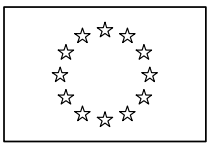

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**Accompanying document to the**

**COMMUNICATION FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT**

**Implementing the Community Strategy to Reduce CO2 Emissions from Cars: Sixth annual Communication on the effectiveness of the strategy**

{COM(2006) 463 final}

# Monitoring of ACEA's Commitment on $CO_2$ Emission Reductions from Passenger Cars (2004)
# Monitoring of JAMA's Commitment on $CO_2$ Emission Reductions from Passenger Cars (2004)
# Monitoring of KAMA's Commitment on $CO_2$ Emission Reductions from Passenger Cars (2004)

**Final reports**
**25 November 2005**

# Monitoring of ACEA's Commitment on $CO_2$ Emission Reductions from Passenger Cars (2004)

**Final version**

**25 November 2005**

**Joint Report**
**of the**
**European Automobile Manufacturers Association**
**and**
**the Commission Services**

## 1. MONITORING OF ACEA COMMITMENT[1] ON $CO_2$ EMISSION REDUCTIONS FROM PASSENGER CARS

## 2. JOINT REPORT OF ACEA AND THE COMMISSION SERVICES[2]: YEAR 2004 REPORT

Note to the reader: ACEA's Commitment as recognised by the European Commission in 1999 was undertaken at a time where the EU only included 15 Member States, and therefore its geographical scope is limited to the EU-15 – as a consequence, the present report only monitors the EU-15 situation.

## 3. ES SUMMARY OF PROGRESS IN DELIVERING THE COMMITMENT

### 3.1. E1 Trends in specific emissions of $CO_2$ (g/km)

In 2004 - using official EU data[3] - the average specific emissions of ACEA's new car fleet registered in the EU-15 was 161 g $CO_2$/km. For petrol-fuelled cars, specific emissions were 170 g $CO_2$/km; for diesel-fuelled cars, the corresponding value was 153 g/km and for alternative fuelled[4] passenger cars the value was 144 g $CO_2$/km.

Compared to the 2003 situation, ACEA reduced the average specific $CO_2$ emissions of its new car fleet (petrol + diesel) registered within the EU by 2 g/km, a reduction of 1.2%[5]. According to ACEA's data, its average new car $CO_2$ emissions in 2004 were 159g $CO_2$/km (petrol + diesel); there was around a 1% deviation between official EU & ACEA (petrol + diesel) figures in 2004

Official EU data only became available in 2002, and were the basis against which the commitment is monitored. The present report (as was done in the 2002 & 2003 reports), includes ACEA's data in addition to official EU-data for the most recent years. Since ACEA source provides data from 1995 on a consistent basis, these data can be used for information purposes regarding earlier years of the commitment.

Since 1995, ACEA has maintained an unbroken trend of $CO_2$ emission reduction (see Figure 1).

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1 As recognized by the European Commission in the Recommendation of 5 February 1999 on the reduction of $CO_2$ emissions from passenger cars (1999/125/EC). Hereafter referred to as "The Commitment".

2 Hereafter often referred to as "The Commission".

3 According to the Joint Monitoring System prior 1995-2001 monitoring was based on data provided by ACEA which are broadly similar to those specified in Annex I of Decision 1753/2000/EC. In 2002, for the first time, official EU data were used in the joint monitoring report -- based on data delivered by Member States under Decision 1753/2000/EC. In the 2004 report ACEA data continues to be used in certain places, where official EU data is not available/inappropriate (such as where consistent longer-term trends are needed to contribute to a better understanding of $CO_2$ reduction developments).

4 These are all vehicles not using diesel or petrol, e.g. LPG, CNG or electric power.

5 All percentage figures are based on unrounded numbers.

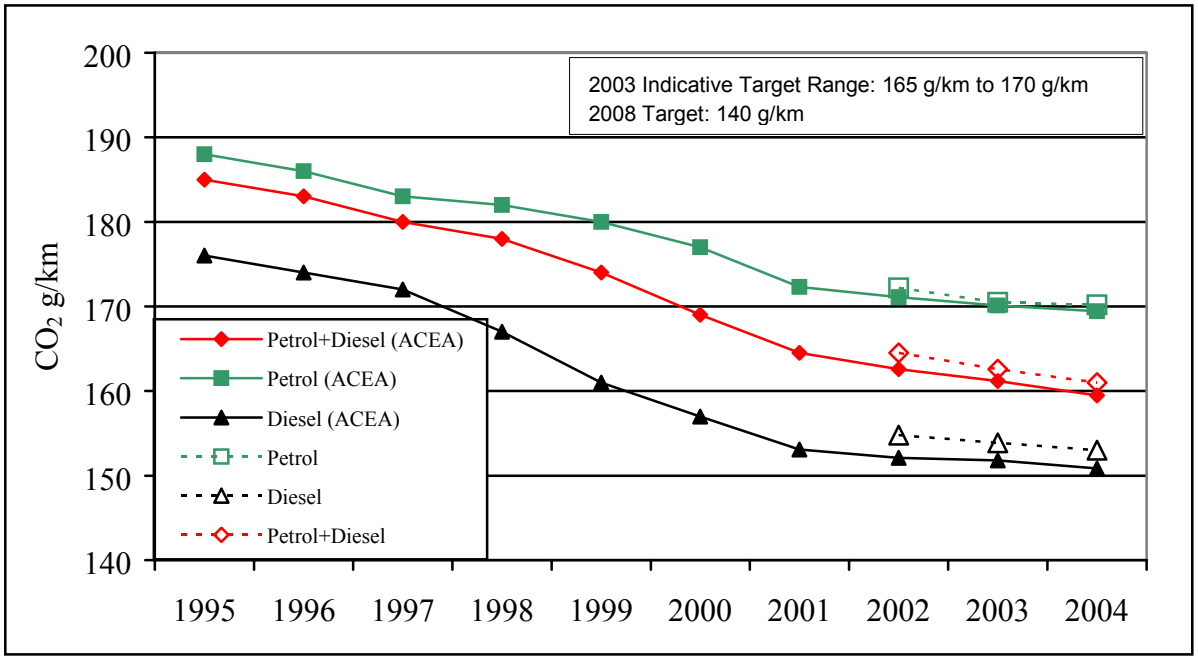



Figure 1: EU Trends of ACEA members' fleet in average specific emissions of $CO_2$.

Using ACEA's time-series between 1995 and 2001 and EU data since 2002, ACEA achieved an overall reduction in new car $CO_2$ emissions of 13.0 %; petrol cars were down by 9.5 %, and diesel cars were down by 13.1 %. The three data points for 2002, 2003 and 2004, based on EU data, are coherent with ACEA's data but differ slightly in absolute value terms.

### 3.2. E2 Trends in specific fuel consumption by fuel type (litres/100km)

Fuel consumption in terms of litres per 100 km (l/100km) has followed a similar downward profile to that of $CO_2$ emissions. Over the 1995 to 2004 period, using ACEA's time-series data, average fuel consumption fell for new petrol and diesel cars combined from 7.6 l/100km to 6.4 l/100km[6] (EU official 2004 data: 6.4 l/100km). The corresponding consumption reductions for new petrol cars and new diesel cars were decreased from 7.9 l/100km to 7.1 l/100km (EU official 2004 data: 7.2 l/100km) and from 6.6 l/100km to 5.7 l/100km (EU official 2004 data: 5.8 l/100km), respectively (see Figure 2).

[6] The following conversion factors were used for the calculation of specific fuel consumption (l/100km) from specific $CO_2$ emissions (g/km): petrol 23.7, diesel 26.6.

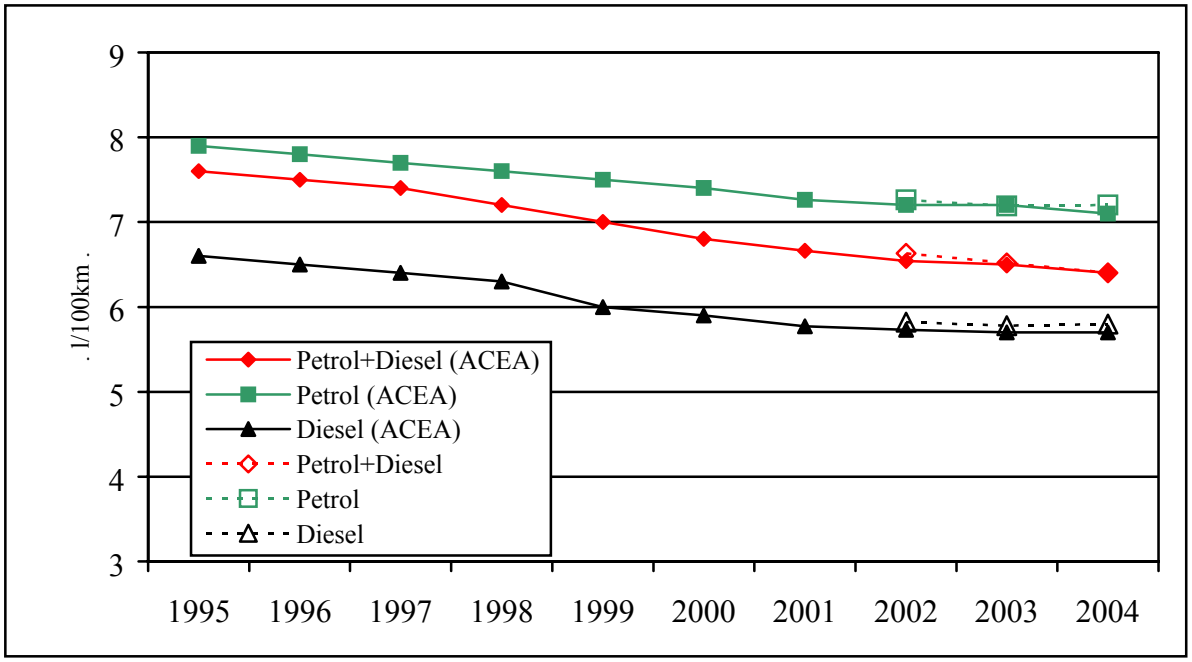



**Figure 2: Trends of ACEA members' fleet in average specific fuel consumption (l/100km) by fuel**

### 3.3. E3 Trends in physical fleet characteristics

Since 1995, ACEA has achieved these sizeable improvements in new car $CO_2$ performance whilst overall increases in physical fleet characteristics have occurred. However, in 2004, EU official figures for car mass showed a decrease compared to 2003. And although average engine capacity and power increased in 2004, compared to 2003, disaggregating the capacity figures shows that diesel engine capacity decreased in 2004. Indeed, based on ACEA's time-series data, the engine capacity of diesel cars in 2004 fell to its lowest level in the entire monitoring period from 1995. This is a clear indication of the application of diesel technology in small cars.

### 3.4. E4 Technical developments introduced to reduce $CO_2$ emissions

In 2004 ACEA manufacturers continued to introduce new technological developments. Notable examples include: variable twin turbo technology and advanced injection systems on diesel engines, stop-start with regenerative braking; friction optimised rear-axle gearbox; clutch bridging 1st gear; and double clutch/direct shifting gearbox. In addition to these new developments, 2004 saw the increased application or continued improvement of vehicle technologies introduced in prior years.

Based on ACEA's historical time-series and the more current EU data, ACEA technological developments, along with the launch of new product ranges, models and variants, reduced the $CO_2$ emissions of ACEA's new car fleet by 13.0 % over the 1995-2004 period.

### 3.5. E5 Brief overall assessment on progress in relation to the target

In 2004, ACEA again reduced the average $CO_2$ emissions of its new car fleet: the average specific emissions of ACEA's new car fleet registered in the EU was 161 g $CO_2$/km. Compared to 1995, $CO_2$ emissions have been cut from 185 g $CO_2$/km in 1995 to 161 g $CO_2$/km in 2004.

ACEA has met all the following undertakings made in its Commitment:

- In 2000, many models were brought to market that emit 120 g $CO_2$/km or less, and the number of such models has increased since then;
- ACEA achieved, well ahead of time, the 2003 estimated intermediate target range of 165 -170 g/km;
- Before the end of 2003 ACEA submitted, to the Commission, its "Potential Reduction Review" statement on moving further towards the Community target of 120 g $CO_2$/km in 2012;
- Each year ACEA has contributed to a transparent joint monitoring of the Commitment with the Commission Services.

In addition ACEA completed, jointly with the Commission Services, a "Major Review" of its Commitment -- in compliance with the provision of the Commitment; this Review was annexed to the 2003 joint Monitoring Report.

A particular feature of these ACEA achievements has been the sharp rise that has occurred in new registrations of cars emitting 120 g $CO_2$/km or less. Using ACEA data, from a zero market share in the mid-1990s such cars achieved a 7.7% share in 2004, with sales of almost one million units. The volume and share of cars emitting 140 g $CO_2$/km or less also rose considerably in 2004.

The 2004 monitoring report shows that ACEA is fully in line with its 2008 commitment. However, ACEA stresses that the 2008 target remains extremely ambitious, both technically and economically. To reach 140 g $CO_2$/km in 2008, ACEA must achieve an annual average reduction rate of 3.3% a year during the remaining period of the Commitment.

The Commission services acknowledge that ACEA has until now met all its targets set out in its Commitment on $CO_2$ emissions from passenger cars, although ACEA has not been able to provide firmer assurances than in the previous years that it will meet its 2008 target of 140 g $CO_2$/km, despite the commitment period drawing closer to its end. They also acknowledge that ACEA has reconfirmed their firm determination to make the best possible efforts to live up to their $CO_2$ Commitment. It is important to note that annual reduction rates required to meet the 140 g $CO_2$/km target in the remainder of the commitment period have again increased in the 2004 reporting exercise, compared to previous years, and that major additional efforts will be required to meet the 140 g $CO_2$/km target.

# 1 MONITORING OF TECHNOLOGICAL DEVELOPMENTS AFFECTING THE COMMITMENT

## 3.6. 1.1 Commitment initiatives

*3.6.1. 1.1.1 Brief description of current R&D programmes*

*3.6.2. 1.1.2 Other*

The ACEA Commitment continues to ensure that right across the European automotive industry, $CO_2$ reduction remains a high priority in R&D expenditures, as well as in product and process planning and development. The vast majority of this R&D effort is being undertaken independently, by each of the ACEA manufacturers freely pursuing their own policies and initiatives in this highly competitive area. It is not possible, for competitive reasons, to review individual manufacturer R&D programmes as part of the monitoring report.

In addition, however, ACEA and its sister body EUCAR are undertaking a collaborative, pre-competitive automotive R&D programme on medium and long-term technologies for $CO_2$ reduction (as detailed in previous Joint Monitoring Reports). The programme reflects the research interests of the participating companies, and serves to illustrate key areas of R&D activity. It seeks to use the EU's "Framework Programme" (FP) funding to launch collaborative projects between manufacturers, suppliers, research institutes and universities. Section 4.5 provides a summary of EUCAR's research activities in 2004.

## 3.7. 1.2 Technological developments

*3.7.1. 1.2.1. Description of fuel efficiency characteristics of new technologies, alternative concepts*

*3.7.2. 1.2.2. Availability of new technologies in the EU*

*3.7.3. 1.2.3. Availability of alternative concepts passenger cars in the EU*

*3.7.4. 1.2.4. Availability of low emission passenger cars (e.g. emitting 120 g $CO_2$/km or less) in the EU*

New technological developments introduced by one or more ACEA manufacturers in 2004 included:

- Variable Twin Turbo technology on diesel engines;
- Piezo-injection systems on diesel engines;
- Stop-start with regenerative braking;
- Friction optimised rear-axle gearbox;
- Clutch bridging 1st gear;
- Double clutch/Direct Shifting gearbox;
- Optimised generator;
- Regulated fuel pump.

New technologies tend to be implemented progressively, reflecting factors such as the need to link-into new model launches, and the need to phase-in range deployment. Also through R&D efforts, improvements to certain existing technologies are made. Therefore in addition to the above-mentioned

new developments, 2004 saw the increased application or continued improvement of vehicle technologies introduced in prior years. In this regard, ACEA would draw specific attention to:

- Further penetration of gasoline direct injection (GDI) and other combustion efficiency technologies;
- Further penetration of 6 speed manual gearboxes and 6/7 speed automatic transmissions;
- Continued greater utilisation of lightweight design and materials;
- Further improvements in energy control management systems, including load levelling;
- Further improvements in engine thermo management and friction reduction;
- Continued technical development & offerings of alternative fuel vehicles (AFVs).

ACEA's technological developments, along with the launch of new product ranges, models & variants, have brought to market cars with attractive product attributes that have shifted the EU new car market towards enhanced fuel efficiency and reduced $CO_2$ emissions.

In 2004, based on ACEA data, ACEA first registrations of (petrol + diesel) cars with $CO_2$ levels of 140 g/km or less, rose to 29.6 % of new registrations (26.9% using EU data) -- up from a 25.9 % share in 2003 and a 2.6 % share in 1995. Further, ACEA continued to build on its Year 2000 achievement of the first of its $CO_2$ commitments: "some members of ACEA will introduce in the EU market models emitting 120 g $CO_2$/km or less". 2004 saw first registrations of cars emitting 120 g $CO_2$/km or less rise by over 14 % on the prior year; though this increase was lower than in 2003, first registrations of such cars totalled almost one million units, and they achieved an impressive 8.3 % share of new registrations (7.7% using EU data), compared to only 0.7 % as recently as 1999.

In total, based on ACEA's historical time-series and the more current EU data, $CO_2$ reductions in the ACEA new car fleet of 13.0 % were achieved over the 1995-2004 period.

### 3.8. 1.3 Description of market trends in physical fleet characteristics

See Sections E3 and 2.4

## 4. 2. STATISTICAL MONITORING (1995-2004)

### 4.1. 2.1 Trends in specific emissions of $CO_2$ (g/km)

In 2004, taking the official EU data, the average specific emissions of ACEA's new car fleet registered in the EU was 161 g $CO_2$/km.

Compared to official EU 2003 data, ACEA reduced the average specific $CO_2$ emissions of its new car fleet (petrol + diesel) registered within the EU by 2 g/km; a reduction of 1.2%. According to ACEA's data, its average new car CO2 emissions in 2004 were 159g $CO_2$/km (petrol + diesel); there was around a 1% deviation between official EU & ACEA (petrol + diesel) figures in 2004.

Since 1995, ACEA has maintained an unbroken trend of $CO_2$ emission reduction. Between 1995 and 2004, using ACEA's historical time-series between 1995 and 2001 and EU data between 2002 and 2004, ACEA achieved an overall reduction in new car $CO_2$ emissions of 13.0 %; petrol cars were down by 9.5 %, and diesel cars were down by 13.1 % (see Figure 3).

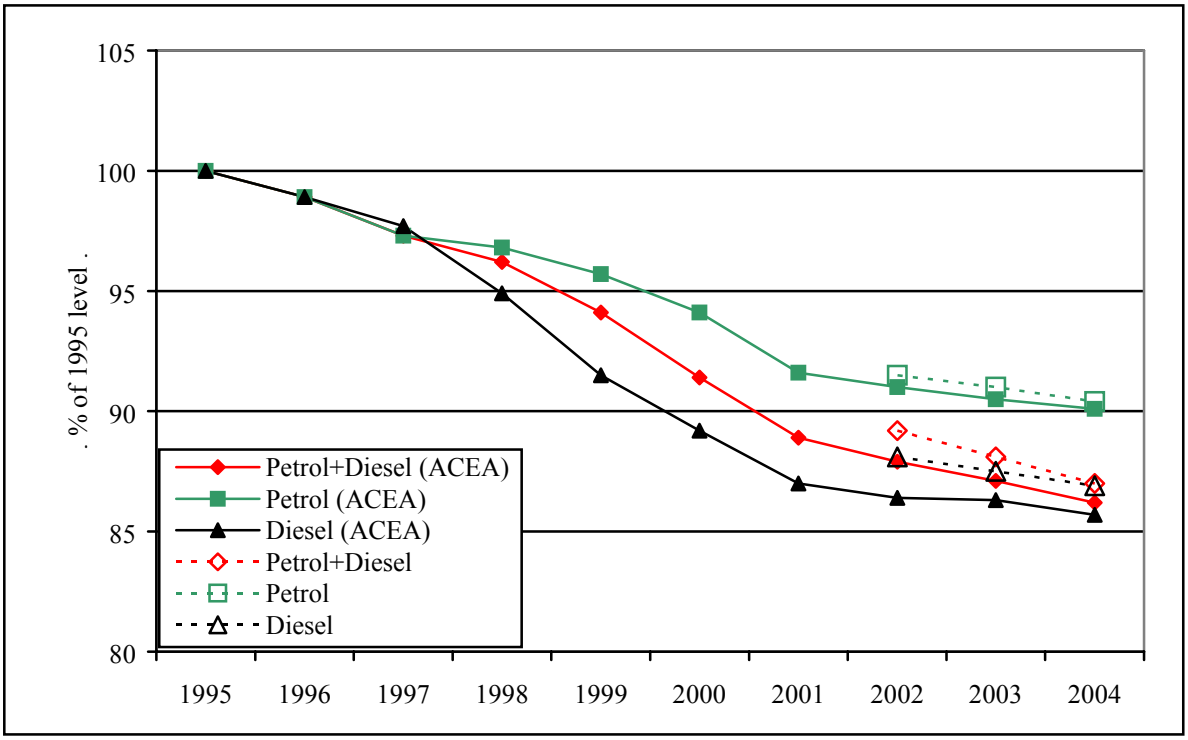


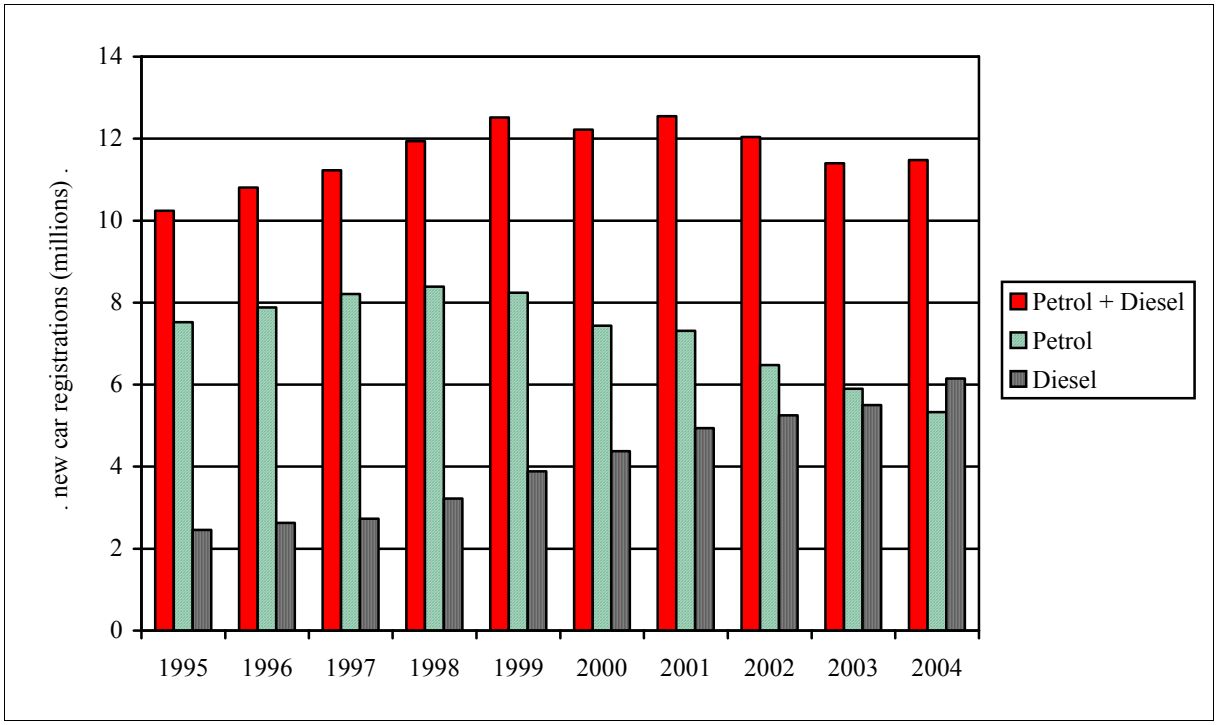

**Figure 3: ACEA's $CO_2$ Reduction Index (1995=100)**

### 4.2. 2.2 Number of newly registered passenger cars

Based on ACEA data, in 2004, ACEA new car registrations in the EU amounted to 11,745,829 units. However compared to 2001, there has been a fall in ACEA sales in the EU of more than 6.4 %[7] (see Figure 4). ACEA's market share of total EU passenger cars reduced to 83% (including Rover) in 2004.

Petrol car registrations totalled 5,333,390 units in 2004, a 9.4 % decrease on the previous year. The number of diesel cars registered totalled 6,151,395 in 2004, an 11.6 % increase on 2003. The number of cars equipped with other fuel types (AFVs) more than halved compared to 2003, to return close 2002 levels (see Section 2.5).

[7] All figures given in this chapter are based on ACEA data.




## 5. FIGURE 4: NEW CAR REGISTRATIONS BY ACEA (MILLION UNITS)

### 5.1. 2.3 Fleet composition

Figure 5 shows ACEA's fleet composition by $CO_2$ categories for the year 2004, and the reference year 1995 (using ACEA data).

