

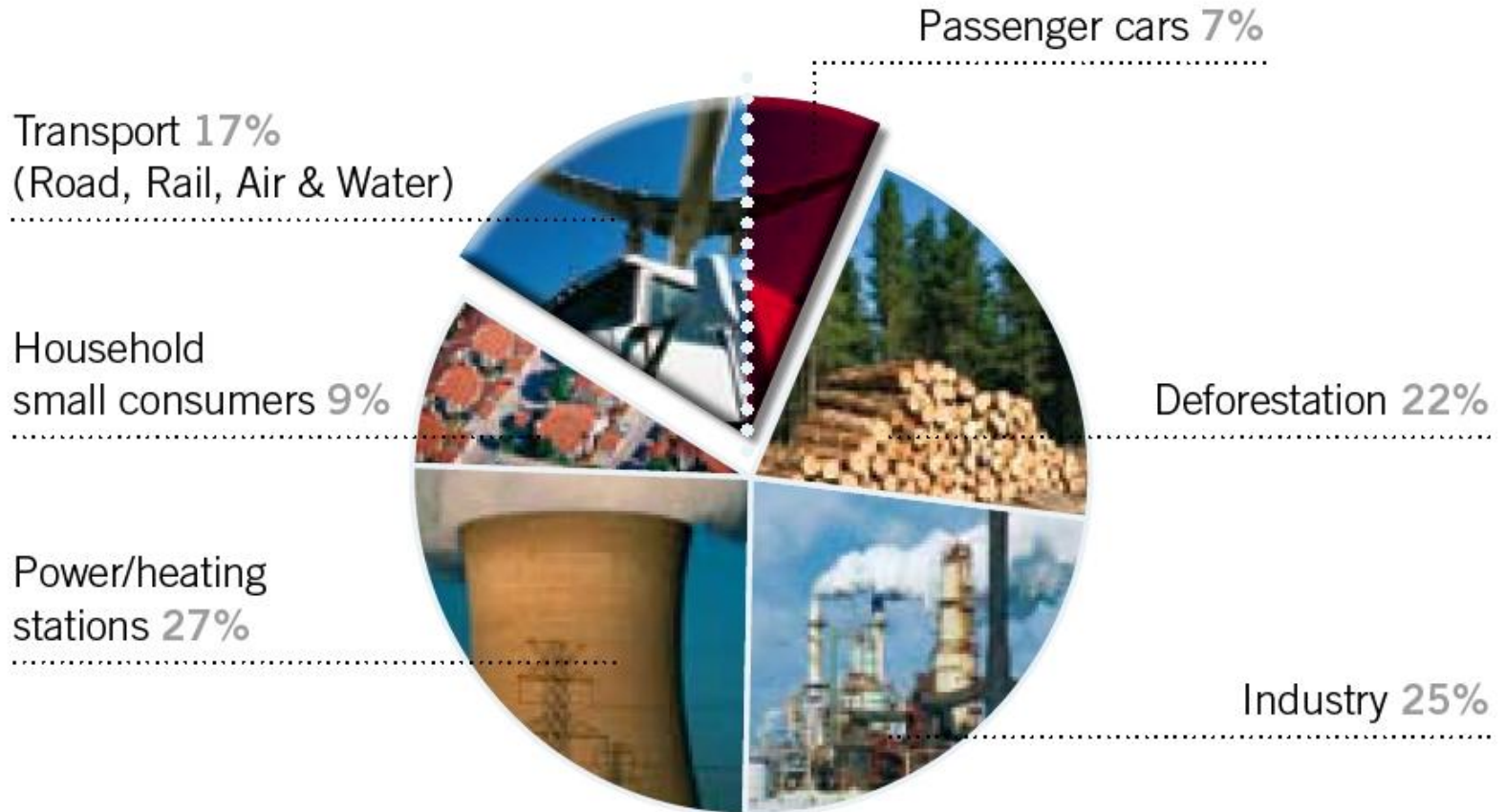
The Road to Sustainable Mobility in SA. And the Barriers that prevent its implementation.

BMW EfficientDynamics
Less emissions. More driving pleasure.



The Road to Sustainable Mobility in SA.

Global CO₂ Emissions – Who's responsible?

