

EU Auto-Fuel Biofuels Roadmap

Dr Ausilio Bauen

European Biofuels Technology Platform

Brussels, 14 October 2014

E4tech: Strategic thinking in sustainable energy

- International consulting firm, offices in UK and Switzerland
- Focus on sustainable energy
- Established 1997, always independent
- Deep expertise in technology, techno-economic modelling, environmental assessment, markets, policy, business and strategy
- A spectrum of clients from start-ups to global corporations, investors, governments and international organisations



LONDON



TOYOTA

Linde



DAIMLER

Fraunhofer



ofgem

BRITISH AIRWAYS

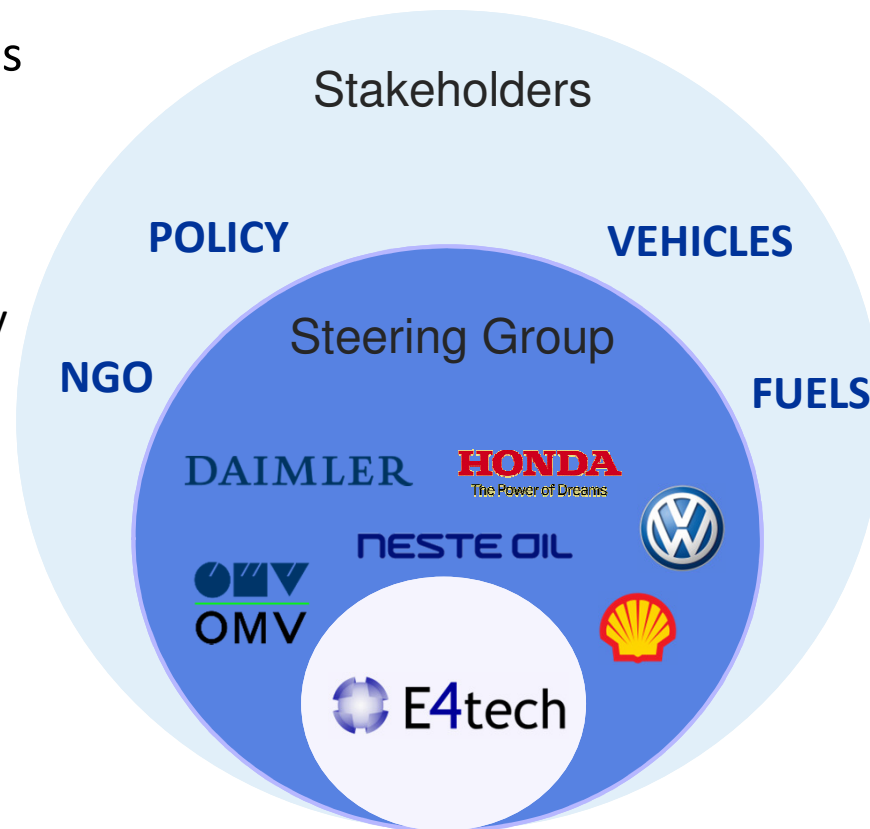


Imperial College
London



The EU Auto-Fuel Biofuels study provides a vision and roadmap for biofuels in the EU to 2030

- Transport energy and environment issues
 - Policy picture is uncertain and fragmented
 - Industry activity also fragmented and biofuels deployment ineffective
 - But decarbonisation and renewable energy targets challenging
- Independent study by E4tech commissioned by fuels and auto industries
- Looks at what can be achieved in terms of sustainable biofuel supply and its integration into vehicle fleet by 2030



The study aims to identify a biofuel-vehicle roadmap that addresses risks and uncertainties to the satisfaction of auto, fuels, consumers and policy stakeholders

The study is comprehensive in its consideration of vehicles and fuels...

