

CNG & LNG Safety: **Perceptions & Reality** **Results of Critical Issues Workshop** **8-9 October 2014** **Brussels**

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Presented to:
The GROUP of EXPERTS on GAS
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COMMON PERCEPTIONS OF NATURAL GAS AS A VEHICLE FUEL

Past & Present



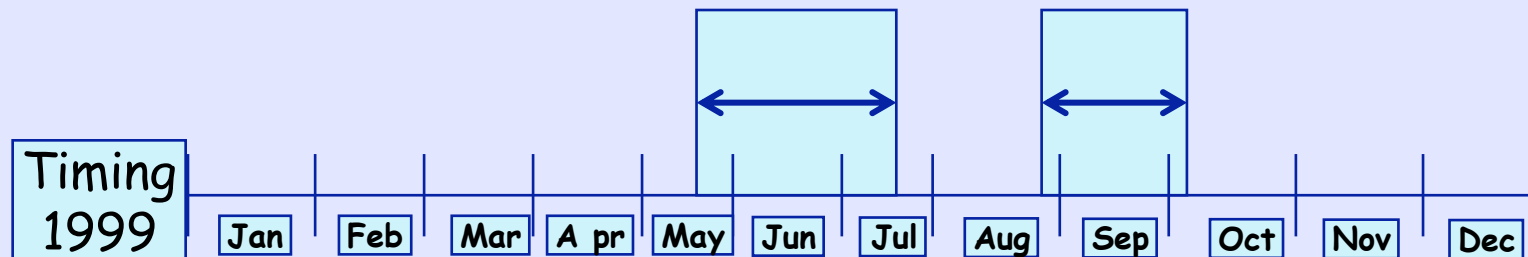
Perception is Reality



1999 Italian NGV Campaign surveyed 800 people, representative of the Italian drivers population

1999: 260,000 NGVs & ~350 CNG stations

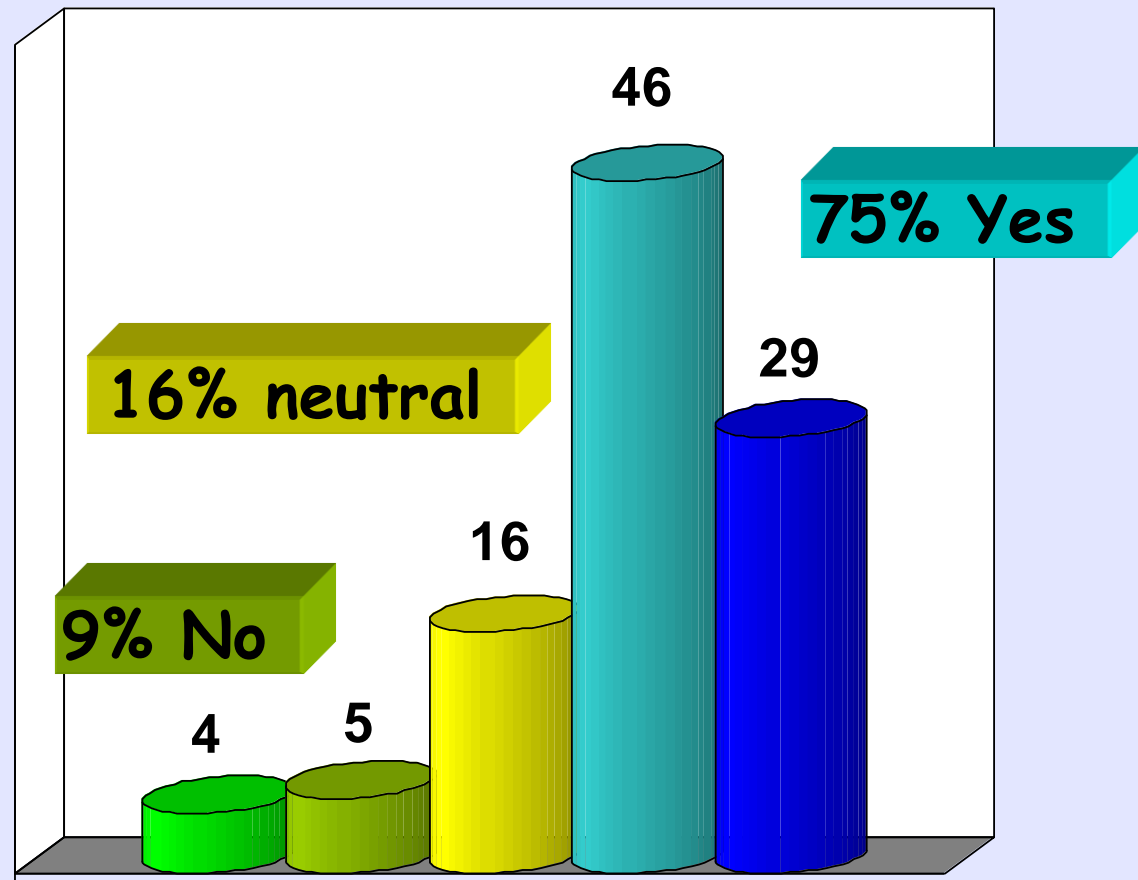
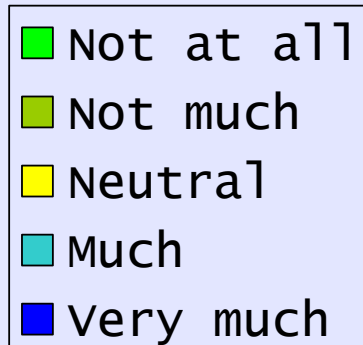
Media Campaign: 3 main newspapers; 8 weekly magazines; 25 monthly magazines (car, science, environment, life style)



Do you think CNG is an attractive motor fuel?

