GFV-22-07

NGV RETROFIT vs OEM: Trends & European Overview

Presentation to Informal Group on Gaseous Fuelled Vehicles

2 October 2012

presented by

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Background notes for this presentation

- The Worldwide Trends in the first part of this presentation includes materials from various presentations by Clean Fuels Consulting and is provided to the Informal Group on Gaseous Fuelled Vehicles as background to the second part of the presentation.
- The information on European OEM/retrofit NGVs has been gathered and prepared by Clean Fuels Consulting (2011-2012). Some of the information was developed for the European Business Congress project, *Legal and Regulatory Environment for the Construction and Operation of CNG Refuelling Stations in European Countries.*
- The European compilation was prepared for DG Enterprise and was supplied by CFC on behalf of NGV Global.

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General Worldwide Trends
Natural Gas Vehicle
Retrofits & OEMs

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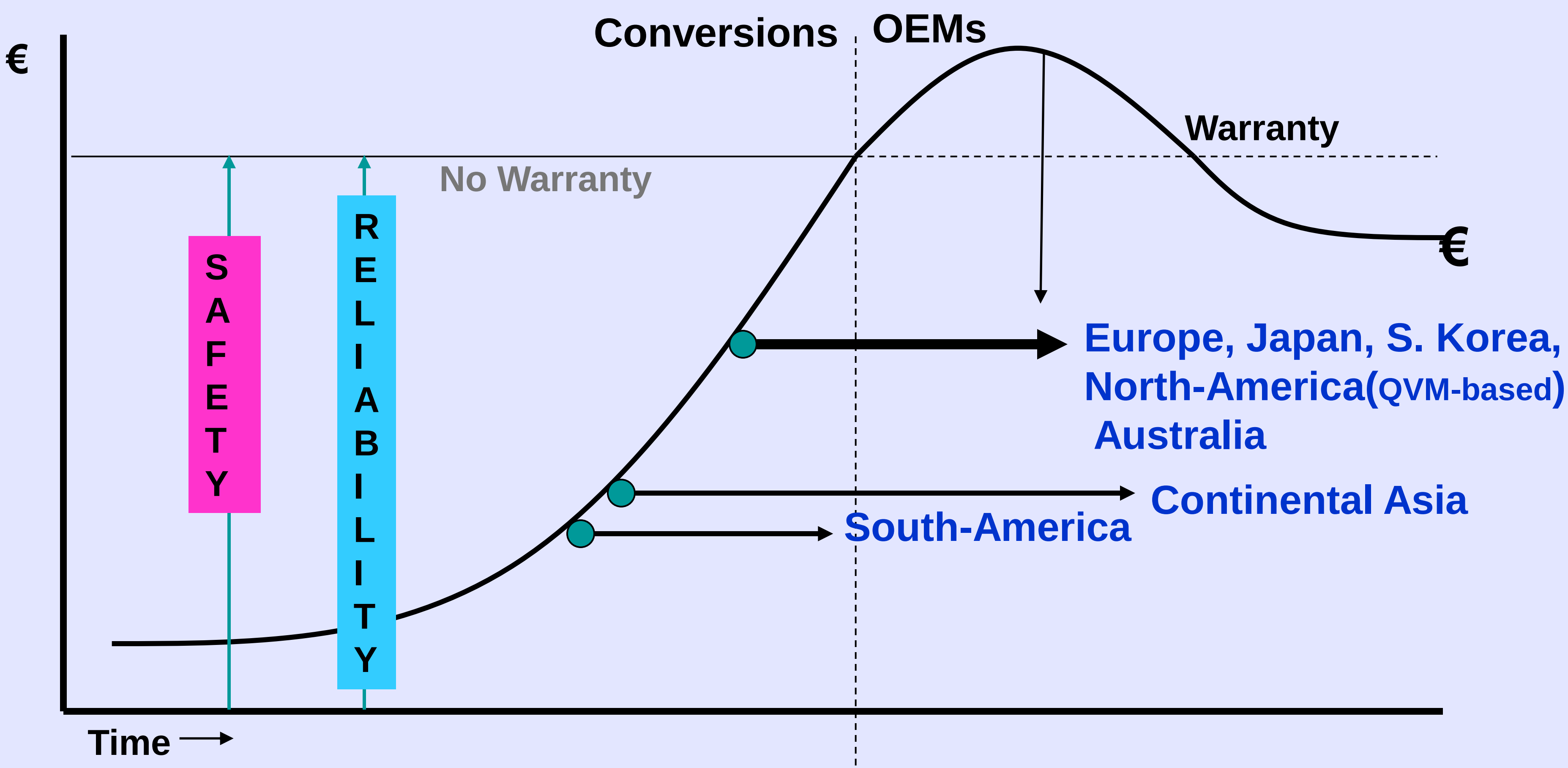
RETROFIT vs OEM



Conversions
Gen I II III IV V VI

QVM* / OEM**

*Qualified Vehicle Modifier
**Original Equipment Manufacturer

Source: Dr. Jeffrey M. Seisler, updated 10 2012

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Light Duty NGVs mostly are retrofit; MD/HD buses & trucks mostly are OEM

REGION	% Passenger Cars	% MD/HD Buses	% MD/HD Trucks
WORLD	94%	3%	2%
ASIA	92%	4.2%	2%
EUROPE	91%	4.5%	4%
S. AMERICA	99%	.004%	.002%
N. AMERICA	86%	10%	2%

Numbers may not equal 100% due to rounding and/or non-road vehicles not included.

