

# 26<sup>th</sup> World Gas Conference

1 – 5 June 2015, Paris, France



## NGV Safety: **Perceptions** & **Realities** in Shaping New Markets

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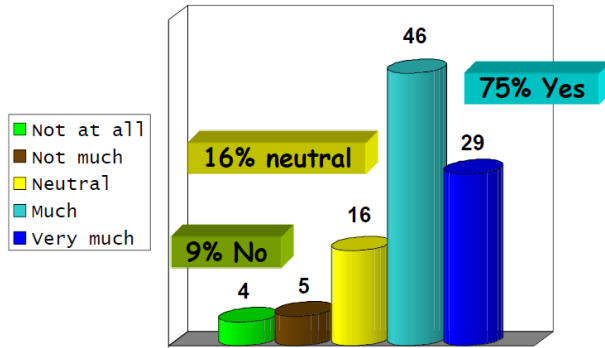
# NGV SAFETY: PERCEPTION IS REALITY



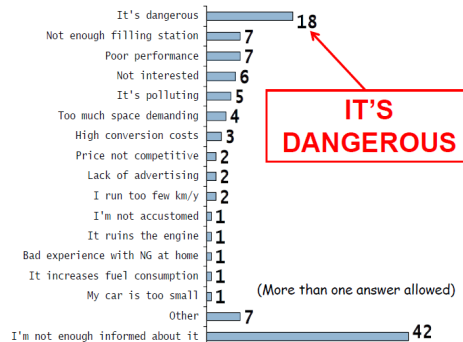
*Changing **perceptions** into **reality** is a necessary and on-going process that needs continued attention and effort.*

# Customer Surveys Over Time: NGVs are Dangerous

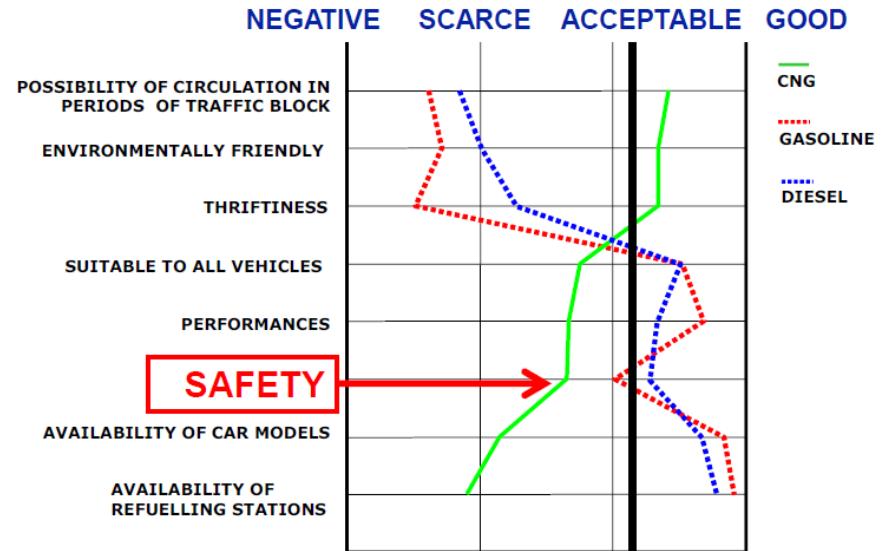
## 1999 SURVEY (Italy) Do you think CNG is an attractive motor fuel?



### Why do you think CNG is NOT attractive?



## 2005 SURVEY (Italy) Fleet operators opinion survey Perception of CNG features vs gasoline and diesel



Source: Italian NGV Scenario 2005, Flavio Mariani, Metauto-ENI Divisione Gas & Power, Cattolica, September 20-21, 2005

Source: The NGV Market in Italy, Flavio Mariani (ENI) as presented at the 2002 Bayerngas Symposium

# NATURAL GAS VEHICLES ARE PROVEN SAFE



# Authoritative Studies Prove NGV Safety

- **NGVs are safe in tunnels (w/standard ventilation)<sup>1</sup>**  
(Hazop studies in: 1989 New York; 1994 Boston)
- **CNG buses are not more dangerous in tunnels than diesel buses<sup>2</sup>** (GdF Suez 2010)
- **In a typical underground parking garage, a CNG vehicle poses no extraordinary risk...is equal to or less than the risk posed by a gasoline fuelled vehicle.<sup>3</sup>** (New York, 1992)
- **NGVs in maintenance workshops: 'no significant hazards'<sup>4</sup>**

1. New York State Energy Research & Development Agency, 1989; Dispersion of CNG Fuel Releases in Naturally Ventilated Tunnels, Center for Fire Safety Studies, Worcester Polytechnic Institute, Mass., November 1994; *Comparative Study of the Inherent Risks of CNG & Diesel Buses*,

2. Dr. Olivier Bordelanne, GdF Suez in Tunnels, NGV Global June 2010. Rome.

3. Hazard Assessment of Natural Gas Vehicles in Public Parking Garages Thomas Grant, et. al, Ebasco Services Incorporated, New York, July 1991.