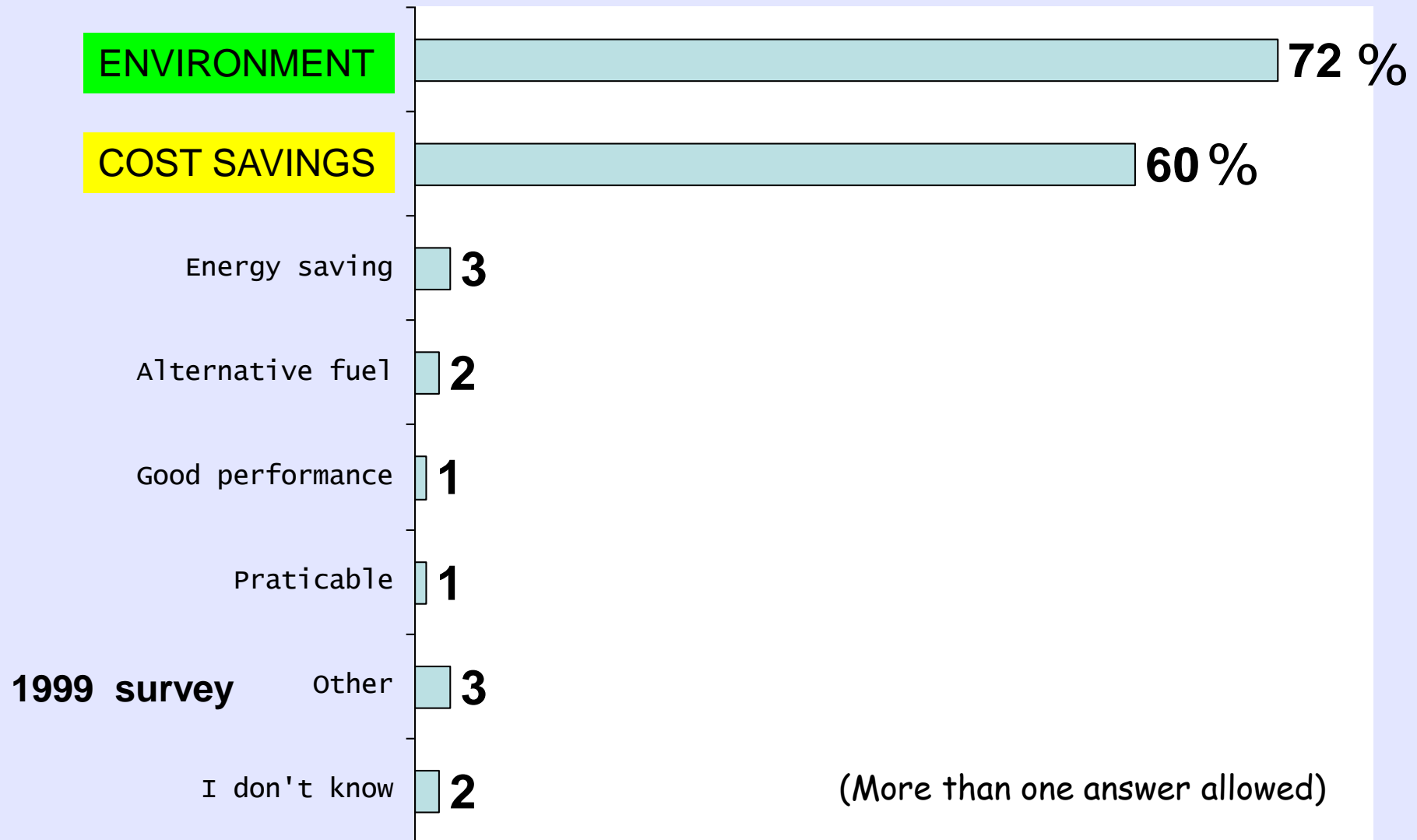


1999 survey



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

Why do you think CNG is attractive?

