



THE ASSOCIATION  
FOR RENEWABLE ENERGY  
& CLEAN TECHNOLOGY

# REA modelling on potential future biofuels target

10<sup>th</sup> December 2019  
DfT



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*Decarbonising the economy*

# Why *must* the target increase?

- GHG emissions from Transport are rising, whilst for other sectors they are falling
- The GHG reduction contribution from transport for 5<sup>th</sup> Carbon budget is XX
- Current (ordinary) obligation levels remain static out to 2032
- Electrification of passenger cars will result in a reduction of biofuel requirements
- The introduction of E10 will result in a reduction in biodiesel blending
- Biomethane will account for growing proportion of biofuels



# Framing the question

How to approach setting the RTFO targets ?

- Option A - set the target level on the basis of GHG savings required to meet carbon budgets.
- Option B - determine the availability of sustainable biomass available to the UK and set the RTFO at that level
- Option C - set targets to maintain current volumes of biodiesel taking into account changes in the demand for vehicles/fuel.



# Option C

- First pass – what target levels are required in order to maintain current biodiesel consumption levels?
- Second pass – can we be more optimistic?



# RTFO forecasting model

Inputs
Fuel Market Growth per annum
Growth/Decline - Grade Split (Diesel)
EV Market Share in 2032
EV Grade Split (Diesel)
Gasoil Demand Decrease % by 2032
Year E10 is Standard Grade
Limit % of E5
Limit % of E10
Limit % of Biodeisel
Biodiesel Double Counting %
Biomethane Growth/annum (2023 base, eqv bn L )
Waste Ethanol Double Counting %



# Variables – Fuel Demand

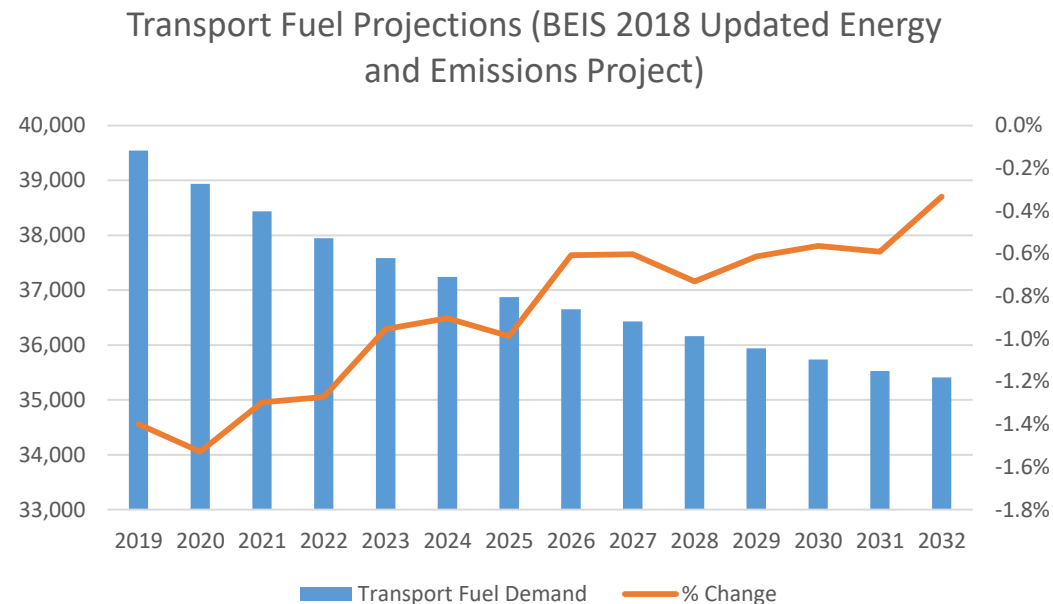
- As a starting point (2019) we took RTFO report 1 figures for fuel demand as of Volumes of fuels by fuel type: United Kingdom, 15 April 2017 to 14 April 2018.

Vehicle Fuel Market Size (billion litres or equiv)						
<i>Diesel Vehicles</i>		<i>Petrol Vehicles</i>	<i>Total Fuel used in Cars</i>	<i>Gasoil (NRMM)</i>	<i>Natural Gas Vehicles</i>	<i>Total</i>
<i>HGV</i>	<i>Other (Cars)</i>					
7.34	22.8	16.49	39.29	5.2	0.006	51.84



# Variables – Fuel Demand

- According to Vehicle Licencing Statistics, vehicle growth has been 1.5% in recent years, whilst RTFO numbers show that fuel demand has increased by 0.5% on average over the last 7 years.
- Future Energy Scenarios – vehicle growth projection 2019 – 2032 = 4.63% (0.36% per annum)
- However, according to BEIS 2018 Updated Energy & Emissions Projections fuel demand will decline by an average of 0.9% (2019 – 2032).