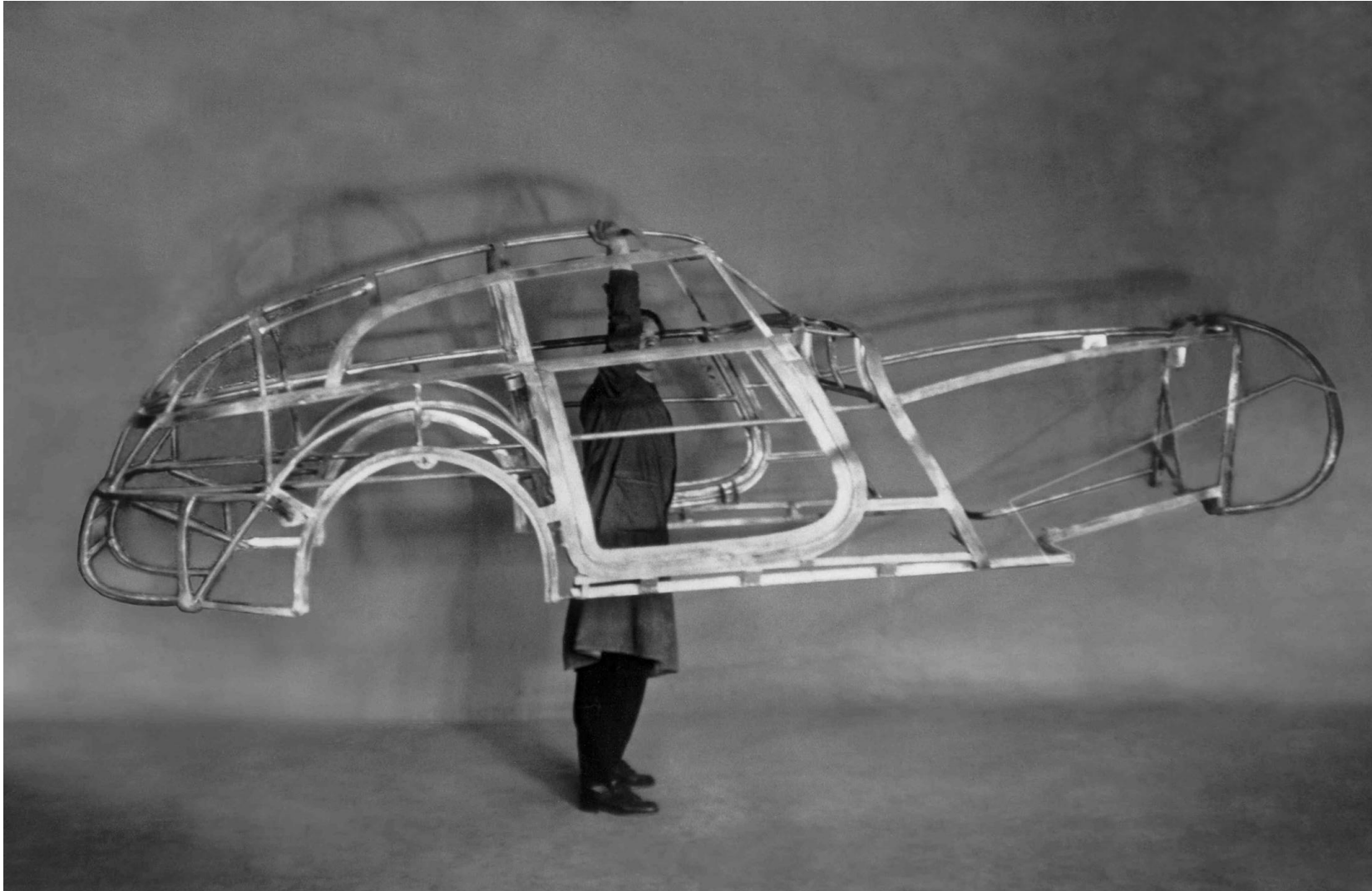


SOURCE: IPCC Fourth Assessment Report, WG III, 2007. World Business Council for Sustainable Development, 2004.

BMW EfficientDynamics. Not just a modern innovation.



Efficiency and dynamics from the start. BMW EfficientDynamics from a historical perspective.



1940: BMW “Mille Miglia” Kamm Racing Saloon.

Efficient dynamics in its purest form: lightweight, powerful, aerodynamic.

- Tubular space frame made of electron steel, weight: 32 kg.
- Outer skin made of aluminium, kerb weight of vehicle: 760 kg.
- Aerodynamics refined in wind tunnel testing.
- 2-litre engine developing 136 hp, top speed: 230 km/h, power-to-weight-ratio: 5.6 hp/kg.



The Road to Sustainable Mobility in SA. BMW EfficientDynamics.