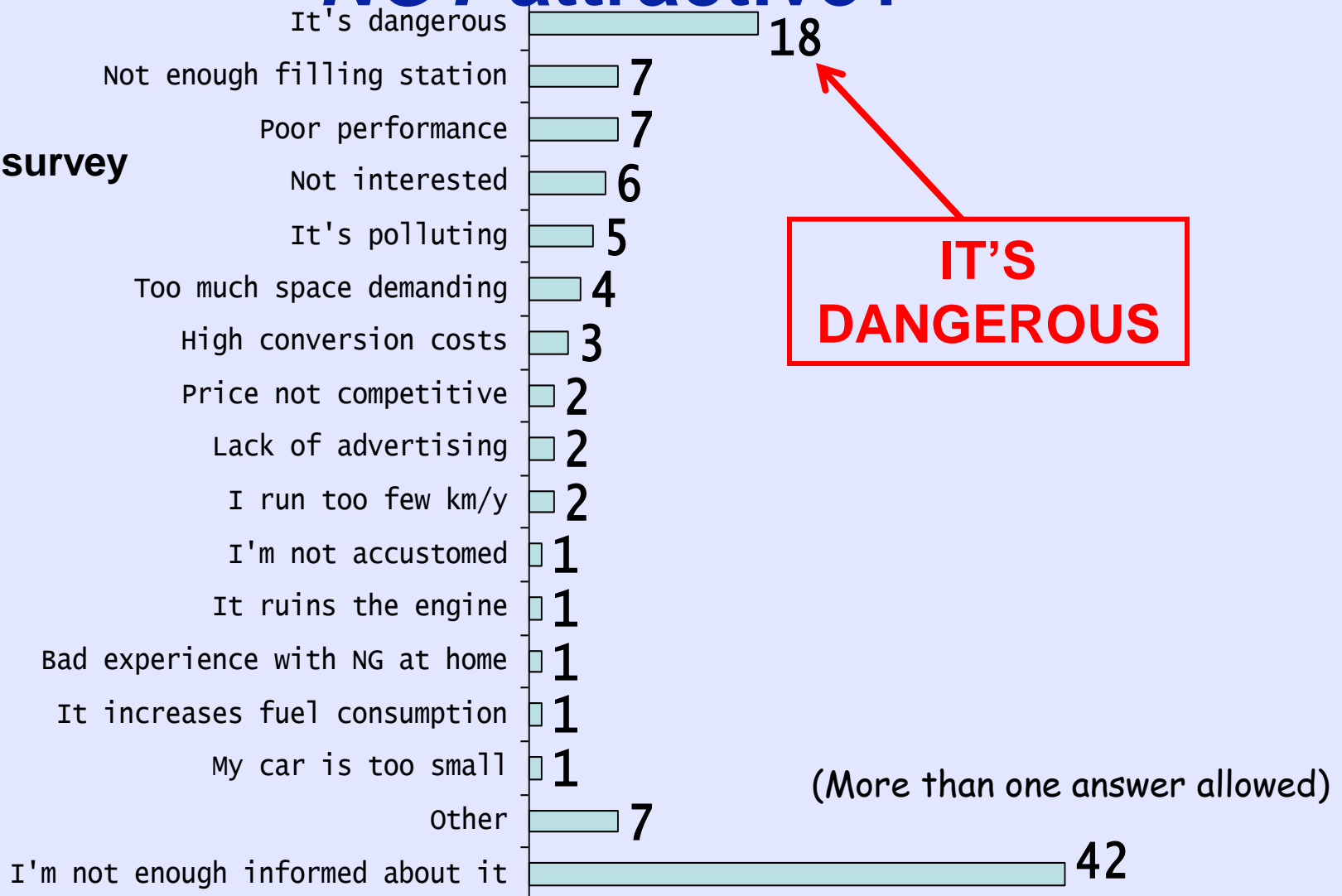


Source: The NGV Market in Italy, Flavio Mariani (ENI) as presented at the 2002 Bayerngas Symposium

Why do you think CNG is *NOT* attractive?