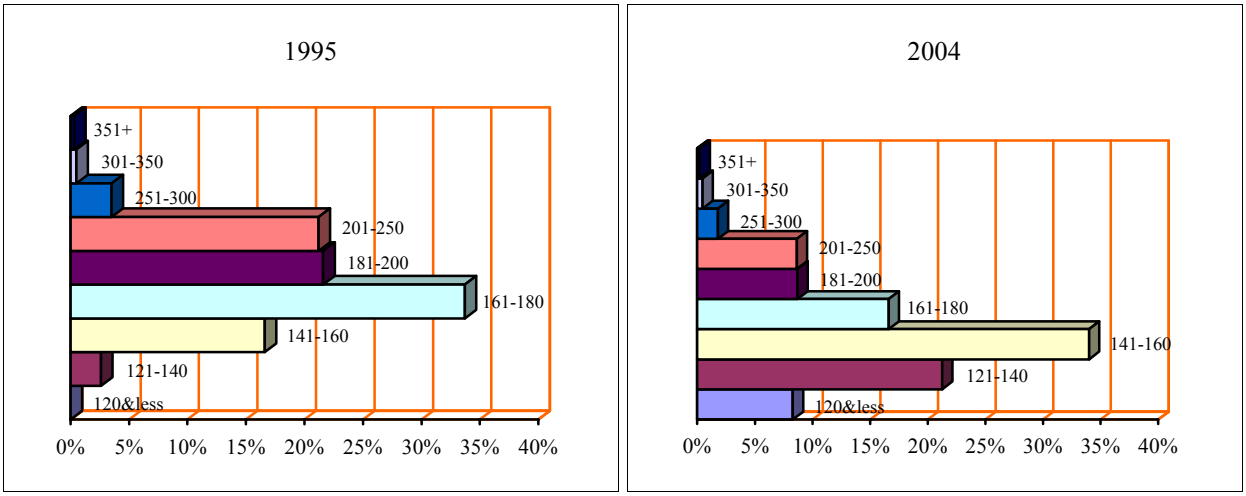



**Figure 5: ACEA's Fleet Composition by $CO_2$ Categories (% share of total registrations) in 1995 and 2004**

In 2004, ACEA's $CO_2$-related fleet composition continued to show a strong move towards more fuel-efficient cars compared to the 1995 situation, with 140 g $CO_2$/km or below cars achieving a 29.6 % share of total (petrol + diesel) registrations in 2004 (26.9% using EU data) -- up from 6.8 % in 1998, and only 2.6 % in 1995 (see Figure 6). Over the 1995 to 2004 period new registrations of such cars have multiplied more than 12-fold, and in 2004 there was over a 15% volume increase. By contrast, in

2004, there were continuing, sizeable falls in both the registrations and market share of cars with $CO_2$ emissions of more than 160 g $CO_2$/km. Registrations of these cars fell by over 6 % in 2004 on the prior year, and by over 48 % compared to 1995; as a proportion of total ACEA registrations, such cars decreased from 80.8 % in 1995, to 64.9 % in 1998 to reach 36.4 % in 2004 (40.3% using EU data).

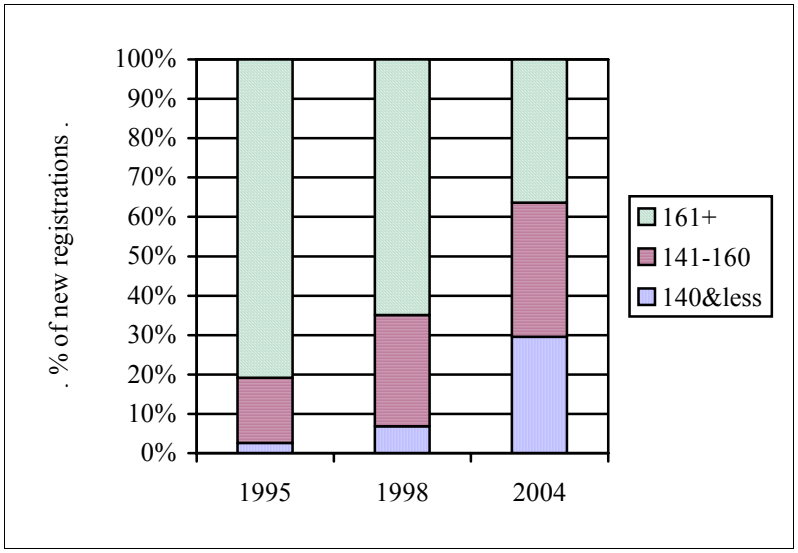



**Figure 6: Change in ACEA's Fleet Composition by "aggregated $CO_2$ Categories"**

Figure 7 shows how ACEA shares of registrations have developed by $CO_2$ category over the 1995-2004 period. As can be seen, ACEA achieved a clearly identifiable "wave-effect" towards enhanced new car fuel efficiency.

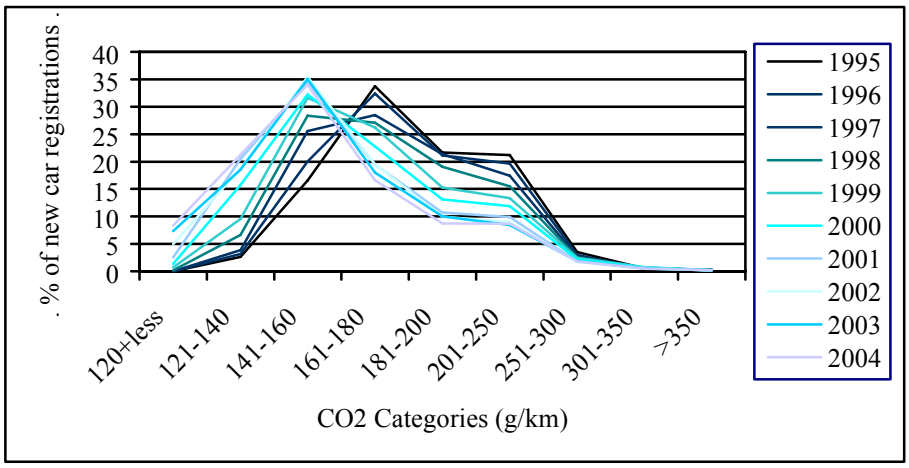
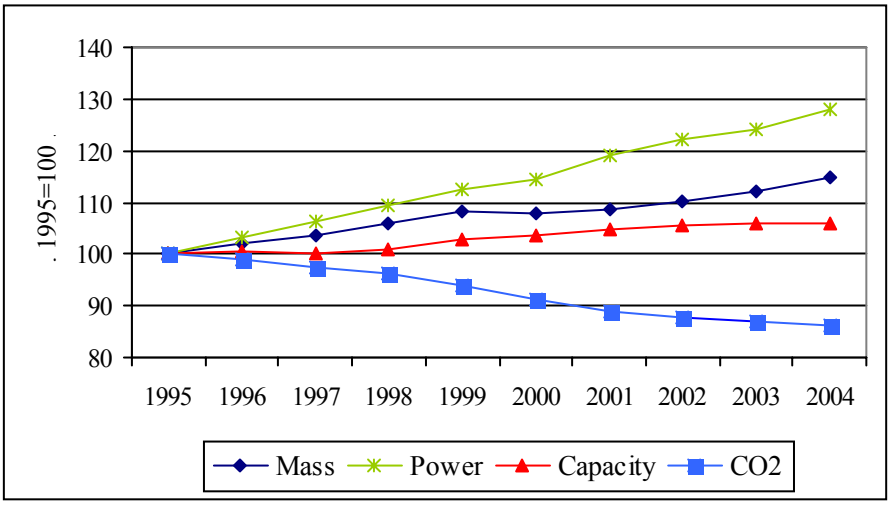


**Figure 7: ACEA's "wave-effect" of $CO_2$ categories towards enhanced fuel efficiency (g/km)**

## 5.2. 2.4 EU trends in physical fleet characteristics

Through its technical developments (such as those set-out in Section 1.2), ACEA has achieved sizeable improvements in new car $CO_2$ performance whilst increases in other physical fleet characteristics have occurred. Trends in physical characteristics of ACEA's new car fleet are shown in Figure 8 below, using ACEA time-series data (see also E3).




**Figures 8: Physical ACEA Fleet Characteristics (1995=100)**

In 2004, using ACEA data, average car mass, engine power and engine capacity showed an increase (petrol + diesel). However, disaggregating the average car capacity figures shows that diesel engine capacity decreased in 2004. Indeed, based on ACEA's time-series data, the engine capacity of diesel cars in 2004 fell to its lowest level in the entire monitoring period from 1995. This is a clear indication of the application of diesel technology in small cars.

It should also be noted that certain physical characteristics of the new car fleet affecting $CO_2$ emissions have altered during the Commitment period, and these are not fully reflected in the above data. Market changes have occurred, such as in relation to more automatic transmissions and an increase in the frontal area of cars. ACEA has presented to the Commission its views on the impact of market changes on new cars $CO_2$ emissions within the time period of the Commitment.

## 5.3. 2.5 Trends in new technologies in the EU

Within their CO2 reduction efforts, ACEA manufacturers continued their on-going technical development of alternative-fuelled vehicle (AFV) technologies; in 2004 ACEA sales of AFVs totalled 22,309 units, according to EU data (18,270 units according to ACEA data – see Figure 9 for AFV sales developments since 1995, based on ACEA data until 2002 included).

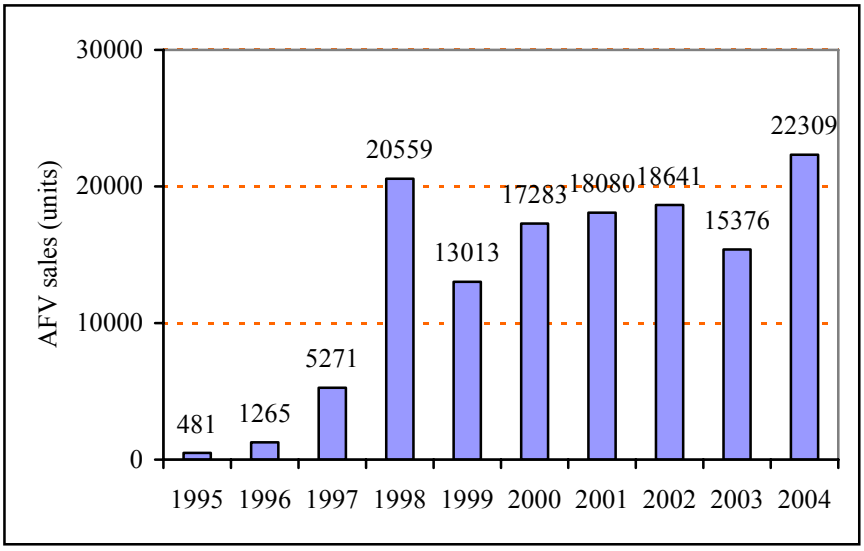



**Figure 9: ACEA sales of Alternative-Fuelled Vehicles (units)**
(***NB: the 2004 value has been added, and the 2003 value correceted, compared to same graph in previous joint report***)

## 5.4. 2.6 Trends in low emission passenger cars in the EU

In 2004 ACEA built further on its Year 2000 achievement of the first of its $CO_2$ commitments ("some members of ACEA will introduce in the EU market models emitting 120 g $CO_2$/km or less"). Using ACEA data, in 2004 ACEA first registrations of 120 g $CO_2$/km or less cars rose by over 14 % on the prior year. Back in 2000, ACEA manufacturers achieved this commitment, by bringing to market more than 20 models that achieved 120 g $CO_2$/km or less - with registrations of almost 160,000 units. In 2004, first registrations of cars emitting 120 g $CO_2$/km or less reached 958,591 units (see Figure 10 for longer-term profile), and achieved a 8.3 % share of total new registrations (7.7% share using EU data).

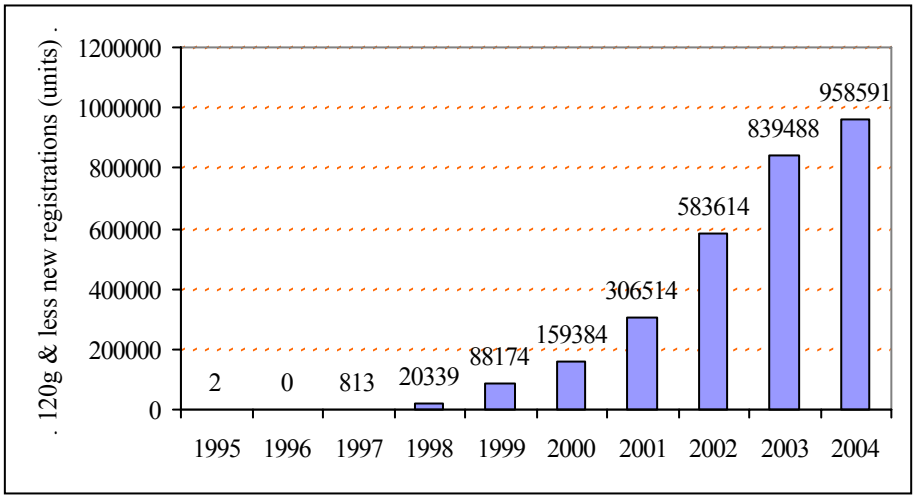



**Figure 10: ACEA Registrations of Cars with $CO_2$ emissions of 120 g $CO_2$/km or less**

### 5.5. 2.7 Trends in alternative concepts passenger cars in the EU

Nothing new to report.

### 5.6. 2.8 Trends in innovative concepts passenger cars in the EU

Nothing new to report.

### 5.7. 2.9 Brief description of the degree of occurrence of grey areas between M1 and N1 vehicles

Nothing to report (see Section 2.10).

### 5.8. 2.10 Data sources, data methods and data confidence levels

The 2004 Joint $CO_2$ Monitoring Report utilises data from the official EU monitoring scheme (1753/2000/EC), that is based on Member State submissions (see Annexes). This is the third year that data, submitted by Member States (slightly processed by the Commission[8]), have been the official basis for the monitoring process. Prior to 2002, ACEA purchased data from the French-based association AAA (Association Auxiliaire de l'Automobile), so as to enable the annual monitoring exercises to be undertaken.

In 2004, the variance between EU & ACEA data in terms of the overall average $CO_2$ figure (petrol + diesel) was around 1%; although differences in some details exist, over the long-term data differences should narrow further. Official EU data are the basis against which the commitment is monitored. The present report (as was done in the 2002 & 2003 reports), includes ACEA's data in addition to the official EU data for the most recent years. The ACEA source provides data from 1995 on a consistent basis, and these data can be used for information purposes regarding earlier years of the commitment.

### 5.9. 2.11 Description of measurement issues for $CO_2$ emission factors

Nothing new to report.

### 5.10. 2.12 Other issues

Nothing new to report.

## 6. 3 KEY ASSUMPTIONS TO THE COMMITMENT

### 6.1. 3.1 Availability of enabling fuels

*6.1.1. Statement on implication for the Commitment and justification*

Nothing new to report.

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[8] The cycle change correction of 0.7 % has been applied, and potentially erroneous allocations of vehicles to $CO_2$ classes, involving a few hundred vehicles, have been suppressed.

### 6.2. 3.2 Distortion of competition

*6.2.1. Statement on implication for the Commitment and justification*

Nothing new to report.

### 6.3. 3.3 Promotion of $CO_2$ efficient technologies

*6.3.1. Statement on implication for the Commitment and justification*

Nothing new to report.

### 6.4. 3.4 Acceptance of innovation

*6.4.1. Statement on implication for the Commitment and justification*

Nothing new to report.

## 7. 4 OTHER ISSUES

### 7.1. 4.1 New measures affecting $CO_2$

*7.1.1. Comment on impact of the issue and on implication for the Commitment*

Nothing new to report.

### 7.2. 4.2 New regulatory measures

*7.2.1. Comment on impact of the issue and on implication for the Commitment*

7.3. ACEA has presented to the Commission its findings concerning the impact of regulations or quasi-regulatory measures on new car $CO_2$ emissions, and the Commission is currently investigating these findings.

### 7.4. 4.3 Fiscal measures

*7.4.1. Comment on impact of the issue and on implication for the Commitment*

Nothing new to report.

### 7.5. 4.4 Breakthrough technologies

*7.5.1. Comment on impact of the issue and on implication for the Commitment*

Nothing further to report (see Sections 1.1, 1.2 & 4.5).

### 7.6. 4.5 Research Programmes: Description and future potential

*7.6.1. Comment on impact of the issue and implications for the Commitment*

EUCAR's effort during 2003 to develop R&D proposals on $CO_2$ reduction for the EU's FP6 research programme was described in the 2003 report. More or less all of the $CO_2$-related proposals were

accepted for funding. During 2004 the focus has been to start up the 2003-accepted projects and to complement with proposals in areas not sufficiently covered.

In December 2004 the EUCAR 'Fuels & Powertrain' program included, in terms of projects running since early 2004:

- **RENEW**: Producing fuels from biomasses
- **NICE**: New Integrated Combustion System for Future Passenger Car Engines
- **HyICE**: Internal Combustion Engine fuelled by hydrogen
- **StorHy**: Storage system for hydrogen (gas, liquid, solid state)
- **HyTRAN**: Fuel Cell based propulsion system and Auxiliary Power Unit (diesel reformer)
- **HyWays:** INFRASTRUCTURE ISSUES FOR THE HYDROGEN FUELLED ROAD TRANSPORT SYSTEM

Proposal submitted for funding, as well as under development, included:

- **HySys**: Components for Fuel Cell and Electric Powertrains

- Three (smaller) proposals on energy storage in Li-Ion batteries, super capacitors and on power electronics, which were submitted for funding during the autumn 2004; these complement the Fuel Cell and Hybrid powertrain projects.

- **Hi-CEPS**: Highly Integrated ICE-Electric Hybrid Vehicle

- **EFFEX**: Aftertreatment systems for future fuels and engines

- **PAGODO**: After-treatment for passenger cars

In addition to these powertrain-oriented projects the proposal **'Super Light Car'** (which addresses low weight body in white through mixed material use) was submitted and accepted for funding during 2004.

### 7.7. 4.6. Other measures - telematics, infrastructure, education

*7.7.1. Comment on impact of the issue and on implication for the Commitment*

Nothing new to report.

### 7.8. 4.7. Economic situation of the car industry

*7.8.1. Comment on impact of the issue and on implication for the Commitment*

ACEA and the Commission agree that the performance of the automotive industry and its capability to invest in and sell technological innovations is dependent on a strong and healthy macro-economy. This also facilitates the market take-up of advanced, and typically more expensive, technologies. Since 2001, the European economic environment has been weak, and ACEA new car sales in the EU fell by more than 6.4% between 2001 and 2004. ACEA has communicated its overall competitiveness concerns to the European Commission, and points out the need for urgent action.

In their 2004 European Competitiveness Report[9], the Commission services paid particular attention to the situation of the automotive industry, and notably underlined that based on the performance on the global automotive market the EU industry was competitive, although it had to face major challenges such as comparatively higher labour costs and poorer productivity than its US and Japanese competitors. The report also stressed that world-wide demand to make vehicles safer and more environment-friendly will continue, and that competitiveness was also dependent on a coherent and cost-effective regulatory framework.

## 8. 5 CONCLUSIONS

### 8.1. 5.1. Progress statement on delivering the Commitment

Since 1995, ACEA has maintained an unbroken trend of $CO_2$ emission reduction. In 2004, the average specific emissions of ACEA's new car fleet registered in the EU was 161 g $CO_2$/km. Compared to the 1995 situation, $CO_2$ emissions have been cut from 185 g $CO_2$/km in 1995 to 161 g $CO_2$/km in 2004.

ACEA also has met all the following undertakings made in its Commitment:

- In 2000, many models were brought to market of 120 g $CO_2$/km or less, and the number of models has increased since then;
- ACEA achieved, well ahead of time, the 2003 estimated intermediate target range of 165 -170 g/km;
- Before the end of 2003 ACEA submitted, to the Commission, its "Potential Reduction Review" statement on moving further towards the Community target of 120 g $CO_2$/km in 2012;
- Each year ACEA has contributed to a transparent joint monitoring of the Commitment with the Commission Services.

In addition ACEA completed, jointly with the Commission Services, a "Major Review" of its Commitment -- in compliance with the provision of the Commitment; this Review was annexed to the 2003 joint Monitoring Report.

A particular feature of these ACEA achievements has been the sharp rise that has occurred in new registrations of cars emitting 120 g $CO_2$/km or less. From a zero market share in the mid-1990s such cars achieved a 7.7% share in 2004, with sales of almost 900.000 units. The volume and share of cars emitting 140 g $CO_2$/km or less also rose considerably in 2004.

### 8.2. 5.2. Statement on expected future progress of the Commitment

The 2004 monitoring report shows that ACEA is fully in line with its 2008 commitment. However, ACEA stresses that the 2008 target remains extremely ambitious, both technically and economically. To reach 140 g $CO_2$/km in 2008, ACEA must achieve an annual average reduction rate of 3.3% a year during the remaining period of the Commitment.

The Commission services acknowledge that ACEA has until now met all its targets set out in its Commitment on $CO_2$ emissions from passenger cars, although ACEA has not been able to provide firmer assurances than in the previous years that it will meet its 2008 target of 140 g $CO_2$/km, despite the commitment period drawing closer to its end. They also acknowledge that ACEA has reconfirmed

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[9] SEC(2004)1397, available at http://europa.eu.int/comm/enterprise/enterprise_policy/competitiveness/doc/comprep_2004_en.pdf

their firm determination to make the best possible efforts to live up to their $CO_2$ Commitment. It is important to note that annual reduction rates required to meet the 140 g $CO_2$/km target in the remainder of the commitment period have again increased in the 2004 reporting exercise, compared to previous years, and that major additional efforts will be required to meet the 140 g $CO_2$/km target.

