



EPoSS
European Technology Platform
on Smart Systems Integration

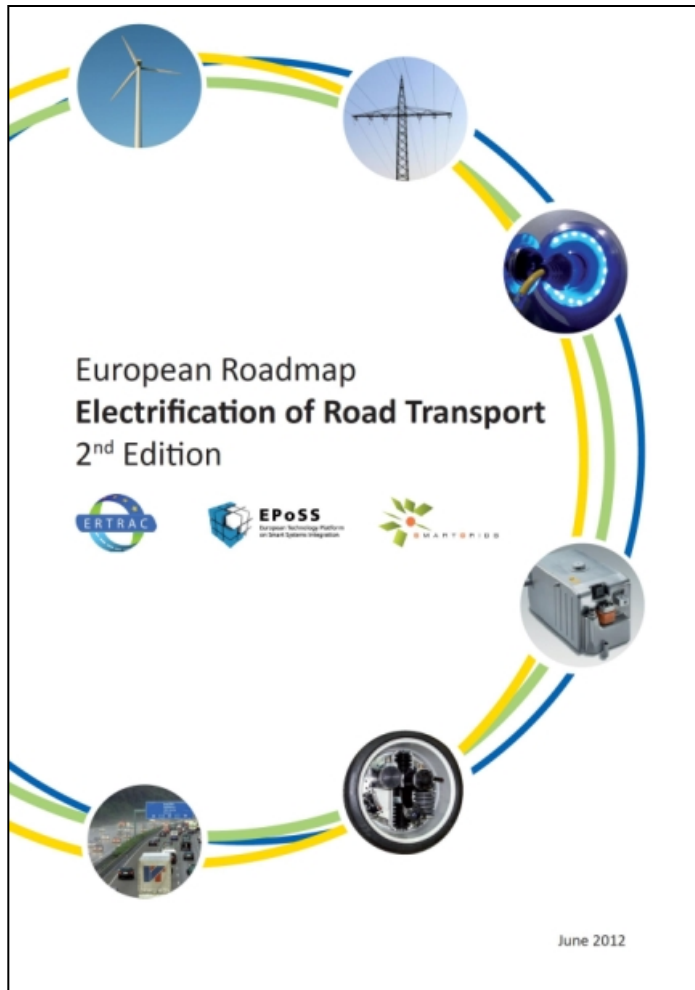


European Roadmap Electrification of Road Transport

8 March 2017

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Electrification Roadmap




2009 / 2012 Versions

- Joint effort of **ERTRAC, EPoSS and SmartGrids**
- Commitment and shared vision of the industries involved in the **European Green Cars / Vehicles Initiative PPPs**
- Base document for **call recommendations** on electric mobility since **2009**
- **Topics covered** in projects
- Input to **ECSEL MASRIA**

Electrification Roadmap

European Roadmap
Electrification of Road Transport
3rd Edition, Version 8.0,
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Draft 2017 Update

- Joint effort of **ERTRAC**, **EPoSS** and **SmartGrids**
- Commitment and shared vision of the industries involved in the **European Green Cars / Vehicles Initiative PPPs**
- Base document for **call recommendations** on electric mobility since **2009**
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Objectives of the Roadmap Update

- start from **customer expectations** regarding the performance and utility of electric vehicles (BEV, PHEV/REX, FCEV)
- consider the role of electrification for Europe's global industrial **competitiveness**
- enlarge the focus from passenger cars only to smaller **(L-category)** and larger **(buses and trucks)** vehicles
- support the consultation process of the European Green Vehicles Initiative **(EGVI) PPP**

What do users expect?

- prices as low as today's ICE driven vehicles or at least vehicles with **costs competitive** to those of today
- **range, reliability, durability** and re-sale **value** of electrified vehicles similar to conventional vehicles
- range adapted to **use cases**
- usage **comfort** as good as the state of the art ICE-powered vehicles

