State of World of Fuel Economy Policy and Technology Trends

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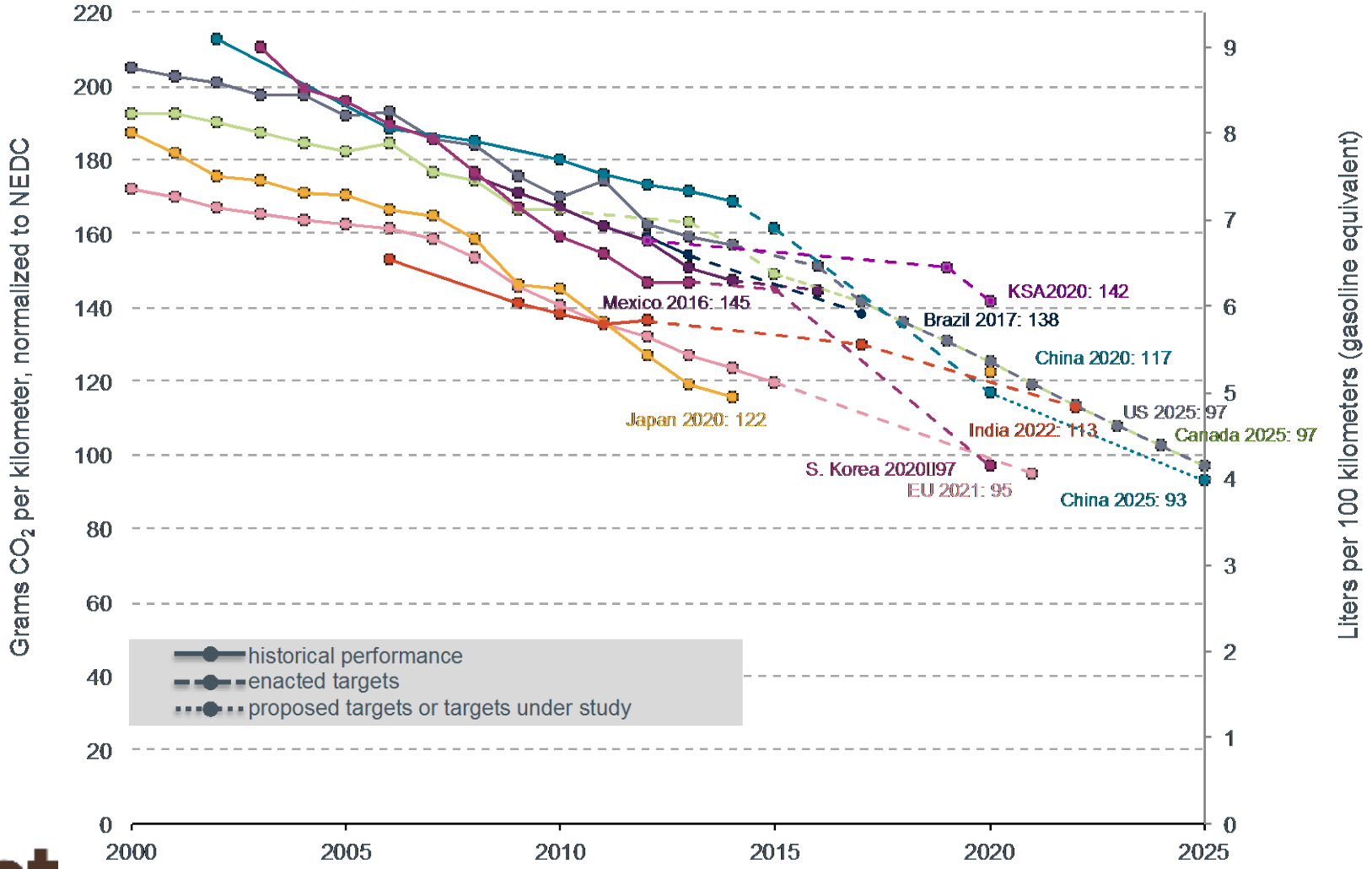
Key messages