# DATA ANNEXES (2004)

*(Note: EU official data; all $CO_2$ figures include a 0.7% adjustment for the cycle change)*

A1: SPECIFIC FUEL EFFICIENCY (l/100km) AND EMISSIONS OF $CO_2$ (g/km) AVERAGED OVER ALL NEWLY REGISTERED PASSENGER CARS FOR EACH DIFFERENT FUEL-TYPE, FOR THE EU AND EACH MEMBER STATE

A2: THE DISTRIBUTION OF $CO_2$ EMISSIONS (g/km) IN THE NEW PASSENGER CAR FLEET FOR EACH DIFFERENT FUEL TYPE, FOR THE EU

A2: THE DISTRIBUTION OF $CO_2$ EMISSIONS (g/km) IN THE NEW PASSENGER CAR FLEET FOR EACH DIFFERENT FUEL TYPE FOR THE EU-15[10] (corrected by 0.7.%)

A3: THE DISTRIBUTION OF AVERAGED MASS, POWER AND ENGINE CAPACITY OF NEW PASSENGER CARS FOR EACH FUEL TYPE FOR THE EU-15 AND EACH MEMBER STATE

[10] except Greece, Netherlands and UK

**A1: SPECIFIC FUEL EFFICIENCY (l/100km) AND EMISSIONS OF $CO_2$ (g/km)* AVERAGED OVER ALL NEWLY REGISTERED PASSENGER CARS FOR EACH DIFFERENT FUEL-TYPE FOR THE EU 15 AND EACH MEMBER STATE**

ACEA MEMBERS - 2004

| | | Identified version | | | | | | | | | | | | Unknown version |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **TOTAL** | **All Fuels** | | **Petrol** | | | **Diesel** | | | **Petrol+Diesel** | | | **AFV** | | |
| | Number | Number | average $CO_2$ | Number | average fuel | average $CO_2$ | Number | average fuel | average $CO_2$ | Number | average fuel | average $CO_2$ | Number | average $CO_2$ | Number |
| **EU 15** | **--** | **11459095** | **161** | **5375334** | **7.2** | **170** | **6061452** | **5.8** | **153** | **11436786** | **6.4** | **161** | **22309** | **144** | **--** |
| Austria | 246085 | 245717 | 159 | 61186 | 7.1 | 168 | 184517 | 5.8 | 155 | 245703 | 6.2 | 159 | 14 | 183 | 368 |
| Belgium | 413988 | 413834 | 154 | 108486 | 6.9 | 164 | 305348 | 5.7 | 150 | 413834 | 6.0 | 154 | 0 | 0 | 154 |
| Denmark | 80637 | 80577 | 166 | 55989 | 7.4 | 175 | 24588 | 5.4 | 143 | 80577 | 6.8 | 166 | 0 | 0 | 60 |
| Finland | 92281 | 91866 | 179 | 75314 | 7.7 | 182 | 16549 | 6.2 | 165 | 91863 | 7.4 | 179 | 3 | 193 | 415 |
| France | 1786749 | 1786748 | 150 | 532912 | 6.8 | 161 | 1252370 | 5.4 | 145 | 1785282 | 5.9 | 150 | 1466 | 130 | 1 |
| Germany | 2788719 | 2697319 | 173 | 1404536 | 7.5 | 178 | 1286403 | 6.3 | 168 | 2690939 | 7.0 | 174 | 6380 | 137 | 91400 |
| Greece | 162880 | 153214 | 168 | 148779 | 7.1 | 168 | 4435 | 6.0 | 160 | 153214 | 7.1 | 168 | 0 | 0 | 9666 |
| Ireland | 97917 | 97560 | 165 | 74769 | 7.0 | 166 | 22790 | 6.1 | 162 | 97559 | 6.8 | 165 | 1 | 210 | 357 |
| Italy | 1884755 | 1883996 | 148 | 730450 | 6.4 | 151 | 1141492 | 5.5 | 146 | 1871942 | 5.8 | 148 | 12054 | 142 | 759 |
| Luxembourg | 40381 | 40381 | 168 | 10411 | 8.0 | 190 | 29970 | 6.0 | 160 | 40381 | 6.5 | 168 | 0 | 0 | 0 |
| Netherlands | n.d. | 362917 | 170 | 256705 | 7.4 | 175 | 106212 | 6.0 | 158 | 362917 | 7.0 | 170 | 0 | 0 | n.d. |
| Portugal | 170175 | 170175 | 145 | 66575 | 6.4 | 152 | 103599 | 5.3 | 141 | 170174 | 5.7 | 145 | 1 | 118 | 0 |
| Spain | 1333410 | 1227679 | 152 | 369218 | 7.0 | 165 | 858461 | 5.5 | 146 | 1227679 | 5.9 | 152 | 0 | 0 | 105731 |
| Sweden | 206250 | 206155 | 198 | 186836 | 8.4 | 199 | 18328 | 7.0 | 187 | 205164 | 8.3 | 198 | 991 | 206 | 95 |
| UK | n.d. | 2000957 | 168 | 1293168 | 7.3 | 173 | 706390 | 6.0 | 159 | 1999558 | 6.8 | 168 | 1399 | 167 | n.d. |

** Correction factor: 0.7 %*

**A2: THE DISTRIBUTION OF $CO_2$ EMISSIONS (g/km) IN THE NEW PASSENGER CAR FLEET FOR EACH DIFFERENT FUEL TYPE FOR THE EU15**

ACEA MEMBERS - 2004

| $CO_2$-Category | All fuels | | Petrol | | Diesel | | Petrol+Diesel | | AFV | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number | Average $CO_2$ | Number | Average $CO_2$ | Number | Average $CO_2$ | Number | Average $CO_2$ | Number | Average $CO_2$ |
| <60 | 60 | 0 | | | | | | | 60 | 0 |
| 60-80 | 1 | 80 | 1 | 80 | | | 1 | 80 | | |
| 81-100 | 18253 | 90 | 37 | 81 | 18216 | 90 | 18253 | 90 | | |
| 101-120 | 861087 | 115 | 56490 | 115 | 798470 | 115 | 854960 | 115 | 6127 | 119 |
| 121-140 | 2205764 | 134 | 742266 | 136 | 1456452 | 133 | 2198718 | 134 | 7046 | 134 |
| 141-160 | 3757525 | 150 | 1730551 | 149 | 2025394 | 150 | 3755945 | 150 | 1580 | 149 |
| 161-180 | 2097664 | 169 | 1317553 | 170 | 774548 | 169 | 2092101 | 169 | 5563 | 168 |
| 181-200 | 1059082 | 190 | 681569 | 190 | 376789 | 189 | 1058358 | 190 | 724 | 186 |
| 201-250 | 1139437 | 221 | 636624 | 220 | 501619 | 221 | 1138243 | 221 | 1194 | 222 |
| 251-300 | 243881 | 271 | 141163 | 273 | 102706 | 268 | 243869 | 271 | 12 | 269 |
| 301-350 | 52117 | 320 | 44892 | 319 | 7223 | 327 | 52115 | 320 | 2 | 318 |
| 351-450 | 23109 | 386 | 23076 | 386 | 33 | 386 | 23109 | 386 | | |
| >450 | 1115 | 508 | 1112 | 508 | 2 | 459 | 1114 | 508 | 1 | 472 |

A2: THE DISTRIBUTION OF $CO_2$ EMISSIONS (g/km) IN THE NEW PASSENGER CAR FLEET FOR EACH DIFFERENT FUEL TYPE FOR THE EU-15*

ACEA MEMBERS – 2004

| $CO_2$-Category | All fuels | | Petrol | | Diesel | | 9. PETROL + DIESEL | | 10. AFV | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number | Average $CO_2$ | Number | Average $CO_2$ | Number | Average $CO_2$ | Number | Average $CO_2$ | Number | Average $CO_2$ |
| <60 | 60 | 0 | | | | | | | 60 | 0 |
| 60-80 | 916 | 80 | 36 | 80 | 880 | 80 | 916 | 80 | | |
| 81-100 | 17291 | 90 | 1 | 83 | 17290 | 90 | 17291 | 90 | | |
| 101-120 | 810901 | 114 | 52202 | 115 | 752572 | 114 | 804774 | 114 | 6127 | 118 |
| 121-140 | 1987611 | 134 | 616014 | 136 | 1364592 | 133 | 1980606 | 134 | 7005 | 133 |
| 141-160 | 2921982 | 149 | 1204179 | 149 | 1716715 | 150 | 2920894 | 149 | 1088 | 147 |
| 161-180 | 1412146 | 169 | 827339 | 169 | 579665 | 170 | 1407004 | 169 | 5142 | 167 |
| 181-200 | 748622 | 189 | 427376 | 190 | 320911 | 189 | 748287 | 189 | 335 | 188 |
| 201-250 | 833791 | 220 | 418558 | 219 | 414091 | 221 | 832649 | 220 | 1142 | 221 |
| 251-300 | 166382 | 269 | 94689 | 271 | 71682 | 266 | 166371 | 269 | 11 | 268 |
| 301-350 | 33221 | 320 | 26649 | 318 | 6572 | 326 | 33221 | 320 | | |
| 351-450 | 14628 | 379 | 14620 | 379 | 8 | 384 | 14628 | 379 | | |
| >450 | 591 | 515 | 590 | 515 | 1 | 452 | 591 | 515 | | |

Data is corrected by 0.7 % (new drive cycle) before arrangement to the $CO_2$ categories.
*except Greece, Netherlands and UK

**A3: THE DISTRIBUTION OF AVERAGED MASS, POWER AND ENGINE CAPACITY OF NEW PASSENGER CARS**

**FOR EACH FUEL TYPE**

ACEA MEMBERS - 2004

| Member State | Mass [kg] | | | | | Power [kW] | | | | | Capacity [cm³] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Petrol | Diesel | Petrol+ Diesel | AFV | Total | Petrol | Diesel | Petrol+ Diesel | AFV | Total | Petrol | Diesel | Petrol+ Diesel | AFV |
| **EU 15** | **1357** | **1249** | **1453** | **1357** | **1413** | **81** | **79** | **83** | **81** | **68** | **1756** | **1604** | **1892** | **1756** | **1559** |
| Austria | 1443 | 1241 | 1509 | 1443 | 1609 | 79 | 74 | 81 | 79 | 80 | 1829 | 1578 | 1913 | 1829 | 1767 |
| Belgium | 1383 | 1198 | 1449 | 1383 | - - | 76 | 70 | 78 | 76 | - - | 1750 | 1490 | 1842 | 1750 | - - |
| Denmark | 1369 | 1341 | 1433 | 1369 | - - | 80 | 82 | 76 | 80 | - - | 1740 | 1693 | 1847 | 1740 | - - |
| Finland | 1374 | 1336 | 1546 | 1374 | 1441 | 88 | 88 | 91 | 88 | 85 | 1821 | 1768 | 2062 | 1821 | 1980 |
| France | 1321 | 1166 | 1388 | 1321 | 1054 | 75 | 71 | 77 | 75 | 46 | 1717 | 1488 | 1816 | 1718 | 1194 |
| Germany | 1423 | 1293 | 1563 | 1422 | 1508 | 91 | 86 | 96 | 91 | 75 | 1889 | 1723 | 2071 | 1889 | 1650 |
| Greece | 1303 | 1295 | 1569 | 1303 | - - | 76 | 76 | 91 | 76 | - - | 1562 | 1547 | 2078 | 1562 | - - |
| Ireland | 1333 | 1265 | 1538 | 1333 | 1567 | 74 | 70 | 86 | 74 | 103 | 1609 | 1494 | 1985 | 1609 | 2435 |
| Italy | 1261 | 1071 | 1382 | 1261 | 1380 | 71 | 58 | 78 | 71 | 64 | 1599 | 1334 | 1769 | 1600 | 1475 |
| Luxembourg | 1480 | 1346 | 1527 | 1480 | - - | 95 | 102 | 93 | 95 | - - | 1984 | 1926 | 2004 | 1984 | - - |
| Netherlands | 1340 | 1276 | 1495 | 1340 | - - | 82 | 80 | 86 | 82 | - - | 1754 | 1662 | 1975 | 1754 | - - |
| Portugal | 1297 | 1140 | 1398 | 1297 | 1100 | 70 | 59 | 78 | 70 | 44 | 1548 | 1293 | 1712 | 1548 | 1242 |
| Spain | 1329 | 1214 | 1378 | 1329 | - - | 77 | 74 | 79 | 77 | - - | 1757 | 1560 | 1842 | 1757 | - - |
| Sweden | 1491 | 1469 | 1707 | 1491 | 1596 | 107 | 107 | 106 | 107 | 96 | 2022 | 2001 | 2223 | 2021 | 2261 |
| UK | 1391 | 1303 | 1553 | 1391 | 1512 | 96 | 96 | 94 | 96 | 81 | 1758 | 1643 | 1968 | 1758 | 1749 |

# Monitoring of JAMA's commitment on $CO_2$ Emission Reduction from Passenger Cars (2004)

## Final report

25 November 2005

**Joint Report**
**of the**
**Japan Automobile Manufacturers Association**
**and**
**the Commission Services**

## 11. MONITORING OF JAMA COMMITMENT[11] ON $CO_2$ EMISSION REDUCTION FROM PASSENGER CARS

## 12. JOINT REPORT OF JAMA AND THE COMMISSION SERVICES[12]: YEAR 2004 REPORT

Note to the reader: JAMA's Commitment as recognised by the European Commission in 2000 was undertaken at a time where the EU only included 15 Member States and therefore its geographical scope is limited to the EU-15 – as a consequence, the present report only monitors the EU-15 situation.

## 13. ES SUMMARY OF PROGRESS IN DELIVERING THE AGREEMENT

### 13.1. E1 Trends in specific emissions of $CO_2$ (g/km)

In 2004 - using official EU data - JAMA members decreased the averaged specific $CO_2$ emissions of passenger cars (petrol + diesel) registered within the EU by about 2g $CO_2$/km from 172 to 170 g $CO_2$/km. This is a 1.0 % drop from 2003[13].

For petrol-fuelled cars, specific emissions increased slightly from 170 g $CO_2$/km to 171 g $CO_2$/km in 2004 – a 0.6 % increase compared to 2003. For diesel-fuelled cars, the 2004 value is 170 g $CO_2$/km, compared to 177 g $CO_2$/km – a 4.0% reduction compared to 2003.

Official EU data only became available in 2002, and are the basis against which the commitment is monitored. The present report (as was done in 2002 and 2003) includes JAMA's data in addition to the official EU-data for the most recent years. Since JAMA's source provides data from 1995 on a consistent basis, this data can be used for information purposes regarding earlier years of the commitment.

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11 As recognized by the European Commission in the Recommendation of 13 April 2000 on the reduction of $CO_2$ emissions from passenger cars (2000/304/EC). Hereafter referred to as "The Commitment"

12 Hereafter often referred to as "The Commission"

13 All percentage figures are based on rounded numbers.

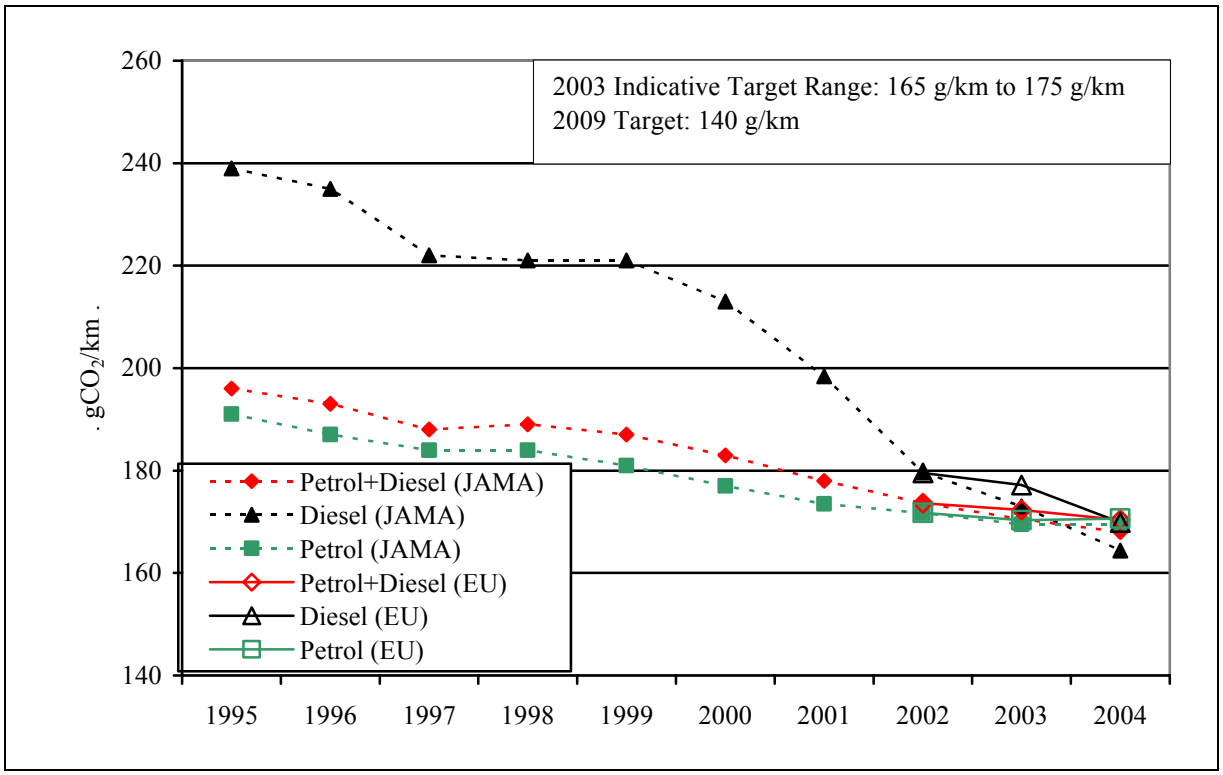


**Figure 3: EU Trends of JAMA members' fleet in average specific emissions of $CO_2$**

Using JAMA's time-series between 1995 and 2001 and EU data since 2002, JAMA achieved an overall reduction in new car $CO_2$ emissions of 13.1 %; for petrol-cars the $CO_2$ value went down by 10.7 % and for diesel cars by 28.9 %. The three data points based on EU data are coherent with JAMA's trend data but differ somewhat in the absolute values.

### 13.2. E2 Trends in specific fuel consumption by fuel type (l/ 100 km)

Based on official EU data, fuel efficiency in 2004 improved compared to 2003 for diesel cars and for the overall JAMA fleet. 2003 values were 7.2 l/100km for petrol, 6.7 l/100km for diesel and 7.0 l/100km for all JAMA members' new registrations[14]. In 2004 comparable values were 7.2 l/100km, 6.4l/100km and 6.9 l/100km. Petrol passenger cars, which counted for the majority of JAMA members' passenger cars registered within the EU over the full 1995 to 2004 reporting period, consumed about 8.0 l/100 km in 1995. Their average fuel consumption decreased to 7.2 l/100 km in 2004. Diesel cars consumed an average of 9.0 l/100 km in 1995, and achieved an average fuel consumption of 6.4 l/100 km in 2004 (see Figure 2).

[14] The following conversion factors were used for the calculation of specific fuel consumption (l/100km) from specific $CO_2$ emissions (g/km): petrol 23.7, diesel 26.6.

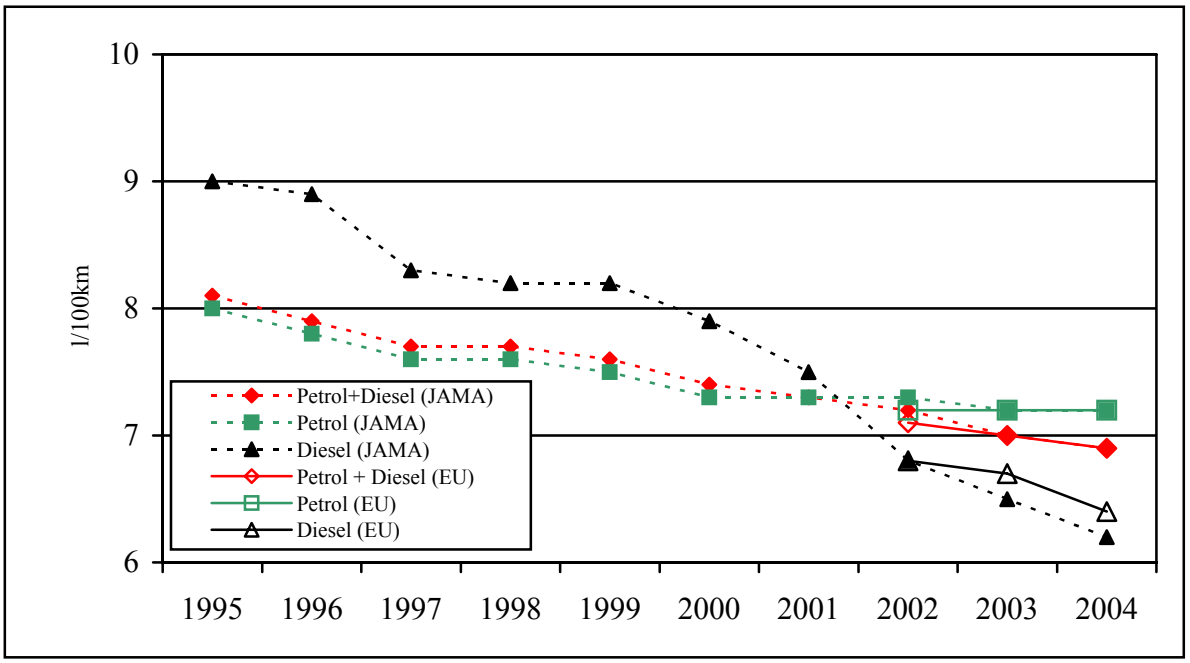


**Figure 4: Trends of JAMA member's fleet in average specific fuel consumption by fuel (l/100km)**

### 13.3. E3 Trends in physical fleet characteristics

Based on JAMA's data, the average mass[15] of new petrol cars increased from 2003 to 2004 – from 1174 kg to 1234 kg; for diesel the values increased slightly from 1458 kg to 1486 kg. When all new registrations are combined the average mass was 1252 kg in 2003 and 1458 kg in 2004. Average engine power of new registrations increased slightly, from 79 kW in 2003 to 80 kW in 2004. Average engine capacity increased from 1688cm$^3$ in 2003 to 1711 cm$^3$ in 2004.

The general trends in physical characteristics over the whole reporting period from 1995 to 2004 show an increase, notably in mass (+ 15 %). This is mainly due to increasing petrol car weight (+ 13 %) and increased diesel passenger car registrations (+ 461 %) over the reporting period. Average engine capacity increased by 3.4 % over the period from 1995 to 2004. The engine power increased by 15 % over the same period.

### 13.4. E4 Technical developments introduced to reduce $CO_2$ emissions

The main new technologies introduced since 1995 include the petrol and diesel direct injection engines. The Continuous Variable Transmission Technology (CVT) and the robotized manual transmission have already been introduced and continue to be used on cars sold on the market. JAMA has also introduced hybrid cars in 2002 and the idling stop mechanism in 1999.

### 13.5. E5 Brief overall assessment on progress in relation to the target

In 2004, JAMA decreased the average specific $CO_2$ emissions of passenger cars registered within the EU by about 2 g $CO_2$/km down to 170 g $CO_2$/km. This is a 1.0 % drop compared to 2003. Compared to 1995, this represents a 13.2% decrease in average specific emissions (from 196 g $CO_2$/km to 170 g $CO_2$/km).

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[15] JAMA's data are based on the kerb weight of the vehicle.

The share of diesel cars in JAMA fleets has increased over the reporting period. While in 1995 petrol cars accounted for 89.6 % of the fleet and diesel cars for 10.4 %, in 2004 the shares were 68.0 % and 32.0 % respectively[16].

JAMA members have pursued the introduction of fuel-efficient cars emitting 120 g $CO_2$/km or less: a total of 114.826 such new vehicles were registered in 2004, representing a 65% increase compared to 2003, which shows a positive effort made by JAMA.

To achieve the $CO_2$ emission targets agreed upon in the commitment by 2009, JAMA will further explore various technologies namely Direct Injection (DI), hybrid vehicles and Continuous Variable Transmission Technology (CVT) etc. JAMA emphasizes the difficulty of planning and managing of $CO_2$ reduction due to unknown factors such as changes of consumer demands.

The 2004 monitoring report shows that JAMA is fully in line with its 2009 commitment. However, JAMA stresses that the 2009 target remains extremely ambitious, both technically and economically. To reach 140 g $CO_2$/km in 2009, JAMA must achieve an annual average reduction rate of 3.5% a year during the remaining period of the Commitment.

The Commission services acknowledge that JAMA has until now met all its targets set out in its Commitment on $CO_2$ emissions from passenger cars, although JAMA has not been able to provide firmer assurances than in the previous years that it will meet its 2009 target of 140 g $CO_2$/km, despite the commitment period drawing closer to its end. They also acknowledge that JAMA has reconfirmed their firm determination to make the best possible efforts to live up to their $CO_2$ Commitment. Nevertheless, it is important to note that annual reduction rates required to meet the 140 g $CO_2$/km target in the remainder of the commitment period have again increased in the 2004 reporting exercise, compared to previous years, and that major additional efforts will be required to meet the 140 g $CO_2$/km target.

[16] Taking 1995 JAMA data and 2004 official data.

## 14. 1. MONITORING OF TECHNOLOGICAL DEVELOPMENTS AFFECTING THE COMMITMENT

### 14.1. 1.1 Commitment Initiatives

*14.1.1. Brief Description of current R & D programs*

Sections 1.2 and 2.5 cover JAMA technological developments and research activities.

### 14.2. 1.2 Technological developments

*14.2.1. 1.2.1 Description of fuel efficiency characteristics of new technologies, alternative concepts*

*14.2.2. 1.2.2 Availability of New Technologies in the EU and Member States*

*14.2.3. 1.2.3 Availability of alternative concepts passenger cars in the EU*

*14.2.4. 1.2.4 Availability of low emission passenger cars (e.g. emitting less than 120g/km) in the EU*

JAMA has committed itself to achieving a 140 g $CO_2$/km emission target by 2009 and JAMA members are continuing $CO_2$ emission reduction R&D towards this goal. Ongoing efforts are made to make technological improvements successively available to the market. The main new technologies introduced since 1995 include the petrol and diesel direct injection engines. The Continuous Variable Transmission Technology (CVT) has already been introduced and continues to be used on cars sold on the market. JAMA members have also introduced hybrid cars in 2002 and idle stop mechanism in 1999.

The $CO_2$ emission reduction technologies made available by JAMA to the market are shown in Figure 7 in Section 2.5. A direct injection gasoline model has been on the market since 1997. A direct injection diesel car debuted on the market in 1998 and has seen a very quick uptake by the markets in 2004 (approximately 29.5 % of JAMA members' first registrations in 2004).

Several low-emission passenger cars have been put on the EU market in recent years, achieving 120 g $CO_2$/km or less. In 2000, JAMA member companies have put 80 g $CO_2$/km petrol-hybrid car and another 119 g $CO_2$/km car with idle stop mechanism on the market. A new 104 g $CO_2$/km petrol-hybrid model was launched in the autumn of 2003.

### 14.3. 1.3 Description of market trends in physical fleet characteristics

For JAMA new cars as a whole, based on JAMA's figures, the average mass of vehicles increased by around 15 % in 2004 as compared with 1995. The main factor is the increase in the weight of petrol-fuelled cars (mass increased by around 13 %). Engine capacity of JAMA new cars showed a shift towards an increase by approximately 3.4% and their engine power presented an increase by approximately 15 % in 2004 as compared with 1995. $CO_2$ emission levels, however, showed a

decrease of approximately 13 % for JAMA new cars as a whole in 2004 as compared with 1995[17], a sign that the cars available on the market have benefited from $CO_2$ reduction technologies (see Section 2.4 for further details and linkage to $CO_2$). EU data are presented in Annex 1.

**15.**

## 16. 2 STATISTICAL MONITORING (1995-2004)

### 16.1. 2.1 Trends in specific emissions of $CO_2$ (g/km)

In 2004, taking the official EU data, the average specific emissions of JAMA's new car fleet registered in the EU was 170 g $CO_2$/km. Compared to 2003, this represents a 1.0% drop. For petrol-fuelled cars there was an increase of 0.6 %, but diesel cars average specific emissions were 4.0 % lower in 2004 than in 2003.