Our model takes the BEIS number of -0.9% decline total fuel demand for Cars and HGV's



# Growth/Decline Split

## Vehicle Licensing Statistics 2018/2019-Q1/2019-Q2 – Department of Transport

<u>New Car Registrations in 2018</u>					
Diesel	700,000				
Petrol	1,500,000				
<u>New Car Registrations in 2019 Q1 (Jan-Mar)</u>		}			
Diesel	190,000				
Petrol	450,000				
<u>New Car Registrations in 2019 Q2 (Apr-Jun)</u>		}			
Diesel	150,000				
Petrol	370,000				
			<u>Average New Car Registrations in 2019</u>		
			Diesel	680,000	
			Petrol	1,640,000	
			↓		
			<u>Average New Car Registrations per year</u>		
			Diesel	690,000	
			Petrol	1,570,000	
			↓		
			<u>% of Total 2018</u>		
			Diesel	31.82%	
			Petrol	68.18%	
			<u>% of Total 2019</u>		
			Diesel	29.31%	
			Petrol	70.69%	
			<u>% Growth of Total</u>		
			<b>Diesel</b>	<b>30.53%</b>	
			<b>Petrol</b>	<b>69.47%</b>	

“Diesel cars accounted for 39% of all licences cars at the end of 2018, slightly below the 2017 peak of 40%. This proportion had been rising from 12% since 1998.”

<https://www.gov.uk/government/statistics/vehicle-licensing-statistics-2018>

<https://www.gov.uk/government/statistics/vehicle-licensing-statistics-january-to-march-2019>

<https://www.gov.uk/government/statistics/vehicle-licensing-statistics-april-to-june-2019>



% Growth = 30/70 split Diesel/Petrol therefore  
% Decline = 70/30 split Diesel/Petrol.





# Variables – Gasoil demand

- The model assumes a decline of 10% by 2032 (can be changed).
- Decline due to e.g electrification of trains etc.



# Variables – Biomethane demand

- Projections in billion of litres (equivalent) for 2019 – 2023 supplied by CNG Fuels.
- After 2021: straight line growth of 0.138 billion litres (equiv) per annum assumed (0.5 TWH per annum) - this can be changed in the model.

	Biomethane		
	TWH	Kt	RTFCs (B)
2019	0.35	25.36	0.10
2020	0.70	50.72	0.19
2021	1.20	86.96	0.33
2022	1.70	123.19	0.47
2023	2.20	159.42	0.61
2024	2.70	195.65	0.74
2025	3.20	231.88	0.88
2026	3.70	268.12	1.02
2027	4.20	304.35	1.16
2028	4.70	340.58	1.29
2029	5.20	376.81	1.43
2030	5.70	413.04	1.57
2031	6.20	449.28	1.71

Note : figures in model already converted to double counting RTFC's



# Ethanol Assumptions

- Year E10 is introduced
- Actual blend level (E5)
- Actual blend level (E10)
- % split between crop based and waste based
  
- All these can be changed in the Model but the base assumptions are =
- 2021
- 4.8%
- 9%
- 0% waste based



# Biodiesel Assumptions

- Actual blend level
- % split between crop based and waste based
  
- All these can be changed in the model but the base case assumes :
  - 7%
  - 100% waste based



# Electric Vehicles

<http://fes.nationalgrid.com/media/1363/fes-interactive-version-final.pdf>

National Grid Future Energy Scenarios  
2018 report.

	No. of total vehicles in 2032
Community Renewables	39.38
Two Degrees	39.02
Steady Progression	39.23
Consumer Evolution	39.31
Average	<b>39.23</b>
	No. of total electric vehicles in 2032
Community Renewables	9.49
Two Degrees	9.21
Steady Progression	3.58
Consumer Evolution	3.50
Average	6.44
	% Electric Vehicles in 2032
Community Renewables	24.09%
Two Degrees	23.61%
Steady Progression	9.12%
Consumer Evolution	8.91%
Average	<b>16.42%</b>

National Grid Future Energy Scenarios  
2019 report.

	No. of total vehicles in 2032
Community Renewables	39.81
Two Degrees	39.83
Steady Progression	39.83
Consumer Evolution	39.83
Average	<b>39.83</b>
	No. of total electric vehicles in 2032
Community Renewables	18.20
Two Degrees	18.04
Steady Progression	3.73
Consumer Evolution	3.63
Average	<b>10.90</b>
	% Electric Vehicles in 2032
Community Renewables	45.72%
Two Degrees	45.29%
Steady Progression	9.36%
Consumer Evolution	9.11%
Average	<b>27.36%</b>



In 2018 National Grid forecasts that the % of EV's in 2032 will range from 8.91% to 24.09%. In 2019 they forecast between 9.11% and 45.72%. We have used 9% in the base case model.

We have assumed that the impact on petrol and diesel is 50/50 but this can be changed in the model.



# Model : Summary of Inputs (Base Case).

Inputs	
Fuel Market Growth per annum	-0.9%
Growth/Decline - Grade Split (Diesel)	70%
EV Market Share in 2032	9%
EV Grade Split (Diesel)	50%
Gasoil Demand Decrease %	10%
Year E10 is Standard Grade	2021
Limit % of E5	4.8%
Limit % of E10	9.0%
Limit % of Biodeisel	7%
Biodiesel Double Counting %	100%
Biomethane Growth/annum (2023 base, eqv bn L )	0.138
Waste Ethanol Double Counting %	0%



