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## The Role of Comprehensive Health Impact Assessment in Evaluating Natural Gas Infrastructure proposals in Massachusetts:

Based upon A White Paper prepared by an *ad hoc* working group  
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### ***Executive Summary***

This white paper provides an overview of four critical issues regarding the role of comprehensive health impact assessment (CHIA) of natural gas 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 the legal foundation for incorporating CHIA into review procedures. Finally, Section IV proposes particular approaches to CHIA at various points in the State application and review process and in the federal environmental review process.

### **I. What is a CHIA**

#### **A. Why include a comprehensive health impact assessment?**

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.”<sup>1</sup> 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 policy making 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

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<sup>1</sup> 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>.

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.<sup>2</sup> 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 currently regulatory approach does not typically 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.
- Adequate cumulative emissions impacts. For example, only some local stationary sources of emissions are typically included when evaluating the additive effects of pipeline-associated air pollution. Local background measurements are not required, even though local atmospheric effects and emissions sources may be significantly different (e.g., thermal inversion or coastal inversion events, local mobile source emissions). In fact, as few as 2% of statewide emissions may originate from stationary sources<sup>3</sup> yet stationary emissions are the only local emissions sources included in air quality evaluations.

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.

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2 In fact, the Department’s rationale in rejecting recommendations in the Algonquin Incremental Market Project to conduct an independent air emissions baseline assessment and health impact study consistent with the resolutions adopted by many municipalities within the New York portion of the AIM Project reflects precisely this approach: “Neither ... is required in order for the NYSDEC to issue the Title V air permit modifications because the AIM Project complies with all applicable federal and state regulations, which have been established to protect public health and safety.” “New York State Department of Environmental Conservation Response to Public Comments: Algonquin Incremental Market Project, May 2015,” which may be found at: [http://www.spectraenergy.com/content/documents/Projects/AIM/NYSDEC\\_Response\\_Public\\_Comments\\_AIM%20Project\\_%20May%202015\\_DEC%20website\\_7625736\\_1-c.PDF](http://www.spectraenergy.com/content/documents/Projects/AIM/NYSDEC_Response_Public_Comments_AIM%20Project_%20May%202015_DEC%20website_7625736_1-c.PDF).

3 E.g., carbon monoxide: <http://www.mass.gov/eea/docs/dep/air/priorities/08pei-data.pdf>

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, inclusive of vulnerable and general populations in potentially affected communities.

The CHIA component gives special attention to vulnerable populations such as environmental justice communities, infants and youth, pregnant women, the elderly, those with chronic health conditions, and industrial workers, because such populations require greater protections than the general population. The CHIA component is also well-designed to evaluate both cumulative impacts and site-specific factors (such as local geography and meteorologic conditions) that may predominate in determining whether human health will be adversely impacted by an action.

#### B. The Steps in the CHIA Process<sup>4</sup>

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 communities or populations of interest, elicit their concerns
  - Describe information needed for the assessment process
  - 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 DEIS and FEIS; disseminates the DEIS and FEIS containing, respectively, the interim and final versions of that text 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

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4 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](http://www.nap.edu/download.php?record_id=13229).

## **II. There is a justified need to incorporate CHIAs into the environmental review of natural gas infrastructure projects in Massachusetts**

Incorporating a CHIA into the environmental review of proposed natural gas infrastructure projects or a proposed policy relating to natural gas 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**

Along with the known role of anthropogenic methane releases in driving climate change, the primary component of the gaseous mixture commonly known as “natural gas”<sup>5</sup> – which alone should prompt serious questioning of our increasing reliance on natural gas<sup>6,7</sup> -- gases and condensate<sup>8</sup> in natural gas 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),<sup>9</sup> with total United States natural gas industry methane emissions accounting for 19 to 21 percent of anthropogenic methane emissions.<sup>10</sup> 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.”<sup>11</sup>

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5 “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/Ing/LNG\\_introduction\\_07.php](http://www.beg.utexas.edu/energyecon/Ing/LNG_introduction_07.php).