1999 survey

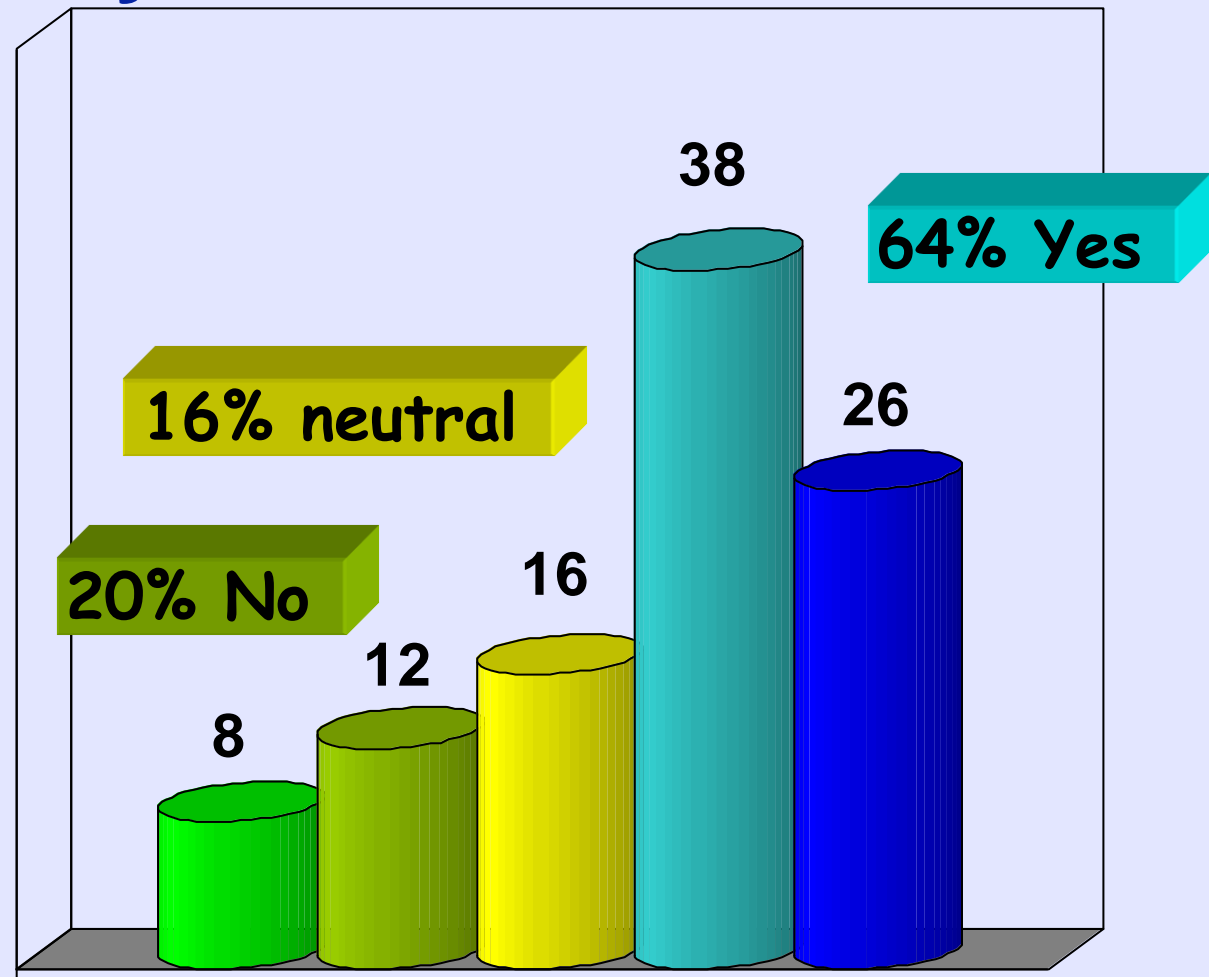
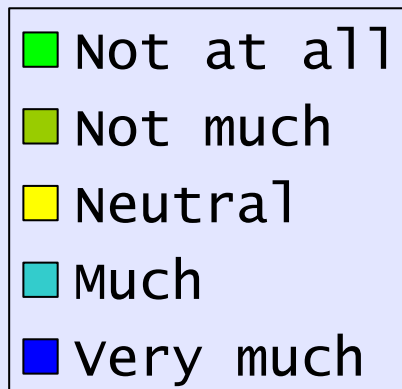


Source: The NGV Market in Italy, Flavio Mariani (ENI) as presented at the 2002 Bayerngas Symposium

Would you be interested in CNG for your own car?



