

出國報告（出國類別：開會）

參加「3<sup>rd</sup> Annual European Biofuels  
Conference」國際研討會

服務機關：台灣中油公司煉製研究所

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派赴國家：捷克

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## 摘 要

由於全球化石能源日趨枯竭及全球對溫室效應氣體減量之必要性，可再生之生質燃料之發展及應用已成為世界許多國家最關心之能源問題，本次出國係參加由 McGRAW Hill 金融集團旗下之 Platts 公司於 103 年 6 月 17 日至 6 月 18 日在捷克共和國首都布拉格舉辦之第三屆歐洲生質燃料年度研討會（3<sup>rd</sup> Annual European Biofuels Conference），參與研討會之成員來自包括各先進生質燃料之製造商、生質燃料研究機構、國際能源機構、歐盟委員會及生質燃料貿易商等。由生質燃料生產廠商、貿易商、研究分析師、和能源及環境專家學者等。

本次研討會內容包括歐洲目前生質燃料之狀況，生質燃料法規之政策改變造成之衝擊、及 2020 年後生質燃料之發展路線圖，生質燃料之生產技術之發展及車用燃料未來之變化等趨勢分析等議題。

將本研討會之專題簡報資訊作綜合整理，重點包括了解歐盟欲達成的長期目標為減碳及增加再生能源之使用；探討歐洲生質燃料之現況及未來生質燃料作為車用燃料上之競爭力；歐盟及其會員國家訂定之法規及政策改變對生質燃料未來發展之衝擊及影響；2020 年後生質燃料之發展路線圖；歐洲生質燃料國際能源機構對於中長期生質燃料市場分析；介紹生質燃料發展趨勢之關鍵因素等。

在研討會中也和與會者中之專家討論國內使用 B2 生質柴油所造成濾網阻塞之疑慮，因 B7 生質柴油在德國用於車輛使用情形良好，因此國內使用 B2 生質柴油之問題應是油品儲槽之管理不佳所造成。

另因台灣與歐洲國家不同，國內並無自產之車用酒精及足夠之生質柴油可供作為車用生質燃料之條件，而使用進口生質燃料對國家經濟發展是負數，亦增加本公司之生產車用燃料之成本，因此建議由公司向經濟部能源局反應台灣不適於推廣酒精汽油及生質柴油。

關鍵詞：生質燃料、生質柴油、車用酒精



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# 本 文

## 一、目的

由於全球化石能源日趨枯竭及必須著眼於可使用能源之永續性，因此生質燃料之發展及應用已成為世界許多國家最關心之能源問題，歐洲地區之國家使用生質燃料亦已多年，爲了有助於相關技術交流以拓展生質燃料之應用，因此該地區每年都會舉辦有關生質燃料之研討會，2014 年 6 月 17 日至 18 日即在捷克共和國首都布拉格市舉辦「3<sup>rd</sup> Annual European Biofuels Conference」研討會，其議程主題涵蓋生質燃料業界先進對於目前歐洲生質燃料之優勢及未來之競爭力作完整性的綜觀報告、探討生質燃料在歐洲及全球由於立法及政策之改變所面臨法規方面之挑戰，以及介紹生產生質燃料之關鍵技術及未來發展等。此研討會與本公司配合政府能源政策進行有關生質柴油及酒精汽油之研究發展相關性高，可以提供本公司相當之參考價值。

## 二、行程簡述

本次出國自 103 年 6 月 15 日出發由桃園國際機場搭乘阿聯酋航空公司班機抵達杜拜，轉機後於 6 月 16 日抵達捷克共和國首都布拉格市，103 年 6 月 17 日至 6 月 18 日參加在該市 Diplomat Hotel 會議廳舉辦之第三屆歐洲生質燃料年度研討會(3<sup>rd</sup> Annual European Biofuels Conference)。

## 三、研討會議程及研討內容

本次於捷克共和國布拉格市舉行之第三屆歐洲生質燃料年度研討會，係由 McGRAW Hill 金融集團旗下之 Platts 公司主辦，參與研討會之成員來自包括各先進生質燃料之製造商、生質燃料研究機構、國際能源機構、歐盟委員會及生質燃料貿易商等。由生質燃料生產廠商、貿易商、研究分析師、和能源及環境

專家學者等作生質燃料之相關專題報告，全議程共有 23 場報告(題目見附錄)，參加研討會之人員約六十餘位。

### 3.1 會議研討內容

此研討會非學術研討會，由歐洲之生質燃料之製造商、生質燃料貿易商、環境及能源政策之分析師、歐盟委員會代表等作相關生質燃料之專題簡報，題目包括歐洲目前生質燃料之狀況，生質燃料法規之政策改變造成之不確定性、及 2020 年後生質燃料之發展路徑，生質燃料之生產技術之發展及車用燃料未來之變化等趨勢分析等。以下僅就與目前研究工作較為相關之研討專題，將簡報重點整理記述如下：

#### 3.2.1 生質燃料在歐洲燃料未來發展上角色之研討

目標：減碳及增加再生能源之使用

(一) 歐盟爲了要達成減碳和使用可永續性的再生能源的目的，訂下的目標是要在 2050 年時之溫室氣體的排放量比 1990 年時降低 80~95%。在交通(包括航空)能源消耗方面則要降低 54%~67%。

(二) 對於道路交通方面有以下三種方法有助於達成上述目標：

- (1) 車輛能源效率提高：經由引擎及其使用之材料之新設計而完成。
- (2) 更清淨之能源：使用新的燃料和推進系統。
- (3) 更好的交通網道路系統。

生質燃料在全球減碳及永續性能源方面似扮演著一關鍵角色。

#### 3.2.2 燃料未來發展路徑

在汽油方面 - 目前汽油車可使用可以摻入 5 Vol.% 酒精之汽油，自 2016 年起 E10 汽油將成爲認可之燃料，在 2020 年代時則將引入 E20 汽油。

在酒精汽油方面 - 目前係使用以可作為食物之農作物為原料製成之酒精，2020 年後則會以木質素為進料製成之酒精將逐年增加。另外在可用作汽油替代燃料如液化石油氣，在 2023 年前使用國內生成之 LPG，之後則可能發展以生質原料作成之生質性液化石油氣。

在柴油方面 - 使用最高可摻入 7 Vol.% 之生質柴油即 B7。生質柴油目前已盡量使用廢植物油及動物油脂，至 2020 之後則會增加使用經加氫處理過後蔬菜油( Hydrotreated Vegetable Oil , HVO)超過使用脂肪酸甲酯。2016 年後也會增加使用以生質料源將其液化後(BTL)和 HVO 作為柴油替代燃料。

在超低污染車輛使用電池供應電力方面 - 供應電力之產生在 2030 年時需達到低於 100 g CO<sub>2</sub>/kWh 低碳排放標準。在使用氢能之車輛，氢能來源係來自製成副產物、蒸汽加熱使甲烷重組及電解水和其他綠能方法來產製。

車輛使用氣體燃料方面 - 主要使用天然氣，要將天然氣從氣井開始取氣至供給車輛當燃料過程中要以最佳化方法減少能源損失。

目前在歐洲燃料之發展須遵從再生能源指令 (Renewable Energy Directive ) 和燃料品質指令 (Fuel Quality Directive)，在 2020 年後則將受減碳及增加使用再生能源之政策影響。

### 3.2.3 國際能源機構對於中長期生質燃料市場分析

1. 全球對於燃料之需求從 2013 至 2019 年預測每年將增加 1.3%。
2. 新興市場快速發展，在一些亞洲及非洲市場由於減少對歐盟及美國生質燃料之出口以及這些國家對於自己農業之支持而發展迅速。
3. 由於摻配之強制規定使得亞洲及非洲因新興市場數量增加，分述如下:

- (1) 在印度已採用 E5 汽油
- (2) 印尼由於歐盟課徵反傾銷稅結果 2014 年 2 月已開始施行使用 B10 柴油。
- (3) 在泰國補助 E20 汽油，馬來西亞使用 B5，和菲律賓使用 B5 及 E10。
- (4) 在南非引進該國久已等待之一強制性之 E2 和 B5 車用燃料。

### 3.2.4 生質燃料發展之關鍵因素

- (1) 政府支持 - 確保能源供應充足及安全，溫室效應氣體減量及促進經濟發展。
- (2) 永續性 - 需考量溫室效應氣體之平衡，不影響食糧供應為前提。
- (3) 先進生質燃料 - 使用木質之生質物質及麥桿作料源，產製第二代以纖維素為進料之酒精。
- (4) 顧客接受度 - 以 E10 成功經驗推廣至更高之摻配量。宣導生質燃料之好處。改良引擎設計使生質燃料更為適用。
- (5) 經濟因素 - 需降低製造成本及會受進料價格之衝擊。
- (6) 與其他替代能源之競爭 - 受天然氣及電動車發展之影響。

## 四、研習心得與建議

1. 本次研討會由歐洲之生質燃料之製造商、生質燃料貿易商、環境及能源政策之分析師、歐盟委員會代表等作相關生質燃料之專題簡報。研討會中瞭解現今生質燃料之國際動態，歐洲生質燃料之狀況，蒐集 2020 年後生質燃料之發展路線圖、生質柴油及酒精汽油之最新技術與未來發展，及車用燃料未來之趨勢分析之資訊，對於提昇本公司低污染車用燃料之研發與產品品質將有助益。