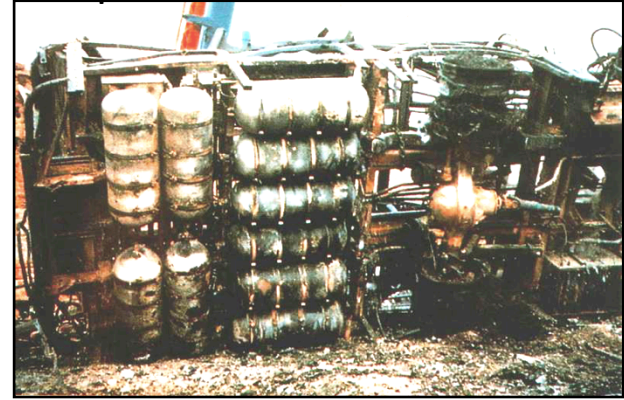
4. "Analyses in Support of Risk-Informed Natural Gas Vehicle Maintenance Facility Codes and Standards: Phase I", SANDIA REPORT, SAND2014-2342, March 2014.

# History of NGV Incidents Prove CNG & L-NGV Safety

Australian truck roll-over: LNG tanks intact



1990 CNG bus fire, Utrecht, NL; Diesel buses exploded but CNG tanks survived



Polish bus fire 2008: only the LNG tanks survived



**CNG & LNG ARE SAFE ...  
IF HANDLED SAFELY!!**



# Building blocks for NGV safety



## **EQUIPMENT STRDS & REGS:**

- Materials Selection
- Safety Factors
- Testing
- Verification



## **EDUCATION OF END USERS:**

- Drivers
- Fleet Managers
- Fueling Station Operators
- First Responders
- General Public

## **INSTALLATION STRDS & REGS:**

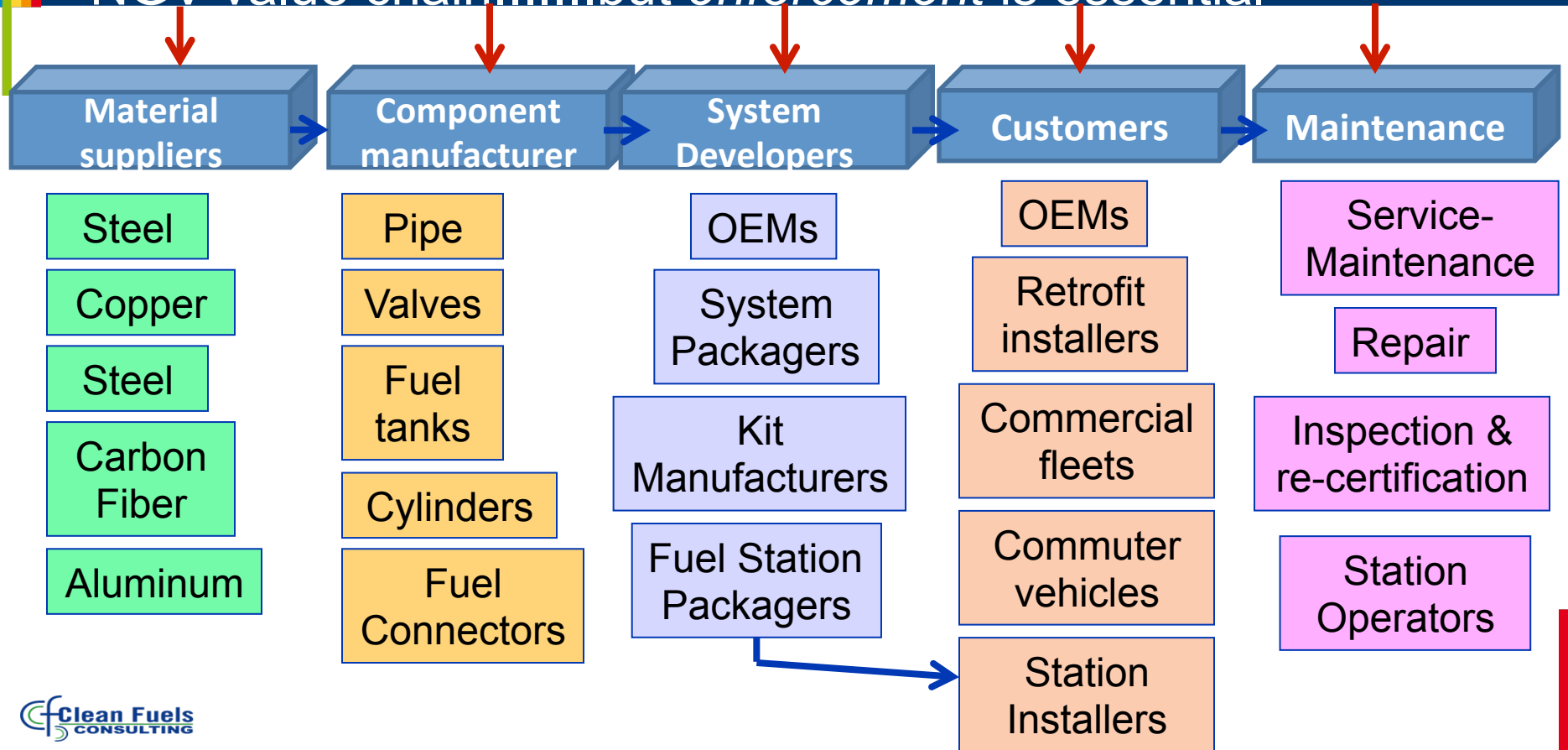
- Station Siting
- Pressure
- Management
- Cylinder Safety

