

Natural Gas Vehicle Technology Forum Summary

Approximately 80 people attended the Natural Gas Vehicle Technology Forum (NGVTF) meeting in Diamond Bar, California, on October 12-13, 2010. The meeting featured a technology exchange between natural gas vehicle (NGV) stakeholders, government, and industry research and development partners. Presentations focused on: 1) NGV technology development and deployment progress and 2) the impact of state government legislation and international NGV market activities on technology development and availability.

The purpose of this year's meeting was to bring together natural gas industry experts in the NGVTF format, which has not been done since 2008. In addition, this meeting was an opportunity for these industry experts to provide feedback to the California Energy Commission's (CEC) Natural Gas Vehicle Research Roadmap (Roadmap), which was also published in 2008. Specifically, the attendees were asked to provide feedback on the following Roadmap topics:

1. Engine development gaps
2. Infrastructure development gaps
3. Platform development gaps

Engine Development Gaps

Attendees stated there is still a need to develop, demonstrate, and deploy larger horsepower/displacement natural gas engine offerings suitable for heavy-hauling and/or off-road applications. That said, the NGV industry needs a better method of measuring where these vehicles are being deployed before this need can be overcome with certainty.

In regards to improving the operating efficiency and power density of heavy-duty natural gas engines, attendees stated a need for developing a subcommittee to determine what commonly accepted engine-testing parameters should be. This issue is viewed as a critical need and that should be added to the Roadmap.

There was a lot of discussion on managing the power density, developing the fuel system, and lowering technology cost of hybrid NGVs. Attendees agreed that cost is the biggest barrier for the majority of potential customers. Most agreed that the NGV industry should focus on using techniques to reduce the weight of NGVs to prepare for the additional weights associated with hybrid technologies. Hybrid NGV technology is not the issue and the industry should prepare for the incorporation of this technology.

The topics of developing HCNG blend options and combustion control in HCCI engines were thought as unnecessary diversions at this point as there are more pressing issues facing the NGV industry at this time. Specifically, the market potential for HCNG has changed greatly since the Roadmap was published. HCCI

technology is promising, but the NGV industry should keep this topic on the radar and reference the results of the diesel industry's efforts to develop this technology.

Infrastructure Development Gaps

Attendees agreed there is a need to compensate for variations in natural gas quality delivered to fueling infrastructure. From an R&D standpoint, if an engine manufacturer developed a solution/strategy based on methane number/gas quality, it would be a benefit to the NGV industry. The group proposed that R&D should be conducted to ensure engines could effectively handle a wide range of methane levels. Additionally, attendees felt there is a need to address gas specifications to CARB and other utilities across the country to help prevent widespread engine failures due to varying fuel quality.

There was lively discussion regarding LNG fueling infrastructure issues and how this fuel can become more commercially available. Attendees agree several issues need to be addressed, as LNG will be an important component of NGV market development and sustainability. Commonality in nozzles/connection points is needed and there is a need to finalize the development of a dispenser standard. Attendees also agreed there is a need to better identify the 'public' that currently use LNG stations and help to educate on the proper use of this fuel. R&D work should be done to reduce the cost of fueling infrastructure and LNG trucks, both of which are barriers to the expansion of the LNG market.

There was widespread agreement on the need for reliable and comprehensive GPS and station operating data. This will be an important issue for the enhanced usability of natural gas as a transportation fuel. Attendees also agreed there is a need to reduce the cost of purchasing and installing the next generation of home refueling devices.

Platform Development Gaps

In regards to the issue of improving vehicle integration to increase NGV market penetration, attendees stated that the issue regarding regulator failure must be addressed. In addition, the following research issues need to be addressed:

- There is a need to develop a downsized turbo-charged engine to run on natural gas
- There is a need to develop a new 6-8L engine
- There is a need to quantify all of vehicle niches/applications to find market possibilities

Attendees also stated there is a need to develop an engine in the 250-300 horsepower range, as well as a replacement for a 5.9L (torque and horsepower combo) for medium-duty applications. In regards to future R&D efforts, the group would like to see different parameters for engine development from DOE (e.g. market development possibilities vs. petroleum displacement).

Finally, attendees see benefit to developing natural gas engines for specific off-road applications. Development of these engines would provide air quality and petroleum reduction benefits, but would not necessarily stimulate the larger NGV market.

NGV Deployment Needs

Attendees identified additional research gaps and deployment needs, as listed below. Additionally, the group agreed there is a need for the development of working groups within the NGVTF, in particular groups that focus on data analysis and market analysis.

Analysis, Data & Outreach Tools

- More analysis on duty cycles and what are the best fuels for each duty cycle so fleets can make better decisions when 'greening their fleet'
- There is a need for tools that are able to be used by those with limited knowledge about alternative fuels or fleet management
- There is a need for fact sheets and easier to use models that can give customers easy to understand payback numbers
- The NGV industry needs better datasets and attendees should develop improved methodologies for acquiring this data
- There is a need for a CNG cylinder registration / tracking system

Training

- Improved and expanded cylinder safety training is needed as gas utilities get requests for training videos from organizations / fleets that instruct how to fuel and on safety
- There is a need for updated and comprehensive materials for first responder training
- There is a need for on-road refuelers to address emergencies / stranding and the NGV industry should work with the Department of Transportation on developing protocol for this type of program
- The NGV industry needs to provide better information to customers on vehicle safety inspection programs

Comments and Next Steps

Comments were provided by several attendees and are attached at the end of this document. The meeting agenda and final attendee list is also attached below.

