Creating a supportive political framework for biogas in road transport.

Dirk Peters (Bradford University)

28/02/2012
1. Introduction

- Dipl.-Ing. Dirk Peters, MBA
  - Bradford University (2009 – 2011)
    - Master of Business Administration (MBA, part-time)
  - German Energy Agency (dena, since 2008)
    - Project Director for alternative fuels and powertrains
    - „Initiative for natural-gas-based mobility: CNG and biomethan as fuels“
  - Volkswagen AG (2005 – 2008)
    - Product Manager for CO₂-efficient engines
    - International Trainee with focus on alternative fuels
- Positions during studies
  - Daimler AG, Volvo AB
1. Introduction (cont‘d)

- Recipient:
  - DG MOVE at European Commission (Unit of Clean Transport & Sustainable Urban Mobility)
- Research questions:
  1. To what extent does market failure suppress the creation of a functioning NGV-market in Germany?
  2. Which policy instruments are used in other countries to mitigate the identified market failures?
  3. Which policy instruments can mitigate the main market failures in the German NGV-market and similar European AFV-markets?
1. Introduction (cont‘d)

• Aims of this presentation
  • Create interest in economic theory for creation of markets and market failure
  • Introduce methodologies and tools for creation of a supportive political framework for alternative fuels (e.g. LBG) and alternative fuel vehicles (AFVs)
  • Quickly show their application at the example of German markets for CNG & CBG in road transport
Content

1. Need for public policy instruments (PPI)
2. Classification of PPI
3. Choice of PPI
4. Existing and recommended PPI in Germany
5. Timing of PPI-introduction
2. Need for a political framework for LBG/LNG

- Challenge: How to move up the product life-cycle?
2. Need for a political framework for LBG/LNG (cont‘d)

- Two complementary markets - two value chains

**Fuel value chain**

- **Feedstock production**
  - Biogas
  - Natural gas

- **Fuel production**
  - Fermentation
  - Cleaning
  - Feeding in grid

- **Fuel distribution**
  - Pipelines
  - Leasing space for pumps on petrol stations

- **Fuel sales**
  - Incl. marketing

**Vehicle value chain**

- **Purchase of materials**
  - e.g. steel, rubber, semiconductors

- **Production and assembly**
  - Vehicle
  - Natural gas components

- **Vehicle distribution**
  - Dealer network
  - Dealer qualification

- **Vehicle sales**
  - Incl. marketing

- **Vehicle use**
  - Driving, refueling, maintaining, emitting

- **Scraping**

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2. Need for a political framework for LBG/LNG (cont’d)

- Two sides of the market are relevant

Market supply
- Market structure
- Intensity of competition
- Knowledge bases of suppliers and manufacturers
- Networking: Vertical relationships, public-private interactions

Market demand
- Market size and segmentation
- Consumers’ requirements
- Price elasticity of demand
- Role of niche markets vs. mass markets

Adoption of AFVs
2. Need for a political framework for LBG/LNG (cont’d)

Supply

Vehicle-OEMs and suppliers
- Develop and market vehicles

Gas businesses
- Build and finances fuel pumps

Filling stations
- Provide space for gas pumps

Demand

Consumers
- Purchase vehicles and fuel for public, commercial or private use

Market for AFVs
2. Need for a political framework for LBG/LNG (cont’d)

• Two main reasons for government intervention in economic literature

  • Existence of market failure
    • Coordination failure in complementary markets
    • Negative Externalities / underprovision of public goods
    • Failure in competition
    • Imperfect information
    • Bounded rationality
    • Principle agent problems
    • Underinvestment in R&D

  • Existence of inappropriate policy instruments (e.g. outdated regulations)
2. Need for a political framework for LBG/LNG (cont’d)

- Market failures move supply and demand to inefficient level
2. Need for a political framework for LBG/LNG (cont’d)

- Coordination failure in complementary markets as a major barrier for AFV-introduction
2. Need for a political framework for LBG/LNG (cont’d)

- Role of government and private stakeholders for AFV introduction

- EU, National, Regional Industry efforts

- Increase of AFV market share & Reduction of AFV costs and overheads per AFV

- Political framework
  - EU, National, Regional

- Industry efforts
  - Invest and develop
3. Classification of public policy instruments

- Both supply-side and demand-side of market can be incentiviced

- "coordination" includes government mediation in complementary markets of fuels and vehicles, e.g. round-tables, roadmaps, consultations

- "engaging the public" includes raising awareness (e.g. on climate change), consumer information (e.g. on product advantages), government branding and PR
4. Selection of public policy instruments

- Recommended process (United Nations)
  - Early signal of government intent
  - Analysis of options
  - Choice of policy instruments
  - (Timing of introduction of instruments)
Identification of environmental problem and (fiscal) objective(s)

Consultation with stakeholders

Should the government intervene?