Data Sources: GVR & Asian NGV Communications

Source: OEM & Retrofit NGVs: *Synergies & Trends,* Working Party on Gas Roundtable on Use of Gas in Transport, Dr. Jeffrey M. Seisler, Clean Fuels Consulting, 18 January 2011,

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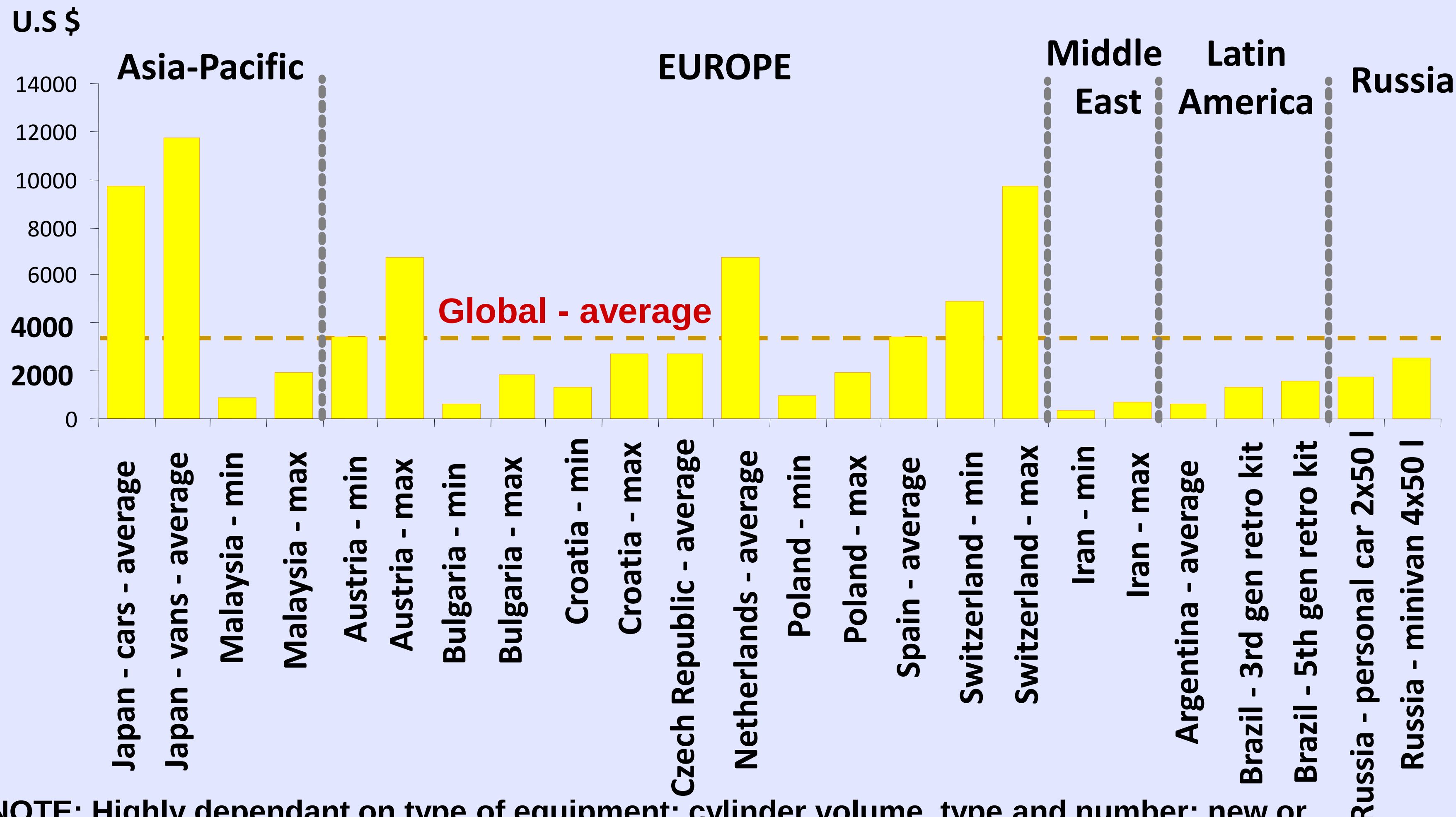
RETROFIT SYSTEMS *MANUFACTURERS*

• Italy	=	14 LDV
• Brazil	=	3 LDV
• Argentina	=	71(retrofitters or manuf.?)
• Netherlands	=	2 LDV; 1 HDV
• US	=	4 LDV; 2 HDV
• Canada	=	2 LDV; 2 HDV
• UK	=	2 HDV
• Australia	=	4 LDV 1 HDV
• Bangladesh	=	350 (only 192 *'authorized'*)
• Russia, Asia,	=	multiple hundreds (?)