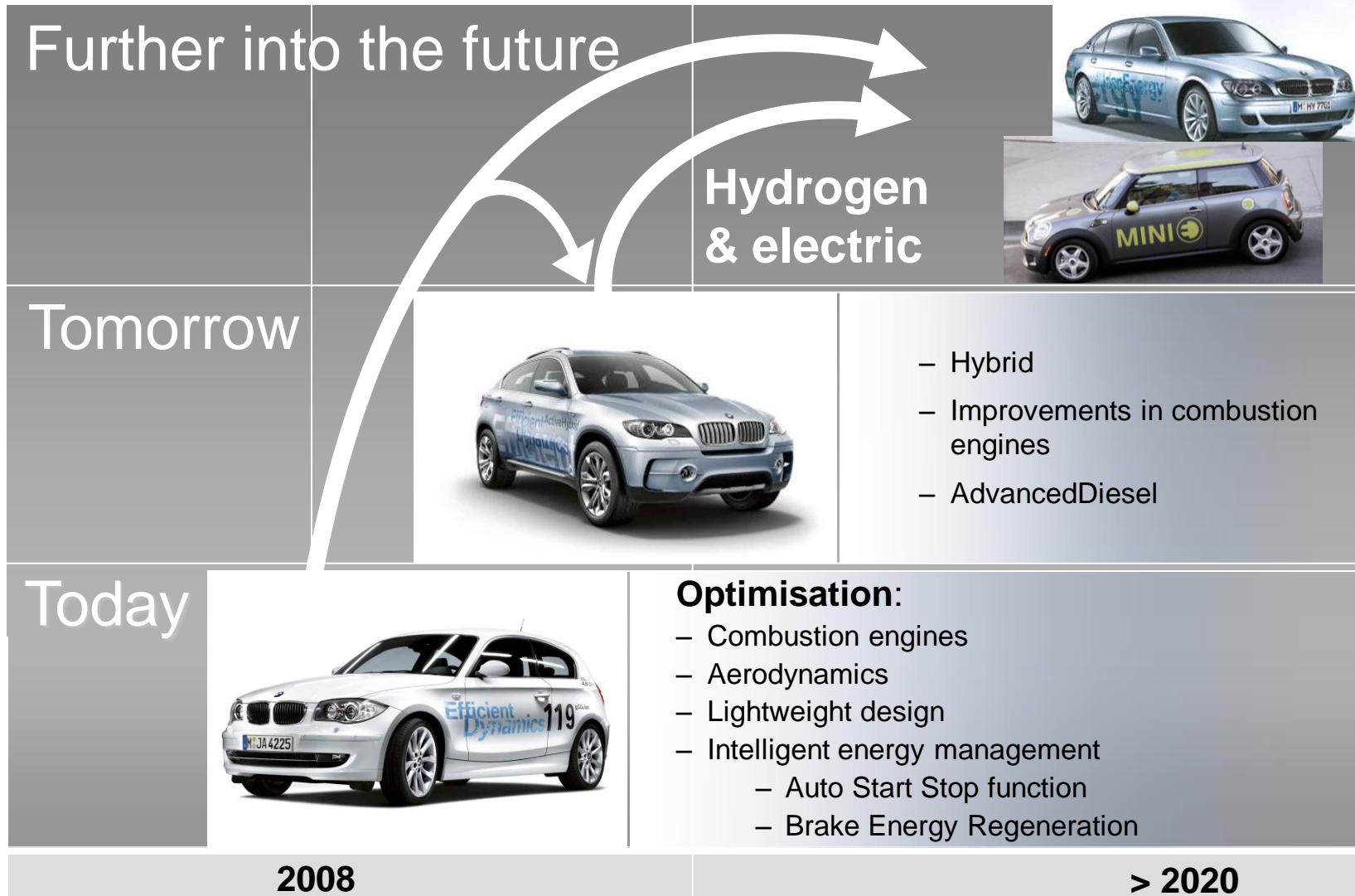
BMW
Efficient Dynamics
"Freedive"
BMW/60/244/E/T
Dur: 60 Sec STEREO
Agency: Ireland/Davenport
Prod Co.: Velocity Films
Edit: Upstairs Post Production
31/07/2008

04

blade
THE BLADE SOURCE POSTPRODUCTION FACILITIES LTD

Sustainable mobility – the vision of the BMW Group.

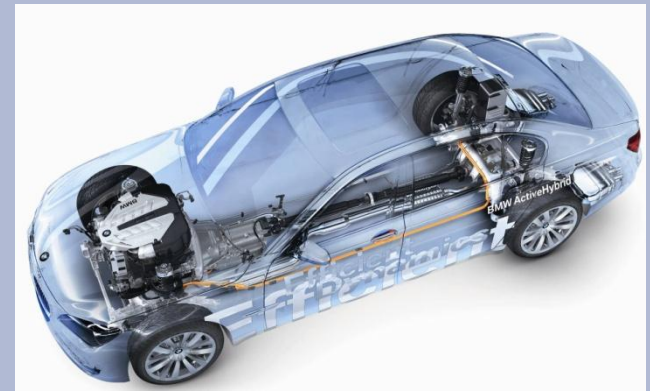
Efficient Dynamics in three phases.



Efficient Dynamics.

Electrification to hybridisation.

- Further decrease in fuel consumption through **hybrid drive system**
- Development of hybrid drive systems offering lower fuel consumption for urban, inter-urban and motorway driving
- Cooperation with Daimler, Chrysler and General Motors on a modular system for hybrid vehicles aimed at:
 - Pooling expertise
 - Utilising synergies
 - Realising efficiency potential
- 2009: First models with BMW ActiveHybrid technology ready for production
 - Fuel consumption: up to 20% lower than vehicles with conventional combustion engine only.



Efficient Dynamics.

MINI E – new pillar in BMW Group concept for sustainable mobility.

Units:	500 MINI E cars for customers in the NYC and LA areas
Output:	150 kW/204 hp
Range:	Up to 250 km
Based on:	MINI
Launch:	December 2008
Conditions:	850 USD per month, 12-month contract
Aim:	This practical trial is intended to provide knowledge for the development of electrically-driven series production vehicles.



Efficient Dynamics. BMW Hydrogen 7.