2. 在歐洲推廣生質柴油最積極之國家為德國，目前已使用 B7 生質柴油，但亦為其未來最高可容許摻入柴油之量，且必須使用非食用之農作物作為料源，以避免造成全球糧食短缺之問題。B7 生質柴油在德國用於車輛使用情形良好，並無如國內使用 B2 即已發生不少因濾網阻塞而衍生之客訴問題，因此使用生質柴油必須做好油品儲槽之管理，盡可能防止水分進入油槽內是基本要件。
3. 因國內地狹人稠，可耕地有限，並無足夠可供生產車用酒精之料源及低成本之生產酒精之技術，故目前國內北/高二市販售之 E3 汽油之酒精係由國外進口。而今年六月前使用摻配成 B2 之生質柴油之 B100 原料亦大都為進口，因台灣與歐洲國家不同，國內並無使用自產再生車用燃料之條件，使用進口生質燃料對國家經濟發展是負數，亦增加本公司之生產車用燃料之成本，因此我國需考量其他再生能源如太陽能及風能之發展。
4. 經向與會者之專家詢問，在歐洲並無採行在生質柴油油槽添加殺菌劑之作法。
5. 歐盟訂定之加熱油規範其 2003 年版已廢止，現行加熱油已與車用柴油共用 EN14214 法規，如此可提升加熱油品質且不會影響車用柴油品質，加熱油在歐洲主要為家庭暖氣用。
6. 在使用有助於汽油之辛烷值提昇之含氧物，歐盟各國只有法國對 ETBE 尚有興趣，其他國家都是以使用 E10 替代 MTBE 為目標。因此建議本公司未來亦不需考慮使用價格較高之 ETBE。

Prague,  
Czech Republic  
**June 17 – 18,**  
**2014**

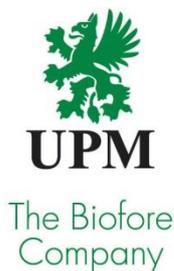
*3<sup>rd</sup> Annual*

# **European Biofuels Conference**

## ***Reassessing strategies in an evolving biofuels landscape***

Platts **European Biofuels** conference returns in the new location of Prague, featuring greater content and even more networking opportunities. This focused event assembles the industry's leading producers, traders and analysts, and will provide a unique and comprehensive overview of the European and international biofuels markets including developments in first and second generation fuels, changes in EU requirements and the outlook for post 2020.

***Sponsored by:***



## **WHY ATTEND?**

- Receive a comprehensive overview of the current strengths and future competitiveness of the European biofuels sector from the leaders of industry
- Understand the challenges for biofuels in the context of changing legislation and policies with dedicated sessions focused on the European, global and regulatory aspect
- Assess the development of trade flows, feedstock options and capacity outlook
- Gain further insight on key developments in biofuel technology and production

## TUESDAY 17<sup>TH</sup> JUNE 2014

08:00 *Registration and continental breakfast– available to sponsor*

09:00 **Opening address**

**The current state of European biofuels**

- Trade flows and prices - 2013 in review
- EU mandates and the political landscape
- The US and the EPA; where next for the RFS?
- Asia's mandates and production
- Talking about my generation - 1st, 2nd and 3rd gen biofuel progress

*Tim Worledge, Editor-in-Chief, Platts*

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## **Understanding the current strengths and future competitiveness of the European biofuels sector – *Leaders discuss***

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*Leaders from the biofuel value chain discuss their current strategies and the challenges they face in supplying, trading and moving biofuels in, within and out of Europe.*

09:30 **A major refiner's perspective**

*Kristóf Székely, Feedstock Trader, MOL*

09:50 **A CEE region's perspective**

*Zygmunt Gzyra, Member of the Management Board, Bioagra*

10:10 **A trader's perspective**

*George Hayes, Head of Global Renewable Fuel Marketing, CHS*

10:30 **A producer's perspective**

*Marko Snellman, Commercial Manager, UPM Biofuels*

10:50 **Group Q&A** - *presenters from the preceding sessions will take questions from the head table*

11:10 *Networking and refreshment break– available to sponsor*

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## Biofuel trade flows, feedstock options and capacity outlook

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### 11:40 **Next generation biofuel market trends**

- Explanation of different biofuels products and pathways currently in Europe
- Charts to show current next-generation biofuels capacity, and announced plants in Europe
- BNEF estimates on 2020 capacity and explanation of EU mandated volumes of next-gen biofuels
- Production cost charts for all key pathways, for 2013 and 2018
- Investment flows & interesting strategic partnerships that we have seen develop

*Claire Curry, Bioenergy Analyst, Bloomberg New Energy Finance*

### 12:05 **Stimulating investments into biofuels in the CEE**

- Polish biofuels market in comparison with other CEE countries - basic market figures, regulations, market size and conditions
- Biodiesel & bioethanol in Poland - overview of entities active on the market;
- Solid biofuels market in CEE - a glance at biomass and the pellet market in Poland and neighbouring countries
- Investors activity - overview of transactions in the region
- The biofuels of tomorrow - perspectives of developing next generation biofuels and new initiatives/innovations introduced in Poland and other CEE countries

*Tomasz Golinski, Analyst, IPOPEMA*

### 12:30 **Double Counting: Bane or Boon?**

- Assessing the impact to the industry
- Assessment of the effectiveness of the measure
- Alternative support measures to consider

*Dr. Gloria Gaupmann, Public & Regulatory Affairs Manager, Clariant Produkte (invited)*

### 12:55 *Networking lunch – available to sponsor*

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## Understanding the challenges for biofuels in the context of changing legislation and policies

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### 14:30 **Overview on European biofuel mandates**

- A snapshot of the current position of Europe's biofuel mandates
- Role of double counting

*Daan Peters, Bioenergy Consultant, Ecofys*

### 14:55 **Market and policy challenges for the European ethanol industry**

- Ongoing revision of the Renewable Energy Directive and Fuel Quality Directive to tackle Indirect Land Usage Charge
- A comprehensive 2030 Climate and Energy policy framework
- Market uptake

*Emmanuel Desplechin, Director for Energy & Environment, ePure*

15:20 **Testing the will - biofuels in an age of uncertainty**

- How committed are politicians to the biofuel sector?
- What are the consequences for a future sustainable biofuels sector?

*Dr. Ben Allen, Senior Policy Analyst, Institute for European Environmental Policy (IEEP)*

15:45 **The biofuels landscape beyond 2020**

- 20/20/20 - the roadmap so far
- Alternative fuels in the post 2020 strategy
- The competitive low carbon roadmap to 2050
- Investing today for tomorrow's energy needs
- Where are the opportunities for the biofuel sector post 2020

*Ruta Baltause, Policy Officer, European Commission*

16:10 *Networking and refreshment break – available to sponsor*

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## **Biofuel pricing, trading and benchmark evolution**

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16:40 **Grains & oilseed price trends and impact on margins**

- What to expect for end 2013/14 and preview of 2014/15
- Margins forecasts and opportunities

*Christophe Cogny, Biofuel & Oilseed Market Analyst, Tallage*

17:05 **Why hedging is important?**

- Principles of hedging
- How to hedge
- Current hedging margins achievable

*Liam Fenton, Managing Director, FC Stone*

17:30 **Outlook, overview and performance of the key benchmarks impacting biofuels**

- How prices are formulated
- Ethanol and biodiesel benchmarks
- Global pricing discrepancy

*Dr. Claudiu Covrig, Senior Analyst, Platts*

17:55 **Networking reception**

- Join us immediately after the conference for drinks and canapés in the exhibition area - **Available to sponsor**



## WEDNESDAY 18<sup>TH</sup> JUNE 2014

08:00 *Registration and continental breakfast– available to sponsor*

08:45 Chairman's welcoming remarks and review of day one  
*Tim Worledge, Editor-in-Chief, Platts*

09:00 **Opening address**

**Opportunities and challenges on the horizon for the European biofuels industry**

- Can biofuels survive the current uncertainty?
- Where do we see signs of hope?
- How can the industry grow to 2020 and beyond?

*Ian O'Gara, Head of Biofuels, Accenture*

09:30 **IEA Medium-term biofuel market analysis**

- What is the 5-year outlook for biofuel production in different markets around the world?
- What is the impact of recent policy developments on biofuel production in the short - and medium-term?
- What is happening in the advanced biofuels industry?

*Anselm Eisentraut, Bioenergy Analyst, International Energy Agency*

10:00 **The role of biofuels within a fuels road map for Europe**

- A range of fuels will be required to deliver ultra-low carbon vehicles in the future
- First and second generation biofuels fuels will play an important role
- There are significant issues which will need to be addressed with respect to the Renewable Energy Directives and beyond

*Jonathan Murray, Deputy Director, Low Carbon Vehicle Partnership*

10:30 *Networking and refreshment break– available to sponsor*

## Key developments in biofuel technology and production

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### 11:00 **Plant development for advanced biofuels production**

- Ongoing projects within EU
- What holds back launching of new projects?
- Assessing the sustainability of advanced Biofuels

*Ingvar Landälv, Vice-chair EBTP Steering Committee, European Biofuels Technology Platform*

### 11:25 **2<sup>nd</sup> generation feedstock developments in Europe**

- Cellulosic sugars: a comparison of first and second generation raw materials
- Case study 1: Woody biomass in Scandinavia
- Case study 2: Grain straw in Eastern Europe
- How second generation cellulosic ethanol costs might evolve in the period to 2025

*Caroline Midgley, Director of Biofuels, LMC International*

### 11:50 **Cellulosic ethanol, how has it progressed so far?**

- Overview of Plants coming online/successful projects or conversely what challenges have transpired?

