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

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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**
- **HVO** (Hydrotreated Vegetable Oil)

Sales volumes Europe 2013
- **Conventional fuel**
- **Other**
- **FAME**
- **LPG**
- **LNG**
- **Ethanol**
- **CNG**
- **HVO**
- **Electricity**

Filling stations Europe 2013, excl charging points
- **Conventional fuel**
- **Other**
- **FAME**
- **LPG**
- **Ethanol (E85)**
- **CNG**
- **HVO**
- **LNG**
- **Hydrogen**
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
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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.
No action is foreseen for LPG.

The core infrastructure is already established.
(today ~28 000 stations)
ALTERNATIVE FUELS INFRASTRUCTURE DIRECTIVE

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
ALTERNATIVE FUELS INFRASTRUCTURE DIRECTIVE

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

*The member states can choose to include hydrogen in their alternative fuels national policy frameworks or not.
ALTERNATIVE FUELS INFRASTRUCTURE DIRECTIVE

THOUGHTS IN THE DIRECTIVE - ELECTRICITY

- 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)
THOUGHTS IN THE DIRECTIVE
- ELECTRICITY

- 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

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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 choose 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
NATURAL GAS PREFERRED FUEL IN THE DIRECTIVE

WHY NATURAL GAS?

- CNG pipelines
NATURAL GAS PREFERRED FUEL IN THE DIRECTIVE

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- Another reason is the prospect of “long term” availability within Europe
NATURAL GAS PREFERRED FUEL IN THE DIRECTIVE

WHY NATURAL GAS?

- Proposed Scale Gas areas in Europe

*Europe shale basins. (Adapted from Kuuskraa et al, reference 6.)*
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- But the directive itself will not result in a massive infrastructure for Natural Gas as automotive fuel
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  - 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 CO\textsubscript{2} emissions
- And natural gas is price competitive on an energy basis compared to liquid hydrocarbons
NATURAL GAS PREFERRED FUEL IN THE DIRECTIVE

WHY NATURAL GAS?

- Natural Gas price comparison

![Chart showing Natural Gas price comparison across countries](chart.png)

sources: CNG Europe, US DoE, pakhiz.com, Zawya
note: AT - Austria, DE - Germany, IT - Italy, NL - Netherlands
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…

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