NREL staff is currently working to identify and discuss specific issues and topics that would be recommended for inclusion in the Roadmap. For example, NREL will be working with the NGVTF to develop a needs assessment and mapping exercise for small-scale fueling infrastructure. Recommendations to the Roadmap will be made available to the CEC by the end of December.

NGV TECHNOLOGY FORUM

October 12-13, 2010

SCAQMD Diamond Bar, CA

Purpose:

(1) First meeting of joint NREL/DOE – CEC – SCAQMD NGV Technology Forum

(2) Technology Exchange between NGV Stakeholders and Government/Industry R&D Partners

- To communicate NGV technology development and deployment progress
 - Present and review existing NGV technology projects and new standards developments
 - Discuss impact energy economics and market opportunities on technology development
- To communicate the impact of State Government legislation and International NGV market activities on technology development and availability
 - Overview of DOE/NREL's programs and priorities for developing NGV technologies
 - Overview of CEC's PIER program and priorities for developing NGV technologies
 - Overview of CA's AB 118 and its potential impact on NGV deployment and technology needs
 - Overview of South Coast AQMD NGV Technology deployment and development program
 - Overview of international NGV markets and vehicle availability from OEMs

Output:

- Seek feedback from Industry Peers and key stakeholders to develop a list of technology gaps, propose specific projects and propose priorities related to NGV R&D needs and demonstration and deployment programs

Day 1 Agenda: Update NGV Industry R&D Roadmap Activities and Opportunities

8:00 - 8:05	Welcome	(host if appropriate)
8:05 - 8:20	Introduction & Agenda Review	Margo Melendez - NREL
8:20 - 8:50	NGVTF – DOE Update 2010 NGV R&D Smith - DOE	Dennis Smith / Mark
8:50 - 9:20	CEC's PIER – Report on 2009 projects – 2010 RFPs	Rey Gonzalez - CEC
9:20 - 9:50	South Coast AQMD – Update – NGV Program	Henry Hogo - SCAQMD
9:50 - 10:10	BREAK	
10:10 - 10:40	NREL - NGVTF RFP Update	Margo Melendez - NREL
10:40 - 11:10	Market needs – what we hear from stakeholders CVEF/NGVA	Stephe Yborra -
11:10 - 11:30	National NGV Legislation Update	Paul Kerkhoven - NGVA
11:30 - 11:50	International NGV Technology Update	Alex Lawson - IANGV
11:50 - 12:10	NGV Road Map Canada - NR Canada	Alex Lawson, on behalf of
12:10 - 1:10	LUNCH - Networking	
1:10 - 1:30	CNG Cylinder Safety – Issue Management	Doug Horne - CVEF
Project reports		
1:30 - 2:00	Transit Lessons Learned – Tiger Team –Task Order subcontractor	Rob Adams - CVEF

2:00 - 3:00	Engine Development Gaps Facilitated - working session	Rey Gonzalez - CEC
3:00 - 3:25	BREAK	
3:25 - 3:55	HPDI Development Project- 2010 Compliant 15L HPDI Westport power	Sandeep Munshi -
3:55 - 4:25	NG engine – CEC & SCAQMD funded Natural Gas Optimized Advanced HD 13L Engine Volvo Technology	Ingemar Magusson -
4:25 - 4:55	CEC Funded Ultra Low Emission 12L HD NG Engine Development Westport	Scott Baker - Cummins
4:55 - 5:15	CEC Funded Wrap up today's meeting	John Gonzales - NREL

Day 2 Agenda: NGV Technology Deployment Efforts

8:00 - 8:30	Continental Breakfast	
8:30 - 8:45	Introduction & Agenda Review	Margo Melendez - NREL
8:45 - 9:10	CA's AB 118 – Report on 2009 projects – 2010 RFPs	Peter Ward - CEC
9:10 - 10:10 - DOE	Recovery Act Overview	Dennis Smith/ Mark Smith
10:10 - 10:30	BREAK	
10:30 - 11:30	Deployment – Strategies - Opportunities CEC - SCAQMD	Panel Discussion DOE –
11:30 - 12:15 Smith - DOE	Infrastructure Development Gaps – LNG & CNG Facilitated – working session	Dennis Smith / Mark
12:00 - 1:00	LUNCH	
1:00 - 2:00	Platform Development Gaps – CNG & LNG Facilitated – working session	John Gonzales - NREL
2:00 - 2:30	Biogas for Transportation Development Gaps	Jim Wegrzyn - BNL
2:30 - 3:00	BREAK	
3:00 - 3:40	Deployment Issues - Conversion Quality –EPA Certification TUG – Incident Investigations – C&S Gaps	Doug Horne - CVEF
3:40 - 4:40	Open discussion NGVTF attendees	All - NREL

4:40 - 5:10

Discussion and questions Wrap-up

- What did we hear? Evaluation cards
- Key points to carry forward and next steps
Smith - DOE

Margo Melendez - NREL

Dennis Smith / Mark

Rey Gonzalez - CEC

Final NGVTF Attendee List

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