EUROPEAN ALTERNATIVE FUELS INFRASTRUCTURE DIRECTIVE AND FUEL QUALITY REQUIREMENTS
ALTERNATIVE FUELS INFRASTRUCTURE DIRECTIVE AND FUEL QUALITY REQUIREMENTS

CONTENT

- Introduction
- Current Alternative Fuels Situation
- Alternative Fuels Infrastructure Directive
  - Implementation plan
  - Fuels included in the directive
  - Road and marine usage
  - Requirements and/or Recommendations?
- Alternative Fuels Infrastructure Implementation
  - Filling station infrastructure
  - Distribution system infrastructure
- Fuel Quality Influence
  - How to assure adequate fuel quality?
  - Implications if fuel quality falls behind
- Conclusions
INTRODUCTION

- How to predict the future?
- Known:
  - Europe want to get less dependent on crude oil derived energy
  - Europe want to get more energy independent
  - Europe want to reduce greenhouse gas emissions
- Will that affect us?
  - YES!
- We are one of the industries that will be most affected!
  - And we have quite a long lead time for development of new products
- What will change for our industry?
  - Fuel/Energy carrier?
  - Engines/Drivetrains?
  - Both?
- For an change to happen evolution needs to occur on:
  - Energy system – Fuel generation
  - Technologies on vehicle level
  - Availability of fuel – Infrastructure
CURRENT ALTERNATIVE FUELS SITUATION

FIVE MAIN ALTERNATIVE FUELS TODAY

- Sales volumes Europe 2012 – 2013
  - Conventional fuel: 338 738 200 ton
  - FAME: 11 409 473 Toe
  - LPG: 4 500 000 ton
  - Ethanol: 2 868 669 Toe
  - CNG: 2 480 000 Toe
  - HVO: 1 500 000 ton

- Infrastructure Europe (filling stations/ recharging points)
  - Conventional fuel: ~ 131 000
  - FAME (B100): no data
  - LPG: ~ 28 000
  - Ethanol (E85): ~ 3 000
  - CNG: ~ 3 000
  - HVO (100% HVO): no data
  - Charging points: ~ 21 000
  - Hydrogen: ~ 50
CURRENT ALTERNATIVE FUELS SITUATION

FIVE MAIN ALTERNATIVE FUELS TODAY

- **FAME (Biodiesel B7, B100)**
- **LPG**
- **Ethanol E10, E85**
- **CNG, LNG**
- **CBG, LBG**

![Sales volumes Europe 2013 oil equivalent](chart1)

![Filling stations Europe 2013, excl charging points](chart2)
ALTERNATIVE FUELS INFRASTRUCTURE DIRECTIVE

WHY A DIRECTIVE? – COMMISSION OPINION

- Main barriers against increased usage of alternative fuels:
  - High cost of vehicles
  - Low level of consumer acceptance
  - Lack of recharging and refuelling stations

- The Directive wants to remove the infrastructure barriers for the use of alternative fuels

- A part of the directive also cover consumer information
  - Neutral price comparison with conventional fuels
  - Clear information about what fuels can be used by a vehicle
    - Standardised labelling in
      - Vehicle manuals
      - At dealerships
      - At recharging and refuelling points
ALTERNATIVE FUELS INFRASTRUCTURE DIRECTIVE

TIME FRAME FOR INTRODUCTION AND IMPLEMENTATION OF THE DIRECTIVE

- 29 September 2014 the Council adopted the directive
- Member States needs to set, and make public, their targets and national policy frameworks latest end 2016
- The Commission shall hand in an evaluation of the targets and frameworks latest end 2017
- Member States shall report their progress end 2019, 2022 and 2025
- There are to be a summary of national legislation and supporting infrastructure for alternative fuels in each member states policy framework
- The framework should also give information on the yearly government funding for:
  - Vehicle charging points and alternative fuel filling stations
  - Production of alternative fuels
  - Research, development and demonstrations of alternative fuels
ALTERNATIVE FUELS INFRASTRUCTURE DIRECTIVE

FUELS INCLUDED IN THE DIRECTIVE

- Biofuels
- Liquefied Petroleum Gas (LPG)
- Liquefied Natural Gas (LNG)
- Compressed Natural Gas (CNG)
- Hydrogen
- Electricity
THOUGHTS IN THE DIRECTIVE - BIOFUELS

