Comments to SEC on high-pressure gas pipeline rules

February 28, 2016

VIA email (rulemaking@sec.nh.gov)

Pamela Monroe, Administrator
NH Site Evaluation Committee
21 South Fruit St. Suite 10
Concord NH 03301

From Mason Pipeline Committee

Response to Request for Advance Public Comment on Rules Related to Certificates of Site and Facility, Site 300

Dear Administrator Monroe.

Thank you for the opportunity to comment regarding Site 300 rulemaking for high-pressure gas pipelines. Mason Pipeline Committee represents landowners and concerned citizens in one of the towns impacted by the proposed Northeast Direct Pipeline (NED).

The Committee would like to bring to SEC's attention that none of us were aware of this request for comment until February 19th. Many concerned people in the numerous NED-impacted communities may be in a similar situation. We would like to request that SEC extend the deadline for submitting comments beyond 29 February 2016 to give the municipalities and members of the public a reasonable opportunity to contribute to this process.

Mason Pipeline Committee's following comments address the five subjects upon which SEC requested comment in their January 25, 2016 letter. Many concerned people have contributed to this effort. A source of some recommendations is the Mason Board of Selectmen's October 15, 2015 Scoping Comments to FERC (Docket FP14-22, Number 20151015-5110)

1. Appropriate setbacks to mitigate potential health and safety impacts

Health Impacts:

Natural gas, particularly fracked gas, is not a clean source of energy. Its many emissions from wells through transmission systems cause deleterious health effects. The recent situation in Porter Ranch, CA, vividly demonstrates these impacts. More than 1,000 people had to leave their homes for many weeks due to a persistent large gas leak that was sickening them. A summary of adverse health impacts from gas compressor stations is found in **Attachment 1** of this document. Mason Pipeline Committee sent this as a comment to FERC.

Dimensional setbacks are not sufficient to mitigate health impacts from gas compressor stations. Air pollutants from compressor stations have been found to travel at toxic levels well beyond a mile from the station. Environmental chemist Dr. Wilma Subra of Earthworks, a highly respected chemical researcher, has documented health impacts as far as 3 miles from a 12,000 HP compressor station. The one planned for New Ipswich is 41,000 HP. Its emissions would most probably have an even wider radius of impact. Toxic emissions can vary greatly in their reach depending on weather conditions and terrain, as shown in the attached image from Dr. Curtis Nordgaard's presentation, "Potential Health Risks from Natural (Fracked) Gas Pipelines". (**Attachment 2** of this document) Dr. Nordgaard is a pediatrician at Boston Children's Hospital.

SEC should require a Comprehensive Health Impact Assessment for the evaluation of every high-pressure gas pipeline project, because of the documented health impacts from gas infrastructure. This Assessment should be the guide for protecting public health. (**Attachment 3**)

Among its findings, this Comprehensive Health Impact Assessment should include provisions for:

- **Air quality testing before and periodically after** construction and operation begin, to be done by independent contractors and funded by high-pressure pipeline applicants.
- **NHDES Air Resources to set limits that exceed EPA thresholds** on toxic compressor station emissions such as benzene, formaldehyde, fine particulates, nitrogen oxide, and radon that are based on peak levels, duration and frequency, rather than in terms of tons per year or 24-hour averages as EPA thresholds are now. We breathe what's in the air every minute -- each toxic peak takes a toll on health even though on a daily average the pollutant levels are below EPA thresholds. Under the federal Clean Air Act, NH is permitted to establish standards that are better than the EPA.

SEC should require the gas industry to use technology to control air pollutants at the source to protect public health. At a minimum:

- **Electric motors** to run the compressors;
- **Air-operated control valves** rather than gas-operated valves which vent gas to the air each time they open or shut;
- **Sufficient on-site containment for venting events** such as blow-downs. To continue industry practices of chronically venting gas to the atmosphere is similar to the days before the Clean Air and Clean Water Acts when factories routinely dumped their waste into our environment.
- **All above-ground gas pipeline facilities to be housed in structures with equipment to capture and recover fugitive emissions**

The cost of these measures to the applicants would certainly be less than the cost of negative health effects in surrounding communities.

Safety Impacts:

Setbacks may have relevance for public safety wherever applicants propose to route high-pressure gas pipelines near sensitive sites such as schools and places where people congregate. But other siting proposals for high-pressure gas pipelines also involve risks to public safety.

For instance, siting high-pressure gas pipelines alongside high-voltage power lines is dangerous. The electric field accelerates the rate of pipeline corrosion. Large grounding arrays are required to combat corrosion. However, in much of New Hampshire where the power lines pass across shallow-to-bedrock soils, the ground does not offer much grounding. In Mason, for instance, power surges that destroy electrical equipment during thunderstorms are common, due to the general lack of good grounding.

The likelihood of accelerated pipeline corrosion where pipelines abut power lines puts two energy systems at risk. A pipeline failure here could destroy two energy supply systems at one blow, which may take some time to repair and have regional economic repercussions.

SEC needs to seriously weigh the consequences of such unwise pipeline siting as is proposed for NED. For detailed information on the serious safety risks of siting pipelines alongside power lines, see the report from electrical engineer Darrell Scott, a Mason Pipeline Committee member (**Attachment 4**). Without a careful ongoing pipeline grounding maintenance program, overseen by independent contractors, a catastrophic event is foreseeable.

2. Pipeline decommissioning plan requirements -

SEC should require that all pipelines and infrastructure be removed, all waste and toxic residue properly disposed of, the land restored to original grade, loamed and planted with native plants. This deconstruction would re-run all the trauma of construction but would better serve landowners and communities in the long run.

SEC should require high-pressure pipeline applicants to have an escrow account established and fully funded prior to operation that covers the full cost of removal. The amount needed should be periodically reviewed and adjusted as needed.

3. Specific criteria to maintain property owners' ability to use and enjoy their property

SEC needs to consider that many owners will no longer have the ability to use and enjoy significant parts of their property due to the presence of high-pressure gas pipelines. The tree screens that protect their residences from the intrusion of abutting property uses may be destroyed, or portions of their property may be rendered unusable. In such cases, the only criteria that would maintain property owners' ability to use and enjoy their property would be for them to be enabled to acquire other property to live on.

For any property owners that lose the ability to use and enjoy their property, SEC should require the gas pipeline applicant to buy whole properties at appraised values prior to the pipeline.

Harsh lighting from compressor stations and other above-ground gas infrastructure can interfere with property owners' ability to use and enjoy their property.

SEC should require full cutoff lighting for all permanently installed exterior luminaires at compressor stations and other high-pressure gas facilities. ("full cutoff" means that no light is projected above the horizontal plane). Exterior lighting must be installed such that no light is projected beyond the property lines (i.e., no "light trespass").

A good water supply is critical for property owners' ability to use their property. Blasting to install high-pressure pipelines can place water supplies at risk, especially for the numerous NH property owners who depend on bedrock aquifers to feed their private wells.

SEC should require well testing and foundation inspections before and periodically after blasting for all wells and buildings up to 1,500 feet away from pipeline blasting sites. Well tests should be done at applicants' expense by a state certified laboratory for flow rate, general water quality parameters, dissolved metals, and oil and hazardous materials likely to be used in the installation, maintenance, and future monitoring/operation of the pipeline, and include radon, arsenic, benzene, VOCs and chemicals used in blasting among other parameters. Foundation inspections should include basement air testing for radon. High-pressure pipeline applicants must be required to fund the restoration of damaged water supplies and the repair of damaged foundations.

4. Project-related sound and vibration impact assessments

SEC should require high-pressure gas pipelines and their infrastructure to meet the same standards as wind energy systems as specified in Site 301.14(f)(2). If no more than 5dBA above background is appropriate for wind, this should be applied to all energy systems.

In addition, **SEC should require compressor stations and gas valve and meter stations to be sited within enclosed buildings** constructed to reduce noise and vibration impacts on surrounding properties.

5. Application requirements to ensure quality construction that minimizes safety issues

Quality construction seems to be lacking in new pipelines, as evidenced by the attached Pipeline Safety Trust (PST) report. (**Attachment 5**) In light of PST's findings that newer pipelines are failing more frequently than ones 75 years old, FERC would be prudent to call a moratorium on new pipeline construction until the problems are identified.

In the absence of such a safety measure, **SEC should insist that high-pressure gas pipeline applicants adhere to industry standards for all aspects of pipeline construction, maintenance, and reporting** as covered in Code of Federal Regulations title 49 part 192 PART 192—TRANSPORTATION OF NATURAL AND OTHER GAS BY PIPELINE: MINIMUM FEDERAL SAFETY STANDARD.

