The prospects for very low carbon vehicles worldwide . . .

Including the significance of fossil fuel vehicle bans, the growing role of cities, and the spread of ZEV mandates.

Drew Kodjak and ICCT staff

STEPS Fall 2017 Symposium US Davis, La Rue Road / Orchard Park Road December 7th, 2017



Bans on internal combustion vehicles How to think about them . . .



*British Columbia, California, Connecticut, Germany, Maryland, Massachusetts, The Netherlands, New York, Norway, Oregon, Québec, Rhode Island, United Kingdom, Vermont

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Cities, Air Pollution, and Real World Emissions



Remote sensing indicated large-scale problems with recent diesel cars, long before Dieselgate



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German real world testing data found Euro 5 & 6 diesel cars emit NO_x emissions many times legal limits.



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Data compiled by ICCT from EU government real world testing programs (2016) reveals relative performance by manufacturer.



Source: International Council on Clean Transportation

Economist.com

Clean Transportation

Air pollution and Dieselgate inspire Paris, London to announce real world emissions data program

ENVIRONMENT | Wed Mar 29, 2017 | 10:44am EDT

Paris and London mayors announce scheme to gauge car emissions



London Mayor Sadiq Khan (L) and Paris Mayor Anne Hidalgo attend a meeting on air pollution in Paris, France, March 29, 2017. REUTERS/Gonzalo Fuentes









TRUE Real World Emissions Rating System



The **TRUE** rating is a three-color rating system designed to inform the interested public about the magnitude of a vehicle's emissions over its full useful life under a wide range of operating conditions and driving behaviors. Emissions are tracked over the lifetime of the vehicle, primarily through the use of **Remote Sensing (RS) technology**, which is able to collect emissions snapshots of thousands of vehicles per day. A green rating is considered to encompass all vehicles with the lowest available real world emissions, and is thus recommended by **TRUE**.

While new vehicles are often certified to pollution levels less than one-half of the legal limit, vehicle emissions rise over a vehicle's lifetime for a variety of reasons, including deterioration of emission control systems, software devices that increase emissions during normal driving (aka defeat devices), or defective parts. Emissions are also affected in a positive way by recalls and retrofits. The **TRUE ratings** incorporate all these factors.

TRUE ratings are represented by Green, Amber & Red Targets. Emissions are considered Good (green), Moderate (amber) or Elevated (red).

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			RANK FUEL EN	NGINE OEM GROUP MOD	ELS			
				Rena	ult Scenic			
g		UE NU URBAN NS INITIATIVE		GREEN RATING	ai I ar			
RANK	FUEL	ENGINE SIZE (L)	OEM GROUP	MODELS	ro			
1	Petrol	1.6	Hyundai/Kia	Hyundai ix20 Kia Venga Hyundai i30 Kia Carens Kia Ceed Hyundai ix35 Hyundai Tucson Kia Soul Kia Sportage	r ne iic O ; ai ;ur ar Siulietta			
2	Petrol	2.0	Volvo	Volvo V40 Volvo V40 Cross Country Volvo S60 Volvo V60 Volvo XC60 Volvo XC90	ee ide 180 Class :an			
3	Petrol	4.4	вмш	BMW 550 BMW 5-Series GT BMW 750 BMW 650 BMW 6-Series Gran Coupe BMW M6 BMW X5 BMW X6	Custom			
4	Petrol	1.3	Toyota	Toyota Yaris Toyota Auris				
5	Petrol	2.0	BMW	Mini New Mini BMW 1-Series BMW 2-Series Active Tour BMW 2-Series Gran Tourer BMW 320 BMW 320 BMW 320 BMW 330 BMW 3-Series GT BMW 520 BMW 4-Series BMW 4-Series BMW 4-Series BMW 4-Series Gran Coupe BMW 24 BMW X1 BMW X3	er			



ZEV mandates go global



ZEV mandates spread around the world

Government	Target year	Percentage of EV credits	ICCT estimate of percent EV sales			
China	2020	12%	3 – 4%			
California	2025	22%	8%			
Quebec	2025	22%	10%			
Europe	2025 2030	15% 30%	5 – 10% 15 – 20%			

- China's New Energy Vehicle mandate is integrated into its existing fuel economy standards, an excellent first step but in need to substantial improvement in the next iteration of the standards.
- California forecasts only 8% EV penetration in 2025 due to credit multipliers which needs substantial enhancements to achieve a ~ 30% target by 2030.
- Quebec's policy is nearly identical to California's but with fewer credits
- Europe's policy currently only a proposal includes incentives for achieving substantial EV penetration levels but no penalties. We forecast substantial penetration levels due to major OEM commitments: VW (20 25% by 2025), BMW and Daimler (15 25% by 2025), Renault / Nissan (20% by 2020 depending on market conditions).

