NGVs Past & Prologue
Lessons Learned to Create Deployment Strategies for Commercializing NGVs
Webinar 3
Natural Gas Vehicles: Role of Government – Policymaking and Strategy Process
Dr. Jeffrey Seisler, CEO
Clean Fuels Consulting
15 December 2014
The Role of Government
Selected Summary Points

• Alternative fuel source(s) must be pursued on a timely basis as any major transition will take many years.

• Fuel transition(s) must be as few as possible, because the infrastructure change-over expense may will be huge.

• Realignment of ongoing fuel shifts may be necessitated by major changes in:
  - Technology
  - International affairs
  - World pricing and supply of fuels

Source: Checklist for Transition to New Highway Fuel(s), Charles Risch, Danilo Santini, January 2012.
THE INVOLVEMENT OF GOVERNMENT IS ESSENTIAL*
(Strategies Supported by Specific Actions!)

- Create incentives (financial & others)
- Enforce mandates (but with incentives)
- Develop standards
- Fund research & development
- Leadership by example
- PR & communications

* What’s good for one alternative fuel is good for them all!
Market Expectations…
Market Realities
Different approaches to NGV market development will help shape government approach to policies.

France
UK
Germany
U.S.
Italy
Norway
MARKET BASED INSTRUMENTS

What is popular?

• Taxation is the most cross-cutting
  - Incentives (subsidies)
  - Penalties
  - Exemptions

• Three main options in the transport sector
  - Fuel taxes
  - Vehicle taxes (sales, import, registration)
  - Vehicle use taxes (i.e. road tolls, parking..)

• Tax *credits* or *tax deductions*
  - $/€ 5000 *deduction* from your taxable income at 50% tax = $2,500
  - $5000 *credit* from taxes you owe = $/€ 5,000!
INCENTIVES & THE NEW ZEALAND NGV EXPERIENCE

• Experience shows that conversions per month were sharply affected by government incentives
  
• When incentives occurred, market share increased
  
• When incentives were removed, market share dropped significantly
  
• After worldwide oil price collapse of 1985-86 program ends
Effect of Incentives on New Zealand NGV Program 1980-1986

- Govt. Target Announced (10% NGVs)
- New Govt. Incentives Announce 50% Δ nat gas & petrol
- CNG voucher program $300 free CNG
- Govt. CNG loan program
- Petrol Price reduced by Govt.
- Extension of CNG Incentives to pioneer areas
- Govt. removes favourable CNG loans conditions
- Devaluation of NZ dollar increases cost of petrol
- Govt. modifies loan program
- Loan program ended

Conversions per month

130,000 NGVs
THE U.S. INCENTIVE TIPS

- Focus projects on reducing emissions or petrol use or (preferably) both
- Tax incentives must be offered for the cost *differential* between NGV & petroleum vehicle, not for *FULL* value of the vehicle!
- Programs have to be easy to administer (no refund hassle, etc.)
- Incentives are needed to support the fuelling infrastructure as well as vehicles
- Grants & cash rebates are more popular than tax credits (especially for consumers OR vehicle salespeople)
- Nonprofit organizations and local governments can be qualified for grants/cash
- U.S. tax incentives have been too short-lived.
ITALIAN NGV GROWTH PER YEAR: WITH & WITHOUT FISCAL INCENTIVES

Lesson learned: Government policies need to be consistent and stable to assure customers of long term market initiatives

Source: M. Ziosi, NGV System Italia, 2011
SUCCESSFUL
BERLIN TAXI CAB PROGRAM
“TUT” 1000 taxis (2001)

• First 400 purchasers of Euro 4 taxis (2005 standard) received € 3068
• Second 300 purchases received € 2567
• The last 300 purchasers received € 2045
• Local gas company provided fuel vouchers ranging from €1534 to €1043 for early to later purchasers
Reward the innovators and earliest adopters who take the most ‘risk’ (and leadership)
Successful Market-Based Incentives
Creative Financing for Cairo Taxis

