

Session 6

New Fuels Transportation

Leader: Joe Vitelli
Leader: Glyn Hazelden
Facilitator: Emily Turner

Session 6 – New Fuels Transportation

Attendance Breakdown

Approximate total attendance	17 persons
Federal Regulators	1 persons
State Regulators	0 persons
International Regulators	0 persons
Pipeline Industry	2 persons
Standard Organizations	2 persons
Researchers	8 persons
Academics	3 persons
Media	1 persons

Session 6 – New Fuels Transportation

Top 4 Identified R&D Gaps

Gap #1 – Pipeline Materials and Joining Technology (*New and Improved Technology*): Establish standardized process for identification and cataloging transmission system infrastructure materials of construction. Assess compatibility with new fuels.

Gap #2 – New Fuels Characterization (*General Knowledge*): Environment inside the pipe: Establish consistent new fuel quality benchmarks. Examine the need for additional fuel conditioning requirements. Evaluate & catalog alternate fuel compatibility with existing and new materials of construction

Gap #3 – Pipeline Infrastructure (*General Knowledge*): Comprehensive national study to assess existing infrastructure (pipeline interstate). Assess risks in existing national infrastructure for system blending opportunities, supply reliability and contingencies.

Gap #4 – Real-Time monitoring of fuel components to generate a Data Warehouse containing fuel information (*General Knowledge*)

Session 6 – New Fuels Transportation

Associated Details: Gap #1: Pipeline Materials & Joining Technology (*New and Improved Technology*)

- a. What pipeline type(s) does the technology target? Existing vs. new pipeline infrastructure
- b. What operating environment(s) would the technology operate? Onshore
- c. What are any functionality and or performance requirements?
 - Compatibility of materials with new fuels
 - Performance requirements may demand new infrastructure
 - Environmentally friendly
- d. What road blocks or barriers prevent the technology deployment?
 - Economics
 - New Standards
 - Research
- e. What are anticipated targets or timeframes to complete this research?
 - Phase 1: Assess existing Infrastructure compatibility, Identify new infrastructure needs: < 3 years
 - Phase 2: Identification and design of materials for new infrastructure. Resolve Need for any Joining Technology Gaps. 3-6 years
 - Phase 3: Deployment of new infrastructure <6 years

Summary: Materials for pipeline construction: Guidelines for the selection of materials for fuel production, storage, and transportation. Pipe metallurgy & ethanol (critical path): ethanol degradation to corrosive oxidation product intermediates; other new fuels have similar issues (hydrogen → SCC, biofuel → MIC). Effects of new fuels on pipeline ancillary components and operating equipment.

Session 6 – New Fuels Transportation

Associated Details: Gap #2: New Fuels Characterization (*General Knowledge*)

- a. What pipeline type(s) does the new knowledge target? Interactions with all existing pipeline types, assessment for new pipelines types
- b. What operating environment(s) does the new knowledge target? Onshore
- c. What technical details are necessary and recommended?
 - Develop knowledge base for new fuels
 - Consistency of fuel quality
 - Compatibility of new and existing fuels
 - Compatibility of fuels with materials
 - Assessment of chemistry for storage/transport
- d. Can any targets or timeframes be identified to complete this research? <3 years

Summary: New Fuels Characterization: There is currently insufficient information about how new fuels interact with each other, existing fuels, and with materials. Regarding the environment inside the pipe: Establish consistent quality assessment criteria for new fuels. Examine the need for additional fuel conditioning requirements. Evaluate & catalog compatibility of new fuel with existing and new construction materials.

New Fuels include:

- Hydrogen
- Biofuel (e.g. Ethanol, Methane, Biodiesel)
- Natural gas from new sources (including LNG)
- Blended Fuels

Session 6 – New Fuels Transportation

Associated Details: Gap #3: Pipeline Infrastructure (*General Knowledge*)

- a. What pipeline type(s) does the new knowledge target? All
- b. What operating environment(s) does the new knowledge target? Onshore
- c. What technical details are necessary and recommended?
 - Fuels characterization, Construction Materials, Joining Technology, Sensor Technology
 - Database documenting integrity data (composition in the line, risk assessment, consequences in the line)
 - Assess need for new infrastructure
 - Information Sharing
- d. Can any targets or timeframes be identified to complete this research? <3 years

Summary: Pipeline Infrastructure: Comprehensive national study to assess existing infrastructure and consider a new pipeline network to enable new fuels transportation. Assess existing national infrastructure for system blending opportunities, supply reliability and contingencies. Critical to have sufficient data to share.

