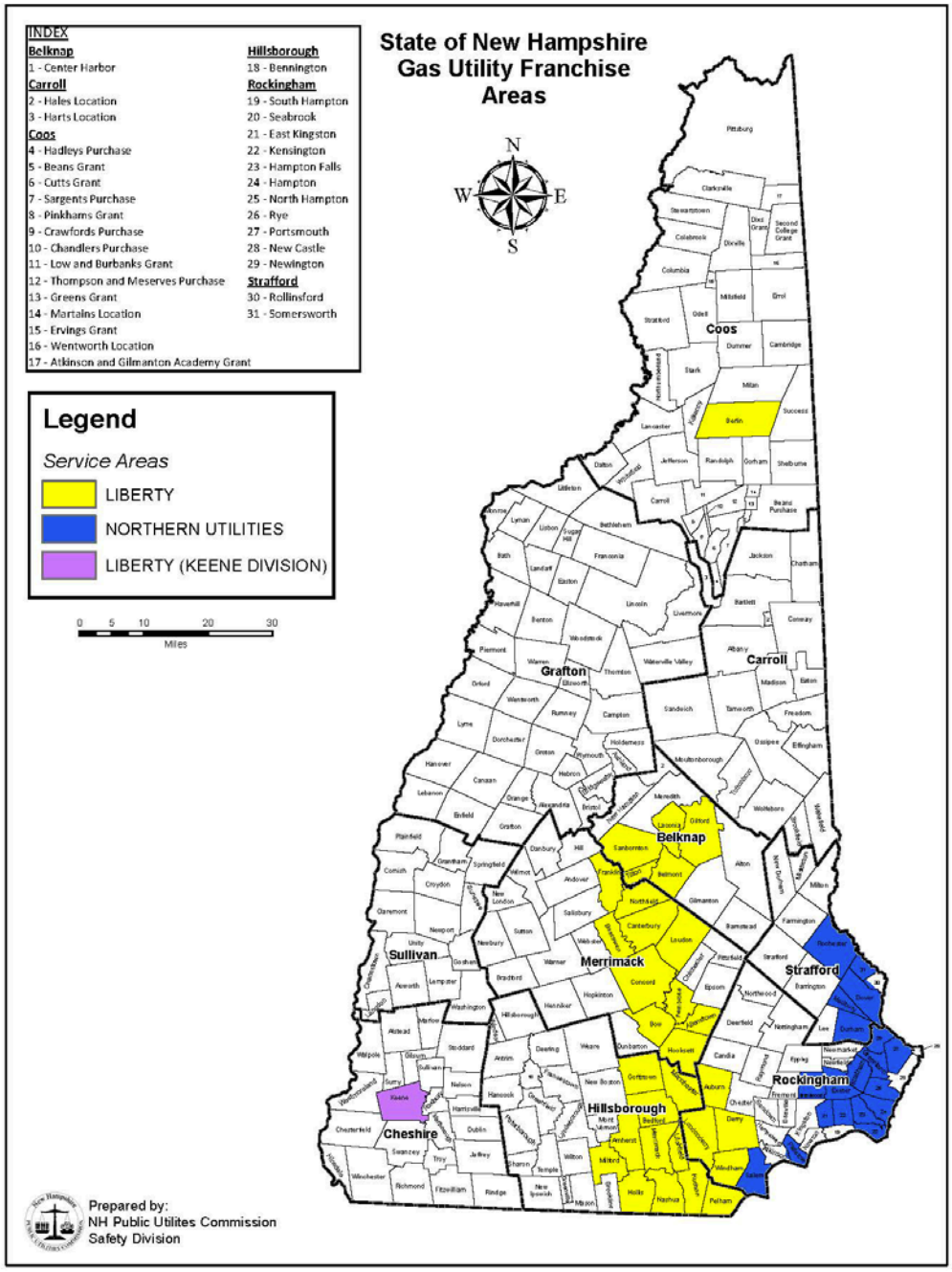
# EXHIBIT "A"




## Communities Served

| Liberty Utilities (Natural Gas) | | | Unitil/Northern Utilities (Natural Gas) | | | NH Gas Corp. (Propane) | Concord Steam Corp. (Steam) |
|---|---|---|---|---|---|---|---|
| Allenstown | Franklin | Merrimack | Atkinson | Hampton | Portsmouth | Keene | Concord |
| Amherst | Gilford | Milford | Dover | Hampton Beach | Rochester | | |
| Auburn | Goffstown | Nashua | Durham | Hampton Falls | Rollinsford | | |
| Bedford | Hollis | Northfield | East Kingston | Kensington | Salem | | |
| Belmont | Hooksett | Pelham | East Rochester | Madbury | Seabrook | | |
| Berlin | Hudson | Pembroke | Exeter | Newington | Somersworth | | |
| Boscawen | Laconia | Sanbornton | Gonic | North Hampton | Stratham | | |
| Bow | Litchfield | Tilton | Greenland | Plaistow | | | |
| Canterbury | Londonderry | Windham | | | | | |
| Concord | Loudon | | | | | | |
| Derry | Manchester | | | | | | |

# EXHIBIT "B"

NH Pipeline Health Study Group

July 1, 2016

**Via e-mail (governorhassan@nh.gov)**
The Honorable Governor Margaret Wood Hassan
Office of the Governor
State House
107 North Main Street
Concord, NH 03301

**Via e-mail (thomas.burack@des.nh.gov)**
Thomas Burack, Commissioner
Department of Environmental Services
29 Hazen Drive; P.O. Box 95
Concord, NH 03302-0095

**RE: Rules Governing the Control of Air Pollution (Env-A 100-4800) - PETITION**

Dear Governor Hassan and Commissioner Burack:

We write as a formal petition to Commissioner Burack, pursuant to R.S.A. 541-A:4 to amend and/or adopt rules under Env-A 1400, the Department of Environmental Services ("DES") Rules governing Regulated Toxic Air Pollutants ("RTAPs" or, singularly, "RTAP"), in certain respects identified below. We request that some of these changes be adopted as emergency rules, under 541-A:18, and otherwise pursuant to Governor Hassan's health, safety and other emergency powers. Pursuant to said powers, we also request that Governor Hassan order that the rulemaking process of R.S.A. 541-A:3 be commenced as soon as possible, in less than the five month period statutorily provided for the normal commencement of the same,[1] for public hearing(s) and comment, and final approval of the proposed and perhaps additional rule changes under Env-A 1400. Our requests are grounded in (1) the immediate need for rule changes to provide standards that will promote human health protection, *see* Env-A 1412.04 ; and (2) the "imminent peril to the public health or safety" and/or "substantial fiscal harm to the state or its citizens," *see* R.S.A. 541-A:18, I, presented by the normal timeframe for commencing the rulemaking process.

In essence, we are writing to request your help in expediting a remedial response to a grave concern.

While the Northeast Energy Direct ("NED") high- pressure natural gas pipeline project application has been withdrawn from the Federal Energy Regulatory Commission ("FERC"), this does not preclude NED V2.0, in some "other" configuration, at any time. Moreover, there are a number of other such pipeline projects in the works for the Northeast, *see* Northeast gas pipeline projects, one or more of which may result in more pipeline infrastructure in New Hampshire, by reconfiguration or extension of the project(s). Pending Public Utilities Commission ("PUC") Docket No. DE 16-241 could open the door to a rush of new pipeline projects by allowing the electric distribution companies ("ECDs") to become the customers pipeline project owners crave, and by further incentivizing such projects by passing their construction costs on to electric ratepayers—in fact, the PUC's decision could bring NED V2.0 virtually as soon as it is handed down, should the PUC force the applicant to re-open bidding.(NED was a bidder before). **Under the expedited FERC certification process, pipeline project approval often takes less than a year** … **But the rulemaking process ordinarily has up to five months just to get off the ground.** *See* Footnote 1, *supra*. In addition to the potential for new massive pipeline project infrastructure, projects such as the Pelham/Windham/Concord Lateral

[1] *See* R.S.A. 541-A:4, I (30 days allowed for acting upon the petition, plus 120 more days for commencing rulemaking by requesting a fiscal impact statement).

expansion/connection, the subject of pending PUC Docket No. DG 15-362, continue to incrementally increase gas pipeline infrastructure in our state. All of which raise health and related cost concerns for New Hampshire, the adequacy of protection afforded citizens under current state air quality requirements, and the need to adopt emergency rules and expedite the rulemaking process to provide the health protective rules we need as soon as possible.[2]

In this regard, the Env-A 1400 rules governing RTAPs are in need of immediate revision. For example, the exemptions under Env-A 1402.01 and Env-A 1402.02 should be immediately amended to confirm their inapplicability to emissions of RTAPs from natural gas derived, in whole or in part, from the hydraulic fracturing ("fracking") process, whether resulting from combustion, venting, leaking or otherwise. The fracking process results in contaminants, including toxic air pollutants, not contained in the natural gas used in New Hampshire at the time the rules were adopted. **Indeed, twenty-two (22) toxic air pollutants on the Table 1450-1 RTAP List, beginning at page 15 under Env-A 1450.01, are known to be associated with hydraulically fractured ("fracked") gas**, either as additives or produced by combustion of this gas, 15 being Toxicity Class I RTAPs, the most toxic. *See* discussion and cited studies and other materials below and RTAP List/Fracked Gas Comparison immediately following the signatories to this letter. Since it contains so many toxic components, including known carcinogens, fracked gas should not be exempted from New Hampshire's toxic air pollution regulations. *See id.; see also generally* "California's Fracking Fluids: the Chemical Recipe," by Tasha Stoiber, et. al. ( EWG; August 2015).

**For all of the above and reasons to follow, please act to protect the health of New Hampshire's citizens by adopting the following recommended amendments <u>in bold</u> to Env-A 1402.01 and Env-A 1402.02, on an emergency basis**:

> **<u>Env-A 1402.01</u>** Statutory Exemptions for Sources and Activities. As specified in RSA 125-I:3, III(a) and (b), the following shall be exempt from regulation under RSA 125-I and these rules:
>
> (a) Normal agricultural operations;
>
> (b) The application of pesticides regulated pursuant to RSA 430:28 through RSA 430:48;
>
> (c) Emissions of RTAPs resulting from mobile sources; and
>
> (d) Emissions of RTAPs resulting from the combustion of virgin petroleum products at stationary sources. **Virgin petroleum products shall not be considered to include natural gas derived, in whole or in part, from the hydraulic fracturing process, RTAP emissions resulting from which, by combustion, venting, leaking or any other form of release, shall be subject to regulation under RSA 125-I and these rules, with emissions of such natural gas from compressor stations subject to hourly baseline**

[2] While the DES should obviously disagree should one be raised, there may be an argument that the DES is bound by the existing (deficient) rules should emergency rules not be adopted and/or the rulemaking process not be completed prior to commencement of proceedings for approval of a new pipeline. *See In re Goldman*, 151 N.H. 770 (2005)(Court found application of a newly enacted statute to an already commenced proceeding to be precluded by state constitutional proscription against retrospective laws affecting established substantive rights).

**ambient air quality monitoring and data collection and analysis in accordance with best practices and the Precautionary Principle, at no less than four sites within at least a three-mile radius of the stationary source, with such sites to include the location of the stationary source and locations of all public schools within the designated radius, for a period of not less than one year before and after initial operation of the stationary source, and at least every three months thereafter, to ensure compliance with RSA 125-I and these rules and as a condition of the issuance of any permitting thereunder.**

REASONS SUPPORTING AMENDMENTS:

A. Neither R.S.A. 125-I nor the DES Rules governing Regulated Toxic Air Pollutants define "virgin petroleum products," leaving the term impermissibly open to the argument that it includes fracked gas, but likewise subject to rule amendment expressing precluding such interpretation;
B. Fracked gas emissions and leaks at compressor stations and otherwise cause established adverse health effects not prevented by current standards.[3] New Hampshire's air quality rules have long set the standard for health and safety, and we should maintain that standard and embrace not only best practices, but also the Precautionary Principle for monitoring fracked gas emissions at stationary sources, including compressor stations.[4] Determining baseline ambient air concentrations for pollutants of concern and requiring emissions testing under available statutory authority will provide reasonable assurances of health and environmental protection from these potential emission sources.
C. The Precautionary Principle is proactive, and the recent Saint-Gobain problems, in particular, underscore the wisdom of being proactive in health-related monitoring;

---

[3] *See, e.g.*, "Gas Compressors and Nose Bleeds: a New Study Connects Health Issues with Rural Gas Compressor Pollution," by Jessica Owen (Fall 2015)(concerning Minisink, New York study); "Potential Hazards of Air Pollutant Emissions from Unconventional Oil and Natural Gas Operations on the Respiratory Health of Children and Infants" by Ellen Webb, et. al. (2014; published in Reviews on Environmental Health, 2016); "Porter Ranch Gas Leak Triggers State of Emergency in California," January 7, 2016 CNN online news article; "Gas Patch Roulette: How Shale Gas Development Risks Public Health in Pennsylvania," by Nadia Steinzor, et. al. (October 2012); "Madison County, New York Department of Health Comments to the Federal Energy Regulatory Committee," prepared for Madison County Department of Health by Thimble Creek Research (September 30, 2014), pp. 14-28; ATSDR/CDC Health Consultation Report (Jan. 29, 2016), p. ii (asthmatics, elderly and others at risk from compressor stations); ATSDR/CDC Health Consultation Report (Apr. 22, 2016), pp. ii-iii (concerning short and long term adverse health effects of particulates); "Human Health Impacts Associated with Chemicals and Pathways of Exposure from the Development of Shale Gas Plays," by Wilma Subra Subra Company (January 9, 2012). Among her other qualifications and credentials, "Mrs. Subra holds degrees in Microbiology/Chemistry from the University of Southwestern Louisiana. She received the MacArthur Fellowship "Genius" Award from the MacArthur Foundation for helping ordinary citizens understand, cope with and combat environmental issues in their communities and was one of three finalists in the Environmental Category of the 2004 Volvo for Life Award." Click "Read More" under her biography.

[4] *See* this link for information concerning the Precautionary Principle.

D. Precautionary, proactive, or just plain reasonable: monitoring and related analysis should be conducted on an hourly basis:

> "Delfino et al (2002) posited that maxima of hourly data, not 24-hour averages, better captured the risks to asthmatic children, stating 'It is expected that biological responses may intensify with high peak excursions that overwhelm lung defense mechanisms.' Additionally, they suggest that '[o]ne-hour peaks may be more influenced by local point sources near the monitoring station that are not representative of regional exposures …".

*See* "Summary on Compressor Stations and Health Impacts," by Southwest Pennsylvania Environmental Health Project (Feb. 24, 2015), pp. 6-7;[5]

E. The proposed monitoring requirements are otherwise very reasonable. At least one-year before and after baseline ambient air quality monitoring around stationary sources generating fracked gas emissions, including compressor stations, is probably the bare minimum needed to accurately gauge the impacts of such emissions, as air quality changes throughout the year, and long-term analysis of pre-emission air quality is necessary to evaluate post-emission effects.[6] Given air and pollution gathering variables, data should be collected and analyzed at no less than four different monitoring sites, with prudence and caution dictating that one be located at every school in an impacted radius. A monitoring radius of at least three miles, but to be determined in accordance with best practices and Precautionary Principle approach, is the safest approach to establishing the radius given that adverse health impacts have already been clearly identified within a three-mile radius of compressor stations,[7] but may be proven to extend to greater distances with further data and greater knowledge in this area. Likewise, particularly given all of the potential adverse health consequences and the still emerging field of knowledge in the area, at least quarterly, rather than bi-annual or annual monitoring and data collection and analysis, would be in accordance with the Precautionary Principle and best practices;

F. The proposed monitoring and permitting requirements are in accordance with R.S.A. 125-I:5, V.

---

[5] To be clear: such monitoring and analysis would not require onsite personnel, as current monitoring technology allows for programmed data collection on hourly, daily, monthly, yearly and other bases.

[6] "[O]ver the course of a year emissions will vary, often greatly. As phases of construction and operation change so will emissions content and concentrations." "Summary on Compressor Stations and Health Impacts," by Southwest Pennsylvania Environmental Health Project (Feb. 24, 2015), p.1. *See also* "Madison County, New York Department of Health Comments to the Federal Energy Regulatory Committee," prepared for Madison County Department of Health by Thimble Creek Research (September 30, 2014), p. 10 (showing variations in ambient air measurements of five VOCs near a compressor station over just a three day period).

[7] *See* "Southwest Pennsylvania Environmental Health Project". *See also* "Human Health Impacts Associated with Chemicals and Pathways of Exposure from the Development of Shale Gas Plays," by Wilma Subra Subra Company (January 9, 2012) (identifying numerous health issues within two miles of compressor stations).