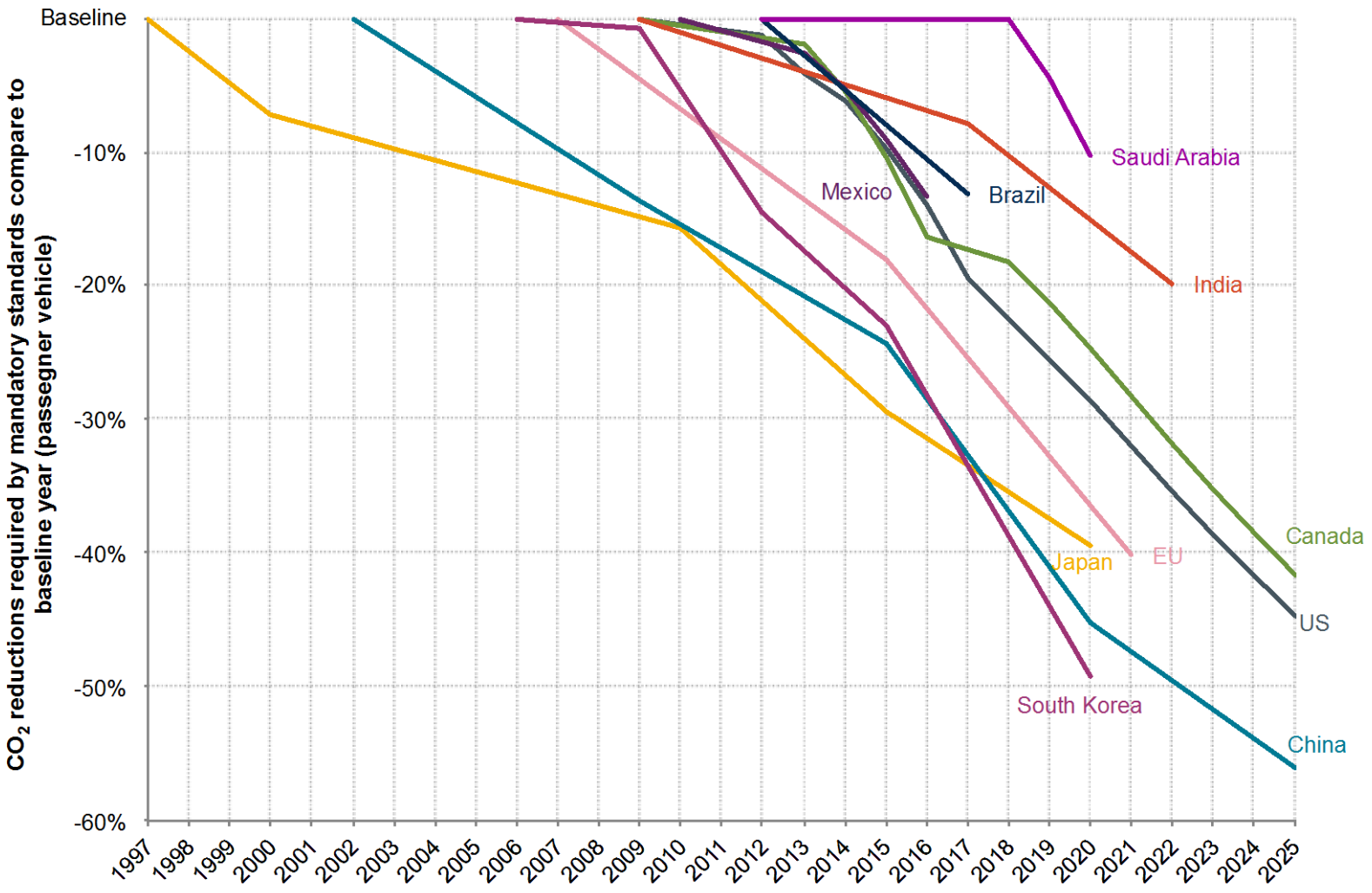
1. To date, 10 regions / countries have adopted fuel economy standards, not including feebates.
2. As a result, the pace to technology innovation and deployment has accelerated.
3. Fuel economy standards are one of the most cost effective and politically attractive climate mitigation measures (e.g., consumer payback is less than 4 – 5 years).
4. Real world emissions are an issue that needs to be addressed (covered later today).
5. Nations interested in adopting policies to improve passenger vehicle, and heavy-duty, fuel efficiency have a wealth of successful policy experience to draw upon.