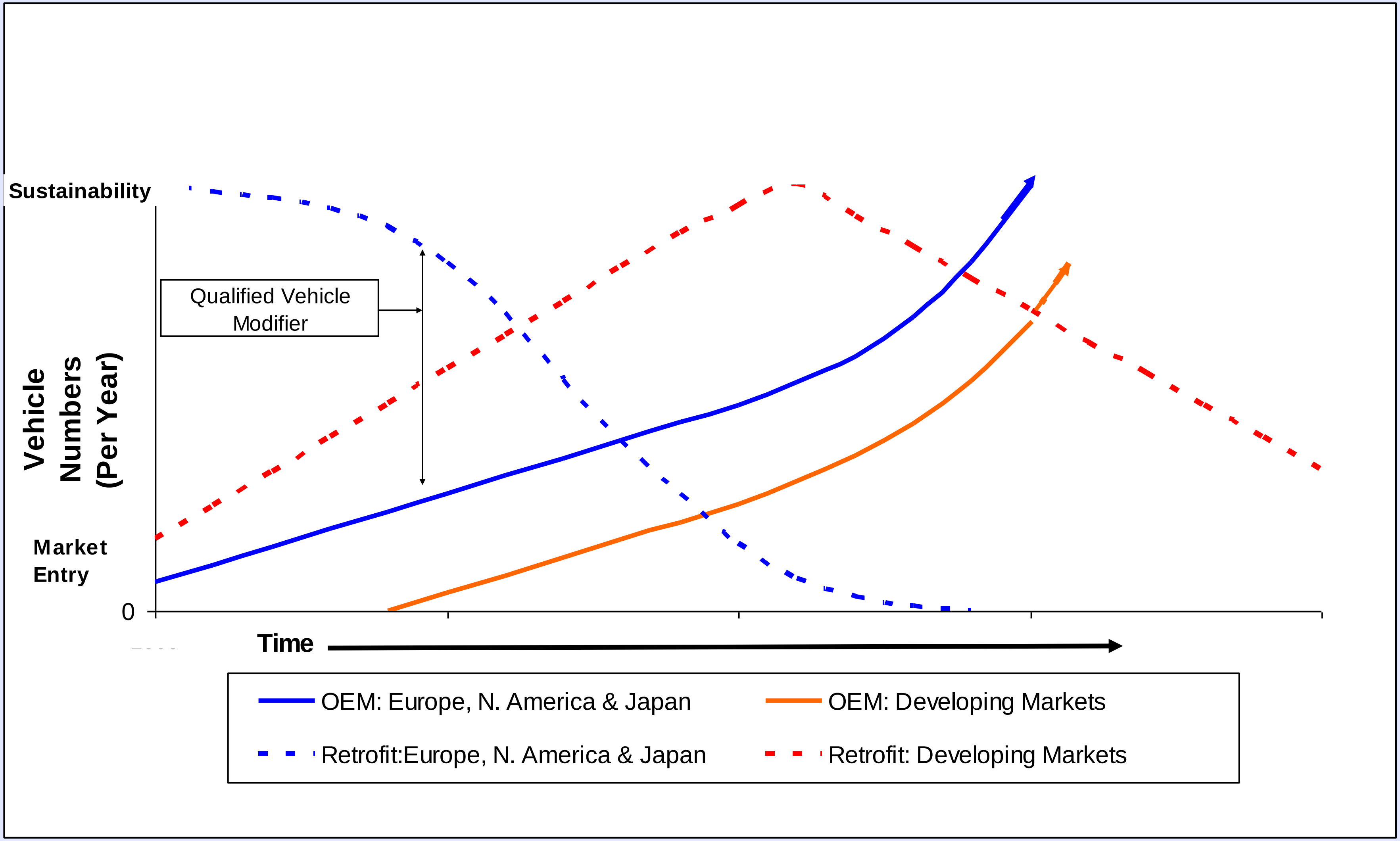
Source: Updated from *OEM & Retrofit NGVs: Synergies & Trends, Working Party on Gas Roundtable on Use of Gas in Transport,* Dr. Jeffrey M. Seisler, Clean Fuels Consulting, 18 January 2011,

Worldwide (outside USA) Average* NGV conversion costs - LDVs



***NOTE: Highly dependant on type of equipment; cylinder volume, type and number; new or recycled components; approvals and certification etc. US costs are more in line with Japan.**

GLOBAL NGV MARKET CONCEPT
OEM vs RETROFIT PATHWAYS



Source: OEM & Retrofit NGVs: *Synergies & Trends,* Working Party on Gas Roundtable on Use of Gas in Transport, Dr. Jeffrey M. Seisler, Clean Fuels Consulting, 18 January 2011,

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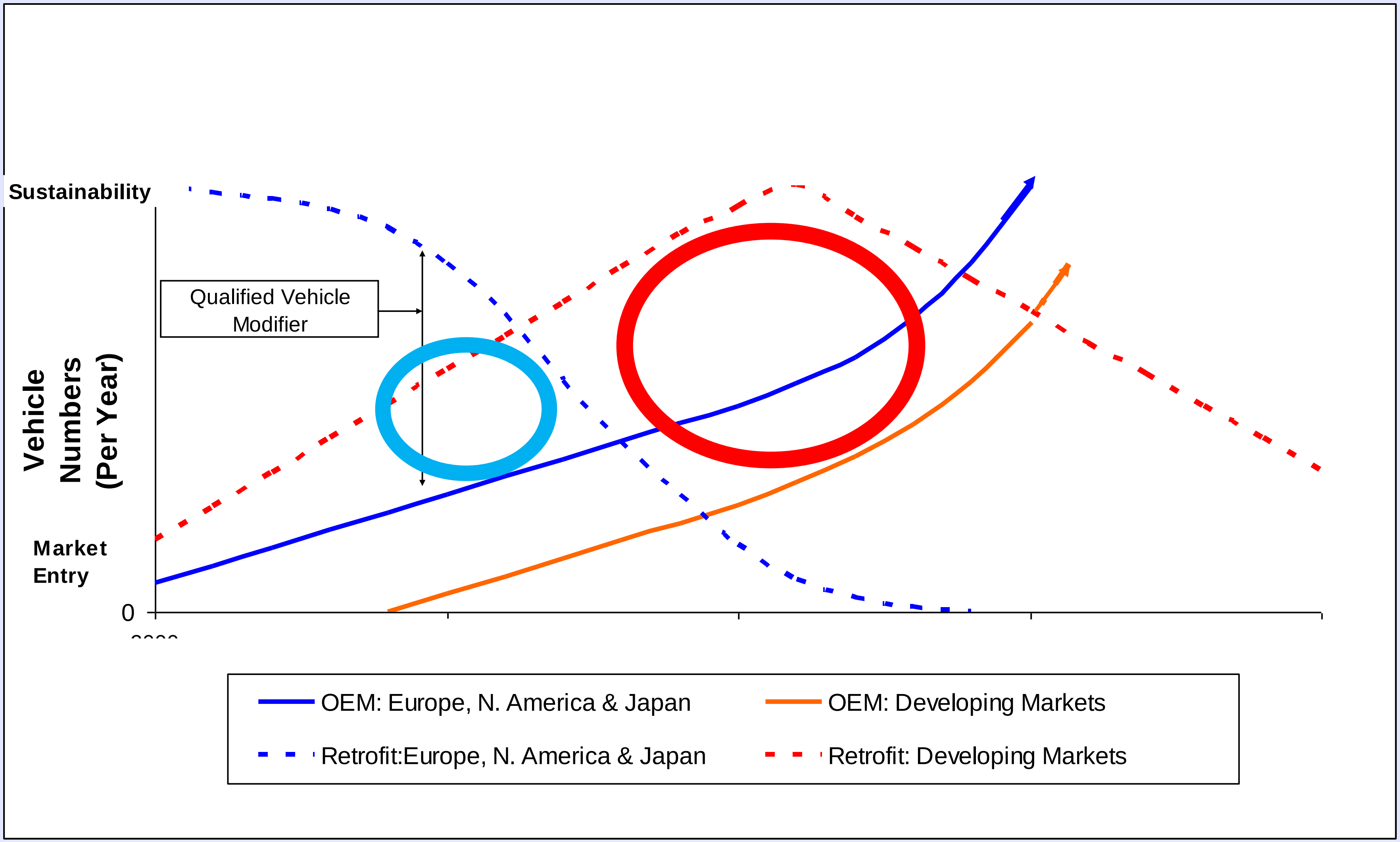
OEM & RETROFIT PATHWAYS
Best 'guestimate' where we are in 2012