YES

Early signal of government intent

Analysis of options

Appropriate government sphere of intervention

Design and administrative considerations

International experience

Distributional impacts

Impacts on competitiveness

Alignment with other policy objectives

(Taxes, tradable permits, regulations and/or information disclosure schemes)

Choice of instrument

No immediate government action needed – watching brief

Source: National Treasury (2006)
Analysis of options
(Taxes, tradable-permits, regulations and/or information disclosure schemes)

- Appropriate government sphere of intervention
- Design and administrative considerations
- Alignment with other policy objectives
- International experience
- Impacts on competitiveness
- Distributional impacts

Choice of instrument

Source: National Treasury (2006)
4. Selection of public policy instruments (cont’d)

- Different target groups $\Rightarrow$ different markets $\Rightarrow$ different policy instruments

**Market for LNG/LBG trucks**

- **Commercial Users**
  - Delivery services, logistics
  - Mostly rational buying behavior
  - Value for money, safety

- **Public users**
  - Municipal services
  - Regulated buying behaviour
  - Chance for early market: Green Public Purchase
4. Selection of public policy instruments (cont‘d)

- Complementary use of temporary and permanent incentives
  - AFV-introduction takes time
  - Permanent policy instruments should
    - be technological neutral,
    - have long-term finance, e.g. by raising tax for conventional vehicles or fuels
4. Selection of public policy instruments (cont‘d)

- Public policy instruments necessary at different levels

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<th>Supply side (push)</th>
<th>Demand side (pull)</th>
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- International
- European
- National
- Regional
- Municipal
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5. Existing and recommended PPI in Germany

- Share of AFV registrations in total new vehicle registrations at 0.8 percent only (22,000 out of 3 mln. vehicles)
- Target of 1 mln battery-electric vehicles in 2020
- New AFV policy instruments recommended by
  - initiative for natural-gas-based mobility
  - National program for electric vehicles
### Germany (examples)

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#### European
- Expert report on alternative fuels.
- CO2-targets for new vehicle fleets (130 and 95g); biofuel quota
- TEN-T infrastructure tender; R&D support
- PR of European Commission; vehicle labelling
- Public purchase

#### National
- dena-initiative w. ministry patronage; NEP
- Biogas injection targets; biofuel quota
- R&D-support, infrastructure support; reduced grid use fees
- Press conference with involvement of state secretary
- Public purchase (use financial evaluation)
- Road and energy tax reduction (prolong); company car taxation

#### Regional and municipal
- ? Sweden: e.g. „Clean vehicles Stockholm“
- ?
- ? Sweden: e.g. „Clean vehicles Stockholm“
- ?
- Purchase bonus for NGV from energy provider

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**EU Fuel Strategy**

**National Fuel Strategies (as also suggested by WS group I on Oct 31, 2011)**

**Regional fuel strategies (as also suggested by WS group III on Oct 31, 2011)**
5. Timing of policy instruments

- Adapt policy instruments to status of market introduction

Fig. 24. Policy instruments along the S-curve (Bunzeck et al., 2010)
Market share of
a) LNG/LBG in fuel market or
b) LNG/LBG vehicles in vehicle market
Thank you!

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Member of EURIST – European Institute for Sustainable Transport
2. Need for a political framework for LBG/LNG (cont’d)

- Increasing the market equilibrium by increasing
  - QD – willingness to demand, or
  - QS – willingness to supply, or both

![Graph showing market equilibrium and political intervention impact]
2. Need for a political framework for LBG/LNG (cont’d)

- Share of responsibilities

![Diagram showing the roles of government, policies, investments, and market stages for LBG/LNG technologies.]

*Government*

- **Policies and interventions**

**Costs per piece**

- **Market penetration**

**Time**

- **R&D**
  - Technology Push
  - Early and niche markets
    - Zone of difficulties
  - Mass market
    - Market pull

**Investments**

- Car manufacturers, energy and petroleum businesses
Negative impact on the NGV market in Germany

- Existence in the NGV-market in Germany

- Failure of competition
- Imperfect information
- Bounded rationality
- Principal agent issue
- Negative Externalities and undersupply of public goods
- Coordination failure in complementary markets
- Underinvestment in R&D

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Fig. 4. Development of population of natural gas vehicles during last decade (dena, 2011a) and targeted numbers of EVs in next decade\textsuperscript{13} in Germany (author’s own)
Fig. 6. Historical development of share of NGVs in total vehicle population in case study countries and Germany in the past ten years; own calculations based on data from NGV Global (2011)\textsuperscript{18}
Fig. 29. NGV-numbers, number of filling stations and vehicle-to-refuelling-station index (VRI) for case study countries (calculation based on data of NGV Global (2011))
Fig. 39. Projection of transition of NGV-market to higher market penetration by overcoming coordination failure over time (author’s own)\textsuperscript{109}