

**MEETING MINUTES**  
**23<sup>rd</sup> Meeting of the**  
**Informal Group on Gaseous Fuelled Vehicles (GFV)**

**Informal 'Workshop' on Heavy Duty Dual-Fuel Retrofits**  
**13 December 2012**  
**European Commission**  
**100 Rue Belliard, Room 09/SDR**

**Purpose of the Workshop**

This informational workshop is organized under the chairmanship of GFV to discuss and help determine what regulatory pathway should be taken in regards to the type-approval of Heavy Duty Dual-Fuel (HDDF) retrofit systems. The discussion follows is a result of the work being done by the Heavy Duty Dual-Fuel Task Force (HDDF TF) on new dual-fuel vehicles/engines.

The results of the workshop will provide input to the HDDF TF in order to produce possible UN provisions for the type-approval of HDDF retrofit systems.

All the documents supporting the presentations can be found at the UNECE website <https://www2.unece.org/wiki/display/trans/GFV+23rd+session>.

**I. Welcome and introduction, André Rijnders (RDW-NL), Chairman of the GFV**

1. Mr. Rijnders presented an overview of the OEM and retrofit situation for heavy duty vehicles. (GFV 23-02e) The workshop today will attempt to evaluate the possibility and potential for developing regulations covering retrofits of heavy duty diesel engines into dual-fuel diesel/natural gas.

**II. Session I: Perspectives on HDDF retrofit systems**

The main points of the presentations are summarized below. (For further details, please consult the official GFV documents, indicated by number for each speaker)

2. *Clean Air Power, Steve Whelan (GFV 23-03e)*

A. As regards the company and its products:

- Overview of CAP background and activities. CAP provides both retrofit systems to customers directly as well as works with OEMs.
- Retrofit system is called 'Genesis': average gas substitution is ~50-60%
- OEM Dual-Fuel system interacts with the engine management software. Average gas substitution is ~70-90%
- Motivation principally is economics and providing ~30% fuel savings to customer (0.15 pence per mile in the UK case)

B. As regards the company position in relation to the future UN regulatory framework:

- Need for a UN Regulation: Lack of regulations leads to uncertainty that is usually exploited by unethical and un-regulated companies. Without a regulation quality control also can be a problem
- Retrofit HDDF should be considered within R115 with fair and logical test protocols and limits;
- Which Euro classes?: The interest will tend to focus on Euro III to Euro V diesel vehicles;
- Which HDDF types?: Retrofit HDDF will be type 1b and, in the majority of the cases, 2b; Type 1a and 3 make no economic sense;
- Emission limits: For regulated emissions the original limits can be applied, for GHG's the mother engine can be used as reference;
- Test protocol: it should be kept to the steady-state 13-mode ESC/WHSC. Retrofit system suppliers generally cannot afford the level of complexity necessary to develop systems for the ETC/WHTC;
- In general, D-F not part of the UK policy framework for carbon reduction;
- 'Light touch' regulatory approach 'appreciated'.

### 3. *Prins Alternative Fuel Systems, Jasper van Sambeek (GFV 23-04e)*

#### A. As regards the company and its products:

- Designer and manufacturer of AFV systems: mixers; gas injection & diesel blend systems for LPG and CNG
- Customers include OEMs, importers & distributors in 50 countries
- Designer and manufacturer of AFV systems: mixers; gas injection & diesel blend systems LPG & CNG; LNG systems being developed.
- Replacement rates for dual-fuel systems: LPG 25-35%; CNG 35-50%
- Customers include OEMs, importers & distributors in 50 countries
- Has systems using air intake manifold and using multi-point fuel injection
- Without after-treatment THC is higher but other emissions are reduced.

#### B. As regards the company position in relation to the future UN regulatory framework:

- A UN regulation is needed: In the absence of a UN Regulation, market entry without national regulatory procedures (homologation, safety checks, etc.) is not possible.
- Regulation 115 could be the approach;
- Emission limits: need some HC dispensation otherwise the addition of an appropriate after-treatment device makes the entire system too expensive;
- Test protocol:
  - Should avoid expensive testing equipment;
  - The right family definition should generate an affordable number of emission tests.