Examples of Barriers to leveraging current pipeline infrastructure to transport new fuels:

- Hydrogen: existing pipeline does not have the capacity to transport large volume of hydrogen – high strength pipes may crack but can carry higher pressures, lower strength pipes can't carry higher pressure
- Pipeline Materials not compatible with new fuels; Some materials too expensive
- Negative impact on overall current infrastructure capacity (i.e. Tankage, segregation)
- SCC for ethanol

Session 6 – New Fuels Transportation

Associated Details: Gap #4: Fuel Composition Data Warehouse (*General Knowledge*)

- a. What pipeline type(s) does the new knowledge target? Gas
- b. What operating environment(s) does the new knowledge target? Onshore
- c. What technical details are necessary and recommended?
 - Data Mining
 - Fuel Chemistry Sensors
 - Expert Elicitation
- d. Can any targets or timeframes be identified to complete this research? <3 years

Summary: Current fuel composition information is dispersed and unavailable to industry for operational purposes. There is also insufficient information available on fuel composition. There is a need for real-time monitoring of fuel parameters generating data for a Data Warehouse containing fuel composition data. Track small changes in fuel characteristics.

Session 6 – New Fuels Transportation

Appendix

Session 6 – New Fuels Transportation

Agenda Phase 1: Feb 7th

1:00PM – 5:00PM

New Fuels Transportation High Level Session Objectives, Ground Rules	1.00 – 1.10
Speaker 1: George Vradis, NYSEARCH	1.10 – 1.25
Discussion, ID Gaps, Vote	1.25 – 2.05
Speaker 2: Bob Wilson, Key Span Energy	2.05 – 2.20
Discussion, ID Gaps, Vote	2.20 – 3.00
Break	3.00 – 3.10
Speaker 3: Yong Yi Wang, Engineering Mechanics Corporation of Columbus	3.10 – 3.25
Discussion, ID Gaps, Vote	3.25 – 4.05
Speaker 4: Glyn Hazelden, Gas Technology	4.05 – 4.20
Discussion, ID Gaps, Vote	4.20 – 5.00

Session 6 – New Fuels Transportation

Agenda Phase 2: Feb 8th

9:30AM – 11:30AM

Speaker 1: Bob H.

9.00 – 9.10

Discussion: Ethanol

9.10 – 9.30

Restate & Prioritize Gaps

9.30 – 10.00

Categorize & Summarize Gaps

10.00 – 11.30

- Address technology development, consensus standards strengthening, or general knowledge
- Is gap short term (1-3 yrs) or long term (>3 yrs)?
- Identify what types of pipeline are Impacted by this gap: liquid transmission, gas transmission, gas distribution metallic, gas distribution and/or non-metallic
- Identify the operation environment: offshore, onshore or arctic?

1:00PM – 2:30PM

Road Map for Gaps

1.00 – 1.30

Prepare for Report Out

1.30 – 2.15

Session 6 – New Fuels Transportation

Ground Rules

- Hold questions until the end of Speaker presentation
- Different Break-Out rooms on Wednesday and Thursday (Rosedown B and Shadows)
- Arrive on Time, Start on Time
- No cell phones
- Don't interrupt
- Focus on the subject, not the people
- Parking Lot: For out of scope items, No off-track
- No computers – computers down
- Every idea is a good idea
- Open dialog
- Stay on time and on agenda

Session 6 – New Fuels Transportation

Gaps

LEGEND:

Pipeline type: LT (liquid transmission); GT (gas transmission; GTM (gas distribution metallic); GTNM (gas distribution non metallic)

Operating Area: Offshore, onshore, artic

GAP	Pipeline Type	Operating Area	Short Term (1-3 years) Long Term (>3 years)	1 - New or Improved Technology	2 - New or Revised Consensus Standard	3 – Creation and Dissemination or General Knowledge
Evaluate alternate fuel compatibility with existing and new materials of construction	GT GTM GTNM	Onshore	Short Term			√
Standardize gas composition monitoring and establish national data warehouse	GT GTM GTNM	Onshore	Short Term			√
Catalog gas transmission infrastructure materials & establish compatibility with alternate supplies	GT	Onshore Offshore	Short Term			√
Update AGA Bulletin 36, establish enterprise wide interchangeability assessment process and criteria consistent with other global evaluation methodology	GT GTM GTNM	Onshore	Short Term		√	
Assess existing pipeline infrastructure for supply blending opportunities, supply reliability & contingency	GT GTM GTNM	Onshore Offshore	Long Term			√