Historical fleet CO_2 emissions performance and current standards (gCO_2/km normalized to NEDC) for passenger cars



* Note that Japan has already exceeded its 2020 statutory target, as of 2013.

Overall CO_2 reduction required by passenger car standards



Cost-effectiveness analyses of light- and heavy-duty fuel economy and CO_2 standards

Rule	Per-Vehicle Cost	Payback Period
US LDV 2017–2025[1]	$1,800	3.5 years
US LDV 2012–2016[2]	$950	3 years
US HDV Phase 1 2014 – 2017[3]	$378–$6,215	1–2 years
California Advanced Clean Cars Program 2017 – 2025[4]	$1,340–$1,840	3 years
Canada LDV 2017-2025[5]	$2,095	2 to 5 years
Canada LDV 2011-2016[6]	$1,195	1.5 years
European 95g CO_2/km Standard 2020[7]	€1,300	4-5 years
India LDV 2020[8]	$400 to $600	2–3 years

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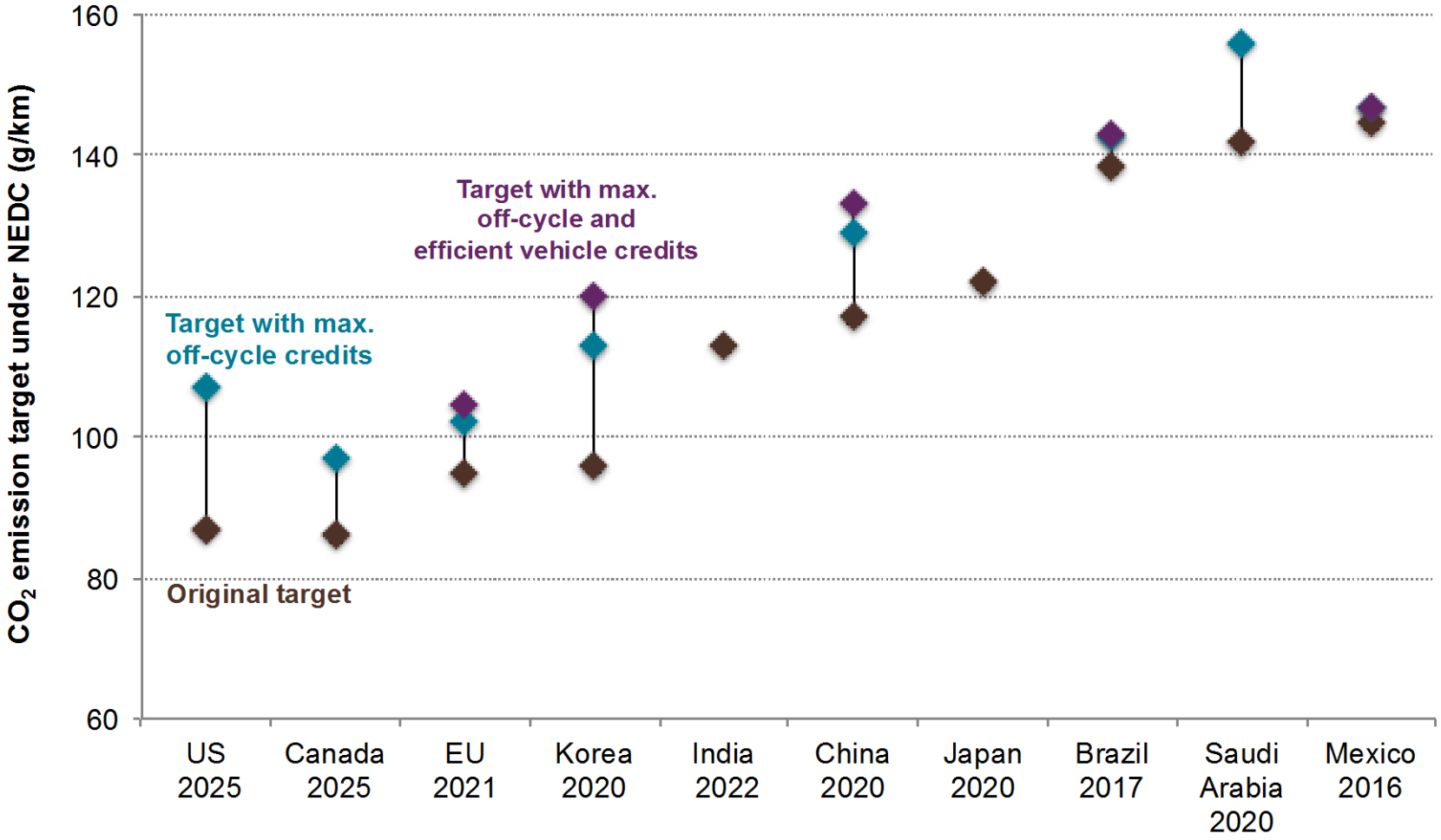
Effects of off-cycle credits and efficient vehicle credits on CO_2 targets