Source: OEM & Retrofit NGVs: *Synergies & Trends,* Working Party on Gas Roundtable on Use of Gas in Transport, Dr. Jeffrey M. Seisler, Clean Fuels Consulting, 18 January 2011,

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European Natural Gas Vehicle Retrofits & OEMs

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Light Duty (LD) NGVs in Europe

- Total LD NGVs: 1,284,707 (73% of ***all*** European NGVs at 1,757,990)
- Assumed LD OEMs: 535,172, or ~42%
- NGV data from 40 European countries (including Turkey) in West and East are considered in the totals.

Vehicle data Gas Vehicle Report June 2012, from data at the end-of 2011

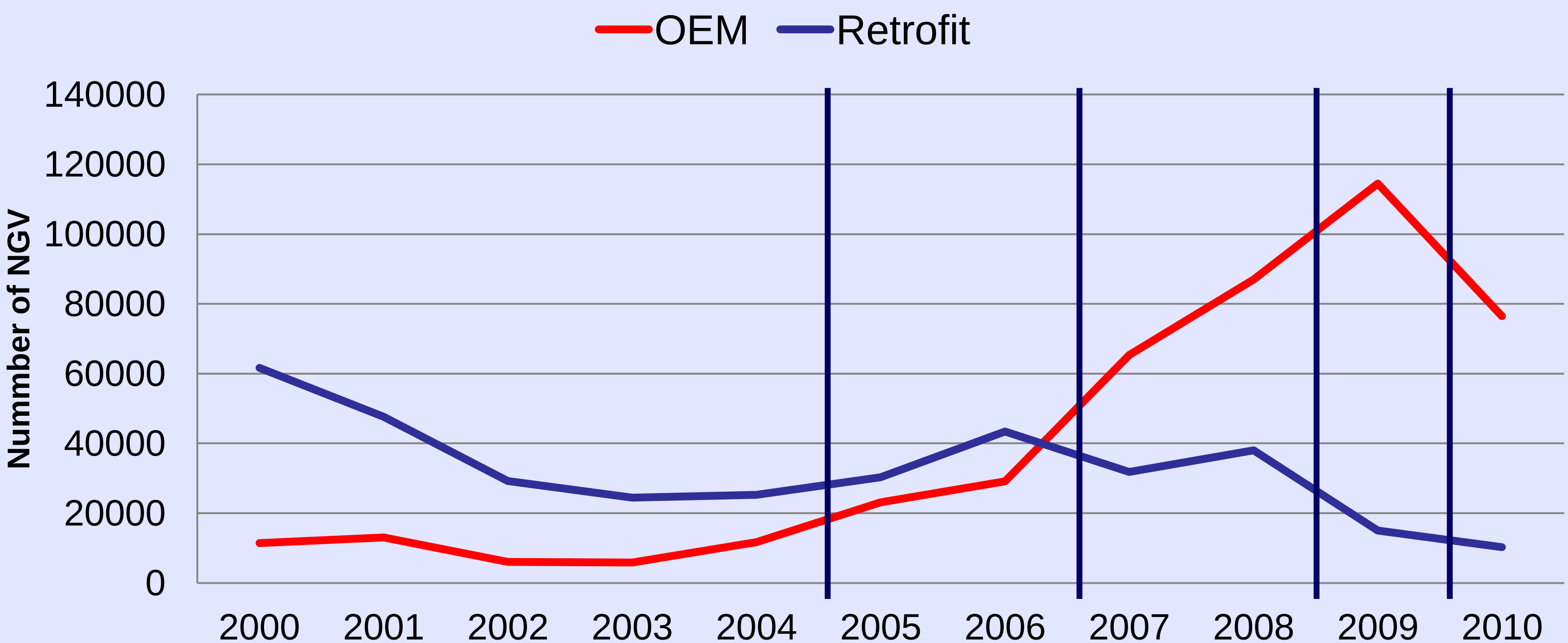
In Europe, OEM NGV sales dominate in Italy, Germany and Sweden

- Italy: 775,590 LD-NGVs – 'guestimate' 50-50 split between OEM & retrofit, with OEMs now dominating sales.
- Germany: 94,504 LD-NGVs ~100% OEM
- Sweden: 37,700 LD-NGVs ~100% OEM including QVM (qualified vehicle modifier) Volvos
- OEM sales play an important role in **Switzerland**, **Austria** (90% OEM vs 10% retrofit) and **Spain** where the total light duty NGV population (3 countries) is 15,816.
- Netherlands OEM NGV population also is increasing but it is difficult to judge how many of their 3,530 LD NGVs are OEMs since they have had a strong conversion network ('guestimate' 25% OEM)

Vehicle data Gas Vehicle Report June 2012, from data at the end-of 2011

ITALY

OEMs gradually have outpaced sales of retrofit NGVs, but NGV registrations are very dependent on incentives.