### 4. *Landi Renzo, (Francesco Cagnolati) (GFV 23 – 05e)*

#### A. As regards the company and its products:

- Experience with D-F going back to the 1980s
- Systems for petrol and diesel: mechanical & electronic injector systems
- Good results on emissions; safety issues similar to CNG

- Can help extend life of vehicle fleets
  - Flexible use of diesel and gaseous fuels, matching power and environmental performance
  - Future plans include developing dedicated ECU's, actuators, regulators, interfaces, etc.;
- B. As regards the company position in relation to the future UN regulatory framework:
- Landi would opt for an appropriate amendment to R.115

#### 5. ACEA-OICA, Jean-François Renaudin (GFV 23 – 06<sup>e</sup>)

General approach:

- Set clear definitions & retrofit principles;
- Split engine retrofit from vehicle retrofit with an approved engine;
- Ensure fair competition among all the manufacturing routes (“in-line” and “off -line” before registration and after-registration) and do not generate loopholes (no relaxed routes to certification);
- No ambiguity regarding liability, responsibility and branding:
  - The retrofitter becomes new engine manufacturer;
  - The engine becomes a new engine-type with a new approval number

Possibilities for next regulatory actions:

- Retrofit Emissions Control system process (REC) – dedicated to emissions control devices
- Amend R.115: challenge to introduce major revisions for HDVs in regulation that has been based on LDVs
- Create a new regulation (their preferred option)
  - New structure
  - Not limited to gas retrofits
  - Consistency with other regulations (w/R.83 vs R.49+REC+other) but much more complex administratively

### III. (Session II) NATIONAL VIEWS

#### 6. The Dutch View, Henk Baarbé (Dutch Ministry of Environment) (GFV 23 -10e)

- No certification at this moment but it is under consideration
- Concerns about environmental benefits of D-F
- Options being considered:
  - R.49?
  - PMS (Portable emissions measurement system)
  - SEMS (Simplified emissions measurement system) (g/kg CO<sub>2</sub>)
- Challenges: determination of replacement ratio; measurement of CH<sub>4</sub> (SEMS)
- Will there be enough D-F retrofit systems to motivate and create new rules?

#### 7. The German View, Stefan Behrning (TUV Rheinland) (GFV 23 -07)

- Dr. Behrning indicated that the presentation is not representing an official national German view but is based on his and TUV's experience and discussions with stakeholders, in order to provide a view of how Germany deals with D-F.

- Procedure is to deduct the difference of the diesel-mode emission (each substance) from the one measured in the D-F mode.
- There is no national approval system. Each vehicle has to be inspected (based on German 70 StVZO)
- CNG-LPG D-F mode is possible according to ECE R67 or R.110. Emissions based on R.49, ESC, ELR & ETC
- European reference fuels are used.
- About 60% of German diesel engines are failing the initial emissions test so it is difficult to find one to convert in order to test on D-F.
- This would be a transition before having something on the European level.

#### Discussion

- It is difficult to certify an engine if they don't know what the baseline diesel engine emissions are.
- Need a way to prove system performance and then move to harmonization.
- Germany is more interested in certifying systems to Euro 6 and not any lesser levels. The certifications regarding D-F also are dealt with on a state-by-state basis.
- Systems can't be low cost, low performance and high benefit.
- There also must be a way to determine how the D-F system itself performs.