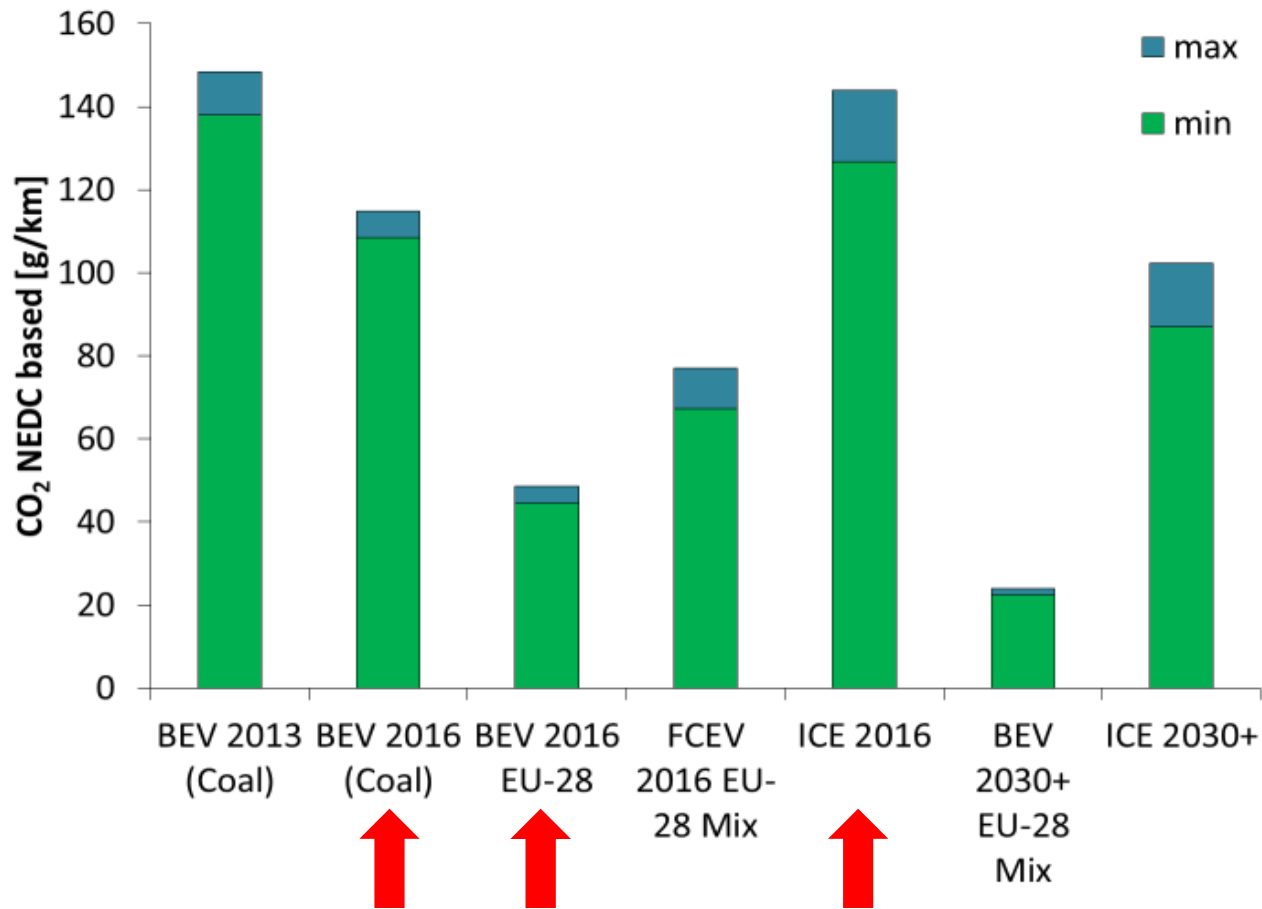
End of “one vehicle fits all” mentality:

- EV will **never fully replace ICE** with same performance
- EVs will be **designed for specific purposes and needs**
- **benefits**, e.g. in terms of access, or synergies with automation and connectivity can compensate

Why Electric Mobility ?

- tackle **climate change**
- improve **air quality**, especially in cities
- meet CO₂ and pollutant emissions **regulations**
- reduce dependence on **fossil fuels**
- accelerate the use of **renewable** energies
- compete worldwide on **technology leadership**

Benefits for Emissions and Energy Efficiency



CO₂ reduction potential of EVs depends on **WTW energy efficiency** and emissions of the **primary energy source**

When do we get Electric Mobility?