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## Looking ahead – opportunities and challenges on the horizon for the European biofuels industry

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### 12:15 **Case Study**

#### **European biofuel policy until and after 2020 - the changing role of European agriculture: from the booster to the loser**

- Short retrospection - the set aside policy and renewable energy policy to get rid of the surplus
- The role of the agriculture sector to implement biofuel production and marketing strategies (France/Germany)
- New challenges due to RED/FQD - distortion of competition by acknowledgement of certification systems?
- The current "playing field" and competitiveness of the EU agriculture in the global market of sustainable certified crops/biofuels
- The end of the 1st generation biofuel story in 2020 and consequences

*Dieter Bockey, Head of Division Biofuels and Renewable Resources, The Union for the Promotion of Oil and Protein Plants (UFOP)*

### 12:40 **Chairman's closing remarks**

*Tim Worledge, Editor-in-Chief, Platts*

### 12:45 *End of conference*

## Objective: Cutting carbon and delivering a sustainable future

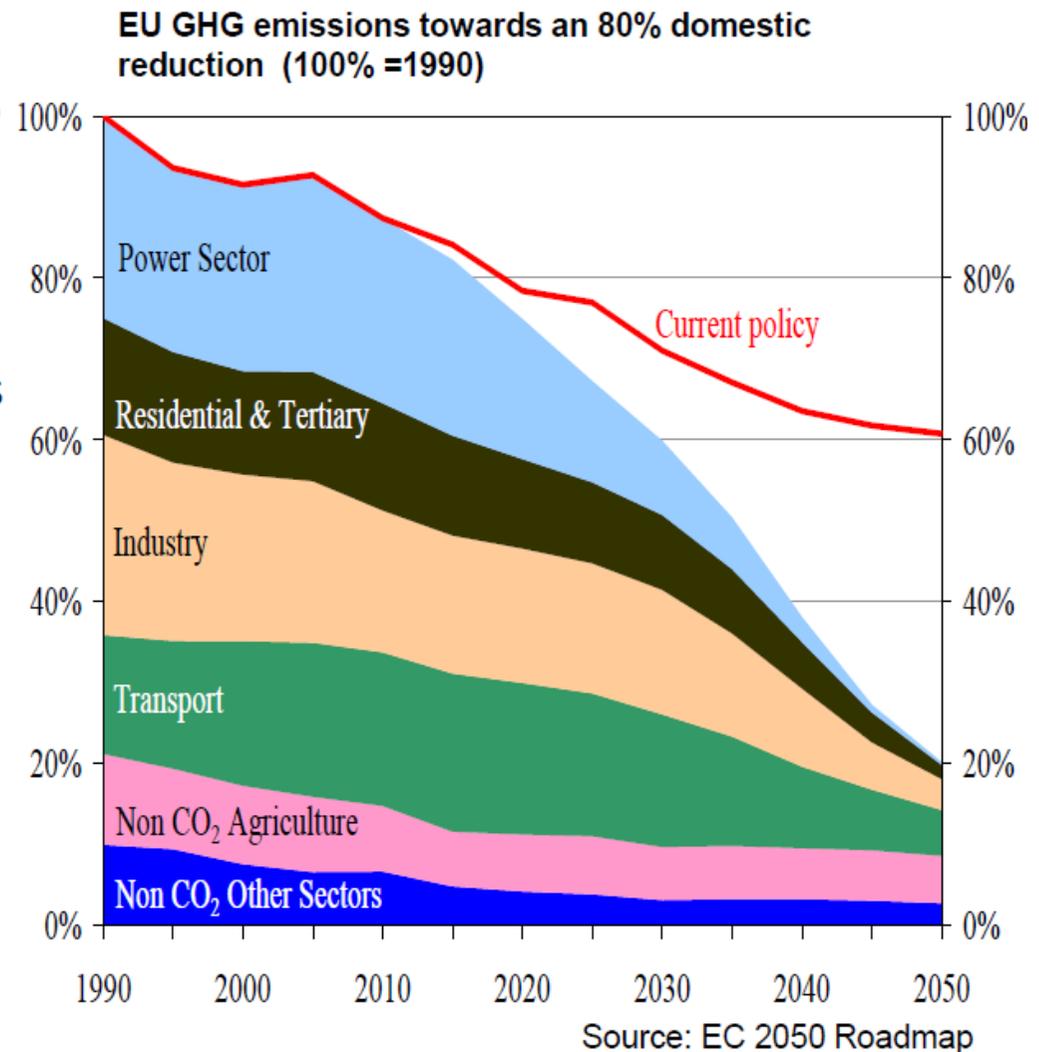
The EU has an objective of reducing greenhouse gas emissions by 80-95% by 2050 compared to 1990.

Transport target for 2050 (including aviation) is to reduce greenhouse gas emissions by between 54% to 67%.

For Road Transport there are 3 main measures intended to deliver this:

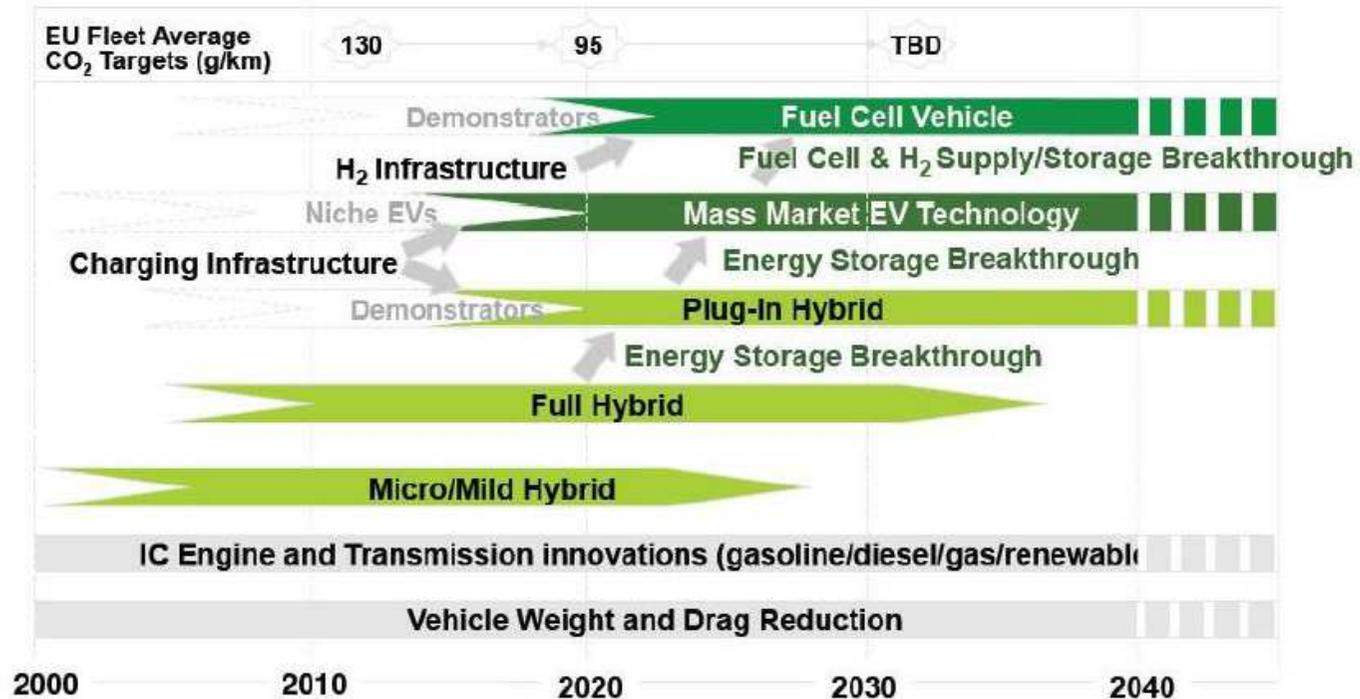
- **vehicle efficiency** through new engines, materials and design;
- **cleaner energy** use through new fuels and propulsion systems;
- **better use of networks.**

Biofuels are seen as playing a key role in delivering carbon reductions and sustainability.



# Existing roadmaps: focus on powertrain and efficiency technologies but lack a cross-cutting view on fuels

Passenger Cars Roadmap  
Source: Auto Council



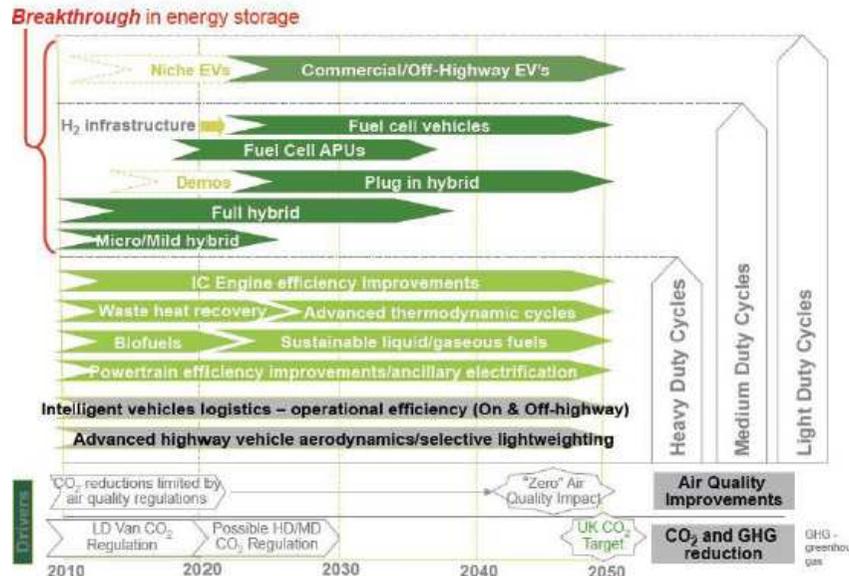
- Efficiency improvements, driven by EU level tailpipe emissions targets and air quality regulations, underpin the roadmap.
- The 2020-2030 period is the decade when EVs (PHEVs, BEVs and/or FCEVs) become a mainstream offer – under energy storage breakthrough condition, assuming adequate grid capacity. Development of these technologies driven by the need to meet the long term EU CO<sub>2</sub> targets<sup>1</sup>.
- The EC transport goals are also expected to become a driver for Zero Emission Vehicles, e.g. CO<sub>2</sub>-free city logistics in major urban centres by 2030 and phasing out conventionally fuelled cars in cities by 2050<sup>2</sup>

1 – A Roadmap for moving to a competitive low carbon economy in 2050, 80%-95% GHG emission reduction by 2050 compared to 1990