---

**Env-A 1402.02** Additional Exemptions for Sources and Activities. Pursuant to RSA 125-I:3, III(c), the owner or operator of a device or process that meets the criteria of Env-A 1401.02 also shall be exempt from the requirements of this chapter for a particular RTAP if the emissions of such pollutant are from, or result from, any of the following sources or activities:

(a) The combustion of one or more of the following fuels:

(1) Coal;

(2) Natural gas, **but not such gas derived, in whole or in part, from the hydraulic fracturing process, RTAP emissions resulting from which, by combustion, venting, leaking or otherwise, shall be subject to the requirements of this chapter …**

REASONS SUPPORTING AMENDMENTS:

A. The fracking process results in contaminants, including specific regulated toxic air pollutants, not contained in the natural gas used in New Hampshire at the time the rules were adopted;
B. Fracked gas emissions and leaks at compressor stations and otherwise cause established adverse health impacts not prevented by current standards.[8]

---

**Additionally, the following toxic air pollutants should be immediately added, or at least reconsidered for addition to, the RTAP List under Table 1450-1, beginning at page 15 under Env-A 1450.01, for the reasons stated**:

1. Radon. Although not on the RTAP List, radon is otherwise the subject of health protective legislation in New Hampshire. *See*, *e.g.*, R.S.A. 125:9, X; R.S.A. 310-A:189-a and R.S.A. 477:4-a. It carries with it radioactive and otherwise toxic ingredients:
   "The gas which flows through the pipeline likely carries gaseous radon with it, and as radon decays within the pipeline, the solid daughter elements, polonium and lead, accumulate along the interior of the pipes. There is a concern that the gas transiting, and being compressed and regulated, will have radioactivity levels which will put at risk not only the workers at these stations and along the pipeline, but potentially also to the residents. Radon, a gas, has a short half-life (3.8 days) but its progeny are lead and polonium, and these are toxic and have relatively long half-lives of 22.6 years and 138 days respectively. There is no data that we can turn to in order to assess the risk of radioactive exposures in our community."[9]

[8] *See* sources cited in Footnote 3, *supra*.

[9] From "Summary on Compressor Stations and Health Impacts," by Southwest Pennsylvania Environmental Health Project (Feb. 24, 2015), p.6 (footnotes omitted).

*See also* "Radon in Natural Gas from Marcellus Shale," by Marvin Resnikoff, Ph.D. (Jan. 10, 2012), p. 13 ("The potential environmental and public health impact of radon in natural gas from the Marcellus Shale formation is enormous."). While there may not be data to assess such risks, the Precautionary Principle weighs in favor of adding radon to the RTAP List. Again, we have seen the effects of not adhering to this principle with the Saint-Gobain issues we are facing today: it is better to prevent in the first place than attempt to retrofit safeguards and mitigate after the fact.[10] As it is not currently on the RATP List, it should be added immediately, accordingly.

2. The following Volatile Organic Compounds ("VOCs") found in fracked (shale) gas should also be reconsidered for inclusion and/or toxicity revision as RTAPs, given the magnitude of potential emissions from these sources and the associated adverse health impacts discussed in "Gas Patch Roulette: How Shale Gas Development Risks Public Health in Pennsylvania," by Nadia Steinzor, et. al. (October 2012):[11]

**Table 7. VOCs in ambient air, sorted by highest percent detection; concentrations are in micrograms per cubic meter, µg/m³** (n = total number of canister samples that were analyzed for a particular chemical; NA = VOC not included in the analysis)

| Volatile Organic Compound (VOC) | n | Number of samples detecting VOC | Percent of n detecting VOC | Min. | Max. | Mean* | Chemical reporting limits for the three labs used | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Columbia | Con-Test | Pace** |
| 2-Butanone | 17 | 16 | 94 | 0.95 | 2.9 | 1.52 | 0.85 - 1.3 | NA | NA |
| Acetone | 17 | 15 | 88 | 8.0 | 19 | 11.85 | 6.5 - 10 | NA | NA |
| Chloromethane | 34 | 27 | 79 | 1.0 | 1.66 | 1.21 | 0.59 - 0.90 | 0.1 | 1.39 1.53 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 34 | 26 | 76 | 0.54 | 0.73 | 0.64 | 0.22 - 0.34 | 0.38 | 5.13 - 5.67 |
| Carbon tetrachloride | 34 | 26 | 76 | 0.46 | 0.76 | 0.62 | 0.091 - | 0.31 | 4.21 - 4.65 |
| Trichlorofluoromethane | 34 | 26 | 76 | 0.6 | 1.8 | 1.48 | 0.81 -1.2 | 0.28 | 3.32 - 3.66 |
| Toluene | 34 | 22 | 65 | 0.68 | 7.9 | 1.83 | 0.53 – 0.82 | 0.19 | 2.52 - 2.79 |
| Dichlorodifluoromethane | 17 | 9 | 53 | 1.9 | 2.8 | 2.41 | NA | 0.25 | 3.32 - 3.66 |
| n-Hexane | 8 | 3 | 38 | 3.03 | 7.04 | 5.23 | NA | NA | 2.37 - 2.61 |
| Benzene | 34 | 11 | 32 | 0.31 | 1.5 | 0.85 | 0.46 - 0.67 | 0.16 | 2.14 - 2.36 |
| Methylene Chloride | 34 | 10 | 29 | 1.9 | 32.62 | 7.93 | 0.49 – 0.76 | 1.7 | 2.33 - 2.57 |
| Total Hydrocarbons (gas) *** | 8 | 2 | 25 | 49.8 | 146 | 97.9 | NA | NA | 46.9 - 52.2 |
| Tetrachloroethylene | 34 | 8 | 24 | 0.12 | 10.85 | 1.68 | 0.10 – 0.16 | 0.34 | 4.54 - 5.02 |
| 1,2,4-Trimethylbenzene | 17 | 4 | 24 | 0.38 | 0.61 | 0.48 | NA | 0.25 | 3.30 - 3.64 |
| Ethylbenzene | 34 | 6 | 18 | 0.27 | 1.5 | 0.54 | 1.4 – 1.9 | 0.22 | 2.91 - 3.21 |
| Trichloroethylene | 34 | 6 | 18 | 0.17 | 5.37 | 2.71 | 0.08 - 0.12 | 0.27 | 3.60 - 3.98 |
| Xylene (m&p) | 34 | 5 | 15 | 0.92 | 5.2 | 1.98 | 2.5 – 3.8 | 0.43 | 2.82 - 3.12 |
| Xylene (o) | 34 | 5 | 15 | 0.39 | 1.9 | 0.76 | 1.2 – 1.9 | 0.22 | 2.91 - 3.21 |
| 1,2-Dichloroethane | 34 | 1 | 3 | 0.64 | 0.64 | 0.64 | 0.59 - 0.90 | 0.2 | 2.71 - 2.99 |

* Mean of samples detecting chemical.[21]

** Pace reporting limits were in ppbv. We converted to µg/m³.[22]

*** Total hydrocarbons reported as parts per billion volume (ppbv).

[10] *See generally*, and specifically page 3 Table 1, at "Potential Hazards of Air Pollutant Emissions from Unconventional Oil and Natural Gas Operations on the Respiratory Health of Children and Infants" by Ellen Webb, et. al. (2014; published in Reviews on Environmental Health, 2016) .

[11] *See generally*, and particularly p. 21 (containing Table 7).

It appears from our comparison of the above Table 7 with the RTAP List, that the following from the above should be added to the RTAP List: 2-Butanone, Chloromethane, Trichlorofluoromethane, Dichlorodifluoromethane, Total Hydrocarbons (gas), Tetrachloroethylene, Ethylbenzene, 1, 2-Dichloroethane, and possibly Xylene (m&p).[12] However, it would be best if a professional from the Department of Environmental Services checked to confirm. To be noted: as shown in the RTAP List/Fracked Gas Comparison to follow, the Table 7 chemicals on the RTAP List are all Toxicity Class I or Toxicity Class II RTAPs, further suggesting that the VOCs identified on Table 7 but not on the current RTAP List should be added to the latter.

3. Particulate matter. Particulate matter, especially PM2.5, and particularly in conjunction with VOCs, present other health risks compelling their inclusion on the RTAP List. From "Madison County, New York Department of Health Comments to the Federal Energy Regulatory Committee," prepared for Madison County Department of Health by Thimble Creek Research (September 30, 2014), pp. 19-20:

"In addition to the VOC exposure presented above, PM2.5 also poses a significant health concern and interacts with the airborne VOCs increasing their impact. In fact, at a compressor station PM2.5 may pose the greatest threat to the health of nearby residents …

The size of particles determines the depth of inhalation into the lung; the smaller the particles are, the more readily they reach the deep lung. Particulate matter (PM10, PM2.5 and ultrafine PM), in conjunction with other emissions, are at the core of concern over potential effects of [fracked gas development sites]. High particulate concentrations are of grave concern because they absorb airborne chemicals in their midst. The more water soluble the chemical, the more likely it is to be absorbed onto a particle. Larger sized particles are trapped in the nose and moist upper respiratory tract thereby blocking or minimizing their absorption into the blood stream. The smaller PM2.5 however, is more readily brought into the deep lung with airborne chemicals and from there into the blood stream. As the particulates reach the deep lung alveoli the chemicals on their surface are released at higher concentrations than they would in the absence of particles. The combination of particles and chemicals serves, in effect, to increase in the dose of the chemical. The consequences are much greater than additivity would indicate; and the physiological response is intensified. Once in the body, the actions between particles and chemicals are synergistic, enhancing or altering the effects of chemicals in sometimes known and often unknown ways.

Reported clinical actions resulting from PM2.5 inhalation affect both the respiratory and cardiovascular systems. Inhalation of PM2.5 can cause decreased lung function, aggravate asthma symptoms, cause nonfatal heart attacks and high blood pressure. Research reviewing health effects from highway traffic, which, like [unconventional natural gas development], has especially high particulates, concludes, "[s]hort-term exposure to fine particulate pollution exacerbates existing pulmonary and cardiovascular disease and long-term repeated exposures increases the risk of cardiovascular disease and death." PM2.5, it has been suggested, "appears to be a risk factor for cardiovascular disease via mechanisms that likely include pulmonary and systemic inflammation, accelerated atherosclerosis and

[12] As noted on the RTAP List/Fracked Gas Comparison following the signatories to this letter, Xylene (m) and Xylene (p) isomers are listed separately on the RTAP List, as RTAP CAS No. 108 – 38 – 3, Toxicity Class I, and RTAP CAS No. 106 – 42 – 3, Toxicity Class I, respectively, but it is not clear to the undersigned if Xylene (m&p) is a distinct chemical which should be added to the RTAP List based on its identification as a VOC in Table 7.

altered cardiac autonomic function. Uptake of particles or particle constituents in the blood can affect the autonomic control of the heart and circulatory system.

Ultrafine particles (<0.1) get less attention in the literature than PM2.5 but is found to have high toxic potency. These particles readily deposit in the airways and centriacinar region of the lung. Research suggests increases in ultrafine particles pose additional risk to asthmatic patients …

There is an abundance of research on the health effects of short term PM2.5 exposure … health effects can occur within 6 hours of elevated PM2.5 exposures, the strongest effects occurring between 3 and 6 hours. Such an acute effect of PM2.5 may contribute to acute increase in the risk of cardiac disease, or trigger the onset of acute cardiac events, such as arrhythmia and sudden cardiac death …

In addition to short term exposures and associated effects, there is evidence of health impacts from long-term exposures. An [health impact assessment] reviewing data from a number of European cities found that nearly 17,000 premature deaths from all causes, including cardiopulmonary deaths and lung-cancer deaths, could be prevented annually if long-term exposure to PM2.5 levels were reduced …"

From the EPA website (emphasis added):

"'Particulate matter,' also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.

The size of particles is directly linked to their potential for causing health problems. EPA is concerned about particles that are 10 micrometers in diameter or smaller because those are the particles that generally pass through the throat and nose and enter the lungs. **Once inhaled, these particles can affect the heart and lungs and cause serious health effects**. EPA groups particle pollution into two categories:

- 'Inhalable coarse particles,' such as those found near roadways and dusty industries, are larger than 2.5 micrometers and smaller than 10 micrometers in diameter.
- 'Fine particles,' such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller …"

From ATSDR/CDC Health Consultation Report (Jan. 29, 2016), p. ii:

"Particulate Matter (PM2.5) - The World Health Organization notes that when annual mean concentrations are in the range of 11-15 µg/m3, health effects can be expected (WHO 2006 …"

*See also* "PA expands particulate monitoring as federal study finds high level in one location," May 5, 2016 online article; and ATSDR/CDC Health Consultation Report (Apr. 22, 2016), pp. ii-iii (short term exposures "to maximum levels of PM2.5 may be harmful to unusually sensitive populations, such as those with respiratory or heart disease" and chronic exposures in "concentration of 15 to 16 µg/m3 may be harmful to the general population and sensitive subpopulations, including the elderly, children, and those with respiratory or heart disease.").

---

In addition to final amendment of the above rules and RTAP List inclusions, the rulemaking process for Env-A 1400 should be commenced as soon as possible to ascertain, through public hearing(s) and comments, such other amendments, including RTAP List additions, as should be made to ensure their applicability to any high-pressure gas pipeline projects and infrastructure. We would greatly appreciate your assistance in this regard.

In further support of this petition and the requests made herein, we also submit the analysis of Dr. Curtis L Nordgaard, *Potential emissions from a New Ipswich compressor station, and some associated health effects,* concerning the New Ipswich, New Hampshire compressor station proposed under the NED project, which follows the RTAP List/Fracked Gas Comparison at the end of this letter. In addition to other relevant information provided in this analysis, Dr. Nordgaard estimates that just that compressor station would have caused over two million ($2,000,000.00) dollars in annual health care costs. Such costs plainly constitute "substantial fiscal harm to the state or its citizens" alone justifying emergency adoption under R.S.A. 541-A:18, I.

We look forward to your response at your earliest convenience. Please direct the same, or any questions, concerns or other communications, to our Chairperson and contact point person, Beverly Edwards, at nadesha@msn.com.

Thank you for your time and courtesy in this matter.

Sincerely,

//s// Richard Husband
Duly Authorized, on behalf of:

NH Pipeline Health Study Group:

By its Board/Members:

//s// Beverly Edwards
Chairperson

//s// Liz Fletcher
Board Member

//s//Douglas Whitbeck
Board Member

//s//Gwen Whitbeck
Board Member

//s//Sue Durling
Board Member

//s//Julia Steed Mawson
Board Member

//s//Marilyn Learner
Board Member

//s//Richard Husband
Board Member

## RTAP LIST/FRACKED GAS COMPARISON

22 toxic air pollutants on RTAP List (beginning at page 15) are associated with fracked gas, either as additives or produced by combustion of this gas (VOCs).

15 of these are Toxicity Class I (most toxic); 6 are Toxicity Class II, 1 is Toxicity Class III.

### 10 RTAPs - 5 Toxicity Class I, 4 Toxicity Class II , 1 Toxicity Class III - are on EPA list of frequent additives to fracked gas

Sources: RTAP List (beginning at page 15) and Table 9, at p. 36, of "Analysis of Hydraulic Fracturing Fluid Data from the FracFocus Chemical Disclosure Registry 1.0," by the EPA (March 2015); *see also* EPA website

Methanol: RTAP CAS No. 67 – 56 – 1, Toxicity Class II

Ethanol: RTAP CAS No. 64 – 17 – 5, Toxicity Class II

Propargyl alcohol : RTAP CAS No. 107 – 19 – 7, Toxicity Class I

Glutaraldehyde: RTAP CAS No. 111 – 30 – 8, Toxicity Class I

Ethylene glycol (aerosol): RTAP CAS No. 107 – 21 – 1, Toxicity Class II

2-Butoxyethanol: RTAP CAS No. 111 – 76 – 2, Toxicity Class I

Napthalene: RTAP CAS No. 91 – 20 – 3, Toxicity Class I

1,2,4-Trimethylbenzene: RTAP CAS No. 95 – 63 – 6, Toxicity Class II

Dimethylformamide: RTAP CAS No. 68 – 12 – 2, Toxicity Class I

Polyethylene glycol: RTAP CAS No. 25322 – 68 – 3, Toxicity Class III

### 11 more RTAPs - 9 Toxicity Class I, 2 Toxity Class II – are identified Table 7 VOCs from fracked gas

Sources: RTAP List (beginning at page 15) and Table 7, at p. 21, of "Gas Patch Roulette: How Shale Gas Development Risks Public Health in Pennsylvania," by Nadia Steinzor, et. al. (October 2012)

Acetone: RTAP CAS No. 67 – 64 – 1, Toxicity Class I

1,1,2-Trichloro-1,2,2-Ttrifluoroethane: RTAP CAS No. 76–13–1 , Toxicity Class II

Carbon tetrachloride: RTAP CAS No. 56 – 23 – 5, Toxicity Class I

Toluene: RTAP CAS No. 108 – 88 – 3, Toxicity Class I

n-Hexane: RTAP CAS No. 110 – 54 – 3, Toxicity Class II

Benzene: RTAP CAS 71 – 43 – 2, Toxicity I

Methylene chloride (dichloromethane): RTAP CAS No. 75 – 09 – 2, Toxicity Class I

Trichloroethylene: RTAP CAS No. 79 – 01 – 6, Toxicity Class I

Xylene m-isomers: RTAP CAS No. 108 – 38 – 3, Toxicity Class I

Xylene p-isomers: RTAP CAS No. 106 – 42 – 3, Toxicity Class I

Xylene o-isomers: RTAP CAS No. 95 – 47 – 6, Toxicity Class I

**A 22nd RTAP, the VOC Formaldehyde - Toxicity Class I – is also found in fracked gas**

Sources: pp. 18-19 at "Madison County, New York Department of Health Comments to the Federal Energy Regulatory Committee," prepared for Madison County Department of Health by Thimble Creek Research (September 30, 2014); pp. 26-27 and Appendix B, pp. 2-6 and Table 12 at p. 10, of ATSDR/CDC Health Consultation Report (Jan. 29, 2016)(asthmatics, elderly and others at risk from compressor stations); p. 5 and Appendix 1 at p. 19 of "California's Fracking Fluids: the Chemical Recipe," by Tasha Stoiber, et. al. ( EWG; August 2015)