SEC should require verification of compliance to these regulations by continued on-site inspections

by qualified industry experts independent from but funded by the pipeline company, reporting to the appropriate NH agencies both during and after construction.

Since these standards are a minimum, SEC should also require that applicants meet the following standards for construction:

- Class 3 and 4 pipe should be used everywhere, including rural areas. (NJ requires minimum of Class 3.)
- Pipelines should be buried below the frost line all along their routes.
- Independent electrical engineers (funded by the applicant) should determine that the grounding arrays for high-pressure gas pipelines routed near power lines are sufficient to prevent corrosion,
- Daily inspections by independent contractors (funded by the applicant) for pipe welds, grounding arrays, fill material and placement, blasting, and whatever else needs inspection before the pipeline is buried. **X-ray** inspection for **ALL welds** should be required.
- SEC should require high-pressure pipeline applicants to map all potential blasting areas before construction, and to list the anticipated depths and composition of the explosive charges, and to assess the impacts of blasting to soils and hydrology within 1500 feet of blast sites.
- SEC should require high-pressure pipeline applicants to use the technology of hammering instead of blasting to trench for pipe in bedrock wherever there is a risk to the quality and stability of aquifers and water supplies from the effects of blasting.
- SEC should require high-pressure pipeline applicants to take measures to minimize outside force damage to pipelines from future potential seismicity wherever they are near fault zones. (NED pipeline route is associated with the Campbell Hill Fault Zone in Mason.)

Not only is quality construction vital for safety, ongoing pipeline maintenance must be responsibly carried out. **SEC should require that high-pressure gas pipeline applicants meet the following obligations for maintenance:**

- Independent electrical engineers (funded by the applicant) should determine that maintenance plans for grounding arrays are sufficient and implemented.
- Staff present daily at compressor stations to monitor and eliminate leaks. Industry practice appears to be for compressor stations to be unstaffed most of the week.
- Appropriate security measures in place to prevent Internet hackers from taking control of the computer systems at compressor stations and other pipeline facilities.
- Pigging stations must properly contain and dispose of residue from cleaning pipelines.
- A maintenance plan for all above-ground infrastructure should be approved by independent engineers.

SEC should require that high-pressure gas pipeline applicants address other pipeline-related public safety issues by:

- Developing and funding the implementation of a comprehensive public safety plan for pipeline-affected towns which provides emergency planning, training, preparedness, and applicants' accountability for cost of training police and firefighters and acquiring necessary capital equipment to successfully respond to pipeline emergencies/failures.
- Identification of an existing adequate alternative drinking water source for each pipeline-affected town that will meet the consumptive, hygiene, and firefighting requirements of the town population for at least six months (49 CFR 195.6 (5)(c)), in the event of aquifer contamination from the pipeline.

In closing, Mason Pipeline Committee understands that by law, **SEC must make a separate finding**

that an energy project as proposed is in the public interest. To make this finding, SEC should consider the larger energy picture for NH as addressed by the **2014 Ten Year Energy Strategy for New Hampshire**. http://www.nh.gov/oep/energy/programs/SB191.htm This plan calls for increased energy efficiency as the cheapest available energy source for NH. Its recommendations for gas pipelines are only for increased gas storage and infill service on existing lines. Please use the Ten Year Energy Strategy as a reference to make a full investigation of the public interest regarding energy choices for New Hampshire, prior to ruling on siting for high-pressure gas pipelines.

The no-build alternative for new high-pressure gas pipelines is likely to be the sensible choice for New Hampshire's environment and economy.

Thank you for your consideration.

Liz Fletcher, compiler of SEC comments for Mason Pipeline Committee
288 Marcel Road, Mason NH 03048

cc: Governor Maggie Hassan

Attachment 1: Mason Pipeline Committee comment to FERC Docket CP16-21 No. 20160115-5094

Attachment 2: AERMOD modeling of NO2 Impacts of Barto Compressor Station

Attachment 3: The Role of Comprehensive Health Impact Assessment White Paper Feb. 20, 2016

Attachment 4: Darrell Scott, comment to SEC on high-pressure gas pipeline safety

Attachment 5: US Pipeline Safety Trust. Safe Pipelines Spring 2015, page 6 "Are Old Pipelines Really More Dangerous?"

Attachment 1: Mason Pipeline Committee comment to FERC Docket CP16-21 No. 20160115-5094

January 14, 2016

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street NE Room 1 A
Washington, DC 20426

re: Tennessee Gas Pipeline Company, L.L.C., Docket No. CP16-21

From Mason (NH) Pipeline Committee

RE: Protection from the Health Impacts of Compressor Stations is Lacking – **Baseline Air Quality Studies Needed Near Proposed Compressor Sites**

Dear Secretary Bose:

The health effects of gas pipeline compressor stations have been documented by EPA, the SW Pennsylvania Health Project, environmental chemist Wilma Subra of Earthworks, and Dr. Curtis Norgaard, Boston pediatrician. These researchers find the following **medical conditions prevalent in individuals living in close proximity to compressor stations:**

* More than half the people suffer from respiratory impacts, throat and nasal irritation, weakness and fatigue and muscle pains.

* Close to half the people suffer from vision impairment and sleep disturbance.

* 42% suffer from allergies, eye irritation, and sinus problems.

* 39% suffer from joint pain, breathing difficulties and severe headaches.

The chemicals detected in the air near compressor stations are associated with these medical conditions.

The chemicals of most concern are three carcinogens -- benzene, formaldehyde and radon -- as well as nitrogen dioxide and fine particulates (PM2.5). PM2.5 acts to increase deep lung absorption of air pollutants. Other volatile organic compounds (VOCS) and hazardous air pollutants (HAPS) are emitted by compressor stations. The mixture of these chemicals in the air people breathe contributes to an array of negative health effects.

Subra has documented acute and chronic health impacts experienced by people living and working near compressor stations. **In addition to the above prevalent conditions, many people suffer the following acute impacts**:

* Nausea, vomiting

* Dizziness, light-headedness

* Irregular heartbeat

* Depression, anxiety

Serious chronic long-term impacts that have been documented are:

* Damage to Liver, Lung, Kidney, Cardiovascular system

* Damage to Developing Fetus and Reproductive system

* Mutagenic Impacts and Developmental Malformations

* Brain impacts and Damage to Nervous system

* Aplastic Anemia

* Leukemia, and Changes in Blood Cells and Blood Clotting Ability

From EPA Office of Inspector General: (Report No. 13-P-0161, Feb, 20, 2013, page 3)

"**EPA Needs to Improve Air Emissions Data for the Oil and Natural Gas Production Sector**"

Table 2: Health impacts of significant pollutants emitted from upstream oil and gas production activities

Greenhouse gases (methane/carbon dioxide)	Potential health impacts related to climate change will vary, but threats include increased incidence of serious infectious disease, extreme temperatures that lead directly to loss of life, and warmer temperatures that can increase air and water pollution and result in human health impacts.
NOx and VOCs, which contribute to groundlevel ozone	Health impacts may include reduction of lung function, inflammation of airways, aggravation of asthma, increased susceptibility to respiratory illnesses (e.g., pneumonia and bronchitis) and premature death. Vulnerable populations (e.g., people with lung ozone disease, children, and the elderly) are especially at risk.
Fine particulate matter (PM 2.5)	Health impacts may include worsening of lung function, asthma attacks, bronchitis, increased susceptibility to respiratory infections, and premature death.
Air toxics including benzene, toluene, ethylbenzene, and xylenes	Health impacts from short-term exposure may include skin and sensory irritation, central nervous system problems, and respiratory problems. Health impacts from long-term exposure may include problems with kidney, liver, and blood systems. For example, benzene is a human carcinogen and health impacts from shortterm exposure may include drowsiness, dizziness, headaches, and irritation of the eyes, skin, and respiratory tract. Long-term exposure has been linked to various blood disorders, reproductive effects, and increased incidence of leukemia.

EPA is aware of these health problems associated with compressor stations and other fracked gas infrastructure, but other than gathering more data to document these problems EPA has failed so far to establish air quality standards to protect people exposed to fracked gas infrastructure emissions.