Vehicle Categories

- Cars/LDV
- HDV
- 2-wheelers

Vehicle types

- ICE B7+
- ICE E5+
- PHEVs (G)
- PHEVs (D)
- EVs
- FCVs
- LPGVs
- NGVs
- LPGVs
- NGVs
- EVs
- FCVs
- E5+
- EV
- FCV

Biofuels

- **Non drop-in diesel substitutes:** FAME, DME
- **Drop-in diesel substitutes:** HVO, FT, co-processed (pyrolysis) oils, sugar-to-diesel
- **Non drop-in gasoline:** ethanol, methanol, butanol
- **Drop-in gasoline:** co-processed (pyrolysis) oils, sugar-to-gasoline
- **Natural gas substitutes:** Biomethane, Bio-SNG

... and in its analysis of aspects influencing biofuel uptake

Vehicle and Infrastructure

- Vehicle fuel economy (and GHG emissions)
- Vehicle introduction dates
- Vehicle sales growth
- Infrastructure roll-out
- Costs

Biofuels

- Competing demands for feedstocks
- Costs
- GHG emissions
- Environmental constraints and sustainability
- Rate of introduction and ramp-up of 2G biofuels

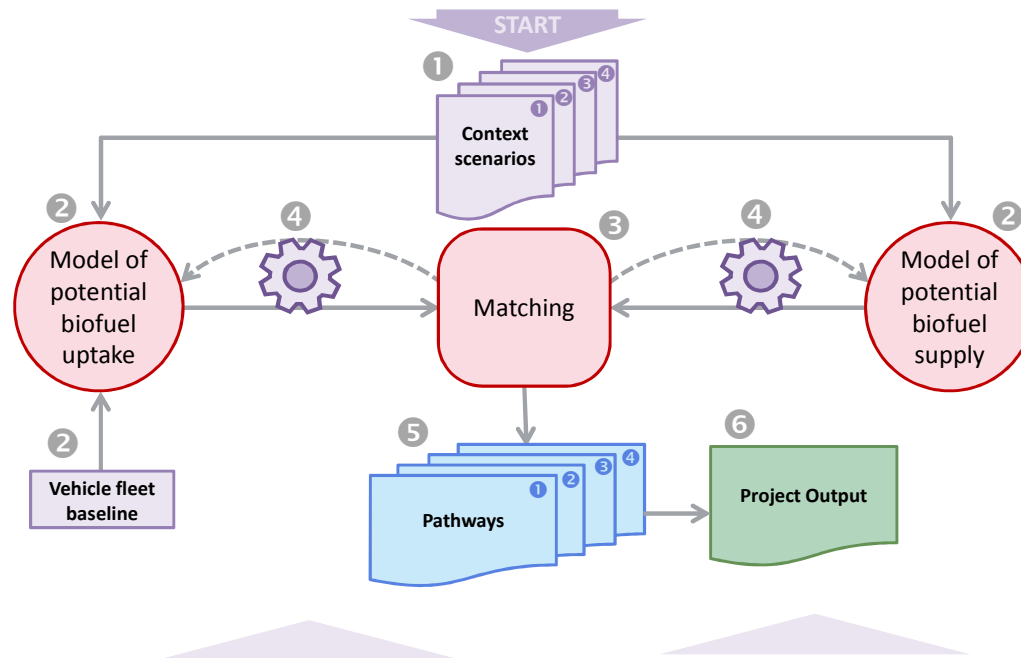
We used time-resolved models of biofuel supply and uptake by vehicles

Biofuel supply model

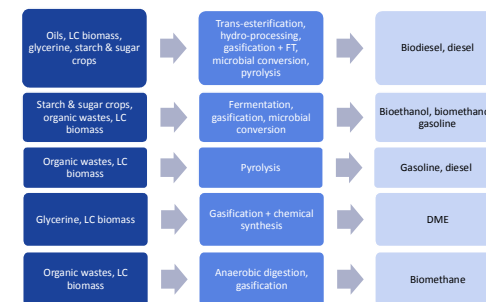
- Considers global crop planting rates, fuel processing plant build-up, env. and other constraints
- Outputs biofuel component volumes, costs, well to tank CO₂

Biofuel uptake model

- Considers vehicle fleet size, replacement rates, usage trends, technology costs and CO₂ legislation; demand from aviation, marine, rail & off-highway
- Outputs parc composition and its bio-compatibility, vehicle and infrastructure costs, potential biofuel uptake, tank to wheels CO₂