NOTE: Formaldehyde does not appear in the Table 7 VOC list because sampling for that study was done with Summa canisters. Badges are generally used for formaldehyde monitoring. Formaldehyde is a carcinogen. Union Leader, December 18, 2015 online article by Meghan Pierce

Compiled by Liz Fletcher for NH Pipeline Health Study Group, May 2016

*Potential emissions from a New Ipswich compressor station, and some associated health effects*

Prepared by Curtis L Nordgaard, MD MSc

Pediatrician at DotHouse Health, Boston MA

**For those air pollutants classified as toxic, what releases do Kinder Morgan predict for the New Ipswich compressor station [1]?**

Per year:

| | |
|---|---|
| Nitrogen dioxide: | 50 tons |
| Carbon monoxide: | 40 tons |
| Sulfur dioxide: | 5 tons |
| Particulate matter: | 9 tons |
| Volatile organic compounds: | 8.5 tons |
| Formaldehyde: | 1.3 tons |

**What health outcomes have been associated with the pollutants that would be released by the New Ipswich compressor station?**

A limited review of public health studies shows:

Nitrogen dioxide: Increased respiratory hospitalizations (2%) [2], heart failure (1.7%) [3]

Carbon monoxide: Increased premature birth rates (4%) [4], low birth weight (7%) [4]

Sulfur dioxide: Increased low birth weight (3%) [4], heart failure (2.4%) [3]

Particulate matter: Increased fatality from heart and lung disease (5.3%) [5], new childhood asthma diagnoses (10-12%) [6]

**What are some actually measured levels of toxic or cancer-causing pollutants near compressor stations?**

Formaldehyde: Levels can exceed acute toxicity thresholds by 25% and cancer risk thresholds by more than 700-fold, up to 800 meters from compressor stations [7]

Particulate matter: Levels of particulate matter near compressor stations may be more than double what is measured at regional monitoring stations [8, 9]

**How might pollution concentrations change near a compressor station in New Ipswich, according to Kinder Morgan [1] ?**

Nitrogen dioxide levels would increase by up to 13.4 micrograms per cubic meter for distances up to 10.3 km from the proposed compressor station.

**What's near the proposed compressor station site?**

Temple Elementary School is very close, only about 800 meters from the proposed site.

Five towns are within the 10 km area of concern mentioned above.

**Based on published health studies, what effects should we expect for children at Temple Elementary School and surrounding towns?**

Formaldehyde: Levels could exceed acute toxicity and cancer-causing thresholds for children at the school based on published observations [7].

Nitrogen dioxide: If concentrations increase as predicted (13.4mcg/$m^3$), public health studies suggest we should expect at least a 7% increase in new childhood asthma diagnoses [6] and a 2% increase in hospitalizations for asthma attacks [10] in a 10 km radius. People with chronic obstructive pulmonary disease, stroke, and heart disease would also be affected, as well as increased overall fatalities from these conditions [10].

**What are the potential health care costs associated with the proposed emissions, based upon scientific estimates [11] ?**

Nitrogen dioxide: $16,000 per ton x 50 tons = $800,000 per year

Sulfur dioxide: $28,000 per ton x 5 tons = $140,000 per year

Particulate matter: $130,000 per ton x 9 = $1,170,000 per year

Estimate of total health care costs: $2.11 million per year, for three pollutants only

References cited:

1. Tennessee Gas Pipeline Company, L.L.C. Northeast Energy Direct Project Environmental Report, Resource Report 9 (Air and Noise Quality). Downloaded 11/23/15.

2. Huang G, et al. An integrated Bayesian model for estimating the long-term health effects of air pollution by fusing modelled and measured pollution data: A case study of nitrogen dioxide concentrations in Scotland. Spat Spatiotemporal Epidemiol. 2015 Jul-Oct;14-15:63-74.

3. Shah AS, et al. Global association of air pollution and heart failure: a systematic review and meta-analysis. Lancet. 2013 Sep 21;382(9897):1039-48.

4. Stieb DM, et al. Ambient air pollution, birth weight and preterm birth: a systematic review and meta-analysis. Environ Res. 2012 Aug;117:100-11.

5. Samoli E, et al.Which specific causes of death are associated with short term exposure to fine and coarse particles in Southern Europe? Results from the MED-PARTICLES project. Environ Int. 2014 Jun;67:54-61.

6. Wendt JK, et al. Association of short-term increases in ambient air pollution and timing of initial asthma diagnosis among Medicaid-enrolled children in a metropolitan area. Environ Res. 2014 May;131:50-8.

7. Macey GP, et al. Air concentrations of volatile compounds near oil and gas production: a community-based exploratory study. Environ Health. 2014 Oct 30;13:82.

8. Nordgaard, CL. Unpublished data, Oct 2015.

9. Southwest Pennsylvania Environmental Health Project, "Summary of Minisink Monitoring Results".

10. To T et al. Health risk of air pollution on people living with major chronic diseases: a Canadian population-based study. BMJ Open. 2015 Sep 2;5(9):e009075.

11. Buonocore JJ, et al. Using the Community Multiscale Air Quality (CMAQ) model to estimate public health impacts of PM2.5 from individual power plants. Environ Int. 2014 Jul;68:200-8.

# EXHIBIT "C"

The State of New Hampshire
# DEPARTMENT OF ENVIRONMENTAL SERVICES

**Thomas S. Burack, Commissioner**

August 4, 2016

Richard M. Husband, Esquire
NH Pipeline Health Study Group
10 Mallard Court
Litchfield, NH 03052

**Re: Petition for Rulemaking**

Dear Mr. Husband:

As we have acknowledged by telephone, the New Hampshire Department of Environmental Services (NHDES) has received your Petition for Rulemaking (Petition) dated July 1, 2016. The Petition requests NHDES to adopt emergency rules to amend Env-A 1400, Regulated Toxic Air Pollutants (RTAPS), to address emissions of natural gas derived in whole or in part from a hydraulic fracturing ("fracking") process, whether such emissions result from combustion, venting, leaking, or otherwise. The Petition asserts that the fracking process results in gas that contains many of the RTAPs listed in Env-A 1450.01, some of which are Toxicity Class I, that are not found in natural gas that is not derived from fracking.

At this time, I deny the petition as to the immediate adoption of emergency rules. This denial is based upon the finding that the request does not satisfy the criteria in RSA 541-A:18, I, to justify the extraordinary action of adopting a rule on an emergency basis. Notwithstanding the denial of the request to adopt an emergency rule, NHDES is undertaking a thorough review of the information presented in the Petition to determine whether revisions to Env-A 1400 are appropriate and, if so, what the most appropriate time frame for those revisions would be. We anticipate that we will need at least 30-60 days to fully evaluate the science underlying the Petition, and additional time to determine the most appropriate course of action.

We appreciate your patience as we work through this process.

Sincerely,

Thomas S. Burack
Commissioner

cc: The Honorable Governor Margaret Wood Hassan
Craig Wright, NHDES Air Resources Director

The State of New Hampshire
**DEPARTMENT OF ENVIRONMENTAL SERVICES**

**Thomas S. Burack, Commissioner**

August 12, 2016

Mr. Richard Husband
NH Pipeline Health Study Group
10 Mallard Court
Litchfield, NH 03052

**Re: Petition for Rulemaking**

Dear Mr. Husband:

This letter responds to your August 5 email follow-up inquiry to our response to your petition to adopt emergency rules to amend Env-A 1400, Regulated Toxic Air Pollutants (RTAPS). Specifically, you inquired whether "the rulemaking process has been initiated under R.S.A. 541-A:4(I) as of July 1, 2016, correct?"

RSA 541-A:4, I, provides as follows:

> I. Any interested person may petition an agency to adopt, amend, or repeal a rule. Within 30 days of receiving the petition, the agency shall determine whether to grant or deny the petition and notify the petitioner. If the agency decides to deny the petition, the agency shall notify the petitioner of its decision in writing and shall state its reasons for denial. If the agency grants the petition, it shall notify the petitioner and commence the rulemaking proceeding by requesting a fiscal impact statement pursuant to RSA 541-A:5 within 120 days of receipt of the petition and continuing the proceeding as specified in RSA 541-A:3.

Because we denied the petition as to emergency rules by our letter dated August 4, 2016, no rulemaking process has been initiated. We also stated that we continue to review the information you provided to determine what revisions, if any, to Env-A 1400 are appropriate. We have an obligation to all stakeholders to propose adoption of new or revised rules such as you have submitted only after thoroughly considering the science behind the proposed rules. Moreover, any changes proposed would also need to be evaluated in light of the specific statutory authority for rulemaking that would provide the legal basis for such proposals. We believe the issues identified in your petition are sufficiently complex that additional time is needed to evaluate them. As we indicated in our August 4 letter, we will need at least 30-60 days to fully evaluate the science underlying the petition and additional time to determine the most appropriate course of action.

If you have further questions regarding the rulemaking process, please contact Pete Demas, Legal Coordinator, at 271-2464 or by email at Peter.Demas@des.nh.gov.

Sincerely,

Thomas S. Burack
Commissioner

cc: The Honorable Margaret Wood Hassan
Craig Wright,Director, Air Resources Division, NHDES
Peter Demas, Legal Coordinator, NHDES

# EXHIBIT "D"

NH Pipeline Health Study Group

October 28, 2016

**Via e-mail (craig.wright@des.nh.gov)**
Craig Wright, Director Air Resources Division
Department of Environmental Services
29 Hazen Drive; P.O. Box 95
Concord, NH 03302-0095

**RE: Request for Hearing and Extension of Public Comment Period, and Public Comment**
**Tennessee Gas Pipeline Company, LLC Application for Renewal Permit**
**Concord Expansion Compressor Station #270B1 on Mammoth Road, Pelham, NH**
**Application No. 15-0300**

Dear Director Wright:

As this matter ties in with the Concord Steam conversion project and concerns matters of great public interest, the Concord Steam Legislative Task Force, Governor Hassan, involved government agency personnel, various concerned citizens, and the media, are being copied on this letter.

Please reference the notice attached as Exhibit "A," concerning a renewal application permit for the 30,000 horse power stand-by compressor station in Pelham, New Hampshire, and consider this letter:

(1) a request for a public hearing on the matter pursuant to Env-A 621.06;
(2) a request for an extension of the comment period to a reasonable time subsequent to the hearing to allow citizens to submit public comments utilizing information obtained at the hearing, and also a submitted public comment relative to this matter; and
(3) a submitted public comment relative to the matter

Our request for a public hearing is made on the following bases and relevant facts, which raise material issues with respect to the subject application.

As you know, we are a group of New Hampshire residents who are deeply concerned about the well-documented adverse health effects of fracked gas. For most of us, the concern arose when our communities were chosen for the path of the Northeast Energy Direct ("NED") high-pressure gas pipeline project and its related infrastructure, including a planned 41,000 horse power compressor station in New Ipswich, New Hampshire, less than a ½ mile from the Temple Elementary School and bordering residential neighborhoods in towns where several members of our group live. Member Julia Steed Mawson is a Pelham resident.

In the course of educating ourselves about NED and all of its implications, we quickly learned that today's "natural" gas, derived through the hydraulic fracturing process—"fracked" gas as it commonly called—is not clean or healthy, as touted., but contains a cocktail of known carcinogens, identified regulated toxic air pollutants ("RTAPs") under Env-A 1450.01, and other health-impairing contaminants, the releases and emissions of which have been shown by studies

throughout the country to cause respiratory and other health problems, especially around compressor stations. *See, e.g.*, "California's Fracking Fluids: the Chemical Recipe," by Tasha Stoiber, et. al. ( EWG; August 2015); "Gas Compressors and Nose Bleeds: a New Study Connects Health Issues with Rural Gas Compressor Pollution," by Jessica Owen (Fall 2015)(concerning Minisink, New York study); "Potential Hazards of Air Pollutant Emissions from Unconventional Oil and Natural Gas Operations on the Respiratory Health of Children and Infants" by Ellen Webb, et. al. (2014; published in Reviews on Environmental Health, 2016); "Porter Ranch Gas Leak Triggers State of Emergency in California," January 7, 2016 CNN online news article; "Gas Patch Roulette: How Shale Gas Development Risks Public Health in Pennsylvania," by Nadia Steinzor, et. al. (October 2012); "Madison County, New York Department of Health Comments to the Federal Energy Regulatory Committee," prepared for Madison County Department of Health by Thimble Creek Research (September 30, 2014), pp. 14-28; ATSDR/CDC Health Consultation Report (Jan. 29, 2016), p. ii (asthmatics, elderly and others at risk from compressor stations); ATSDR/CDC Health Consultation Report (Apr. 22, 2016), pp. ii-iii (concerning short and long term adverse health effects of particulates); "Human Health Impacts Associated with Chemicals and Pathways of Exposure from the Development of Shale Gas Plays," by Wilma Subra Subra Company (January 9, 2012).

Indeed, concerned citizens were advised by Dr. Curtis L. Nordgaard, a preeminent Massachusetts pediatrician likewise concerned with the adverse health effects of fracked gas, that remedial health care costs associated with the emissions from the New Ipswich compressor station proposed for NED—only 11,000 horse power larger than the Pelham station—would likely be in the $2 million per year range. *See Potential emissions from a New Ipswich compressor station, and some associated health effects*, pp. 13-15 of the attached Exhibit "B" (identified in paragraph below).

Because of the health concerns relating to fracked gas emissions, we petitioned Commissioner Burack and the Department of Environmental Services ("DES") on July 1, 2016 to immediately amend the Env-A 1400 rules to address deficiencies in the regulation of these emissions. A copy of this petition, which flags **22 identified RTAPs** in fracked gas, is attached hereto as Exhibit "B" and incorporated in full herein by reference in further support of this letter, along with a copy of September 4, 2016 correspondence from Dr. Nordgaard identifying **several more likely RTAPs** in New Hampshire fracked gas,[1] which is attached as Exhibit "C." Although our July 1, 2016 petition was denied, the DES is assessing the propriety of our petition requests on its own. Currently, the DES is attempting to obtain a sample of the fracked gas sold by the applicant to Liberty Utilities for use in New Hampshire, for complete analysis, identification of all of its components, and a determination of how best to address fracked gas and its components under Env-A 1400. The applicant and/or Liberty Utilities, as good corporate citizens, should be more than willing to comply with such a request, particularly as we have amply demonstrated health concerns supporting the Env-A 1400 review and amendments requests, such that the burden is on the applicant (and Liberty Utilities) to prove that our concerns and requests are nonetheless misguided. Such "proof," of course, requires identification of all of the contents of the fracked gas used in New Hampshire, to distinguish it from the gas and contents discussed in all of the aforementioned fracked gas studies and otherwise establish that its emissions are harmless. The scales must always come down on the side of protecting health.

[1] These RTAPs are cadmium, (radioactive) lead, barium, PCBs (polychlorinated biphenyls) and maybe mercury (depending upon whether it was filtered from the subject gas by mercury guard beds).

**In light of the health concerns associated with fracked gas emissions, the current unknown status of the components of the fracked gas used in New Hampshire, and the DES' ongoing consideration of this issue and the propriety of amending Env-A 1400 to more appropriately address fracked gas, we urge the DES to not consider this application until these matters have been addressed first. We need to establish the true health risks that we are dealing with, foremost, and before anything else: citizens should not be used as guinea pigs.**

**Moreover, after addressing the matters discussed in the preceding paragraph, if the DES is still inclined to go forward with the subject application, we would urge the DES to analyze and consider the full impact of Liberty Utilities' service expansion plans on the operation of the subject compressor station, the frequency and volume of its emissions, and consequent health impact on citizens, as part of the application process.**

Although the Pelham compressor station is currently just used as a stand-by facility which only operates during peak demand and likely less than 1% of the time, we understand that its operation is tied in with service "downstream," including the Concord area, such that Concord and other "downstream" demands increase its operational time. As the DES is probably aware: although GreenCity Power submitted a proposal for converting the Concord Steam operation to a safe, non-greenhouse gas emission source of energy, *see* attached Exhibit "D," the state rejected it out of hand and is signing on for conversion to Liberty Utilities' gas.[2] As the DES may not be aware: Liberty Utilities has aggressive expansion plans targeting other new customers around Concord, and likely other new customers "downstream" of the Pelham compressor station—all of whom would, presumably, add to the system demand and the compressor's operation time. Of course, any increase in the compressor's operation time increases its emissions and health concerns correspondingly. There is no justification for exposing the children and other citizens of Pelham to increasingly noxious emissions just so the state can reap some short-term savings on energy bills—the "justification" for the Concord Steam conversion to gas rather than a healthier, greener alternative. Likewise, Liberty Utilities' other expansion plans must be carefully analyzed in depth to determine if they will increase the operation time of the Pelham compressor station. **While there is currently insufficient information to consider whether a renewal permit should be issued in this matter at all, no permit should be issued (if at all) without a condition restricting further gas expansion and/or the compressor station's operational time to present less than 1% operational norms**.