6 USEPA considers methane to be a major greenhouse gas: “Pound for pound, the comparative impact of CH<sub>4</sub> on climate change is more than 25 times greater than CO<sub>2</sub> over a 100-year period.” <http://www3.epa.gov/climatechange/ghgemissions/gases/ch4.html>.

7 Table 2: The 20 year Global Warming Potential of methane is 56-105 times higher for methane relative to CO<sub>2</sub> [http://www.eeb.cornell.edu/howarth/publications/Howarth\\_2014\\_ESE\\_methane\\_emissions.pdf](http://www.eeb.cornell.edu/howarth/publications/Howarth_2014_ESE_methane_emissions.pdf)

8 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.

9 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>.

10 *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/bd4379a92ceceac8525735900400c27/e5f2425e2e668a2b85257ea5005176fa!opendocument>.

- “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,] [r]esearchers 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 superemitters, 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 superemitters are included, then the study-average emission factors could exceed both EPA estimates.”<sup>12</sup> 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<sup>13</sup> 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.”<sup>14</sup> This new information, combined with other data acquired from other studies, led USEPA last week to announce its re-evaluation of its inventory.<sup>15</sup>
- A study of natural gas leaks from the Boston area’s natural gas infrastructure published in January 2015 showed that natural gas is leaking in the city at rates two to three times higher than previous government estimates, with an overall leak rate of 2.1 percent to 3.3 percent.<sup>16</sup>

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.<sup>17</sup>

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.

11 <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>.

12 <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>.

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

14 <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>.

15 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](http://www3.epa.gov/climatechange/ghgemissions/usinventoryreport/DRAFT%20Proposed%20Revisions%20to%20NG%20Transmission%20Storage%20Segment%20Emissions_2016-01-20.pdf).

16 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>.

17 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](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>.

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.”<sup>18</sup>

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.<sup>19</sup> 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 and, in particular, in Pennsylvania, shows that a decision to allow further expansion of natural gas infrastructure to deliver and utilize natural gas extracted by means of high volume hydraulic fracture technology (“HVHF”), or “fracked gas”, 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 New York’s medical community have affirmed this conclusion.<sup>20</sup>

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18 <http://www.napsr.org/SiteAssets/mediainfo/SNL%20Sept%2009%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://thepeopletribune.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](http://www.mssny.org/MSSNY/About_MSSNY/Position_Statements/HTML-Position_Statements-2.aspx#260000).

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.<sup>21</sup> 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. 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

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.”

<sup>21</sup> See, e.g.,

- Regarding air quality impacts due to a rural compressor station, “The estimated annual PM2.5 concentration...may be harmful to the general population and sensitive subpopulations, including the elderly, children, and those with respiratory or heart disease. Agency for Toxic Substances and Disease Registry, Health Consultation, Brooklyn Township. Apr 2016. [http://www.atsdr.cdc.gov/HAC/pha/BrooklynTownship/BrooklynTwnsp\\_pm2-5\\_HC\\_Final\\_04-22-2016\\_508.pdf](http://www.atsdr.cdc.gov/HAC/pha/BrooklynTownship/BrooklynTwnsp_pm2-5_HC_Final_04-22-2016_508.pdf)
- 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](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 the

procedure for planned and unplanned pipeline evacuation events is simply to release into the air the fuel gas contained in the pipeline.

Research has also shown that even minute amounts of endocrine disrupting chemicals commonly used in fossil fuel operations may impact humans, particularly during fetal development, infancy, and childhood - a concern not currently addressed by the environmental review process. 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 into transmission and distribution gas pipelines.

Other factors that confirm that a CHIA would add value to the decision making process in New York are the presence of broad stakeholder concerns about the decision’s health effects, the potential for impacting environmental justice communities, 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.