Neither does NHDES appear to have air quality standards that would be protective. Both agencies consider compressor stations to be "minor" emitters, based on the National Ambient Air Quality Standards (NAAQS). These standards measure pollutants in tons per year averages, a totally inadequate measure for pollutants that may vary wildly over the course of a day or week -- from nothing at all to peaks many times the EPA limit. Human health is much more affected by frequency and duration of peak pollutant emissions, not annual averages. (Madison County NY Dept of Health Comments to FERC, Docket CP14-497, 10/15/2014)

Compressor stations have wide variations in their emissions from day to day and over the course of a day. Averaging pollutants in tons per year allows KM/TGP to say they meet EPA's air quality standards, while masking the extreme peaks of pollutants that compressor stations frequently emit.

It is a shame that EPA has so far failed to establish relevant air quality standards to adequately protect human health from compressor station emissions.

In southern NH the NED gas pipeline proposes a huge 41,000 HP compressor station that would affect air quality and human health in the towns of New Ipswich, Greenville, Temple, Mason, and Rindge. TGP has mapped 13 proposed alternative sites in or near these towns for Market Path Station 4. In addition, Market Path Station 3, also 41,000 HP, is proposed for MA or NH: 3 of its proposed alternative

sites are located in Winchester, NH.

Baseline air quality in compressor station impacted areas needs to be established before NED is constructed, to determine air quality impacts from the proposed compressor stations.

Ground level air sampling for benzene, formaldehyde, fine particulates (PM2.5), nitrogen dioxide and radon needs to be done on a periodic (perhaps monthly) basis throughout the year before construction begins, at sites near all sensitive receptors within 2 miles of all proposed compressor locations.

Mason Pipeline Committee asks FERC to require Tennessee Gas Pipeline Co. to fund air quality baseline studies that meet the above parameters in all areas where compressor station are proposed along NED's entire route, to gather baseline data on the air pollutants listed above. These studies should be done by independent contractors who have not previously worked for KM/TGP and do not anticipate doing so.

When private project developers apply to permitting agencies, they are often required to fund relevant studies by independent contractors to gauge the project's impact. Please apply these sensible standards to the NED project.

Sincerely,

Liz Fletcher
For Mason NH Pipeline Committee

The following publications are sources of health data quoted in this comment:

EPA Office of Inspector General, "EPA Needs to Improve Air Emissions Data for the Oil and Natural Gas Production Sector" Report No. 13-P-0161, Feb, 20, 2013.http://www.epa.gov/sites/production/files/2015-09/documents/20130220-13-p-0161.pdf

EPA Response: http://www.epa.gov/sites/production/files/2015-09/documents/13-p-0161_agency_response.pdf

Inspector General Comment: http://www.epa.gov/sites/production/files/2015-09/documents/13-p-0161_ig_comment_on_response.pdf

Macey et al. "Air concentrations of volatile compounds near oil and gas production: a community-basedexploratory study" Environmental Health 2014.13:82 http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14050236

Madison County, New York, Dept of Health, Comments to FERC, Docket CP14-497-000, Dominion-Transmission, Oct. 15, 2014 http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14050235 also included in 20151120-5038

Southwest Pennsylvania Environmental Health Project, "Summary on Compressor Stations and Health Impacts" Feb, 24, 2015. http://www.environmentalhealthproject.org/wp-content/uploads/2012/03/Compressor-station-emissions-and-health-impacts-02.24.2015.pdf

Dr. Curtis Norgaard, speaking in Temple as reported in Monadnock Ledger Transcript by journalist Ashley Saari, December 17, 2015. http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14050237

Attachment 2: AERMOD modeling of NO2 Impacts of Barto Compressor Station

Barto compressor model of NO_2 emissions

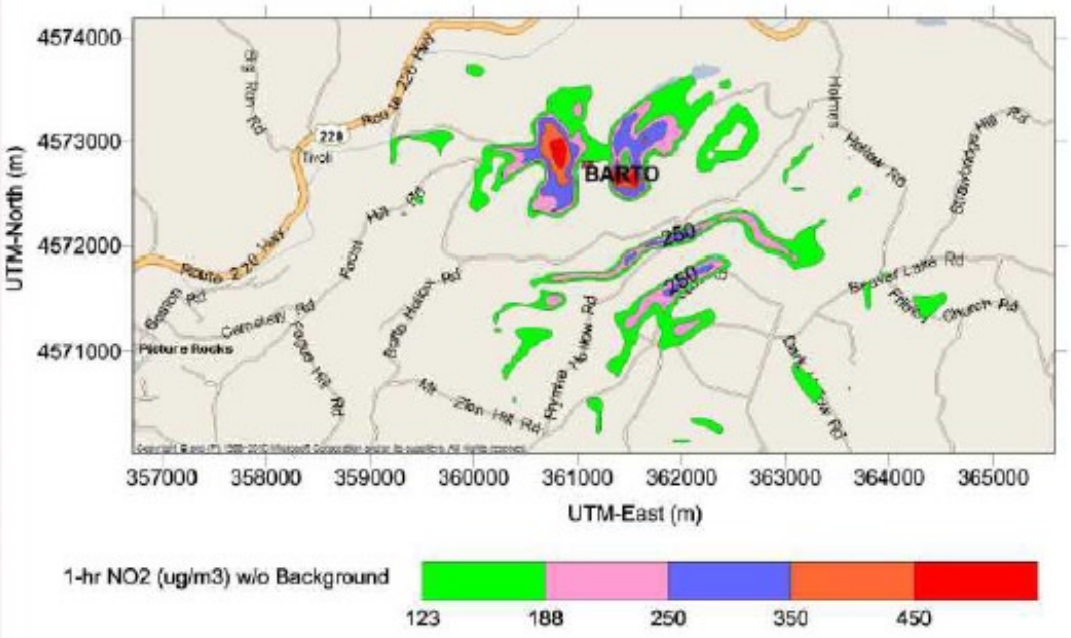


Figure 3. Area with 8th Highest NO_2 Concentrations (Tier 1-Full Conversion) Exceeding the 1-Hour NAAQS of 188 ug/m3 by Plant Allowable Emissions Alone

AERMOD Modeling of NO2 impacts of the Barto Compressor Station. Tran, KT, AIM Environmental 2013.

The Role of Comprehensive Health Impact Assessment in Evaluating Infrastructure for Natural Gas Transport

A White Paper prepared by an ad hoc working group

(20 February 2016)

Executive Summary

This white paper provides an overview of four critical issues regarding the role of comprehensive health impact assessment (CHIA) in review of applications for permits and certificates concerning natural gas transport infrastructure proposals. Section I outlines the essential features of CHIA and the value it adds to the review process. Section II documents the increasing need for CHIA given recent developments in the installation, operation, monitoring, and researching of natural gas transportation infrastructure. Section III covers incorporating CHIA into review procedures. Section IV proposes particular approaches to CHIA at various points in the application and review process and in the federal environmental impact assessment process.

I. What is a CHIA

A. Purpose

A comprehensive health impact assessment ("CHIA") is an in-depth and systematic approach to health impact assessment that uses "an array of data sources and analytic methods and considers input from stakeholders to determine the potential effects of a proposed policy, plan, program or project on the health of a population and the distribution of those effects within the population.1 A CHIA provides recommendations on minimizing, monitoring, and managing those effects.

CHIAs inform decision-making by identifying and prospectively evaluating potential effects on human health of a development proposal and its alternatives, aiming specifically at predicting how development induces unintended changes in health determinants and resulting changes in health outcomes. After considering multiple factors, a CHIA informs decision-making about whether to proceed with a proposed activity and if so, offers recommendations to address health-related gaps in data, to minimize risks and maximize benefits, and to establish a monitoring framework. A CHIA can be performed at many different levels of policymaking and regulation.