For the reasons set forth above, we respectfully request and urge that a public hearing be scheduled in this matter and that the comment period be extended for a reasonable period of time (at least two weeks) after the public hearing to allow citizens the opportunity to submit public comments benefitting from the information presented at the hearing.

Thank you for your time and courtesy. Should anyone wish to contact us for any reason, we may be reached via the e-mail address RMHusband@mail.com.

---

[2] Honestly—and this is more for those copied on this letter than the DES: what makes the Concord Steam "bidding" process, resulting in an almost immediate State-run cattle drive of Concord Steam customers to Liberty Utilities with only cursory consideration of the alternatives, any different than the other one-party "bidding," alleged collusion-wracked processes being debated and investigated in Concord right now? *See* Article 1; Article 2; Article 3.

Sincerely,

//s// Richard Husband
Duly Authorized, on Behalf of:

NH Pipeline Health Study Group:

By its Board/Members:

//s// Beverly Edwards
Chairperson

//s// Liz Fletcher
Board Member

//s//Douglas Whitbeck
Board Member

//s//Gwen Whitbeck
Board Member

//s//Susan Durling
Board Member

//s//Julia Steed Mawson
Board Member

//s//Marilyn Learner
Board Member

//s//Richard Husband
Board Member

cc: Members of the Concord Steam Legislative Task Force (via e-mail)
Honorable Governor Margaret Hassan (via e-mail, c/o Kerry.Holmes@nh.gov )
Vicki Quiram, Commissioner, N.H. Department of Administrative Services (via e-mail, c/o commweb@nh.gov)
Christopher G. Aslin, Esquire, Assistant Attorney General (via e-mail)
John McCutcheon (via e-mail)
Dr. Melinda Treadwell (via e-mail)
The New Hampshire Municipal Pipeline Coalition (via e-mail)
NHPLAN (via e-mail)
Other concerned citizens (via e-mail)
*The Union Leader* (via e-mail)
*Concord Monitor* (via e-mail)
*Pelham-Windham News* (via e-mail)

# EXHIBIT "A"

STATE OF NEW HAMPSHIRE
DEPARTMENT OF ENVIRONMENTAL SERVICES
AIR RESOURCES DIVISION
CONCORD, NEW HAMPSHIRE

# NOTICE OF PERMIT REVIEW PUBLIC HEARING AND COMMENT PERIOD

Pursuant to the New Hampshire Code of Administrative Rules, Env-A 621.02, notice is hereby given that the Director of the New Hampshire Department of Environmental Services, Air Resources Division (Director), has received an application for a state permit to operate from, and based on the information received to date, intends to **issue such permit to:**

**Tennessee Gas Pipeline Company, LLC**
**Concord Expansion Compressor Station #270B1**
**Mammoth Road**
**Pelham, New Hampshire**

**For the Following Devices:**
**One Compressor Turbine and One Emergency Generator**

The application and draft permit are on file with the Director, New Hampshire Department of Environmental Services, Air Resources Division, 29 Hazen Drive, P.O. Box 95, Concord, NH 03302-0095, (603) 271-1370. Information may be reviewed at the office during working hours from 8 a.m. to 4 p.m., Monday through Friday. Additional information may also be obtained by contacting Patricia North at the above address and phone number. Requests for a public hearing and/or written comments filed with the Director in accordance with Env-A 621.06, and received no later than **Monday, November 14, 2016.** shall be considered by the Director in making a final decision.

Craig A. Wright, Director,
Air Resources Division

# EXHIBIT "B"

**NOTE: THIS EXHIBIT**

**IS THE SAME AS EXHIBIT "B"**

**TO THIS MOTION**

# EXHIBIT "C"

Federal Energy Regulatory Commission
888 First Street NE
Washington, D.C. 20426
Sept 4, 2016

Re: Spectra Energy, Atlantic Bridge Project Environmental Assessment
Docket No. CP16-9-000

To Secretary Bose:

I am writing to comment on the Atlantic Bridge Environmental Assessment (EA). The formal comment period has ended. However, in response to requests for an extension of the public comment period, the Commission has indicated that it will continue accepting and reviewing public comments. I am therefore submitting my observations that the Atlantic Bridge EA failed to disclose and address the presence of toxic contaminants in gas delivered by the Algonquin Pipeline and therefore did not adequately assess risks to the environment and human health.

### *1. Several lines of evidence indicate that gas delivered by the Algonquin Pipeline contains mercury*

A. Companies that analyze natural gas samples in support of pipeline operations indicate that trace metals including mercury are present in natural gas, which they are able to test for[1]:

"...trace metal content in natural gas streams and LNG can reach parts per million (ppm) levels..."[1]

Although it seemed unlikely to be honored, I did request a de-identified sample analysis from one such company. The request was of course denied on the grounds that the data were proprietary.

B. Mercury is one of several toxic substances produced by the operation of Metering & Regulating stations as identified in this Resource Conservation and Recovery Act (RCRA) report for a M&R station in New Bedford, MA:[2]

**EPA Waste Codes for Facility** (Facility #1 : ALGONQUIN GAS TRANSMISSION, LL, EPA waste code: all)

| EPA Waste Code |
|---|
| D001: Ignitable waste |
| D005: Barium |
| D007: Chromium |
| D008: Lead |
| D009: Mercury |
| D018: Benzene |

**(2007)**

**Reporting Year: 2007**

**Facility #1 : ALGONQUIN GAS TRANSMISSION, LL**

**Basic Facility Info**

| | |
|---|---|
| Handler ID | MAR000009993 |
| Facility Name | ALGONQUIN GAS TRANSMISSION, LLC -M&R 17 |
| Street Number | 1183 |
| Address Line 1 | SHAWMUT |
| City | NEW BEDFORD |
| State | MA |
| Zip Code | 02741 |
| County | PLYMOUTH |
| 113th Congressional District | MA09: Massachusetts 9 |
| First NAICS Code | 42471: Petroleum Bulk Stations and Terminals |
| Current Owner | ALGONQUIN GAS TRANSMISSION, LLC |
| Site Land Type | Private |

1 http://www.intertek.com/petroleum/natural-gas-trace-metals/
2 http://www.rtknet.org/db/brs/brs.php?reptype=f&epa_id=MAR000009993&reporting_year=2007&database=brs&detail=3&datype=T

C. The Applicant has clearly stated that mercury can be present in their gas, which necessitates the incorporation of a "mercury guard bed" as part of the proposed LNG facility in Acushnet, MA:

"Mercury may be present in very small quantities in the feed gas and will be removed via a mercury guard bed during the pretreatment process. Mercury is considered an environmentally hazardous material."[3]

To the best of my knowledge, compressor stations and metering & regulating stations do not contain mercury guard beds even though they release gas directly into the environment.

Based upon these lines of evidence, I conclude that mercury is present as a toxic contaminant in the gas being delivered to Massachusetts.

***2. Gas transmitted by the Algonquin Pipeline likely contains volatile radioactive lead***

As discussed in Section 2.7.5 of the Atlantic Bridge EA, gas in the Algonquin pipeline does contain radon. Radon decays into radioactive lead and other progeny as acknowledged in the EA. The EA indicates that the pipeline is cleaned regularly and any hazardous materials properly disposed of.

The RCRA report (section 1B above) indicates that the pipeline liquids produced at this M&R station do include lead. It does not seem likely that lead is used in pipeline maintenance and operation processes. Rather, the more likely source of lead at the New Bedford M&R station is from the gas itself as acknowledged by the EA. Lead is an EPA criterion air pollutant and can exist in the volatile state (like radon). Therefore, it seems likely that while some radioactive lead is precipitating within the pipeline, some is being transported along the pipeline in the volatile state and is released into the environment.

***3. Pipeline liquids removed from the Algonquin pipeline contain barium, cadmium, and PCBs***

As noted in the RCRA report presented above, liquids removed from the Algonquin pipeline include cadmium and barium. Cadmium is toxic and carcinogenic. Barium can be toxic in certain forms, and originates from the Marcellus Shale[4]. Like radon and radium, it is naturally occurring in the Marcellus Shale along with methane and is a component of fracked gas.

Pipeline liquids recovered from the New Bedford M&R also contain PCBs at an unknown concentration, but greater than 50 ppm[2]:

**Generated Waste Basics**

| | |
|---|---|
| Page Number | 1 |
| Waste Description | WASTE PIPELINE LIQUIDS WITH GREATER THAN 50 PPMS PCBS |
| Form of Waste Category | Organic Liquids |
| Form of Waste (Regularized) | Other organic liquid (specify in comments) - Organic Liquids |

These are likely present as a component of the pipeline itself, which was built prior to the institution of bans and restrictions on the production and use of PCBs.

3 Algonquin Gas Trasmission, LLC. Access Northeast Project. Draft Resource Report 11, sec. 11.4.1.9.
4 http://energy.wilkes.edu/PDFFiles/Library/The_Science_of_Marcellus_Shale_Wastewater.pdf

***4. The Atlantic Bridge EA omitted any assessment of mercury, lead, cadmium, PCBs, and barium releases into the environment, and potential human exposures***

A. As detailed in Resource Report 9 for the Atlantic Bridge Project, the Weymouth compressor station would include storage tanks for pipeline liquids. Like other above-ground storage tanks, these would release hazardous air pollutants. In particular, flashing during the tank operation process can release significant quantities of hazardous air pollutants. The Resource Report includes calculations estimating the quantity of hazardous air pollutants that could be released by flashing (up to 325.5 pounds per hour[5]). However, there is no reference to cadmium, PCBs, lead, or mercury released during the operation of these tanks (including during flashing). Since some if not all of these toxic and/or carcinogenic materials can exist as a gas, they would likely be released during the operation of storage tanks at the Weymouth compressor station.

B. Lead, mercury, and cadmium (like radon) are not altered by combustion. Therefore any quantity of these toxic pollutants existing in the gas phase will be entrained into the compressor engine and released in the exhaust stream. They will also be released during venting (e.g., blowdowns) and fugitive emissions. None of these sources of heavy metal pollution (in exhaust, venting, or fugitive emissions) were addressed in the EA.

The half life of radioactive lead is on the order of 21 years. Heavy metals and PCBs are persistent environmental pollutants. Therefore, even a low rate of emission can lead to significant accumulation of these pollutants in the local environment over time.

C. Lead is an EPA criterion pollutant. Given the analysis presented here, it would seem necessary to evaluate the presence and quantity of volatile lead emissions from the pipeline. This should take the form of a quantitative analysis of releases, rather than the qualitative dismissal used to address other important topics in the EA.

D. **Without being properly evaluated by an EIS, the toxic and/or carcinogenic pollutants identified here pose an unquantified and unknown degree of risk to the environment and human health.**

***5. Summary and conclusions***

In this comment I have provided evidence that certain toxic and/or carcinogenic pollutants are present in the gas and/or liquid state in the Algonquin Pipeline. These pollutants would likely be released by facilities proposed under the the Atlantic Bridge project as air pollutants that persist and accumulate in the environment. However, their release was not evaluated during the EA process. Therefore, I make the following recommendations in accordance with instructions in the EA and under NEPA:

A. *These and many other important comments warrant the preparation of an EIS*. It was unwarranted for the Commission to require only an EA. The existing EA refers to a project which has been substantially modified and has many unanswered but important criticisms. It is still possible at this time to require that the Applicant prepare an EIS that incorporates the criticisms raised in this docket, based upon the current formulation of the Weymouth compressor station proposal.

5 Algonquin Gas Trasmission, LLC. Atlantic Bridge Project. Resource Report 9, Weymouth Compressor Station Table E-1A, Flash analysis.

B. *The Commission should choose the "No-Action" alternative.* As detailed in previous comments including comments by Senators Markey and Warren, the EA was prepared by a consultant with a close relationship to the Applicant. The Commission should therefore have a lower threshold to disagree due to this bias; namely, the Commission should more broadly consider the need to choose the the "No-Action" alternative.

The EA discussion of the "No-Action" option[6] omits the many concerns outlined in this and previous comments. It also does not include recent developments such as this year's Massachusetts Supreme Judicial Court ruling that the state Department of Environmental Protection is failing to meet its mandated Global Warming Solutions Act targets[7], which I will not outline in detail here. In brief, the Atlantic Bridge and other fossil fuel infrastructure cannot be built and expanded in the state if we are to meet the Global Warming Solutions Act targets as mandated by the state legislature and confirmed by the Supreme Judicial Court. That is true whether the fossil fuel infrastructure entails the emission of carbon dioxide or the much more potent greenhouse gas, methane.

**When considering the risks, costs and burdens of the Atlantic Bridge project, it is expedient for the Commission to choose the "No-Action" option as provided by section 7 of the Natural Gas Act.**

Signed,

Curtis L Nordgaard MD MSc
Pediatrician
Dorchester, MA

CC:
Erin Flaherty
Town of Weymouth
Massachusetts Department of Environmental Protection, Southeast Region
Massachusetts Attorney General
EPA New England-Region 1 Office of Environmental Review

6 Federal Energy Commission and Natural Resources Group. Atlantic Bridge Environmental Assessment, Section 3.1. May 2016.

7 https://www.bostonglobe.com/metro/2016/05/18/sjc-rules-that-state-failed-issue-proper-regulations-cut-emissions/N6rAAeeGAr4LrjqF8K71JJ/story.html

# EXHIBIT "D"

**Subject:** Re: More Concord Steam Information
**From:** Bev Edwards <nadesha@msn.com>
**Date:** 10/19/2016 4:35 PM
**To:** "Gary.Daniels@leg.state.nh.us" <Gary.Daniels@leg.state.nh.us>, "Jeb.Bradley@leg.state.nh.us" <Jeb.Bradley@leg.state.nh.us>, "Dick.Hinch@leg.state.nh.us" <Dick.Hinch@leg.state.nh.us>, "dickhinch@gmail.com" <dickhinch@gmail.com>, "Lynne.Ober@leg.state.nh.us" <Lynne.Ober@leg.state.nh.us>, "Lynne.Ober@comcast.net" <Lynne.Ober@comcast.net>, "Gene.Chandler@leg.state.nh.us" <Gene.Chandler@leg.state.nh.us>, "Steve.Shurtleff@leg.state.nh.us" <Steve.Shurtleff@leg.state.nh.us>, "SteveShurtleff@aol.com" <SteveShurtleff@aol.com>, Renata <renata.baker@leg.state.nh.us>, Kyle <Kyle.Baker@leg.state.nh.us>, Lou <l.dallesandro@comcast.net>
**CC:** State Senate Dan Feltes <danfeltes@gmail.com>

Dear Honorable Members of the Concord Steam Legislative Task Force,

Thank you for your attention to the email I sent you yesterday. I sincerely appreciate your mentioning statements from it at the Task Force meeting. I had intended to be there, but was held up for the afternoon.

Below is an email I am forwarding to you in the interest of further clarification. It comes from Aaron Walters, one of the managing partners of Green City Power, in response to several questions from me regarding the steam pipes and GCP's execution of a bid with the state.

Bev Edwards

**Bev Edwards**
603-878-3227
nadesha@msn.com

---

**From:** Aaron Walters <awalters@greencity-power.com>
**Sent:** Wednesday, October 19, 2016 10:47 PM

**Clarifications**:

1. GreenCity Power's proposal was to acquire the **STEAM DISTRIBUTION SYSTEM AND THE STEAM GENERATION PLANT.** So GreenCity Power would have acquired and maintained the steam pipes (ie: approx 8 miles of underground pipes) as well as the generation plant.
2. GreenCity Power **submitted a Formal Proposal to the State (**dated February 4, 2016)
3. GreenCity Power made multiple attempts to follow-up with the State re: our Proposal to invest $20M+ into the entire steam plant and distribution system, contingent ONLY on finding a Mutually-Acceptable path forward with the State. The State refused to meet with GreenCity Power.

**Proof is in the Numbers:**

A. In winter of 2015-2016 the users (State, City & Downtown Business District) were paying **approx $45/Mlbs** for Steam.
B. **Under GreenCity's Proposal**:
a. State Buildings would have paid: **$34/Mlbs (a 25% reduction** in Steam Price)
b. City & Downtown Businesses would have paid: **$40/Mlbs (a 12% reduction** in Steam price)
C. **Impact of State's Decision to Convert to Gas,** using current low gas prices:
a. State's Cost of Steam using gas: **$52/Mlbs** (a **53% PREMIUM** to GreenCity's offer and 15% premium to what they paid last year!)
b. City [Government]'s Cost of Steam using gas: **$115/Mlbs** (a **287% PREMIUM** to GreenCity's Offer)
c. Downtown Businesses cost of steam using gas: **$68/Mlbs** (a **70% PREMIUM** to GreenCity's Offer).