The average specific $CO_2$ emission levels of JAMA new cars over the entire reporting period showed a downward trend (see Figure 3). According to JAMA's data between 1995 and 2001 and EU data since 2002, the average specific $CO_2$ emission levels of new cars (petrol and diesel) decreased by an average of roughly 1.5 % each year and fell from 196 g $CO_2$/km in 1995 to 170 g $CO_2$/km in 2004 (marking a 13.1 % reduction as compared with 1995). The averaged specific $CO_2$ emission levels of petrol-fuelled cars recorded a decrease from 191 g $CO_2$/km in 1995 to 170 g $CO_2$/km in 2004 - a 11.0 % reduction as compared with 1995[18]. This gives an average annual reduction of around 1.2 % The averaged specific $CO_2$ emission levels of diesel cars recorded a decrease from 239 g $CO_2$/km in 1995 to 170 g $CO_2$/km in 2004- a 28.9 % reduction. This amounts to a 3.2 % average annual reduction over the period.

Total average fuel consumption decreased within the reporting period from 1995 to 2004, using JAMA's 1995 data and 2004 official EU data, the diesel fuel consumption decreased from about 9.0 l/100 km to 6.2 l/100km, and the petrol fuel consumption from 8.0 l/100 km to 7.2 l/100km. For all vehicles, the average fuel consumption was 6.9 l/100km.

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17 Taking 1995 JAMA data and 2004 official data.

18 Taking 1995 JAMA data and 2004 official data.

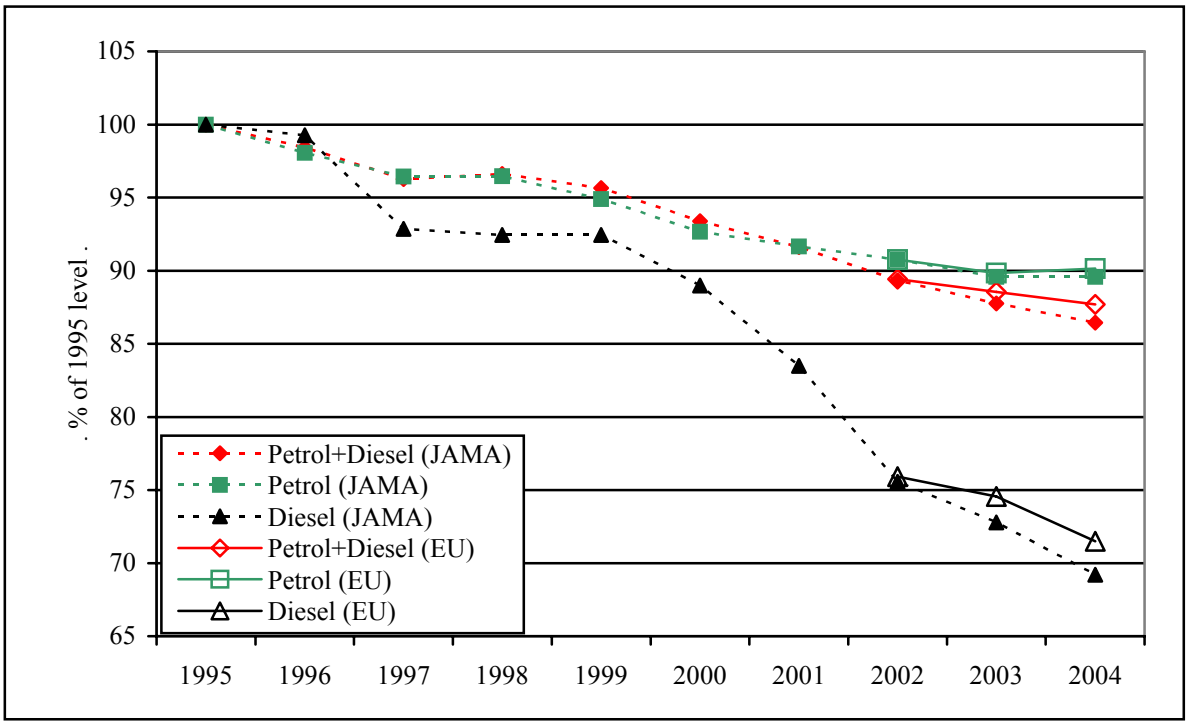



**Figure 3: JAMA members' $CO_2$ Reduction Index (1995=100)**

### 16.2. 2.2 Number of newly registered passenger cars

Based on JAMA data, the number of registered petrol passenger cars increased from 1,013,138 vehicles in 1995 to 1,222,073 vehicles in 2004 (+20.6 %). Petrol cars represent about 69.3 % of total first registrations of petrol and diesel cars produced by JAMA in 2004.

The number of registered diesel passenger cars increased from 117.577 in 1995 to 541,934 in 2004 (+460.9 %), showing a much bigger increment than petrol cars (see Figure 4).

The number of all passenger cars registered in 2004 is 1,818,516, representing a 1.5% increase compared to 2003.

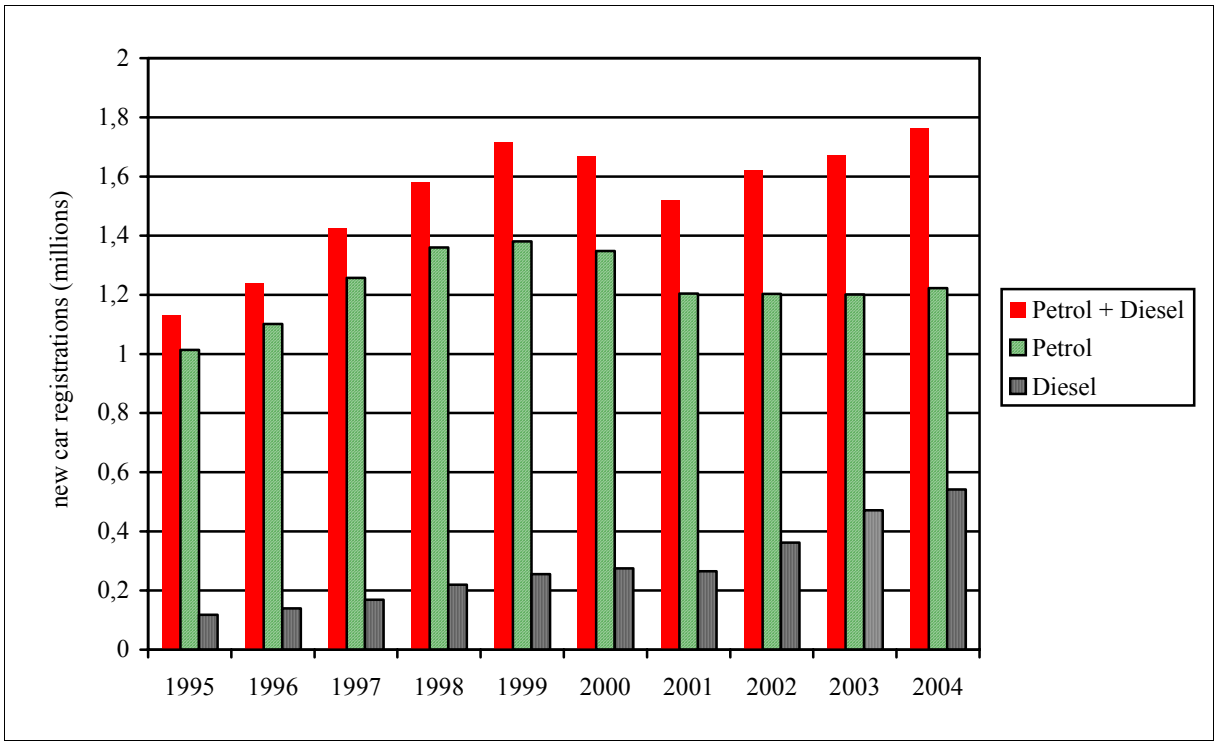



**Figure 4: New Car Registrations by JAMA (million units)**

### 16.3. 2.3 Fleet Composition

The share of cars emitting 160 g $CO_2$/km and less has increased from 16.2 % in 1995 to 45.8 % in 2004, while the share of the car emitting more than 161 g $CO_2$/km decreased from 83.8 % to 54.2 % (using JAMA data).

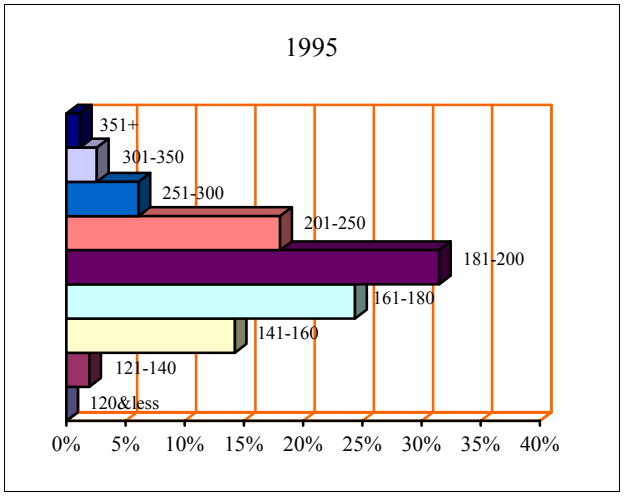



**Figure 5a : JAMA's Fleet Composition per $CO_2$ Category in Shares of Total (petrol +diesel) in 1995**

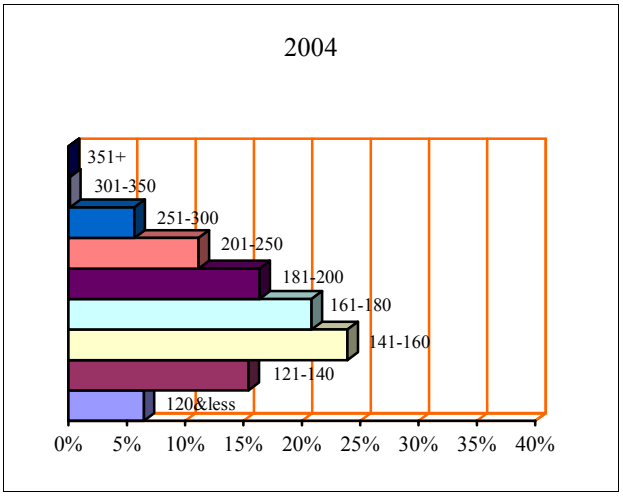



**Figure 5b : JAMA's Fleet Composition per $CO_2$ Category in Shares of Total (petrol +diesel) in 2004**

Furthermore, as Figures 5a and 5b show, a significant increase in registrations can be seen in the category "121 to 140 g $CO_2$/km"; there were 286,152 new registrations for this category in 2004, up from 20,055 in 1995. Figure 5c shows the rapid growth in the 140 g $CO_2$/km or less and 141 g $CO_2$/km to 160 g $CO_2$/km ranges over the reporting period. Over the same period, there was a significant drop in the registration of vehicles in the 181g $CO_2$/km to 200 g $CO_2$/km range, as well as reduction in shares in all higher emissions ranges.

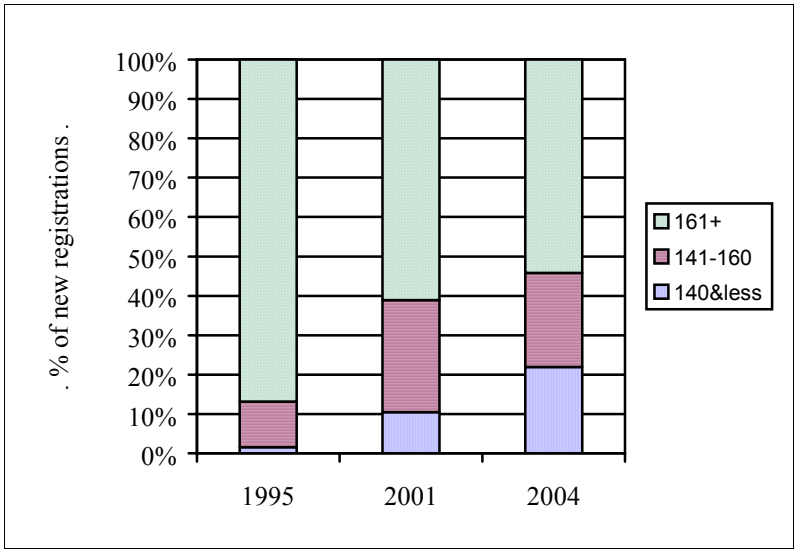
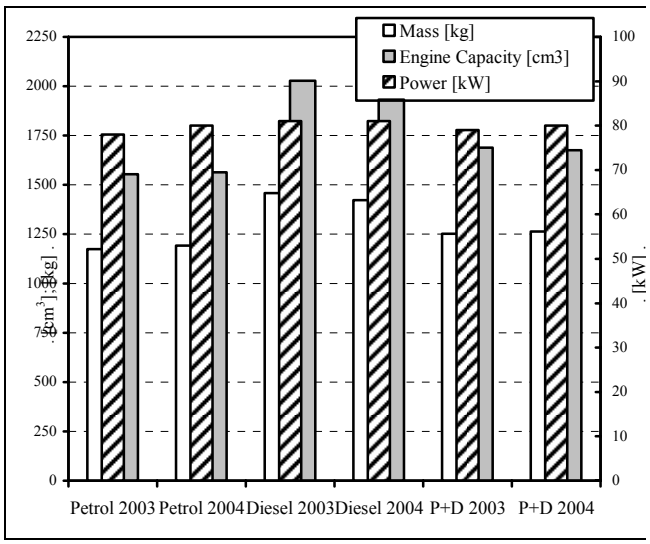



**Figure 5c: Change in JAMA's Fleet Composition by "aggregated $CO_2$ Categories"**

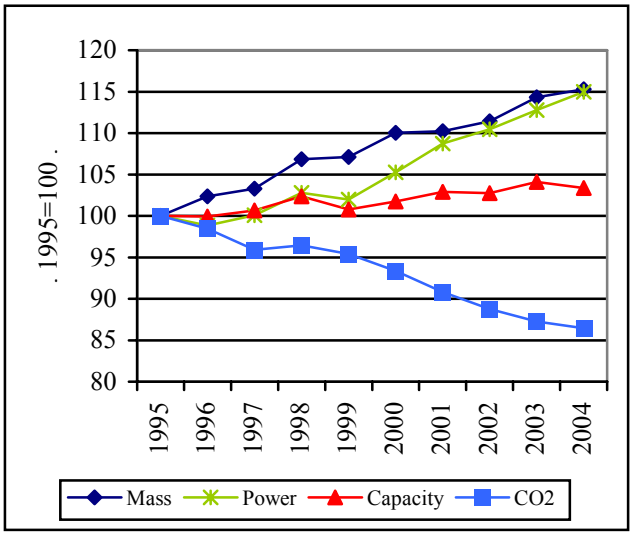
## 16.4. 2.4 EU trends in physical fleet characteristics

Using JAMA time-series data, changes in physical characteristics - engine power and vehicle mass - showed an upward trend from 2003 to 2004, continuing the overall trend present from 1995 (see Figures 6a and 6b). On the other hand, it shows only a marginal growth for the engine capacity. The average mass of new car registrations rose slightly from 1252 kg in 2003 to 1263 kg in 2004; engine capacity decreased slightly from 1688 $cm^3$ to 1676 $cm^3$; and power increased slightly from 79 to 80 kW. Average diesel-fuelled car mass was over a third higher than that for petrol and the capacity was 20 % higher for diesel-fuelled cars than for petrol cars.




**Figures 6a: Physical JAMA members' fleet characteristics for 2003 &2004**

***(All based on JAMA data)***




**Figures 6b: Physical JAMA fleet characteristics *(All based on JAMA data)***

Average total automobile mass was 1089 kg in 1995 and increased by 15.3% over the reporting period (1263 kg in 2004). Petrol automobiles' average mass has increased by 12.9 % within the reporting period, from 1032 kg in 1995 to 1192 kg in 2004. Diesel automobiles' average mass reached the minimum of 1447 kg in 1997 (against 1295 kg in 1995) but increased up to 1557 kg in 2001, then decreased again to 1422kg in 2004; i.e. a 0.2 % decrease over the reporting period from 1995 to 2004.

Total engine capacity has increased by 4.1 % within the reporting period, from 1621 $cm^3$ in 1995 to 1688 $cm^3$ in 2003, but it slightly decreased to 1676 in 2004. Petrol engine capacity increased up to 1563 (against 1543 $cm^3$ in 1995), that is a peak in the reporting period. Diesel engine capacity decreased to 1932 $cm^3$ capacity in 2004 (against 2298 $cm^3$ in 1995). The overall trend shows only a marginal growth in average engine capacity over the reporting period.

Total engine power was 70 kW in 1995 and rose to 80 kW by 2004, an 11.4 % increase in EU average over this eight years period. Petrol engine power has increased from 70 kW in 1995 to 80 kW in 2004. Diesel engine power has steadily increased by 22.7 % within the reporting period, i.e. from 66 kW in 1995 to 81 kW in 2004.

Using JAMA time-series data, the physical characteristics increased over the period, however, average specific $CO_2$ emissions dropped by 14.3 % in the same time (see Figure 6b).

JAMA is currently investigating concerning market changes. JAMA will present to the Commission its views on the impact of market changes on new cars $CO_2$ emissions within the time period of the Commitment.

## 16.5. 2.5 Trends in new technologies in the EU

JAMA's members have introduced several new technologies on the EU market over the monitoring period (see description in 1.2). Trends in sales vary across technologies, but overall, with the exception of direct injection diesel engines the shares of these technologies remain small. The shares of cars equipped with direct injection diesel engines have increased from 0 % to 29.5 % since their respective launch in 1998. Important technologies to mention are also the hybrid powertrains and idle stop mechanisms, that were introduced since 2000.

The trends for each technology, as well as the share of new passenger cars equipped with these technologies in total new passenger car sales by JAMA members, are shown in Figure 7. (Based on JAMA data)

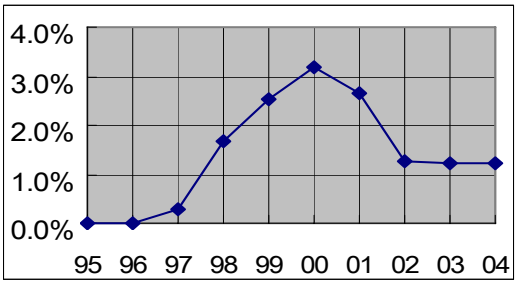
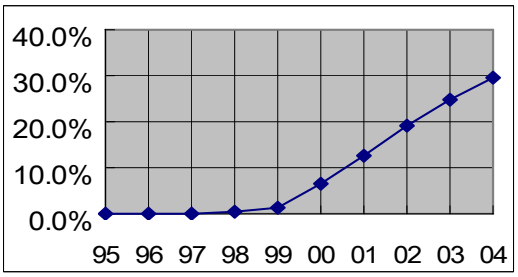
| Qualitative Description | Quantitative (Optional) |
|---|---|
| Direct Injection for petrol engines was first marketed in 1997, has shown definite growth until 2000 and is receding since then. |  |
| Direct Injection for diesel engines was introduced to the market in 1998 and shows rapid growth from 1999 to 2004. |  |

**Figure 7: Trends in New Technologies launched by JAMA members on the EU market**

## 16.6. 2.6 Trends in low emission passenger cars in the EU

JAMA released its first "120 g $CO_2$/km or less" car on the EU market in 1999. In 2000, JAMA has launched a 119 g $CO_2$/km car and a 80 g $CO_2$/km petrol-hybrid car. Furthermore, JAMA released a 104 g $CO_2$/km petrol-hybrid model in the autumn of 2003 (see Section 1.2.4).

In 2004, 114808 JAMA cars with emissions of 120 g $CO_2$/km or less were registered in the EU, up from 5544 cars in 1999[19]. Previously there had been no registrations of vehicles in this emissions category.

[19] Taking 1999 JAMA data and 2004 official data.

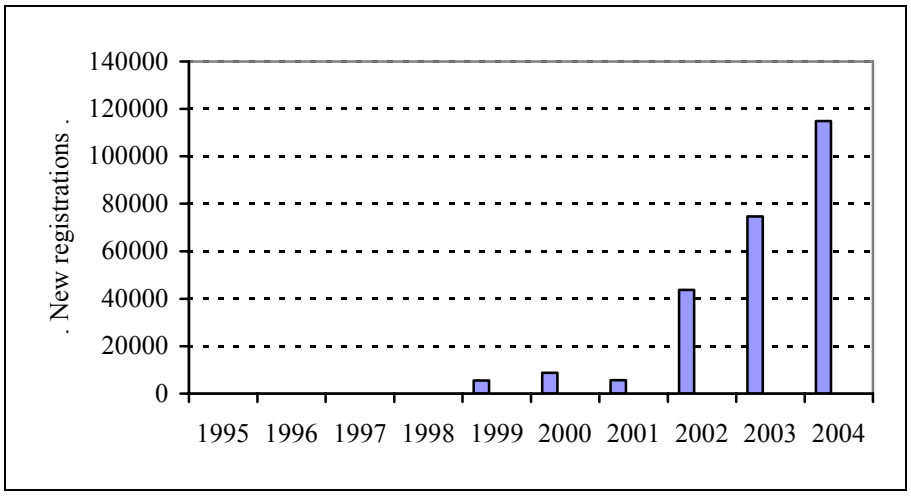



**Figure 8: JAMA members Sales of Vehicle with Specific Emission of 120 g $CO_2$/km or less**

**(2004 based on EU data)**

## 16.7. 2.7 Trends in alternative concepts passenger cars in the EU

Nothing to report.

## 16.8. 2.8 Trends in innovative concepts passenger cars in the EU

Nothing to report.

## 16.9. 2.9 Brief Description of the degree of occurrence of Grey Areas between M1 and N1 vehicles

Based on own data JAMA estimates the number of M1 vehicles with a type approval for M1 and N1 which are potentially registered as N1 in the EU is equal to a total of 96053 vehicles, 5.3 % of total registrations in 2004.

## 16.10. 2.10 Data methods, data sources, and data confidence levels

The 2004 Joint $CO_2$ Monitoring Report is based on data from the official EU monitoring scheme (1753/2000/EC), that is based on Member State submissions (see Annexes). This is the third year that data submitted by Member States (slightly processed by the Commission[20]) have been the official basis for the monitoring process. As part of the monitoring exercise, JAMA and the Commission services agreed that the EU data as provided by Member States were of a very good quality. Some improvements with regard to the identification rates in a few Member States and the combination of registration data and corresponding $CO_2$ values will be achieved when the $CO_2$ values become part of the registration document, thus further increasing the quality of the data reported.

[20] The cycle change correction of 0.7 % has been applied, and potentially erroneous allocations of vehicles to $CO_2$ classes, involving a few hundred vehicles, have been suppressed.

### 16.11. 2.11 Description of measurement issues for $CO_2$ Emission Factors

The JAMA Commitment specified that new car $CO_2$ emissions would be measured according to Directive 93/116/EC. Since the establishment of the JAMA Commitment, the mandatory type approval method of measuring $CO_2$ emissions has been revised by Directive 99/100/EC. In 2003, JAMA and the Commission reached a consensus on a correction factor adjustment; it was agreed that a 0.7 % reduction should be applied to "measured" emissions to align them with the Commitment's basis. In this report, this adjustment has been applied to 2001 to 2004 data. For future years it was also agreed that this 0.7 % adjustment should be maintained unless new data are provided by the associations, that prove its inappropriateness.

### 16.12. 2.12 Other Issues

Nothing to report.

## 17. 3 KEY ASSUMPTIONS TO THE AGREEMENT

### 17.1. 3.1 Availability of Enabling Fuels

*17.1.1. Statement on implication for the Commitment and justification*

Nothing to report

### 17.2. 3.2 Distortion of Competition

*17.2.1. Statement on implication for the Commitment and justification*

Nothing to report.

### 17.3. 3.3 Promotion of $CO_2$ efficient technologies

*17.3.1. Statement on implication for the Commitment and justification*

Nothing to report.

### 17.4. 3.4 Acceptance of innovation

*17.4.1. Statement on implication for the Commitment and justification*

Nothing to report.

## 18. 4 OTHER ISSUES

### 18.1. 4.1 New Measures affecting $CO_2$

*18.1.1. Comment on impact of the issue and on implication for the Commitment*

Nothing to report.

### 18.2. 4.2 New regulatory measures

*18.2.1. Comment on impact of the issue and on implication for the Commitment*

JAMA is sharing and supporting ACEA's findings concerning the impact of regulations or quasi-regulations on new cars $CO_2$ emissions.

### 18.3. 4.3 Fiscal Measures

*18.3.1. Comment on impact of the issue and on implication for the Commitment*

Nothing to report.

### 18.4. 4.4 Breakthrough technologies

*18.4.1. Comment on impact of the issue and on implication for the Commitment*

Nothing to report.

### 18.5. 4.5 Research programmes: Description and Future Potential

*18.5.1. Comment on impact of the issue and on implication for the Commitment*

Nothing to report.

### 18.6. 4.6 Other measures - telematics, infrastructure, education

*18.6.1. Comment on impact of the issue and on implication for the Commitment*

JAMA believes that measures such as the promotion of trade in purchase of new cars, presentations of correct and proper car maintenance methods, driver training, optimization of infrastructure, effective and efficient land use, and efforts to achieve a smoother traffic road will have a beneficial effect on $CO_2$ reduction. JAMA thinks that such measures should therefore be embraced in a positive manner under government lead and with the co-operation of the industrial sectors involved.

### 18.7. 4.7 Economic situation of the car industry

*18.7.1. Comment on impact of the issue and on implication for the Commitment*

Nothing to report.

## 19. 5 CONCLUSIONS

### 19.1. 5.1 Progress Statement on Delivering the Agreement

In 2002, JAMA achieved the intermediate target range of 165 - 175 g $CO_2$/km. JAMA members continue to put on the market more $CO_2$ efficient vehicles, both petrol and diesel, which are also more attractive to the customers.