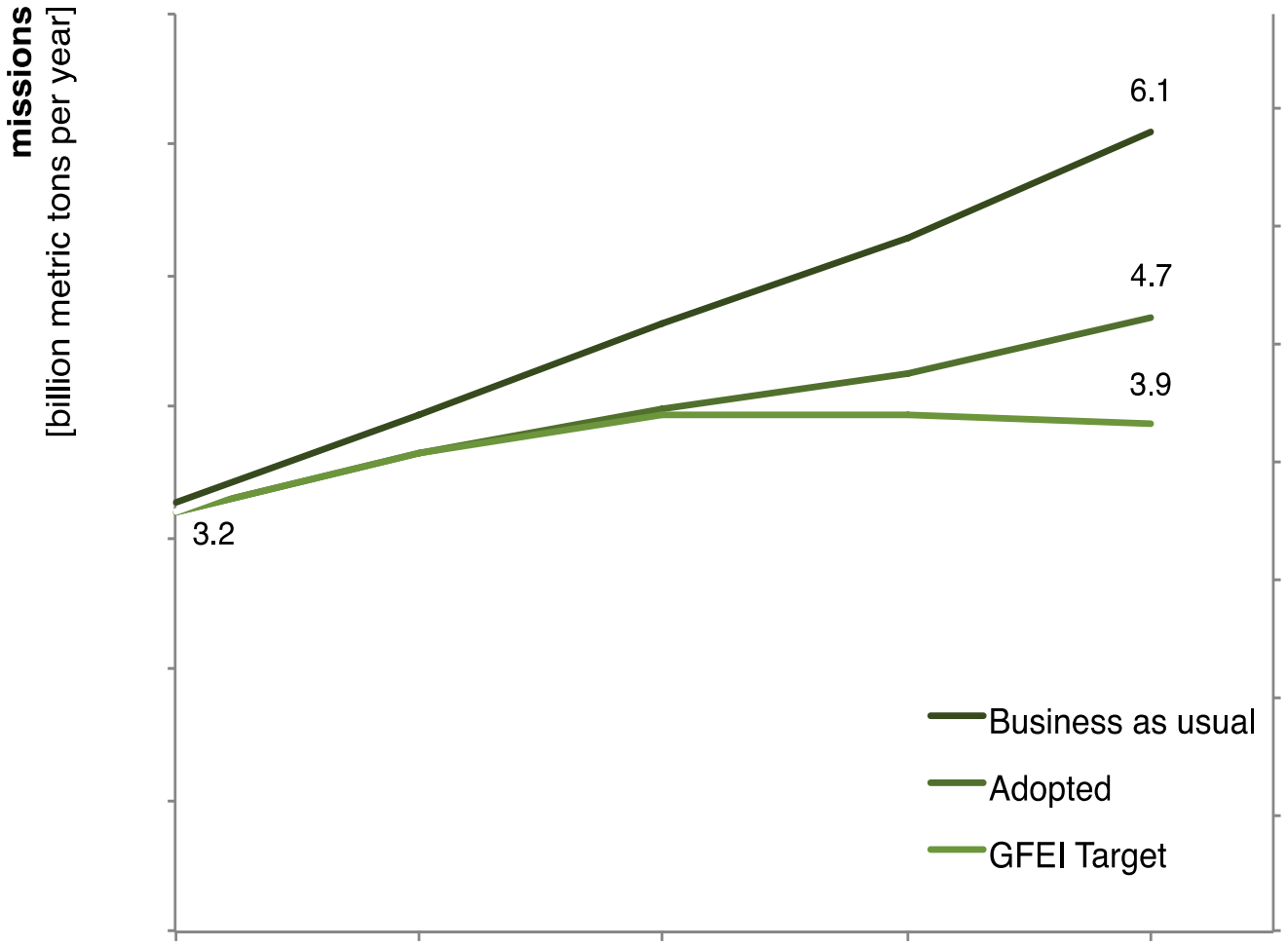


Off-cycle credit examples

- Properly designed, off-cycle credits reduce manufacturers' compliance cost and spur technology innovation
- Improperly designed, they weaken the standards

	Target	Technology	Max. credit (% of target)	Note
Brazil	1.82 MJ/km (2017)	Start-stop	0.0227 MJ/km	Additional technologies upon OEM's application
		Active grill shutter	0.0049 MJ/km	
		Gear shift indicator	0.0134 MJ/km	
		Tire pressure monitoring system	0.0134 MJ/km	
		(Total)	0.0544 MJ/km (3.0%)	
EU	95 g/km (2021)	Technology not be covered by the NEDC	7 g/km (7.4%)	High-efficiency A/C, gear shift indicator, tire pressure management system, low rolling resistance tire and bio fuels up to 10 g/km is already included in the target
US Canada	143 g/mi (2025)	High-efficiency A/C	5 g/mi	Tire pressure monitoring system is mandatory for safety; additional technologies upon OEM's application. Credits are different for cars and light trucks
		Low GWP/leakage refrigerant	13.8 g/mi	
		Start-stop Thermal management Solar/thermal control More technologies…	10 g/mi	
		(Total)	28.8 g/mi (20.1%)	

How are we doing against GFEI target to double fuel economy for new passenger vehicles by 2030?



*Estimated using ICCT's Global Transportation Roadmap model (Facanha, et al., 2012). **Business as usual** = vehicle efficiency remains at 2005 levels. **Adopted** = currently adopted policies. **GFEI Target** = countries adopt standards that reduce average fuel consumption of new vehicles to 50% below 2005 levels by 2030 (GFEI, 2014).*