(RECALL: **The cost of heating has 4 basic components:** (1) fuel cost, (2) operations & maintenance costs, (3) boiler efficiency, (4) **capital cost. The State has repeatedly made the error of comparing just the cost of Fuel (gas cost of $0.95/therm) to the total delivered cost of heat/steam.)**

The KEY POINTS are:
(a) In February 2016, GreenCity Power made an offer that would have benefited ALL customers of Concord Steam (including All State Buildings, All downtown buildings, All City buildings)
(b) The State refused to meet or discuss GreenCity's Proposal
(c) Since the State had NO INTEREST in discussing GreenCity Power's proposal, and Concord Steam was driven out of business, all users were forced to find an alternative source of heating. It is for this reason that the issues about abandoning the steam pipes has come up. This was all avoidable!

The net results are:
(i) Higher heating costs for all former Concord Steam Customers
(ii) Substantial capital investment required by the City/State/Downtown Businesses
(iii) Higher CO2 and GHG emissions by converting to a fossil fuel
(iv) added strain on New Hampshire's Timber/Forestry industry.

Best regards,

Aaron Walters, CFA
Managing Partner
GreenCity Power
(T) 630-386-3900
100 N. Riverside Plaza
Suite 1670
Chicago, IL 60606
www.greencity-power.com

---

# EXHIBIT "E"

The State of New Hampshire
**Department of Environmental Services**

**Thomas S. Burack, Commissioner**

December 16, 2016

Mr. Thomas C. Dender
Tennessee Gas Pipeline LLC
1001 Louisiana Street
Houston, Texas 77002

**Re: Request for Public Hearing Regarding**
**Concord Expansion Compressor Station #270B1**
**Mammoth Rd., Pelham, New Hampshire**
**Facility ID #3301191266; Application #15-0300**

Dear Mr. Dender:

The New Hampshire Department of Environmental Services (DES) has received a request for a public hearing regarding the draft permit for Tennessee Gas Pipe Company, LLC, Concord Expansion Compressor Station #270B1, Mammoth Rd., Pelham, New Hampshire. As a result of the request, DES will be holding a public hearing regarding the above mentioned draft permit. The hearing will be held on **Wednesday, January 18, 2017, at 6:00 p.m. at the Pelham Town Hall located at 6 Village Green, Pelham, New Hampshire**. DES has enclosed a copy of the public notice in accordance with the New Hampshire Code of Administrative Rules Env-A 622.05(e)(2), *Requests for Public Hearing.*

If you have any questions regarding the public hearing, please contact John McCutcheon of the Air Resources Division, Permitting & Environmental Health Bureau by calling (603) 271-0886 or via e-mail at *john.mccuthuceon@des.nh.gov*.

Sincerely,

Catherine A Beahm

Catherine A. Beahm
Air Permits Program Manager
Permitting and Environmental Health Bureau

cab/vhd
*By certified mail #7011 1570 0003 6778 4731*

Enclosures: Public hearing notice

cc: Town of Pelham
Hearing requestors
Michael Zeilstra, Kinder Morgan

STATE OF NEW HAMPSHIRE
DEPARTMENT OF ENVIRONMENTAL SERVICES
AIR RESOURCES DIVISION
CONCORD, NEW HAMPSHIRE

**NOTICE OF PERMIT REVIEW**
**PUBLIC HEARING AND COMMENT PERIOD**

On October 14, 2016, the New Hampshire Department of Environmental Services, Air Resources Division (DES), published a public notice of its intent to issue, amend, or deny a State Permit to Operate to:

**Tennessee Gas Pipeline Company, LLC**
**Concord Expansion Compressor Station #270B1**
**Mammoth Road**
**Pelham, New Hampshire**

**For the Following Device:**
**One Compressor Turbine and One Emergency Generator**

The October 14, 2016 public notice specified the procedures for requesting a public hearing. A request for a public hearing was subsequently filed with DES in accordance with Env-A 621.06. The Director has granted the request for a public hearing and has scheduled the hearing for **Wednesday, January 18, 2017,** at **6:00 PM** at the Pelham Town Hall located at 6 Village Green, Pelham, NH 03076.

**Please note that, in the event of inclement weather, the hearing will instead be held at the same time and location on Wednesday, January 25, 2017**. If the January 18 hearing date is postponed, notification will be made on the WMUR website (www.wmur.com) under "closings".

The application and draft permit are on file with the Director, New Hampshire Department of Environmental Services, Air Resources Division, 29 Hazen Drive, P.O. Box 95, Concord, NH 03302-0095, (603) 271-1370. Information may be reviewed at the office during working hours from 8 a.m. to 4 p.m., Monday through Friday. Additional information may also be obtained by contacting John McCutcheon at the above address and phone number. Written comments filed with the Director no later than January 25, 2017 shall be considered by the Director in making a final decision.

Craig A. Wright
Director
Air Resources Division

# EXHIBIT "F"

NH Pipeline Health Study Group
c/o RMHusband@gmail.com

January 18, 2017

Craig A. Wright, Director Air Resources Division
Director, Air Resources Division
NH Department of Environmental Services
29 Hazen Drive, P.O. Box 95
Concord, NH 03302-0095

**RE: Tennessee Gas Pipeline Company, LLC Application for Renewal Permit Concord Expansion Compressor Station #270B1 on Mammoth Road, Pelham, NH Application No. 15-0300**

Dear Director Wright:

The NH Pipeline Health Study Group would like to thank the DES for holding this public hearing on the air permit renewal application for the Concord Expansion Compressor Station in Pelham, NH. The position expressed in our October 28, 2016 letter requesting this hearing has not changed: to protect citizens, the DES should first conclude its fracked gas analysis, followed by appropriate Env-A 1400 rule changes and assessment of the operational and health impacts of Liberty Utilities' gas expansion plans on the Pelham compressor station, before considering the permit application.[1] But, we would like to offer more information supporting our position, as well as comments concerning data gathering, modeling and measures to reduce emissions should the Pelham or any other New Hampshire compressor station be allowed to operate going forward.

Although the Pelham compressor station is relatively small in size (6,346 HP) and has been permitted for full-time use, it has run only a very small percentage of the time and we are concerned that there exists a serious health risk if its use is intensified as seems the clear result of gas expansion plans. Our concerns are borne out by a 2016 Health Consultation study around the smaller (5,400 HP) Brigich gas compressor in Pennsylvania.

After receiving numerous complaints of health problems such as nausea, headache, burning upper respiratory tract, nosebleeds and stinging eyes, the federal Agency for Toxic Substances and Disease Registry ("ATSDR") undertook a study on the air quality around the Brigich compressor station in Chartiers Township, PA., a copy of which accompanies. The results of this study indicate that it is vital to monitor and control air emissions from compressor stations, even compressor stations the size of the one at Pelham.

[1] Otherwise, any issued permit should be expressly conditioned on public review and reassessment of the matter upon the conclusion of these considerations.

In this study, the ATSDR detected nine chemicals that exceeded health-based comparison values (CV) -- acetaldehyde, benzene, carbon tetrachloride, chloroform, crotonaldehyde, formaldehyde, 1,2-dichloroethane, 1-methoxy-2-propanone, and 1,1,2-trichloroethane. Hydrogen sulfide was also found to be a contaminant of concern, exceeding its health-based CV. (pages 8, 11, 13) In addition, the average level of fine particulate matter (PM2.5) detected during the study (12.4 ug/m3) fell within the range where health effects can be expected. (World Health Organization 11-15 ug/m3 quoted on page 33)

As bad as these finding are, the ATSDR acknowledges that this study has significant limitations which may mask even worse concerns: it lacks continuous ambient air data from all seasons of the year, limiting its ability to assess long-term chronic and short-term peak chemical exposures; and it may not have adequately captured peak emissions incidents such as blowdowns or flaring events. Because of these shortcomings in the data gathering, the health risk from compressor station emissions is likely to be greater than what this study has detected.

In this study's recommendations, the ATSDR calls for the appropriate environmental agencies to collect emission source or fence-line samples of a wide range of chemicals for long term and peak exposures. It also recommends air modeling of fugitive and combustion emissions at compressor stations to gain greater understanding of air quality near these facilities.

Beyond data gathering and modeling, the ATSDR recommends taking steps to control the release of emissions at the source, to protect sensitive populations living near compressor stations.

Accordingly, please require all New Hampshire compressor stations to have fence-line air quality monitoring that gathers data whenever the station is operating, including during blowdowns and venting, and to use the following technology to control air pollutants at the source:

* 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 and blow-downs.
* Equipment to capture and recover fugitive emissions should be located within the structures that house above-ground gas pipeline facilities.

Indeed, in addition to appropriate health-protective limitations on operational frequency and volume of emissions, the NH Pipeline Health Study Group strongly urges the DES to adopt all of the ATSDR's recommendations as conditions for the Pelham compressor station, and any other compressor station, that may be allowed to operate going forward.

Fugitive releases and blowdowns are a huge cause of compressor station emissions. Metropolitan Engineering Consulting and Forensics Services, an environmental consulting firm that specializes in remediation of petroleum spills, has found that U.S. compressor stations annually lose 50 billion cubic of fugitive emissions, and another seven billion cubic feet of emissions from blowdowns.[2] They recommend keeping compressors pressurized when off-line; connecting blowdown vent lines to the fuel gas system to recover the vented gas; installing static seals on compressor rod packing; installing ejectors on blowdown vent lines to enable leaked gas to be pumped into an operating compressor or fuel gas system.

[2] *See* https://sites.google.com/site/metropolitanenvironmental/the-lowdown-on-gas-compressor-blowdown-the-dirty-truth-of-unreportable-emissions.

These are all relatively low-cost measures to reduce emissions, far less than the cost of negative health effects in the surrounding community. Fracking uses many chemicals listed by the state as Regulated Toxic Air Pollutants. Shale gas contains higher levels of radon than conventional natural gas. Radon degrades into relatively long-lived radioactive lead.

Some additional thoughts and comments …

As discussed at the group's September meeting with the DES in Concord, blowdowns require careful monitoring. Blowdowns are generally planned, of course, and, as part of the DES modeling/analysis in this matter, we would appreciate it if the DES confirmed pertinent average yearly blowdown data for the Pelham compressor station with Tennessee Gas Pipeline Company (number of times, volume each time, etc.) and factored that into its modeling and analysis—supported, of course, by the actual collection of data during planned blowdowns. Unfortunately, *unplanned* blowdowns may involve far greater releases of emissions than planned ones, as the pipeline company has the ability (with the right equipment) to pump the gas out of the pressurized area before a planned blowdown, but no such opportunity with an unplanned one.

Dr. Curtis L. Nordgaard, referenced in our prior submissions to the DES, advises that one of the problems with both mercury and lead emissions near homes is that both may accumulate in dust. As part of its methodology, we believe that the DES should identify the levels of these toxins which may be growing in nearby homes or other buildings over time, and assess the adverse health effects. Dr. Nordgaard has suggested that testing the total gamma, beta and alpha radiation might be one approach, absent a better one.

Dr. David Carpenter, another doctor concerned with the adverse health effects of fracked gas emissions who heads up the School of Public Health and an Environmental Health program at New York University in Albany, New York, and who has been involved in this field of testing, advises that the best way to monitor for formaldehyde is using a badge that is placed near the site of interest, and left open for a number of hours before it is removed and sent for analysis. If the DES is considering another method, we would greatly appreciate a discussion about this.

The NH Pipeline Health Study Group urges the DES to continue to set a high standard for protecting the health of New Hampshire's people. Thank you very much.

Sincerely,

//s// Richard Husband
Duly Authorized, on behalf of:

NH Pipeline Health Study Group:

By its Board/Members:

//s// Beverly Edwards
Chairperson

//s// Liz Fletcher
Board Member

//s//Douglas Whitbeck
Board Member

//s//Gwen Whitbeck
Board Member

//s//Susan Durling
Board Member

//s//Julia Steed Mawson
Board Member

//s//Marilyn Learner
Board Member

//s//Richard Husband
Board Member

# EXHIBIT "G"


# World has three years left to stop dangerous climate change, warn experts

Former UN climate chief Christiana Figueres among signatories of letter warning that the next three years will be crucial to stopping the worst effects of global warming

**Fiona Harvey Environment correspondent**

Wednesday 28 June 2017 13.00 EDT

Avoiding dangerous levels of climate change is still just about possible, but will require unprecedented effort and coordination from governments, businesses, citizens and scientists in the next three years, a group of prominent experts has warned.

Warnings over global warming have picked up pace in recent months, even as the political environment has grown chilly with Donald Trump's formal announcement of the US's withdrawal from the Paris agreement. This year's weather has beaten high temperature records in some regions, and 2014, 2015 and 2016 were the hottest years on record.

But while temperatures have risen, global carbon dioxide emissions have stayed broadly flat for the past three years. This gives hope that the worst effects of climate change - devastating

droughts, floods, heatwaves and irreversible sea level rises - may be avoided, according to a letter published in the journal Nature this week.

The authors, including former UN climate chief Christiana Figueres and Hans Joachim Schellnhuber of the Intergovernmental Panel on Climate Change, argue that the next three years will be crucial. They calculate that if emissions can be brought permanently lower by 2020 then the temperature thresholds leading to runaway irreversible climate change will not be breached.

Figueres, the executive secretary of the UN Framework Convention on Climate Change, under whom the Paris agreement was signed, said: "We stand at the doorway of being able to bend the emissions curve downwards by 2020, as science demands, in protection of the UN sustainable development goals, and in particular the eradication of extreme poverty. This monumental challenge coincides with an unprecedented openness to self-challenge on the part of sub-national governments inside the US, governments at all levels outside the US, and of the private sector in general. The opportunity given to us over the next three years is unique in history."

Schellnhuber, director of the Potsdam Institute for Climate Impact Research, added: "The maths is brutally clear: while the world can't be healed within the next few years, it may be fatally wounded by negligence [before] 2020."

Scientists have been warning that time is fast running out to stave off the worst effects of warming, and some milestones may have slipped out of reach. In the Paris agreement, governments pledged an "aspirational" goal of holding warming to no more than 1.5C, a level which it is hoped will spare most of the world's lowest-lying islands from inundation. But a growing body of research has suggested this is fast becoming impossible.

Paris's less stringent, but firmer, goal of preventing warming from exceeding 2C above pre-industrial levels is also in doubt.

The authors point to signs that the trend of upward emissions is being reversed, and to technological progress that promises lower emissions for the future. Renewable energy use has soared, creating a foundation for permanently lowering emissions. Coal use is showing clear signs of decline in key regions, including China and India. Governments, despite Trump's pronouncements, are forging ahead with plans to reduce greenhouse gases.

The authors called for political and business leaders to continue tackling emissions and meeting the Paris goals without the US. "As before Paris, we must remember that impossible is not a fact, it's an attitude," they wrote.

They set out six goals for 2020 which they said could be adopted at the G20 meeting in Hamburg on 7-8 July. These include increasing renewable energy to 30% of electricity use; plans from leading cities and states to decarbonise by 2050; 15% of new vehicles sold to be electric; and reforms to land use, agriculture, heavy industry and the finance sector, to encourage green growth.

Prof Gail Whiteman said the signs from technical innovation and economics were encouraging: "Climate science underlines the unavoidable urgency of our challenge, but equally important is the fact that the economic, technical and social analyses show that we can resoundingly rise to the challenge through collective action."

While the greenhouse gases poured into the atmosphere over the last two centuries have only gradually taken effect, future changes are likely to be faster, scientists fear. Johan Rockström of the Stockholm Resilience Centre said: "We have been blessed by a remarkably resilient planet over the past 100 years, able to absorb most of our climate abuse. Now we have reached the end of this era, and need to bend the global curve of emissions immediately, to avoid unmanageable outcomes for our modern world."