Intimately related to environmental impacts, the objective of a CHIA can, and should, be incorporated into an environmental impact statement ("EIS") but very often, is not. As a result, the typical EIS:

- Does not consider the human health impacts of the project; and when it does, the analysis is narrow
- Does not encompass human health in the "description of the affected environment." As a result, there are no baseline rates of potentially impacted health problems, no identification of drivers of those problems, no "consequences of the alternatives" in terms of human health -- direct, indirect, or cumulative health risks are not systematically identified or analyzed
- Does not review pertinent medical research and public health studies
- Rarely involves health experts and officials

- Rarely proposes the "no action" alternative or mitigation measures to protect and promote health

Further, the typical regulatory agency approach estimates the total short-term and long-term emissions directly sent into air or water by the project under consideration. Estimated total emissions are then compared with Federal or State standards for "acceptable" emissions.2 If the estimated levels fall below critical thresholds, the project is assessed as having a non-significant health impact. This approach is inadequate. For example, the following are but three examples of impacts that the typical approach presently does not include:

- Emission spikes. Regulatory agencies measure emissions in terms of averages taken over numerous short (for example, one hour or less) or long-term intervals (for example one or more days). Recent studies have found that these averages do not reveal the occurrence of very high levels of "peak" emissions that may occur at irregular intervals. These peaks may have serious adverse health impacts that are not captured by averaging over longer periods of time. A comprehensive assessment performed according to public health professional standards would capture information on peak emissions and their consequent health implications.
- Dynamic evolution of emissions. Regulatory agencies take a very local and static view of toxic emissions, assessing them in isolation from each other and only at the time and place immediately adjacent to their source. Many if not most standards are based on single chemical emission, while under most circumstances it is a mixture of different chemicals that are emitted. In addition, any single emission can disperse widely, evolve, and combine with other emissions and atmospheric conditions and become reabsorbed into distant water and soil. Only a comprehensive health assessment can properly evaluate the full range of emission impacts.
- Downstream and upstream impacts. Regulatory agencies restrict their assessment of impacts to the operations of the project in question. However, pipeline impacts extend far beyond pipeline operations. Pipelines are a "midstream" structure, placed between the start-point of gas well production sites and the endpoint of commercial or residential consumption. Adding a pipeline has the impact of expanding both production and consumption; and many studies have reported that the endpoint use of pipeline-provided gas in residential stoves has adverse impacts on respiratory function. Only the CHIA component of an environmental impact assessment would, correctly, view this as a pipeline impact.

The above examples are not exhaustive. The issue of vulnerable sub-populations (such as people with pre-existing asthmatic conditions) is not routinely addressed by regulatory agencies, but is a key CHIA element.

As an integral component of an EIS, the CHIA must be completed before any final decisions are made by the regulators, and, must inform such decisions. Unlike the other components of an EIS, which focus on estimating and evaluating the increase in environmental stressors (e.g., air, water and soil contamination; population movement; etc.) and then on articulating means and methods to eliminate adverse environmental impacts to the maximum extent practicable, the CHIA component is specifically designed to consider and evaluate potential human health impacts by identifying the potential pathways for such stressors to harm human health, quantifying the cumulative risks posed by such stressors, and recommending necessary mitigation. The goal of the CHIA component of an EIS, then, is to maximize preservation of the health of individuals and to minimize negative health impacts. The CHIA component therefore focuses specifically on health outcomes linked to potential exposures, including respiratory, cardiovascular, oncologic, dermatologic, reproductive, developmental, neurological, psychiatric, substance abuse, emerging infectious disease and injury/motor vehicle related impacts, with a special emphasis on vulnerable and general populations in the community. The CHIA component gives special attention to vulnerable populations, such as subpopulations of low socioeconomic status, racial and ethnic minorities, infants and youth, pregnant women, the elderly, the infirm, and industrial workers, be-

cause such populations must be protected from levels of exposure that might be judged "on average" to be of insignificant adverse impact. The CHIA component is also well-designed to evaluate both cumulative impacts and site-specific factors (such as local geography and meteorological conditions) that may predominate in determining whether human health will be adversely impacted by an action.

B. The Steps in the CHIA Process 3

The first two steps determine the tools to be used in the following four.

1. Screening –determines what policy/regulatory requirements would the CHIA inform. Identify lead(s) and partners
2. Scoping – develops the framework for the CHIA component; identifies the important possible health effects, affected populations, and available evidence. Identifies budget. Includes the following steps/tools:
    - Literature search and gathering of opinions from medical and public health experts, scientists, and engineers, as well as economists and sociologists
    - Identify stakeholders and their information needs
    - Identify and prioritize stressors which might lead to health impacts
    - Identify the boundaries of the potential impact
    - Specify budget
    - Use the above information to identify methods and tools for data collection
3. Assessing risks and benefits – analyzes baseline conditions and predicts potential effects
4. Developing recommendations – develops human health-based recommendations and a feasible plan for implementing them
5. Reporting – produces the text to be included in the EIS, disseminates the EIS to decision-makers, the public, and other stakeholders
6. Monitoring and evaluating – determines the extent to which inclusion of CHIA in the EIS added value to it, identifies the obstacles to research, and monitors outcomes of implementing decision

II. The need to include CHIAs into environmental impact assessments of the natural gas transport infrastructure is increasingly significant

Incorporating a CHIA into an environmental assessment of a proposed natural gas transport infrastructure project or a proposed policy relating to natural gas transport infrastructure is essential since the CHIA component informs decision-making by, among other things, identifying potential risks and benefits of the proposal and making recommendations to minimize risks, maximize benefits, address data gaps, and establish a monitoring framework.

A. Increased understanding of releases and their human health effects

Setting aside the known impacts on the natural environment of anthropogenic releases of methane, the primary component of the mix of fuel gases commonly known as "natural gas" 4 – which alone should give cause to question the desirability of expanding natural gas transport infrastructure 5 -- gases and condensate 6 in natural gas transport infrastructure have known human health effects. Recent studies show that those releases occur in quantities greater than had been previously estimated and in patterns that pose risk to human health. The need for incorporation of CHIA into environmental impact assessments of natural gas infrastructure projects thus becomes that much more important.

1. Releases

Recent research documents the prevalence of leaks in each component of the natural gas extraction, processing, and transport infrastructure system. As but a few examples:

- According to USEPA, 92.1 percent of methane emissions in the United States natural gas industry come from fugitive emissions (62.1 percent of the total) and vented emissions (30 percent of the total), 7 with total United States natural gas industry methane emissions accounting for 19 to 21 percent of anthropogenic methane emissions. 8 Additionally, "In the largest, most comprehensive study ever conducted on methane emissions from natural gas gathering facilities and processing plants, researchers led by Colorado State University found that 0.47 percent of the methane produced domestically is lost during gathering and processing operations. According to the study, methane emissions from gathering systems are equivalent to 30 percent of overall methane emissions in the current U.S. greenhouse gas inventory. The majority of these methane emissions were attributed to normal operations of gathering facilities." 9
- "A Colorado State University-led research team ... completed the most comprehensive field study to date of the amount of methane being emitted at the nation's natural gas transmission and storage infrastructure. [Based on 2012 data,] researchers detected methane emissions at compressor stations that were both operating and idle. Estimates based on on-site measurements indicate about 30 percent of aggregate emissions were from facilities where all compressors were idle. ... Without the two super emitters, average methane emissions recorded during the study were higher than the Greenhouse Gas Reporting program, but comparable to or lower than the Environmental Protection Agency's Greenhouse Gas Inventory estimate. When the super emitters are included, then the study-average emission factors could exceed both EPA estimates." 10 A follow-up analysis of the data "found that the total amount of methane emitted into the atmosphere from the transmission and storage sector is not statistically different from the emissions reported in the Environmental Protection Agency's 2012 Greenhouse Gas Inventory 11 for the sector[, which] ... estimated emissions between 1,680 to 2,690 Gg/yr (mean of 2,071 Gg/yr). The study estimates that total methane emissions from the transmission and storage sector resulted in the loss of 0.28% to 0.45% (mean of 0.35%) of the methane transported in 2012." 12 This new information, combined with other data acquired from other studies, led USEPA last week to announce its re-evaluation of its inventory. 13
- A Harvard University study of natural gas leaks from the Boston area's natural gas infrastructure published in January 2015 showed that natural gas is leaking from that infrastructure at rates two to three times higher than previous government estimates, with an overall leak rate of 2.1 percent to 3.3 percent. 14

Additionally, at present, planned releases of large volumes of transported fuel gases into the atmosphere (commonly known as "blowdown events") are an integral component of routine pipeline infrastructure operations. 15

The above, and other, studies and analyses led USEPA last year to propose regulations that tighten requirements intended to reduce methane emissions from the natural gas transport infrastructure system. 16

These releases, occurring through spills, leaks, and intended releases, pose threats to the environment and human health ranging from impacts on forests and wetlands to exposure to radiation, gas, and hazardous condensate.

The push to build new natural gas transport infrastructure appears to be having a materially adverse impact on pipeline safety:

- According to a 2015 Pipeline Safety Trust analysis of federal data, new pipelines are failing at a rate on par with gas transmission lines installed before the 1940s. Carl Weimer, director of the Pipeline Safety Trust, told attendees at a National Association of Pipeline Safety Representatives

annual meeting in Tempe, Arizona, "The new pipelines are failing even worse than the oldest pipelines." The Trust looked at the annual average number of incidents per 10,000 miles of onshore transmission lines over 2005-2013 based on when the pipelines were installed, as reported to PHMSA and found a "bathtub curve" with high points on the ends and low points in the middle, indicating that the oldest pipes and the newest pipes had the highest rates of incidents.