• Egyptian ‘shared savings plan’ organized by government & Nassar Bank
• No cost ‘loans’ to taxi drivers to convert vehicles: conversions provided ‘free’
• Cost repaid by paying petrol price for natural gas until loan is repaid, then fuel costs drop by 50%
• Cash flow back to bank/government is continual and can be ‘recycled’ back to new customers
• Cleaner air contribution is immediate and growing
• Revenue impact = time value of money loaned
POLICY TOOLS: Non-Financial Incentives

- Exemptions from ‘Bad-Air’ day traffic bans or limitations 4 Italian cities, Paris, etc.
- Exemptions from time-of-day traffic restrictions i.e. London congestion charge;
- Restrictions on commercial traffic, such as noise limits on late night commercial traffic (bad for diesel; good for NGVs)
- Access to carpool lanes…United States, mainly;
- ‘No-Wait’ taxi zones at airports & train stations. Very successful in Sweden where first initiated; challenged in Texas courts by taxi association!
POLICY TOOLS: WHEN DO MANDATES WORK?

• Best with incentives. Financial ‘carrot’ helps ensure compliance
• Transition approach most likely for success (i.e. gradual increase of % procurements of vehicles over time)
• To be successful mandates must be implemented AND enforced*

(*i.e. Mandates to sell or produce specific vehicles are unenforceable.)
ENERGY POLICY ACT 1992 (US)

Fleet Mandate Phase-in

Impacts diminished by ‘unintended consequences’

Program terminated March 2008

Alternative Fuel Vehicles
% of New Vehicle Purchase

- Federal
- State
- Energy Providers
POLICY TOOLS: Funding for RD&D

• Support can be provided to advance ‘market proven’ technologies (like NGVs) and accelerate growth
• Private sector can’t pay (all) & keep product costs low
• Over-investment in long-term alternative fuels and technologies (i.e. hydrogen & ‘battery’ vehicles) can penalize the ones that are ‘market-ready’.
• Don’t put all the government’s financial eggs in one fuel basket.
The Chasm of Commercialisation

Many new technologies and products do not become commercially viable
Time Taken to Introduce New Technologies Requiring Infrastructures
(# of years to spread to 25% of the U.S. population)

Source: Transportation and Climate Change: Options for Action, Canadian Transportation Association, November 1999
POLICY TOOLS: Leadership by Example

- Governments purchasing clean vehicles can motivate industry (safety, Environmentally Enhanced Vehicles, renewables, etc.) by helping to create a critical mass needed to reach economies of scale.

- New initiatives fostered by *innovators (champions)*, followed by the rest of the ‘bell-shaped-curve’.

- New initiatives fostered by innovators and satisfied early adopters, leading to early majority market take off.
Historical ‘NGV Leadership by Example’

Bill Clinton 1994  
Cong/Gov. Bob Wise’s ‘New NGV’  
Queen Silvia, Sweden in her NGV  
PM John Major with his ‘fleet’ NGV  
G.Bush Sr. NGV @ the White House 1993  
Boone Pickens’ Backyard FuelMaker with the Bushes 1992
THE POLICY MAKING & STRATEGY PROCESS
How to decide what to do and in what order of priority
A comprehensive AFV policy is very important

We already have this.

We prefer this.
Roadmaps can provide direction

• Roadmaps help avoid ‘disjointed incrementalism’
  - ‘Incremental’ is OK
  - ‘Disjointed’ is inefficient and less effective than coordination

• Short & mid-term planning lays the foundation for longer term infrastructure development (fuel)

• More certainty in policies (if possible from the roadmap) encourages commitment for investors, vehicle and equipment suppliers, & customers.
Roadmap: Where the rubber meets the road.....and getting traction instead of spinning the wheels

- Situation
- Goals
- Gaps & Challenges
- Action Items
- Priorities & Timelines
- Milestones

- Where we are today
- Where we want to be
- What is in the way
- What has to be done
- What is most important to do & in what order
- Landmarks & measures of success
The NGV Roadmap
Each Stakeholder has a Role to Play