1999 survey

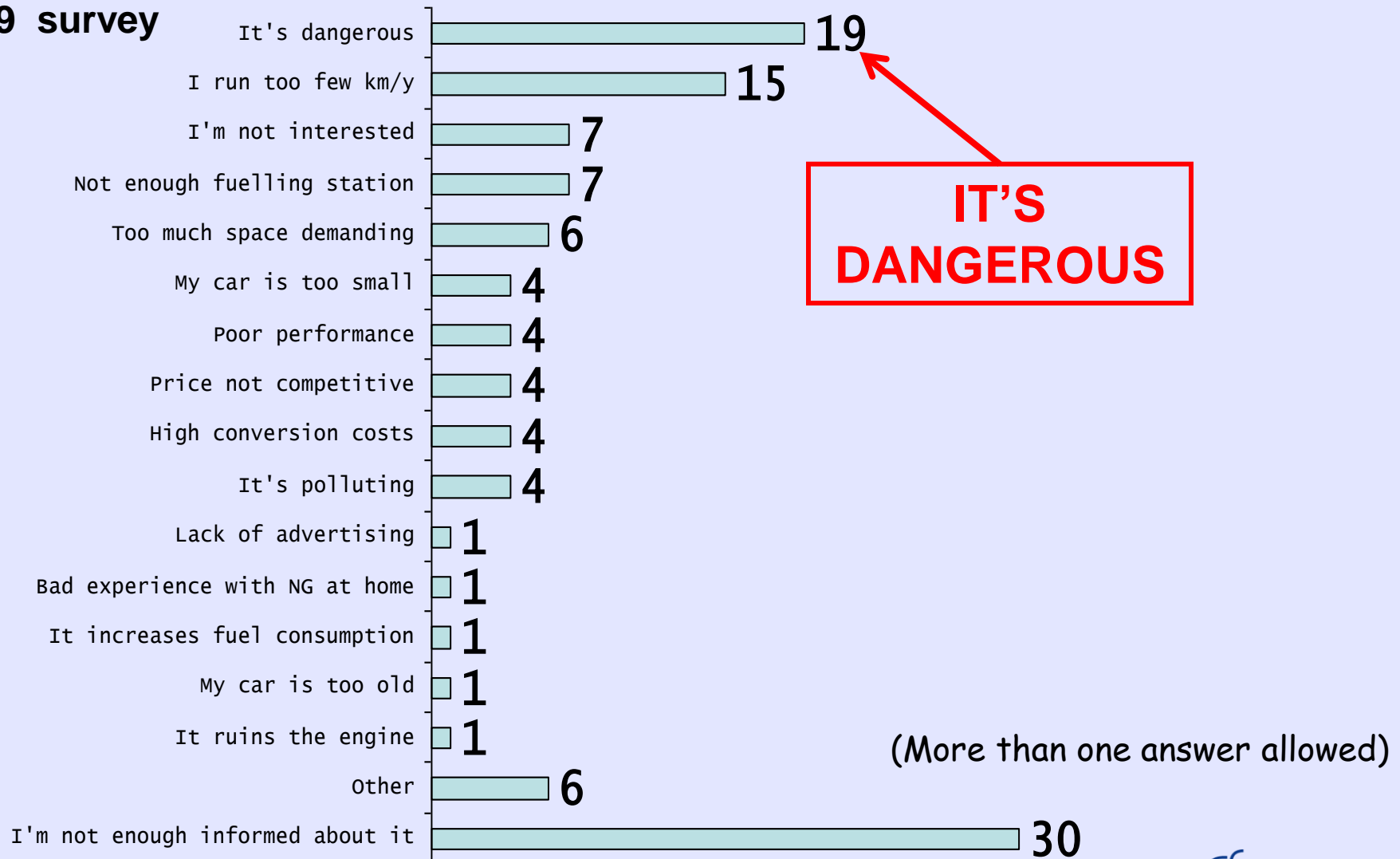


Source: The NGV Market in Italy, Flavio Mariani (ENI) as presented at the 2002 Bayerngas Symposium



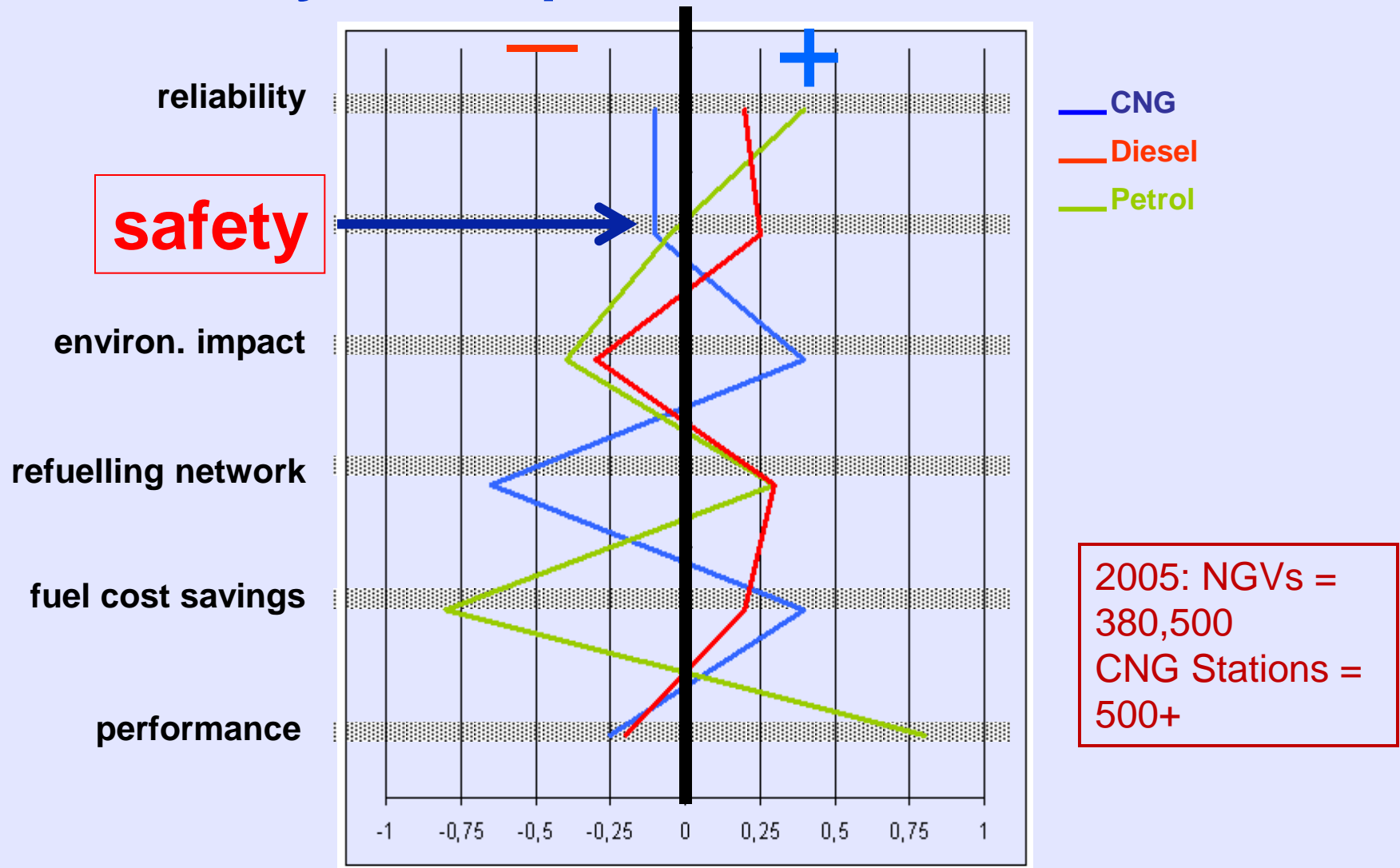
If not, why?