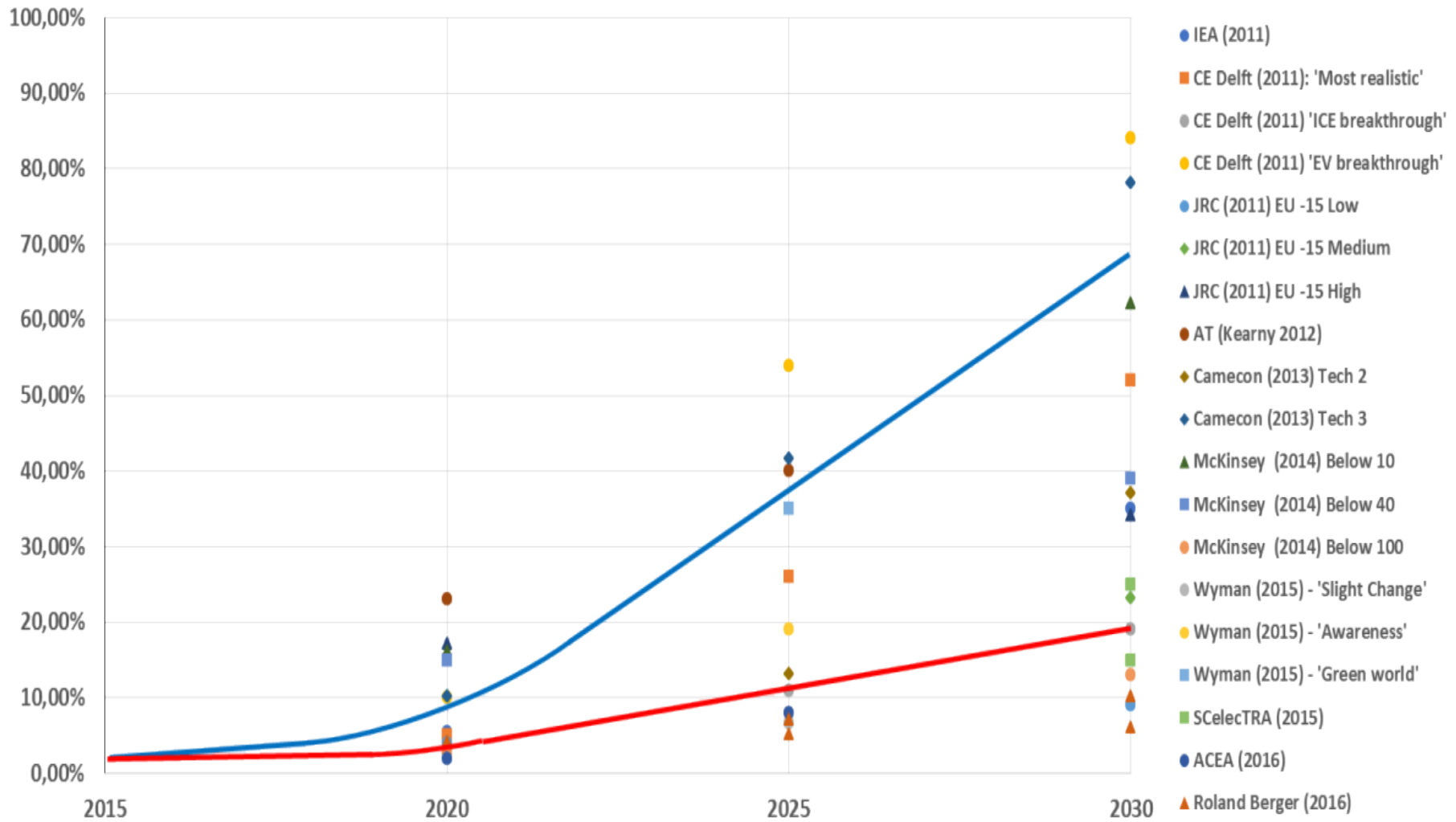
- Approx. **500 thousand EVs** on EU roads
- Real **market take-up** is imminent.
- Massive **investments** will make electric cars an industrially viable and cost competitive product.
- Noticeable **change in the automotive portfolio** will occur in the next 5 to 10 years.
- Technical shortcomings and cost issues will remain and require **more research, development and innovation** activities.