Comparison of the latest adopted regulations for efficiency in selected regions

Region	New light-duty vehicles				New heavy-duty vehicles			
	Percent of global LDV sales, 2014	Baseline Model Year	Implementation Period	Reduction in average CO_2 rate (grams/vehicle-km)	**Percent of global HDV sales, 2014**	Baseline Model Year	Implementation Period	Reduction in average CO_2 rate (grams/vehicle-km)
China	27%	2010	2016-2020	35%	31%	2012	2014-2015	11%
EU + EFTA	20%	2010	2020-2021	32%				
US	17%	2010	2017-2025	49%	11%	2011	2014-2018	14%
Japan	6%	2010	2020	16%	5%	2006	2015	12%
Brazil	4%	2012	2013-2017	13%				
India	3%	2010	2018-2022	18%				
Canada	2%	2010	2017-2025	47%	1%	2011	2014-2018	14%
South Korea	2%	2010	2020	39%				
Mexico	1%	2010	2014-2016	18%				
Saudi Arabia	1%	2012	2016-2020	19%				

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Conclusions

- Fuel economy standards are one of the most cost effective and politically attractive carbon mitigation measures.
- Policy options include performance standards – such as fuel economy standards – or fiscal measures such as feebates (which are easier to development and implement).
- Nations may want to consider regional collaborations to develop and implement policy actions across a wider market.