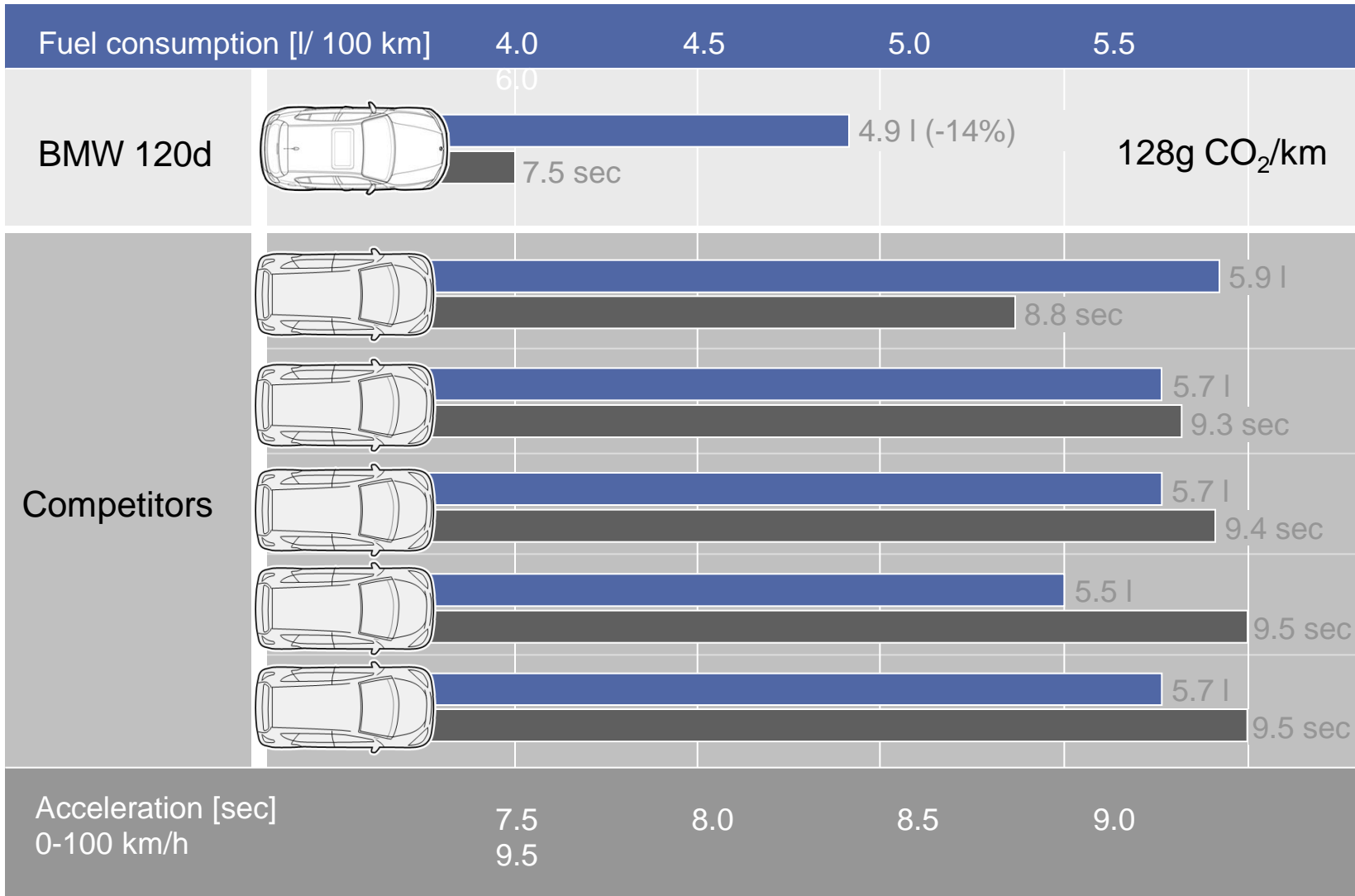
5 g CO₂ /km

- Top speed: **230** km/h (limited)
- Acceleration 0 – 100 km/h: **9.5** sec.
- Range: LH2 > **200** km, petrol > **500** km