# Current targets with no market change.

Year	Renewable Fuel Obligation (% total)	Crop Cap (%)	Vehicle Fuel Market Size (billion litres or equiv)							Required RTFC's (billions)
			Diesel Vehicles		Petrol Vehicles	Total Fuel used in Cars	Gasoil (NRMM)	Natural Gas Vehicles	Total	
			HGV	Other (Cars)						
2019	8.4%	4.0%	7.34	22.8	16.49	39.29	5.2	0.006	51.84	4.354
2020	9.6%	4.0%	7.34	22.8	16.49	39.29	5.2	0.006	51.84	4.976
2021	9.6%	3.8%	7.34	22.8	16.49	39.29	5.2	0.006	51.84	4.976
2022	9.6%	3.7%	7.34	22.8	16.49	39.29	5.2	0.006	51.84	4.976
2023	9.6%	3.5%	7.34	22.8	16.49	39.29	5.2	0.006	51.84	4.976
2024	9.6%	3.3%	7.34	22.8	16.49	39.29	5.2	0.006	51.84	4.976
2025	9.6%	3.2%	7.34	22.8	16.49	39.29	5.2	0.006	51.84	4.976
2026	9.6%	3.0%	7.34	22.8	16.49	39.29	5.2	0.006	51.84	4.976
2027	9.6%	2.8%	7.34	22.8	16.49	39.29	5.2	0.006	51.84	4.976
2028	9.6%	2.7%	7.34	22.8	16.49	39.29	5.2	0.006	51.84	4.976
2029	9.6%	2.5%	7.34	22.8	16.49	39.29	5.2	0.006	51.84	4.976
2030	9.6%	2.3%	7.34	22.8	16.49	39.29	5.2	0.006	51.84	4.976
2031	9.6%	2.2%	7.34	22.8	16.49	39.29	5.2	0.006	51.84	4.976
2032	9.6%	2.0%	7.34	22.8	16.49	39.29	5.2	0.006	51.84	4.976



What happens if the market stays the same (no change, no growth, no decline) but the obligations increase as per policy ?



# Current Targets : No market change.

Year	Double Counting Biodiesel (Volume)	Single Counting Biodiesel (Volume)	Biodiesel as % of Total BioD, Diesel+ Gasoil	Biodiesel Limit	Double Counting Ethanol (Volume)	Single Counting Ethanol (Volume)	Ethanol as % of total Petrol +Ethanol	Ethanol limit as % of Petrol	Biomethane (Volume)	Total % by obligation	Crop %	Waste Based %
2019	1.778	0.000	5.0%	7.0%	0.000	0.792	4.8%	4.8%	0.006	8.4%	1.53%	3.4%
2020	2.089	0.000	5.9%	7.0%	0.000	0.792	4.8%	4.8%	0.006	9.6%	1.53%	4.0%
2021	2.089	0.000	5.9%	7.0%	0.000	0.792	4.8%	4.8%	0.006	9.6%	1.53%	4.0%
2022	2.089	0.000	5.9%	7.0%	0.000	0.792	4.8%	4.8%	0.006	9.6%	1.53%	4.0%
2023	2.089	0.000	5.9%	7.0%	0.000	0.792	4.8%	4.8%	0.006	9.6%	1.53%	4.0%
2024	2.089	0.000	5.9%	7.0%	0.000	0.792	4.8%	4.8%	0.006	9.6%	1.53%	4.0%
2025	2.089	0.000	5.9%	7.0%	0.000	0.792	4.8%	4.8%	0.006	9.6%	1.53%	4.0%
2026	2.089	0.000	5.9%	7.0%	0.000	0.792	4.8%	4.8%	0.006	9.6%	1.53%	4.0%
2027	2.089	0.000	5.9%	7.0%	0.000	0.792	4.8%	4.8%	0.006	9.6%	1.53%	4.0%
2028	2.089	0.000	5.9%	7.0%	0.000	0.792	4.8%	4.8%	0.006	9.6%	1.53%	4.0%
2029	2.089	0.000	5.9%	7.0%	0.000	0.792	4.8%	4.8%	0.006	9.6%	1.53%	4.0%
2030	2.089	0.000	5.9%	7.0%	0.000	0.792	4.8%	4.8%	0.006	9.6%	1.53%	4.0%
2031	2.089	0.000	5.9%	7.0%	0.000	0.792	4.8%	4.8%	0.006	9.6%	1.53%	4.0%
2032	2.089	0.000	5.9%	7.0%	0.000	0.792	4.8%	4.8%	0.006	9.6%	1.53%	4.0%



1. Waste Biodiesel demand will grow to about 2 billion litres, 5.9% of diesel demand.
2. Ethanol demand will stay at about 800 million litres, 4.8% of Petrol demand.
3. Crop = 1.53%
4. Waste based = 4%





# Transport Fuel demand with market changes

Year	Vehicle Fuel Market Size						
	Diesel Vehicles		Petrol Vehicles	Total Fuel used in Cars	Gasoil (NRMM)	Natural Gas Vehicles	Total
	HGV	Other (Cars)					
2019	7.34	22.8	16.49	39.29	5.2	0.006	51.8
2020	7.18	22.5	16.3	38.7	5.2	0.096	51.2
2021	7.02	22.1	16.0	38.1	5.1	0.193	50.5
2022	6.82	21.8	15.8	37.6	5.1	0.330	49.8
2023	6.62	21.4	15.6	37.0	5.0	0.468	49.1
2024	6.43	21.1	15.3	36.4	5.0	0.606	48.4
2025	6.23	20.7	15.1	35.8	5.0	0.744	47.8
2026	6.04	20.4	14.9	35.3	4.9	0.882	47.1
2027	5.84	20.0	14.6	34.7	4.9	1.020	46.4
2028	5.65	19.7	14.4	34.1	4.8	1.158	45.7
2029	5.46	19.3	14.2	33.5	4.8	1.296	45.1
2030	5.28	19.0	14.0	32.9	4.8	1.434	44.4
2031	5.09	18.6	13.7	32.4	4.7	1.572	43.7
2032	4.91	18.3	13.5	31.8	4.7	1.710	43.1