In addition, JAMA completed a "Major Review" based on 2003 data and Article 10 of Decision 1753/2000/EC with the Commission. This Review was annexed to the 2003 Monitoring report.

In 2004, the number of new registered cars emitting less than 120 g/km CO2 rose considerably to reach 114.808 (74.679 in 2003). Similarly, the share of cars emitting 140 g/km CO2 or less continued to rise consistently in 2004.

### 19.2. 5.2 Statement on Expected Future Progress of the Agreement

JAMA achieved the intermediate target range of 165 - 175 g $CO_2$/km in 2002, one year earlier than estimated. The final target value of 140 g $CO_2$/km in 2009 requires further serious effort to JAMA members. Emissions reductions will have to fall faster for the 2009 target (140 g $CO_2$/km) to be met. In order to reach the 2009 target, annual emissions reductions will have to increase to an average reduction rate of around 3.5 % per year over the period until 2009.

Importantly, and as agreed upon, this target will mainly be achieved by technological developments affecting different car characteristics and market changes linked to these developments. Regarding technological developments, JAMA reiterated that its members would aim at a high share of new cars equipped with $CO_2$ efficient technologies. Japanese automobile manufacturers have agreed to make every endeavor to contribute to the achievement of JAMA's goals.

The 2004 monitoring report shows that JAMA is fully in line with its 2009 commitment. However, JAMA stresses that the 2009 target remains extremely ambitious, both technically and economically. To reach 140 g $CO_2$/km in 2009, JAMA must achieve an annual average reduction rate of 3.5% a year during the remaining period of the Commitment.

The Commission services acknowledge that JAMA has until now met all its targets set out in its Commitment on $CO_2$ emissions from passenger cars, although JAMA has not been able to provide firmer assurances than in the previous years that it will meet its 2009 target of 140 g $CO_2$/km, despite the commitment period drawing closer to its end. They also acknowledge that JAMA has reconfirmed their firm determination to make the best possible efforts to live up to their $CO_2$ Commitment. Nevertheless, it is important to note that annual reduction rates required to meet the 140 g $CO_2$/km target in the remainder of the commitment period have again increased in the 2004 reporting exercise, compared to previous years, and that major additional efforts will be required to meet the 140 g $CO_2$/km target.

# JAMA
# Data Annexes

**20. DATA ANNEXES (2004)**

**21.**

A1: SPECIFIC FUEL EFFICIENCY (L/100km) AND EMISSIONS OF $CO_2$ (g/km) AVERAGED OVER ALL NEWLY REGISTERED PASSENGER CARS FOR EACH DIFFERENT FUEL-TYPE, FOR THE EU AND EACH MEMBER STATE

A2: THE DISTRIBUTION OF $CO_2$ EMISSIONS (g/km) IN THE NEW PASSENGER CAR FLEET FOR EACH DIFFERENT FUEL TYPE, FOR THE EU

A3: THE DISTRIBUTION OF AVERAGED POWER AND ENGINE CAPACITY OF NEW PASSENGER CARS FOR EACH FUEL TYPE FOR THE EU-15 AND EACH MEMBER STATE

A1: SPECIFIC FUEL EFFICIENCY (l/100km) AND EMISSIONS OF $CO_2$ (g/km)* AVERAGED OVER ALL NEWLY REGISTERED PASSENGER CARS FOR EACH DIFFERENT FUEL-TYPE FOR THE EU 15 AND EACH MEMBER STATE

JAMA MEMBERS – 2004

| | | Identified version | | | | | | | | | | | | Unknown version |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **TOTAL** | **All Fuels** | | **Petrol** | | | **Diesel** | | | **Petrol+Diesel** | | | **AFV** | | |
| | Number | Number | average $CO_2$ | Number | average fuel | average $CO_2$ | Number | average fuel | average $CO_2$ | Number | average fuel | average $CO_2$ | Number | average $CO_2$ | |
| **EU 15** | **- -** | **1779104** | **170** | **1209135** | **7.2** | **171** | **569121** | **6.4** | **170** | **1778256** | **6.9** | **170** | **848** | **206** | **- -** |
| Austria | 50409 | 50378 | 168 | 21952 | 7.1 | 168 | 28426 | 6.3 | 168 | 50378 | 6.7 | 168 | 0 | 0 | 31 |
| Belgium | 54220 | 54129 | 162 | 26923 | 7.0 | 166 | 27206 | 5.9 | 157 | 54129 | 6.5 | 162 | 0 | 0 | 91 |
| Denmark | 30457 | 30457 | 163 | 27665 | 7.0 | 166 | 2792 | 5.3 | 140 | 30457 | 6.8 | 163 | 0 | 0 | 0 |
| Finland | 43704 | 43581 | 177 | 40551 | 7.5 | 178 | 3030 | 6.4 | 171 | 43581 | 7.4 | 177 | 0 | 0 | 123 |
| France | 163521 | 163521 | 172 | 65085 | 6.8 | 162 | 98429 | 6.7 | 178 | 163514 | 6.7 | 172 | 7 | 192 | 0 |
| Germany | 378985 | 365563 | 174 | 275358 | 7.3 | 174 | 90205 | 6.6 | 175 | 365563 | 7.1 | 174 | 0 | 0 | 13422 |
| Greece | 65426 | 53587 | 171 | 51655 | 7.2 | 171 | 1932 | 6.1 | 163 | 53587 | 7.2 | 171 | 0 | 0 | 11839 |
| Ireland | 46484 | 46438 | 167 | 42453 | 6.9 | 165 | 3985 | 7.1 | 188 | 46438 | 7.0 | 167 | 0 | 0 | 46 |
| Italy | 271515 | 271245 | 154 | 133478 | 6.5 | 153 | 137320 | 5.8 | 154 | 270798 | 6.1 | 154 | 447 | 190 | 270 |
| Luxembourg | 4774 | 4774 | 178 | 2005 | 7.8 | 185 | 2769 | 6.5 | 174 | 4774 | 7.1 | 178 | 0 | 0 | 0 |
| Netherlands | n.d. | 78408 | 169 | 68557 | 7.2 | 170 | 9851 | 6.2 | 165 | 78408 | 7.0 | 169 | 0 | 0 | n.d. |
| Portugal | 25096 | 25096 | 149 | 14090 | 6.2 | 148 | 11006 | 5.6 | 149 | 25096 | 6.0 | 149 | 0 | 0 | 0 |
| Spain | 170092 | 131294 | 175 | 58932 | 7.2 | 171 | 72362 | 6.7 | 177 | 131294 | 6.9 | 175 | 0 | 0 | 38798 |
| Sweden | 39891 | 39887 | 189 | 38980 | 7.9 | 188 | 907 | 7.8 | 207 | 39887 | 7.9 | 189 | 0 | 0 | 4 |
| UK | n.d. | 420746 | 177 | 341451 | 7.4 | 176 | 78901 | 6.9 | 183 | 420352 | 7.3 | 177 | 394 | 225 | n.d. |

* Correction factor: 0.7%

A2: THE DISTRIBUTION OF $CO_2$ EMISSIONS (g/km) IN THE NEW PASSENGER CAR FLEET FOR EACH DIFFERENT FUEL TYPE FOR THE EU-15

JAMA MEMBERS - 2004

| $CO_2$-Category | All fuels | | Petrol | | Diesel | | Petrol + Diesel | | AFV | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number | Average $CO_2$ | Number | Average $CO_2$ | Number | Average $CO_2$ | Number | Average $CO_2$ | Number | Average $CO_2$ |
| <60 | | | | | | | | | | |
| 60-80 | 392 | 74 | 392 | 74 | | | 392 | 74 | | |
| 81-100 | 6 | 99 | 6 | 99 | | | 6 | 99 | | |
| 101-120 | 114,410 | 117 | 40,588 | 115 | 73,819 | 117 | 114,407 | 117 | 3 | 108 |
| 121-140 | 274,616 | 133 | 202,079 | 134 | 72,532 | 130 | 274,611 | 133 | 5 | 131 |
| 141-160 | 424,997 | 151 | 305,990 | 151 | 118,988 | 152 | 424,978 | 151 | 19 | 153 |
| 161-180 | 370,638 | 171 | 262,605 | 171 | 108,005 | 170 | 370,610 | 171 | 28 | 169 |
| 181-200 | 291,522 | 190 | 172,756 | 189 | 118,463 | 191 | 291,219 | 190 | 303 | 186 |
| 201-250 | 198,943 | 220 | 177,622 | 218 | 20,853 | 236 | 198,475 | 220 | 468 | 224 |
| 251-300 | 100,505 | 273 | 44,289 | 276 | 56,195 | 270 | 100,484 | 273 | 21 | 274 |
| 301-350 | 2,508 | 322 | 2,249 | 320 | 258 | 338 | 2,507 | 322 | 1 | 319 |
| 351-450 | 513 | 392 | 506 | 392 | 7 | 373 | 513 | 392 | | |
| >450 | 54 | 466 | 53 | 466 | 1 | 454 | 54 | 466 | | |

**A3: THE DISTRIBUTION OF AVERAGED MASS, POWER AND ENGINE CAPACITY OF NEW PASSENGER CARS**

**FOR EACH FUEL TYPE**

JAMA MEMBERS - 2004

| Member | Mass [kg] | | | | | Power [kW] | | | | | Capacity [cm³] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| State | Total | Petrol | Diesel | Petrol+ Diesel | AFV | Total | Petrol | Diesel | Petrol+ Diesel | AFV | Total | Petrol | Diesel | Petrol+ Diesel | AFV |
| **22. EU 15** | **1319** | **1234** | **1486** | **1319** | **1530** | **80** | **80** | **81** | **80** | **107** | **1711** | **1581** | **1987** | **1711** | **2189** |
| Austria | 1376 | 1214 | 1501 | 1376 | - - | 78 | 74 | 81 | 78 | - - | 1747 | 1509 | 1930 | 1747 | - - |
| Belgium | 1336 | 1224 | 1446 | 1336 | - - | 76 | 75 | 77 | 76 | - - | 1677 | 1510 | 1842 | 1677 | - - |
| Denmark | 1248 | 1243 | 1302 | 1248 | - - | 78 | 78 | 70 | 78 | - - | 1583 | 1578 | 1634 | 1583 | - - |
| Finland | 1325 | 1309 | 1536 | 1325 | - - | 87 | 87 | 83 | 87 | - - | 1733 | 1709 | 2048 | 1733 | - - |
| France | 1363 | 1147 | 1506 | 1363 | 1233 | 80 | 73 | 84 | 80 | 75 | 1812 | 1450 | 2051 | 1812 | 1567 |
| Germany | 1310 | 1242 | 1518 | 1310 | - - | 83 | 82 | 86 | 83 | - - | 1729 | 1631 | 2022 | 1729 | - - |
| Greece | 1299 | 1290 | 1550 | 1299 | - - | 79 | 79 | 87 | 79 | - - | 1594 | 1576 | 2079 | 1594 | - - |
| Ireland | 1256 | 1225 | 1610 | 1256 | - - | 76 | 75 | 89 | 76 | - - | 1541 | 1480 | 2199 | 1541 | - - |
| Italy | 1257 | 1134 | 1376 | 1257 | 1475 | 70 | 66 | 74 | 70 | 98 | 1556 | 1326 | 1778 | 1555 | 2029 |
| Luxembourg | 1415 | 1263 | 1525 | 1415 | - - | 90 | 95 | 86 | 90 | - - | 1928 | 1769 | 2044 | 1928 | - - |
| Netherlands | 1246 | 1209 | 1505 | 1246 | - - | 79 | 78 | 84 | 79 | - - | 1631 | 1578 | 2001 | 1631 | - - |
| Portugal | 1298 | 1181 | 1447 | 1298 | - - | 71 | 64 | 80 | 71 | - - | 1521 | 1304 | 1800 | 1521 | - - |
| Spain | 1435 | 1276 | 1564 | 1435 | - - | 85 | 83 | 87 | 85 | - - | 1908 | 1627 | 2137 | 1908 | - - |
| Sweden | 1385 | 1376 | 1783 | 1385 | - - | 93 | 92 | 98 | 93 | - - | 1830 | 1817 | 2376 | 1830 | - - |
| UK | 1331 | 1269 | 1609 | 1331 | 1970 | 87 | 88 | 83 | 87 | 118 | 1749 | 1649 | 2179 | 1749 | 2381 |

# Monitoring of KAMA's Commitment on $CO_2$ Emission Reduction from Passenger Cars

# (2004)

**Final version**

**25 November 2005**

**Joint report of the**

**Korea Automobile Manufacturers Association**

**and**

**the Commission Services**

**Monitoring of KAMA[21]'s Commitment[22] on $CO_2$ Emission Reduction from Passenger Cars**

**JOINT REPORT OF KAMA AND THE COMMISSION SERVICES[23]: YEAR 2004 REPORT**

Note to the reader: KAMA's Commitment as recognised by the European Commission in 2000 was undertaken at a time where the EU only included 15 Member States, and therefore its geographical scope is limited to the EU-15 – as a consequence, the present report only monitors the EU-15 situation.

ES SUMMARY OF PROGRESS IN DELIVERING THE COMMITMENT

## E1 Trends in specific emissions of $CO_2$ (g/km)

KAMA reduced the average $CO_2$ emission of its new passenger car fleet registered in the EU market to 168 g $CO_2$/km in 2004,[24] from 197 g $CO_2$/km in 1995 and 179 g $CO_2$/km in 2003. This represents a reduction of 14.7 % over the whole monitoring period of 1995 to 2004 and 6.1 % over the period[25] 2003 to 2004[26]. Consequently KAMA fulfilled the intermediated target (165 – 170 g/km) for the year 2004.

Average specific $CO_2$ emission from petrol-fuelled cars fell from 195 g $CO_2$/km in 1995 to 160 g $CO_2$/km in 2004 (a 17.9 % drop). Average specific $CO_2$ emissions from diesel-fuelled cars fell from 309 g $CO_2$/km in 1995 to 189 g $CO_2$/km in 2004 (a significant 38.8 % drop) (see Figure 1).

---

21 KAMA represents the Korea Automobile Manufacturers Association of Hyundai Motor Company, KIA Motors Corporation, GM Daewoo Auto & Technology Company, Renault Samsung Motor Company, and Ssangyong Motor Company.

22 As recognized by the European Commission in the Recommendation of 13 April 2000 on the reduction of CO2 emissions from passenger cars (2000/303/EC). Hereafter referred to as "The Commitment".

23 Hereafter often referred to as "The Commission"

24 All $CO_2$ performance figures from 2001 for KAMA have been corrected by 0.7% under the consideration of new test cycle, as to bring them in line with the amended Directive 93/116/EC on which the Commitment is based (see Section 2.11).

25 All percentage figures are based on rounded numbers.

26 For 2002, 2003 and 2004, official EU data are used in the Joint Monitoring Report since, according to the Joint Monitoring System, the monitoring has to be based on the data delivered under Decision 1753/2000EC. According to this scheme prior 1995-2001 monitoring was based on data provided by KAMA.

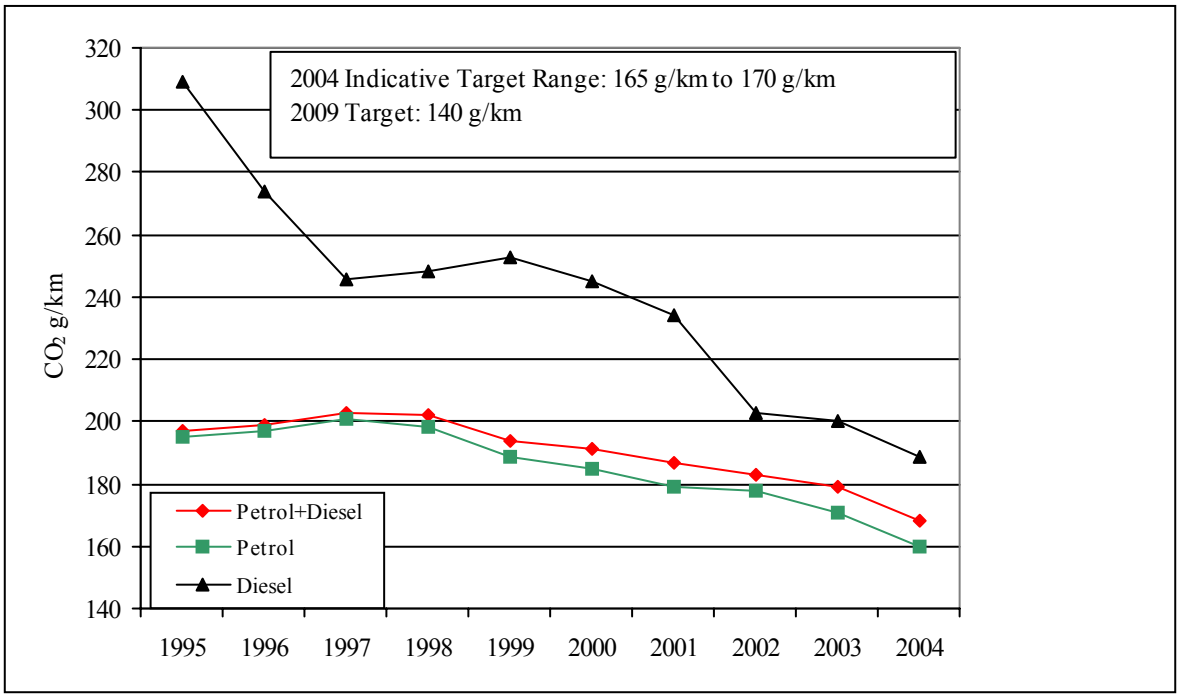



**Figure 1: EU Trends of KAMA's Fleet in Specific Average Emissions of $CO_2$**

*(2002, 2003 and 2004: EU data are used, corrected by 0.7 %)*

| **E2** | **Trends in specific fuel consumption by fuel type (ℓ/100km)** |
|---|---|

Specific fuel consumption in terms of liters per 100 km (l/100 km) of petrol and diesel engines is proportional to their $CO_2$ emissions - the lower the fuel consumption, the lower the emissions.

Average fuel consumption for petrol and diesel cars combined decreased from 8.2 ℓ/100 km in 1995 to 6.8 ℓ/100 km in 2004.[27]

New petrol cars, which represented 72 % of KAMA's sales volumes over the reporting period, consumed about 8.1 ℓ/100 km in 1995, which decreased to 6.7 ℓ/100 km in 2004. New diesel cars consumed an average of 11.6 ℓ/100 km in 1995, down to 7.1 ℓ/100 km in 2004 (see Figure 2).

[27] The following conversion factors were used for the calculation of specific fuel consumption (l/100km) from specific $CO_2$ emission (g/km): petrol 23.7 and diesel 26.6

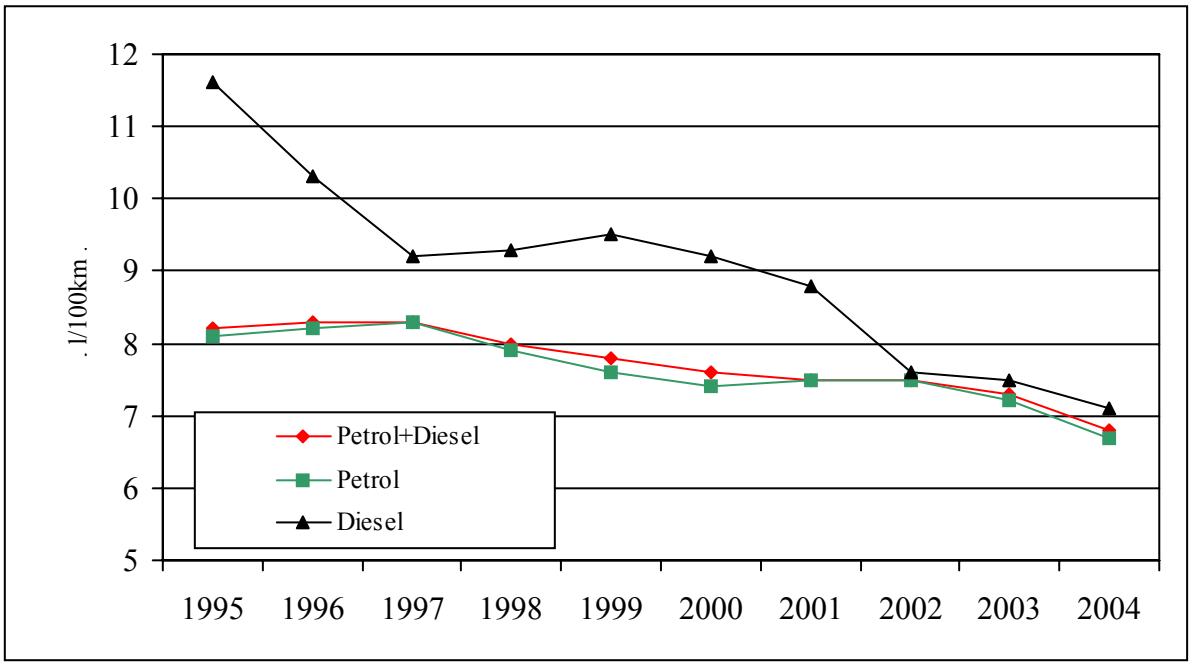



**Figure 2: Trends in KAMA's Fleet in Specific Average Fuel Consumption, by Fuel Type**

*(2002, 2003 and 2004: EU data are used)*

## E3 Trends in physical fleet characteristics

The average power for newly registered cars has decreased by 1.4 % between 2003 and 2004. The overall power has decreased from 70 kW in 2003 to 69 kW in 2004. While the average power of petrol engine decreased from 64 kW to 62 kW between 2003 and 2004, the power of diesel engine dropped from 87 kW to 85 kW for the same period.

While the mass of petrol cars decreased from 1,292 kg to 1,133 kg between 2003 and 2004, the mass of diesel cars also dropped for the same period from 1,905 kg to 1,741 kg. Consequently, the overall mass of newly registered cars has decreased from 1454 kg to 1306 kg, by 10.2 % between 2003 and 2004.

The average engine capacity has decreased by 4.0 % – from 1,632 $cm^3$ in 2003 to 1,566 $cm^3$ in 2004. While the engine capacity of petrol cars decreased from 1,404 $cm^3$ to 1351 $cm^3$ between 2003 and 2004, the engine capacity of diesel cars also decreased from 2,209 $cm^3$ to 2,130 $cm^3$ for the same period.

With the assistance of general trends of an overall decrease in engine power and capacity within the monitoring period, total fuel consumption for petrol and diesel cars combined decreased significantly also with reduction of average mass and application of various technological developments.

## E4 Technical developments introduced to reduce $CO_2$ emissions

In addition to meeting emission regulations (EURO 3 & 4) and OBD (On Board Diagnostics) regulations in place in the EU, KAMA members tried to reduce $CO_2$ emissions and improve fuel economy with various technical developments.

KAMA members tried to reduce $CO_2$ emissions by applying new technologies such as advanced torque based actuator control, advanced knock control, combustion improvement, engine friction reduction, variable geometry intake system, variable geometry timing system, variable geometry turbocharger, CVVT (Continuously Variable Valve Timing), cooled EGR (Exhaust Gas Recirculation), fuel-cut range increase, weight reduction, swirl control system, multi-hole injector, low friction piston ring, High Speed Diesel Injection (HSDI) engine with cooled EGR and VGT (Variable Geometry Turbocharger), motor driven power steering, drag reduction, low friction tire, and FGR (Final Gear Ratio) tuning, and automatic transmission efficiency improvement within the reporting period.

KAMA members introduced these newly developed vehicles in the EU market from 2001. As a result, the share of diesel cars with $CO_2$ level of 121 - 160 g $CO_2$/km category has increased from 21,615 units in 2003 to 42,759 units (up by 197.8 %) in 2004. HSDI diesel engines were introduced in 2001, increasing from a 0.4 % to 29.1 % share of total KAMA sales volume in the period 2001 to 2004; the volume will steadily increase and contribute to a remarkable reduction of $CO_2$ in the EU market.

In order to introduce low emission cars, KAMA members developed diesel passenger cars of small displacement with common rail ($2^{nd}$ generation HSDI engines) that were launched on the EU market in 2003.

**E5 Brief overall assessment on progress in relation to the target**

Mainly due to the application of new technologies such as advanced torque based actuator control, variable combustion improvement, variable intake manifold system, CVVT system, advanced knock control, swirl control system, six-hole injector, increase the range of fuel-cut, weight reduction, low friction piston ring, and HSDI diesel engine with cooled EGR and VGT, etc. on the EU market, a reduction of average specific $CO_2$ emissions was accomplished from 197 g $CO_2$ g/km to 168 g $CO_2$/km between 1995 and 2004.

The most impressive achievement by KAMA in the EU market is the substantial increase of cars with $CO_2$ level of 120 g $CO_2$/km or less. Two models of car with this level were introduced in 2003, but 24,287 units were registered in 2004, which is 4.3 % share of overall KAMA sales volume. Hence, the share of cars with $CO_2$ level of 160 g $CO_2$/km or less has surpassed the half point (exactly, 54.1 %) of total KAMA sales volume in 2004, and contributed to achieve the 2004 indicative target range of 165 - 170 g $CO_2$/km.