Fuel	Additional Technology	Additional per vehicle cost over E10/B7 (Euro 6) baseline			
		Car	LDV	Bus	Truck
E20	Materials, calibration, CO2 optimization potential if octane number increased	+	n/a	n/a	n/a
E85	Wide-range lambda-sensing, new fuel lift pump, fuel injection system material (stainless steel), CO2 optimization potential if octane number increased	++	n/a	n/a	n/a
B10	Materials, calibration, oil sensing/ change interval	++	++	++	++
B20	Further after-treatment optimization (higher noble metal content), CO ₂ penalty for 3-5 g CO ₂ /km, new DPF regeneration strategy, oil sensing	+++	+++	+++	+++



We explored economic and policy scenarios to test the sensitivity and resilience of the roadmap

- Each scenario includes regulatory assumptions to and beyond 2020:
 - Vehicle tailpipe CO₂
 - Fuel-chain CO₂
- And assumptions on the evolution of vehicle fleets and biofuels
 - Rate of introduction of long-term technologies (electricity, hydrogen) vs cheaper short-mid term solutions (smaller cars, efficiency, natural gas)
 - Rate of biofuel dev., level of imports

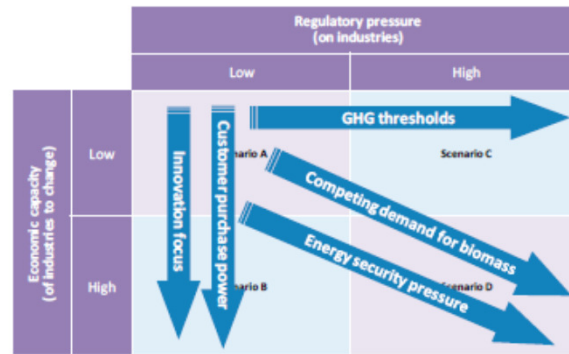


Figure 3: Influence of context scenarios on features of biofuels supply

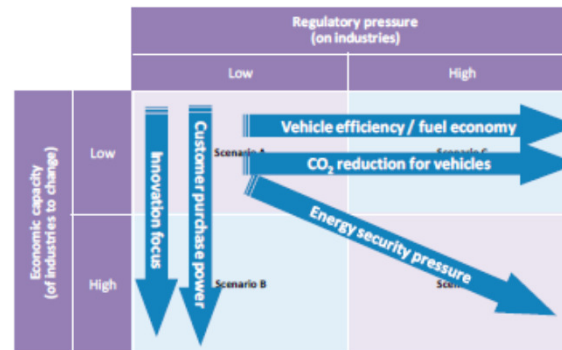


Figure 4: Influence of context scenarios on features of vehicle fleets and fuel demand

