Compressed Natural Gas for Automotive Applications: 
*An Exploratory Workshop*

March 17, 2011

At the Northwestern University
Jacobs Center of the Kellogg School of Management
2001 Sheridan Road
Evanston, Illinois

(Plenary session in Leverone Hall, Room 101; breakout sessions in rooms 160, 165, and 101 or 387)

Virtual electronic participation in plenary sessions available through a dedicated URL upon request.
CNG is a critical component of US transportation that will be needed on national security, sustainability and economic grounds. The potential is already evident in other countries and sectors with the US lagging behind. Vigorous development, improvement, application, and acceptance of CNG will be required but how to achieve the needed speed, scope and effectiveness is not obvious – “hope is not a strategy”. Much must be done to develop, diffuse and manage the enabling systems and the required physical and social infrastructures. Together with volatile contextual drivers and the perceptual as well as real inhibitors, these requirements produce a “wicked” innovation challenge with unclear and complex ways ahead for specific steps and their interplay. And, when facing such creativity-demanding new system innovation conditions, the vision must be well promoted and action processes properly targeted and managed if they are to achieve their game-changing goal. They must also be pursued adaptively and globally, be rich in intelligence, and have sharp performance and impact metrics and standards for monitoring progress.

Though this is not the first CNG workshop, ours will differ from others in that its focus will be Goals and Action. It will also differ in its application of such integrated tools as roadmapping together with scenario planning to enhance results oriented planning and implementation. To achieve this it will bring together a blend of industry and academic resource people, including players with strong beliefs in and incentives for achieving CNG improvement and value-creating progress. Discussion contributors representing a variety of fields will include: Researchers who are well informed on the trajectories of critical related new knowledge; innovation management specialists; automotive systems and component experts familiar with what will be needed; and intellectual property lawyers. Their role will be to ask the difficult questions and indicate the shape of solutions. Students bringing the enthusiasm of fresh minds will also participate.

As important as the broad cross-disciplinary and multi-industry/knowledge make-up base of attendees, the architecture of the meeting will directly support the action goals. In addition to the plenary sessions, opportunity will be provided for small group task-force deliberations. These will lay the groundwork for roadmapping the “why”’s, what’s, how’s, who’s, when and where-next’s” of specific challenges identified in pre-workshop discussions. A specific goal of the Workshop will be to stimulate follow-on small face-to-face and virtual discussions and actionable projects along with further workshops, executive-level conferences. At a more macro level, attention-gaining conventions and trade shows that bring to the fore the advances in performance, weight, range and CNG cost parameters that can stimulate demand, of engine and component availability and local and expanded refueling and support infrastructures and policy changes will also be needed.

But the challenges are substantial. Leadership to coalesce the disparate players and forces required to achieve success in the application of CNG to the automotive worlds, winning over skeptical public and policy-making communities, reaching out to and breaking down barriers that hamper collaboration and learning from global experience, but also to capturing achievable global market-share, will be paramount. Good and continually updated intelligence, the capacity to carry out high impact studies, a base to promote local consortia in major metropolitan centers and more broadly and a variety of deep, robust and excitement building momentums are lacking. A consequent specific task for the Workshop will therefore be a consideration and pre-planning for the development of a National CNG Transportation Knowledge Center.
Agenda

9:00AM  Registration and coffee (Room 101, Leverone Hall)

9:30AM  Setting the stage (Radnor, Herring)
  • Workshop introductions and overview
  • The shifting CNG business case? Drivers, constraints goals, strategies and timing?
  • What we can already see happening; and need to see
  • The Global Potential: Imperatives/threats/opportunities?
  • Impact of changing scenarios and what we need to know/do/prepare for?
  • Building the knowledge and support bases.

10:00AM  Participant identification

10:10AM  CNG Application Examples
  • Westport-Juniper (and Ford) experiences (Lapetz)
  • City of Chicago CNG initiatives and perspectives (Stewart)
  • Municipal Fleets Business Case findings (C. Johnson)

10:55AM  Open Discussion

11:15AM  Break

11:30AM  Introduction to Roadmapping/Scenario Planning and Task Force charge (Grossman, Strauss)

Noon  Lunch Break (Food may be purchased in Kellogg basement level Cafeteria)

1:00PM  Split into Roadmap Input Taskforces – breakouts will be given discussion guides on: Achievement metrics; drivers & constraints; political/economic/policy issues, risks and key uncertainties; action requirements; roles; timing; and, research implications.)
  Taskforces:
  • Infrastructure (drilling, distribution, refueling)
  • Vehicles Systems/Components
  • Building National Consortia; National & Global Promotion; Establishing a CNG Knowledge Center; Building a local (Chicago/Midwest) consortium as an example (needs, key participants, roles, and how to implement?)