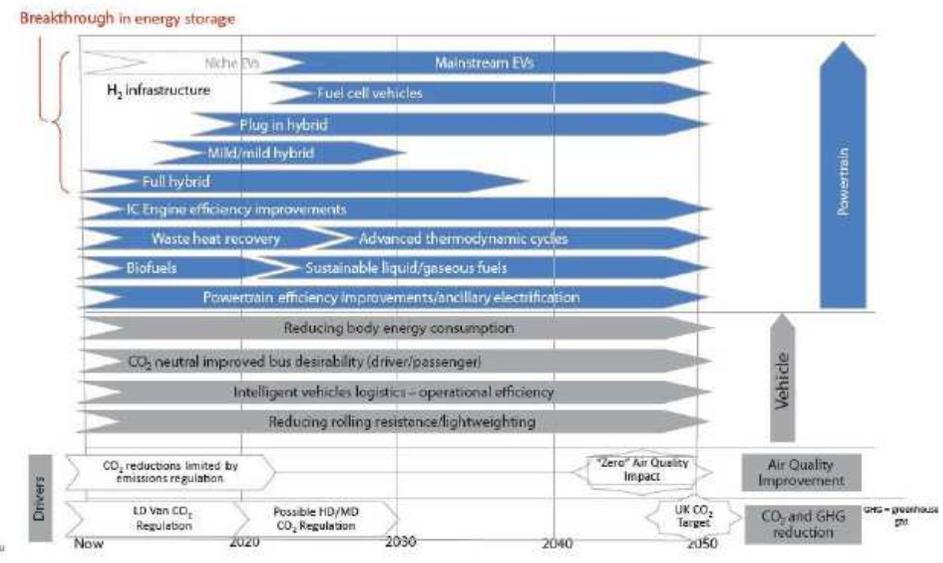
2 – EC Transport 2050 Strategy, Transport White Paper 2011

# A fuel roadmap must align these 3 vehicle roadmaps and be consistent with the underlying drivers

## Commercial & Off-Road Vehicles Source: Auto Council



## Buses Source: LowCVP and Ricardo

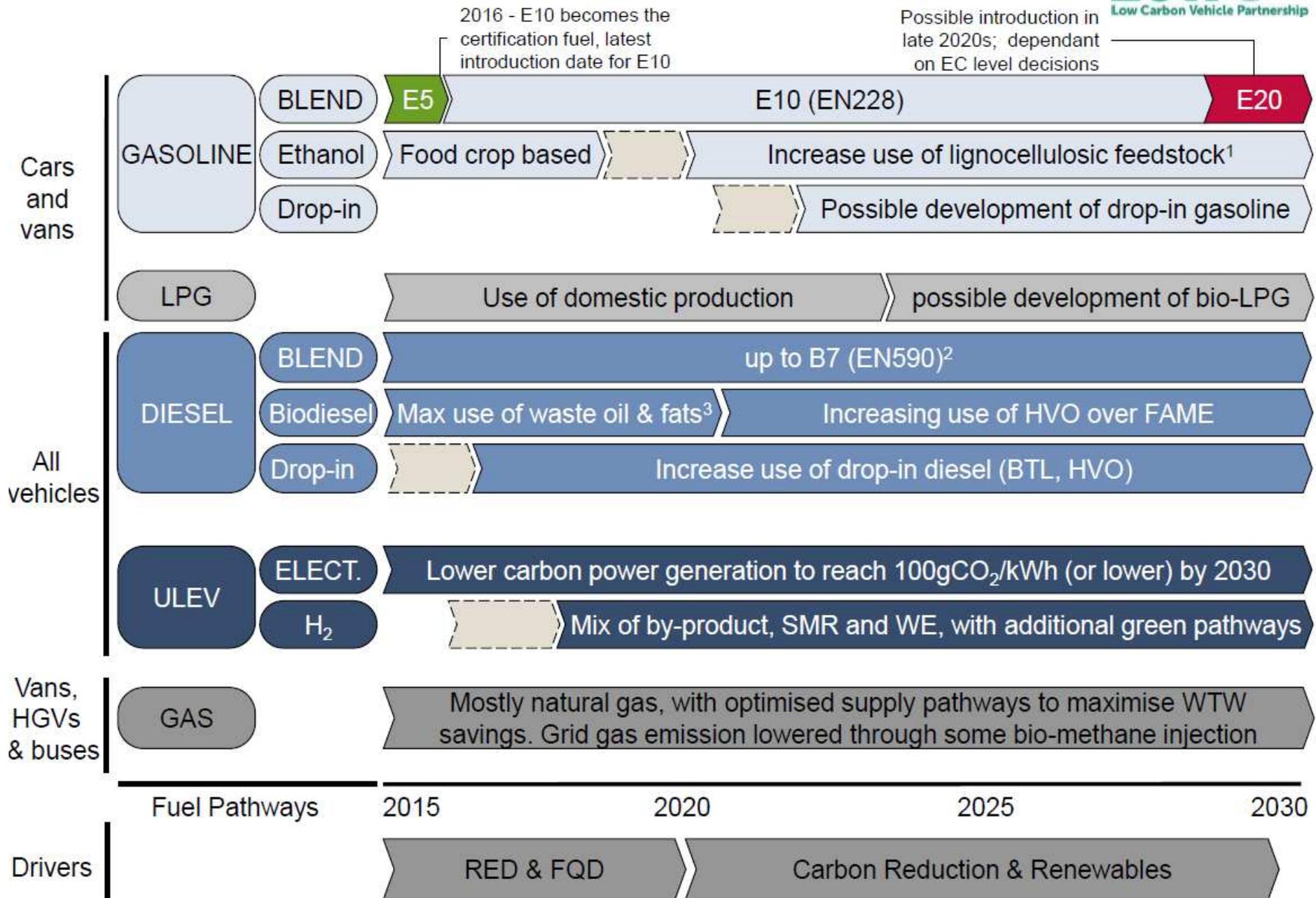


- As for cars, **efficiency gains are an essential part of the commercial vehicle roadmaps** and the 2020-2030 decade when powertrains are increasingly hybridised, with full electric (BEV and FCEVs) expected to be adequate for some duty cycles.
- The roadmap does not include a **cross-cutting liquid fuel strategy** (e.g. type and blends of biofuels, diesel/gasoline balance), and there is no explicit roadmap for gas vehicles.

### The role of the fuel roadmap

- The **fuel roadmap must align these 3 vehicle roadmaps** and be consistent with the underlying drivers, namely the EU and MS level emission targets.

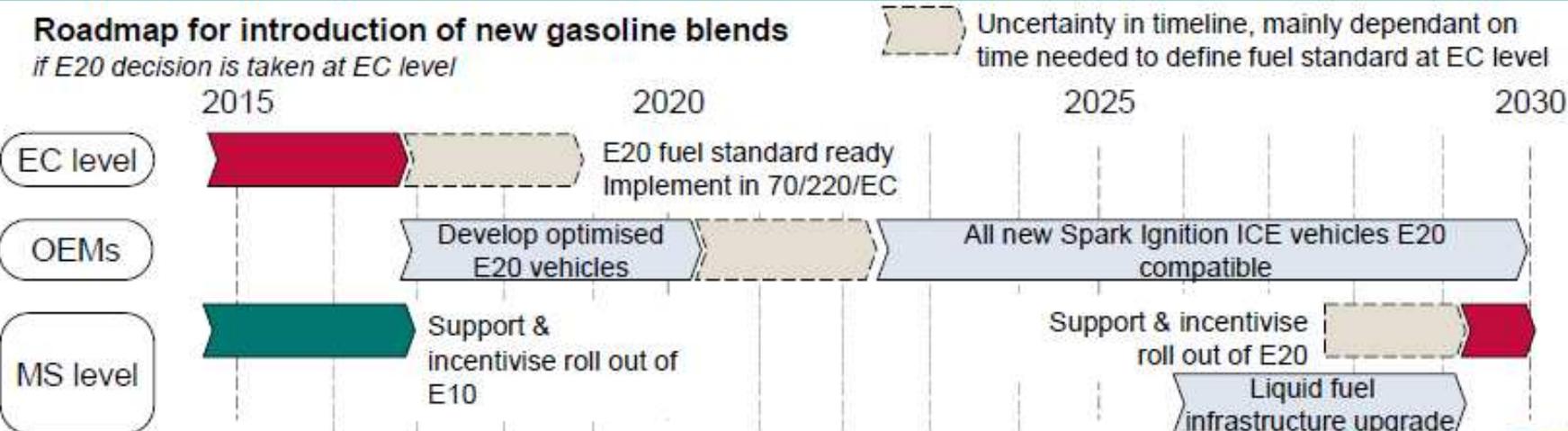
# Fuel roadmap, including fuel types and blends fulfils this objective



Source: Element Energy, Fuels Roadmap, a report for the LowCVP, 2014

## A new gasoline blend beyond E10 will require an EC level decision and would be implemented in the MS in mid to late 2020s

- Introduction of **E20** would bring further carbon savings but requires agreement on a E20 fuel standard (for which work has started).
- OEMs and fuel producers need to **agree on the E20 fuel octane number**
- UK has **2-grade gasoline market** which requires a greater proportion of **E20 vehicles** in fleet. Adoption in UK is estimated to start in late 2020s at best.
- The early introduction of **E20 compatible vehicles** ahead of **E20 optimised vehicles** will allow an earlier E20 fuel rollout
- For E2G<sup>1</sup> to ramp up from early commercialisation, **EC level policy clarity and MS support mechanisms** will be required.