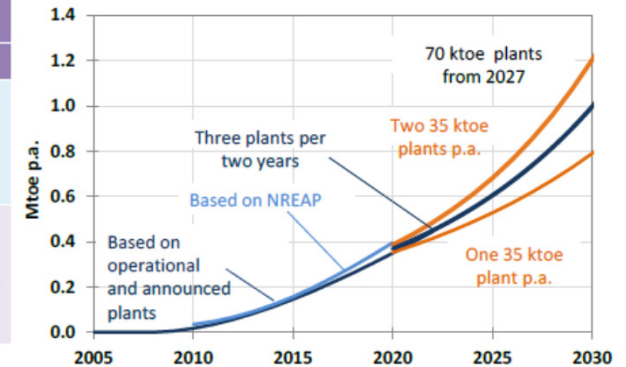
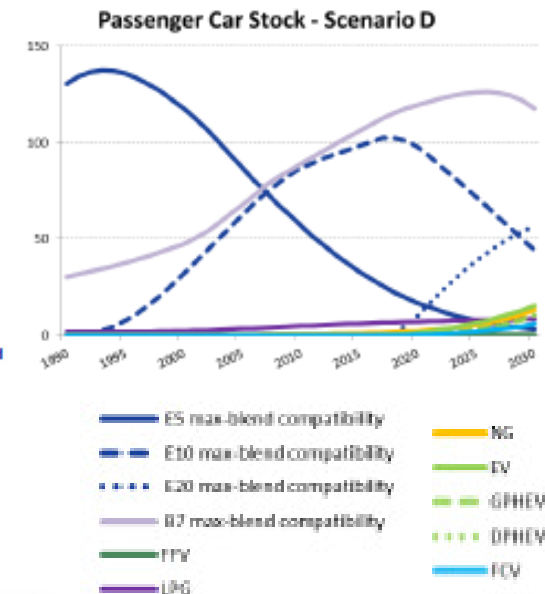
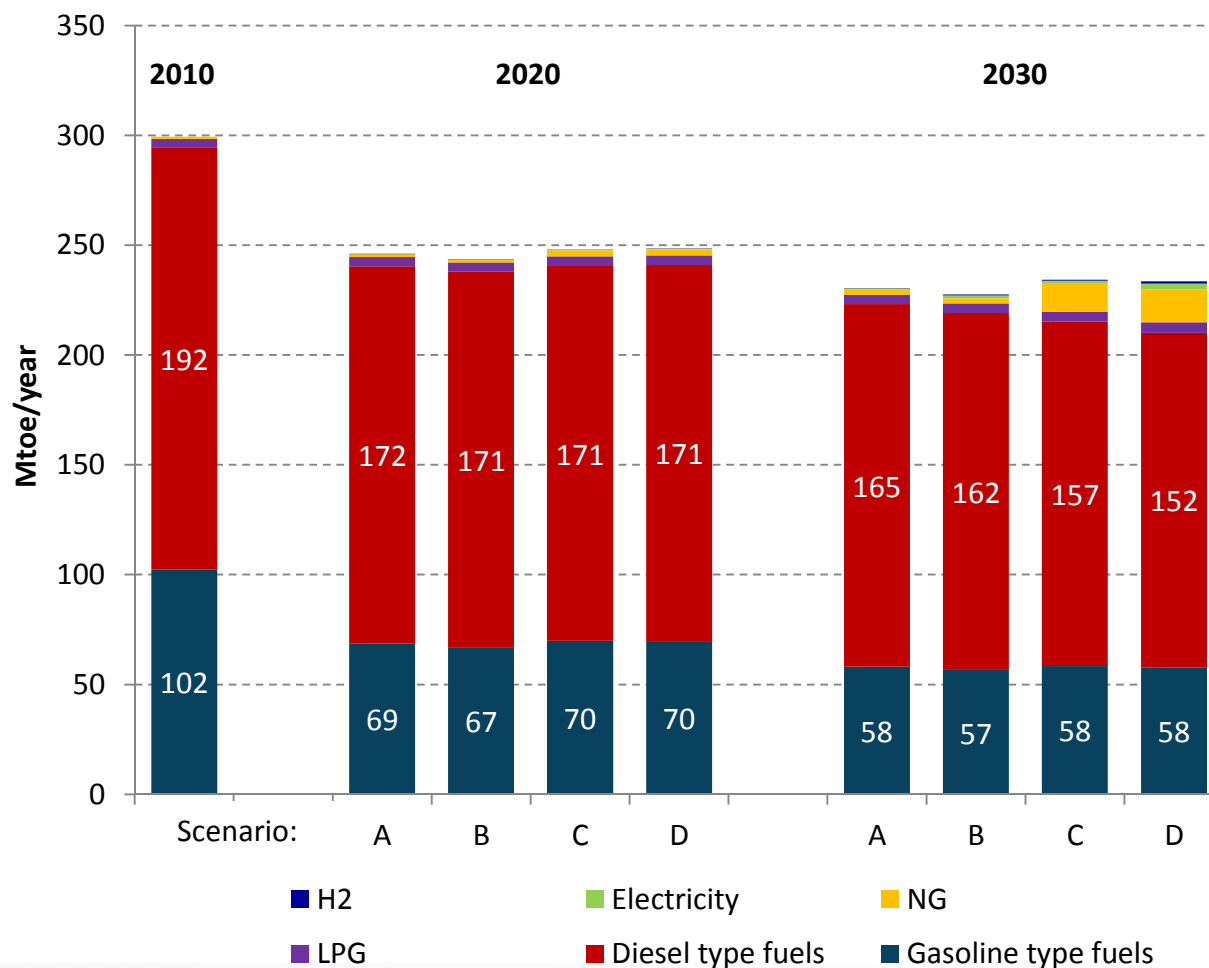