2:45PM  Break

3:00PM  Taskforce Reports (10 minutes each)

4:00PM  “How to Refine and Achieve the Vision?” Next steps for individuals and groups. (Complete the Evaluation and Action form during the discussion.)

5:00PM  Close
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<tr>
<th>Attendee Brief Bios for CNG Workshop (in alphabetical order)</th>
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<tbody>
<tr>
<td><strong>Hamid Arastoopour</strong>: Illinois Institute of Technology. Professor of Energy &amp; Director Wagner Institute of Sustainability and Energy Research; transport research. Ph.D. Gas Engineering IIT.</td>
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<tr>
<td><strong>Gary DeGregorio</strong>: Decision Innovation, Inc.; was Distinguished Member of Technical Staff, Motorola Labs. Over 30 years with Motorola, focus included systems engineering, decision management, decision-related processes, knowledge foundation and architectures as well as strategic roadmapping. MSEE, University of Illinois-Urbana. (GATIC).</td>
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<tr>
<td><strong>Shaun Denman</strong>: Bosch. Marketing Manager, Gasoline Fuel Injection. Manage planning/pricing of component/systems; previously during 9 years with Bosch, responsible for sale of powertrain components, controllers and sensors.</td>
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<td><strong>James De Wolf</strong>: Emerald Publishing (UK); Vice-President Academic Publishing, head Boston Office.</td>
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<td><strong>Mike Duoba</strong>: Argonne National Labs. Center for Transportation Research, Energy Systems Div., Worked with many leading automobile firms; major role in support of Student programs. MS &amp; BS Mechanical Engineering.</td>
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<td><strong>Susan Gaud</strong>: Former Senior Director External Technology Sourcing, Kraft; President, Industrial Research Institute. Ph.D. Physical Chemistry, Northwestern University (GATIC).</td>
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<td><strong>David Grossman</strong>: President, Dynamic Strategy Group. Director Global Technology Strategy, General Motors (32 years with GM in planning, engineering and international executive positions); Roadmapping specialist and consultant. Trained small businesses in mapping tools with Michigan Small Business and Technology Development Center (GATIC).</td>
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<tr>
<td><strong>Mark Hellmann</strong>: An internationally known legal authority on intellectual property law, with over 25 years of experience in copyright matters spanning print media, electronic media, computer software, computer hardware, internet, video media, and design. Head of two firms (GATIC).</td>
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<td><strong>Louis Herring</strong>: American CNG Consortium Leader, entrepreneur, responsible, with technical collaboration, for CNG conversion system for trucks. Former military.</td>
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<td><strong>Vince Higgs</strong>: co-creator, Visto, LLC (CNG auto conversion).</td>
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<td><strong>Yasuo Ikawa</strong>: Professor, School of Knowledge Science, Japan Advanced Institute of Science &amp; Technology (JAIST). 24 years in R&amp;D with Toshiba Corporation. PhD. Engineering, Tokyo Institute of Technology; Leader GATIC-Japan. (GATIC)</td>
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<td><strong>Bret Johnson</strong>: Assoc. Director, NU Transportation Research, Director, Center for Commercialization of Innovative Transportation Technology. Earlier engineering &amp; project management positions at 3COM, Northrop-Grumman, GE Astospace, and Grayhill, Inc.</td>
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**Caley Johnson:** National Renewable Energy Laboratory; Studies on Business Case for Use of Compressed Natural Gas on Municipal & other transport fleets.

**Shungo Kawanishi:** Professor, Japan Advanced Institute of Science & Technology; Director Internat Programs. VP & Professor, Trans-Pacific Hawaii College. Ph.D. University of Georgia. (GATIC).

**Diego Klabjan:** Associate Professor Industrial Engineering & Management Science, NU McCormick School of Engineering, Director, Sustainable Energy Center Ph.D. Georgia Institute of Technology (Transportation Industry Dissertation prize winner). Also with MIT & University of Illinois.

**Jeff Lassaline:** President, J. Lassaline & Associates, over 30 years in marketing and business development in OEM Automotive industry.

**John Lapetz Jr.:** Juniper Engines; 35 years with Ford motor including 28 in global leadership in Alternative Fuels and Vehicles, rep Ford in US Dept. of Energy Freedom CAR program; also Director of Technology, Clean Vehicle Education Foundation.

**Diane Lawniczak:** Bosch. Director of Project Management and Global Technical Manager for Gasoline System. Responsible for OEM system projects and technical window to key customers on a global basis. With Bosch for 13 years.