Session 6 – New Fuels Transportation

Gaps

LEGEND:

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GAP	Pipeline Type	Operating Area	Short Term (1-3 years) Long Term (>3 years)	1 - New or Improved Technology	2 - New or Revised Consensus Standard	3 – Creation and Dissemination or General Knowledge
Comprehensive national study to assess the nations pipeline infrastructure- long term / short term “retrofit or build” options	GT LT	Onshore Offshore	Long Term			√
Review pipeline integrity and management standards to ensure alternate fuels are compatible with existing standards & practices.	GT GTM GTNM LT	Onshore Offshore	Short Term		√	
Examine the need for additional fuel conditioning to maximize alternate fuel supply opportunities	GT GTM GTNM	Onshore Offshore	Long Term			√
Establish fuel quality assessment criteria for alternate fuels	GT LT	Onshore	Long Term		√	
Environment inside the pipe	LT	Onshore	Short Term	√		√

Session 6 – New Fuels Transportation

Ancillary Gap Information

- [14] Materials of pipeline construction: Guidelines for the selection of materials for production and transportation; Pipe metallurgy & ethanol (critical path); how ethanol chemistry changes during pipeline transportation from start to finishing point; ethanol degradation to corrosive oxidation product intermediates; Ethanol may cause swelling or deterioration of soft goods (PIGs, valves...) * see Environment inside the pipe
- [14] Evaluate & catalog alternate fuel compatibility with existing and new materials of construction (composites, metallic, non-metallic, coatings etc..). (Some work underway at DOE, limited scope and funding)
- [15] Standardize gas composition & parameter monitoring (sampling & analysis), establish centralized enterprise wide data warehouse based on representative regional / system receipt & delivery points including storage (NGC+ Recommendation)
- (5) Environment inside the pipe: How does utilization of complete corn stalk change chemistry to cause contamination from distillation of ethanol from cellulosic feedstock? Pipeline integrity? Best practices for moisture control

Session 6 – New Fuels Transportation

Ancillary Gap Information

- (8) Assess existing national infrastructure for system blending opportunities, supply reliability and contingencies considering new supplies, particularly those having direct market area impacts.
 - (8) Establish consistent fuel quality assessment criteria for alternate fuels to ensure continued safe, reliable, utilization & operation of the nation's pipeline systems.
- (8) Comprehensive national study to assess existing infrastructure; evaluate the need for long & short term pipeline infrastructure improvements to enhance system reliability & deliverability of traditional & alternate fuel sources. Include evaluation of “retrofit or build” options.

Session 6 – New Fuels Transportation

Ancillary Gap Information

- (3) Review existing pipeline integrity management & operating standards to ensure alternate fuels use are compatible with existing practices and requirements (NDE, joining standards & practices, leak detection, other assessment programs).
- (3) Examine the need for additional fuel conditioning requirements such that alternate fuel sources can be fully embraced (biofuels, landfill recovery gas etc). Recommend conditioning options for various fuel sources (filtering, nanotechnology, gamma radiation sterilization, trace moisture removal)
- (2) Establish standardize process for identification and cataloging transmission system infrastructure materials of construction and assess potential for component failures linked to compositional changes, perform risk assessments based on reasonably expected gas compositions, and compositional changes relative to original component installation. [\(Expands the scope of NYSEARCH Distribution System Materials Analysis\)](#)
- (2) Update AGA Bulletin 36 interchangeability criteria to reflect more recent adjustment gases, new appliance designs and assessment of installed appliance populations. Establish a consistent enterprise wide approach considering harmonization with other globally accepted assessment criteria. [\(NGC+ Recommendation, NPC Report Recommendation\)](#)

Government/Industry Pipeline R&D Forum - New Orleans, Louisiana, February 7-8, 2007

Session 6 – New Fuels Transportation

Parking Lot

- Effects of economics on capital investment: Will building pipelines for ethanol be economic? How can we get the most energy out of a single stalk of corn? Ethanol economics: production costs similar to unleaded gasoline; cost to build plant (profitable); government price supports for farmers not growing corn
- Pipeline Operations & Regulations: Review existing pipeline integrity management & operating standards
- Impact to End Use: Update AGA Bulletin 36 interchangeability criteria to reflect more recent adjustment gases, new appliance designs