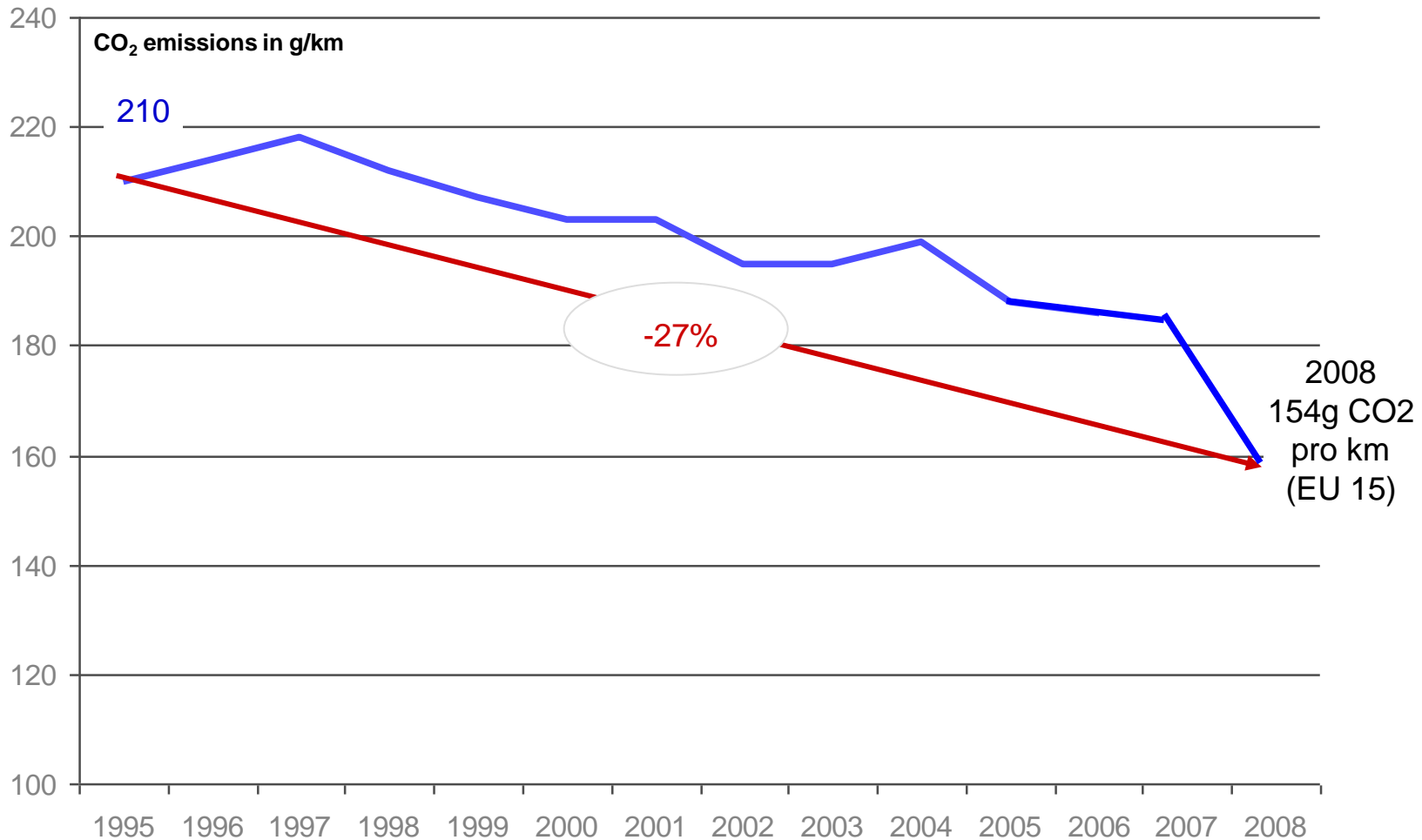
BMW EfficientDynamics.

Results in best acceleration and lowest fuel consumption.



Efficient Dynamics.

Development of CO₂ emissions of BMW Group vehicles in Europe, 1995 – 2008.



Efficient Dynamics – latest measures focus on the whole vehicle.

Available as standard on all cars.



High-efficiency engines



Lightweight design



Aerodynamics



Intelligent energy management

Brake Energy
Regeneration,
Auto Start Stop,
etc.

Efficient Dynamics – further potential.

Optimum vehicle conditioning through anticipatory energy management.



EfficientDynamics:

Efficiency and dynamics through anticipatory, situation-based heat management

4

Reduction of friction inside the engine through increase in engine temperature

→ Improved efficiency

3

Higher torque through reduction in engine temperature

→ Improved dynamics

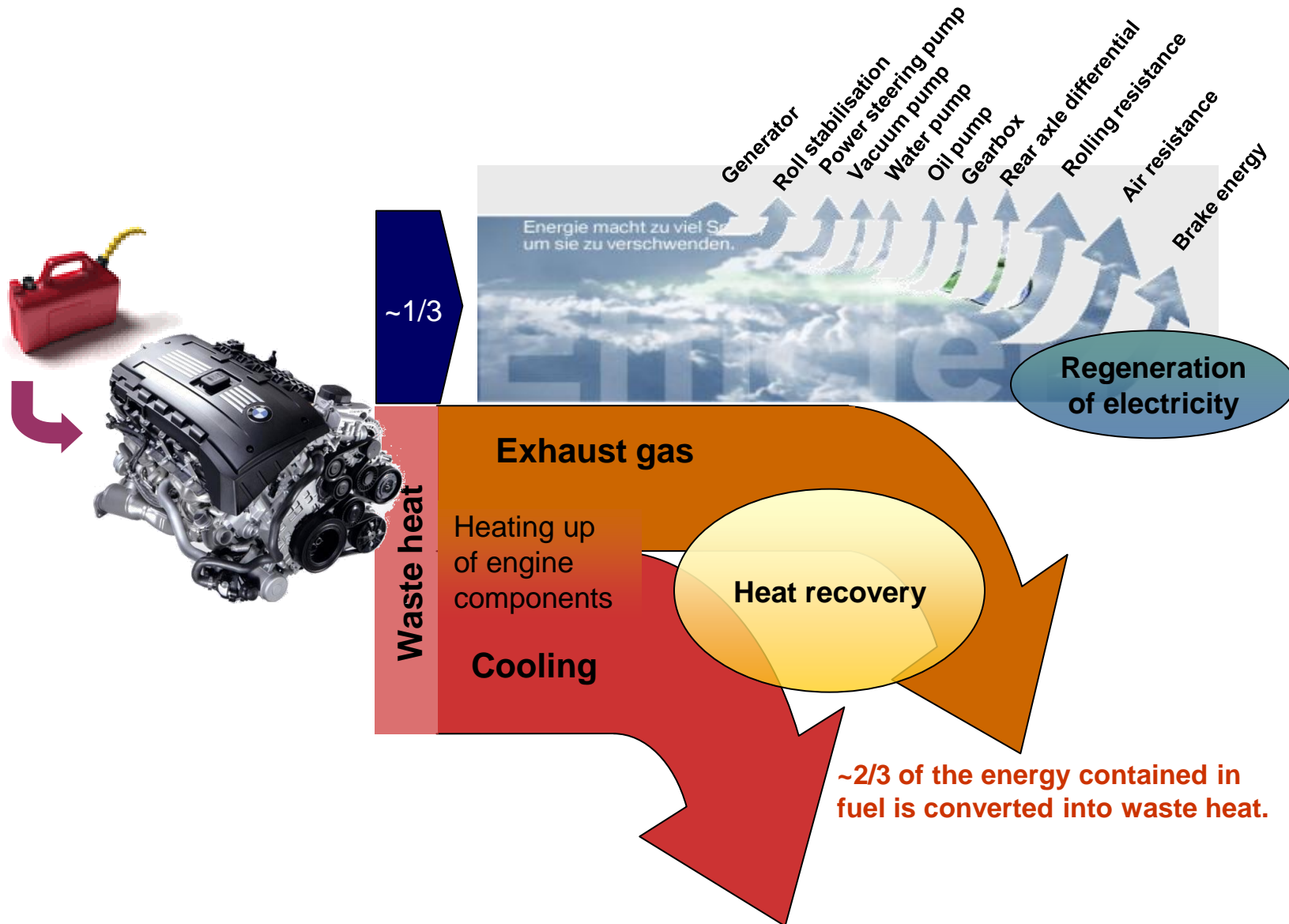
2

Knowledge of nature of road ahead (incl. speed, height,...)

1

Efficient Dynamics – further potential.

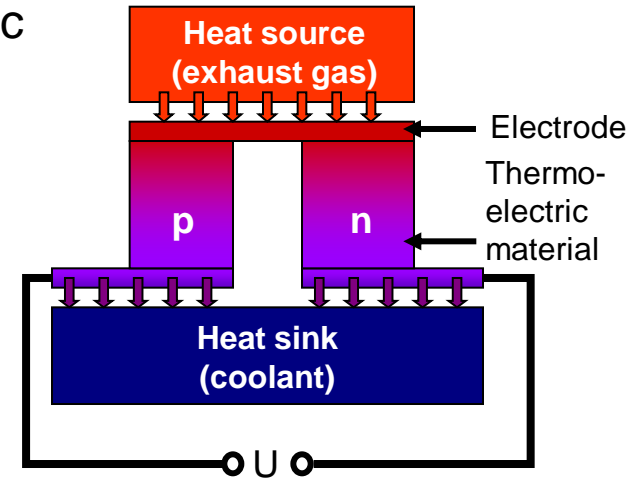
Energy flows in a vehicle.



Efficient Dynamics – further potential.

Heat recovery offers additional potential.

- Direct conversion of heat energy into electric energy
- Transfer of technologies from space research to the automotive industry
- Years of experience with the application of thermo-electricity in space research