- Robert Miller, chairman of the National Association of Pipeline Safety Representatives said in a September 1, 2015 interview that while more emphasis has been placed on construction inspections, "If it's brand new, if it's all new materials, if everybody was doing their job correctly, why would we have an uptick in ... failures?" Miller, who is also the Arizona Corporation Commission's pipeline safety section supervisor, said, "You can only attribute that, in my personal opinion, to poor construction practices or maybe not enough quality control, quality assurance programs out there to catch these problems before those pipelines go into service."
- Robert Hall, director of the NTSB's Office of Railroad, Pipeline and Hazardous Materials Investigations, noted in a September 1, 2015 interview that the "bathtub curve phenomenon" is well established among industries working through the struggles of new technology, but he agreed that the rapid construction of pipelines in the United States is likely a contributing factor to "people ... out there possibly taking shortcuts or not being as diligent" as they would be if the pace of construction were less fervent." 17

Pipeline ruptures occur even in newly constructed pipelines. As but one example: a 20 foot by 20 foot rupture occurred in January 2015 in a buried 42 inch pipeline in Missouri that went fully online in November 2009. 18 Reductions in staffing at regulatory agencies make oversight and timely correction of deficiencies more difficult.

2. Human health effects

Experience in other states across the country shows that a decision to allow further expansion of natural gas infrastructure to allow transport of natural gas extracted by means of high volume hydraulic fracture technology ("HVHF") has the potential to result in significant substantive effects on human health, particularly effects that could be avoidable, involuntary, adverse, and irreversible. Numerous members of the medical community have affirmed this conclusion. 19

Residents living near shale gas operations have reported health issues ranging from dizziness, sinus disorders, bronchitis, and other respiratory symptoms to depression, nausea, fatigue, headaches, anxiety, difficulty concentrating, and cancer. A Colorado School of Public Health study released in March 2012 found that cancer risks were 66 percent higher for residents living less than half a mile from oil and gas wells than for those living farther away, with benzene being the major contributor to the increased risk. While these studies primarily relate to gas extraction activity consequences, some research has included consideration of pipelines and compressor stations. 20 Health impacts may occur in these situations even when conventional means of monitoring air quality do not universally document actionable levels of specific toxins. In essence, the human beings who, and farm and domestic animals that, are becoming ill are serving as "bioassays," revealing the presence of toxins or combinations of toxins that are difficult or impractical to measure in other ways. Thus, instead of measuring environmental contaminants as an indicator of or surrogate for human health impacts, in this setting it may be more accurate and more efficient to measure human health indicators directly as the primary "outcome measures" of possible contaminants. Moreover, it must be kept in mind that (a) leaks occur in the infrastructure used to transport gas extracted from HVHF gas wells and (b) standard procedure for planned and unplanned pipeline evacuation events is simply to release into the air the fuel gas contained in the pipeline.

Further, research has also shown that even minute amounts of endocrine disrupting chemicals

commonly used in fossil fuel operations may impact humans, particularly children and the unborn, a concern not currently addressed. Such chemicals include many of the additives used in fracking procedures, as well as many of the volatile aromatic compounds (such as "BTEX": benzene, toluene, ethylene, and xylene) that travel with methane and other components of natural gas.

Other factors that confirm that a CHIA would add value to the decision-making process are the presence of broad stakeholder concerns about the decision's health effects, the potential for unequally distributed impacts, the potential for the CHIA to recommend and result in timely changes to various proposals, and the likely availability of resources and technical capacity to conduct the CHIA.

A. Precedent for fossil fuel CHIAs

A CHIA covering natural gas transport infrastructure operations should be undertaken in order to assess the risks to human health that the transport infrastructure already poses and the cumulative and site-specific human health risks that additional infrastructure development will be anticipated to bring about. The timing of such an assessment will be discussed later in this paper.

There is established precedent for preparing HIAs to evaluate the impacts of high volume hydraulic fracturing (HVHF) and other fossil fuel operations. For example:

- In 2007, a health impact assessment was performed for the Bureau of Land Management and Minerals Management Service for oil and gas development proposals on Alaska's North Slope. This assessment led to new requirements for air quality analysis and monitoring of any oil related contaminants in subsistence foods, along with more worker education. It also identified significant public health impacts not normally examined in the context of an environmental review, including risks from increased traffic accidents, drug trafficking, and infectious diseases. 21
- In 2010, a draft health impact assessment was completed in Garfield County, Colorado for proposed natural gas development in Battlement Mesa. 22 The draft assessment concluded "that [the] health of the Battlement Mesa residents will most likely be affected by chemical exposures, accidents or emergencies resulting from industry operations and stress related community changes." The researchers went on to recommend a set of mitigation measures to reduce the health threats to local residents. The Battlement Mesa assessment clearly demonstrates the feasibility and utility of health impact assessments for evaluating risks to the health of local residents from HVHF and horizontal drilling operations.
- In September 2014, the City of Hermosa Beach, California released its report covering its health impact assessment of the E&B oil well drilling and production project proposed to be undertaken in the city. 23 While the assessment concluded that when considered by itself, the project under review is expected not to cause more than nuisance health impacts to the general population, it provided monitoring recommendations for the city to consider, including a community liaison committee to address resident's active concerns about project activities; a follow-up community health assessment to identify if some groups are disproportionately impacted by project activities; and a quality of life survey to establish baseline conditions in Hermosa Beach, and to monitor health status changes during the project.
- On December 17, 2014, the New York State Department of Health (NYSDOH) released its review of the health impacts of HVHF. This 186-page document served as the foundation for NYDEC's determination not to issue permits for high volume hydraulic fracturing. 24 While NYSDOH did not employ a formal CHIA to reach its conclusions, it "identified environmental problems associated with fracking that could contribute to adverse public health impacts. Among them: air pollution (particulate matter, ozone, diesel exhaust, and volatile organic compounds) that could affect respiratory health; drinking water contamination from underground migration of methane and/or fracking chemicals associated with faulty well construction or seismic activity; drinking water contamination from inadequate water treatment of fracking waste or from surface

spills of fracking chemicals or wastewater; earthquakes and the creation of fissures; increased vehicle traffic; increased noise; increased demand for housing and medical care; and public health problems related to climate change impacts from methane and other greenhouse gas emissions into the atmosphere." 25 NYSDOH concluded that "there are significant uncertainties about the kinds of adverse health outcomes that may be associated with [HVHF], the likelihood of the occurrence of adverse health outcomes and the effectiveness of some of the mitigation measures in reducing or preventing environmental impacts which could adversely affect public health." 26 The contributions of the NYSDOH's thorough review of the health and science literature were pivotal in NYSDEC's determination under SEQRA that HVHF should not proceed in New York State.

III. Incorporating CHIAs into the environmental impact assessment of a natural gas infrastructure project

1. In enacting the National Environmental Policy Act of 1969, as amended, 27 Congress declared a national policy "which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man." In order to carry out that policy, the federal government must "use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may ... assure for all Americans safe [and] ... healthful ... surroundings; [and to] attain the widest range of beneficial uses of the environment without ... risk to health or safety." 28 The environmental assessment process contained in the Act is a systematic interdisciplinary approach "intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment."29 Specifically, all federal agencies are to prepare detailed statements assessing the environmental impact of and alternatives to major federal actions significantly affecting the environment.