Milestones

Case considered	EV 2016	EV 2020		EV 2030	
Hypothesis	Existing	User friendly affordable	High performances premium	User friendly affordable	High performances premium
Electric grid consumption (Wh/km) ²²	140	130	135	115	120
Range (km) ²¹	250	250	500	250	700
Retail extra cost (€) ²³	> 7000	> 4000	> 7000	Comparable	> 7000
Battery total energy (kWh)	28	26	55	27	70
Battery cell gravimetric energy density (Wh/kg)	160	> 180	300	> 330	500 ²⁴
Battery cell cost ²⁵ (€/kWh)	180	100	140	80	120

- **2020:** Mass production of passenger cars and scaling-up of heavy duty vehicle electrification
- **2025:** Fully revised electric vehicle concept
- **2030:** Redesigned electrified road transport meeting the requirements of the future connected society

EV and PHEV Sales Forecast

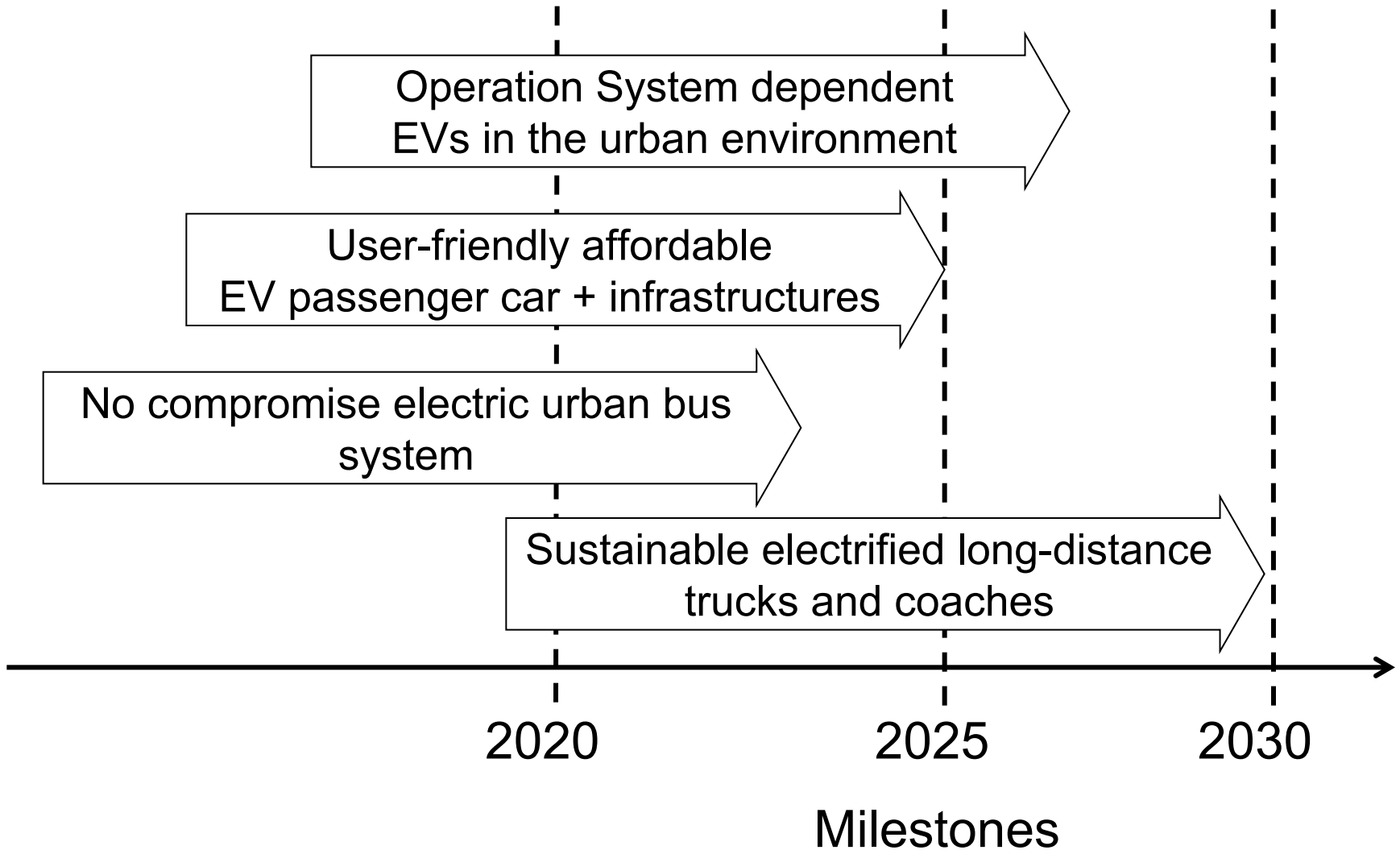


red: evolution blue: major breakthroughs + full policy support

What has to be done?