No incentives	+/- 1.500 €	2.000 €	3.500 €	No incentives

Sources: Flavio Mariani, Metauto - Eni Gas & Power, 2005, 2009, 2010 & NGV System Italia

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GERMANY

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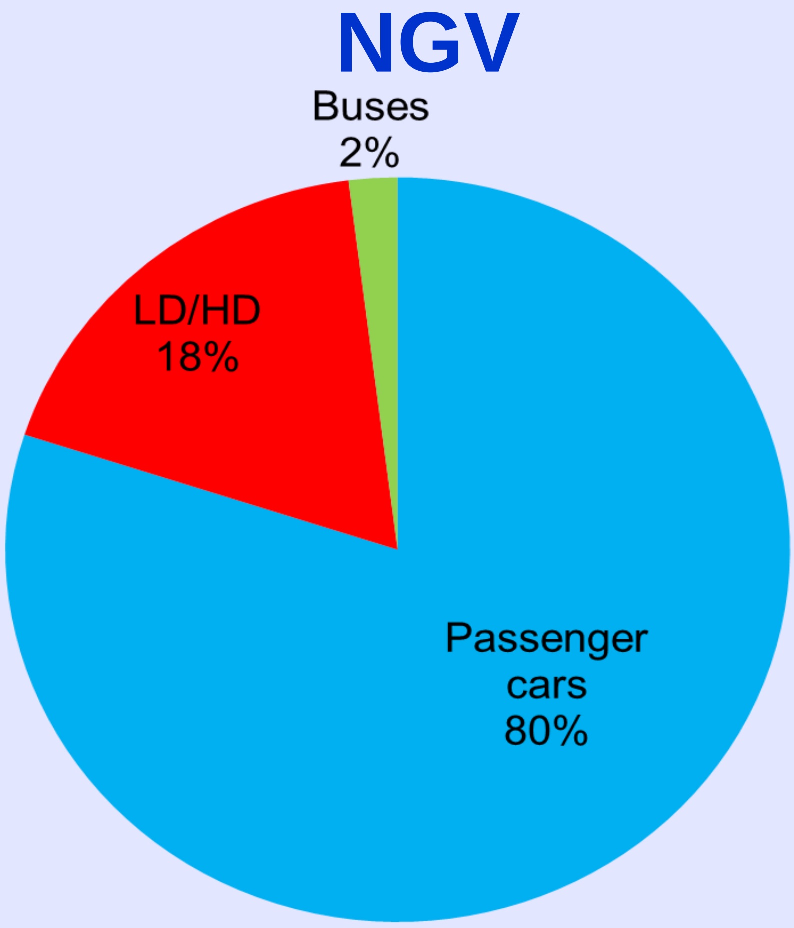
70-75% of NGVs are used for fleet and commercial applications



Source: Ergas mobil, Timm Kehler,NGV Rome, June 2010

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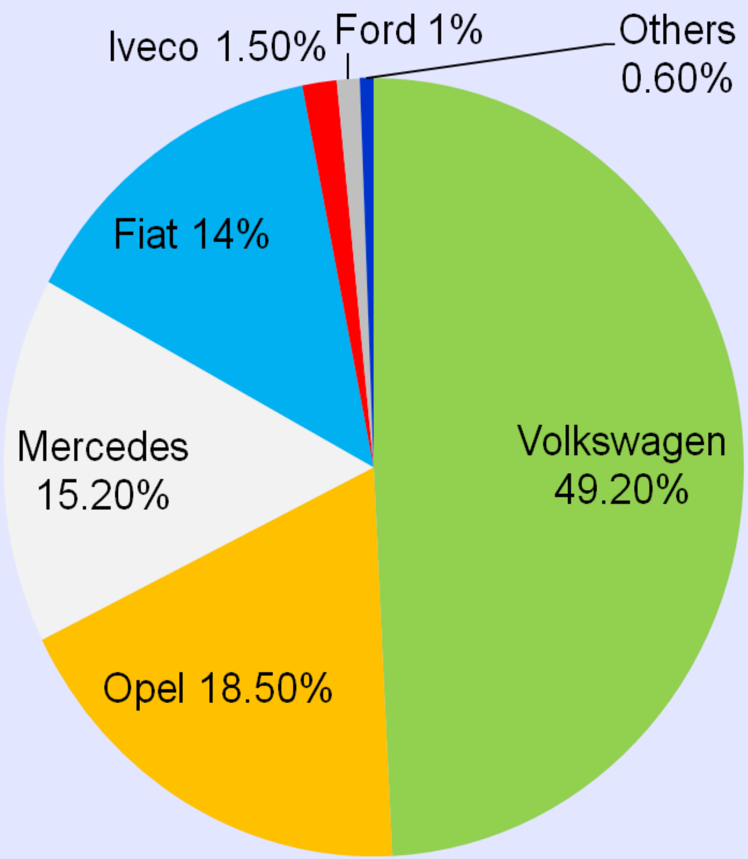
Volkswagen dominates the German NGV market with 49%

6 German OEM are currently in the market:

- Volkswagen
- Mercedes
- Opel
- Ford
- Evobus
- MAN

2 foreign OEM:

- FIAT
- IVECO



Source: Ergas mobil, Timm Kehler,NGV Rome, June 2010

Associated ‘conversion industries’ based in Germany tend to be design & engineering firms but do not produce mainstream NGV retrofit systems

- Brachetti and Partner
- IAV (engineering & development)
- IvS
- Air LNG (investigating LNG applications for turbines for stationary and mobile applications