2. "Environment" in the NEPA context encompasses the human environment, which is interpreted comprehensively "to include the natural and physical environment and the relationship of people with that environment. (See the definition of 'effects' (Sec. 1508.8[, which defines 'effects' to include effects on, among others, health, whether direct, indirect, or cumulative].) This means that economic or social effects are not intended by themselves to require preparation of an environmental impact statement. When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment." 30

3. Typically there is no information pertaining to, or discussion of, specific potential health impacts or vulnerable subpopulations in the usual NEPA-mandated EIS that either the state or federal agencies undertake or require of an applicant. This serious deficiency in the existing process of evaluating the environmental impact of a proposed project results in current environmental assessments covering natural gas transport infrastructure projects containing no references to peer-reviewed literature on health effects near such infrastructure despite there being several determinants of health impacts that should be studied – and would be in the CHIA component of an EIS relating to that infrastructure. Those determinants include:

- Baseline health of population and prevalence of relevant diseases
- Identity and location of vulnerable populations and high-risk groups (e.g., communities with low socioeconomic status, racial and ethnic minorities, women of childbearing age, infants, youth, elderly, and people with pre-existing or latent health conditions) and areas of particular concern (e.g., sites near residences, schools, camps, recreational facilities, nursing homes, hospitals, agricultural regions, areas of sensitive geographical characteristics, such as wetlands and natural wildlife preserves, and sites likely to concentrate contaminants)

- Pathways of exposure: all potential pathways that link the activity to health, direct, indirect and cumulative (e.g., risks of multiple chemical exposures; accident risk, diet/subsistence factors; strain on services; and social changes such as violence and crime)
- Modeling of, for instance, air impacts, local and distant
- Review of scientific information and research on health impacts of compressor stations, metering stations, regulating stations and pigging facilities and other infrastructure associated with transported natural gas, including Colorado research on negative health impacts from HVHF-related air pollution
- Input from local population and county and regional health departments
- Worker health included as part of the community health evaluation
- A literature search and expert opinions from the medical and public health community and from other experts

The CHIA component also provides recommendations for health-based mitigation. For instance, in the case of air impacts, recommendations could include best control practices near particularly vulnerable communities that may drive enhanced mitigation measures, development of site-specific monitoring and adaptive management based on local meteorological conditions and population vulnerability, and/or alternative siting or avoidance of some areas altogether. With respect to water impacts, health-based mitigation could include identification and monitoring of sensitive receptors and addressing unique pathways such as subsistence consumption.

The failure to evaluate and attempt to mitigate potential health impacts associated with natural gas transport infrastructure can result in a number of negative outcomes for states, including more illness and disability and decreased productivity; increased cost to insurers, business owners and the state for health care; social instability; loss of community support; and particularly adverse effects for those who are poor, already ill, underserved or otherwise vulnerable.

IV. Proposal for a CHIA on Natural Gas Transport Infrastructure Development

A. Project Description

The proposed CHIA component of an EIS covering natural gas transport infrastructure will assess the potential health impacts of that infrastructure and will inform decision-making about permitting and development of permit conditions encompassing needed health-based mitigation. (At higher policy levels, a CHIA could inform new legislation or regulations related to energy policy and delivery options, including consideration of the comparative health benefits of most forms of renewable energy, including the positive impact of renewable alternatives on climate stability, with its associated health benefits.) Unlike the non-human health related components of the EIS, the CHIA component will give special attention to how the infrastructure may affect vulnerable populations and to what mitigation is needed to protect such groups. The potential health impacts that should be examined through the systematic approach of a CHIA include, but are not limited to, those potentially resulting from or relating to:

- air pollution
- water contamination
- soil contamination
- exposure to endocrine-disrupting and other chemicals
- waste management
- radiation exposure
- spills, accidents

- road safety
- social concerns such as housing, community character, schools, substance abuse and infectious diseases
- economic issues such as employment, home value, health costs, loss of productivity
- health infrastructure including availability of insurance
- justice concerns such as vulnerable populations and equality
- synergistic and cumulative effects of multiple stressors

The CHIA component will lead to recommendations for health-based mitigation (including the potential denial of permits or imposition of permit limitations), additional or new regulations, education programs, monitoring, and further study and potentially risk assessment(s).

B. Implementing the CHIA in the EIS process

Two major issues arise when considering how to incorporate CHIA into the environmental review of an interstate natural gas transport infrastructure project: (a) what geographical extent does the CHIA cover and (b) at what stage in the permit application review process is the project?

CHIA needs a baseline condition against which a project's particular incremental and cumulative impacts can be assessed; and the area whose information will be used to articulate that condition.

Where an applicant is in the project review process drives how CHIA may be addressed. For example,

- Before the EIS process gets underway, there is the opportunity to develop the baseline condition with assistance from other agencies, and to issue guidance that incorporates CHIA into the requirements for an acceptable environmental assessment of a project.
- Respecting applications pending before the FERC as of the date of this White Paper that have not yet been declared "complete" for processing purposes, FERC could inform the applicant that an acceptable environmental assessment for the project would include a CHIA component fulfilling requirements that are provided to the applicant, with the CHIA component encompassing a description of the baseline condition and an assessment of the incremental and cumulative human health impacts that the project is anticipated to generate. In consultation with other impartial agencies, FERC could also identify the qualifications of those who would undertake the CHIA components of the environmental assessment.
- Respecting applications pending before FERC as of the date of this White Paper that have already been declared "complete" for processing purposes, FERC could inform the applicant of the need for it to supplement the environmental assessment by expanding that assessment to encompass a CHIA. The difference between this situation and the situation described immediately above is, in this case, the need to have the supplementation completed before expiration of the time period set forth in federal law for consideration of the application in question in order to have the CHIA's assessment have any impact on agency decision-making on the application.

References and Notes:

1 North American HIA Practice Standards Working Group, "Minimum Elements and Practice Standards for Health Impact Assessment (Version 3, September 2014)," found at http://hiasociety.org/wp-content/uploads/2013/11/HIA-Practice-Standards-September-2014.pdf.

2 Derived from Figure S-1 (p. 7) in National Research Council (2011), "Improving Health in the United States: The Role of Health Impact Assessment by Committee on Health Impact Assessment", found at http://www.nap.edu/download.php?record_id=13229

3 “Natural gas is composed primarily of methane, but may also contain ethane, propane and heavier hydrocarbons. Small quantities of nitrogen, oxygen, carbon dioxide, sulfur compounds, and water may also be found in natural gas.” http://www.beg.utexas.edu/energyecon/lng/LNG_introduction_07.php.

4 USEPA considers methane to be a major greenhouse gas: “Pound for pound, the comparative impact of CH4 on climate change is more than 25 times greater than CO2 over a 100-year period.” http://www3.epa.gov/climatechange/ghgemissions/gases/ch4.html. To address the issue of reducing anthropogenic releases of methane into the atmosphere, that agency recently issued a series of regulations and requests for information on emissions occurring at various stages of natural gas extraction, processing, and transportation. See http://www3.epa.gov/airquality/oilandgas/actions.html.

5 In the context of this White Paper, “condensate” means liquids -- hydrocarbon liquids and water -- that condensed out of the natural gas stream and particulate matter formed during natural gas contact with the materials that coat the inside of the natural gas pipeline.

6 USEPA, “Estimate of Methane Emissions from the U.S. Natural Gas Industry,” Table 2, posted September 15, 2015 and found at http://www3.epa.gov/ttn/chief/ap42/ch14/related/methane.pdf.

7 Ibid., at “5.0: Conclusions.” According to USEPA, methane emissions from oil extraction activities and from natural gas extraction, transportation, and distribution activities account for nearly 30 percent of total United States anthropogenic methane emission sources. USEPA news release dated August 18, 2015, “EPA Proposes New Commonsense Measures to Cut Methane Emissions from the Oil and Gas Sector/Proposal Cuts GHG Emissions, Reduces Smog-Forming Air Pollution and Provides Certainty for Industry,” found at http://yosemite.epa.gov/opa/admpress.nsf/bd4379a92ceceeac8525735900400c27/e5f2425e2e668a2b85257ea5005176fa!opendocument.

10 http://source.colostate.edu/researchers-measure-methane-lost-in-natural-gas-operations/. The study itself, A. Marchese et al., “Methane Emissions from United States Natural Gas Gathering and Processing,” Environ. Sci. Technol. 2015, 49, 10718–10727, may be found at http://pubs.acs.org/doi/pdf/10.1021/acs.est.5b02275.

11 http://source.colostate.edu/csu-study-measures-methane-emissions-natural-gas-transmission-storage-sites/. The report, R. Subramanian et al., “Methane Emissions from Natural Gas Compressor Stations in the Transmission and Storage Sector: Measurements and Comparisons with the EPA Greenhouse Gas Reporting Program Protocol,” Environ. Sci. Technol. 2015, 49, 3252–3261, may be found at http://pubs.acs.org/doi/pdfplus/10.1021/es5060258.

12 USEPA’s Greenhouse Gas Inventory is one of the federal agency’s two programs that track methane from the natural gas infrastructure system.