Figure 11: Lignocellulosic ethanol production capacity in the EU to 2030



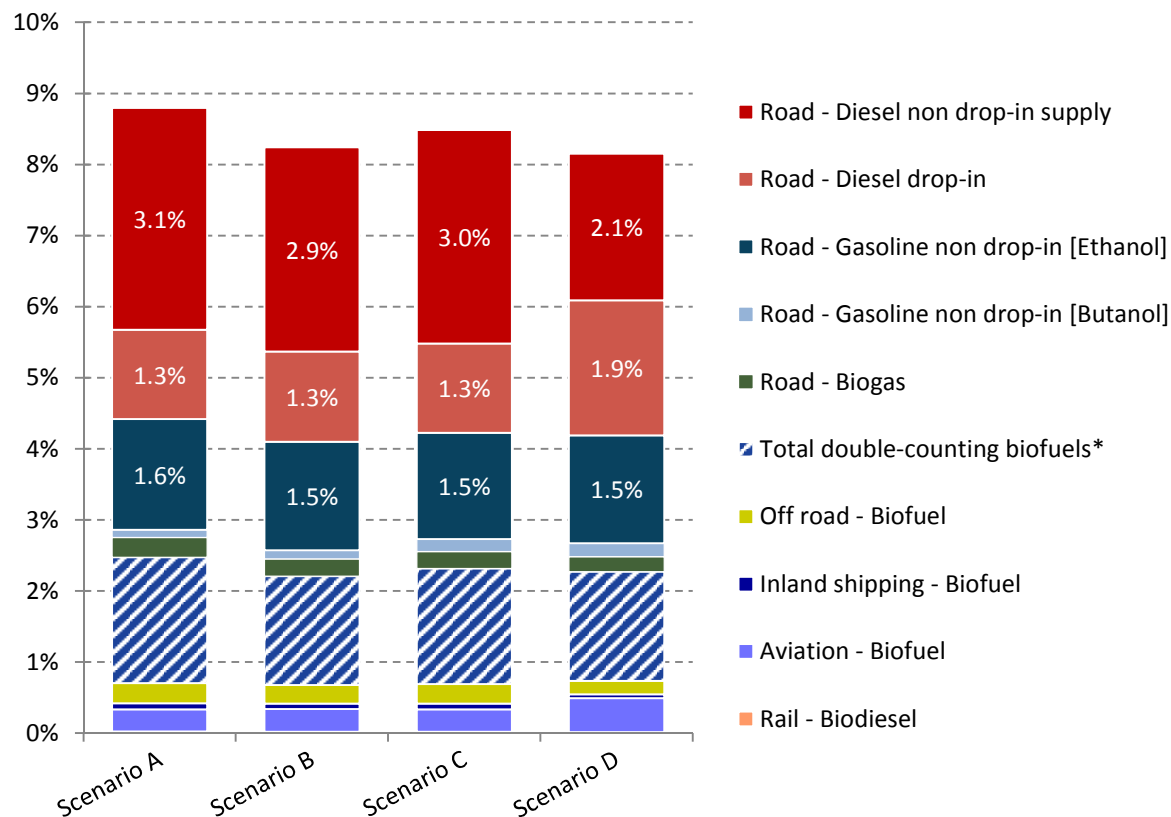
Liquid fossil fuels likely to continue to dominate road transport fuel supply to 2030