To achieve the $CO_2$ emission targets of 140 g $CO_2$/km agreed upon in the Commitment by 2009, KAMA members are developing fuel-efficient car technologies such as, inter alia, $2^{nd}$ generation

HSDI engine, GDI (Gasoline Direct Injection) engine, DCT (Dual Clutch Transmission), CVT (Continuously Variable Transmission), 5&6-speed automatic transmission, weight reduction, reduction of drag force and HEV (Hybrid Electric Vehicle).

As the total sales volume in 2004 rose by 33.6 %, the sales volume of petrol vehicles increased by 31.0 % and that of diesel vehicles by 40.8 % in the period 2003 to 2004. As stated above, KAMA members supplied 24,287 units of cars emitting less than 120 g $CO_2$/km on the EU market in 2004. Thanks to extended supply of these models, KAMA achieved the 2004 intermediate target range of 165 - 170 g $CO_2$/km of its Commitment by the average reduction rate of 6.1 % in 2004 compared with the $CO_2$ level in 2003.

KAMA showed a rate of reduction rate of $CO_2$ emissions over the period of 2003 and 2004 which was sufficient to fulfil the 2004 intermediate $CO_2$ emissions target.

But KAMA will further explore various technologies such as CVT, direct injection engine, HEV to reduce $CO_2$ emissions in order to reach 140 g/km in 2009 and must achieve an average reduction of 5.6 g (3.3 %) a year during the remaining period of the commitment.

In summary, while the 2009 target remains still challenging for KAMA, the 2004 monitoring report shows that KAMA is fully in line with its Commitment and, in the present circumstances, KAMA has no reason to believe that it would not live up to its Commitment. However, the Commission and KAMA see a need to accelerate further the introduction of fuel-efficient new technologies to reach the 2009 target.

## 1. MONITORING OF TECHNOLOGICAL DEVELOPMENTS AFFECTING THE COMMITMENT

### 1.1 Commitment Initiatives

1.1.1 Brief Description of current R&D programmes

1.1.2 Other

KAMA members achieved good progress towards meeting the $CO_2$ emissions targets of 2004 and 2009 through the recent intensive investments into R&D to meet the $CO_2$ emissions target of 2004 and 2009. They have already started new R&D projects aiming at reducing passenger cars $CO_2$ emission as well as other emissions.

The Korean government allowed the domestic sale of diesel passenger cars satisfying EURO-3 emission regulation from 2005 and EURO-4 emission regulation from 2006. So far, KAMA members launched diesel passenger cars on the EU market without the base of a domestic market due to stringent emission regulation of diesel passenger car in Korea. Hereafter the R&D activities of KAMA members will be increased and low $CO_2$ emitting diesel passenger cars are expected to be of relative popularity in Korea in future. This is expected to contribute remarkably to $CO_2$ reduction.

### 1.2 Technological Developments

1.2.1. Description of fuel efficiency characteristics of new technologies, alternative concepts
1.2.2. Availability of New Technologies
1.2.3. Availability of low emission passenger cars (e.g. emitting 120 g/km or less)
1.2.4. Availability of alternative concept passenger cars
1.2.5. Availability of innovative concept passenger cars

KAMA members have committed themselves to achieve the target and are running several R&D programmes. KAMA is convinced that these programmes will contribute to further reducing specific $CO_2$ emission to meet the target.

The technological activities can be divided into 5 major categories; Engine Programme, Transmission Programme, After-Treatment Improvement Programme, Car Weight Reduction Programme, and Reduction of Resistances Programme.

KAMA members have already reached the 2004 $CO_2$ emissions target range and also have a plan to reduce $CO_2$ emission by 2009 with some strategies such as applying new specific technologies to petrol and diesel engines, transmission, reducing resistance and drag, weight reduction, etc.

**Engine Programme**

In order to meet the targets by 2009, KAMA members have a plan to reduce $CO_2$ significantly by applying new technologies to petrol engine such as dual CVVT, aluminium cylinder block, engine friction reduction and direct injection, and also applying new technologies to diesel engine such as downsizing, combustion improvement, engine friction reduction, and ISG (Idle Stop & Go) system.

KAMA members are trying to develop the higher performance and lower $CO_2$ emission engines. KAMA members have introduced various kinds of technological developments to reduce $CO_2$ emissions over the monitoring period as follows.

- Advanced torque based actuator control
- Variable geometry intake system
- Combustion improvement
- CVVT
- Advanced knock control
- Fuel-cut range increase
- Swirl control system
- Six-hole injector
- Low friction piston ring
- Weight reduction
- HSDI diesel engine with cooled EGR and VGT

The new technologies and products launched by KAMA members have resulted in recent $CO_2$ reduction performance. KAMA members also have strategies of $CO_2$ reduction by developing the fuel-efficient engines such as DISI (Direct Injection Spark Ignition) engine, and HSDI engine, which have potentials of $CO_2$ reduction in 4-6 % and 30-40 % compared to conventional engines respectively.

KAMA members actually started to launch HSDI diesel cars onto the EU market from the end of 2001 and will increase the portion of diesel cars in taking the place of petrol cars. Small displacement passenger cars with 2$^{nd}$ generation HSDI engine were launched in 2003.

**Transmission Programme**

Transmission is one of the major factors affecting $CO_2$ emission. Its efficiency and speed are the main factors to be improved so as to reduce emissions. KAMA members are focusing on reducing $CO_2$ by 5 % with self-development of DCT, automatic transmission with variable line pressure control, CVT for the EU market.

KAMA members launched passenger cars with applied technologies such as the line-up variable control system for the improvement of efficiency with 6-speed manual transmission onto the EU market in 2002. KAMA members are also trying to develop 5 & 6-speed automatic transmission, DCT, technology of FGR tuning and Automated Selected Gearbox (ASG) for the EU market during the remaining period.

**After-Treatment Improvement Programme**

KAMA members are investigating several after-treatment systems for fuel-efficient diesel engines to be used in the near future, e.g. 4-way catalyst and photo catalyst systems. These will be applied to different car classes such as small and/or medium size cars and KAMA expects that these cars will be launched onto the EU market in the near future. Development of after-treatment system in parallel with $CO_2$ reduction to meet the stringent emission regulation, along with European OBD system for diesel cars in the EU was accomplished at the end of 2001 and was launched in 2002.

With the allowance of the domestic sale of diesel passenger cars from 2005, new after-treatment system in parallel with $CO_2$ reduction to meet the stringent emission regulation will be increased, which will remarkably contribute to $CO_2$ reduction.

**Car Weight Reduction Programme**

This programme is one of the major measures to contribute to $CO_2$ emission reduction. KAMA members are developing aluminium bodies and chassis for lightweight vehicles. This activity will consist of extrusion, three-dimensional bending, casting as well as tube hydro-forming. In the case of chassis, the suspension system is a promising area where new technology can be applied. Vehicle weight will be continuously reduced as long as the regulation on safety permits.

**Reduction of Resistances Programme**

KAMA members tried to develop new technologies such as reduction of engine friction and motor driven power steering for reducing $CO_2$ emission (by 5-15 %) which were launched into the EU market in 2003, and extended into the more units in 2004. Aerodynamic drag may be improved by reducing drag coefficient or modifying frontal area shape that have an effect on $CO_2$ reduction. Drag coefficient has been decreased significantly in recent years through expanded use of vehicle wind tunnel during research and development. Tire rolling resistance has been also decreased by each KAMA member's special specification for $CO_2$ reduction, along with low friction silica tire, preserve tire life, ride quality, brake distance, and handling under a variety of road conditions. KAMA members have already set to work for getting further gains of 5-10 % on this programme.

## 1.3 Description of market trends in physical fleet characteristics

There has been no significant market trend with regard to the physical fleet characteristics within the reporting period. KAMA members have achieved some improvements in new car $CO_2$ reduction as most parameters have decreased in general (see Section 2.4).

Averaged engine capacity decreased steadily after 1996 to 1,416 $cm^3$ in 1999 but increased to 1,546 $cm^3$ in 2002 and 1,632 $cm^3$ in 2003 due to the increased sale of medium size diesel cars. However, it decreased again down to 1,566 $cm^3$ in 2004, although the averaged engine power in 2004 is almost on the same level as in 2002 and 2003 (68 kW in 2002, 70 kW in 2003, and 69 kW in 2004). This results of KAMA members' efforts to apply the higher performance engine technologies such as HSDI, combustion improvement and reduction of engine friction, etc.

## 2. STATISTICAL MONITORING (1995-2004)

### 2.1 Trends in specific emission of $CO_2$ (g/km)

As shown in Figure 1, the average specific $CO_2$ emission of passenger cars sold by KAMA members on the EU market increased from 197 g $CO_2$/km in 1995 to 203 g $CO_2$/km in 1997. After 1997 it continuously decreased to 183 g $CO_2$/km in 2002, 179 g/km in 2003 and 168 g/km in 2004. KAMA members in the EU market achieved an average reduction in specific $CO_2$ emission of about 14.7 % over the period 1995 to 2004. Specific $CO_2$ emission from petrol cars, which occupied most sales volumes, reached the highest (201 g $CO_2$/km) in 1997 and decreased afterwards due to the increase of petrol mini car (<1000 $cm^3$) sales. After 2001, the number of diesel car sales increased from 55,219 units in 2001, 71,708 units (up by 29.9 %) in 2002 and 110,680 units (up by 54.3 %) in 2003 to 155,884 units (up by 40.8 %) in 2004, which affected the reduction of $CO_2$ emission.

Diesel cars with higher $CO_2$ emissions due to its heavier weight showed a sharp decrease of $CO_2$ emission within the reporting period. The overall trend in total fuel consumption shows a significant decrease from 1997 onward, mainly driven by the decrease of fuel consumption in petrol cars and by the increased sales of segment A/B diesel cars (see Figure 3).

The overall $CO_2$ emission of KAMA shows a steady decrease since 1998 and the $CO_2$ reduction rate of KAMA will be increased with increasing the number of diesel passenger cars by 2009.

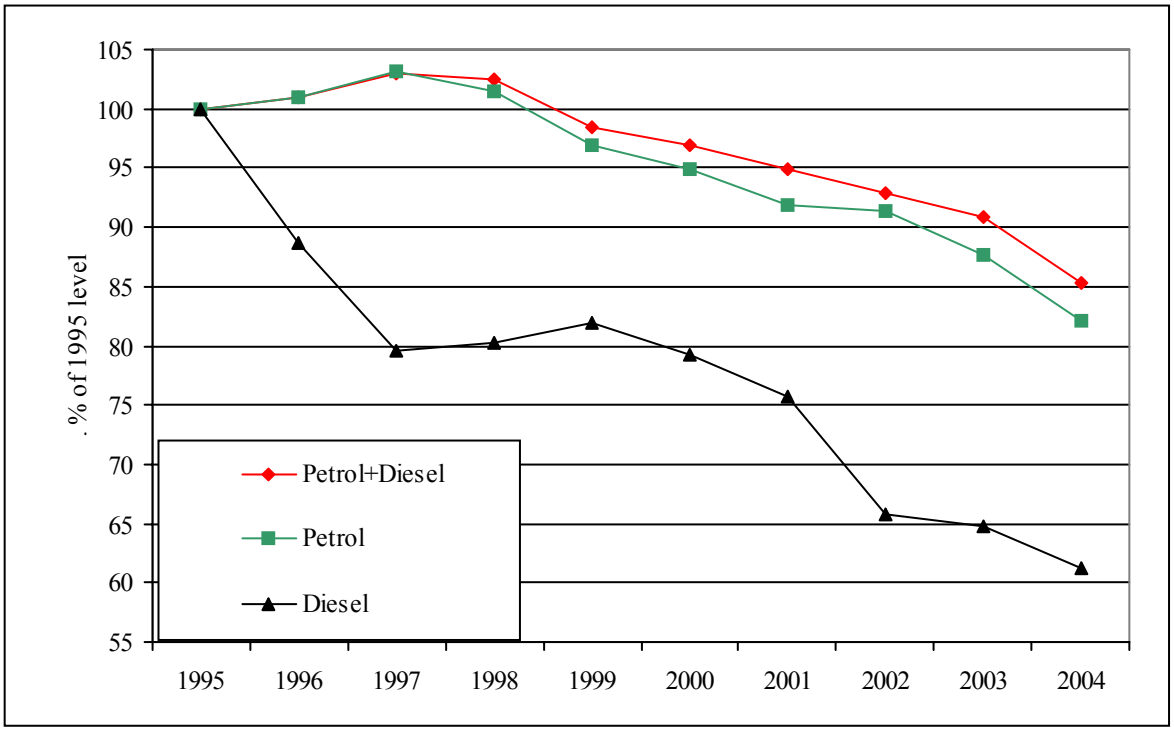



**Figure 3: KAMA's $CO_2$ Reduction Index (1995= 100)**

*(2002, 2003 and 2004: EU data are used)*

## 2.2 Number of newly registered passenger cars

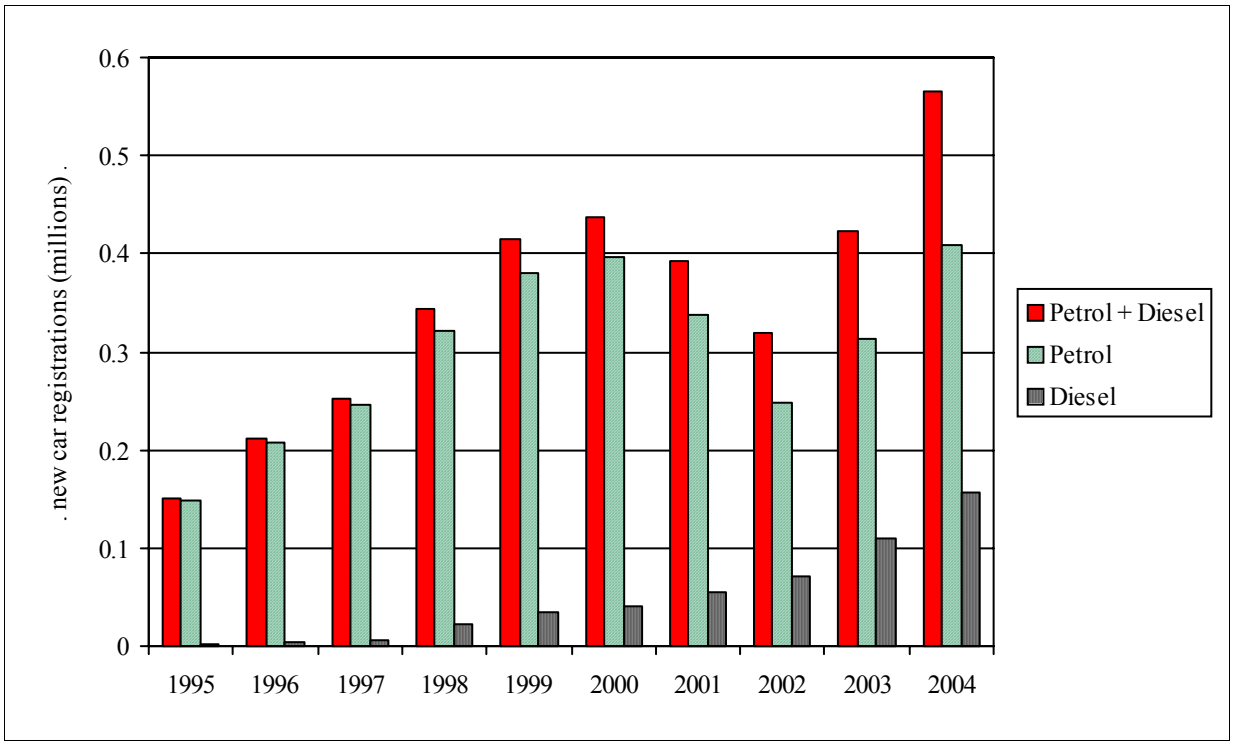
Total new car registration for petrol and diesel vehicles by KAMA was 565,392 units in 2004, increased by 33.6 % compared to 2003 registrations (423,282 units).

Even though petrol cars represent the largest share of new registrations every year, the share of petrol cars follows a continuous downwards tendency for the whole monitoring period, with higher decrease rates in the last 3 years (77.8 % in 2002, 73.9 % in 2003 and 72.4 % in 2004) (see Figure 4). The number of petrol cars emitting less than 140 g $CO_2$/km that were sold in the EU market before 2002 reached 38,121 units (9.0 % share) in 2003 and 139,768 units (24.7 % share) in 2004, showing a sharp increase rate. The number of diesel passenger cars sold increased from 55,219 units in 2001, 71,708 units in 2002 (up by 29.9 %) and 110,679 units in 2003 (up by 54.3 %) to 155,884 units (up by 40.8 %) in 2004 (see Figure 4).

## 2.3 Fleet Composition

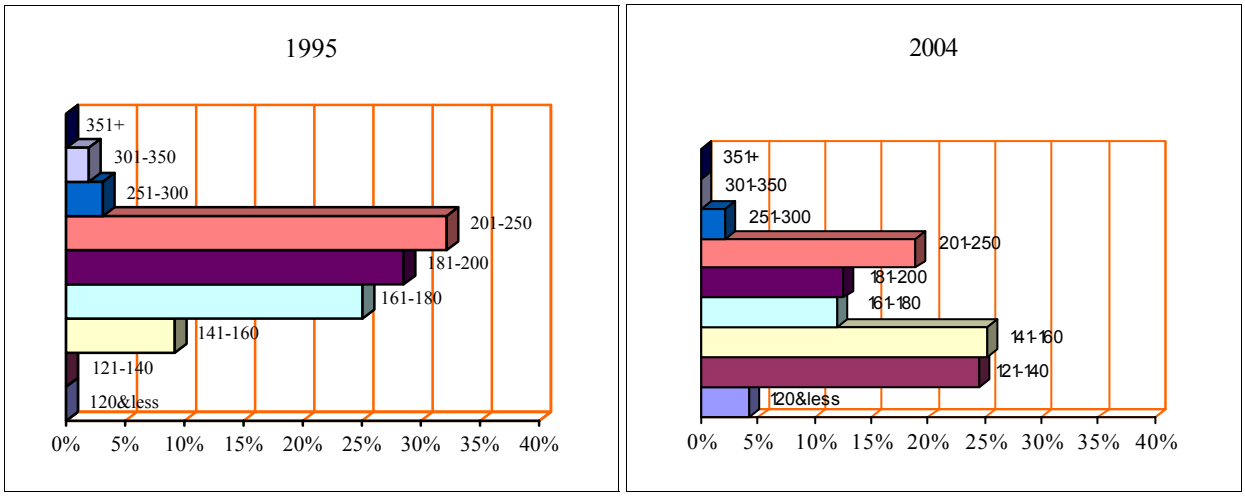
KAMA's fleet composition has changed towards more fuel-efficient cars over the monitoring period.

In 2004, KAMA's $CO_2$-related fleet composition continued to show a remarkable move towards more fuel-efficient cars, with sales of cars emitting 160 g $CO_2$/km or below rising to 54.1 % in 2004. The share of the 181-200 g $CO_2$/km category declined by 16.3 % over the period 1995 to 2004 (from 28.5 % to 12.2 %). The share of cars emitting 160 g $CO_2$/km or less has increased from 9.2 % in 1995 to 40.3 % in 2002, 45.2 % in 2003 and 54.1 % in 2004, which mainly contributed to reducing $CO_2$ emission (see Figure 5). Especially the number of cars in the lower categories of 140 g $CO_2$/km or less has reached 164,746 units (29.1 % share). This category has seen the most dramatic increase, thus contributing to KAMA's achievements. Even though the share of 200 g $CO_2$/km or more categories declined gradually every year (35.1 % in 2002, 28.4 % in 2003 and 21.0 % in 2004), further progress towards the lower categories should be achieved to meet the target of 2009.




**23. FIGURE 4: NUMBER OF NEWLY REGISTERED PASSENGER CARS BY KAMA**

*(2002, 2003 and 2004 EU data are used)*



24. FIGURE 5A : KAMA'S FLEET COMPOSITION PER $CO_2$ CATEGORY (% SHARE OF TOTAL REGISTRATIONS) IN 1995 AND 2004 (2004 BASED ON EU DATA NOT CORRECTED BY 0,7%)

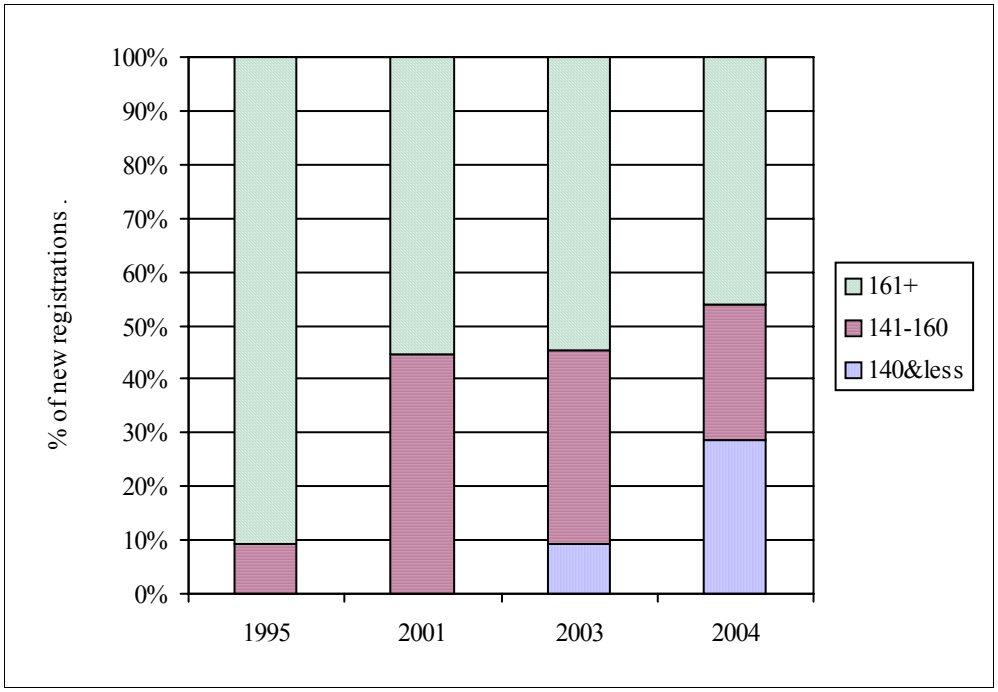



**Figure 5b: Change in KAMA's Fleet Composition between 1995, 2001, 2003 and 2004 by "aggregated $CO_2$ Categories"**

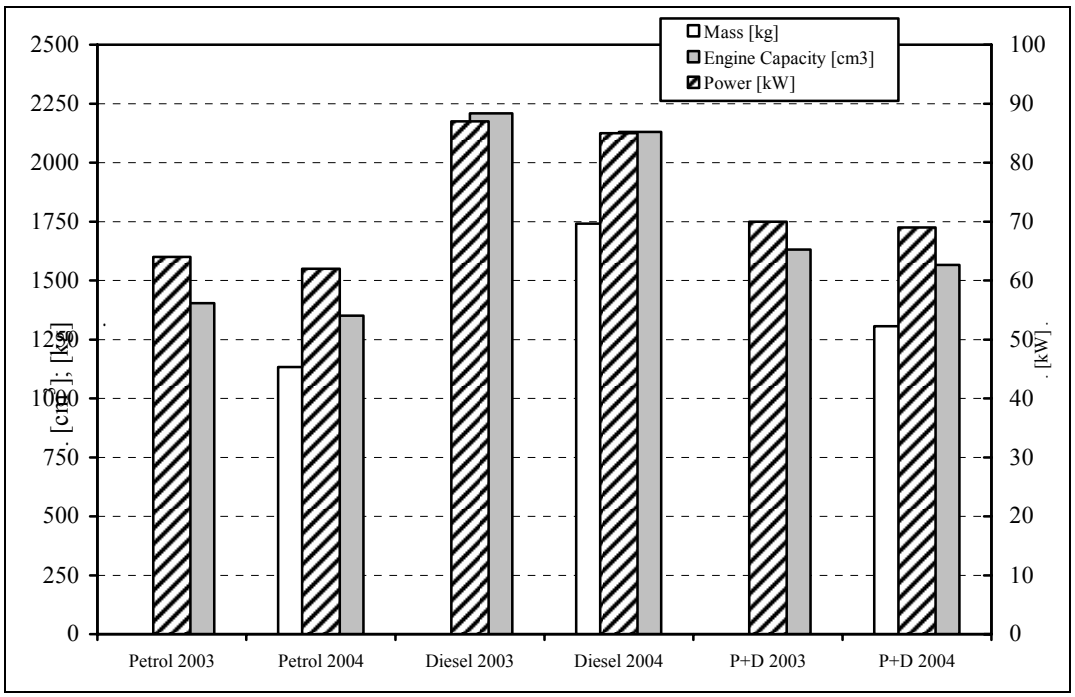
## 2.4 EU trends in physical fleet characteristics

While the mass of petrol cars decreased from 1,292 kg to 1,133 kg between 2003 and 2004, the mass of diesel cars also dropped for the same period from 1,905 kg to 1,741 kg. Consequently, the overall mass of newly registered cars has decreased from 1454 kg to 1306 kg, by 10.2 % between 2003 and 2004 (using KAMA data).