#### B. Precedent for fossil fuel CHIAs

There is established precedent for preparing HIAs to evaluate the impacts of 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.<sup>22</sup>
- In 2010, a draft health impact assessment was completed in Garfield County, Colorado for proposed natural gas development in Battlement Mesa.<sup>23</sup> 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.<sup>24</sup> 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

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results of studies conducted by the Pennsylvania Department of Environmental Protection, the Texas Commission on Environmental Quality, consultants for Dish, Texas, and by Earthworks, a not-for-profit organization, and others, 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](http://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>



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.<sup>25</sup> 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."<sup>26</sup> 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."<sup>27</sup> 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 review of natural gas infrastructure projects**

#### **A. MEPA, NEPA, and CHIA**

1. As lead agent on a state certificate or other approval under the Clean Water Act or Clean Air Act for an interstate natural gas pipeline project, the Department of Environmental Protection has the responsibility to evaluate the environmental effects of that project. In carrying out this responsibility, it must consult with all other state agencies that could provide it with information and evaluation needed to ensure that the adverse environmental effects of at least those components of the project that are located in Massachusetts are eliminated or, if that is not possible, are minimized to the maximum extent practicable. Since such elimination or minimization necessarily entails, among other things, eliminating or minimizing adverse human health effects that a project may pose,<sup>28</sup> the Department

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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](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>, at 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](http://www.health.ny.gov/press/reports/docs/high_volume_hydraulic_fracturing.pdf).

28 See, for example, *Riverhead Business Improvement District Management Association, Inc. et al. v Stark*, 253 AD2d 752 (Second Dept, 1998) ("To comply with SEQRA, the Town Board was obligated to consider the

must ensure that all human health impacts arising from any natural gas infrastructure project over which it has approval jurisdiction are minimized to the maximum extent practicable, if not totally eliminated.

2. In enacting the National Environmental Policy Act of 1969, as amended,<sup>29</sup> 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.”<sup>30</sup> 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.”<sup>31</sup> Specifically, all federal agencies are to prepare detailed statements assessing the environmental impact of and alternatives to major federal actions significantly affecting the environment.

“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.”<sup>32</sup>

3. Typically there is no meaningful evaluation of potential human health impacts in the usual MEPA- or NEPA-mandated EIS. 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.*, environmental justice communities, pregnant women or those 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

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environmental concerns that were reasonably likely to result from [the proposed action]”); ECL 1-0101.1, 1-0101.3.a, 1-0101.3.c, 8-0101, 8-0105.6; see also 6 NYCRR 617.2(l): “Environment means the physical conditions that will be affected by a proposed action, including ... human health.”

29 Pub. L. 91-190, 42 U.S.C. 4321 *et seq.*

30 42 USC 4331(b).

31 40 CFR 1500.1(c).

32 40 CFR 1508.14.

- 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 sites or individuals and addressing unique exposure pathways such as subsistence consumption.

The failure to evaluate and attempt to mitigate potential health impacts associated with natural gas infrastructure can result in a number of negative outcomes for the State, 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.

#### B. MEPA, NEPA, CHIA, and the Natural Gas Act

1. The Energy Policy Act of 2005 revised the Natural Gas Act to have it expressly reserve to states their authorities under the Water Pollution Control Act, the Clean Air Act, and the Coastal Zone Management Act.<sup>33</sup> The Department is the cognizant State agency for regulation of activities within the State covered by the Water Pollution Control Act and Clean Air Act. The Department's authorization to administer the federal Water Pollution Control Act program in lieu of USEPA is based upon ECL 1-0101, 3-0301, and Article 8, among other authorities. Under the analytical approach that the Fourth and DC Circuits respectively used in *AES Sparrows Point LNG, LLC et al. v Smith et al.*, 527 F.3d 120 (4<sup>th</sup> Cir., 2008) and *Dominion Transmission, Inc. v Robert Summers et al.*, 723 F.3d 238 (DC Cir, 2013), therefore, the Department's review under the Water Pollution Control Act Section 401 properly encompasses environmental review of the project subject to the Section 401 certification and that environmental review is subject to MEPA review – which encompasses health impact assessments.<sup>34</sup>

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<sup>33</sup> At 15 USC 717b(d).

<sup>34</sup> FERC itself acknowledges in a case before it heard a decade ago, that because the Coastal Zone Management Act is a federal requirement, “the CZMA and the NGA [Natural Gas Act] are laws of equal dignity and should be read to complement rather than preempt one another.” [108 F.E.R.C. ¶ 61,155 at PP 8-13]. The same perspective should equally apply to state authority under the Water Pollution Control Act and under the Clean Air Act.