- Biofuels already have nearly 5% of the market.
- They work as blended fuels and do not require any specific infrastructure.
- A key challenge will be to ensure their sustainability.
THOUGHTS IN THE DIRECTIVE
- LIQUEFIED PETROLEUM GAS (LPG)

- No action is foreseen for LPG.
- The core infrastructure is already established.
  (today ~28 000 stations)
THOUGHTS IN THE DIRECTIVE
- NATURAL GAS (CNG & LNG)

- Common standards for CNG and LNG refuelling points by 2015
- 2020 target CNG:
  Adequate refuelling in urban and other densely populated areas.
- 2025 target CNG/LNG (road):
  Recommended max distance between filling stations (TEN-T core network)
    - 150 km for CNG
    - 400 km for LNG
- 2025 target LNG (shipping):
  Refuelling in a sufficient number of TEN-T seaports
- 2030 target LNG (shipping):
  Refuelling in a sufficient number of TEN-T inland ports
The hydrogen infrastructure directive has changed

- From a requirement to an option*

A member state that chooses to include Hydrogen needs to:

- Create an infrastructure that ensure the circulation of hydrogen vehicles within the national network
- Including cross-border links where appropriate
- Implemented by 31 December 2025
By 31 December 2020:
Adequate charging points in urban and other densely populated areas

- Recommendation:
  A minimum of one recharging point per ten electric vehicles

- Common recharging connector (plug) for the whole of Europe ("Combo 2" type plug, EN 62196-3)
DIRECTIVE REQUIREMENTS ON FILLING STATION INFRASTRUCTURE

LNG FILLING STATIONS
- Currently ~77 filling stations in EU
- If meeting the recommended maximum of 400 km in between filling station in the Ten-T core network
  => ~150 filling stations by 2025
- In Sweden the required number of stations would be ~5 by 2025

CNG FILLING STATIONS
- Currently ~3 000 filling stations in EU
- If meeting the recommended maximum of 150 km in between filling station in the Ten-T core network
  => ~400 filling stations by 2025
- In Sweden the required number of stations would be ~10 by 2025
DIRECTIVE RECOMMENDATION ON FILLING STATION INFRASTRUCTURE

HYDROGEN FILLING STATIONS

- Currently ~50 filling stations in EU
- If meeting the earlier recommended maximum of 300 km in between filling station in the Ten-T core network
  => ~200 filling stations by 2025
- In Sweden the required number of stations would be ~6 by 2025

ELECTRIC CHARGING POINTS

- Currently ~21 000 charging stations in EU
- With 10 vehicles per charging point and target year 2020
  => ~1 500 000 electric vehicles on the road
  => ~150 000 recharging point!
- Roughly the same number of recharging points as conventional filling stations

Estimated growth of sales/year:
- 2013 – 50 000
- 2015 – 100 000
- 2021 – 500 000
- 2025 – 1 000 000

1) today ~ 260 000 000 conventional vehicles in Europe => <1/100 filling nozzle / vehicle
2) analysis by the Transport and Environment (T&E) environmental think tank
CONCLUSION OF THE INFRASTRUCTURE DIRECTIVE

- Member states must develop framework for alternative fuels infrastructure until end 2016
- The directive supports electricity, hydrogen and CNG/LNG
- For electricity the recommendation is one charging point per 10 electric vehicle by 2020
- Member states can chose to include hydrogen in the framework.
- For CNG and LNG the directive is strict
  - CNG vehicles should be able to commute freely in the entire EU by 2025.
  - LNG shall be available along the TEN-T core network by 2025
  - LNG should be available at major sea and inland ports
DIRECTIVES ALTERNATIVE FUELS INFRASTRUCTURE SITUATION 2025?

PROPOSED INFRASTRUCTURE TRANSITION 2013 - 2025

Assumptions recharging points:
Sales – analysis by the Transport and Environment (T&E) environmental think tank
Recharging points – 1 for every 10 vehicles
NATURAL GAS PREFERRED FUEL IN THE DIRECTIVE

WHY NATURAL GAS?