Energy generation in space research

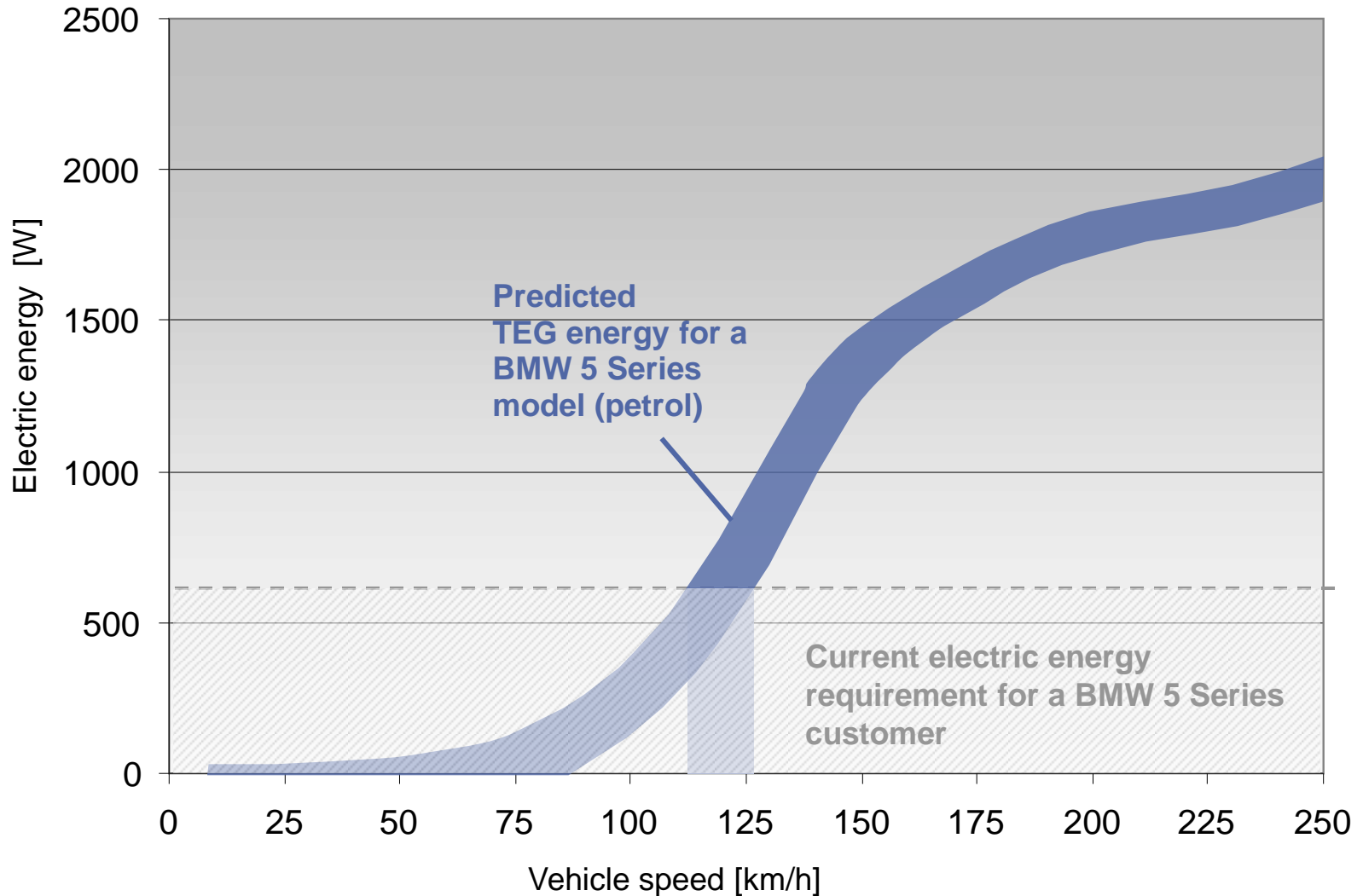


Direct conversion of waste heat into electricity



Efficient Dynamics – further potential.

In the future a TEG will be capable of meeting average electricity demand.



Efficient Dynamics.

Over one million vehicles already delivered as standard with Efficient Dynamics.

The BMW Group "140g fleet".

In spring 2009, 27 models of the BMW Group emit 140g CO₂/km max.