Further, consider that while federal law governs questions involving the interpretation of a federal statute [see *Kamen v. Kemper Financial Services*, 500 U.S. 90, (1991)], the determination that federal law applies does not inevitably require the application of a uniform federal rule. Applying federal law, courts may either fashion a uniform federal common law rule or adopt state law as the federal rule of decision. See *id.*; *United States v. Kimbell Foods, Inc.*, 440 U.S. 715, (1979). In *Kimbell Foods*, for example, the Supreme Court outlined the analysis that determines whether uniform federal common law or state law should apply. The determination depends on the nature and importance of the government interest at issue and the effect of applying state law. To decide whether a national federal rule is necessary, courts should consider: (1) the need for a nationally uniform law; (2) whether incorporation of state law would frustrate specific objectives of the federal program at issue; and (3) the extent to which application of a federal common law rule would upset commercial expectations that state law would govern. Thus, developing a federal common law rule is the exception rather than the rule. Federal law should coincide with

At least one other state – Washington – already views its authority to independently evaluate the environmental impacts of a natural gas infrastructure project under its state environmental review statute and has declared its position to FERC, essentially using the rationale of the *Dominion Transmission* case to justify its assertion of jurisdiction.<sup>35</sup>

2. The supposed impediments to MEPA's application to an interstate or other natural gas infrastructure project, though, have no play in FERC's own environmental impact assessment under NEPA. Thus,

- as previously discussed under Section III.A.2, FERC is free to more comprehensively evaluate the human health impacts of a proposed project subject to its jurisdiction; and
- when recommending matters to be addressed during FERC's EIS scoping process relating to an interstate natural gas transport infrastructure project and when commenting on the adequacy of a federal DEIS, the Department and the Departments of Health and of State are free to join the Department in urging FERC to undertake the more in-depth human health impact assessment that inclusion of CHIA concepts into FERC's NEPA process can provide.

#### **IV. Proposal for a CHIA on Natural Gas Transport Infrastructure Development in Massachusetts**

##### **A. Project Description**

the relevant state law unless state law would undermine the objectives of the federal statutory scheme and there is a distinct need for nationwide legal standards. See *Kimbell Foods*, 440 U.S. at 728, 99 S.Ct. at 1458.

Interestingly, in the Federal Water Pollution Control Act context, by virtue of the language of 33 USC 1342(d)(2), while USEPA may overrule a state water quality certificate issuance, its authority to override a state *denial* is unclear. Also, while USEPA may withdraw its authorization when confronted with a state not administering its water quality program properly, it must exercise this power “with restraint and reserve it for only extreme situations [and] it is extremely doubtful that the unsatisfactory handling of a single permit would ever warrant EPA revocation of a state’s... authority.” *United States v. Cargill, Inc.*, 508 F. Supp. 734, 740 (D. Del. 1981) (citing *Save the Bay, Inc. v. Administrator of EPA*, 556 F.2d 1282, 1284-87, 1290 [5th Cir. 1977]).

35 See October 6, 2015 letter, Gordon White (Washington Department of Ecology program Manager for Shorelands and Environmental Assistance Program) to Kimberly D Bose (Secretary, Federal Energy Regulatory Commission) regarding “Comments on NEPA Draft EIS for Oregon LNG (Docket No. CP09-6, CP09-7) and Washington Expansion Project (Docket No. CP13-507),” at “Attachment” pages 1 and 2:

“**Page 4-573:** For clarification purposes, the following three paragraphs should be substituted for that in the DEIS:

**4.2.9.5 Coastal Zone Management Act** ‘Approved by the federal government in 1976, Washington’s Coastal Zone Management Program (WCZMP) is the authority that the Washington State Department of Ecology’s Shorelands and Environmental Assistance Program relies on when reviewing a project for federal consistency. As described in section 1.5.1.9, the WCZMP applies to all 15 coastal counties that front salt water, extending three nautical miles from shore on the Pacific Coast. The WEP would be within Washington’s coastal zone for activities in Thurston, Pierce, King, Snohomish, Skagit, and Whatcom Counties.