Inputs	
Fuel Market Growth per annum	-0.9%
Growth/Decline - Grade Split (Diesel)	70%
EV Market Share in 2032	9%
EV Grade Split (Diesel)	50%
Gasoil Demand Decrease %	10%
Year E10 is Standard Grade	2021
Limit % of E5	4.8%
Limit % of E10	9.0%
Limit % of Biodiesel	7%
Biodiesel Double Counting %	100%
Biomethane Growth/annum (2023 base, eqv bn L )	0.138
Waste Ethanol Double Counting %	0%



- Total vehicle fuel market size decreases by 8.7 bln Litres due to :
  - More efficient vehicles
  - Electric vehicles
- HGV diesel demand will fall due to improved efficiency and the uptake of natural gas/biomethane.
- Diesel cars decline at a higher rate than petrol cars.



# ...the results for biofuel supply

Year	Required RTFC's (billions)	Double Counting Biodiesel (Volume)	Single Counting Biodiesel (Volume)	Biodiesel as % of Total BioD, Diesel+ Gasoil	Biodiesel Limit	Double Counting Ethanol (Volume)	Ethanol (Volume)	Ethanol as % of total Petrol +Ethanol	Ethanol limit as % of Petrol	Biomethane (Volume)	Total % by obligation	Crop %	Waste Based %
2019	4.354	1.778	0.000	5.0%	7.0%	0.000	0.792	4.8%	4.8%	0.006	8.4%	1.53%	3.4%
2020	4.911	2.017	0.000	5.8%	7.0%	0.000	0.780	4.8%	4.8%	0.096	9.6%	1.53%	4.1%
2021	4.845	1.605	0.000	4.7%	7.0%	0.000	1.443	9.0%	9.0%	0.193	9.6%	2.86%	3.6%
2022	4.780	1.514	0.000	4.5%	7.0%	0.000	1.422	9.0%	9.0%	0.330	9.6%	2.86%	3.7%
2023	4.715	1.423	0.000	4.3%	7.0%	0.000	1.401	9.0%	9.0%	0.468	9.6%	2.85%	3.9%
2024	4.650	1.332	0.000	4.1%	7.0%	0.000	1.380	9.0%	9.0%	0.606	9.6%	2.85%	4.0%
2025	4.585	1.241	0.000	3.9%	7.0%	0.000	1.359	9.0%	9.0%	0.744	9.6%	2.85%	4.2%
2026	4.520	1.150	0.000	3.7%	7.0%	0.000	1.339	9.0%	9.0%	0.882	9.6%	2.84%	4.3%
2027	4.456	1.061	0.000	3.5%	7.0%	0.000	1.314	9.0%	9.0%	1.020	9.6%	2.83%	4.5%
2028	4.392	1.006	0.000	3.3%	7.0%	0.000	1.221	8.5%	9.0%	1.158	9.6%	2.67%	4.7%
2029	4.328	0.952	0.000	3.2%	7.0%	0.000	1.127	7.9%	9.0%	1.296	9.6%	2.50%	5.0%
2030	4.264	0.897	0.000	3.1%	7.0%	0.000	1.035	7.4%	9.0%	1.434	9.6%	2.33%	5.2%
2031	4.200	0.839	0.000	2.9%	7.0%	0.000	0.949	6.9%	9.0%	1.572	9.6%	2.17%	5.5%
2032	4.136	0.782	0.000	2.8%	7.0%	0.000	0.862	6.4%	9.0%	1.710	9.6%	2.00%	5.8%



- Ethanol grows to 1.44 billion litres and then declines due to crop cap.
- Biodiesel declines by 1.23 billion litres from 2020 to 2032.
- Biomethane grows to 0.855 billion litres equiv (double counted = 1.71).