Topics

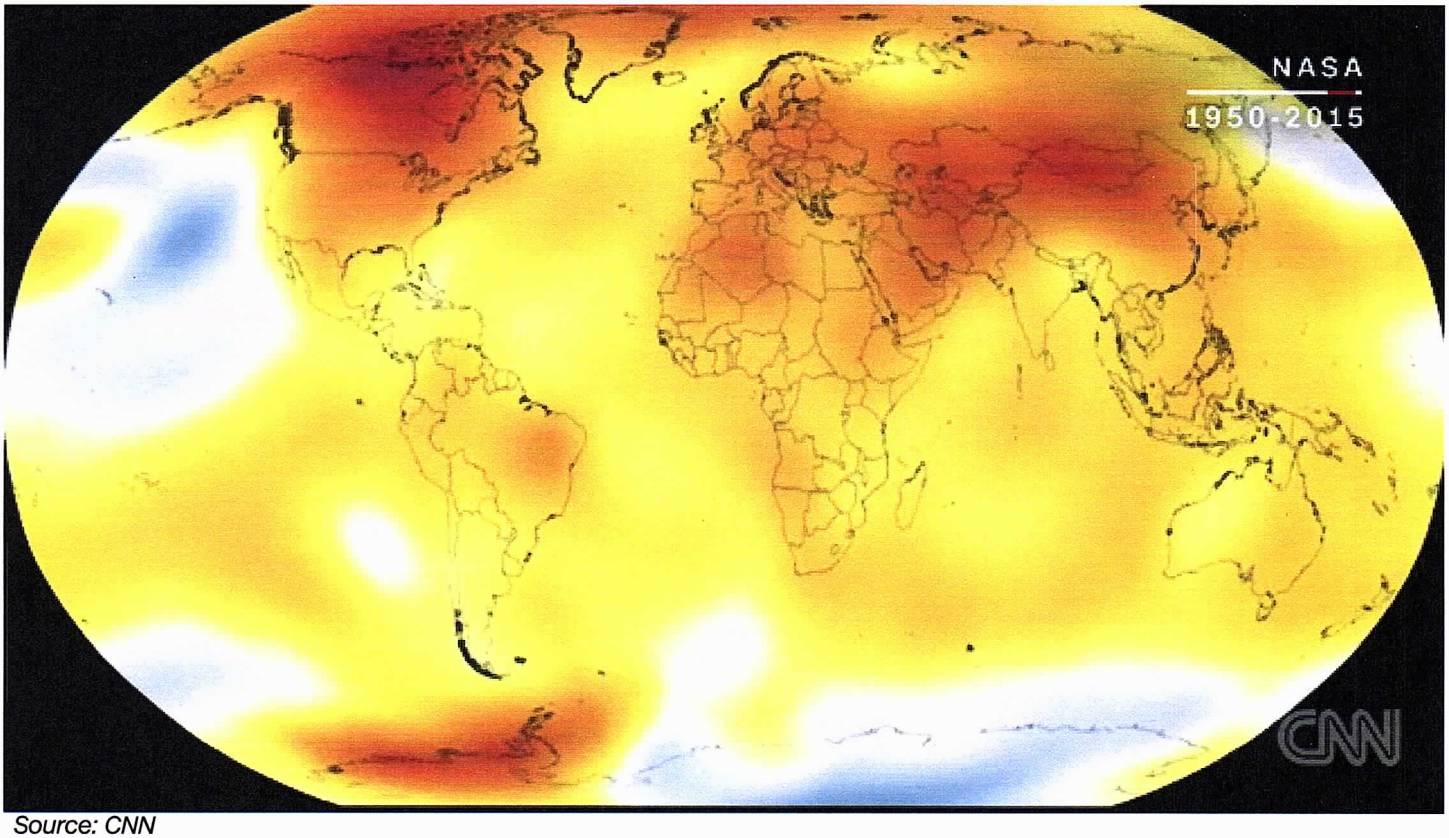
- Climate change
- Greenhouse gas emissions
- Paris climate agreement
- Christiana Figueres

# EXHIBIT "H"

# century, studies say

**By Ashley Strickland, CNN**

Updated 9:37 PM ET, Mon July 31, 2017




*Source: CNN*

**Undeniable climate change facts** 02:24

## Story highlights

The Earth's global temperature could rise close to or more than two degrees by 2100, studies say

One study suggests that a global temperature rise of 1.3 degrees may already be "baked in"

***Editor's Note:*** *"The Climate Crisis: A CNN Town Hall Event with Al Gore" will air at 9 p.m. ET on Tuesday, August 1, on CNN.*

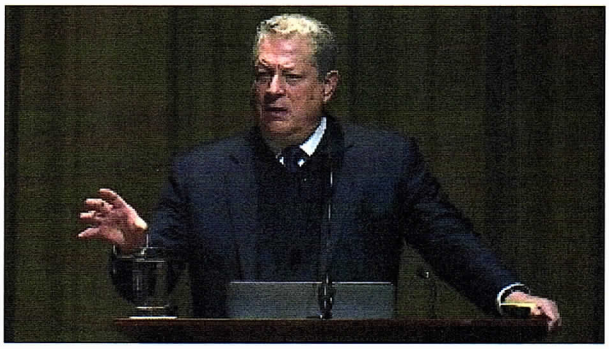
**(CNN) —** By the end of the century, the global temperature is likely to rise more than 2 degrees Celsius, or 3.6 degrees Fahrenheit.

This rise in temperature is the ominous conclusion reached by two different studies using entirely different methods published in the journal Nature Climate Change on Monday.

One study used statistical analysis to show that there is a 95% chance that Earth will warm more than 2 degrees at century's end, and a 1% chance that it's below 1.5 C.

"The : is 3.2 C," said . ect of existing

emission mitigation policies. Achieving the goal of less than 1.5 C warming will require carbon intensity to decline much faster than in the recent past."



**Related Article:** Scientists highlight deadly health risks of climate change

**Photos:** The effects of climate change on the world

The second study analyzed past emissions of greenhouse gases and the burning of fossil fuels to show that even if humans suddenly stopped burning fossil fuels now, Earth will continue to heat up about two more degrees by 2100. It also concluded that if emissions continue for 15 more years, which is more likely than a sudden stop, Earth's global temperature could rise as much as 3 degrees.

"Even if we would stop burning fossil fuels today, then the Earth would continue to warm slowly," said Thorsten Mauritsen, author of the second study. "It is this committed warming that we estimate."

Taken together, the similar results present a grim reality.

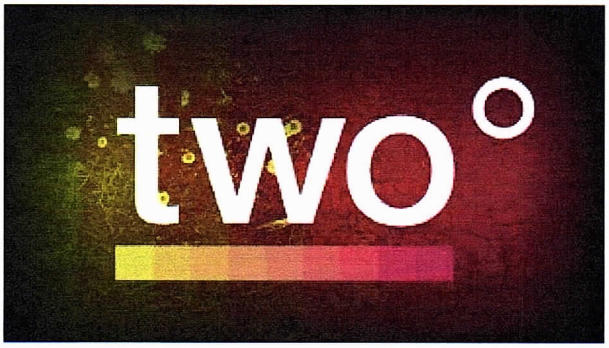
"These studies are part of the emerging scientific understanding that we're in even hotter water than we'd thought," said Bill McKibben, an environmentalist not affiliated with either study. "We're a long ways down the path to disastrous global warming, and the policy response -- especially in the United States -- has been pathetically underwhelming."

Because both studies were completed before the United States left the Paris Agreement under President Trump earlier this year, that has not been accounted for in either study.

"Clearly the US leaving the Paris Agreement would make the 2 C or 1.5 C targets even harder to achieve than they currently are," said Raftery.

## Why two degrees?

The 2 degree mark -- that's a rise of 3.6 degrees Fahrenheit in global temperature -- was set by the 2016 Paris Agreement. It was first proposed as a threshold by Yale economist William Nordhaus in 1977. The climate has been warming since the burning of fossil fuels began in the late 1800s during the Industrial Revolution, researchers say.




**Related Content:** 2 degrees: key to clim

If we surpass that mark, it has been estimated by scientists that life on our planet will change as we know it. Rising seas, mass extinctions, super droughts, increased wildfires, intense hurricanes, decreased crops and fresh water and the melting of the Arctic are expected.

The impact on human health would be profound. Rising temperatures and shifts in weather would lead to reduced air quality, food and water contamination, more infections carried by mosquitoes and ticks and stress on mental health, according to a recent report from the Medical Society Consortium on Climate and Health.

Currently, the World Health Organization estimates that 12.6 me weather tween 2030

and 2050 is expected to cause 250,000 additional global deaths, according to the WHO.

**See Iceland's melting glaciers in 360° | Click and drag to look around** 04:06

## Our potential future

The first study used population, carbon emission and gross domestic product data from 152 countries (accounting for 98.7% of the world's population as of 2015) over the past 50 years to develop a new statistical model, said Raftery, a professor of statistics and sociology at the University of Washington.

Many studies come from the Intergovernmental Panel on Climate change and use climate model scenarios -- not forecasts -- to use as examples of what might happen, based on specific assumptions about economics, population and carbon emissions in the future.

"This leaves open the question of how likely they are, or whether they cover the range of possibilities," Raftery said. "In contrast, our results are statistically based and probabilistic, in that they aim to cover the range of likely outcomes."

What Raftery and his colleagues discovered is that population is not a factor.

"This is due to the fact that much of the expected future population growth will be in Africa, in countries whose carbon emissions are currently very low," Raftery said.

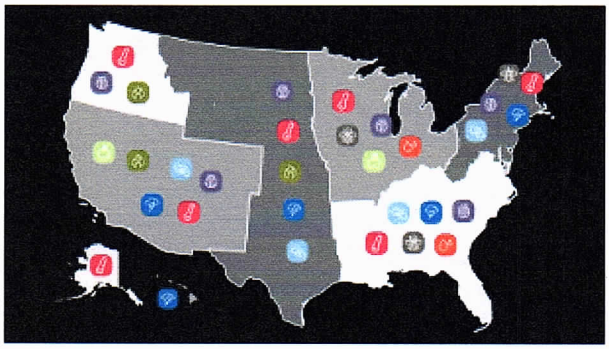
The study confirms conclusions of many other studies, said Bill Hare, director and senior scientists of nonprofit Climate

ɔy.

about where

ɔase in the

**Related Article:** Higher seas to flood dozens of US cities, study says; is yours one of them?



**Related Article:** Where climate change is threatening the health of Americans

ambition of climate and energy policies," Hare said.

The other finding of the study suggests that achieving a goal of less than 1.5 Celsius warming would require carbon intensity to decline faster than it has in the past. "The whole purpose of climate and energy policy is to accelerate decarbonisation and this will necessarily be faster than what we have seen globally," Hare said.

Mauritsen, author of the second study and climate researcher at Max Planck Institute for Meteorology, also shared thoughts on Raftery's findings.

"It seems interesting in that it uses an economic statistical model that accounts for an increasing energy efficiency as societies develop," Mauritsen said. "It shows that the 1.5 to 2 degrees targets will not be met without additional mitigation, and suggests that a focus on energy efficiency is the best way forward."

## The impact of our past

By combining observations of past global warming and how much heat and carbon is being captured and taken in by the ocean, Mauritsen and his co-author, Robert Pincus, found that even though CO2 has an incredibly long lifetime in the atmosphere, the ocean's absorption capacity may reduce estimates of global warming by 0.2 degrees Celsius.

They arrived at the "committed" warming of 1.3 Celsius by 2100, and the estimate including the ocean factor is 1.1 degrees Celsius. But that is still nearly 2 degrees Fahrenheit: 1.8, to be precise.

**Related Article:** Hail of a forecast: Climate change means fewer hailstorms but bigger hail

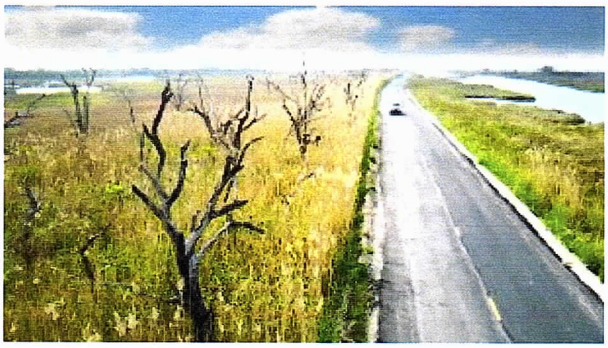
"What the study is not concerned with is how future emissions might develop," Mauritsen said. "This is a societal problem where we as physical scientists have fairly little to add. These future emissions will, however, add warming on top of the already committed warming and so our study can act as a baseline for estimating how far we are from reaching various temperature targets."

Hare also found this study to be consistent with previous papers on global temperatures on the rise.

"It shows, in effect, that unless we start reducing emissions quickly -- soon there is a risk that we will overshoot temperature limits like 1.5 or 2 degrees C," Hare said. "It is just another confirmation of how dangerous the present situation is unless CO2 emissions, which have flatlined in the last few years, really start dropping.

"This addresses a somewhat different question, namely how much warming should we expect if fossil fuel emissions were to suddenly cease," Raftery said. "In contrast, our study tries to assess how much warming we should expect given realistic future trajectories of emissions. Thus the other study provides a lower bound on expected emissions and warming, and this we would

**Related Article:** Depression, anxiety, PTSD: The mental impact of climate change



**Related Article:** 5 things you can do about climate change

## Join the conversation

See the latest news and share your comments with CNN Health on Facebook and Twitter.

# What can be done?

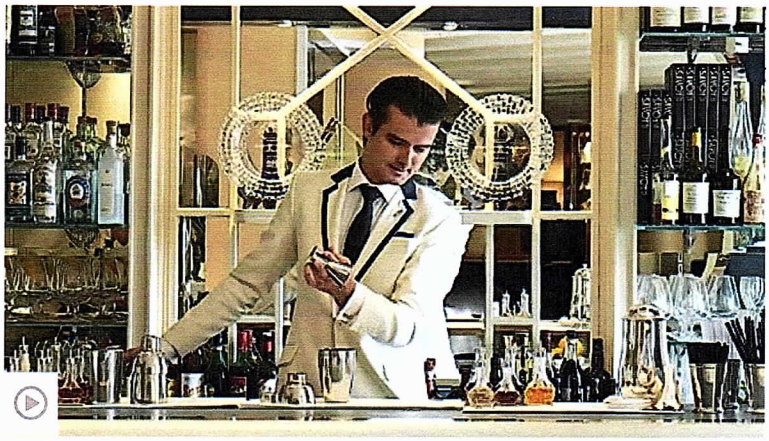
Researchers know that if there is any hope of preventing the outcomes they include in their findings, changing public policy is key.

"The next few years are going to be key in the fight against global warming," said Dargan Frierson, co-author of the first study. "Are we going to get to work installing clean energy, or stick to old polluting sources? If we don't act quickly, we better get to work preparing for many severe consequences of a much hotter world."

"There are only two realistic paths toward avoiding long-run disaster: increased financial incentives to avoid greenhouse gas emissions and greatly increased funding for research that will lead to at least partial technological fixes," said Dick Startz, economist and co-author of the second study. "Neither is free. Both are better than the catastrophe at the end of the current path."

Silver linings and hope are hard to find in climate change studies, but they also don't account for every factor.

"The only bright point is that, as the study authors say, they haven't factored in the plummeting cost of solar power," McKibben said. "That's the one way out we still might take -- but only if our governments take full advantage of the breakthroughs our engineers have produced."



How 'cocktail museum' became world's best bar

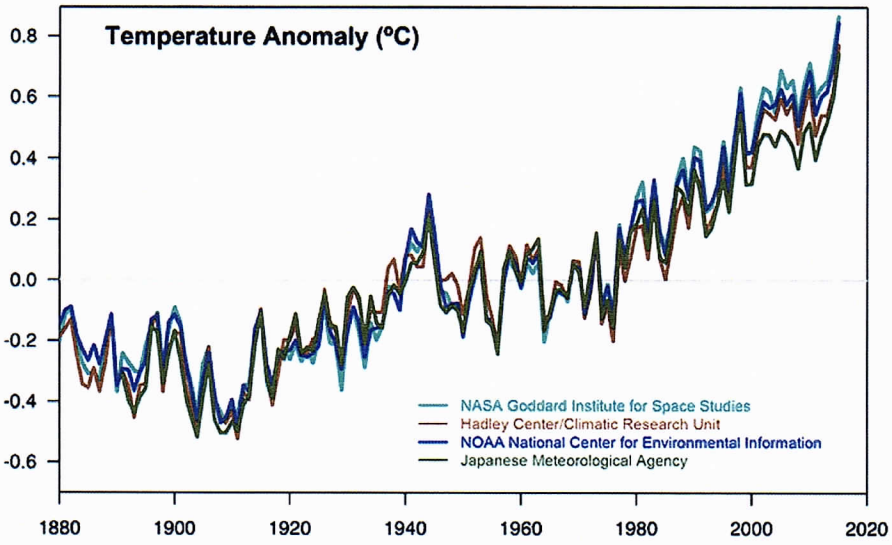
Bill Gates invests $80 million to build Arizona smart city

8 things to do in Tsim Sha Tsui

Plague on decline in Madagascar, but 9 countries on alert

# EXHIBIT "I"

# Scientific consensus: Earth's climate is warming




Temperature data from four international science institutions. All show rapid warming in the past few decades and that the last decade has been the warmest on record. Data sources: NASA's Goddard Institute for Space Studies, NOAA National Climatic Data Center, Met Office Hadley Centre/Climatic Research Unit and the Japanese Meteorological Agency.

Multiple studies published in peer-reviewed scientific journals[1] show that 97 percent or more of actively publishing climate scientists agree*: Climate-warming trends over the past century are extremely likely due to human activities. In addition, most of the leading scientific organizations worldwide have issued public statements endorsing this position. The following is a partial list of these organizations, along with links to their published statements and a selection of related resources.