“To receive a consistency determination with the WCZMP, the WEP must demonstrate compliance with the following state laws and their implementing regulations (WACs):

- SEPA ( ... Ecology is the SEPA Lead Agency for the WEP);
- Shoreline Management Act (RCW 90.58);
- Water Pollution Control Act (RCW 90.48);
- Washington Clean Air Act (RCW 70.94)

“WA Ecology has requested that Northwest prepare an overview Consistency Analysis Document to summarize how the WEP would comply with enforceable policies within coastal zone counties. This document, in addition to the relevant regulatory documents for CZMA consistency demonstrating compliance with the laws listed above, would be used by Ecology to make a single CZMA determination for the WEP. If the WEP is authorized by FERC, Northwest would need to demonstrate that its project is consistent with the CZMA before FERC would allow any construction activities to begin.’

The proposed CHIA component of an EIS covering natural gas transport infrastructure in Massachusetts will assess the potential health impacts of that infrastructure and will inform decisionmaking 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
- environmental 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 Department's processes

1. As discussed under Section III.B.1, the Department has the requisite authority to undertake, and, in the context of implementing MEPA obligations, to direct the undertaking, of an assessment of the human health impacts of a natural gas transport infrastructure project.

The Department, as lead agency, can obtain any needed expertise to develop the requirements for a CHIA and to evaluate the adequacy and comprehensiveness of any resulting assessment. The Department of Health should be an important source of expertise.

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 Department needs to determine the area of the State whose information

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**“Page 1-20, SEPA:** Note that Ecology could also opt to complete a Supplemental DEIS should it find the current DEIS lacking in important areas.”

The letter may be found at: <http://columbiariverkeeper.org/wp-content/uploads/2015/10/2015.10.6-Washington-Dept-of-Ecology-Comments-on-DEIS.pdf>

Washington's "State Environmental Policy Act" closely parallels ECL Article 8 in impact analysis approach and in substantive effect: *cf.* Washington Department of Ecology's Online SEPA Handbook, found at <http://www.ecy.wa.gov/programs/sea/sepa/handbk/hbch03.html> and the Department's "SEQR Handbook," found at [http://www.dec.ny.gov/docs/permits\\_ej\\_operations\\_pdf/seqrhandbook.pdf](http://www.dec.ny.gov/docs/permits_ej_operations_pdf/seqrhandbook.pdf) ).

will be used to articulate that condition. For example, should the information be drawn from the State as a whole or only from the area through which the infrastructure is proposed to pass or from some other portion of the State (such as an area that does not have any pipeline infrastructure)? The Department should consult with the Department of Health in making this determination.

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

- Before the Department receives any application, it has the opportunity to develop the baseline condition on its own with assistance from other State agencies, such as the Department of Health, and to issue guidance that incorporates CHIA into the requirements for an acceptable environmental assessment of a project.
- Respecting applications pending before the Department as of the date of this White Paper that have not yet been declared “complete” for processing purposes, the Department should inform the applicant that an acceptable environmental assessment for the project would require a CHIA component fulfilling requirements that the Department provides the applicant, ideally incorporating recommendations contained in this White Paper.
- Respecting applications pending before the Department as of the date of this White Paper that have already been declared “complete” for processing purposes, the Department 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.

2. Putting aside the question of state agency authority and responsibility to ensure a proposed project’s thorough environmental review under MEPA, the Department, the Department of Health, and any other relevant state and local agencies have the opportunity to participate in the FERC scoping process intended to ensure the complete assessment of a project’s environmental impacts and in FERC’s process seeking public input on the adequacy of the environmental review contained in a project’s DEIS. The State agencies should avail themselves of both opportunities to emphasize to FERC the need to include a CHIA into FERC’s EIS process.

### ***Summary***

This White Paper summarized the basic function of the Comprehensive Health Impact Assessment (CHIA) and its role in the environmental review process for natural gas infrastructure projects. A subset of related health concerns were reviewed to demonstrate that need. The legal basis and manner of incorporating the CHIA into gas infrastructure project review was also discussed.

While not to be considered a binding plan for developing the CHIA process in the State, it does provide a framework for developing the CHIA process and calls for that process to start immediately, in order to better evaluate the human health risks associated with natural gas infrastructure projects.