#### 8. *The Italian rules for diesel-gas retrofit systems type approval* (Corrado Storchi, Landi Renzo) (GFV 23 – 08)

- Diesel mode maintained in the D-F system
- Emissions: ECE/EU regulation must be met
- Noise levels at original ECE/EU levels
- Diesel engine governor unchanged
- Safety: approved within UNECE R.67 and R.110.
- 'System family' of components are tested; some more than once.
- Inspection & Approval like bi-fuel retrofit vehicles
- Final approval by local departments of Ministry of Transport

#### Discussion

- Rules under R.115 apply
- No rules for gas energy ratio (GER). Measurement is gas and diesel

#### 9. *The UK D-F Vehicle Scene or How the UK is dealing with HDDF* (Steve Whelan, CAP) (GFV 23 – 09)

- Clarifies he is not speaking on behalf of the Department of Transport; it's his/CAP observations
- Engines can be certified to EC or national level but to date, only national approvals have been provided and the sale of the vehicle must remain in-country
- Regulatory approach should be 'light': UK is mostly interested in ensuring that, through their enforcement, that badly converted vehicles are not on the road. Legislation has not been proposed.
- Conversion subsequently notified by VTG10 form plus brief details of conversion. VOSA have option to require inspection or testing. Applies to both CNG and LNG.

#### 10. *The US EPA approach to regulating NGV conversions* (Jeff Seisler, NGV Global/Clean Fuels Consulting) (GFV 23 – 12e)

- The US Environmental Protection Administration (EPA) has issued rules related to conversions of petrol vehicles to CNG that are intended to (and will) make conversions

easier and less expensive than full compliance requirements that have been in place for retrofit system suppliers since about 1994.

- Prior to 1994 gasoline vehicles were allowed by unofficial 'administrative exemption' to be converted without being considered to be 'tampering' by EPA. In 1994 regulations changed (at the request of the NGV advocates) and EPA began using a more serious certification process, which was in place since 1994 and became one reason NGV conversions were so expensive in the US.
- A three tier, aged-based system was established that was more flexible for NGV conversions of cars more than 2 years old yet still requires monitoring and compliance with EPA 'relaxed' requirements.
- Vehicles are classified as: new (less than 2 years olds); Intermediate age (two years up to 'useful life'; and out of useful life (OUL) (not specified in years, but presumably 5-7 years)
- Requirements are to check on functionality of OBD system when operating on the alternative fuel instead of certification like OBD demonstration.

#### **IV. FINAL DISCUSSION:** What can we conclude from the discussion today?

- Country-by-country approach or international harmonization?
- Some sort of regulatory structure is needed. But competition is an issue for OEMs. The US approach recognizes the need regarding new vehicles. We have a risk of unfair competition and a risk to the environment if the D-F systems are not dealt with carefully. We want to avoid, for example, a D-F vehicle that only runs on diesel. We want to avoid creating loopholes; not only for unfair competition but for other risks.
- Comment that D-F economics will forestall these vehicles being converted and then running on diesel.
- We need to talk about OEM solutions and retrofit situations. The Commission has alluded to 'administrative retrofits' (used by OEMs to simplify certification) and 'real retrofits', which need specific regulations to guide the quality of conversions.
- International guidance is required because some countries prohibit D-F systems because there are no available regulations.
- We need to eliminate the regulatory loopholes and have a system that takes this view into consideration. One issue is to define a used vehicle.
- Today we have some possible administrative issues re: type approval, a framework directive and type approval. Each country recognizes the UN regulations (signatories) to accept compliance. But it doesn't indicate that each regulation is the minimum regulation. But in Europe a minimum rule is needed.
- History of D-F has been country-by-country. This is mostly because of the small volume of available systems. Current regulations are fostered because OEMs have become involved. Ultimately technology will move to the OEMs. In the meantime, there is a large international market where CNG and LNG are expanding. Customers and the environment need to be protected against bad quality D-F systems, therefore, international regulatory guidance should be provided to require contracting parties to be more responsible about enforcement. Maybe a tiered approach to regulations, with some aspects of the US EPA approach should be considered.

#### **V. Conclusions & Closing Remarks,** André Rijnders, Chairman GFV

- The conclusion from today's workshop and discussion that can be brought to the GRPE is that there is a need for international regulation for dual-fuel retrofit systems. But we need to reflect on what happened today and we will address this topic again at the next

GFV meeting and make a summary plus a short discussion (due to having only a half day at the meeting on 15<sup>th</sup> January 2013). But we must give consideration to the next steps and put the questions on the table to be evaluated in order to find a good solution to D-F regulation.