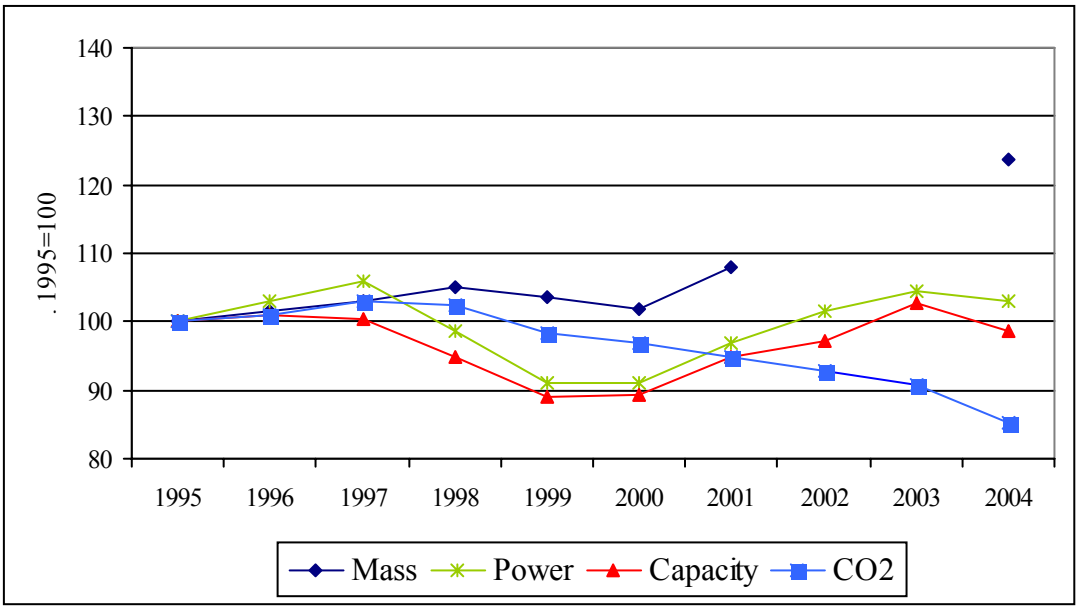
Total engine capacity has steadily decreased from 1,589 $cm^3$ in 1995 to 1,416 $cm^3$ in 1999 (with a slight increase in 1996) and increased to 1,546 $cm^3$ in 2002 and 1,632 $cm^3$ in 2003; but decreased into 1,566 in 2004. As a result, the engine capacity has decreased by 1.4 % over the whole monitoring period of 1995 to 2004, and decreased by 4.0 % over the period 2003 to 2004. Petrol engine capacity reached the maximum 1,583 $cm^3$ in 1996 (against 1,568 $cm^3$ in 1995), and reached 1,357 $cm^3$ in 2002, 1,404 $cm^3$ in 2003 and 1,351 $cm^3$ in 2004; i.e. decreased by 13.8 % over the period 1995 to 2004. Diesel engine capacity has generally decreased from 2,735 $cm^3$ in 1995 to 2,195 $cm^3$ in 2002, 2,209 $cm^3$ in 2003 and 2,130 $cm^3$ in 2004; i.e. decreased by 22.1 % over the period 1995 to 2004. The respective drops in petrol engine capacity (13.8 %) and in diesel engine capacity (22.1 %) have contributed to the decrease in overall engine capacity over the reporting period of 1995 to 2004, with total engine capacity (petrol + diesel) decreasing from 1,589 $cm^3$ in

1995 to 1,566 $cm^3$ in 2004 (by 1.4 %). The fact that the reduction rate of capacity for overall engines over the whole monitoring period is not so large as that of petrol or diesel engines taken separately is mainly due to the increase of the diesel cars market share, from 1.6 % in 1995 to 27.6 % in 2004 (see Figure 6).

Total engine power reached the maximum 71 kW in 1997 (against 67 kW in 1995) and was 68 kW in 2002, 70 kW in 2003 and 69 kW in 2004; i.e. finally increased by 3.0 % over the reporting period 1995-2004. Petrol engine reached the maximum 71 kW in 1997 (against 67 kW in 1995) and decreased to 62 kW in 2004, i.e. decreased by 7.5 % over the monitoring period. Diesel engine power has substantially increased by 31.8 % within the monitoring period, i.e. from 66 kW in 1995 to 85 kW in 2004 (see Figure 6b).




**Figures 6a : Physical KAMA fleet characteristics for 2003 and 2004**




**Figures 6b : Physical KAMA fleet characteristics 1995 to 2004 (percent of 1995 values)**

(The 2002 and 2003 official EU data on mass contained inconsistencies and are therefore not displayed in Figure 6b.)

## 2.5 Trends in new technologies

As noted in Section 1.2, KAMA members endeavoured to apply several technologies to reduce $CO_2$ emission such as torque based actuator control, advanced knock control, variable geometry intake system, HSDI diesel engine, engine & driving friction reduction, and weight reduction etc. within the reporting period.

The share of cars applied with several kinds of technical developments introduced by KAMA to reduce $CO_2$ emissions over the monitoring period of 2003 and 2004 are as follows.

- Advanced torque based actuator control : 35.7%
- Advanced knock control : 30.5 %
- Engine friction reduction : 33.4%
- HSDI diesel engines : 29.1%
- Variable geometry turbocharger : 3.9 %
- Combustion improvement : 44.2%
- Variable geometry intake system : 7.6 %
- Variable geometry timing system : 7.1%
- CVVT : 1.3%
- Cooled EGR : 9.1%
- Motor driven power steering : 14.9%
- Drag reduction : 40.6%
- Low friction tire : 51.8%
- Gear ratio tuning : 23.8%
- Automatic transmission efficiency improvement : 0.6%

- Weight reduction : 12.9%[28]

Among the above technologies, the HSDI technology has been concentrated on the high $CO_2$ emitting diesel passenger cars (250 g $CO_2$/km or more), and is known to contribute to the reduction of around 17 % of $CO_2$ emission in the SUV segments. The HSDI diesel engines among total registered cars in EU market reached the share of 29.1 % in 2004 compared with 24.9 % in 2003. The share of HSDI diesel engines will be expected to increase continually and hence low $CO_2$ emitting diesel passenger cars will also be of relative popularity for next several years, concurrently with diesel cars penetrating the Korean domestic market from 2005.

Besides HSDI, the technologies of combustion improvement, CVVT, cooled EGR and low friction tyre were more widely applied in 2004 than that had been in 2003, which also gave the benefit to achieve the intermediate $CO_2$ emissions target in 2004.

### 2.6 Trends in low emission passenger cars

KAMA supplied 24,288 units of the fuel-efficient cars emitting 120 g $CO_2$/km or less onto the EU market in 2004.

### 2.7 Trends in alternative concept passenger cars

KAMA members are developing Hybrid Electric Vehicles (HEV) and planning to launch them on the EU market in the near future.

### 2.8 Trends in innovative concept passenger cars

Nothing to report.

### 2.9 Brief Description of the degree of occurrence of Grey Areas between M1 and N1 vehicles in the Member States

Nothing to report.

### 2.10 Data sources, data methods and data confidence levels

2.10.1 Data Sources

2.10.2 Data Methods

2.10.3 Data confidence levels

Nothing to report.

### 2.11 Description of measurement issues for $CO_2$ Emission Factors

[28] The rates used in Section 2.5 are based on the KAMA's estimation number of cars shipped to the EU region in the monitoring period.

KAMA's $CO_2$ emissions figures have been established according to Directive 93/116/EC[29], which amended Directive 80/1268/EC. Among other changes, the new cycle includes for the first time a cold start period – the deletion of the initial 40 seconds of unmeasured engine idling prior to the commencement of the test, and consequently values for fuel consumption and $CO_2$ emissions are higher under the new system. The implementation of this new measuring procedure has led to an artificial average increase of the $CO_2$ emission figures, compared to the previously used Directive, whereas the $CO_2$ emissions from cars in the real world have not changed.

In 2002 it was also agreed that data from 2001 onwards should be adjusted by 0.7 %.

## 3. KEY ASSUMPTIONS TO THE COMMITMENT

### 3.1 Availability of Enabling Fuels

Nothing to report.

### 3.2 Distortion of Competition

Nothing to report.

### 3.3 Promotion of $CO_2$ efficient technologies

Cars with low $CO_2$ emission technology like lean burn engine and CVT could not be launched onto the EU market although they were introduced in 1998 in the Korean market, due to the stringent emission regulations of EU. KAMA members have high expectations for certain technologies; in particular those associated with fuel-efficient lean burn cars (with de-NOx catalyst) such as gasoline direct injection engines to contribute to reducing $CO_2$ emission in the near future.

### 3.4 Acceptance of innovation

Nothing to report.

## 4. OTHER ISSUES

### 4.1 New Measures affecting $CO_2$

[29] The Directive in force at the time of the KAMA Commitment.

Nothing to report.

### 4.2 New regulatory measures

Nothing to report.

### 4.3 Fiscal Measures

Nothing to report.

### 4.4 Breakthrough technologies

Nothing to report.

### 4.5 Research Programmes: Description and Future Potential

KAMA members have committed themselves to achieve a target (140 g $CO_2$/km of $CO_2$ emission in 2009) and are running several R&D programmes to investigate methods to reduce $CO_2$ emission up to 20-30 % according to the car segments.

The activities can be divided into several major categories: The Engine Programme, the Transmission Programme, the After-Treatment Improvement Programme, the Car Weight Reduction Programme, and the Reduction of Resistances Programme (see Section 1.2). KAMA members tried to develop new technologies for reducing $CO_2$ emission during the monitoring period such as advanced torque based actuator control, advanced knock control, engine friction reduction, HSDI diesel engines, variable geometry turbocharger, combustion improvement, variable geometry intake system, variable geometry timing system, CVVT, cooled EGR, motor driven power steering, drag reduction, low friction tire, gear ratio tuning, automatic transmission efficiency improvement and weight reduction.

These technologies will be combined and modified for reducing $CO_2$ emissions more and launched step by step onto the EU market in the near future.

In addition to the above technologies, KAMA members are trying to develop new technologies such as dual CVVT, advanced reduction of engine friction, reduction of resistances (running and rolling), small vehicle with 2$^{nd}$ generation HSDI engine, idle stop-go system, and hybrid vehicle for reducing $CO_2$ emissions; the number of cars which applied new technologies will be increased for meeting the targets of 2009.

Moreover, the consortium to develop the hybrid electric and the fuel cell electric vehicles has been selected as one of the next generation growth engines by the Korean government since 2004, and hence the newly developed technologies for these electric vehicles will be applied widely into

KAMA supplied cars in the near future. This trend will be the new turning point to step forward into achieving the final target in 2009.

### 4.6 Other measures - telematics, infrastructure, education

KAMA members will consider implementing the driver education activities for more environmentally friendly driving in the EU. KAMA believes that such initiatives will encourage customer acceptance of $CO_2$ efficient technology and are one of the contributors to "market changes linked to technical development" as specified in the Commitment.

KAMA also believes that measures such as the promotion of trade in purchase of new cars, presentation of correct and proper car maintenance methods, driver training, optimisation of infrastructure, effective and efficient land use, and efforts to achieve a smoother traffic flow by using Intelligent Transportation Systems (ITS) will have a beneficial effect on $CO_2$ reduction. KAMA thinks that such measures should therefore be embraced in a positive manner under government lead and with the co-operation of the industrial sectors involved.

### 4.7 Economic situation of the car industry

Even though the economic situation in Korea has been recovering gradually, the long lasting effects of economic crisis have retarded the $CO_2$ reduction of cars more than planned. The Commission notes that KAMA's sales in the EU have been rising sharply over the last 3 years, and reached their highest historic value in 2004.

KAMA notes that the development costs for technologies will be higher for their members than other associations that have large sales volume in the EU market and represents an important burden of investment to KAMA members during past several years after economic crisis.

One of KAMA members was recently sold out to a Chinese automaker.

## 5. CONCLUSIONS

### 5.1 Progress Statement on Delivering the Commitment

In 2004, KAMA achieved the intermediate target range of 165 - 175 g $CO_2$/km by the remarkable $CO_2$ reduction level of 11 g $CO_2$/km compared to the $CO_2$ emission level (179 g $CO_2$/km) in 2003.

KAMA members are committed to concentrate on additional $CO_2$ emission reductions by developing fuel-efficient cars. KAMA reduced the average $CO_2$ emission of its new passenger car fleet registered in the EU market from 197 g $CO_2$/km in 1995 to 168 g $CO_2$/km in 2004. This represents a reduction of 14.7 % over the whole monitoring period of 1995-2004 and 6.1 % over the period 2003 to 2004.

When the fleet composition is considered (see Section 2.3), an outstanding feature is the sharp increase of the share of low $CO_2$ cars emitting less than 160 g $CO_2$/km (54.1 %), which shows the endeavour and will of KAMA members to meet the Commitment.

Moreover, KAMA members supplied to the EU market 22,223 units of car model emitting less than 120 g $CO_2$/km, which played an essential role in achieving the 2004 target of $CO_2$ emissions level.

## 5.2 Statement on Expected Future Progress of the Commitment

In 2004 KAMA's $CO_2$-related fleet composition showed a wide move towards more fuel-efficient cars with 160 g $CO_2$/km or below car sales rising to 54.1 % from 9.2 % in 1995.

The average $CO_2$ emission in 2004 indicated the value of 168 g $CO_2$/km, and therefore KAMA fulfilled the intermediate target range of 165-170 g $CO_2$/km in 2004. Importantly, and as agreed upon, the targets has mainly be achieved by technological developments affecting different car characteristics and market changes linked into these developments.

Regarding technological developments, although the current progress in fuel-efficient car technology development of KAMA members is relatively slower than that of European automobile manufacturers KAMA will increase the share of more fuel-efficient cars with the new technologies such as 2$^{nd}$ generation HSDI engine for small size passenger cars, high efficiency manual transmission with 6 speed, high efficiency automatic transmission with 5 speed, DCVVT (Dual Continuous Variable Valve Timing), MDPS (Motor Driven Power Steering) and alternative fuel combustion system (HEV, Fuel cell, etc.), etc..

KAMA members launched diesel passenger cars on the EU market and achieved $CO_2$ emission of 168 g $CO_2$/km even without the sales of this technology in the domestic market. In the future, the R&D activities of KAMA members will be accelerated and low $CO_2$ emitting diesel passenger cars will be expected to be of relative popularity, which will remarkably contribute to $CO_2$ reduction.

In order to get the final value of 140 g $CO_2$/km in 2009, KAMA will further explore the various technologies such as the above mentioned to reduce $CO_2$ emissions, and should achieve the higher average reduction of 5.6 g $CO_2$/km (3.3 %) a year during the remaining period of the commitment rather than the annual reduction rate of 3.2 g $CO_2$/km (1.6 %) over the monitoring period of 1995 to 2004. KAMA is well aware that the 2009 target remains extremely challenging both technically and economically.

In summary, while the 2009 target remains still challenging for KAMA, the 2004 monitoring report shows that KAMA is fully in line with its Commitment and, in the present circumstances, KAMA has no reason to believe that it would not live up to its Commitment. However, the Commission and KAMA see a need to accelerate further the introduction of fuel-efficient new technologies to reach the 2009 target.

# ANNEXES (2004)

ANNEX 1: DATA ANNEXES

*(Note: EU official data)*

A1: SPECIFIC FUEL EFFICIENCY (l/100km) AND EMISSIONS OF $CO_2$ (g/km) AVERAGED OVER ALL NEWLY REGISTERED PASSENGER CARS FOR EACH DIFFERENT FUEL-TYPE, FOR THE EU AND EACH MEMBER STATE

A2: THE DISTRIBUTION OF $CO_2$ EMISSIONS (g/km) IN THE NEW PASSENGER CAR FLEET FOR EACH DIFFERENT FUEL TYPE, FOR THE EU

A3: THE DISTRIBUTION OF AVERAGED MASS, POWER AND ENGINE CAPACITY OF NEW PASSENGER CARS FOR EACH FUEL TYPE FOR THE EU-15 AND EACH MEMBER STATE

ANNEX 2: Major Review of KAMA's Commitment on CO2 Emission Reductions from Passenger Cars, including an assessment in accordance with Article 10 of Decision 1753/2000/EC - Joint Conclusions of the Korea Automobile Manufacturers Association and the Commission Services

A1: SPECIFIC FUEL EFFICIENCY (l/100km) AND EMISSIONS OF $CO_2$ (g/km)* AVERAGED OVER ALL NEWLY REGISTERED PASSENGER CARS FOR EACH DIFFERENT FUEL-TYPE FOR THE EU 15 AND EACH MEMBER STATE

| | | Identified version | | | | | | | | | | | | Unknown version |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **TOTAL** | **All Fuels** | | **Petrol** | | | **Diesel** | | | **Petrol+Diesel** | | | **AFV** | | |
| | Number | Number | average $CO_2$ | Number | average fuel | average $CO_2$ | Number | average fuel | average $CO_2$ | Number | average fuel | average $CO_2$ | Number | average $CO_2$ | |
| **EU 15** | **- -** | **565483** | **168** | **409508** | **6,7** | **160** | **155884** | **7,1** | **189** | **565392** | **6,8** | **168** | **91** | **194** | **- -** |
| Austria | 14664 | 14661 | 171 | 7600 | 6,5 | 153 | 7061 | 7,2 | 191 | 14661 | 6,8 | 171 | 0 | 0 | 3 |
| Belgium | 16327 | 16122 | 171 | 9463 | 6,8 | 161 | 6659 | 6,9 | 184 | 16122 | 6,8 | 171 | 0 | 0 | 205 |
| Denmark | 12411 | 12411 | 162 | 10824 | 6,9 | 164 | 1587 | 5,6 | 149 | 12411 | 6,8 | 162 | 0 | 0 | 0 |
| Finland | 4485 | 4485 | 181 | 4157 | 7,7 | 181 | 328 | 6,5 | 174 | 4485 | 7,6 | 181 | 0 | 0 | 0 |
| France | 45068 | 45068 | 173 | 18840 | 6,6 | 157 | 26199 | 6,9 | 184 | 45039 | 6,8 | 173 | 29 | 209 | 0 |
| Germany | 96852 | 85530 | 176 | 67392 | 7,1 | 168 | 18138 | 7,7 | 204 | 85530 | 7,2 | 176 | 0 | 0 | 11322 |
| Greece | 35028 | 34951 | 160 | 34251 | 6,7 | 159 | 700 | 7,5 | 199 | 34951 | 6,7 | 160 | 0 | 0 | 77 |
| Ireland | 9429 | 9422 | 181 | 7088 | 7,3 | 172 | 2334 | 7,8 | 208 | 9422 | 7,4 | 181 | 0 | 0 | 7 |
| Italy | 106846 | 106826 | 157 | 72498 | 6,1 | 146 | 34279 | 6,9 | 182 | 106777 | 6,4 | 157 | 49 | 173 | 20 |
| Luxembourg | 3091 | 3091 | 165 | 821 | 7,0 | 165 | 2270 | 6,2 | 166 | 3091 | 6,4 | 165 | 0 | 0 | 0 |
| Netherlands | n.d. | 37615 | 168 | 35306 | 7,0 | 165 | 2309 | 7,8 | 209 | 37615 | 7 | 168 | 0 | 0 | n.d. |
| Portugal | 6448 | 6448 | 152 | 4492 | 6,0 | 143 | 1954 | 6,4 | 170 | 6446 | 6,2 | 152 | 2 | 220 | 0 |
| Spain | 101830 | 89408 | 162 | 60813 | 6,5 | 154 | 28595 | 6,6 | 177 | 89408 | 6,6 | 162 | 0 | 0 | 12422 |
| Sweden | 13584 | 13581 | 188 | 12928 | 7,9 | 186 | 653 | 8,5 | 225 | 13581 | 7,9 | 188 | 0 | 0 | 3 |
| UK | n.d. | 85864 | 175 | 63035 | 6,9 | 164 | 22818 | 7,8 | 207 | 85853 | 7,1 | 175 | 11 | 245 | n.d. |

* Correction factor: 0.7%

A2: THE DISTRIBUTION OF $CO_2$ EMISSIONS (g/km) IN THE NEW PASSENGER CAR FLEET FOR EACH DIFFERENT FUEL TYPE FOR THE EU-15*

KAMA MEMBERS - 2004

| $CO_2$-Category | All fuels | | Petrol | | Diesel | | 25. PETROL + DIESEL | | 26. AFV | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number | Average $CO_2$ | Number | Average $CO_2$ | Number | Average $CO_2$ | Number | Average $CO_2$ | Number | Average $CO_2$ |
| <60 | | | | | | | | | | |
| 60-80 | | | | | | | | | | |
| 81-100 | | | | | | | | | | |
| 101-120 | 24,287 | 118 | 19,376 | 119 | 4,911 | 116 | 24,287 | 118 | | |
| 121-140 | 140,459 | 134 | 120,392 | 134 | 20,066 | 129 | 140,458 | 134 | 1 | 133 |
| 141-160 | 141,005 | 153 | 118,287 | 152 | 22,693 | 154 | 140,980 | 153 | 25 | 159 |
| 161-180 | 72,107 | 171 | 67,744 | 171 | 4,349 | 171 | 72,093 | 171 | 14 | 169 |
| 181-200 | 69,073 | 190 | 38,258 | 189 | 30,810 | 190 | 69,068 | 190 | 5 | 192 |
| 201-250 | 106,683 | 222 | 36,309 | 222 | 70,336 | 222 | 106,645 | 222 | 38 | 215 |
| 251-300 | 11,377 | 271 | 9,008 | 274 | 2,361 | 259 | 11,369 | 271 | 8 | 276 |
| 301-350 | 381 | 306 | 24 | 315 | 357 | 306 | 381 | 306 | | |
| 351-450 | 110 | 357 | 110 | 357 | | | 110 | 357 | | |
| >450 | 1 | 469 | 0 | 0 | 1 | 469 | 1 | 469 | | |

* The correction factor (0.7 %) is not considered on these data.

A3: THE DISTRIBUTION OF AVERAGED MASS, POWER AND ENGINE CAPACITY OF NEW PASSENGER CARS FOR EACH FUEL TYPE

| Member State | Mass [kg] | | | | | Power [kW] | | | | | Capacity [cm³] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Petrol | Diesel | Petrol+ Diesel | AFV | Total | Petrol | Diesel | Petrol+ Diesel | AFV | Total | Petrol | Diesel | Petrol+ Diesel | AFV |
| **EU 15** | **1306** | **1133** | **1741** | **1306** | **1299** | **69** | **62** | **85** | **69** | **70** | **1566** | **1351** | **2130** | **1566** | **1647** |
| Austria | 1444 | 1132 | 1781 | 1444 | - - | 72 | 58 | 88 | 72 | - - | 1694 | 1293 | 2125 | 1694 | - - |
| Belgium | 1302 | 1071 | 1636 | 1302 | - - | 68 | 59 | 81 | 68 | - - | 1542 | 1264 | 1944 | 1542 | - - |
| Denmark | 1249 | 1224 | 1418 | 1249 | - - | 71 | 71 | 71 | 71 | - - | 1545 | 1512 | 1769 | 1545 | - - |
| Finland | 1276 | 1249 | 1621 | 1276 | - - | 77 | 77 | 81 | 77 | - - | 1622 | 1592 | 1999 | 1622 | - - |
| France | 1433 | 1087 | 1681 | 1433 | 1344 | 74 | 60 | 83 | 74 | 76 | 1718 | 1306 | 2014 | 1718 | 1732 |
| Germany | 1354 | 1197 | 1933 | 1354 | - - | 76 | 71 | 96 | 76 | - - | 1706 | 1516 | 2412 | 1706 | - - |
| Greece | 1135 | 1120 | 1856 | 1135 | - - | 62 | 61 | 89 | 62 | - - | 1356 | 1340 | 2145 | 1356 | - - |
| Ireland | 1466 | 1264 | 1916 | 1466 | - - | 75 | 68 | 94 | 75 | - - | 1664 | 1479 | 2224 | 1664 | - - |
| Italy | 1218 | 1001 | 1678 | 1218 | 1216 | 60 | 49 | 84 | 60 | 67 | 1408 | 1094 | 2071 | 1408 | 1409 |
| Luxembourg | 1430 | 1164 | 1527 | 1430 | - - | 72 | 66 | 75 | 72 | - - | 1717 | 1429 | 1820 | 1717 | - - |
| Netherlands | 1196 | 1153 | 1852 | 1196 | - - | 67 | 65 | 93 | 67 | - - | 1455 | 1401 | 2288 | 1455 | - - |
| Portugal | 1216 | 1083 | 1522 | 1216 | 1335 | 57 | 50 | 72 | 57 | 83 | 1352 | 1139 | 1841 | 1352 | 1798 |
| Spain | 1273 | 1119 | 1601 | 1273 | - - | 66 | 59 | 80 | 66 | - - | 1508 | 1295 | 1960 | 1508 | - - |
| Sweden | 1340 | 1308 | 1973 | 1340 | - - | 83 | 83 | 98 | 83 | - - | 1772 | 1744 | 2313 | 1772 | - - |
| UK | 1502 | 1224 | 2042 | 1502 | 1758 | 85 | 73 | 95 | 85 | 38 | 1687 | 1410 | 2452 | 1687 | 2456 |

ANNEX 2

**Major Review of KAMA's Commitment on $CO_2$ Emission Reductions from Passenger Cars, including an assessment in accordance with Article 10 of Decision 1753/2000/EC**

**Joint Conclusions of the Korea Automobile Manufacturers Association and the Commission Services**

## Section 1: Background

KAMA undertook in their voluntary Commitment to reduce new passenger car $CO_2$ emissions to carry out, based on 2004 data, a "Major Review" addressing the following:

> *"KAMA is willing to contribute to a periodic monitoring of its commitments, jointly undertaken by KAMA and the Commission, which it sees as the main tool to examine the evolution during the period of the Commitment. This should include a joint "Major Review" in 2004, covering both KAMA and non-KAMA developments. This would incorporate the results of $CO_2$ emission reductions up to and including calendar year 2004, including comparison of that year's fleet average to the estimated target range."*

With regard to this 'estimated target range', the KAMA Commitment states:

> *"For 2004, KAMA considers an estimated target range of 165-170 g $CO_2$/km to be appropriate."*

Moreover the Annex of the voluntary Commitment states:

> *"The reduction in $CO_2$ emissions will not be linear; the pace will notably depend on the timing of availability of the enabling fuels on the market as well as on the lead-times for new technologies and products and their market penetration. The reduction profile is therefore expected to be relatively slow initially and to gather pace later."*

Article 10 of Decision 1753/2000/EC[30] requires that:

[30] Decision No 1753/2000/EC of the European Parliament and of the Council of 22 June 2000 establishing a scheme to monitor the average specific emissions of $CO_2$ from new passenger cars. *OJ L 202 , 10/08/2000 P. 0001 – 0013.*

*"The reports for intermediate target years and the final target years will indicate whether the reductions are due to technical measures taken by the manufacturers or to other measures such as changes in consumer behaviour."*

Since the evaluations to be carried out under the "Major Review" and under Article 10 are partly overlapping a joint assessment has been carried out by KAMA and the European Commission. Apart from KAMA's and the European Commission's own contributions this work was supported by studies and service contracts[31].