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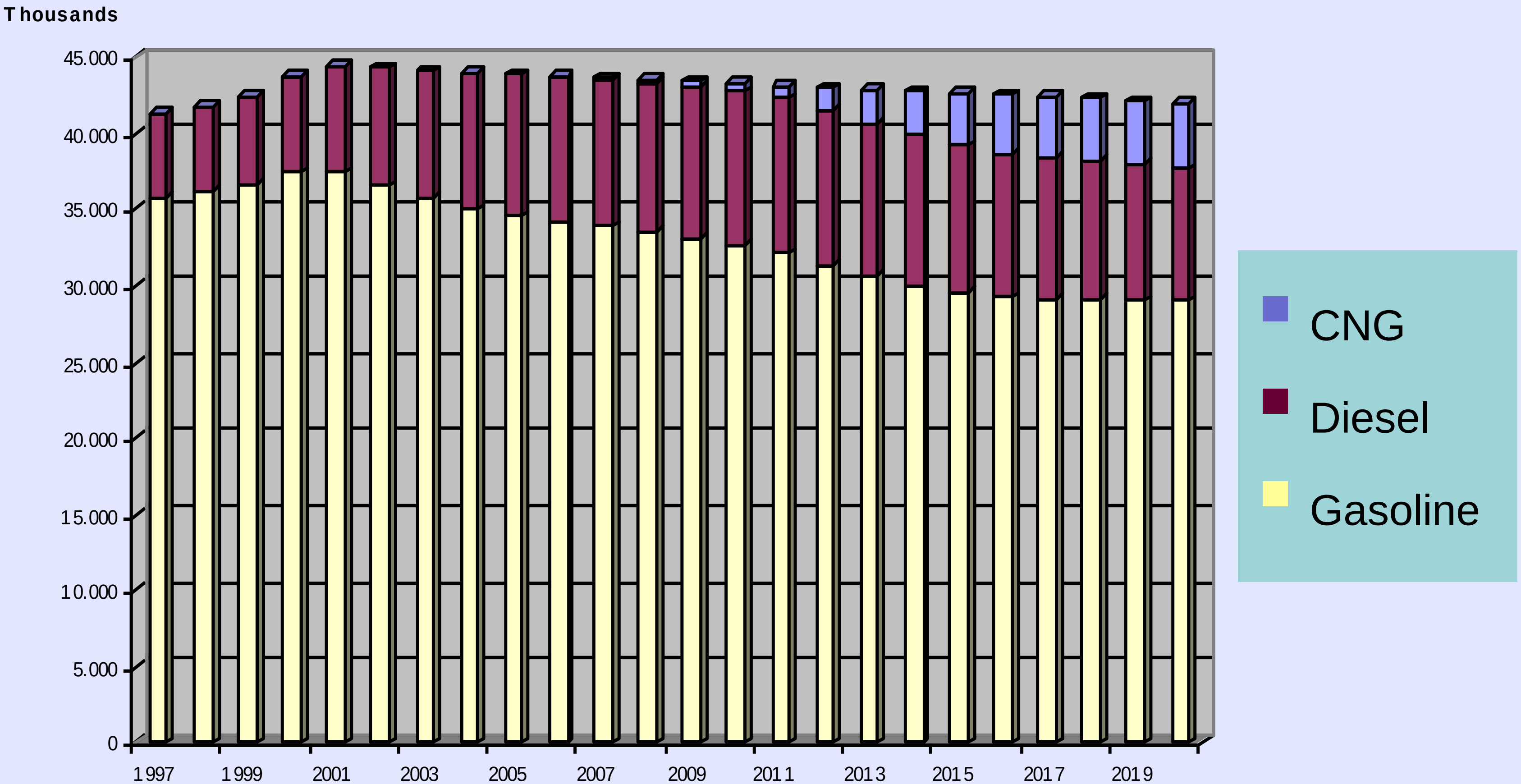
CNG passenger car registration is projected to approach diesel cars by 2020