- GOVERNMENT(S),
- ENERGY SUPPLIER(S),
- VEHICLE & EQUIPMENT SUPPLIERS
- COMMERCIAL FLEET OWNERS & OPERATORS
- RESEARCH INSTITUTES
- EDUCATIONAL INSTITUTIONS
- ENVIRONMENTAL GROUPS
- NON-GOVERNMENTAL ORGANIZATIONS
ALTERNATIVE FUELS IN URBAN TRANSPORT
A Blue Print for Implementation (Clean Cities)

PUBLIC & PRIVATE INPUT & SUPPORT

- Emissions analyses
- Well-to-Wheel analyses
- Cost benefit analyses
- Decision support tools
- Tighter emissions standards
- Technology availability
- Fuel availability
- Fuel costs

NEW TECHNOLOGY INTRODUCTION

- Biogas
- Hybrid
- EVs
- Fuel Cells
- LPG
- CNG

THE MARKET

- Non-fiscal incentives
- Fiscal incentives
- Leadership by example
- PR & communications

Stakeholders

- Local government
- Energy suppliers (gas/electric/oil/others)
- Commercial/private vehicle operators
- Original equipment manufacturers
- Environmental organisations
- Original equipment manufacturers
- Environmental organisations

*Best Available Technology

L:presentations and sheets/clean cities network.9.2002.ppt
INTO THE FUTURE:
WHAT CAN BE LEARNED FROM
THE ROADMAP EXPERIENCES?

International Energy Agency
European Commission
U.S. DOE

German Energy Agency
California RD&D Roadmap
City of Almaty Kazakhstan

Into the Future with Energy Roadmaps, J. Seisler, NGV Global Bi-annual Conference, Mexico City, 6-9th November 2012
All ‘Roadmaps’ are different depending on the entity, objectives, timeframe, etc.

- **Federal governments/countries**
  - Recommendations
  - Mandates

- **States**: similar to federal level

- **Cities**: foster consensus amongst stakeholders & the community
Critical Actions Identified

German NGV Roadmap

- Increase OEM NGV offerings
- Continue energy tax reduction & differentiation by CO2 output beyond 2018
- Demand oriented development of CNG network (not ‘build it and they will come’)
- Fuel pump price display CNG in petroleum equivalents
- Capacity utilization of fuelling stations needs to be increased (vehicles per station) (April 2014 = 105 NGVs/station)
- Increase biomethane & develop certification system
Canadian Roadmap
NGV Market Focus

• Focus on high fuel consuming, centrally fuelled fleets
  - Heavy duty & medium duty/OEM
  - LDVs retrofit (but not commuter vehicles)
• Short sea shipping (LNG) (1 ship = 50 trucks)
• Rail applications (1 locomotive = 20 trucks)
• Create collaborative environment with stakeholders to move forward
Infrastructure Concepts & Strategies

- Cores, Rings & Corridors
- Blue Corridors & Gas Highways
Who are the best partners to invest in the fuel infrastructure?

Who Owns Gasoline Retail? And is there profit in alternative fuels?

The Association for Convenience & Petroleum Retailing
In the U.S. the *convenience industry* sells 80% of the gasoline.

*Consumers think major oil owns 63% of stores*
In Europe the oil majors and their dealers represent a large share of retail fuel stations and are target partners for NGVs.
German market research identified customers’ tolerances travelling to CNG stations

‘Acceptable’ distance between refuelling stations was determined through customer market research

- towns and cities  approx. 5 km
- mixed areas  approx. 10-15 km
- rural areas  approx. 20-25 km

Construction of approx. 1,000 new CNG refuelling systems at public petrol stations

Total capital expenditure:

approx. € 250 million

Source: Ecrgasmobile 10.06.2003
Cores, Rings & Corridors

Growth strategy for natural gas refuelling station networks in Germany is providing CNG to customers across the country.

Legend:
- Cores
- Rings
- Corridors

Source: Jeffrey M. Seisler, European NGV State of the Union, 11th ENGVA Annual European NGV Conference & World Fair NGV & H2V, Bolzano June 2005
LNG Fuelling Station Strategies

- Central fuelling for fleets returning to base
- “Selling through the fence” (maybe easier with CNG)
- Fuelling at LNG truck terminus locations
- Connect the dots: LNG corridors
- (L-CNG in corridors to promote CNG too!)
2014 Directive ‘Deployment of the Alternative Fuels Infrastructure’ originally specified development of CNG & LNG stations for road and ports; also EV charging points.