# Obligation increases

Year	Renewable Fuel Obligation (% total)	Crop Cap (%)	Required RTFC's (billions)	Double Counting Biodiesel (Volume)	Single Counting Biodiesel (Volume)	Biodiesel as % of Total BioD, Diesel+ Gasoil	Biodiesel Limit	Double Counting Ethanol (Volume)	Ethanol (Volume)	Ethanol as % of total Petrol +Ethanol	Ethanol limit as % of Petrol	Biomethane (Double Counted Volume)	Total % by obligation	Crop %	Waste Based %
2019	8.4%	4.0%	4.354	1.778	0.000	5.0%	7.0%	0.000	0.792	4.8%	4.8%	0.006	8.4%	1.53%	3.4%
2020	9.6%	4.0%	4.911	2.017	0.000	5.8%	7.0%	0.000	0.780	4.8%	4.8%	0.096	9.6%	1.53%	4.1%
2021	11.0%	3.8%	5.552	1.958	0.000	5.7%	7.0%	0.000	1.443	9.0%	9.0%	0.193	11.0%	2.86%	4.3%
2022	11.5%	3.7%	5.726	1.987	0.000	5.9%	7.0%	0.000	1.422	9.0%	9.0%	0.330	11.5%	2.86%	4.7%
2023	12.0%	3.5%	5.894	2.012	0.000	6.1%	7.0%	0.000	1.401	9.0%	9.0%	0.468	12.0%	2.85%	5.1%
2024	12.5%	3.3%	6.055	2.034	0.000	6.3%	7.0%	0.000	1.380	9.0%	9.0%	0.606	12.5%	2.85%	5.5%
2025	13.0%	3.2%	6.209	2.053	0.000	6.4%	7.0%	0.000	1.359	9.0%	9.0%	0.744	13.0%	2.85%	5.9%
2026	13.5%	3.0%	6.357	2.068	0.000	6.6%	7.0%	0.000	1.339	9.0%	9.0%	0.882	13.5%	2.84%	6.3%
2027	14.0%	2.8%	6.498	2.082	0.000	6.8%	7.0%	0.000	1.314	9.0%	9.0%	1.020	14.0%	2.83%	6.7%
2028	14.3%	2.7%	6.542	2.081	0.000	6.9%	7.0%	0.000	1.221	8.5%	9.0%	1.158	14.3%	2.67%	7.1%
2029	14.5%	2.5%	6.537	2.057	0.000	6.9%	7.0%	0.000	1.127	7.9%	9.0%	1.296	14.5%	2.50%	7.4%
2030	14.7%	2.3%	6.529	2.030	0.000	7.0%	7.0%	0.000	1.035	7.4%	9.0%	1.434	14.7%	2.33%	7.8%
2031	14.9%	2.2%	6.497	1.988	0.000	7.0%	7.0%	0.000	0.949	6.9%	9.0%	1.572	14.9%	2.17%	8.1%
2032	15.0%	2.0%	6.463	1.946	0.000	7.0%	7.0%	0.000	0.862	6.4%	9.0%	1.710	15.0%	2.00%	8.5%



- Obligation increased to 15% by 2032 allows waste based biodiesel to remain at 2 billion litres of demand.
- Crop Cap limits demand for Ethanol



# Maximum Obligation changes

Year	Renewable Fuel Obligation (% total)	Crop Cap (%)	Required RTFC's (billions)	Double Counting Biodiesel (Volume)	Single Counting Biodiesel (Volume)	Biodiesel as % of Total BioD, Diesel+ Gasoil	Biodiesel Limit	Double Counting Ethanol (Volume)	Ethanol (Volume)	Ethanol as % of total Petrol +Ethanol	Ethanol limit as % of Petrol	Biomethane (Double Counted Volume)	Total % by obligation	Crop %	Waste Based %
2019	8.4%	4.0%	4.354	1.778	0.000	5.0%	7.0%	0.000	0.792	4.8%	4.8%	0.006	8.4%	1.53%	3.4%
2020	9.6%	4.0%	4.911	2.017	0.000	5.8%	7.0%	0.000	0.780	4.8%	4.8%	0.096	9.6%	1.53%	4.1%
2021	11.0%	3.8%	5.552	1.958	0.000	5.7%	7.0%	0.000	1.443	9.0%	9.0%	0.193	11.0%	2.86%	4.3%
2022	11.5%	3.7%	5.726	1.987	0.000	5.9%	7.0%	0.000	1.422	9.0%	9.0%	0.330	11.5%	2.86%	4.7%
2023	12.0%	3.5%	5.894	2.012	0.000	6.1%	7.0%	0.000	1.401	9.0%	9.0%	0.468	12.0%	2.85%	5.1%
2024	12.5%	3.3%	6.055	2.034	0.000	6.3%	7.0%	0.000	1.380	9.0%	9.0%	0.606	12.5%	2.85%	5.5%
2025	13.0%	3.2%	6.209	2.053	0.000	6.4%	7.0%	0.000	1.359	9.0%	9.0%	0.744	13.0%	2.85%	5.9%
2026	13.5%	3.0%	6.357	2.068	0.000	6.6%	7.0%	0.000	1.339	9.0%	9.0%	0.882	13.5%	2.84%	6.3%
2027	14.0%	2.9%	6.498	2.080	0.000	6.8%	7.0%	0.000	1.318	9.0%	9.0%	1.020	14.0%	2.84%	6.7%
2028	14.5%	2.9%	6.633	2.089	0.000	6.9%	7.0%	0.000	1.297	9.0%	9.0%	1.158	14.5%	2.84%	7.1%
2029	14.7%	2.9%	6.627	2.027	0.000	6.8%	7.0%	0.000	1.276	9.0%	9.0%	1.296	14.7%	2.83%	7.4%
2030	15.0%	2.9%	6.662	1.986	0.000	6.8%	7.0%	0.000	1.256	9.0%	9.0%	1.434	15.0%	2.83%	7.7%
2031	15.5%	2.9%	6.781	1.987	0.000	7.0%	7.0%	0.000	1.235	9.0%	9.0%	1.572	15.5%	2.82%	8.1%
2032	15.8%	2.9%	6.808	1.942	0.000	7.0%	7.0%	0.000	1.214	9.0%	9.0%	1.710	15.8%	2.82%	8.5%

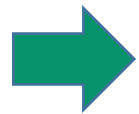


- Keeping the crop cap at 2.9% in 2027 allows E10 to be fully utilised which also allows total obligation to be increased to 15.8% by 2032.