Source: BGW, Natural Gas Vehicles 2020

NGVs are anticipated to impact more on diesel car sales then on gasoline cars



Source: BGW, Natural Gas Vehicles 2020

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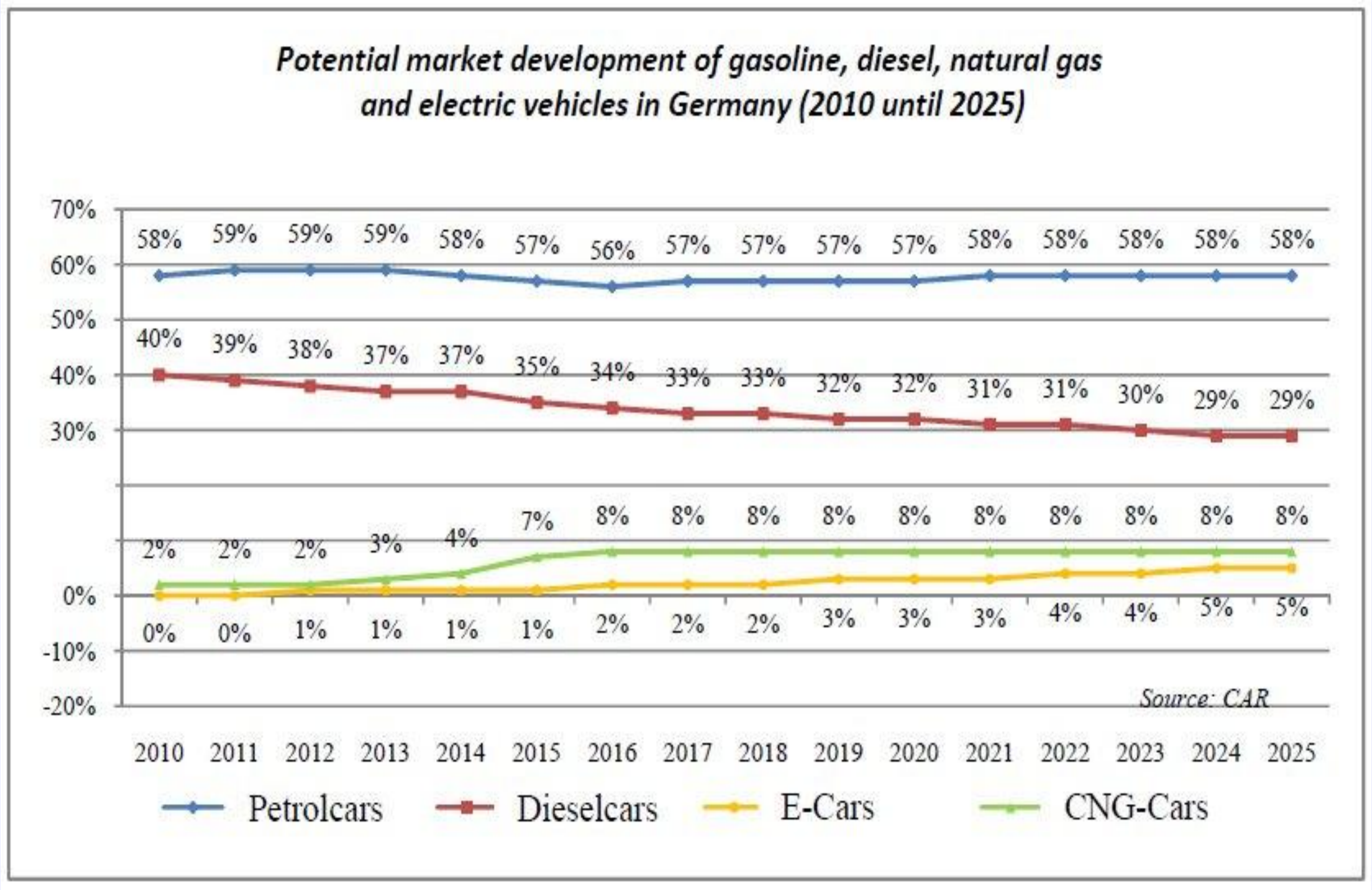
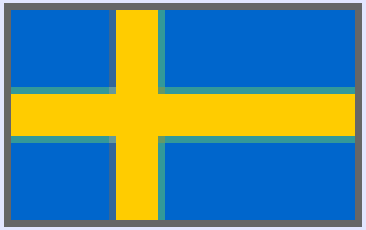
NGVs should be 8% of total vehicles in Germany in 2016 (challenging target!)

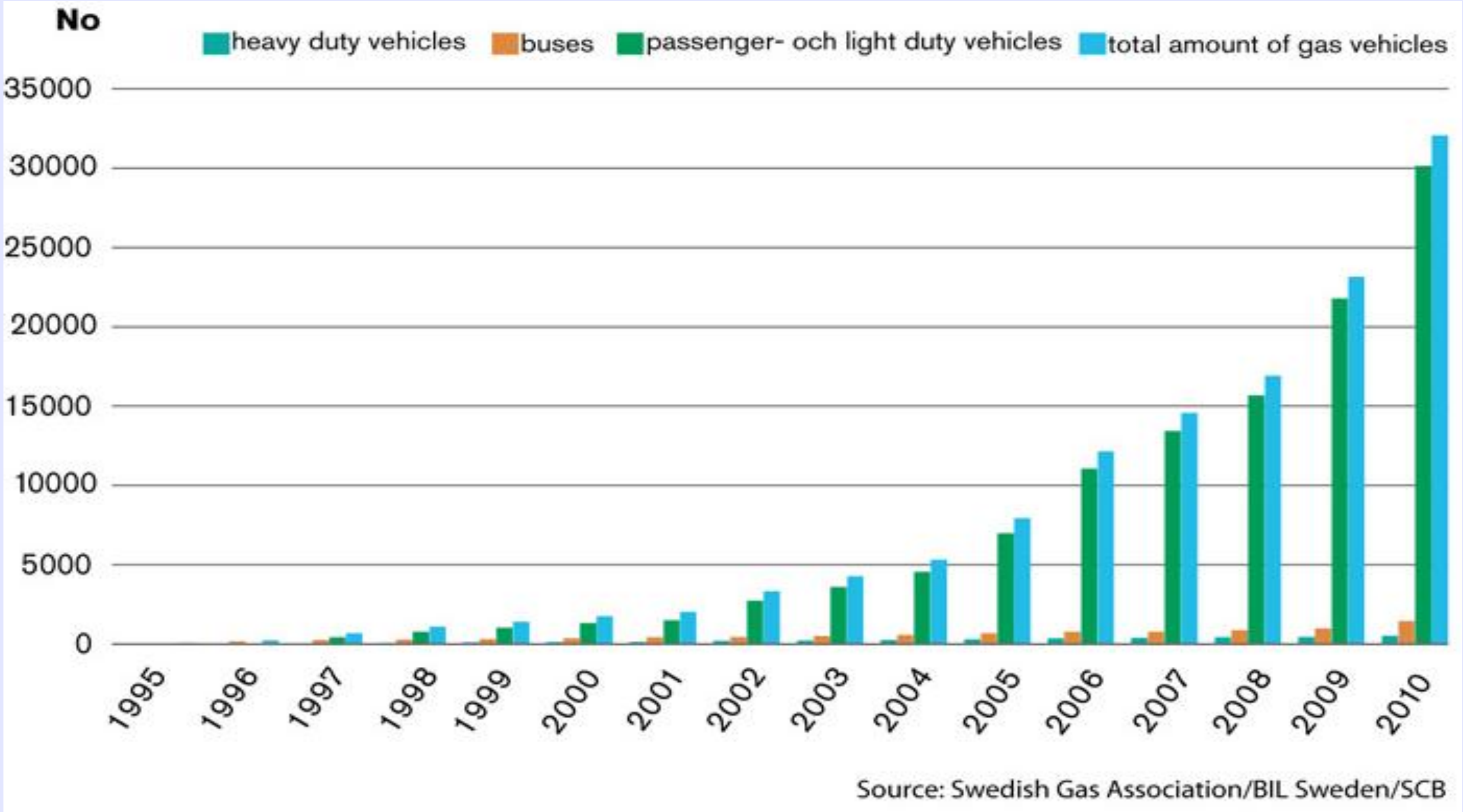


Source: ENI, Compressed natural gas as fuel for NGV – potential, synergy and development , September 2011