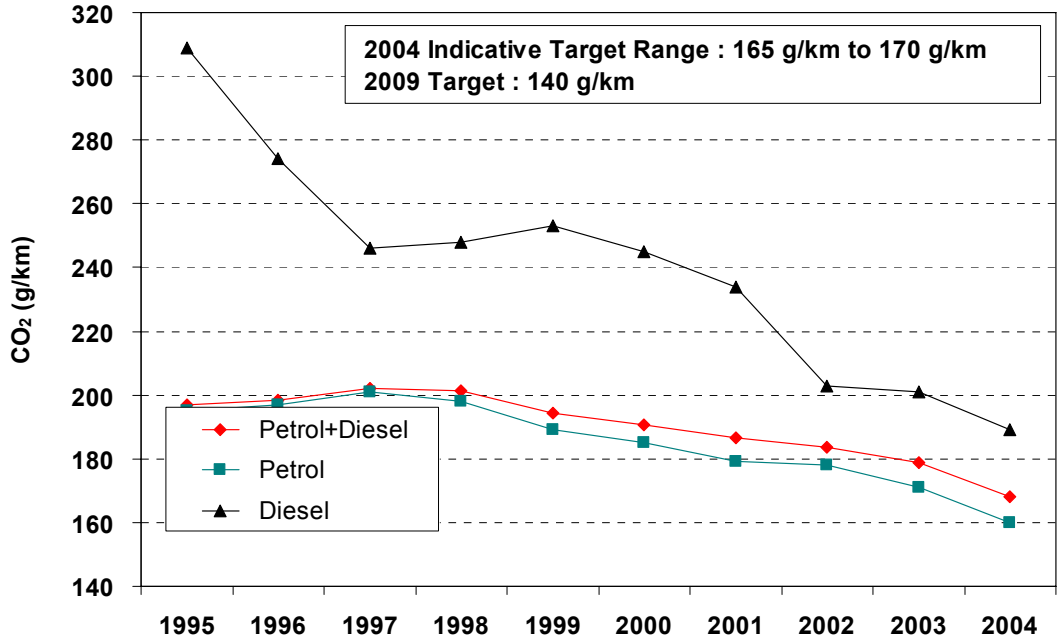
**Section 2: Observed $CO_2$ values and main KAMA Achievements with respect to its $CO_2$ Commitment**

Without further analysis it can be clearly established that KAMA has met the following undertakings made in its Commitment:

- In 2003, KAMA introduced in the EU market car models emitting 120 g $CO_2$/km or less, and the number of such cars sold increased significantly in 2004;
- Before the end of 2004, KAMA submitted to the European Commission its review on the potential for additional $CO_2$ reduction, with a view to moving further towards the Community's objective of 120g $CO_2$/km by 2012;
- KAMA contributed to a transparent monitoring of the Commitment.

Concerning the observed $CO_2$ values they fell into the intermediate target range of 165-170 g /km in 2004 (see 2004 data, as presented in the 2005 Joint Monitoring Report). KAMA's initial prediction that the reduction in $CO_2$ emissions will not be linear has so far turned out to be correct. The KAMA fleet data show that the average specific $CO_2$ emission value increased from 197 g /km in 1995 to 203 g /km in 1997, but since 1997 it continuously decreased to 168 g/km in 2004. KAMA members achieved an average reduction of about 14.7 % over the period 1995 to 2004.

[31] DLR service contract contribution: "Preparation of the 2003 review of the commitment of car manufacturers to reduce $CO_2$ emissions from M1 vehicles - Final Report of Task A (Article 10)"




Two crucial questions have been addressed in the course of the "Major Review"/Article 10 work:

1) Have there been obstacles in the operating environment, for which KAMA cannot be held accountable, but which hampered its efforts to meet the Commitment, or which caused underperformance? This question is addressed in Section 3.

2) Have factors other than technological developments by KAMA members resulted in changes of the specific $CO_2$ emissions of new passenger cars? This question is addressed in Section 4.

The answers to these questions are important in answering whether or not the observed $CO_2$ reductions can be fully counted towards the achievement of the KAMA members, and whether or not KAMA could have achieved more but for obstacles in the operating environment.

## Section 3: Operating Environment

The text of the Commitment lists a number of assumptions made by KAMA at the point of signature. These assumptions mainly concern:

i. The economic situation
ii. Enabling fuels
iii. Regulatory conditions
iv. Unhampered diffusion of technology and acceptance of innovations

If the assumptions are met it is assumed that no obstacles have occurred in the period covered by the "Major Review".

**Economic Situation**

KAMA and the Commission agree that the performance of the automotive industry and its capability to invest in technological innovations is dependent on a strong and healthy macro-economy. This also facilitates the market take-up of advanced and typically more expensive technologies.

With regard to this, Joint Monitoring System states:

> *"Any detrimental impact on the financial performance, competitiveness and employment within the Korean industry associated with the Commitment will be reviewed, including on the structural change of the Korean automobile industry as regards to mergers and acquisitions, and its impact on the commitments. Negative effects on the Korean car industry which go beyond those which might normally be expected in the context of their Commitment will be taken into consideration in the monitoring procedure."*

The long lasting effect of Korean economic crisis deteriorated the capabilities of Korean car makers, affecting lower $CO_2$ reduction of cars as planned. Over the reporting period, KAMA's new cars sales in the EU increased steadily until 2000, followed by a sharp decrease in 2001 and 2002. Since then sales increased again, and reached a historic highest in 2004.

KAMA notes that the development costs for technologies will be higher for its members than for other associations that have large sales volume in the EU market, and that these costs have represented an important burden of investment to KAMA members during past several years after economic crisis.

Although KAMA is of the opinion that it is working in an increasingly difficult economic environment there are no indications that this should have had a significant adverse effect on the implementation of the Commitment within the review period.

**Enabling Fuels**

The Commitment is based on fuel qualities as laid down in Directive 98/70/EC (50 ppm sulphur content). In the Commitment KAMA expects marketed fuels to have a sulphur content of 30 ppm in 2005 (which is beyond the review period). The Commission's fuel quality monitoring[32] shows full compliance with Directive 98/70/EC. Moreover, a few Member States have started to introduce low sulphur fuels with a sulphur content of 10 ppm.

| **EU 15** | **Average Sulphur Content, ppm** | | | |
|---|---|---|---|---|
| **Fuel / Year** | **2001** | **2002** | **2003*** | **2004*** |
| ***Petrol*** | 68 | 51 | 37 | 35 |
| ***Diesel*** | 223 | 169 | 125 | 113 |

*Excludes France, which did not report in 2003 and 2004.

Although KAMA had preferred to see 30 ppm or 10 ppm fuels homogeneously made available on the EU market, it is in general satisfied with the fuel qualities provided in the review period.

**Automotive Regulations**

The Commitment was made in 1999. According to the Commission, since that point of time, in the review period no new EU regulation relevant for $CO_2$ emissions came into effect.

KAMA is currently investigating this issue focusing on the potential impacts of legislation on emissions, safety, recycling and other legislative developments over the whole

[32] updated data based on COM(2004 )310.

Commitment period as well as their implications for the move towards the Community objective of 120 g/km in 2012.

**Technologies and innovations**

Over the 1995 to 2004 period, KAMA members introduced a wide range of the newly developed technologies into the EU market to reduce $CO_2$ emissions. These technologies cover all the vehicle engineering fields such as the improvement of engine efficiency, improvement of transmission, reduction of vehicle weight, reduction of air resistance, improvement of rolling resistance, etc. Major applications of technical developments introduced by KAMA to reduce $CO_2$ emissions are as follows:

- Improvement of engine efficiency

With the help of electronically controlled fuel injection system, KAMA members were able to introduce the quiet and smooth operating diesel engines, so called HSDI, from 2001, and to contribute to extending the share of diesel cars in the EU market. This technology has been applied mainly to the diesel engines in the SUV segments and contributed to the large reduction of $CO_2$ emission. The HSDI diesel engines among total newly registered KAMA cars in EU market reached the share of 29.1 % in 2004 and is expected to steadily increase and contribute to a remarkable reduction of $CO_2$ in the EU market. Moreover, the share of small diesel cars in the EU market could be remarkably increased in 2003 and 2004 owing to the benefits of the HSDI technology.

Besides the HSDI diesel engines, there are many other technologies that contributed to improve the engine efficiency, as described below:

- Variable geometry intake system
- CVVT (Continuously Variable Valve Timing)
- Variable geometry turbocharger
- Advanced knock control
- Fuel-cut range increase
- Cooled EGR (Exhaust Gas Recirculation)
- Swirl control system
- Engine friction reduction
- Advanced torque based actuator control

- Improvement of transmission

The efficiency and speed of transmission are also major factors to be improved so as to reduce $CO_2$ emissions. KAMA members launched passenger cars with the line-up variable control system for the improvement of efficiency with 6-speed manual transmission onto the EU market in 2002, and also developed the initial models of 5 & 6-speed automatic transmission, and FGR (Final Gear Ratio) tuning for the EU market in recent period.

- FGR tuning
- Automatic transmission efficiency improvement (5 & 6-speed)

➢ Reduction of vehicle weight

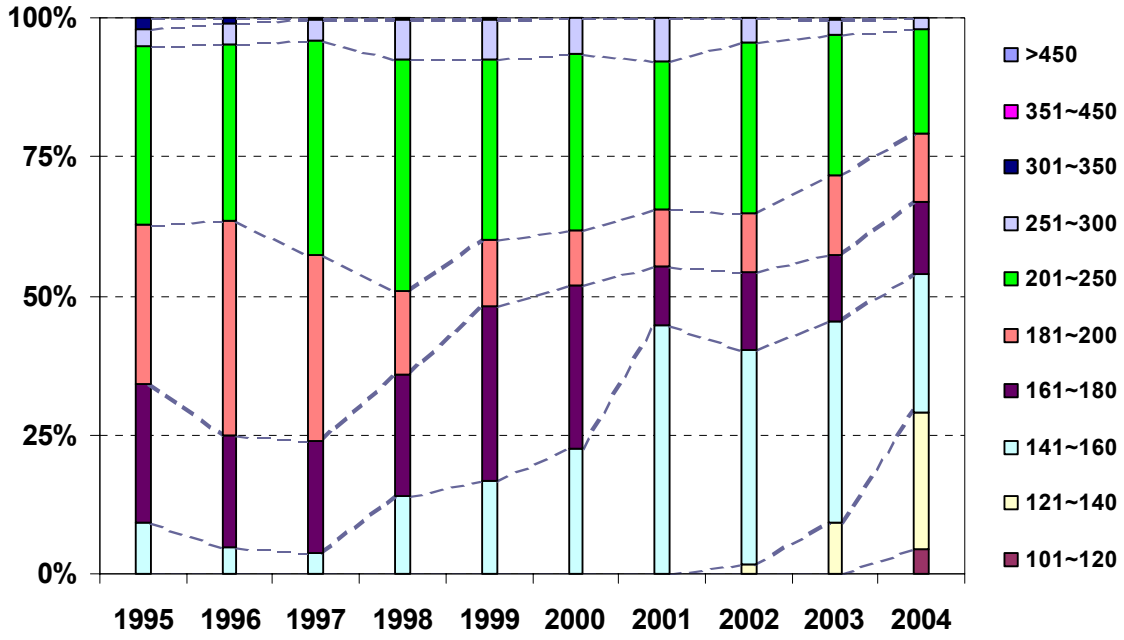
The vehicle weight is one of the major determinants of $CO_2$ emissions, and the increase of weight may offset the benefits achieved by the introduction of new technologies to reduce the $CO_2$ emissions. Hence, KAMA members applied the modern light weight materials such as high strength low alloy steel and/or aluminium into the vehicle body, the engine and the other subsidiary parts. As a result, the introduction of vehicle weight reduction technologies contributed to the reduction of the total specific $CO_2$ emissions during the monitoring period, although overall the average vehicle mass of new cars sold by KAMA increased over that period.

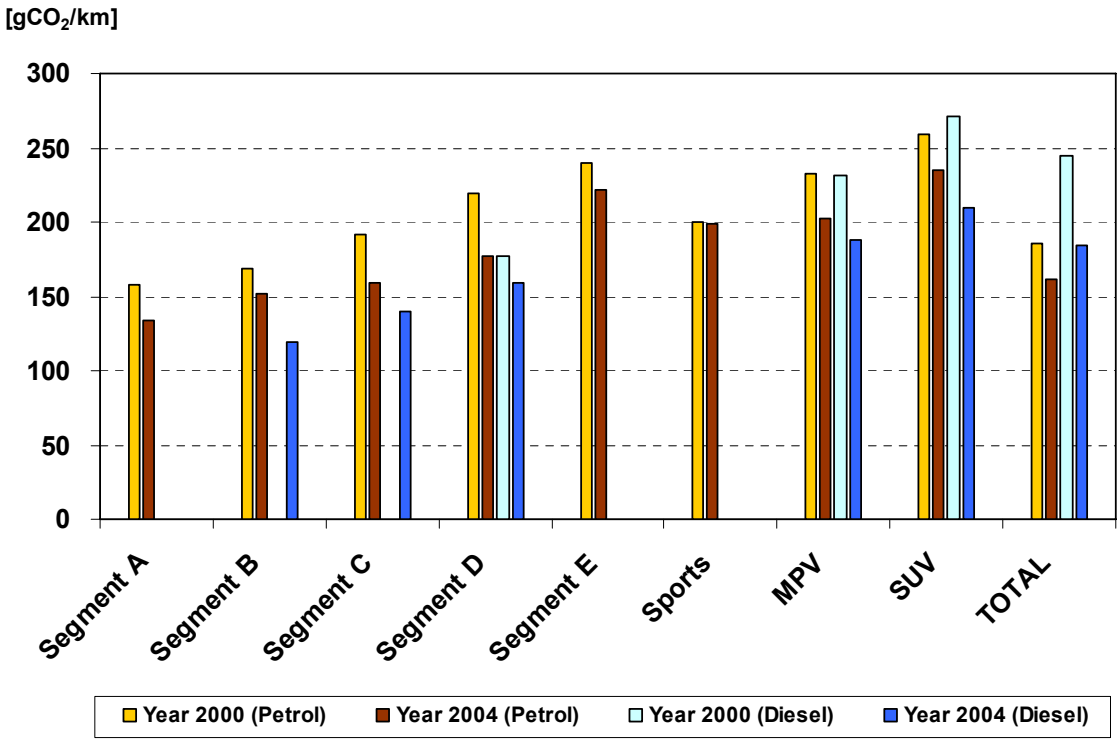
➢ Improvement of vehicle resistance

KAMA members launched the motor driven power steering into the EU market in 2003, and increased its market penetration in 2004. Aerodynamic drag may be improved by reducing drag coefficient, which has been decreased significantly in recent years through extended use of vehicle wind tunnel during research and development. Tire rolling resistance has been also decreased notably with the application of low friction silica tire taking into account handling under a variety of road conditions.

- Motor driven power steering
- Drag reduction
- Low friction tire

In 2004, the share of low $CO_2$ cars emitting less than 160 g $CO_2$/km reached 54.1 % regarding the fleet composition by the outstanding endeavour and the will of KAMA members to meet the Commitment.




**Section 4: Other factors beside technological developments**

DLR[33] has been contracted by the Commission in order to investigate whether other factors beside technological developments have contributed to the observed reductions of the $CO_2$ emissions of new passenger cars between 1995 and 2003. For this purpose DLR applied descriptive and econometric methods. The conclusions drawn from these investigations are presented below, and are considered to be also valid for the year 2004.

**Technical influences**

Remarkable changes in the use of technologies for the reduction of the fuel consumption for new passenger cars have been observed within the period under investigation. In this regard the analysis of DLR confirms the observations presented under Section 3 for the period 1995-2004. The identified improvement in diesel technology is much than in petrol technology. While the identified improvement in the individual segments ranges between 0.1% and 17.6% for petrol vehicles, it ranges between 5.5% and 20.6% for diesel vehicles.

**Non-technical influences**

Non-technical influences with a potential to affect the behaviour of car purchasers were analysed: politically motivated measures such as taxes and car labelling but also socio-economic trends, e.g. fuel prices, per capita GDP, and other factors like the model range demanded by consumers and/or offered by the manufacturers. The effects of these variables on KAMA's average specific $CO_2$ emissions were analysed with the following results:

- Influences with respect to the model range

Concerning KAMA's car fleet, some changes have been observed between 1996 and 2004[34]. Most significant is the growth of segment B (Small cars), which represented only 0.02 % of all new registrations in 1996 but 29.7 % in 2004. In addition a considerable growth appeared for segment A (Mini cars) from 3.3 % to 20.9 %, as well as for MPV (Multi Purpose Vehicles), from 5.7 % to 18.6 %, and for SUV from 4.2 % to 16.4 %.

On the other hand, a steep decreasing trend is seen for the share of segment C (Lower Medium cars) from 72.0 % of all new registrations in 1996 to 5.8 % in 2004. The segment D (Medium cars) also shows the significant decrease from 14.7 % to 5.1 %.

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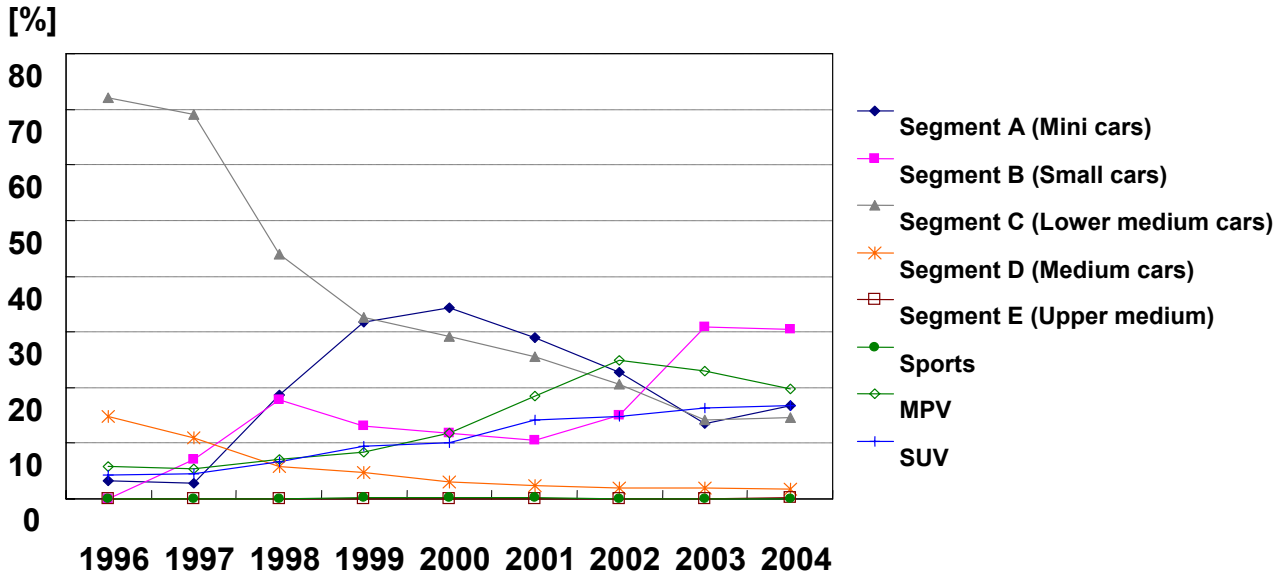
33 German Aerospace Centre - Institute of Transport Research: "*Preparation of the 2003 review of the commitment of car manufacturers to reduce $CO_2$ emissions from M1 vehicles*".

34 Due to high inconsistencies, data for 1995 could not be used.

If the segment structure had not changed between 1996 and 2004, but the specific emissions per segment had developed according to the actual observed values (including the progressive dieselisation of the fleet), the average $CO_2$ emission of KAMA's fleet for 2004 would have been 6.4 $gCO_2$/km lower than the monitored value (translating into an hypothetical 161.6 $gCO_2$/km compared to the observed value of 168.0 $gCO_2$/km in 2004). However in 1996 KAMA's car fleet was highly dominated by segment C (Lower medium cars) representing more than 70% of its fleet. KAMA members have endeavoured and managed to develop their offer in a more balanced way across the various segment ranges, and the 1996-2004 comparison at constant segment structure therefore has mainly an illustrative value. This widening of the offer has notably resulted in a fair increase of the SUV and MPV segments, as outlined above.




- Influences with respect to car labelling

The effectiveness of the car labelling Directive 1999/94/EC is currently being assessed as part of the implementation of Article 9 of this Directive. Although no final assessment is available at this point of time, all information indicates that the car labelling Directive had, up to now, only negligible effects on consumer's car choice and did therefore not contribute to the observed reduction in specific $CO_2$ emissions.

- Influences with respect to the GDP per capita, fuel prices and circulation taxes:

Several attributes were included as variables in the models and, after a pre-assessment of results, the parameters per capita GDP, fuel prices and circulation taxes were selected for more detailed scenario analysis to understand the extent to which changes in these variables could affect average $CO_2$ emissions. DLR's analysis calculates differences in hypothetical

$CO_2$ values that would result in that year depending on different values for per capita GDP, fuel prices and circulation taxes. Overall, the investigation finds some evidence of positive and negative influences of non-technical factors on average $CO_2$ emissions in the period analysed. Given the magnitude and mixture of effects, as well as the associated uncertainties, DLR could not identify any significant influence of the pre-selected variables.

In summing up all the factors and building upon DLR's findings, there is no evidence that the observed total reductions of KAMA's $CO_2$ fleet average was significantly influenced by other factors than technological developments.

**Section 5: Outlook**

KAMA used the occasion of the "Major Review" to draw attention to a number of aspects which it considers important for the achievement of the 140 g $CO_2$/km target in 2009:

- Safety measures: KAMA aims at complying with EURO NCAP and expects that even more requirements concerning safety are likely in the future; that may act as negative factors on the reduction of $CO_2$.

- Emission regulations: EURO 4 was known when the Commitment was signed and took effect in 2005. However, future regulations (EURO 5) might have negative effects on $CO_2$ emissions, especially with regard to the fuel-efficiency of diesel vehicles.

In addition KAMA mentioned that regulations concerning recycling and noise may lead to an increase of $CO_2$ emissions either by impacting on some fuel efficiency parameters like combustion process and air resistance or by increasing the weight of the vehicle.

The Commission and KAMA agree that the possible repercussions of such regulations are and will be taken into account in the monitoring process.

**Section 6: Conclusions**

The Commission and KAMA agree that, over the 1995-2004 period:

a) The reduction in specific $CO_2$ emissions has been overwhelmingly achieved by technological developments. The small market changes observed did not influence the $CO_2$ emissions significantly. In any case it is very difficult to distinguish between market changes caused by technology and market changes caused by other factors, e.g. general consumer behaviour, economic situation, fuel prices, fiscal measures, availability of consumer information, mainly for two reasons: the market changes observed in the period 1995 to 2004 are relatively small and $CO_2$ relevant technological developments penetrated practically all vehicle categories.

b) In the light of these findings it can be stated that all applicable undertakings specified in KAMA's $CO_2$ Commitment have been met, and in some cases over achieved.

c) The assumptions listed by KAMA in its Commitment have been met and the environment under which its members are operating has not prevented KAMA from meeting its Commitment.

d) KAMA draws attention to a number of points which are of importance for the delivery of the 140 g $CO_2$/km target in 2009.

In summary, KAMA and the Commission conclude that KAMA has, during the period 1995 to 2004, met all the obligations stated in their Commitment. Despite having gone through a hard economic situation during the first years of the commitment period, the Korean car industries have delivered a sizeable contribution to the EU's strategy for reducing greenhouse gas emissions and to its Kyoto reduction objectives.