## AMERICAN SCIENTIFIC SOCIETIES

### Statement on climate change from 18 scientific associations

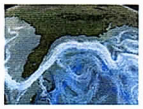
"Observations throughout the world make it clear that climate change is occurring, and rigorous scientific research demonstrates that the greenhouse gases emitted by human activities are the primary driver." (2009)[2]

### American Association for the Advancement of Science

## Latest resources

**Video: Greenland's thinning ice**

**Video: Ocean circulation plays an important role in absorbing carbon from the atmosphere**



**Video: Annual Arctic sea ice minimum 1979-2016 with area graph**

"The scientific evidence is clear: global climate change caused by human activities is occurring now, and it is a growing threat to society." (2006)[3]

## American Chemical Society

"Comprehensive scientific assessments of our current and potential future climates clearly indicate that climate change is real, largely attributable to emissions from human activities, and potentially a very serious problem." (2004)[4]

## American Geophysical Union

"Human-induced climate change requires urgent action. Humanity is the major influence on the global climate change observed over the past 50 years. Rapid societal responses can significantly lessen negative outcomes." (Adopted 2003, revised and reaffirmed 2007, 2012, 2013)[5]

## American Medical Association

"Our AMA ... supports the findings of the Intergovernmental Panel on Climate Change's fourth assessment report and concurs with the scientific consensus that the Earth is undergoing adverse global climate change and that anthropogenic contributions are significant." (2013)[6]

## American Meteorological Society

"It is clear from extensive scientific evidence that the dominant cause of the rapid change in climate of the past half century is human-induced increases in the amount of atmospheric greenhouse gases, including carbon dioxide (CO2), chlorofluorocarbons, methane, and nitrous oxide." (2012)[7]

## American Physical Society

"The evidence is incontrovertible: Global warming is occurring. If no mitigating actions are taken, significant disruptions in the

Earth's physical and ecological systems, social systems, security and human health are likely to occur. We must reduce emissions of greenhouse gases beginning now." (2007)[8]

## The Geological Society of America

"The Geological Society of America (GSA) concurs with assessments by the National Academies of Science (2005), the National Research Council (2006), and the Intergovernmental Panel on Climate Change (IPCC, 2007) that global climate has warmed and that human activities (mainly greenhouse-gas emissions) account for most of the warming since the middle 1900s." (2006; revised 2010)[9]

# SCIENCE ACADEMIES

### International academies: Joint statement

"Climate change is real. There will always be uncertainty in understanding a system as complex as the world's climate. However there is now strong evidence that significant global warming is occurring. The evidence comes from direct measurements of rising surface air temperatures and subsurface ocean temperatures and from phenomena such as increases in average global sea levels, retreating glaciers, and changes to many physical and biological systems. It is likely that most of the warming in recent decades can be attributed to human activities (IPCC 2001)." (2005, 11 international science academies)[10]

## U.S. National Academy of Sciences

"The scientific understanding of climate change is now sufficiently clear to justify taking steps to reduce the amount of greenhouse gases in the atmosphere." (2005)[11]

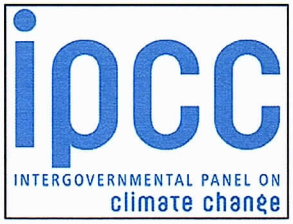
# U.S. GOVERNMENT AGENCIES

## U.S. Global Change Research Program


"The global warming of the past 50 years is due primarily to human-induced increases in heat-trapping gases. Human 'fingerprints' also have been identified in many other aspects of the climate system, including changes in ocean heat content, precipitation, atmospheric moisture, and Arctic sea ice." (2009, 13 U.S. government departments and agencies)[12]

# INTERGOVERNMENTAL BODIES

## Intergovernmental Panel on Climate Change




"Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen."[13]

"Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems."[14]

# OTHER RESOURCES

### List of worldwide scientific organizations

The following page lists the nearly 200 worldwide scientific organizations that hold the position that climate change has been caused by human action.
http://opr.ca.gov/s_listoforganizations.php

### U.S. agencies

The following page contains information on what federal agencies are doing to adapt to climate change.
http://www.c2es.org/docUploads/federal-agencies-adaptation.pdf

**Technically, a "consensus" is a general agreement of opinion, but the scientific method steers us away from this to an objective framework. In science, facts or observations are explained by a hypothesis (a statement of a possible explanation for some natural phenomenon), which can then be tested and retested until it is refuted (or disproved).*

*As scientists gather more observations, they will build off one explanation and add details to complete the picture. Eventually, a group of hypotheses might be integrated and generalized into a scientific theory, a scientifically acceptable general principle or body of principles offered to explain phenomena.*

---

## References


1. J. Cook, et al, "Consensus on consensus: a synthesis of consensus estimates on human-caused global warming," *Environmental Research Letters* Vol. 11 No. 4, (13 April 2016); DOI:10.1088/1748-9326/11/4/048002

   Quotation from page 6: "The number of papers rejecting AGW [Anthropogenic, or human-caused, Global Warming] is a miniscule proportion of the published research, with the percentage slightly decreasing over time. Among papers expressing a position on AGW, an overwhelming percentage (97.2% based on self-ratings, 97.1% based on abstract ratings) endorses the scientific consensus on AGW."

   J. Cook, et al, "Quantifying the consensus on anthropogenic global warming in the scientific literature," *Environmental Research Letters* Vol. 8 No. 2, (15 May 2013); DOI:10.1088/1748-9326/8/2/024024

   Quotation from page 3: "Among abstracts that expressed a position on AGW, 97.1% endorsed the scientific consensus. Among scientists who expressed a position on AGW in their abstract, 98.4% endorsed the consensus."

   W. R. L. Anderegg, "Expert Credibility in Climate Change," *Proceedings of the National Academy of Sciences* Vol. 107 No. 27, 12107-12109 (21 June 2010); DOI: 10.1073/pnas.1003187107.

   P. T. Doran & M. K. Zimmerman, "Examining the Scientific Consensus on Climate Change," *Eos Transactions American Geophysical Union* Vol. 90 Issue 3 (2009), 22; DOI: 10.1029/2009EO030002.

N. Oreskes, "Beyond the Ivory Tower: The Scientific Consensus on Climate Change," *Science* Vol. 306 no. 5702, p. 1686 (3 December 2004); DOI: 10.1126/science.1103618.

2. Statement on climate change from 18 scientific associations (2009)
3. AAAS Board Statement on Climate Change (2006)
4. ACS Public Policy Statement: Climate Change (2010-2013)
5. Human-Induced Climate Change Requires Urgent Action (2013)
6. Global Climate Change and Human Health (2013)
7. Climate Change: An Information Statement of the American Meteorological Society (2012)
8. APS National Policy 07.1 Climate Change (2007)
9. GSA Position Statement on Climate Change (2010)
10. Joint science academies' statement: Global response to climate change (2005)
11. Understanding and Responding to Climate Change (2005)
12. Global Climate Change Impacts in the United States (2009)
13. IPCC Fifth Assessment Report, Summary for Policymakers (2014)
14. IPCC Fifth Assessment Report, Summary for Policymakers (2014)

This website is produced by the Earth Science Communications Team at

**NASA's Jet Propulsion Laboratory** | California Institute of Technology

Site Editor: **Holly Shaftel**
Site Manager: **Randal Jackson**
Science Editor: **Susan Callery**

Site last updated: November 14, 2017

# EXHIBIT "J"

# Trump administration report attributes climate change to 'human activities'

By Gregory Wallace

Updated 9:30 PM ET, Fri November 3, 2017


*Source: CNN*

**Undeniable climate change facts** 02:24

**(CNN)** — A significant federal government study released Friday finds "no convincing alternative explanation" for the changing climate other than "human activities, especially emissions of greenhouse gases."

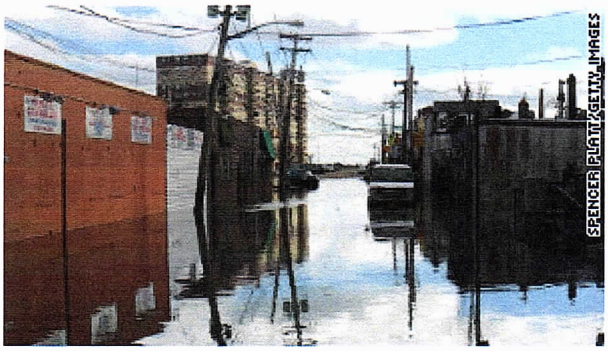
When drafts of the report were circulated earlier this year, some participants voiced concern that President Donald Trump's administration would seek to somehow interfere with the report, due to skepticism from Trump and others in his administration about climate science. Trump has nominated climate skeptics to top Environmental Protection Agency posts, and his administration has actively worked to dismantle climate protections, along with pulling out of the Paris climate accord.

But the study released Friday spoke specifically to the effects and costs of climate change.

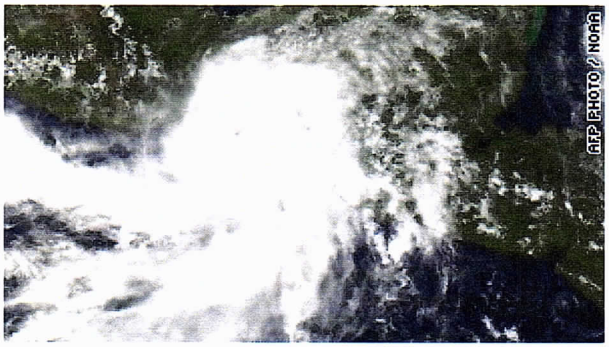
"This assessment concludes, based on extensive evidence, that it is extremely likely that human activities, especially emissions of greenhouse gases, are the dominant cause of



ury. For the
ıcing




**Related Article:** 500-year floods could strike NYC every five years, climate study says




**Related Article:** Government report calls on Trump to act on climate change

alternative explanation supported by the extent of the observational evidence," the report said.

Warming temperatures globally, rising sea levels, more frequent heat waves and increased numbers of forest fires are evidence of the changing climate, the report stated.

The Climate Science Special Report is required by federal law and includes contributions from multiple government agencies and non-government academic experts. The report is a component of the Fourth National Climate Assessment.

"The magnitude of climate change beyond the next few decades will depend primarily on the amount of greenhouse gases (especially carbon dioxide) emitted globally," the report said.

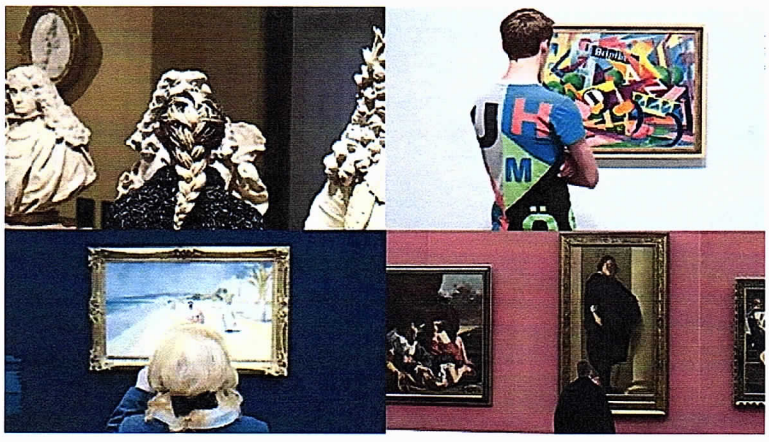
The Trump administration has indicated multiple times that climate change is not one of its priorities. Trump has previously labeled climate change a "hoax."

In addition to the administration's withdrawal from the Paris agreement, the EPA did not include climate change in its recent strategic plan, has moved to overturn the landmark Clean Power Plan, and has dropped experts from advisory panels.

EPA Administrator Scott Pruitt has proposed organizing teams to debate climate science.

But the White House said Friday it "supports rigorous scientific analysis and debate."

"The climate has changed and is always changing," spokesman Raj Shah said in a statement. "In the United States, energy related carbon dioxide emissions have been declining, are expected to remain flat through 2040, and will also continue to decline as a share of world emissions."



## Photographer captures people ma

# EXHIBIT "K"

The New York Times https://nyti.ms/2vdswoz

CLIMATE

# Scientists Fear Trump Will Dismiss Blunt Climate Report

By LISA FRIEDMAN AUG. 7, 2017

WASHINGTON — The average temperature in the United States has risen rapidly and drastically since 1980, and recent decades have been the warmest of the past 1,500 years, according to a sweeping federal climate change report awaiting approval by the Trump administration.

The draft report by scientists from 13 federal agencies concludes that Americans are feeling the effects of climate change right now. It directly contradicts claims by President Trump and members of his cabinet who say that the human contribution to climate change is uncertain, and that the ability to predict the effects is limited.

"Evidence for a changing climate abounds, from the top of the atmosphere to the depths of the oceans," a draft of the report states. It was uploaded to a nonprofit internet digital library in January but received little attention until it was published by The New York Times.

The authors note that thousands of studies, conducted by tens of thousands of scientists, have documented climate changes on land and in the air. "Many lines of evidence demonstrate that human activities, especially emissions of greenhouse

The report was completed this year and is a special science section of the National Climate Assessment, which is congressionally mandated every four years. The National Academy of Sciences has signed off on the draft report, and the authors are awaiting permission from the Trump administration to release it.

One scientist who worked on the report, Katharine Hayhoe, a professor of political science at Texas Tech University, called the conclusions among "the most comprehensive climate science reports" to be published. Another scientist involved in the process, who spoke to The New York Times on the condition of anonymity, said he and others were concerned that it would be suppressed.

The White House and the Environmental Protection Agency did not immediately return calls or respond to emails requesting comment on Monday night.

The report concludes that even if humans immediately stopped emitting greenhouse gases into the atmosphere, the world would still feel at least an additional 0.50 degrees Fahrenheit (0.30 degrees Celsius) of warming over this century compared with today. The projected actual rise, scientists say, will be as much as 2 degrees Celsius.

A small difference in global temperatures can make a big difference in the climate: The difference between a rise in global temperatures of 1.5 degrees Celsius and one of 2 degrees Celsius, for example, could mean longer heat waves, more intense rainstorms and the faster disintegration of coral reefs.

Among the more significant of the study's findings is that it is possible to attribute some extreme weather to climate change. The field known as "attribution science" has advanced rapidly in response to increasing risks from climate change.

The E.P.A. is one of 13 agencies that must approve the report by Aug. 18. The agency's administrator, Scott Pruitt, has said he does not believe that carbon dioxide is a primary contributor to global warming.

"It's a fraught situation," said Michael Oppenheimer, a professor of geoscience and international affairs at Princeton University who was not involved in the study. "This is the first case in which an analysis of climate change of this scope has come

up in the Trump administration, and scientists will be watching very carefully to see how they handle it."

Scientists say they fear that the Trump administration could change or suppress the report. But those who challenge scientific data on human-caused climate change say they are equally worried that the draft report, as well as the larger National Climate Assessment, will be publicly released.

The National Climate Assessment "seems to be on autopilot" because of a lack of political direction, said Myron Ebell, a senior fellow at the Competitive Enterprise Institute.

The report says significant advances have been made linking human influence to individual extreme weather events since the last National Climate Assessment was produced in 2014. Still, it notes, crucial uncertainties remain.

It cites the European heat wave of 2003 and the record heat in Australia in 2013 as specific episodes where "relatively strong evidence" showed that a man-made factor contributed to the extreme weather.

In the United States, the authors write, the heat wave that broiled Texas in 2011 was more complicated. That year was Texas' driest on record, and one study cited in the report said local weather variability and La Niña were the primary causes, with a "relatively small" warming contribution. Another study had concluded that climate change made extreme events 20 times more likely in Texas.

Based on those and other conflicting studies, the federal draft concludes that there was a medium likelihood that climate change played a role in the Texas heat wave. But it avoids assessing other individual weather events for their link to climate change. Generally, the report described linking recent major droughts in the United States to human activity as "complicated," saying that while many droughts have been long and severe, they have not been unprecedented in the earth's hydrologic natural variation.

Worldwide, the draft report finds it "extremely likely" that more than half of the global mean temperature increase since 1951 can be linked to human influence.

In the United States, the report concludes with "very high" confidence that the number and severity of cool nights have decreased since the 1960s, while the frequency and severity of warm days have increased. Extreme cold waves, it says, are less common since the 1980s, while extreme heat waves are more common.

The study examines every corner of the United States and finds that all of it was touched by climate change. The average annual temperature in the United States will continue to rise, the authors write, making recent record-setting years "relatively common" in the near future. It projects increases of 5.0 to 7.5 degrees Fahrenheit (2.8 to 4.8 degrees Celsius) by the late century, depending on the level of future emissions.

It says the average annual rainfall across the country has increased by about 4 percent since the beginning of the 20th century. Parts of the West, Southwest and Southeast are drying up, while the Southern Plains and the Midwest are getting wetter.

With a medium degree of confidence, the authors linked the contribution of human-caused warming to rising temperatures over the Western and Northern United States. It found no direct link in the Southeast.

Additionally, the government scientists wrote that surface, air and ground temperatures in Alaska and the Arctic are rising at a frighteningly fast rate — twice as fast as the global average.

"It is very likely that the accelerated rate of Arctic warming will have a significant consequence for the United States due to accelerating land and sea ice melting that is driving changes in the ocean including sea level rise threatening our coastal communities," the report says.

Human activity, the report goes on to say, is a primary culprit.

The study does not make policy recommendations, but it notes that stabilizing the global mean temperature increase to 2 degrees Celsius — what scientists have referred to as the guardrail beyond which changes become catastrophic — will require significant reductions in global levels of carbon dioxide.