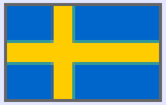
SWEDEN



In Sweden the majority of the NGVs are passenger cars



Source: Biogas Renewable Methane Gas, Leif Holmberg, Swedish Gas Association



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OEMs offer a variety of NGVs in Sweden

VOLVO*
- V70 Bi-fuel

FIAT
- Punto Evo
- Doblò
- Fiorino

IVECO
- EcoDaily

MERCEDES
- Sprinter NGT
- E Class
- B 170 NGT

OPEL
- Zafira
- Combo

VOLKSWAGEN
- Passat
- Touran
- Caddy
- Caddy Maxi
- Transporter

*Qualified vehicle modifier now owned by Westport LD

Source: Fordonsgas

Volkswagen dominated
2009 Swedish NGV car market

- Volkswagen TSI Passat EcoFuel accounted for 68% of the total NG passenger cars sales in Sweden
- Then follow Mercedes B 170 NGT (24 %), VW Touran, VW Caddy, Opel Zafira, Mercedes E 200 NGT, Opel Combo, and Fiat Punto

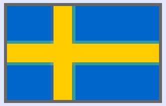
Source: NGVA Europe, 2009

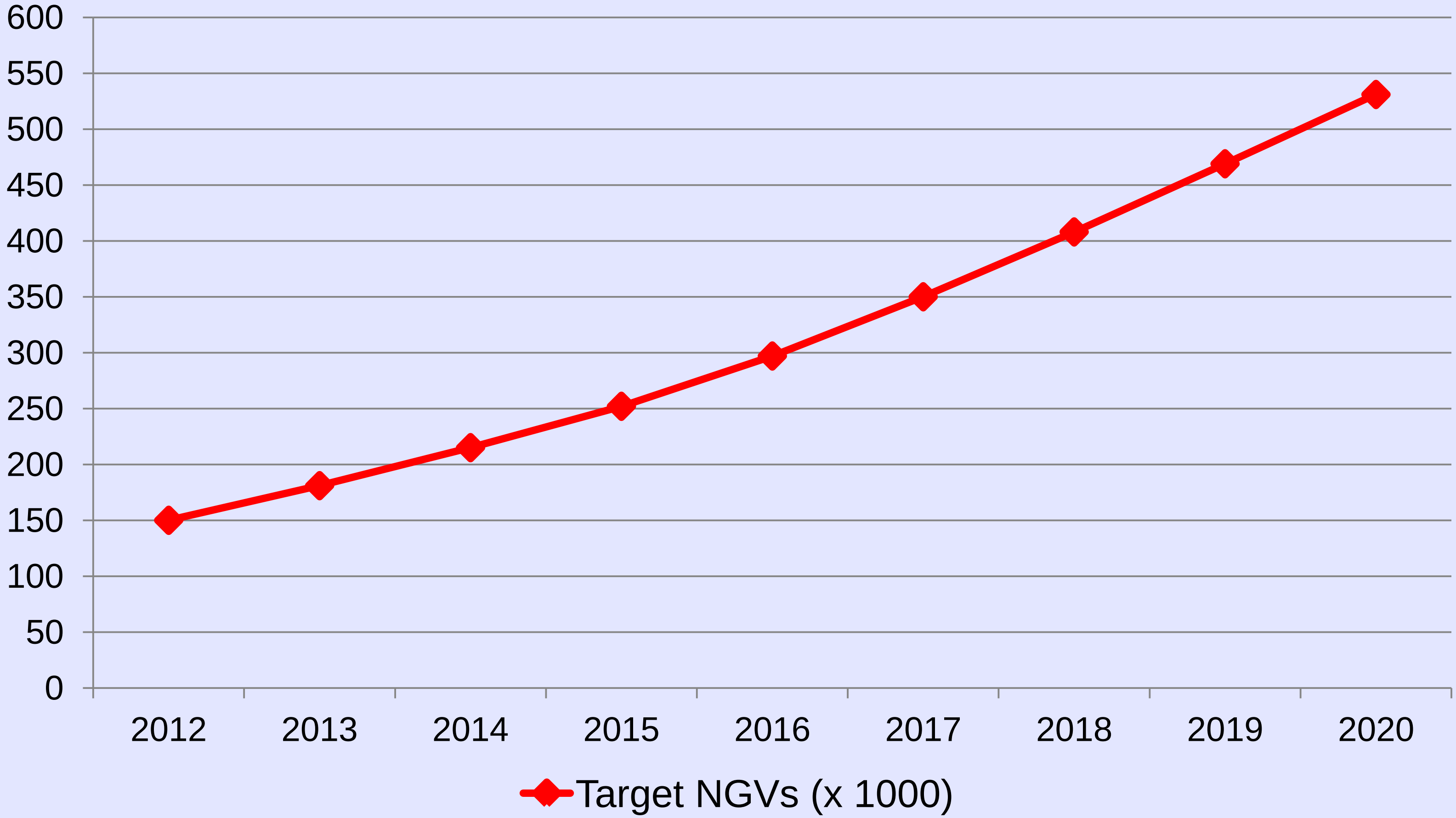
Volkswagen also is leading on medium duty NGV sales

- Volkswagen Caddy accounts for some 45 % of the total sales
- Followed by Opel Combo, VW Transporter, Fiat Fiorino, Iveco Daily, and Fiat Doblò

Source: NGVA Europe, 2009

Swedish target is to reach 500,000 NGVs by 2020





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