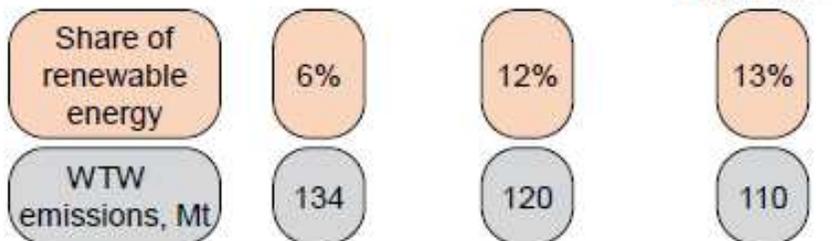
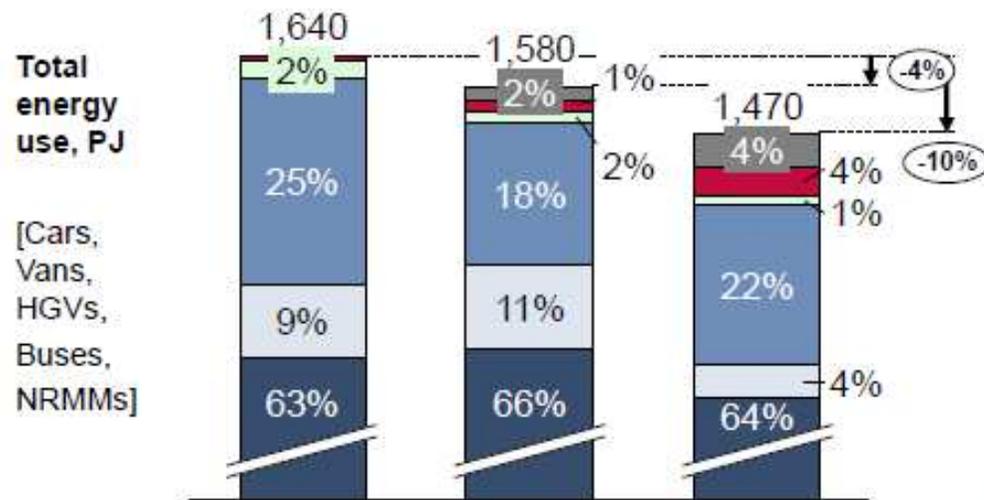
Source: Element Energy, Fuel Roadmap, a report for the LowCVP 2014

1 – E20 optimised ICE do not achieve good performance when run on lower blends (higher fuel consumption and hence higher emissions)

2 – Ethanol (or butanol) made from waste or lignocellulosic material that deliver high WTW emission savings

# Roadmaps show potential to reduce GHG emissions by 20% WTW between 2020 and 2030, and double renewable energy share

## Illustrative impact of the fuel roadmap in UK<sup>1</sup>



- The combination of powertrain roadmaps and fuel roadmap will deliver a reduction of emissions through:
  - An **improvement in the fleet energy efficiency** to the extent that total energy use decreases by 4%-10% between 2020 and 2030 (depending on powertrain technology uptake)
  - An **increasing use of biofuels, gas and grid decarbonisation**
- By 2030, **FAME, drop-in diesel and ethanol** are still providing most of the renewable energy due to dominance of petrol and diesel vehicles
- Car market will move increasingly to gasoline** as emission requirements are becoming more difficult to meet by diesel ICE

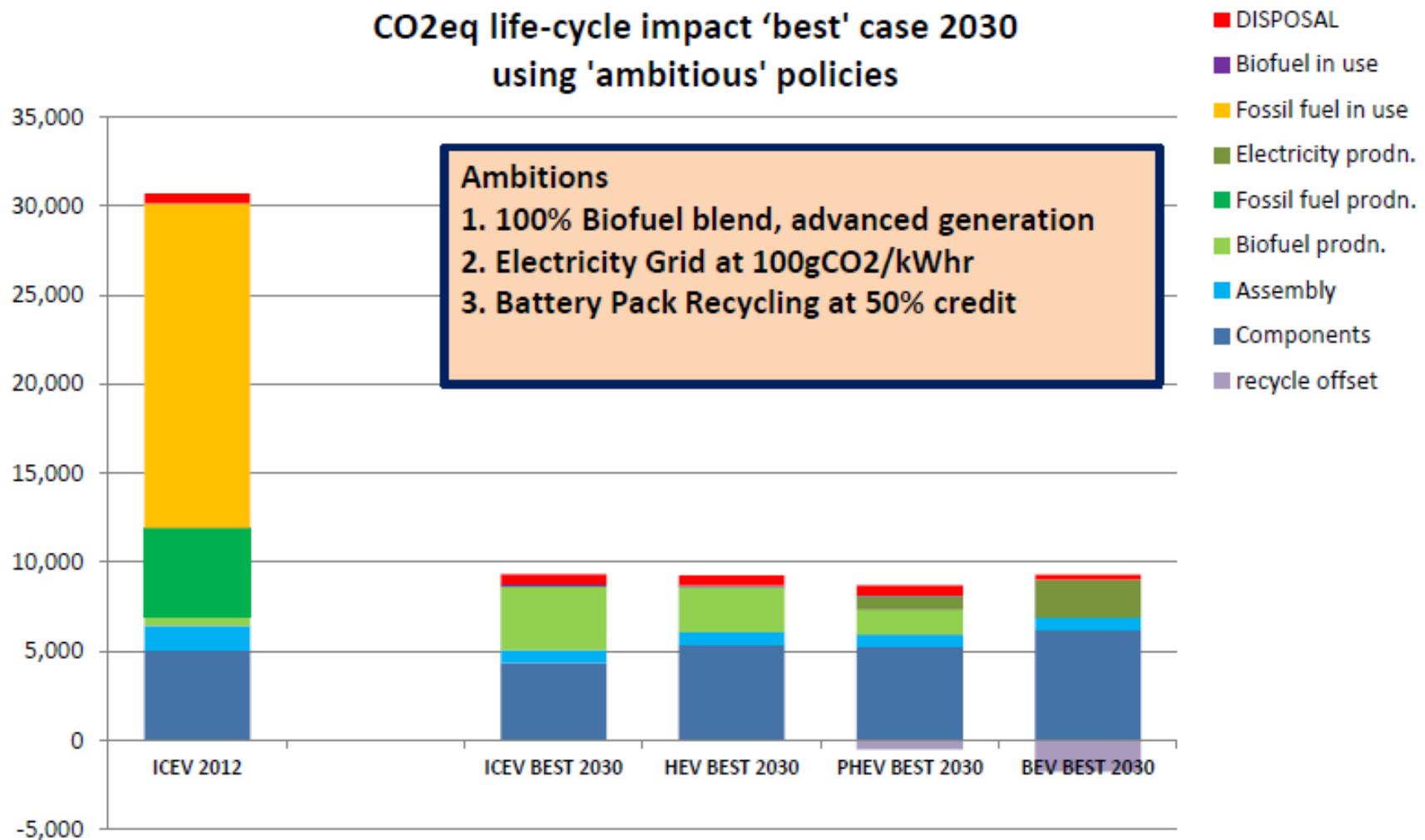
### 2030 sales share assumptions

Powertrain scenario	Base	High AFV
ULEV [cars]	30%	60%
ULEV + gas [vans]	10%	20%
Gas [HGVs]	7%	26%
ULEV + gas [buses]	7%	15%

Source: Element Energy. Fuel Roadmap, a report for LowCVP, 2014. 1 – Based on emissions, vehicle efficiency, fleet and travel assumptions in consistency with approach developed in *Options and recommendations to meet the RED transport target*, Element Energy for the LowCVP, 2014

# Ambitious policies to introduce renewables could deliver >65% reductions in GHGs for road transport

CO2eq life-cycle impact 'best' case 2030 using 'ambitious' policies



Source: PE International. Life cycle CO<sub>2</sub>e assessment of low carbon cars 2020-2030. A report for LowCVP. 2013

## Conclusions

### **Meeting the Renewable Energy Directive transport target will be difficult but possible**

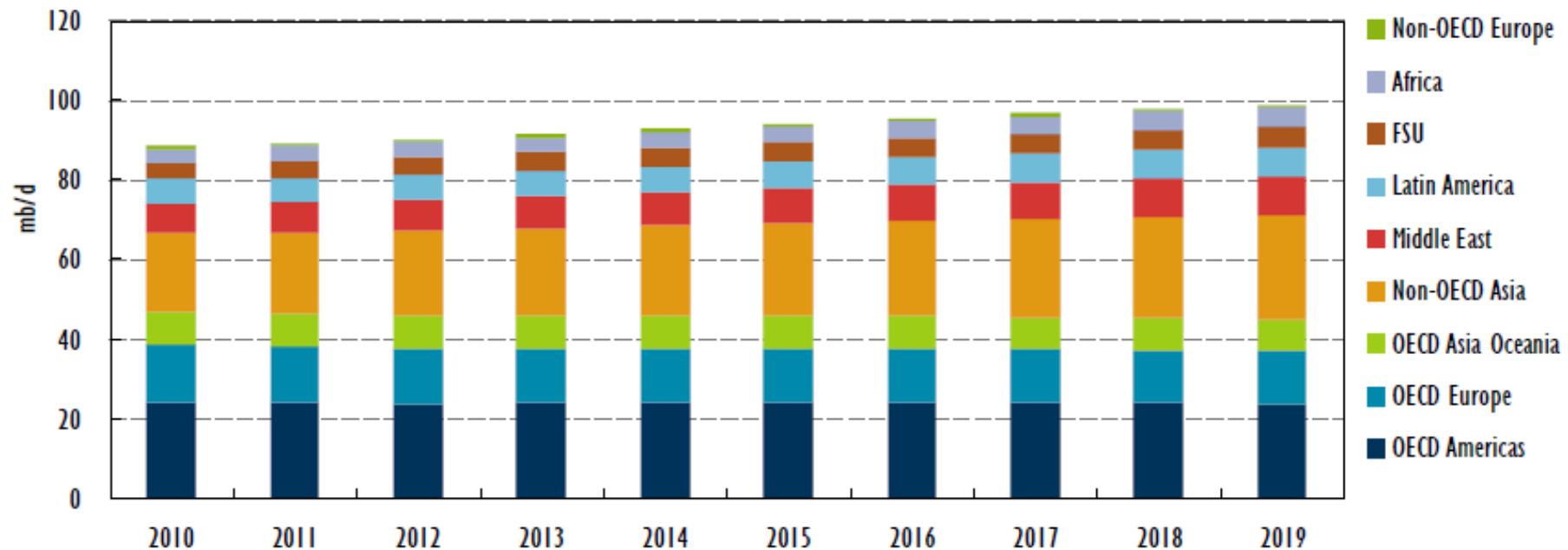
- Roll out E10 and increase the biodiesel blending up to B7 blend wall.
- Maximise the use of double counting fuels that do not use food crop feedstock
- This will be reliant on high utilisation of Used Cooking Oil (UCO) and other waste oil feedstocks for B7 biodiesel.
- Member States will need to maximise the take-up of alternatives.