Road transport fuel demand



Biofuels alone could contribute at least 8% of the 10% RED target in 2020

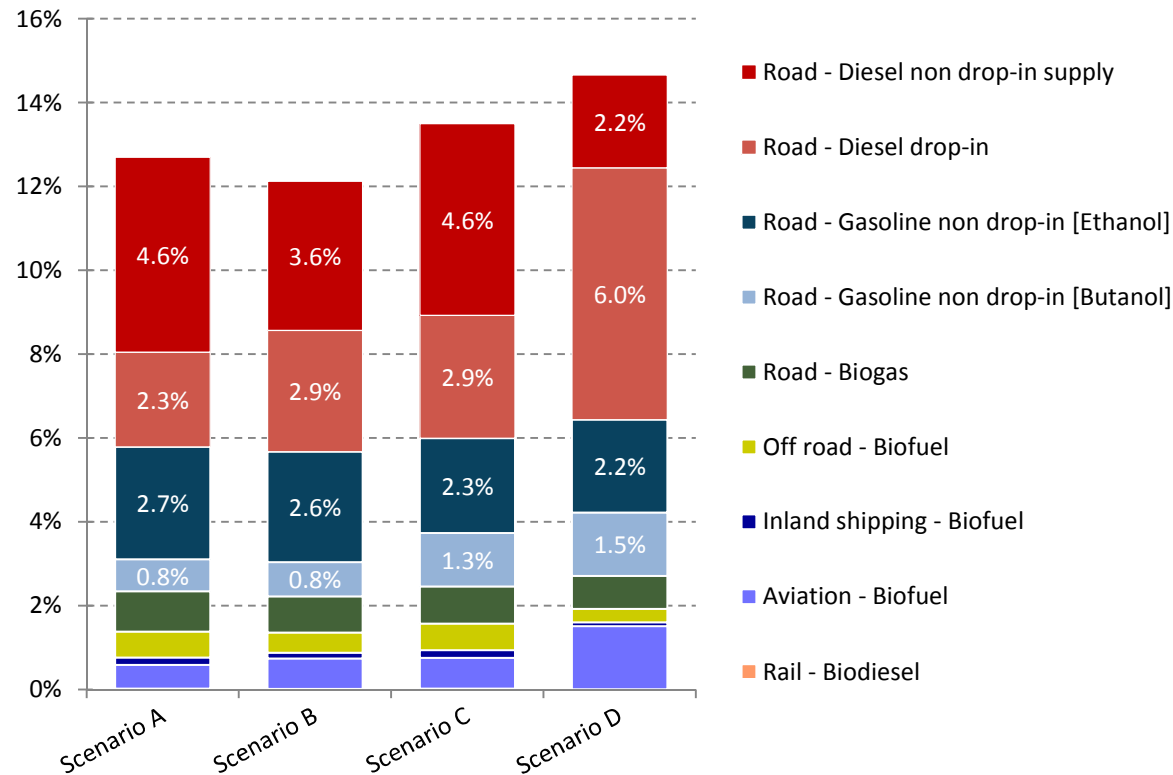
Contribution of biofuels to the RED target



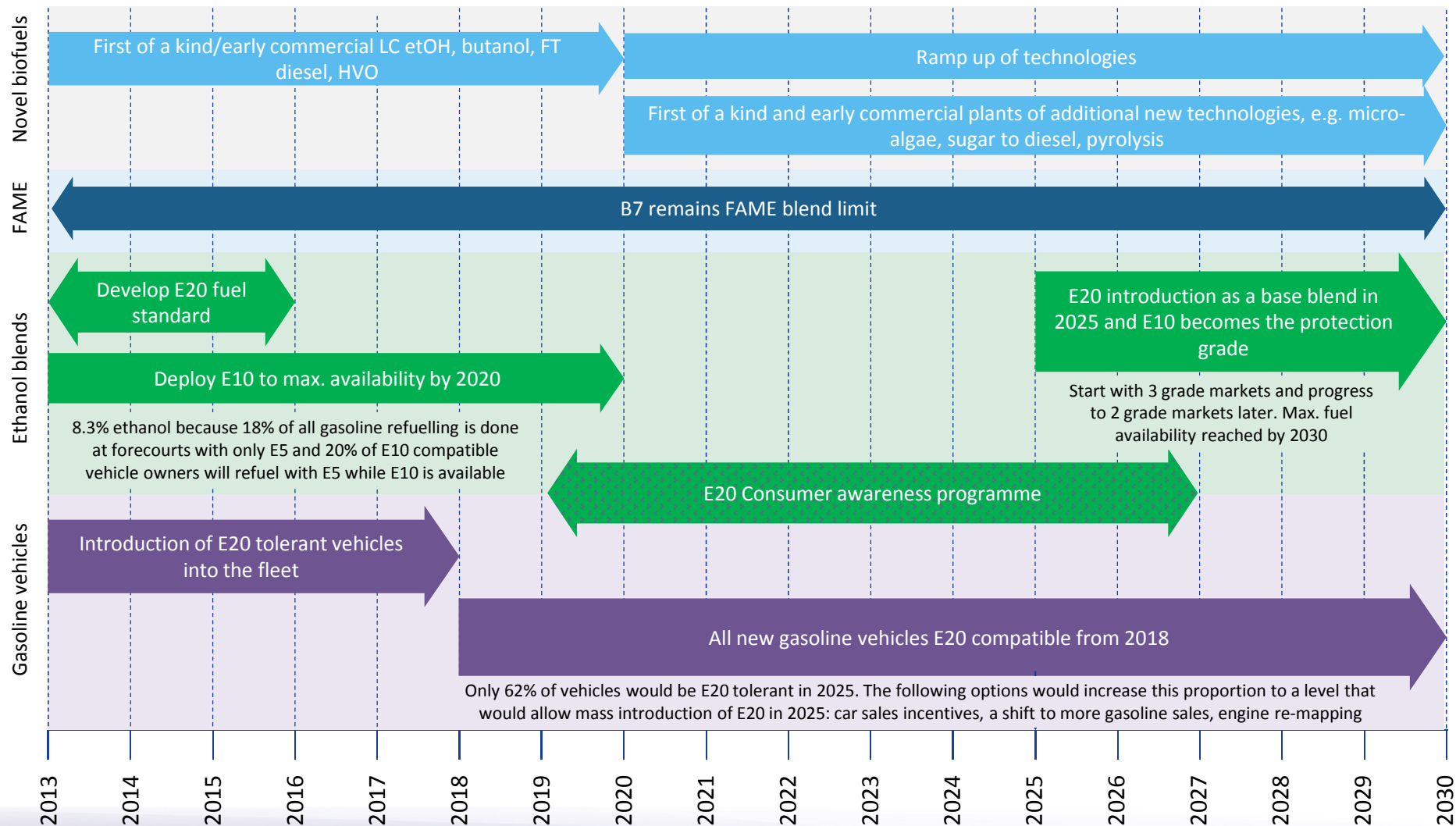
* This amount represents the calculated total amount of biofuels used in transport that are eligible for double counting