13.http://source.colostate.edu/results-of-second-methane-emissions-study-published/. The study, D. Zimmerle et al., Methane Emissions from the Natural Gas Transmission and Storage System in the United States,” Environ. Sci. Technol. 2015, 49, 9374–9383, may be found at http://pubs.acs.org/doi/pdf/10.1021/acs.est.5b01669.

14.USEPA, “Inventory of U.S. Greenhouse Gas Emissions and Sinks: Revisions under Consideration for Natural Gas Transmission and Storage Emissions January 2016),” posted January 20, 2016, and found at http://www3.epa.gov/climatechange/ghgemissions/usinventoryreport/DRAFT%20Proposed%20Revisions%20to%20NG%20Transmission%20Storage%20Segment%20Emissions_2016-01-20.pdf.

15 K. McKain et al., “Methane emissions from natural gas infrastructure and use in the urban region of Boston, Massachusetts,” Proceedings of the National Academy of Sciences, 112: 1941-1946 (February 17, 2015), which may be found at http://www.pnas.org/content/112/7/1941.full.pdf.

16 See Argonne National Laboratory, “Natural Gas Pipeline Technology Overview,” (2007), p.45.

This report may be found at http://corridoreis.anl.gov/documents/docs/technical/apt_61034_evs_tm_08_5.pdf. See also "Infrastructure" in Concerned Health Professional of New York, "Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking (Unconventional Gas and Oil Extraction), Third Edition (October 2015)", found at http://concernedhealthny.org/wp-content/uploads/2012/11/PSR-CHPNY-Compendium-3.0.pdf.

17 USEPA news release dated August 18, 2015, "EPA Proposes New Commonsense Measures to Cut Methane Emissions from the Oil and Gas Sector/Proposal Cuts GHG Emissions, Reduces Smog-Forming Air Pollution and Provides Certainty for Industry," found at http://yosemite.epa.gov/opa/admpress.nsf/bd4379a92ceceeac8525735900400c27/e5f2425e2e668a2b85257ea5005176fa!opendocument. See also [Natural Gas STAR Annual Implementation Workshop, Pittsburgh, Pennsylvania, November 18, 2015, "Directed Inspection and Maintenance for Transmission Compressor Station Leak Reduction: Program Focus Supported by Subpart W Data," found at http://www3.epa.gov/gasstar/documents/workshops/2015_AIW/19mccarthypugh.pdf.

18 http://www.napsr.org/SiteAssets/mediainfo/SNL%20Sept%209%202015%20BathTub%20Curve%20Construction%20Practices.pdf. USEPA's 2015 rulemaking proposals intended to reduce methane emissions from natural gas infrastructure may have the beneficial consequence of providing an enforceable adjunct in New York State to PHMSA's pipeline safety program in the form of NYSDEC's Air Resources program.

19 "Pipeline Ruptures Near Pike 43", The People's Tribune, February 3, 2015, found at http://thepeoplestribune.com/?author=2 .

20 In support of an HIA on HVHF, in October 2011, 250 physicians and medical professionals wrote a letter calling for a comprehensive public health impact assessment on HVHF.

The Medical Society of the State of New York adopted Position Statement 260.904 "Protecting Public Health from Natural Gas Infrastructure" in May, 2015, which states that the Society recognizes the potential impact on human health and environment associated with natural gas infrastructure and supports governmental assessment of the health and environmental risks that are associated with natural gas pipelines. The Position Statement may be found at http://www.mssny.org/MSSNY/About_MSSNY/Position_Statements/HTML-Position_Statements-2.aspx#260000.

In June 2015, the American Medical Association adopted a similar policy (number: H-135.930): "Protecting Public Health from Natural Gas Infrastructure," found at https://searchpf.ama-assn.org/SearchML/searchDetails.action?uri=%2FAMADoc%2Fhod.xml-0-297.xml which states, "Our AMA recognizes the potential impact on human health associated with natural gas infrastructure and supports legislation that would require a comprehensive Health Impact Assessment regarding the health risks that may be associated with natural gas pipelines."

21 See, e.g.

- D. Brown et al., "Understanding exposure from natural gas drilling puts current air standards to the test," Reviews in Environmental Health 2014: 29(4):277-92, the abstract for which may be found at http://www.ncbi.nlm.nih.gov/pubmed/24690938.
- Southwest Pennsylvania Environmental Health Project, "Summary of Minisink Monitoring Results" found at http://www.environmentalhealthproject.org/wp-content/uploads/2015/06/Summary-of-Minisink-Results.Public.pdf (documented episodic spikes in air pollutants emanating from this compressor station, which became operational in 2013, corresponded with waxing and waning self-reported health symptoms among 35 residents in eight families living within a mile of the compressor. Six of 12 children suffered from nosebleeds); and W Gillingham et al., "Toxic Air Emissions During a Compressor Station Blowdown at Hancock New York" (submitted for publication).

- In comments to the Federal Energy Regulatory Commission, New York's Madison County Health Department reviewed the literature on compressor station emissions and expressed concerns about associated health impacts, including documented correlations between health problems and residential proximity to compressor stations. It also reviewed health outcomes associated with exposures to chemicals known to be released from compressor stations, including volatile organic compounds, carbonyls and aldehydes, aromatics, and particulate matter. In addition, gas from fracking operations transiting through compressor stations carries gaseous radon. The Health Department noted a troubling lack of information on the intensity, frequency, and duration of emission peaks that occur during the blowdowns and large venting episodes that are a normal part of compressor operations. https://www.madisoncounty.ny.gov/sites/default/files/publicinformation/madison_county_doh_comments_-_docket_no._cp14-497-000.pdf
- A research team led by David O. Carpenter at University at Albany found high levels of formaldehyde near 14 compressor stations in three states. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4216869/. In Arkansas, Pennsylvania, and Wyoming, formaldehyde. levels near compressor stations exceeded health-based risk levels. Other hazardous air pollutants detected near compressor stations in this study were benzene and hexane.
- Southwest Pennsylvania Environmental Health Project's (2015, February 24) "Summary on compressor stations and health impacts," found at http://www.environmentalhealthproject.org/wp-content/uploads/2012/03/Compressor-station-emissions-and-health-impacts-02.24.2015.pdf, describes impacts that are based upon the researchers' first-hand experience with health impacts in southwest Pennsylvania. It also describes the results of other studies conducted by the Pennsylvania Department of Environmental Protection, by the Texas Commission on Environmental Quality, consultants for Dish, Texas, and by Earthworks, a not-for-profit organization, and by other organizations, identifying the various pollutants emitted during compressor station operations.

22 See A. Dannenberg et al., "Use of Health Impact Assessment in the U.S.: 27 Case Studies, 1999–2007," American Journal of Preventive Medicine, 2008; 34(3):241–256, which may be found at www.cdc.gov/healthyplaces/publications/AJPM_HIAcasestudies_March2008.pdf. See also R. Bhatia and A. Wernham, "Integrating Human Health into Environmental Impact Assessment: An Unrealized Opportunity for Environmental Health and Justice," which may be found at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2516559/#b70-ehp0116-000991.

23 The draft report may be found at http://www.garfield-county.com/environmental-health/battlement-mesa-health-impact-assessment-draft2.aspx

24 The report, entitled, "Health Impact Assessment: E&B Oil Drilling and Production Project," may be found at: http://www.slideshare.net/StopHermosaBeachOil/final-health-impact-assessment-2014

25 New York State Department of Health, "A public health review of high volume hydraulic fracturing for shale gas development, December 17, 2014." The report may be found at http://www.health.ny.gov/press/reports/docs/high_volume_hydraulic_fracturing.pdf

26 Concerned Health Professional of New York, "Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking (Unconventional Gas and Oil Extraction), Third Edition (October 2015)", found at http://concernedhealthny.org/wp-content/uploads/2012/11/PSR-CHPNY-Compendium-3.0.pdf, on page 74.

27 New York State Department of Health, "A public health review of high volume hydraulic fracturing for shale gas development, December 17, 2014." The report may be found at http://www.health.ny.gov/press/reports/docs/high_volume_hydraulic_fracturing.pdf

Attachment 4: Darrell Scott, comment to SEC on high-pressure gas pipeline safety

162-H:10-b Siting of High Pressure Gas Pipelines; Rulemaking; Intervention. –

II. (f) Best practical measures to ensure quality construction that minimizes safety issues.

Overview:

A key safety risk arises from Kinder Morgan's (KM) plan to co-locate the NED 30-inch high-pressure pipeline with a 345kV three-phase HVAC power line. This "co-location" proposal is problematic in regards to pipeline longevity. The proposal has the NED pipeline running adjacent and parallel to the existing HVAC power lines for many miles. The existing right-of-way was never intended for a buried pipeline, which raises safety concerns due to difficult terrain to be traversed and the induced corrosion from being near the power lines.