### **Post 2020 there is scope to significantly reduce carbon emissions and increase renewables in road transport fuels**

- The deployment of E20 gasoline in late 2020s
- Development of drop-in fuels for both gasoline and diesel **needs a framework for investment now**
- The role of electric and hydrogen powered vehicles will be dependent on the level of renewable energy sources
- Methane and biomethane have a role in road transport but a dedicated gas strategy is required, and LPG has a continuing role

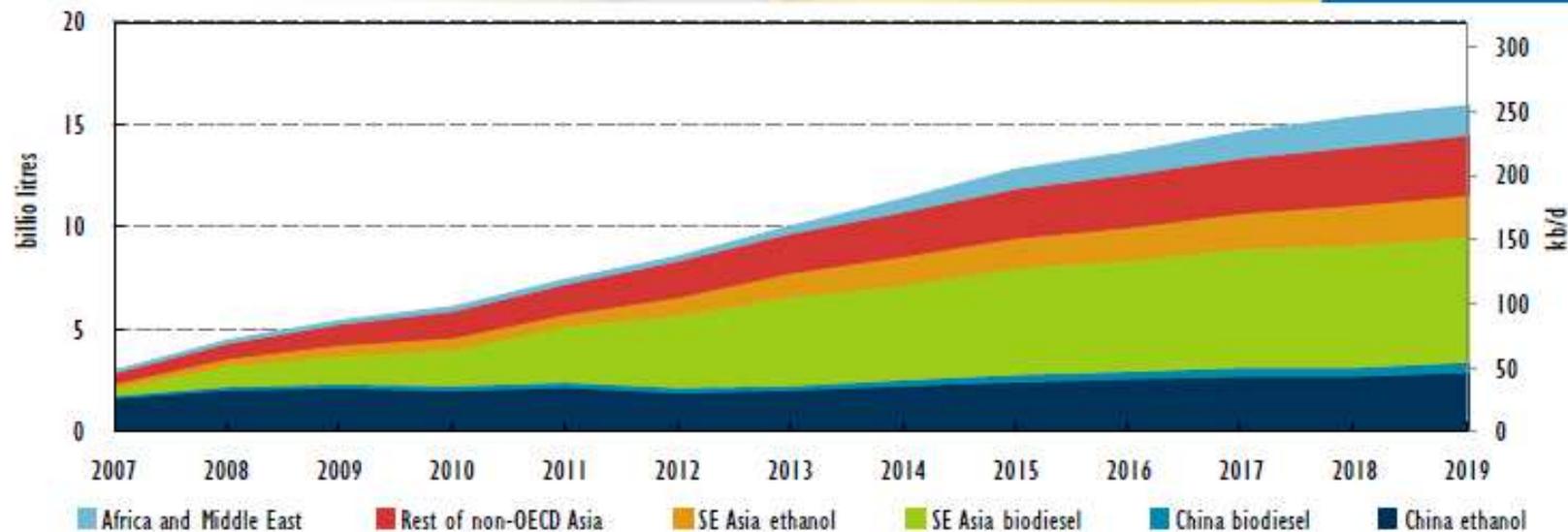
**Need to encourage investment in R&D and commercialisation to develop new renewable energy solutions for road transport in the future. This will require clear and consistent policies to give confidence to investors at European and Member State levels.**

# Global oil demand inches steadily higher through the forecast



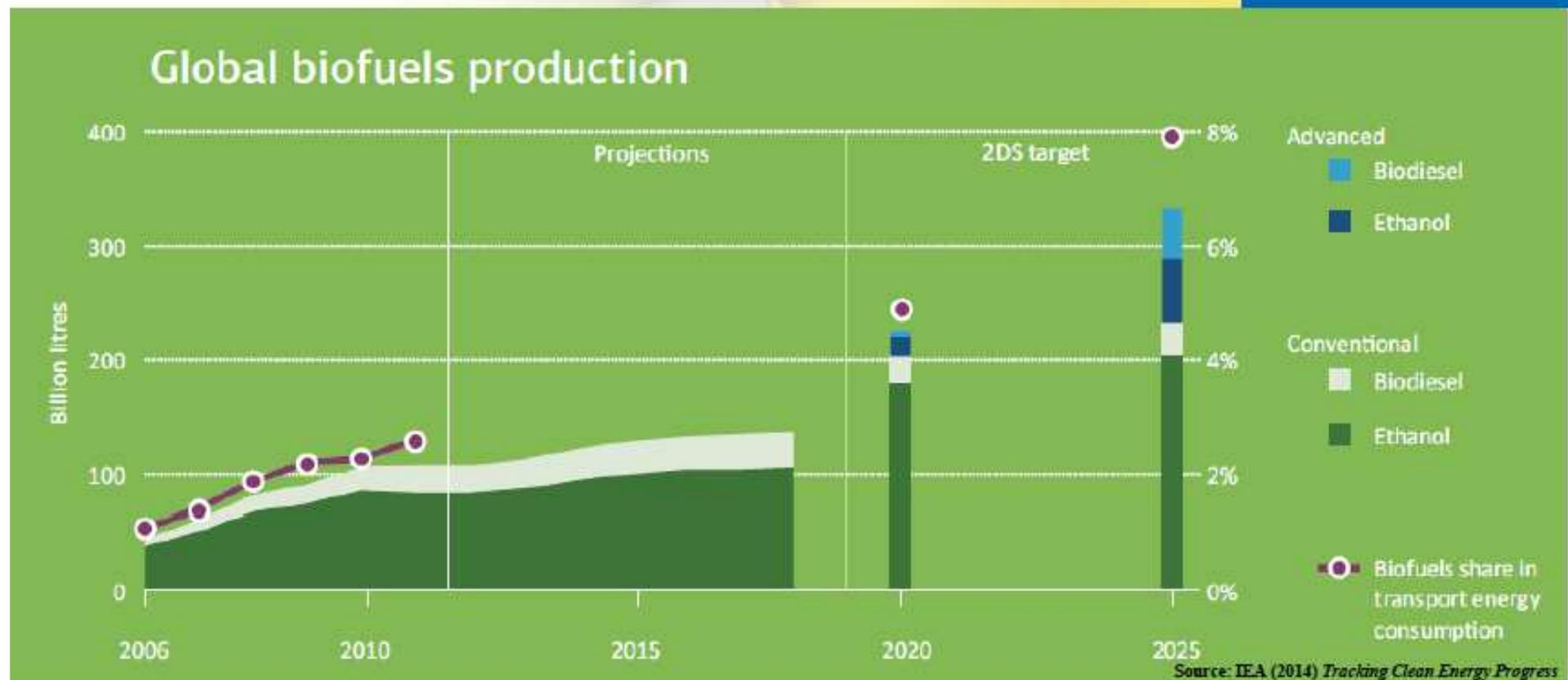
*+1.3% per annum, 2013-19, as macroeconomic momentum builds*

# Emerging markets expanding rapidly



- **Production in several Asian and African markets expands rapidly driven by:**
  - Rising bills for fossil fuel subsidies and oil imports
  - Vanishing export markets (EU, US)
  - Support for agricultural sector
- **Growing number of emerging markets in Asia and Africa with blending mandates**
  - **India:** E5 finally adopted, but meeting the target proves difficult
  - **Indonesia:** B10 as of Feb. 2014 as result of anti-dumping tariffs in the EU
  - **Thailand:** subsidies for E20; **Malaysia (B5)** and **Philippines (B5, E10)**
  - **South Africa:** introducing long-awaited E2 and B5 mandate
  - **Zimbabwe:** E10 as of Oct. 13, may rise to E20 later in 2014

# Biofuels production falling behind targets of IEA Biofuel Roadmap



- In a low CO2 scenario (IEA 2°C Scenario) biofuels' share in total transport increases to 27% in 2050
- Advanced biofuels play key role → only low-carbon fuel alternative for long-distance, heavy transport modes
- Without significant improvements of the policy framework for advanced biofuels, targets in the 2DS will not be met!



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# The biofuels industry at a crossroads: will it scale?

Prague, 18<sup>th</sup> June 2014

A large, solid blue chevron graphic pointing to the right, positioned behind the text "High performance. Delivered."

High performance. Delivered.

# Despite a promising start, biofuels have faced a rocky ride the last 7 years as detractors highlighted a range of issues



- Two main criticisms of biofuels:
  - GHG Balance
  - Impact on food prices / hunger
- Topics and issues are hotly contested and debated
- Governments are nervous of pushing forward legislation at odds with vocal campaigning organisations
- There are good and bad biofuels - for governments easier to push a complete moratorium on food based feedstocks rather than try to weed the good from the bad
- Advanced biofuels will be the main recipient of government support in the medium term as long as they can supply economically competitive biofuels

*"Biofuels do far more harm than good" Mar 2009*

*"Biodiesel industry dealt a blow by EU policy changes" Sep 2012*

*"Biofuels: a solution that became part of the problem" Mar 2008*

*"Biofuels starving our people, leaders tell UN" Jun 2008*

*"Save the planet - by taking your car on an alcohol-fuelled jaunt" Feb 2006*

*"Biofuel demand leading to human rights abuses, report claims" Feb 2008*

# Key trends

- Government support
  - Energy security
  - Greenhouse gas (GHG) reductions
  - Economic development
- Sustainability
  - GHG balance
  - Indirect land use change (ILUC)
  - Food vs fuel
  - Water
  - Measurement
- Advanced biofuels
- Consumer acceptance
  - E10 experience and higher blends
  - Understand the benefits
  - Advanced engines
- Economics
  - Improve conversion costs
  - Impact of feedstock prices
- Competition from alternative sources
  - Natural gas
  - Electrification