By 2030, biofuels could contribute between 12 to 15% of road transport fuel energy

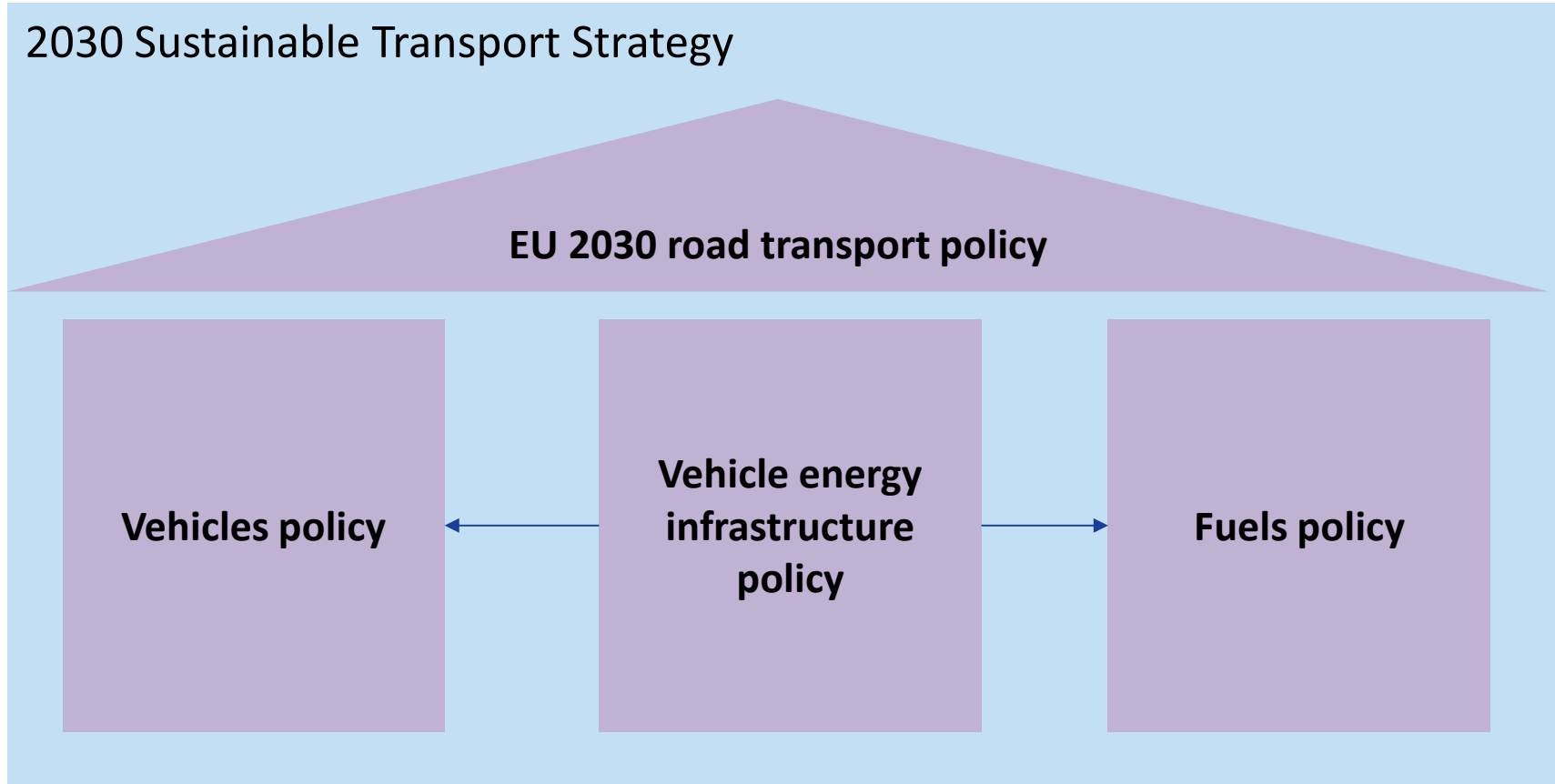
**Biofuel contribution to transport fuel by 2030
(on energy basis)**