The specific targets were removed in the final version.

Still the mandate exists to 2020, 2025 and 2030 to install ‘appropriate numbers’ of fuelling stations.

Sources: EU documents Ten-T; AFV Infrastructure policy impacts; etc.
Main Points/Concerns about infrastructure policy

- Private sector investment alone will not achieve all the targets; financial incentives are required.
- Historical evidence suggests that public/private partnerships are the most successful (policy development & financing)
- Engagement of the traditional and independent fuel suppliers for niche market road transport fuels is challenging but essential.
All the alternative fuels, to one degree or another, have to deal with some form of *THE CHICKEN AND THE EGG*

**WHICH COMES FIRST?**

**THE ANSWER IS:**

They both have to come at (roughly) the same time: fuelling and vehicles.
Best Strategies
Avoid Past Mistakes; Learn from Creative Successes
Politics - Markets - Technology
Best Strategies
Institutional Requirements

• Vast opportunities to ‘incentivize’ markets exist
• *All* tools should be promoted to ensure long-term sustainability of strategies
• Incentives (rewards) *or* mandates both can work but sticks are always better *with* carrots) *Balance*
• Government should understand the cost/benefit of environmental & health impacts (value of a cost per ton reduced pollution)
• Energy security is enhanced by diversifying from petroleum transportation fuels to alternatives
• When market shares rise, corresponding incentives can be reduced..... But *gradually*
Government incentives based on market share can be attractive from a *revenue impact* perspective and promote *longer lasting policies*.
Best Strategies
Institutional Requirements

• Positive-sum (win-win) approach is advisable
• Stakeholder input (consensus?) is best for policy sustainability
• Reporting & feedback mechanisms allow for mid-stream corrections, improvements & sustainability
• Pro-active is better than re-active
Best Strategies

Market-Building: the process

• **Strategic roadmaps** (with flexible milestones) can be helpful.

• **Consensus-building** amongst all key NGV stakeholders is a proven technique. (In particular, bring together the chickens & the eggs.)

• **Understand the customers’ fuelling needs** (public & private) & the nature of the fuelling infrastructure business.
Best Strategies
Market-Building: strategic targets

• Entry strategy targeting high fuel users have been the logical first targets – fleets…or others: Taxi cabs & buses can help establish critical mass of stations

• Hub & spoke (including ‘blue corridors’) is a proven, logical strategy

• Ports are ready-made hubs for NGVs: airports and seaports (trucks & ships)
Best Strategies

Technology Considerations

• No matter how much money you invest in research & technology, product development to Tier 1 quality takes *time, time, time*

• Beware of ‘hype before hardware’: premature market entry (& without adequate downstream service & support) can be disastrous

• Standards and regulations are the foundation of technology progress

• With safety in mind, implementation & enforcement of regulations is critical for global growth

• “Cheap is not safe.”
Lessons Learned

Create & support AFV associations

• AFV associations have been lightning rods and catalysts for AFV growth
• Associations provide a focus for advocacy work (especially national), market strategy & development and technology advancement.
• Stakeholders need to continue and expand their support of the associations as it elevates the commercialization efforts.
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APPENDIX SLIDES TO FURTHER SUPPORT POINTS MADE IN THE PRESENTATION
Government Considerations Regarding Alternative Fuels

- Environment (incl. public health impacts)
- Energy Efficiency
- Energy Independence and Energy Security
- Feedstock Adequacy and Reliability
- Taxpayer Affordability
- National Economic Impacts
- International Considerations
- Political Continuity (will this policy get us elected..and re-elected?)