# Long term growth is broadly expected, but projected future supply will come from non-food based biofuels

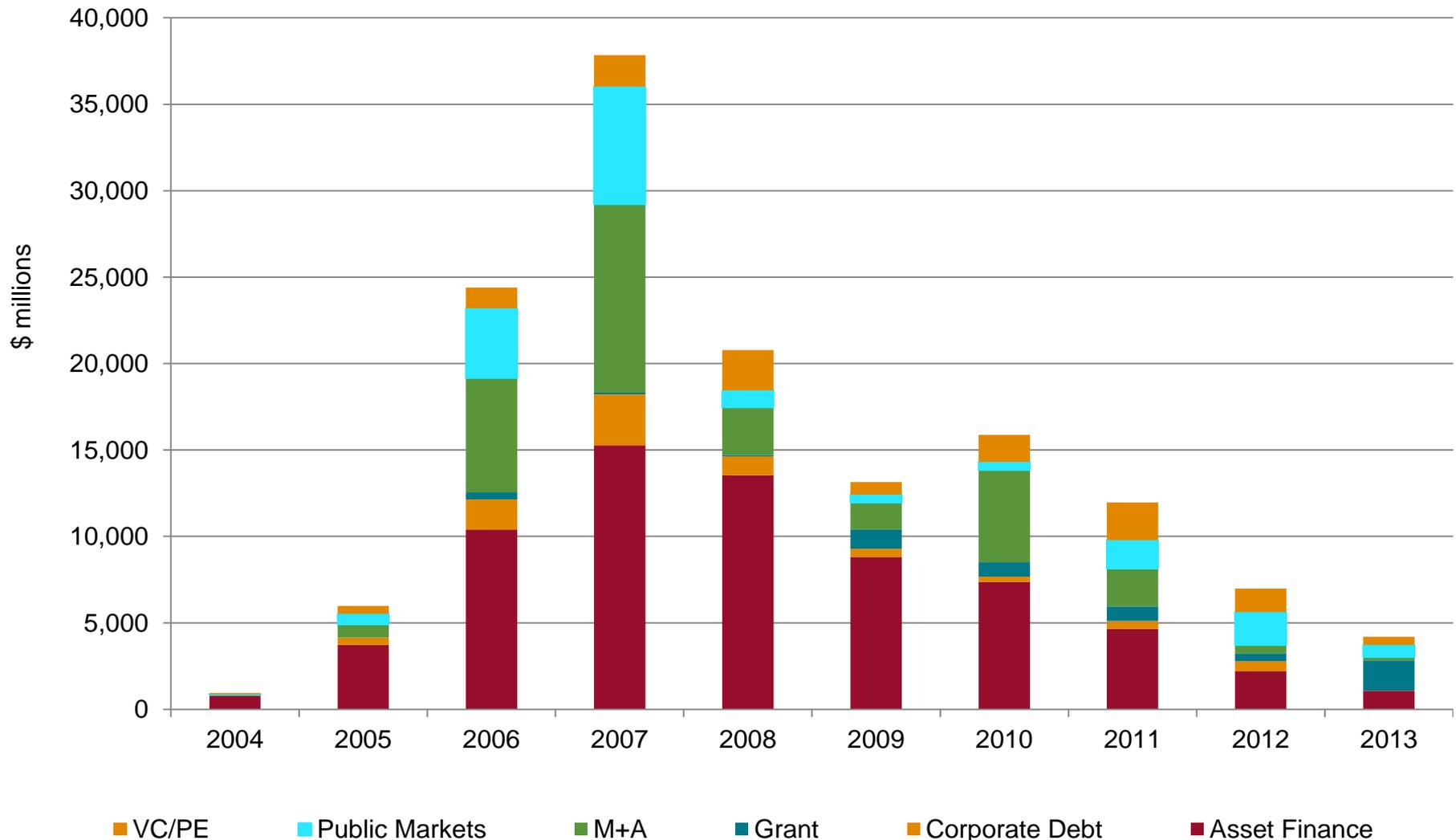
Demand by scenario (mb/d)	2000	2012	New Policies		Current Policies		450 Scenario	
			2020	2035	2020	2035	2020	2035
OECD	44.6	40.8	39.4	32.8	40.1	37.1	38.0	24.9
Non-OECD	26.5	39.6	48.3	59.2	49.2	64.2	45.6	45.6
Bunkers	5.2	7.0	7.8	9.3	7.8	9.7	7.5	7.7
<b>World Oil</b>	<b>76.3</b>	<b>87.4</b>	<b>95.4</b>	<b>101.4</b>	<b>97.1</b>	<b>111.0</b>	<b>91.1</b>	<b>78.2</b>
World biofuels	0.2	1.3	2.1	4.1	1.9	3.3	2.6	7.7

- Market potential: according to the latest IEA WEO, biofuels use more than triples in the New Policies Scenario, to 4.1 mboe/d in 2035 (market equating to ~\$140bn pa (@\$0.6/litre)).
- Biofuels meet 37% of road fuel demand in 2035 in Brazil, 19% in US and 16% in EU.
- Legislative support remains, focus on advanced biofuels.
- Governments appear committed to biofuels - looking for supply to come from advanced (non-food based crops) with very specific targets and support mechanisms.

## Drivers remain the same:

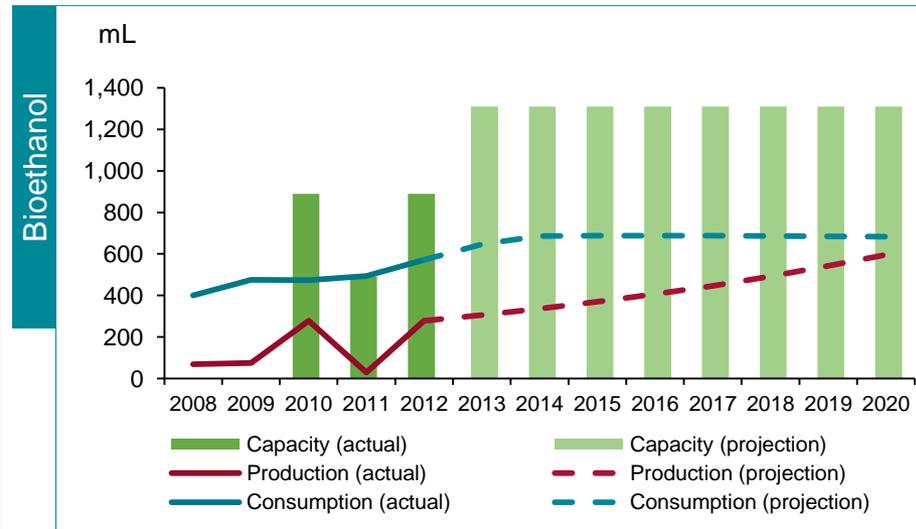
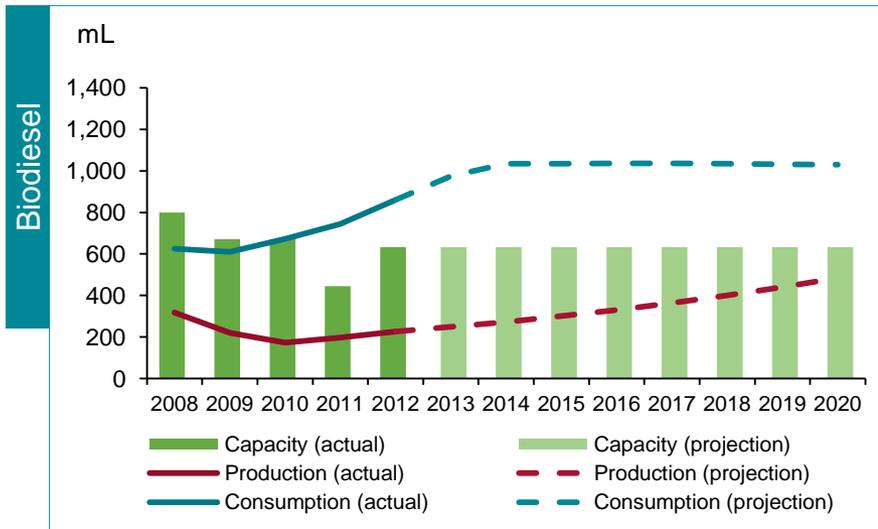
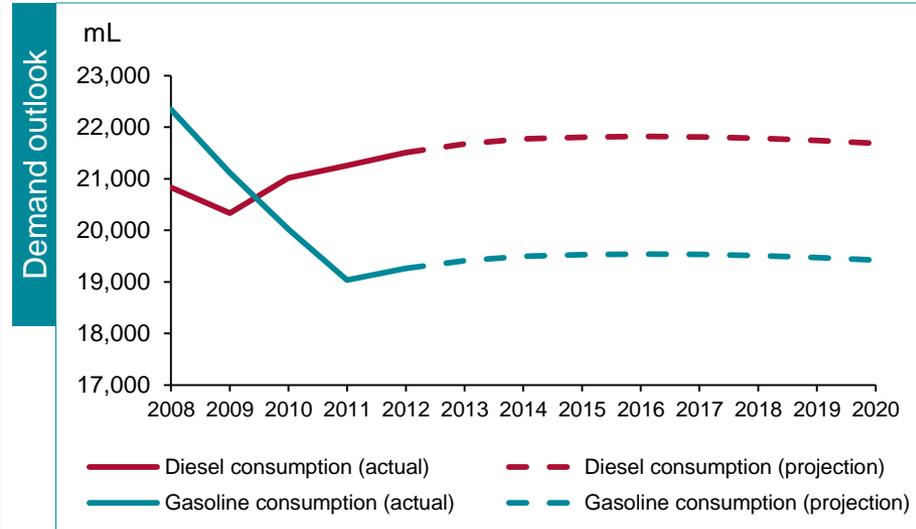
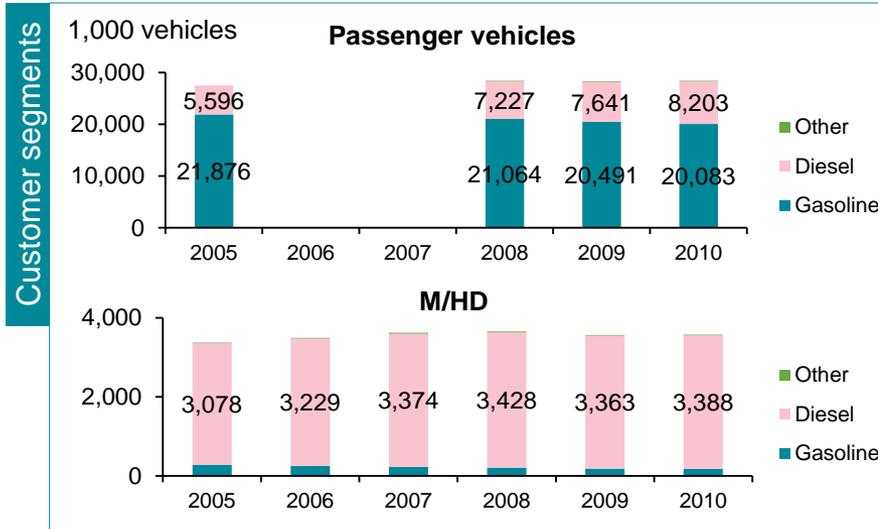
- Government have concluded that biofuels offer one of the few solutions to decarbonising the transport sector, whilst supporting economic development and energy security.
- Whilst electric vehicles, natural gas and other renewable transport fuels will all play a part in the overall solution, biofuels represent the main technology available at **reasonable scale** and **cost** in the **medium term**.
- As you move from geography to geography the reasons are always the same – a wish for energy security, economic development or carbon reduction - it is just the emphasis that changes.