BMW 520d:
5,1 l / 136 g



BMW 520d Touring:
5,3 l / 140 g



BMW 320d:
4,8 l / 128 g



BMW 320d Touring:
4,9 l / 130 g



BMW 320d Coupé:
4,8 l / 128 g



BMW 320d Cabrio:
5,3 l / 140 g



BMW 318d:
4,7 l / 123 g



BMW 318d Touring:
4,8 l / 125 g



BMW 123d 5-Türer:
5,2 l / 138 g



BMW 123d 3-Türer:
5,2 l / 138 g



BMW 123d Coupé:
5,2 l / 138 g



BMW 120d 5-Türer:
4,8 l / 128 g



BMW 120d 3-Türer:
4,8 l / 128 g



BMW 120d Cabrio:
5,1 l / 134 g



BMW 120d Coupé:
4,8 l / 128 g



BMW 118d 5-Türer:
4,5 l / 119 g



BMW 118d 3-Türer:
4,5 l / 119 g



BMW 118d Cabrio:
4,9 l / 129 g



BMW 116d 5-Türer:
4,4 l / 118 g



BMW 116d 3-Türer:
4,4 l / 118 g



MINI One:
5,3 l / 128 g



MINI Cooper:
5,4 l / 129 g



MINI Cooper D:
3,9 l / 104 g



MINI One Clubman:
5,4 l / 130 g



MINI Cooper D Clubman:
4,1 l / 109 g



MINI Cooper Clubman:
5,5 l / 132 g



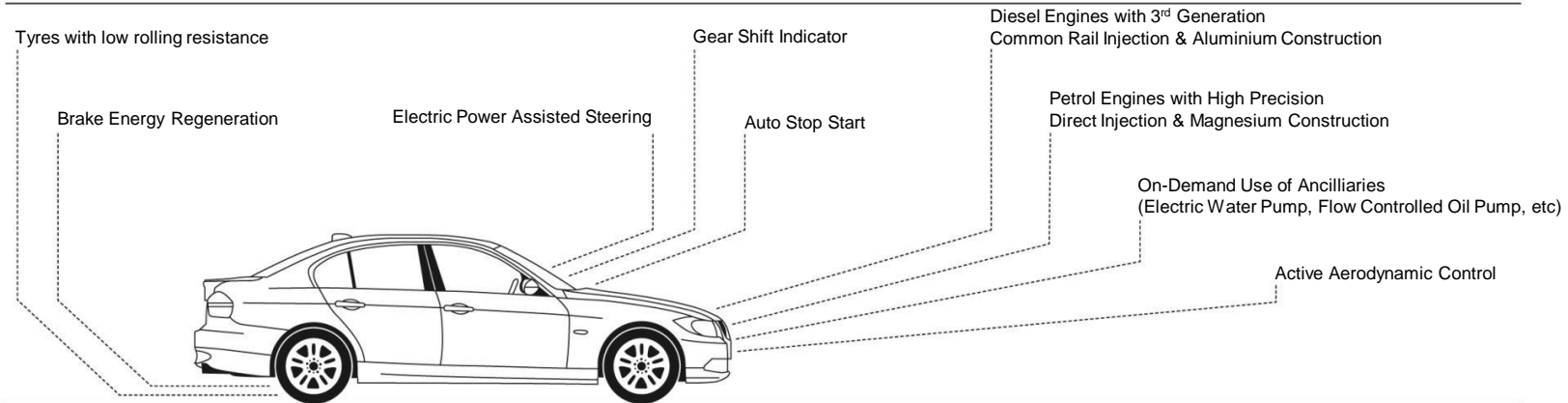
MINI Cooper Cabrio:
5,7 l / 137 g



BMW EfficientDynamics.

Higher output, lower emissions.

An Overview of BMW EfficientDynamics Technologies.



Model	Output	Increase in output over previous model	Fuel consumption in EU test cycle	CO2 emissions	Reduction in CO2 emissions compared to previous model
BMW 116i	90 kW/122 hp	+ 6%	5.8 l/100km	139 g/km	- 23%
BMW 118d	105 kW/143 hp	+ 17%	4.5 l/100km	119 g/km	- 21%
BMW 123d	150 kW/204 hp	--	5.2 l/100km	138 g/km	--
BMW 320d	130 kW/177 hp	+ 8%	4.8 l/100km	128 g/km	- 16%
BMW 520d	130 kW/177 hp	+ 8%	5.1 l/100km	136 g/km	- 14%
BMW X3 2.0d	130 kW/177 hp	+ 18%	6.5 l/100km	172 g/km	- 10%

Global Fuel Standards.

How SA Measures up.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
USA	TII B8	TII B5 (LEV)						TII B4		TII B2	
EU - HDV	EURO IV				EURO V				EURO VI		
EU - LDV	EURO IV					EURO V				EURO VI	
S Korea	EURO III	EURO IV				EURO V					
Brazil	EURO III			EURO IV			EURO V				
Argentina	EURO III			EURO IV				EURO V			
Beijing*	EURO II	EURO III			EURO IV			EURO V			
China	EURO II		EURO III			EURO IV			EURO V		
Mumbai*	EURO III					EURO IV		EURO V			
India	EURO II					EURO III		EURO IV			
Thailand	EURO II					EURO III		EURO IV			
RSA	EURO II									???	

Source: PetroSA

BMW EfficientDynamics.

Potential Savings in 2012.

Models	Today			EU Spec			CO2 Saving
	ZA Spec	kW	l/100km	CO2	kW	l/100km	
118i	100	7.5	177	105	5.9	140	-20.9%
120i	115	7.9	189	125	6.4	152	-19.6%
120d	130	5.5	147	130	4.8	128	-12.9%
130i	195	9.2	220	195	8.3	197	-10.5%
320i	115	7.9	189	125	6.1	146	-22.8%
320d	130	5.5	147	130	4.8	128	-12.9%
325i	160	8.4	203	160	7.1	170	-16.3%
330i	200	8.7	210	200	7.2	173	-17.6%
330d	180	6.3	167	180	5.7	152	-9.0%
335i	225	9.6	231	225	9.1	218	-5.6%
520d	130	5.6	149	130	5.1	136	-8.7%
525i	160	8.7	210	160	7.4	176	-16.2%
530i	200	8.8	212	200	7.7	182	-14.2%
530d	173	6.7	179	173	6.4	170	-5.0%
550i	270	10.9	267	270	10.9	260	-2.6%
X5 30i	200	11.7	279	200	10.3	247	-11.5%
X5 30d	173	8.7	231	173	8.2	217	-6.1%
X5 35d	210	8.8	233	210	8.3	220	-5.6%
X5 48i	261	12.5	299	261	12.1	289	-3.3%
							-15.4%
							or 6 040 tons of CO2

BMW EfficientDynamics.

What the Motor Industry needs.

- **A jointly developed roadmap penned by Government, the fuel industry, automotive manufacturers, and bodies such as SANEA, PetroSA and others.**
- Clean and widely available fuel.
- Consumer buy-in - - **CRITICAL.**
- **Incentive for consumers to drive cars with lower emissions.**
- Encouraging manufacturers to invest in fuel and emission- saving technologies.

BMW EfficientDynamics.

What South Africa needs.

- A collaborative, integrated approach covering industries outside of the automotive sector.
- An optimized transport infrastructure and an intelligent traffic management system.
- Inclusion of the energy generating industry & other energy intensive industries, like steel plants and major manufacturing.
- Incentivised investments in CO2 reduction, for both industry AND consumers.

Thank you for your attention.