- Natural Gas is a preferred fuel in the Directive
- But the directive itself will not result in a massive infrastructure for Natural Gas as automotive fuel
- In large parts of Europe there is a mature infrastructure for using natural gas as energy carrier
  - One of the main reasons why natural gas has become a preferred alternative
- Another reason is the prospect of “long term” availability within Europe
- The reduced carbon to hydrogen fraction of natural gas can help reduce CO₂ emissions
- And natural gas is price competitive on an energy basis compared to liquid hydrocarbons
NATURAL GAS PREFERRED FUEL IN THE DIRECTIVE

BUT IS IT POSSIBLE TO DEVELOP EURO VI ENGINES WITHOUT A STANDISED FUEL?

- Latest emission standards (Euro VI/Euro 6) have been reached thanks to:
  - Advanced engine and aftertreatment technology
  - Together with mature fuel qualities

- But, the European standard for automotive NG is not ready
  - And the proposal is heavily influenced by
    - “All” current NG sources “should” be approved
    - Automotive is still a small portion of the total NG usage in Europe

- Parameters that makes optimisation of NG engines difficult
  - Methane Number as low as 65
  - Siloxane levels 5 times higher than component supplier recommendation
  - Sulphur level 30 mg/kg + odorisation (3 to 7 mg/kg extra)
  - Energy content can differ more than 15%
  - AFR can span from ~13,5 to ~17
CONCLUSION

- EU has ambitious goals for 2030:
  - a binding EU target of at least 40% reduction of greenhouse gas emissions*
  - a binding target of at least 27% of renewable energy used at EU level
  - an energy efficiency increase of at least 27%, to be reviewed by 2020 having in mind an EU level of 30% for 2030

- The transport sector needs to contribute to reach those goals
  - By 2020 at least a 10% renewable share in the transport sector

*Compared to 1990 emission
CONCLUSION

- In the Alternative Fuels Infrastructure Directive the “winners’’ are natural gas and electricity
  - How are we to obtain the natural gas?
    - Increased import from Russia?
    - Fracking?
  - How are we to promote renewable fuel for the transportation sector?
    - Will all resources be tied up to build up NG infrastructure?
  - And how are we to develop low emission gas engines without a fuel standard?
QUESTIONS?

Don’t hesitate to ask…

Daniel Danielsson  
AVL MTC  
Technical Expert Fuels and Lubricants  
Phone: +46(0)8 120 56 727  
E-Mail: daniel.danielsson@avl.com
The TEN-T consists of two planning layers:

1. The "comprehensive network": a multi-modal network of relatively high density which provides all European regions. The total length of the comprehensive network amounts to:
   - 138 072 km of railway lines
   - 136 706 km of roads
   - 23 506 km of inland waterways

2. The "core network": a part of the comprehensive network, distinguished by its strategic importance for major European and global transport flows. The total length of the core network amounts to:
   - 68 915 km of railway lines
   - 59 630 km of roads
   - 23 506 km of inland waterways
THE RENEWABLE ENERGY DIRECTIVE

THE RED IMPOSES TWO KEY REQUIREMENTS FOR THE UPTAKE OF RENEWABLE ENERGY AND – MORE SPECIFICALLY – BIOFUELS IN THE TRANSPORT SECTOR.

- EU Member States are required to meet a minimum binding target of 10% renewable energy share in the transport sector by 2020
  - All types of renewable energy used in all transport modes are included in the target setting.
  - Some renewable energy sources are counted differently. For example, the contribution of advanced biofuels towards achieving the 10% target is counted twice.
  - Electricity from renewable energy sources for road transport is counted 2.5 times.
  - Renewable Energy Calculations in the RED Biofuels must also meet minimum sustainability criteria as well as minimum GHG savings per unit of energy.

- Each Member State is requested to establish a National Renewable Energy Action Plan (NREAP), including information on targets for different transport and non-transport sectors
  - In addition, Member States are expected to implement measures to achieve these targets, assessing the contribution of both energy efficiency and energy saving measures.
  - The RED places the responsibility for fulfilling the RED targets on the Member States.
ALTERNATIVE FUELS INFRASTRUCTURE DIRECTIVE AND FUEL QUALITY REQUIREMENTS

DANIEL DANIELSSON

- Technical Expert Fuels & Lubes at AVL MTC
- Chairman - AVL Liquid Alternative Fuels Group
- Member of the Swedish Standardisation Committee
- Chairman – SMR’s Fuels and Lubricants Committee
- Working with fuels and lubes since 1997
- At AVL since 2008
- Focus on alternative and conventional fuels
  Function – Availability - Production
- Focus on engine and transmission lubricants