Source: Adapted from: Checklist for Transition to New Highway Fuel(s), Charles Risch, Danilo Santini, January 2012.
**U.S. NGV Development 1965-2010**

(characterized in 4 stages)

- **1965** SoCal Gas introduces NGVs
- **1988** NGV Coalition founded
- **1990** Clean Air Act Amendments set stricter emissions targets for next decade
- **1991** Congestion Mitigation Air Quality (CMAQ) provides billions of dollars for AFV development
- **1993** Clean Cities Program begins
- **2004** EPAct & DOE NGV budget cancelled
- **2007** HDV emissions regs phase-in
- **2009** Recovery Act funds 3,300 NGVs & 140 fuel stations
- **2010**

**Chart:** Tiax 2010; annotations by Clean Fuels Consulting 2013
Market-Based Incentives

German Tax Rules for Natural Gas & LPG

- 1996-2009 CNG tax reduced by 61% (from DM 47.6 kWhr to DM 18.7 kWhr)
- 2002 benefits extended to 2020
- March 2006 tax rules provide break for LPG and CNG: to 2009 for LPG; 2020 for CNG
- June 2006 Bundestag adapts law to make both tax breaks apply through 2018.

• Lesson learned: Government policies need to be consistent and stable to assure customers of long term market initiatives
Nassar Bank offers funding for taxi conversion to CNG

"Gas Card" system (loan pay-back system using the CNG-diesel price differences

Diesel price increased by 50%
Expecting tax reduction on CNG equipment

Commercial vehicles must use NG by Dec. 1999

Incentives continue; CNG price advantage

Public-private partners start
\- Pilot projects
\- Funding
\- Standards

Source: IGU, November 2004 updated GVR to January 2011
THE INDIA EXPERIENCES WITH NGV MANDATES

- 1998 decree that public vehicle convert to NGVs by 2001
- Supreme court enforced deadline although majority of buses remained on diesel (only 6 CNG fuelling stations installed).
- Public unable to get to work; riots occurred & 6 buses were burned. Deadline was prolonged.
- The govt. adopt “Command & Control” & “Market Mechanism” approaches (fines & follow-up).

→ Lesson learned: Gradual phase-in implementation & an enforceable plan are needed
Alternative Fuel R&D Hype Cycle
(Fuel du Jour RD&D Funding ‘Concept’)

Multiple Billions

Billion

Many Millions

More Millions

Some Millions

Peanuts

Electric cars

Methanol

Hydrogen fuel cells

Hybrids

Liquid Biofuels

NGVs

EVs

LPG

Petroleum Retail Product Chain is Complex

- **Major Oil Company**
  - Company owned & operated stations
  - Company owned, Dealer operated
  - Dealer owned company franchise
  - Branded independents

- **Wholesale fuel distributors**
  - Private branded independents
  - Unbranded independents
  - Convenient store / hyper markets
  - Truck Stop / Travel Centers (US Model)

- **Controlled fuel distributors**
  - Company owned & operated station
  - Company owned, Dealer operated franchise
  - Dealer owned & operated

- **Oil company owned refinery**
  - National owned refinery
  - Nationally-Owned vertically integrated Oil Company

- **Independent**
  - Oil company owned refinery
  - National owned refinery

- **Clean Cities**
  U.S. Department of Energy
Other fuel strategies take into account gas availability (or lack thereof)

- Virtual pipelines and ‘mother-daughter’ stations can now bring gas to areas where there is no gas infrastructure (yet)
- Home fuelling brings CNG to NGV operators whose residence is suited to this option
Incentives should be reduced gradually over time to avoid market shocks and ‘dislocation’.

Gradual reductions keep markets intact for a ‘soft landing’.

Sudden end to incentives can kill the market, (even if the end date is known).

Broken eggs & dead chickens.

Solar energy tax credits U.S (1985)
New Zealand tax incentives (‘84-85)
Cash incentives for NGVs, Italy (2009)
Etc. Etc.
Best Strategies
Institutional Requirements

• Policies should be long term and consistent over time (‘knee jerk’ reactive decisions kill the market): vision-strategy-focus
• Pro-active is better than re-active
• Rewarding early adopters works
• Credits & deductions on cost differential of the vehicle/fuel station, not full cost
• Exemptions from traffic & pollution restrictions work well (and are economic for government!)
• Free parking and special ‘clean vehicle’ access lanes costs little and motivates markets through increased visibility