## **QUALIFIED PERSONNEL:**

- Training
- Operating and maintenance procedures

Source: modified from *Natural Gas Vehicle Safety in the United States: Importance, Approach, and Lessons Learned*, Argonne National Laboratory, CNG-NGV Kazakhstan Forum, August 18, 2011

# Safety requirements are imposed along each link in the NGV value chain.....but *enforcement* is essential





# Weak links along the Safety Chain

- **Low quality raw materials**
- **Inferior components or 'knock-offs'**
- **Single unit certification – no batch testing**
- **Untrained certification officials**
- **Bribed certification officials**
- **Human errors**



**'CHEAP' IS NOT SAFE**

# Making weak links stronger

- Identifying the problem
- Who is responsible? (Buyer beware?)
- How to rectify the problem?
- What can be done to prevent a recurrence?
- Who is liable?
- Penalties?
- Enforcement!

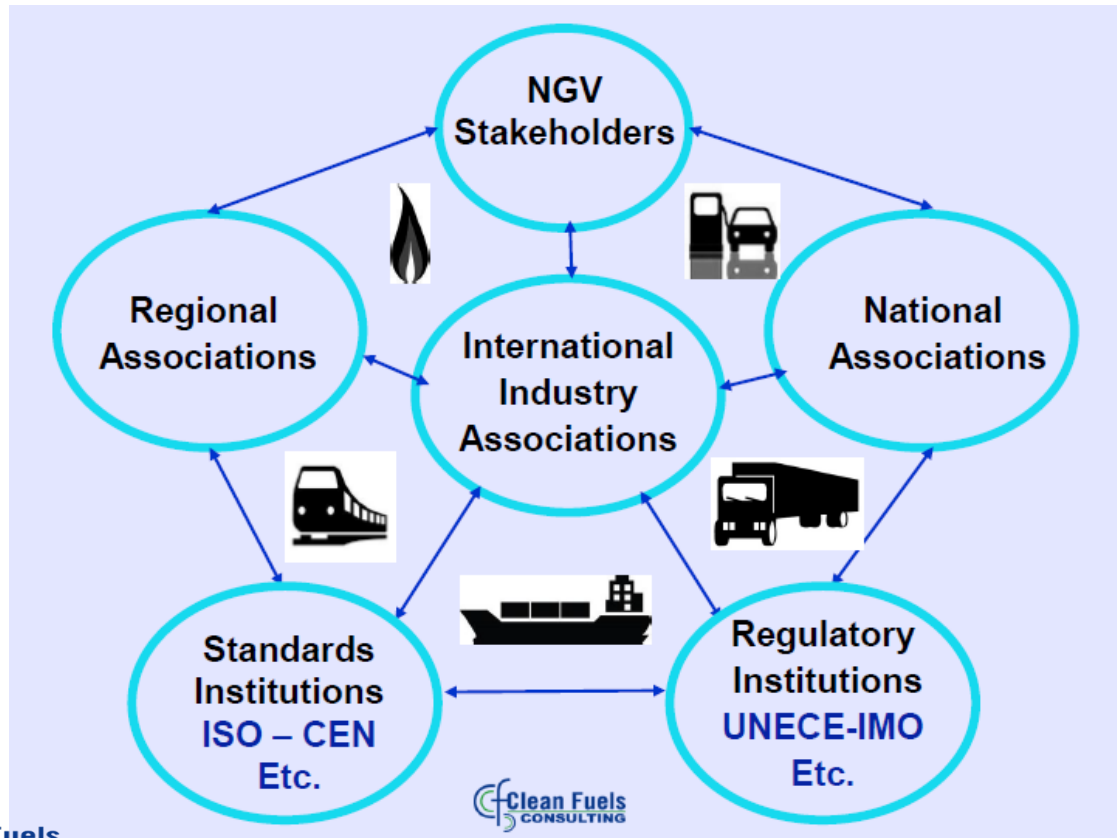


(Thomas Nast, cartoonist)

## Strategic vision to promote safe technology & best practices

- **Cross-fertilized, harmonization of international standards and regulations that *recognize the common safety attributes (and risks)* of natural gas as a fuel alternative to petroleum fuels (*to the best extent possible.....*).**
- **Cross-fertilization of **industry associations** (road-off-road/marine/rail) and their members' knowledge, skills and experiences will speed market entry.**
- **Integration of NGV global markets for all applications where they converge (*seaports, airports, corridors*)**

# Associations supporting gaseous fuel propulsion – *road, marine, rail -- must work together*



***Natural gas safety is the common thread to speed new market development.***

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