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Basics of the NEV mandate in China

- Integrated into China's fuel efficiency standard
- 2-6% EV market share in 2020 depending on vehicle mix (4% @ICCT estimate)
- May lead to substantial weakening of fuel efficiency standard



Potential impact on manufacturers China OEM well positioned to sell NEV credits

			2015 NEV production	2019	2020				2015 NEV production	2019	2020	
JAC	1	安徽江淮汽车股份有限公司	7956	18439	23233	5	i9 }	陕西通家汽车股份有限公司		0	0	
	2	安徽猎豹汽车有限公司		0	3050	6	60 _	上汽大众汽车有限公司		108011	136094	SAIC-VW
	3	北京奔驰汽车有限公司		15498	19527	6	51 _	上海汽车集团股份有限公司	12182	9802	12351	
	4	北京汽车股份有限公司	13593	13439	16933	6	2 _	上汽大通汽车有限公司		0	0	
	5	北京汽车集团有限公司		0	0	6	3	上汽通用(沈阳)北盛汽车有限公		24664	31076	
	6	北京汽车制造厂有限公司		0	0	6	64 _	上汽通用东岳汽车有限公司		31601	39818]
	7	北京现代汽车有限公司	102	63895	80507	6	5 _	上汽通用汽车有限公司	24	46352	58404	SAIC-GM
	8	北汽(广州)汽车有限公司		0	0	6	6 _	上汽通用五菱汽车股份有限公司		105825	133340	
	9	北汽福田汽车股份有限公司	463	0	3093	6	7 才	神龙汽车有限公司		42191	53161	
	10	北汽银翔汽车有限公司		17351	21862	6	8	沈阳华晨金杯汽车有限公司		4966	6258	
	11	比亚迪汽车工业有限公司		6445	8121	6	i9 🖡	四川野马汽车股份有限公司		0	0	
BYD	12	比亚迪汽车有限公司	46428	12301	15499	7	0	四川一汽丰田汽车有限公司		8469	10671	
	13	大庆沃尔沃汽车制造有限公司	215	0	0	7	1 5	天津一汽丰田汽车有限公司		28246	35591	
	14	丹东黄海汽车有限责任公司		0	0	7	2 🗦	天津一汽夏利汽车股份有限公司		3703	4666	
DFW-HON	15	东风本田汽车有限公司		23599	29735	7	3	维柴(重庆)汽车有限公司		0	0]
	16	东风雷诺汽车有限公司		0	0	7	4 -	一汽-大众汽车有限公司		98578	124208	FAW-VW
	17	东风柳州汽车有限公司		14576	18366	7	5 -	一汽海马汽车有限公司	3	3870	4877	
	18	东风汽车公司	790	6282	7916	7	6 -	一汽吉林汽车有限公司		0	0	
	19	东风汽车有限公司	815	61910	78006	7	7	长安标致雪铁龙汽车有限公司		0	0	
	20	东风小康汽车有限公司		12448	15685	7	8	长安福特汽车有限公司		52531	66189	
	21	东风裕隆汽车有限公司		3656	4606	7	9	长安马自达汽车有限公司		10147	12785	
	22	东风悦达起亚汽车有限公司		37386	47106	8	10 H	长城汽车股份有限公司		44669	56283	
	23	东南(福建)汽车工业有限公司	729	4486	5653	8	81 }	折江飞碟汽车制造有限公司		0	0	
	24	福建奔驰汽车工业有限公司		0	0	8	32 ¥	折江豪情汽车制造有限公司		18494	23303	
	25	福建新龙马汽车股份有限公司		0	0	8	3	折江吉利汽车有限公司	27426	17288	21783]
	26	观致汽车有限公司		0	0	8	8 4)	郑州日产汽车有限公司		0	0	
	27	广东福迪汽车有限公司		0	0	8	5	中国第一汽车集团公司		13831	17427]
0	28	广汽本田汽车有限公司		34039	42890	8	6 1	重庆力帆乘用车有限公司		0	0	10
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European Passenger Car CO₂ Standards (proposed)



- EU proposed targets are 81g/km (67 mpg) in 2025 and 67g/km in 2030 (81 mpg) under a U.S. test cycle).
- Auto companies that achieve the ZEV targets would benefit from a 5% relaxation of the CO2 target.

Post 2025, fuel economy standards do double duty – accelerate EVs and generate CO2 reductions



- Based on our latest technology assessment, ICE's can achieve ~ 70 g/km target in 2025 without any EVs at a compliance cost at over 1,250 Euros.
- At the same target of 70 g/km, EVs become 20% market share, and compliance costs drop to 700 Euros.

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