**Rebecca Marsh:** Publishing Director, Emerald Publishing (UK); University of Sterling.

**John Perles:** Global manufacturer; currently start-up firms in solar & CNG automotive conversion.

**Michael Radnor:** Professor, Kellogg School of Management, Northwestern; founder & Chair of Organization & Management Department. Director, Center for Technology & Innovation Management (CTIM); Co-founder & President of GATIC. Worked for Westinghouse, Lucas Industries, Israel Aircraft Industries, & Tann Controls. Ph.D. Industrial Eng., Northwestern University (GATIC)

**Robert Schultz:** President, Schultz Investment Fund, exploring alternative fuel ventures.

**Matt Stewart:** Senior Automotive Equipment Analyst, City of Chicago. Responsible for the purchase of alternative-fuel, hybrid and electric vehicles as well as implementation of diesel-emissions-retrofit, idle-reduction and other programs that reduce petroleum usage and emissions from the city-wide fleet, including police, fire, airports and sanitation.

**Jeffrey Strauss:** 35 years experience in cross-cultural service management; innovation, strategic planning and marketing; Associate Director, Northwestern CTIM (GATIC.)

Michael Wasielewski: Clare Hamilton Hall Professor of Chemistry, Northwestern, Director, Argonne - Northwestern Solar Energy Research (ANSER) and concurrent position as Senior Scientist Nanoscale Materials at Argonne; Fellow of American Association for the Advancement of Science. Currently heads over $40 million in energy funded research projects. Ph.D. University of Chicago.

Jeff Wyatt: President, Venchurs, Inc – packaging and logistics; 15 years in strategy development and process roadmapping.

Northwestern Students
Anup P. Dhalwani: Kellogg MBA student, Investment Banking with focus on automotive industry

David Morse: Kellogg MBA student, management consulting and sustainability; joining Accenture’s clean energy practice. As an Accenture intern, contributed to a just published report on alternative transportation fuels in the US and China.

Ian Murray: Ph.D. student, McCormick School of Engineering, with extensive experience in advanced organic photovoltaics and other energy sources as well as materials; also owns high tech start-up.

Owen Worley: Ph.D. student, McCormick School of Engineering - Sustainable Energy Center.
Collaborating Workshop Organizers

1. **CTIM** (the Center for Technology & Innovation Management) that is based in the Buffett Center for International and Comparative Studies at Northwestern University is located in the university’s Kellogg School of Management. It was launched as a National Science Foundation University-Industry Cooperative Research Center at the initiative of GATIC affiliated firms (including Baxter, DuPont, General Motors, IBM, IMS, Intel, Kodak, Kraft, Lockheed Martin, Lucent, Ford, Material Sciences, Motorola, Rockwell Automation, Roche, Siemens Westinghouse, Tripod, and United Technologies.) Together with its IBD forerunner it has carried out funded research and consulting projects totaling approximately $50 Million for companies, US and International government agencies (including the Department of Commerce, US Trade & Development Agency, NASA, USAID, World Bank, UN and various foundations) across the country and worldwide. It co-founded GATIC.

2. **GATIC** (Global Advanced Technology & Innovation Consortium) works with experts from top universities and firms on the increasingly challenging techno-innovation demands by bringing better management tools, models and new types of organization into practice. Launched by CTIM-Northwestern University, the Japan Advanced Institute of Science and Technology and ETH-Zurich in 2002, it was joined by universities worldwide. Fittingly, GATIC operates through virtual regional “hubs” truly driven by industry practice and research (“industry-driven and academically informed”). It provides the infrastructure and stimulus for the exchange of pointed practical intelligence on strategic implications of emerging conditions and threats and the development of creative solutions. This is accomplished through regional and global meetings and with customized research, clinics, training, guidance in developing in-house capability and structure, and early “weak-signal” monitoring. Recognized for such techno-innovation management support processes as roadmapping and scenario planning & services management, GATIC introduced these processes into Japan, including their National Energy Development Organization – NEDO.

3. **ACNG** (American CNG) **Consortium** is an inclusive community of participants drawn from across the spectrum of the CNG enterprise who recognize the national economic, environmental, and security interests at stake and that the United States offers the largest untapped market in the world for CNG as a transportation fuel. By listening to our members, clients, industry leaders, academic and research institutions, as well as the marketplace, the Consortium applies the iconic American values of entrepreneurial self-interest in the service of the American public. The Consortium advocates for a realignment within the industry, and a re-imaging of CNG to help public recognition of CNG as an attractive fuel option for the near-term and foreseeable future. Launching a dynamic CNG “Knowledge Center” that will inform strategic planning and cultivate and attract the intellectual leadership in relevant fields needed to meet the challenges that impede expansion of domestic CNG use is an important goal of the Consortium. The Consortium identifies innovative technologies, management practices, and products and seeks ways to incentivize the application of innovation both to improve quality and performance, and to, combined with group purchasing power, reduce pricing. Acknowledging that the foreign CNG market is far more robust than the fledgling U.S. market, and that a globally integrated CNG market will benefit the American marketplace, the Consortium is evolving as a globally linked enterprise.