Nearly 200 nations agreed as part of the Paris accords to limit or cut fossil fuel emissions. If countries make good on those promises, the federal report says, that will be a key step toward keeping global warming at manageable levels.

Mr. Trump announced this year that the United States would withdraw from the Paris agreement, saying the deal was bad for America.

***Correction: August 9, 2017***

An article on Tuesday about a sweeping federal climate change report referred incorrectly to the availability of the report. While it was not widely publicized, the report was uploaded by the nonprofit Internet Archive in January; it was not first made public by The New York Times.

***Correction: August 15, 2017***

*An article last Tuesday about a sweeping federal climate change report misstated the professional credentials of Katharine Hayhoe, who contributed to the report. She is a professor at Texas Tech University, not a government scientist.*

Follow @NYTClimate on Twitter

A version of this article appears in print on August 8, 2017, on Page A1 of the New York edition with the headline: Climate Report Full of Warnings Awaits President.

# EXHIBIT "L"

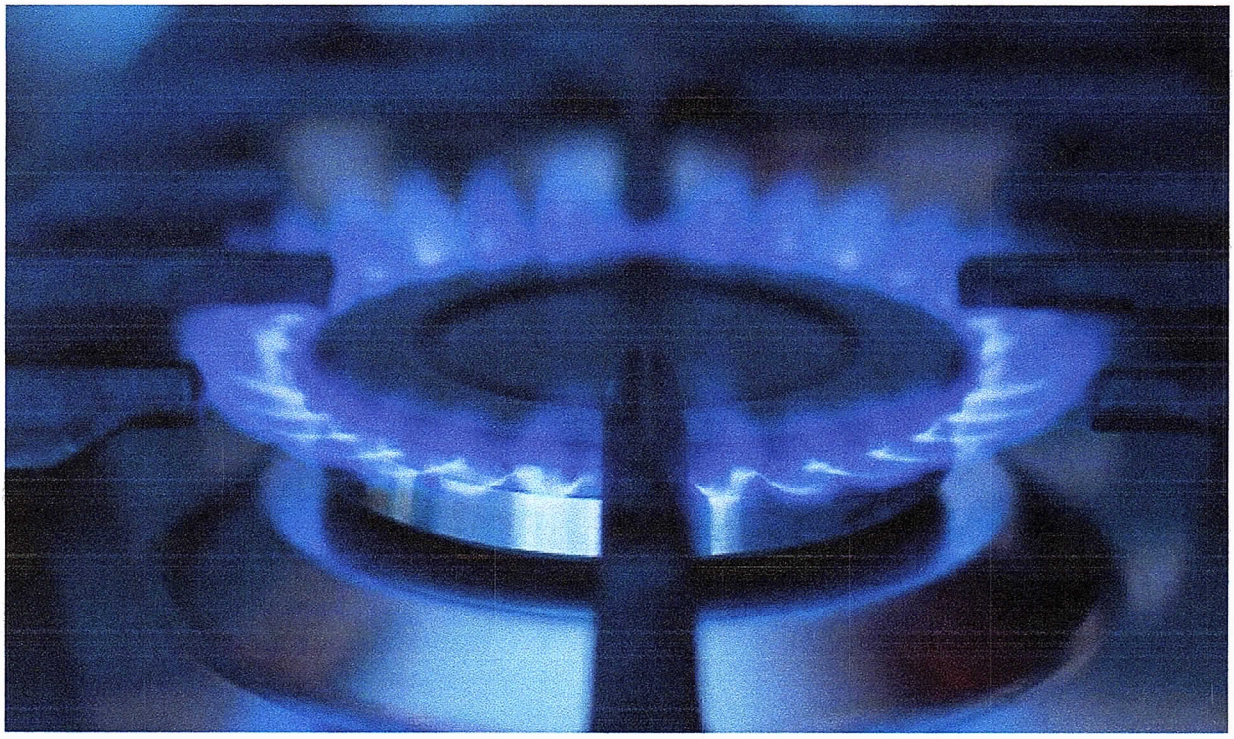
E&E NEWS

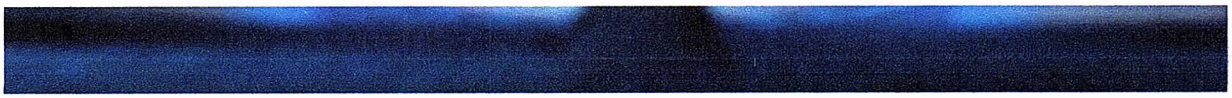
SUSTAINABILITY

# How Bad of a Greenhouse Gas Is Methane?

The global warming potential of the gaseous fossil fuel may be consistently underestimated

By Gayathri Vaidyanathan, ClimateWire on December 22, 2015





At present, nations report methane emissions in terms of $CO_2$ equivalents, using GWP100 as the conversion factor. This allows nations, such as the United States, that use natural gas to generate electricity to present a cleaner façade to the world than they have in reality. *Credit: ©iStock*





SAN FRANCISCO—Environmental advocates are trying to change how policymakers consider the climate impacts of methane, a potent greenhouse gas.

The change, if implemented, could make natural gas a less attractive option for generating electricity in power plants.

At issue is the global warming potential (GWP), a number that allows experts to compare methane with its better-known cousin, carbon dioxide. While $CO_2$ persists in the atmosphere for centuries, or even millennia, methane warms the planet on steroids for a decade or two before decaying to $CO_2$.

In those short decades, methane warms the planet by 86 times as much as $CO_2$, according to the Intergovernmental Panel on Climate Change.



But policymakers typically ignore methane's warming potential over 20 years (GWP20) when assembling a nation's emissions inventory. Instead, they stretch out methane's warming impacts over a century, which makes the gas appear more benign than it is, experts said. The 100-year warming potential (GWP100) of methane is 34, according to the IPCC.

There is no scientific reason to prefer a 100-year time horizon over a 20-year time horizon; the choice of GWP100 is simply a matter of convention.

The 100-year GWP value underestimates the gas's negative impacts by almost five times, said Ilissa Ocko, a climate scientist at the nonprofit Environmental Defense Fund. The quick warming in the short run catalyzed by methane can affect environmental processes, such as the flowering of plants, she said at the American Geophysical Union meeting last week.

"The short-lived climate pollutants [like methane] that we emit from human activities are basically controlling how fast the warming occurs," she said. "This is because they are very powerful at absorbing radiation."

EDF and some scientists are calling on the United Nations and policymakers to stop relying on GWP100. They would instead like experts to use GWP20 and GWP100 as a slashed pair.



**A push for quicker reductions**

"Just like if you were looking at blood pressure and there is only one number, and you'd be like, 'Where is the other one?'" Ocko said.

Ocko and her colleagues will soon publish a peer-reviewed study with this message to get the scientific community on board. Their hope is this convention would be more widely accepted among policymakers.

The effort has gained urgency since the United States has become a large natural-gas-producing nation. Its emissions of methane between 1990 and 2013 have fallen by 15 percent, according to U.S. EPA, though some studies have suggested that methane inventories may be faulty.

If the proposed nomenclature change is adopted by the United Nations, which collects greenhouse gas inventories from nations every year, it could change the optics of the climate change reductions nations are implementing, said Bryce Payne, director of science and technology at Gas Safety Inc., a company that measures methane emissions.

At present, nations report methane emissions in terms of $CO_2$ equivalents, using GWP100 as the conversion factor. This allows nations, such as the United States, that use natural gas to generate electricity to present a cleaner façade to the world than they have in reality, he said.

Payne and two other scientists wrote a letter to the U.S. delegation at the United Nations' climate change summit this month suggesting that the United Nations Framework Convention on Climate Change require nations to use a 10-year global warming potential, or GWP10, in their emissions inventory. This would allow quicker curbs on methane, they wrote.

"Efforts to control methane emissions should be part of a broad effort to reduce, preferably end, anthropogenic [greenhouse gas] emissions at the earliest possible date," he wrote.

*Reprinted from Climatewire with permission from Environment & Energy Publishing, LLC. www.eenews.net, 202-628-6500*

## ABOUT THE AUTHOR(S)

**Gayathri Vaidyanathan**

**Recent Articles**

Disasters Debated

Why the Deadly Louisiana Flood Occurred

What If Global Warming Emptied India?

# EXHIBIT "M"

Plymouth Record Enterprise

# Plymouth leads the way to new energy future

by Marcia Morris write the author

April 15, 2010

PLYMOUTH — When the Carbon Coalition's Climate Change Resolution passed voters approval at Town Meetings across New Hampshire in 2007, one of the things it did was encourage town officials to set up local advisory Energy Committees to look at ways that communities could save energy in municipal buildings. Over 160 New Hampshire towns and cities passed the resolution that spring, but it is fair to say that thus far, none has been more effective at producing results than Plymouth.

The Plymouth Energy Committee Chairman Paul Phillips this week announced that the town has received notification that it has been awarded $230,000 of Energy Efficiency and Conservation Block Grant (IEECBG) program funding by the Office of Energy Planning through the U.S. Department of Energy. The funding will enable Plymouth to conduct energy audits of seven town buildings, energy efficiency upgrades on four town buildings, including an ambitious model "retrofit" of the Water and Sewer Department Administration building, and the installation of photo voltaic systems on 3 buildings, the Plymouth Elementary School, the Pease Public Library and the Water and Sewer District building.

The Office of Energy Planning received 270 grant applications totaling $21 million of requests for the $6.6 million of available EECBG funding.

Phillips said that the Plymouth projects were well suited to fulfill some of the objectives of the grant because they are expected to provide ample opportunity for public education on high profile public buildings. The Water and Sewer Department building in particular, a double modular structure similar to many area residences, can serve as a model for the energy and money saving potential of energy retrofits on homes in the local area. He also noted that the timing of the Pease Public Library expansion project and the Plymouth Elementary School renovations, approved by voters at Town and District Meetings in March, provided an excellent window of opportunity to integrate the renewable energy upgrades into the design.

Plymouth Select Board has scheduled a public hearing that is required by statute to accept the "unanticipated" funds at the next regular meeting, April 26 at 6:30 p.m. in the Town Hall, after which a contract will be signed. The work will then go out to bid and is expected to begin this summer.

Plymouth has been unusually blessed with an extraordinary group of exceptionally qualified individuals volunteering to serve on the Energy Committee. The town is also well positioned to take the leadership role in modeling the potential for sustainable energy solutions for New Hampshire because of an array of factors, including the resources of Plymouth State University, with its track record for completing ambitious cutting edge (Leadership in Energy Efficient Design (LEED) projects, the presence of an innovative and dynamic grassroots movement to promote energy efficiency in the Plymouth Area Renewable Energy Initiative (PAREI), the community outreach efforts of the New Hampshire Electric Co-op, headquartered in Plymouth, and supportive town and local elected officials.

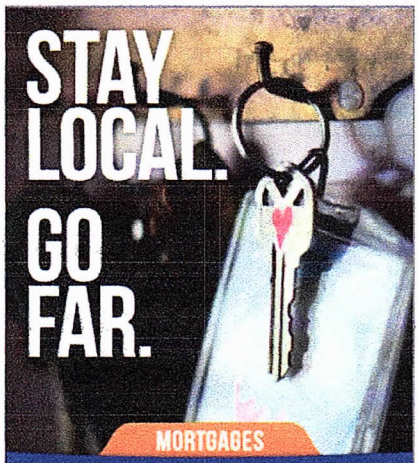
In addition to Phillips, Plymouth Energy Committee members include Ray Gosney, Steve Whitman, Steve Kahl, Bob Reals, John Mauchly, Tyler Durham, David Colburn, Brandon Miller and Madeline McElaney.

Voters at Town Meeting in Plymouth once again this year reiterated their commitment to alternative energy by approving warrant articles establishing a more formalized Town Energy Commission to supersede the ad hoc local energy committee and approving a warrant article to establish a tax exemption on the installation of renewable energy systems in Town.

With the action at Town meeting this year, Plymouth became the first town to receive approval from voters for the establishment of a more formalized Energy Commission under new state enabling legislation that came into effect this past September. The Commission will oversee moneys from a newly established municipal energy fund and will assist in administering grant funding for projects in the Town of Plymouth but will have not policy-making authority.

At the regular Select Board meeting this Monday night, Paul Phillips presented the energy committee's





recommendation for how to proceed on the establishment of the Plymouth Energy Commission. He reported that the current members of the committee are in unanimous agreement in recommending a six member commission, with 3 alternates, to be appointed by the board in staggered terms of from 1 to 3 years so that revolving membership will be achieved. The Select Board will take up their recommendation at a meeting in the near future.

Plymouth is also waiting to hear about another substantial grant to be awarded under the nationwide Beacon Communities Grant program. Plymouth was chosen by state officials as a "model" community, along with Nashua and Berlin, to compete with other states for New Hampshire's application for the award. Phillips indicated that in keeping with the community wide spirit of the Beacon project, one of the first tasks of the newly established Plymouth Energy Commission would likely be to ask the board to authorize participation in a Plymouth Energy Reduction Council, a public/private partnership bringing together businesses, civic organizations and other stakeholders in a community wide effort to study ways to reduce energy consumption throughout the Town and surrounding area.

Thanks for visiting SalmonPress.com

# EXHIBIT "N"

The New York Times

U.S.

# In New Hampshire, Towns Put Climate on the Agenda

By KATIE ZEZIMA MARCH 19, 2007

BARTLETT, N.H., March 18 — As they do every March at the town meeting here, residents debated and voted Thursday on items most local: whether to outfit the town fire truck with a new hose, buy a police cruiser and put a new drainpipe in the town garage.

But here and in schools and town halls throughout New Hampshire, between discussions about school boards and budgets, residents are also considering a state referendum on a global issue: climate change.

Of the 234 incorporated cities and towns in New Hampshire, 180 are voting on whether to support a resolution asking the federal government to address climate change and to develop research initiatives to create "innovative energy technologies." The measure also calls for state residents to approve local solutions for combating climate change and for town selectmen to consider forming energy committees.

"This is an important issue to people in New Hampshire; it's an environmentally friendly state," said Kurt Ehrenberg, a spokesman from the Sierra Club's New Hampshire office. "One of the driving factors here is the lack of federal leadership on this issue, and it's forced people to find a solution on the local level."

While the resolution is nonbinding, organizers hope to use it to force presidential candidates to address climate change during the New Hampshire presidential primary.

"We're trying to bring to the attention of presidential candidates that we are concerned about this in little purple New Hampshire," said Don Martin, 61, a real estate agent in Bristol who helped collect signatures to put the initiative on the agenda in his town, where it passed by a wide margin. "New Hampshire is fairly middle-of-the-road to conservative, and if we're concerned about this, then maybe you guys *should* pay attention to it."

As of Sunday, 134 towns had passed the initiative; some had yet to hold their meetings.

The New Hampshire Carbon Coalition, a bipartisan citizens group led by a former Republican state senator and the former chairman of the state Democratic Party, spearheaded the initiative to have climate change considered at town meetings. The last time voters in New Hampshire focused on a global issue at such meetings was in 1983, when more than 100 towns asked that the federal government do something about acid rain, which was polluting the state's waterways.

A handful of towns often take up national issues at their meetings, said Steve Norton, executive director of the New Hampshire Center for Public Policy Studies, an independent state policy group, but "this is definitely a little more rare."

"It might be somewhat normal for a town to take on a national initiative," Mr. Norton said, "but not half the towns in the state."

Here in Bartlett, a town of about 2,200 people in the White Mountains, the measure passed almost unanimously at the Thursday meeting. Bartlett's interest is both economical and environmental: best known for its ski areas, the town suffered from a lack of snow last year and in the first half of this winter.

"We have a vested interest in climate change here. We like to get snow," said Doug Garland, a town selectman who owns a snowshoeing and cross-country skiing area.

David P. Brown, a professor of climatology and geography at the University of New Hampshire, said that the state's average winter temperatures had risen over the past 30 years and that snowfall had decreased. "Every reputable climate model projects a continued warming for New England," Professor Brown said, "and I expect that trend to be mirrored in New Hampshire."

While the resolution has been supported widely, not all voters have approved of it. Gene Chandler, a selectman in Bartlett, said he did not think national issues should be brought before town meetings.

Tom Naegeli, 74, of Mont Vernon, voted against the measure in his town meeting. It passed overwhelmingly. "I just don't think it should be in the town meeting at all," Mr. Naegeli said. "I don't see any evidence of global warming."

Barry Rabe, a professor of public policy at the University of Michigan who tracks local climate change initiatives, said that Colorado and Washington had passed renewable energy standards by ballot initiative and that Texas had held hearings on the issue.

"To me New Hampshire is breaking a little different ground, using the town meeting approach," Professor Rabe said, "which isn't a widely available operation."

Mr. Ehrenberg, of the Sierra Club, said he and others hoped the votes would send a message that change could come from the bottom up.

"Those bumper stickers you see," he said, " 'Think globally, act locally' — this is really the embodiment of that."

A version of this article appears in print on , on Page A8 of the New York edition with the headline: In New Hampshire, Towns Put Climate on the Agenda.