1999 survey



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

Italian customers' *appreciation* of NGVs: Safety was a preceived issue in 2005



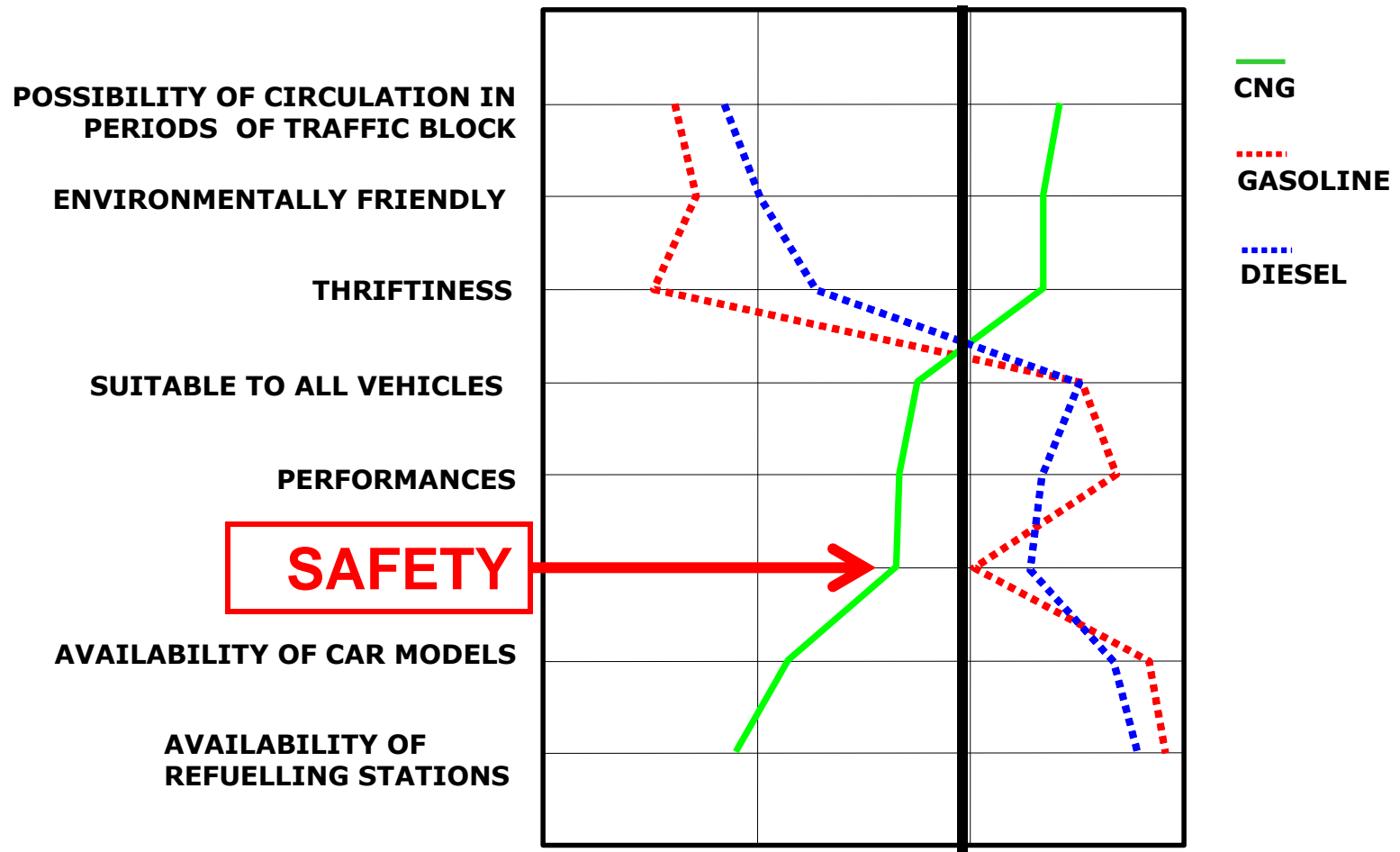
Source: Italian NGV Scenario 2005, Flavio Mariani, Metauto-ENI Divisione Gas & Power, Cattolica, September 20-21, 2005



Fleet operators opinion survey

Perception of CNG features vs gasoline and diesel

NEGATIVE SCARCE ACCEPTABLE GOOD



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

RESULTS

Findings & Conclusions



6th Annual Critical Issues Workshop CNG & LNG Safety: **Perception** & **Reality**