Background details:

1. **Solid granite**. The right-of-way (ROW) crosses Kidder Mountain in New Ipswich, Fletcher Granite quarry in Mason, and historical quarries in Milford, and is not conducive to bury a pipeline safely below the frost line. It also traverses numerous ledges and outcroppings with very steep pitches and crosses a steep gorge over the Souhegan River. These slopes will be difficult to cover with fill that will not wash away without using hard fill that will damage the pipeline coating designed to protect it from corrosion.
2. **Anti-corrosion methods are complicated**. Pipelines will corrode due to metal ionizing in the soil and the resulting electrical current flowing from the pipe into the ground. This will occur anywhere the pipeline coating allows metal contact to the soil. Pipeline corrosion can be mitigated with DC cathodic protection electrical circuitry that reverses the direction of electrical current such that it flows from the ground into the pipe. The design of the necessary DC cathodic protection is dependent on proximity to the power lines, soil resistivity, soil and geology conditions, and pipeline coating material. This protection system requires constant monitoring for effectiveness and maintenance for proper operation.
3. **HVAC interferes with anti-corrosion**. The close proximity of and running parallel to the 345kV power transmission lines will induce AC currents which will interfere with the DC cathodic mitigation systems and create its own AC current flow to corrode pipes. Again, this affect can be mitigated with additional electrical circuits and monitored for induced AC voltages, but this also requires constant monitoring and maintenance. Lightning strikes to the power lines and phase-to-ground faults from electrical power disruptions can induce very high currents in nearby buried pipelines, can degrade pipeline protective coatings, and can cause severe corrosion in the pipe.
4. **Thinner-walled pipes in rural areas**. Kinder Morgan representatives have stated, at public hearings in NH, that less expensive thinner walled pipes are used in rural areas. This will reduce the expected lifetime of this gas pipeline due to corrosion. This increases the need for constant monitoring and maintenance.
5. **Poor maintenance record.** Master Limited Partnerships (MLPs) like Kinder Morgan Energy Partners are skimping on crucial maintenance spending. They do not pay corporate income taxes. Instead, they distribute almost all their free cash flow to their investors. They seem more inclined to pay fines after accidents happen rather than spending money to prevent accidents.

Rules need to address industry standards for all aspects of pipeline construction, maintenance, reporting, etc. Much of this is covered in Code of Federal Regulations title 49 part 192 PART 192—TRANSPORTATION OF NATURAL AND OTHER GAS BY PIPELINE: MINIMUM FEDERAL SAFETY STAN-

DARD. However, verification of compliance to these regulations will require constant on-site inspections by qualified industry experts on staff to NH and not from the pipeline company.

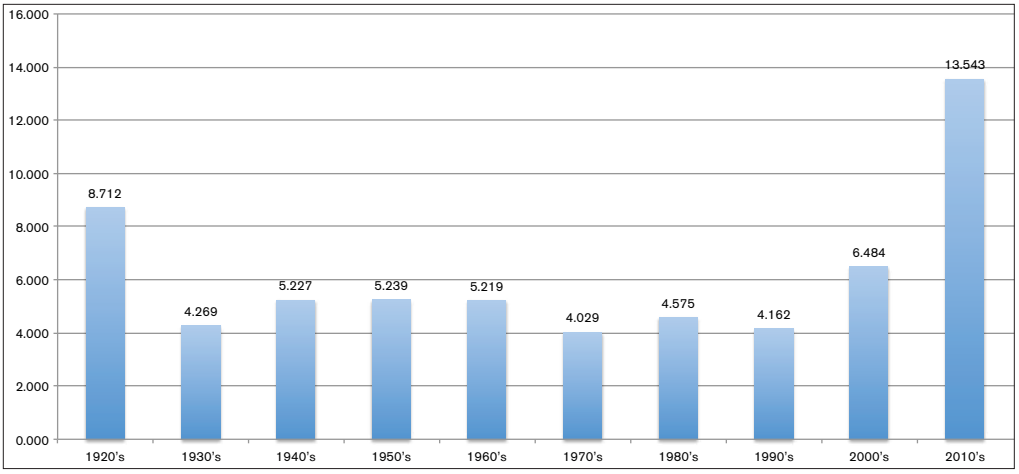
An aside to the the SEC:

Kinder Morgan has chosen this new preferred pathway along the HVAC ROW in NH not because it is the safest and shortest path, but to give the false impression that no new ROW will be taken. In truth, to build this pipeline safely thru NH, will require a new ROW at a distance from the power lines. Such a new ROW could be better located in more suitable topography.

Are Old Pipelines Really More Dangerous?

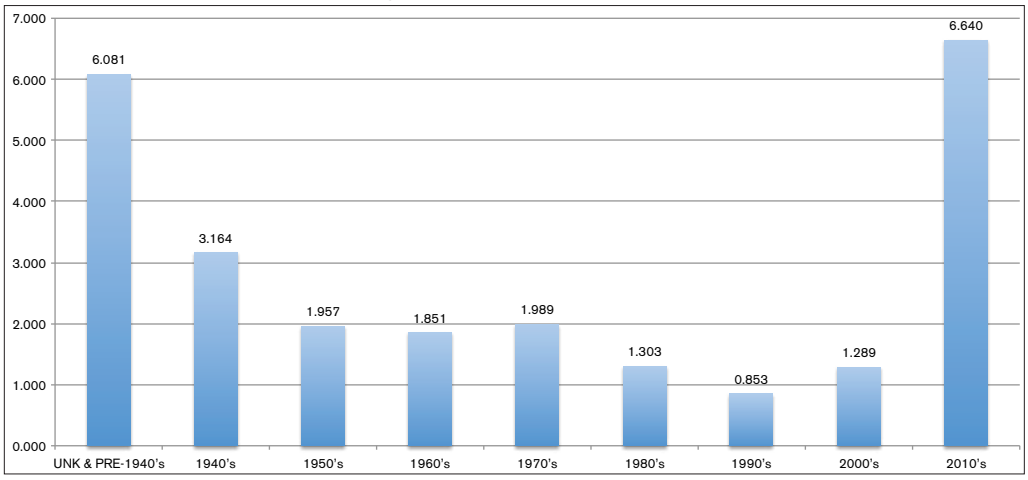
This sentiment is heard frequently, and even more often turned into a statement of fact, that old pipelines are more dangerous. But the truth is that is not necessarily the case. While some *types* of old pipelines are well-known to be riskier, like cast iron pipes and pipes with seams welded using LF-ERW (low frequency electric resistance weld), in general we do not see older pipes failing much more than new pipes on a per mile basis. In fact, we recently analyzed pipeline incidents in relation to the decade those same failed pipes were installed – one analysis for onshore hazardous liquid (HL) pipelines, and one for onshore gas transmission pipelines. The results were surprising. Though they varied between hazardous liquid and gas transmission pipelines (all onshore), generally the very oldest pipes were more dangerous (pipe installed before the 1930s), and – here's the surprising part – more dangerous still were the very newest pipelines – those installed since 2010. Is this a reflection of "getting the kinks out" when pipelines are first installed? Is it a pattern that will continue or change? Unfortunately, we don't have the kind of data we would need to replicate this analysis in decades past, so it will only be in the future that we're able to answer our questions. The graphs are concerning to us though, as one interpretation of the results is that some pipelines are initially installed with weak and vulnerable aspects which fail; and only after fixing these initial failures do the pipelines operate safely. There are surely other interpretations of the results, and we would love to hear from you if you have ideas of why this is occurring. The uncertainty surrounding the safety of new pipelines underscores the need to push for pipelines to be sited, installed, tested and inspected in the best way possible, and for the regulators to ensure that is the case through strong and enforced regulations. And all of this only works well when the public has the ability to be involved in the process and has access to the information needed to understand and review all aspects of pipeline safety. We still have a long way to go.

 # Incidents Per 10,000 Miles Of Onshore Hazardous Liquid Pipeline By Decade Of Pipe Installed
(Avg Of Annual Incidents 2005-2013)



All data from PHMSA. Mileage data from operator's annual reports, incident data from flagged incident reports.
Contact us for more specifics.

 # Incidents Per 10,000 Miles Of Onshore Gas Transmission Pipeline By Decade Of Pipe Installed
(Avg Of Annual Incidents 2005-2013)



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