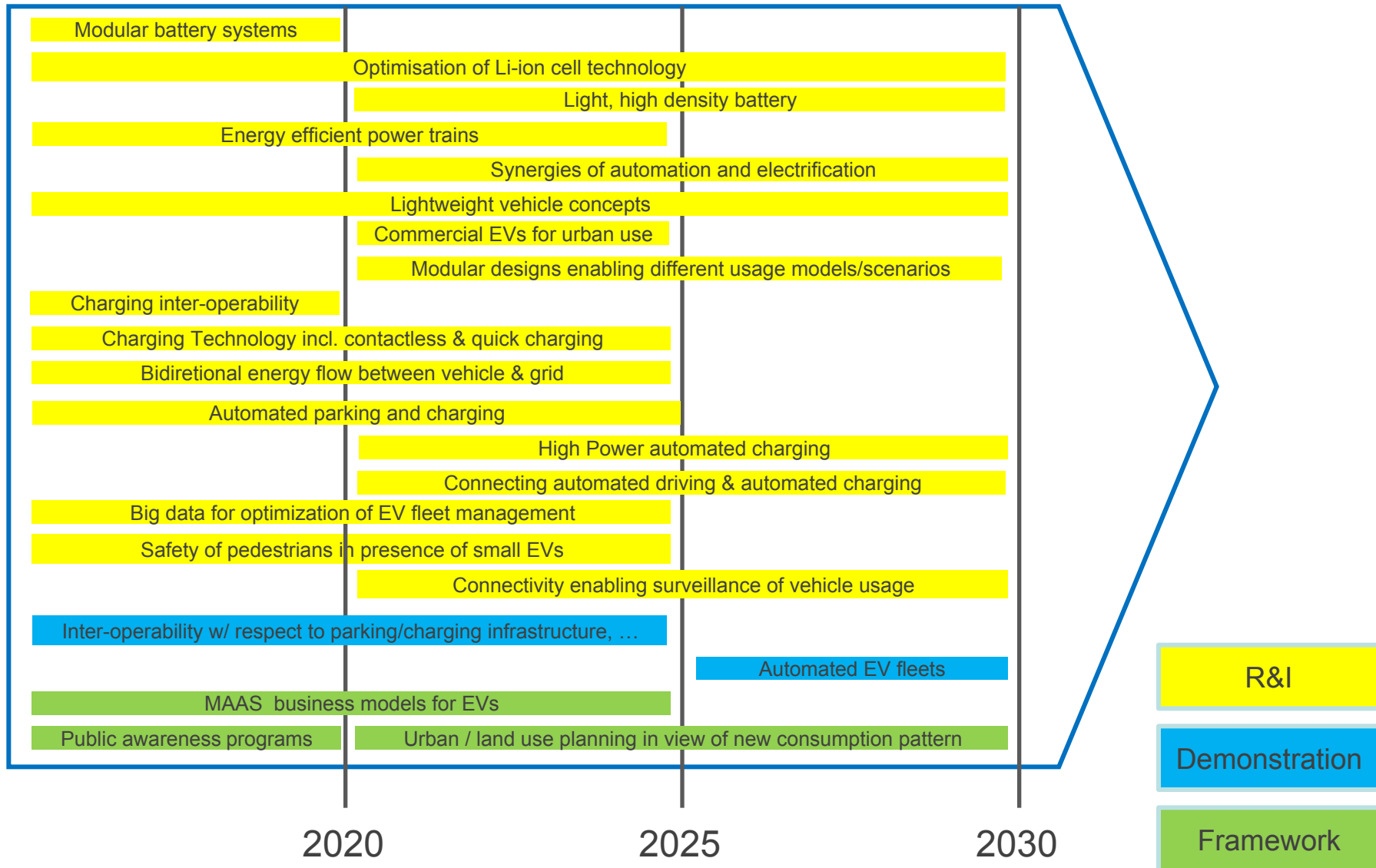
- progress in **performance and energy efficiency**
- improve **energy storage** systems
- supply innovative **vehicle concepts**
- exploit potential of **connectivity and automation**
- establish **battery manufacturing** in EU
- provide **incentives** to support the market take-up
- ensure availability of **charging infrastructure**
- make mobility offers for **leasing or sharing EVs**

Four Big Initiatives



Roadmaps

Example: Operation system dependent EVs in the urban environment





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