share from 2020 onwards, as costs gets competitive.
- 2010-2020: Market uptake is limited by production capacity, consumer scepticism, electricity infrastructure bottlenecks etc.
- Government incentives for EVs high at first in some countries, will be reduced after 2015 as costs go down.
- Smart charging implemented from 2018 onwards. After 2025, fast charging is offered throughout the EU, removing range limitations.

Vehicle sales scenario 3



Overall impact on emissions: CO_2



Impacts on government revenues

Estimated impacts on annual revenues in 2030, EU27

	2020	2030
Fuel and electricity taxes	- €1 - 3.5 billion	- €18 - 38 billion
VAT from vehicle sales	+ €3 - 8 billion	+ €11 - 18 billion
Other vehicle taxes	- €0.5 - 2 billion	- €11 - 23 billion

Assuming that current tax systems and subsidies remain in place!

Study 2: Does employment give an additional rationale for EV or PHEV?

- Client ECF
- What would be the employment impacts of largescale transition to PHEV and EV?
- Literature review: Identify current state of the art of the literature on EV and hybrids with respect to employment impacts
- Purpose: preliminary conclusions and go/no-go decision further study

Overview of the literature

- 30 studies of which 23 useful in giving quantification of some impacts
- Most studies took situation in US, EU, Germany or the World as perspective.
- All studies took a partial perspective - none of the studies contained a full economic analysis where prices/market shares change.
  - In contrast with literature on e.g. renewable energy
  - Two US studies took input-output approach and can be regarded as most comprehensive
- Several studies took a very simplified engineering perspective
  - EV car is more expensive to make;
  - therefore more value is added;
  - and thus in more employment
- This neglects foregone consumption, capital intensity of EV and price impacts on markets.

Overview of impacts

1. Impact on car ownership
2. Impact on manufacturing of cars, maintenance, fuelling, infrastructure and maintenance
3. Impact on consumption, oil imports, innovation and rebound impacts

Behavioral impacts on car ownership

- EV shift costs from fixed to variable cost components
- Hence: purchase of car more expensive, less cars sold, loss in employment
- Hence: lower costs of using a car, more mileage, gain in employment

However,

- Net balance of effects not deductable from the literature (although it would be fairly simple to do this)
- TCO is not a good measure for behavioral impacts: consumers attach more weight to purchase costs than to mileage costs.
- Auxiliairy impacts on modal shift and congestion have not been analyzed.

> Impacts on manufacturing

	Hybrids	EV
Car manufacturing	Increase	Decrease
Maintenance/recycling	Neutral	Small decrease
Fuelling	Decrease	Small increase
Infrastructure	Neutral	Increase

> Conc: also impacts on manufacturing are unclear

> Indirect economic impacts

- Consumer spendings: if the stimulation of EV is done in such a way that the TCO is decreased through EV, additional consumer spendings may have a permanent positive employment benefit
- Reduced oil consumption will have a temporarily positive employment impact (until balance of trade is restored);
- Innovation and competitiveness may be enhanced of EU car manufacturing – also because of potential shortage in the long-run of engineering personel.

Conclusions

- EV is likely to become a realistic alternative in the near future for ICE.
- Employment benefits may form a reason for stimulating more uptake of EV, however these cannot be discerned from the current strand of literature
- If the TCO is taken as a measure to guide policies, and if policies are steered towards lowering the TCO through EV, employment benefits are likely.
- EVs impact on a large range of policy areas (and vice versa) and many of them (e.g. standardisation of charging, charging infrastructure, implementation in the RED, harmonisation of fiscal policies) require action in the short to medium short term.

Thank you for your attention!

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- Greening of the economy, EU ETS analysis and expansion to aviation/ maritime shipping are core business.
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