# If EV market share is 25% in 2032 ...

Year	Renewable Fuel Obligation (% total)	Crop Cap (%)	Required RTFC's (billions)	Double Counting Biodiesel (Volume)	Single Counting Biodiesel (Volume)	Biodiesel as % of Total BioD, Diesel+ Gasoil	Biodiesel Limit	Double Counting Ethanol (Volume)	Ethanol (Volume)	Ethanol as % of total Petrol +Ethanol	Ethanol limit as % of Petrol	Biomethane (Double Counted Volume)	Total % by obligation	Crop %	Waste Based %
2019	8.4%	4.0%	4.354	1.778	0.000	5.0%	7.0%	0.000	0.792	4.8%	4.8%	0.006	8.4%	1.53%	3.4%
2020	9.6%	4.0%	4.869	2.001	0.000	5.8%	7.0%	0.000	0.772	4.8%	4.8%	0.096	9.6%	1.52%	4.1%
2021	11.0%	3.8%	5.457	1.926	0.000	5.7%	7.0%	0.000	1.412	9.0%	9.0%	0.193	11.0%	2.85%	4.3%
2022	11.5%	3.7%	5.578	1.936	0.000	5.9%	7.0%	0.000	1.375	9.0%	9.0%	0.330	11.5%	2.84%	4.7%
2023	12.0%	3.5%	5.687	1.940	0.000	6.1%	7.0%	0.000	1.339	9.0%	9.0%	0.468	12.0%	2.83%	5.1%
2024	12.5%	3.3%	5.786	1.938	0.000	6.2%	7.0%	0.000	1.303	9.0%	9.0%	0.606	12.5%	2.81%	5.5%
2025	13.0%	3.2%	5.874	1.932	0.000	6.4%	7.0%	0.000	1.267	9.0%	9.0%	0.744	13.0%	2.80%	5.9%
2026	13.5%	3.0%	5.951	1.919	0.000	6.5%	7.0%	0.000	1.230	9.0%	9.0%	0.882	13.5%	2.79%	6.4%
2027	14.5%	2.9%	6.232	2.009	0.000	7.0%	7.0%	0.000	1.194	9.0%	9.0%	1.020	14.5%	2.78%	7.0%
2028	15.0%	2.9%	6.282	1.983	0.000	7.1%	7.0%	0.000	1.158	9.0%	9.0%	1.158	15.0%	2.76%	7.5%
2029	15.6%	2.9%	6.362	1.972	0.000	7.3%	7.0%	0.000	1.122	9.0%	9.0%	1.296	15.6%	2.75%	8.0%
2030	16.3%	2.9%	6.469	1.975	0.000	7.5%	7.0%	0.000	1.085	9.0%	9.0%	1.434	16.3%	2.73%	8.6%
2031	17.2%	2.9%	6.637	2.008	0.000	7.9%	7.0%	0.000	1.049	9.0%	9.0%	1.572	17.2%	2.72%	9.3%
2032	17.7%	2.9%	6.637	1.957	0.000	8.0%	7.0%	0.000	1.013	9.0%	9.0%	1.710	17.7%	2.70%	9.8%



- Obligation could be increased to 17.7% if B8 was introduced from 2028 !



# Scenarios

- The model could help to analyse....
  - Effect of changing the mix between single counting and double counting biodiesel and ethanol.
  - Different rates of growth of bio-methane.
  - Different rates of growth of EV.
  - Introduction of B10.
- Any other interesting variables to study ?



# Our asks.....

- Consult on increasing ordinary Obligation level to 11% in 2021 rising to 15.8% by 2032
- Be prepared to reconsider the crop cap (2.9% lowest)

- We should be striving to achieve more, but current target levels will mean we deliver less
- GHG emissions from transport are *rising*, yet a *major reduction is required* in order to meet Carbon Budgets
- EVs, E10 & biomethane will all result in a reduction of biofuel volumes
- .... and we haven't even looked at higher blend levels (B30, B100, E20, E85) or HVO



# Appendix



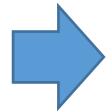


# DUKES

**Table 3B: Estimated consumption of road transport fuels by vehicle class**

	1995	2000	2005	2010	2018 <sup>a</sup>
<b>Petrol:</b>					<i>Million tonnes</i>
Cars and taxis	19.9	20.2	18.1	14.1	11.2
Light goods vehicles	1.6	1.0	0.5	0.3	0.2
Motorcycles etc.	0.2	0.2	0.2	0.2	0.2
<b>Total</b>	<b>21.7</b>	<b>21.4</b>	<b>18.9</b>	<b>14.6</b>	<b>11.6</b>
<b>Diesel:</b>					
Cars and taxis	2.8	4.1	6.6	8.6	11.1
Light goods vehicles	2.5	3.5	4.6	4.8	6.0
Heavy goods vehicles	6.2	6.1	6.7	5.9	6.5
Buses and coaches	1.7	1.5	1.5	1.4	1.1
<b>Total</b>	<b>13.2</b>	<b>15.3</b>	<b>19.4</b>	<b>20.7</b>	<b>24.6</b>

<sup>a</sup> Data for 2018 have been estimated using 2017 percentage splits



6.5 million Mt = 7.34 billion litres (1129 litres = 1Mt)