# After initial exuberance, investment has declined as overcapacity & unclear regulatory support tempers zeal



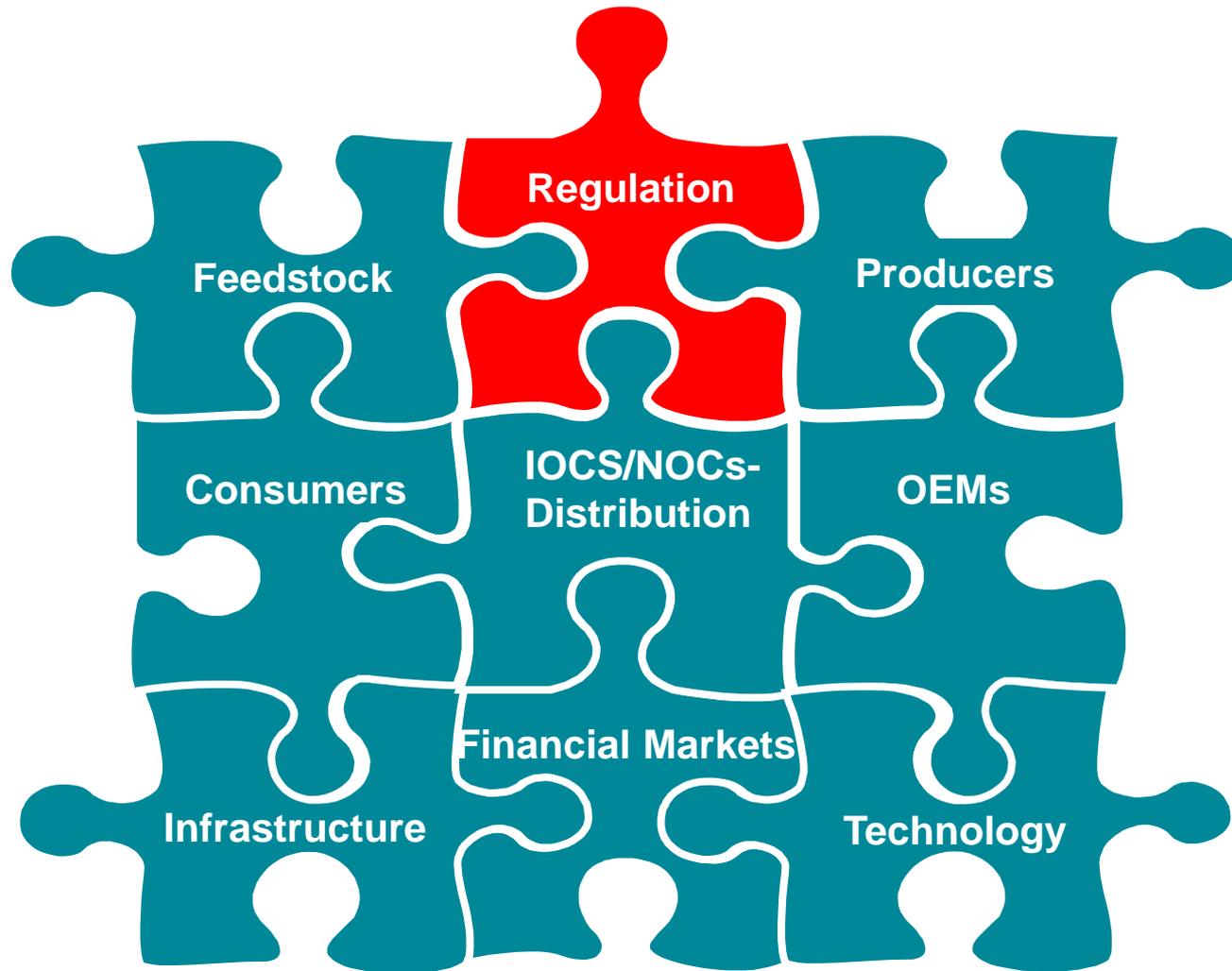


# Will biofuels consumption in the UK continue to flatline?



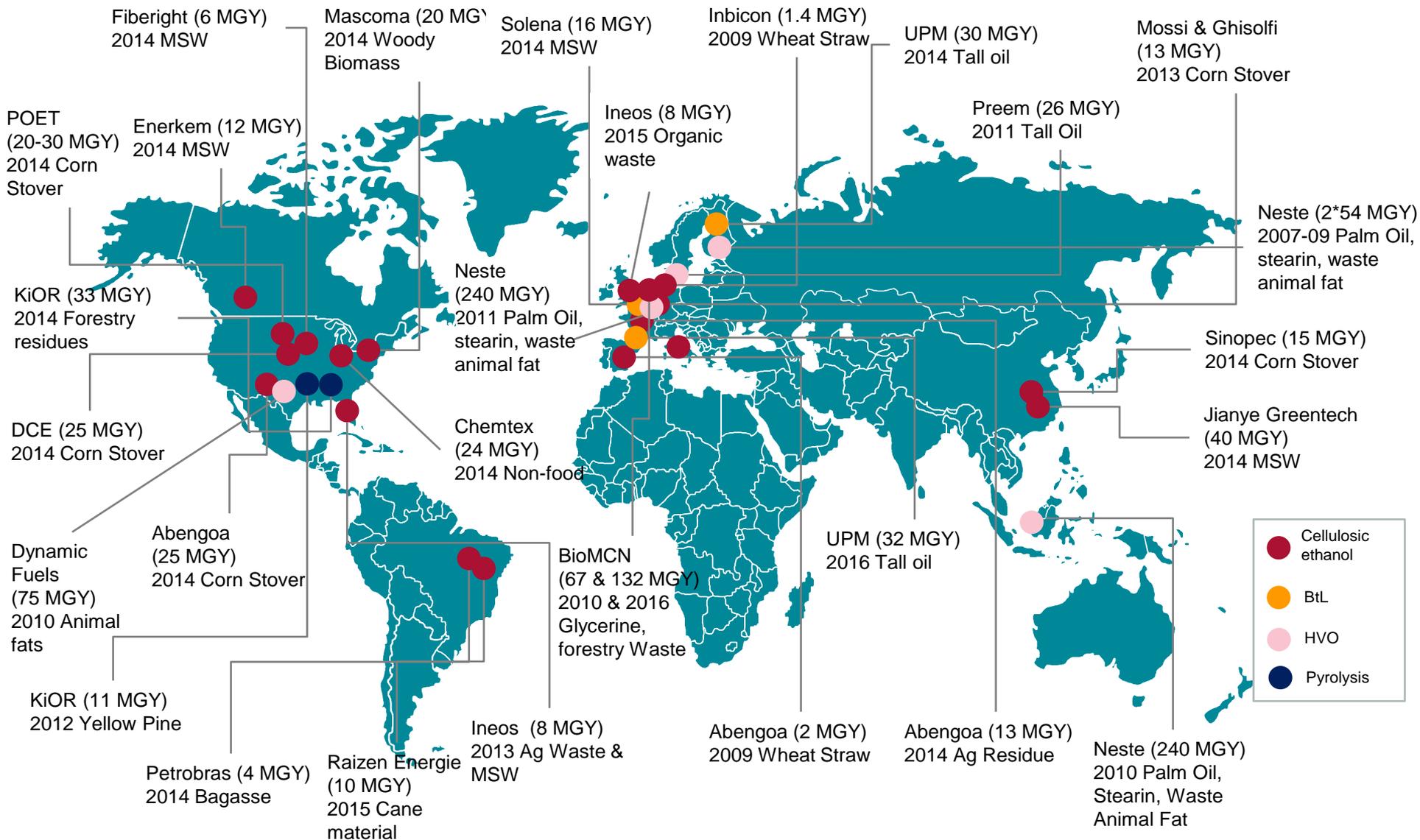
# A number of elements need to fall into place for a globally traded biofuels market to develop

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# Hope springs eternal: Selected active and planned advanced biofuel plants worldwide (Existing / Planned)



# Watch out! Substantial scope for ICE efficiency improvements and competing alternative technology cost reduction

## ICE

- Substantial scope for car ICE fuel economy improvement
- Aerodynamic and engine gains in heavy duty segment
- OEMs prefer ICE improvements to meet targets



## Electric

- PHEV/EV battle continues – may see more EVs with range extenders
- Performance will be limited by the constraints of the lithium-ion battery
- Number of new vehicle models being introduced in 2013 and 2014



## Hydrogen

- FCEV vehicles commercial in 2015; prices higher than conventional ICE
- Distribution/Dispensing logistics are key constraining factor
- Technology improvement rate will lag electric for several years
- Less OEM commitment than 12 months ago



## Natural Gas

- LNG for trucks/marine growing in US due to gas/oil price spread
- CNG has high penetration in some countries (eg. Italy, Pakistan)
- Long-standing 'chicken and egg' problem for infrastructure



## Biofuels

- Make or break year for cellulosic ethanol
- Cellulosic costs likely to remain higher than corn/cane
- Increasing emphasis on renewable diesel



# Will we see the resurrection of the biofuels industry in the next 7 years?

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- Change is the new normal for the transport fuel sector
- In the mid-term, biofuels will be the main alternative transport fuel
- Governments appear committed to biofuels for now
- Advanced biofuels will be the main recipient of government support in the medium term
- Technology challenges remain, but a number of players are expected to start commercial operations in the coming 18 months.
- Competition will continue to intensify – especially from EVs and Gas
- No single winner – will be market specific
- What does the industry need to do?
  - Watch natural gas
  - Consumer is king
  - Find OEM support
  - Work together as an industry and present a united front