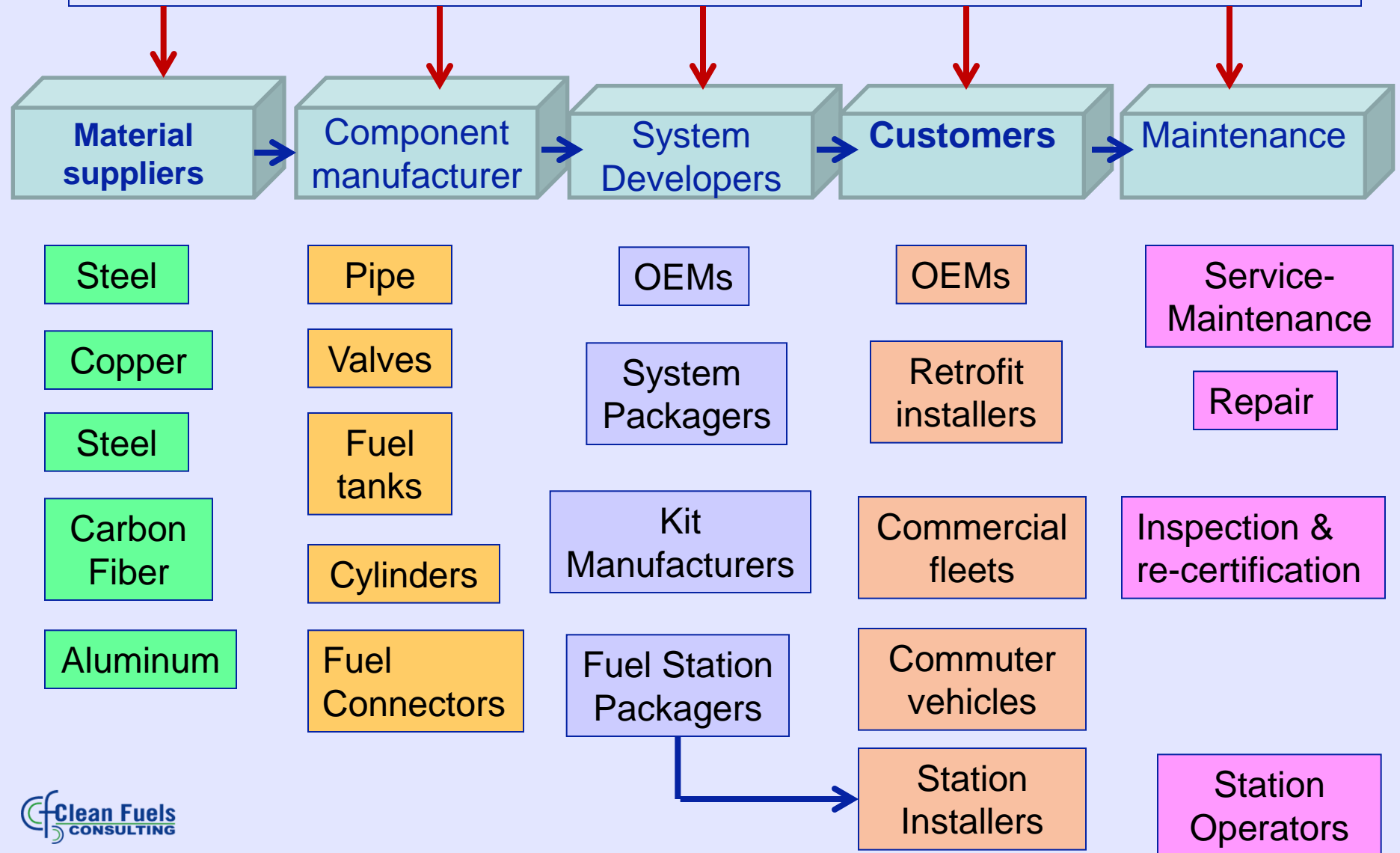
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Safety requirements are imposed along each link in the NGV value chain



Weak links along the NGV value chain



Session 1



- Low quality raw materials
- Inferior components or ‘knock-offs’
- Single unit certification – ‘batch testing’ needed
- Equipment installers at the workshop & maintenance staff are untrained
- Certification officials lack training
- Bribed certification officials
- Human errors



NGV Safety issues have remained constant over time

- ***Perception is reality and NGV safety remains an issue.***
- ***NGVs are safe....if you handle them safely.***
- ***The safety ethic and the concept of 'quality' vary widely from country-to-country.***





Technical Issues for CNG Safety

- *Installers need to follow appropriate installation **codes** and **instructions** from their suppliers*
- *Periodic inspections and cylinder recertification are weak links in the safety chain.*
- *The NGV industry must continue to understand the causes of NGV incidents in order to effect changes in codes/standards, resulting in safer products.*
- *An automotive-grade corrosion performance test is required in NGV industry standards. (R.110)*
- *The NGV industry should learn from the hydrogen industry and consider adopting hydrogen vehicle industry practices.*

LNG Safety for Road, Sea and Rail



Session 3

- *There are potential hazards as well as safeguards at each stage of the LNG supply chain.*
- *Lessons learned from industrial LNG applications are applied to transport sectors.*
- *Marine sector NGV standards are emanating from the top down.*
- *The rail sector use of LNG is in its infancy and mostly is prohibited except through exemptions and for purposes of ‘proof of concept.’*



Small scale liquefaction



Truck to ship bunkering



Burlington Northern Santa Fe



Design and Safety of CNG and LNG Fuelling Systems

- ***Development of natural gas as a marine fuel will depend on the development of robust safety standards and regulations for bunkering (fuelling ships) and related activities.****
- ***Proving safety through hazardous operations studies (HAZOP) is being done on a case-by-case, location-by-location basis, which is very expensive and time-consuming.***
- ***There are no standards or regulations for mobile fuelling stations.***



Conclusions



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

- ***A process to systematically track CNG incidents internationally would promote continued learning and safety.***
- ***'Best practices', sharing experiences of stakeholders and preparing good documents for broad dissemination could be a good way to introduce safety concepts that are not necessarily in the context of legal regulations or even standards.***



Conclusions

Harmonization of standards and regulations as well as vigilant implementation and enforcement within each NGV sector will continue to be a challenge but should be a long-term priority that will promote safety, reliability, and reduce costs for manufacturers and customers.