- National Grid FES (Future energy scenarios) 2018 report

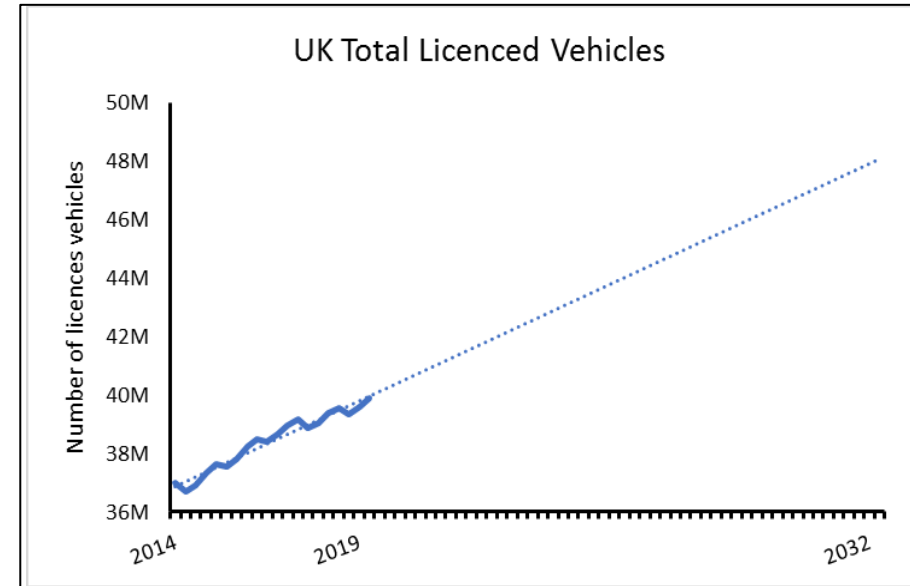
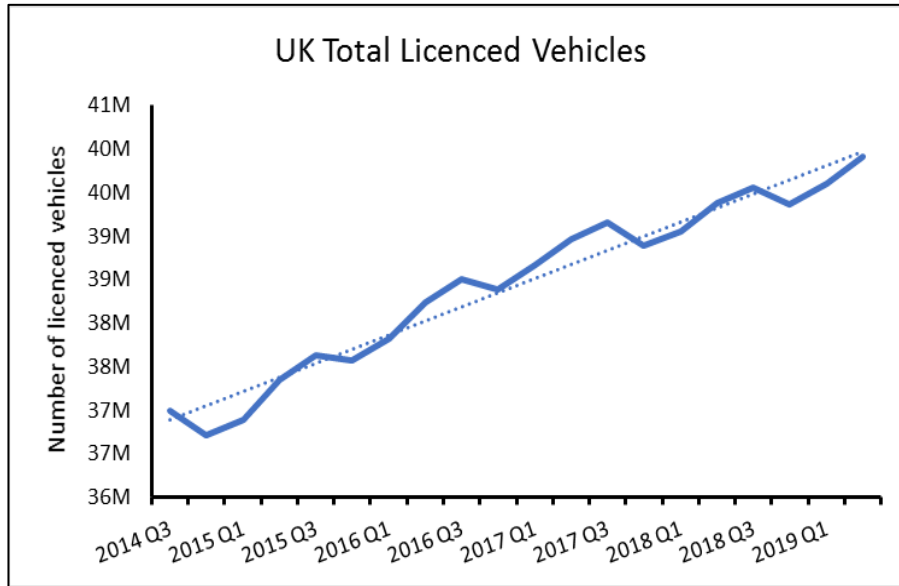
	% total vehicle growth			
	2016-2020	2020-2030	2030-2040	2040-2050
Community Renewables	3.08%	3.58%	2.85%	-3.63%
Two Degrees	2.86%	2.87%	2.19%	-4.44%
Steady Progression	2.91%	3.37%	2.92%	-0.48%
Consumer Evolution	2.96%	3.53%	3.14%	0.19%
Average	2.95%	3.33%	2.78%	-2.09%
Estimate average growth/year	0.74%	0.33%	0.28%	-0.21%
	% total vehical growth 2019 - 2032		Per year	
Community Renewables	4.92%		0.38%	
Two Degrees	4.02%		0.31%	
Steady Progression	4.68%		0.36%	
Consumer Evolution	4.90%		0.38%	
Average	<b>4.63%</b>		<b>0.36%</b>	

<http://fes.nationalgrid.com/media/1363/fes-interactive-version-final.pdf>



# Vehicle Licensing Statistics – Department of Transport

<https://www.gov.uk/government/statistical-data-sets/all-vehicles-veh01#contents>

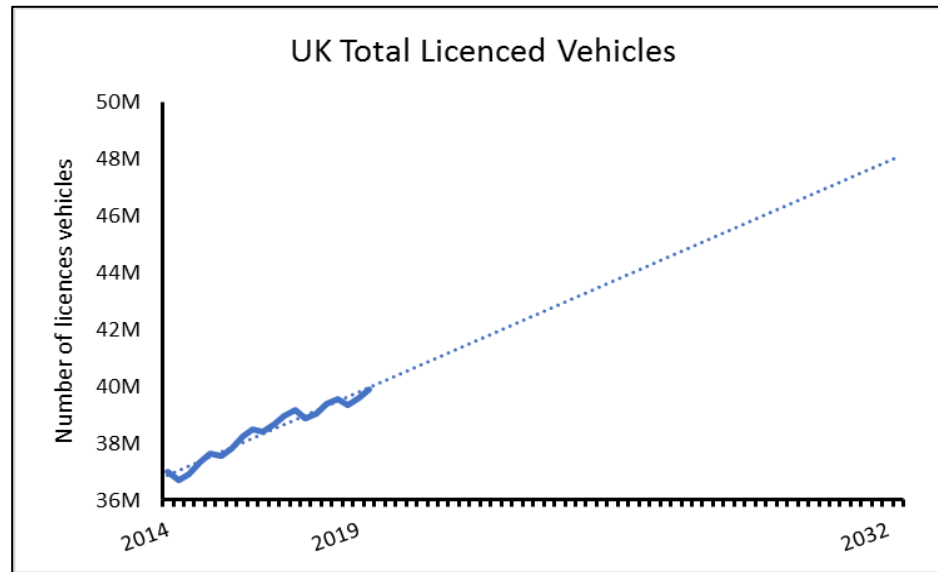


Assumption: the vehicle market will grow in a linear fashion



# Vehicle Licensing Statistics – Department of Transport

<https://www.gov.uk/government/statistical-data-sets/all-vehicles-veh01#contents>