Successful deployment of biofuels will depend on a shared fuel and automotive industry vision and roadmap



A coherent and overarching road transport policy to 2030 remains critical in meeting climate and energy objectives



Policy should provide long term clarity to stimulate fuel efficiency, alternative vehicles, and alternative fuels

Policy recommendations:

- A single 2030 GHG emissions reduction target for the combined auto-fuel industries
- An economically efficient allocation of the target across the fuel and auto industry
- A harmonised implementation across the EU via direct regulation on the auto and fuel industry (separately) or directives

Policy considerations:

- Evidence of what could be achieved through fuel and vehicle measures
- Development of required fuel and vehicle technologies, and infrastructure
- Consumer education and acceptance
- A framework for the deployment of biofuels, including harmonising blend levels, across Europe and accelerating the introduction of E20.

A biofuels policy framework should cover sustainability, advanced biofuels, infrastructure and consumer issues

A **sustainability** framework should encourage:

- **certification** of biofuels
- **use of waste or underutilised resources**
- biofuels with **greater GHG savings**
- **ILUC mitigation measures**
- a **global market**

An **advanced biofuels** framework should:

- specify **share of emissions reductions** from advanced biofuels
- provide **support to a cross-industry roadmap** to 2030
- include **initiatives at MS level**

A framework on **infrastructure and vehicles** requires:

- a **CEN mandate to develop E20**
- **harmonisation of blend rates** across Europe
- **consumer engagement**

Alignment with current 2030 policy proposals on biofuels sustainability and competition between uses of biomass resources

A harmonised biofuels roadmap is important in achieving the EU 2030 climate and energy policy proposal's aims

The roadmap is:

- **Relevant to the policy proposal's context**
 - Oil prices expected to remain high
 - EU increasingly dependent on energy imports
 - EU 2050 Roadmaps – Transport: GHG savings: 60% by 2050 (1990); 20% by 2030 (2008)
- **Aligned with its high level policy objectives**
 - EU-wide energy market integration
 - Cooperation between MSs in developing national plans
 - Affordable, competitive, secure and sustainable energy
 - Energy sector contribution to jobs and growth
- **Important in meeting the non-ETS and renewable targets**
 - GHG emissions reduction target to 2030 (40% r. 1990)
 - Non-ETS target allocated amongst MSs (30% r. 2005)
 - Renewable energy target (27%)

<http://www.e4tech.com/auto-fuel.html>