- ***The NGV industry must police itself to ensure safe system designs and safe products.***
- ***Countries entering the NGV market should look to the highest level of international standards and regulations – ISO and UNECE – as the best models to guide the safe adoption of equipment, whether it is for the road, marine or rail sectors. Countries should not ‘borrow’ regulations from other countries.***



Conclusions

Training is critical, desired and available but costly. The NGV and safety expertise needs to reach more people throughout the NGV value chain who need it the most in order to help provide safe equipment and practices to all NGV markets.

*The **cost** frequently is something the stakeholders are not willing to pay for.*





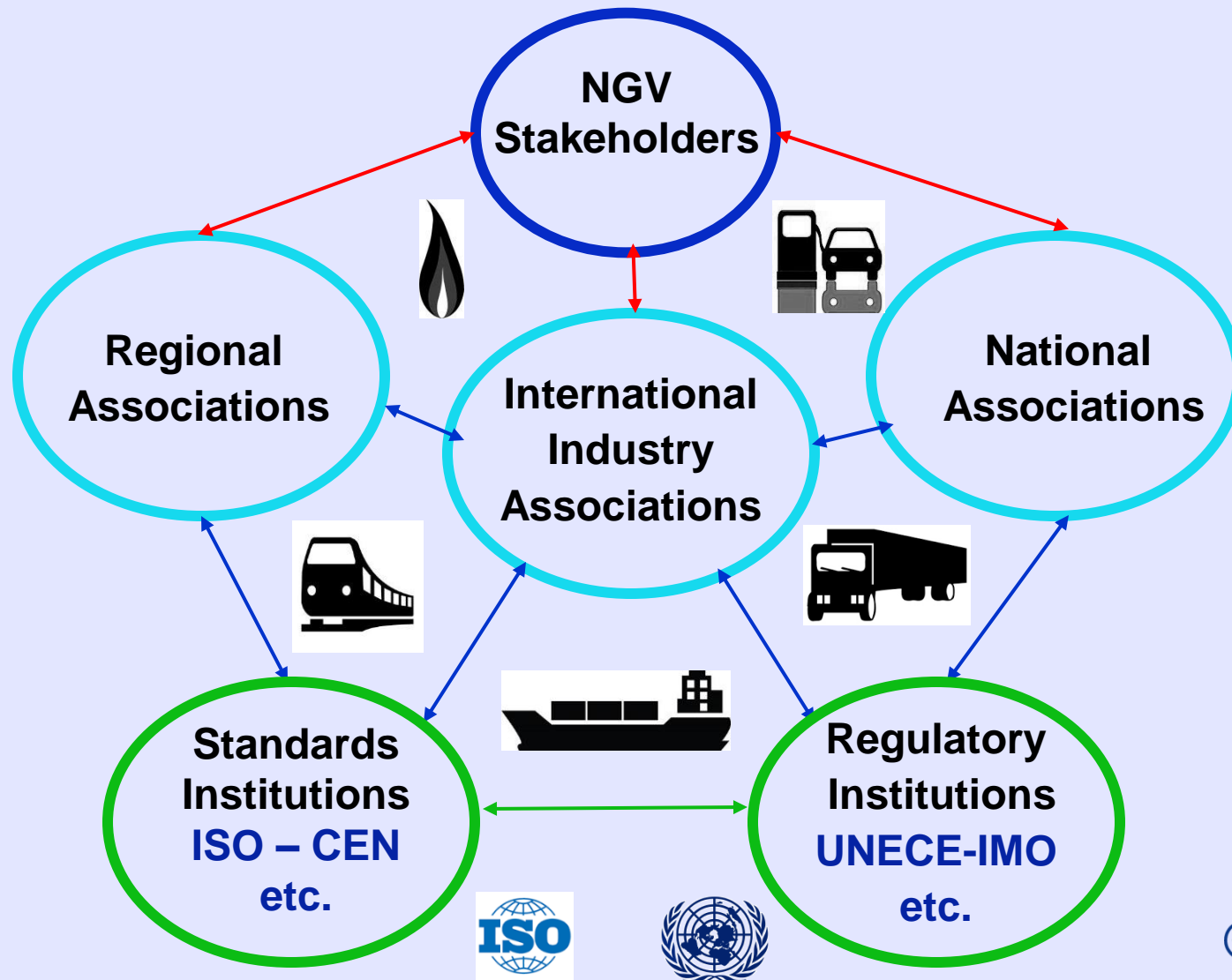
Final Conclusion

Expanding cooperation between the advocates and stakeholders supporting the different NGV technologies and fuel sectors – CNG, LNG & biomethane for road, off-road, marine and rail applications -- will speed the market entry and commercialization of methane throughout all the transportation sectors.

Cross fertilization of knowledge, expertise and experience between the transport sectors (road, marine and rail) is possible but it likely will involve cooperation via industry associations and standards and regulatory organizations at the various levels, international, regional and national.



International institutions & associations supporting gaseous fuel propulsion – *NGVs, marine, rail* -- must work together



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Complete Results paper available by visiting:
www.cleanfuelsconsulting.org



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