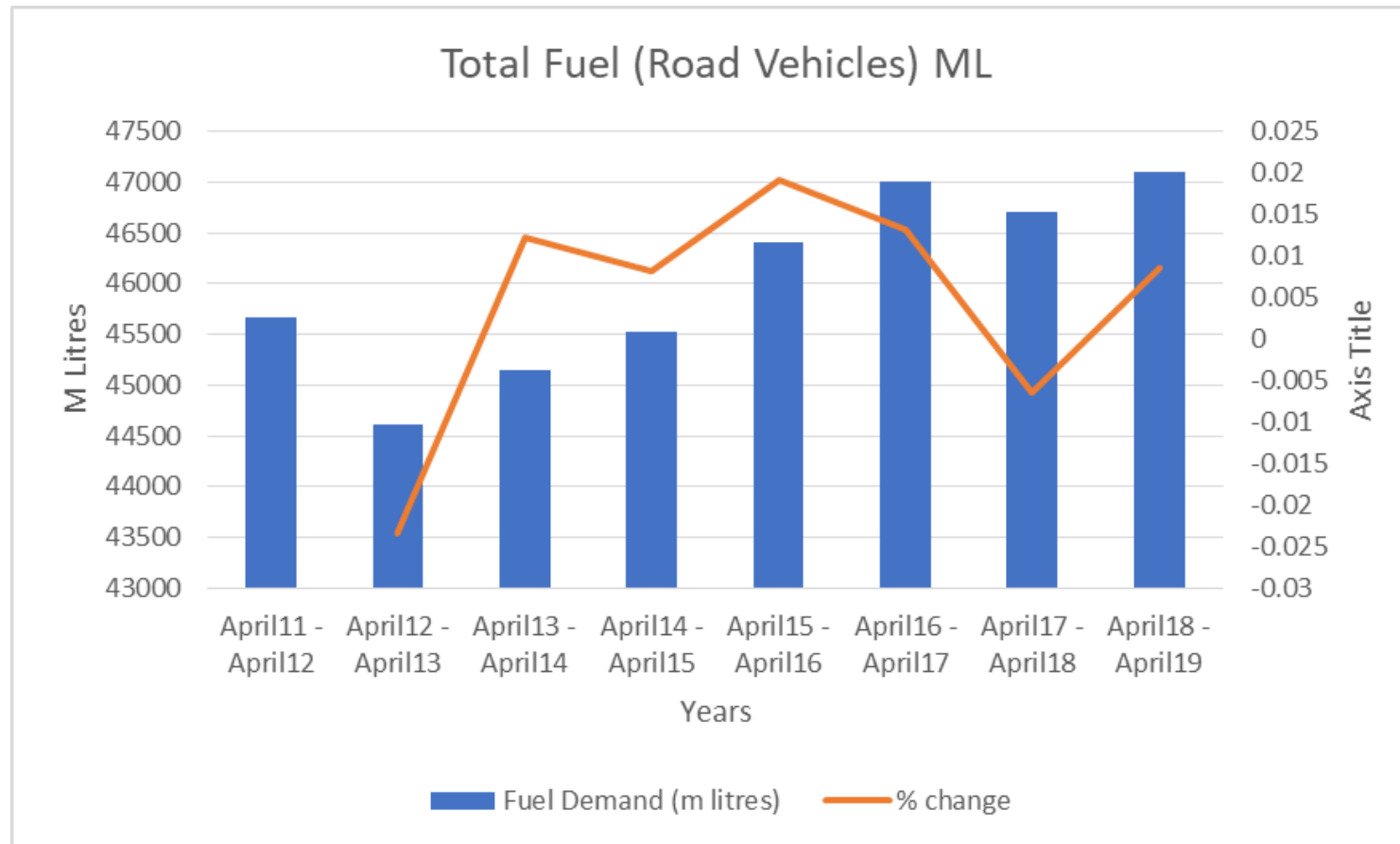


Year	No. of licenced vehicles (M)	year on year % increase
2019	39.90	n/a
2020	40.52	1.53%
2021	41.14	1.51%
2022	41.76	1.48%
2023	42.38	1.46%
2024	43.00	1.44%
2025	43.62	1.42%
2026	44.24	1.40%
2027	44.86	1.38%
2028	45.48	1.36%
2029	46.10	1.34%
2030	46.72	1.33%
2031	47.34	1.31%
2032	47.96	1.29%

- The vehicle market will grow by approximately 8 million between 2019 – 2032.
- This is equivalent to 0.62 million each year.
- Which equates to a yearly % increase of between 1.53% and 1.29%.

Assumption: the vehicle market will grow in a linear fashion





Source = RTFO (**Table RTFO 01**) reports

