Testimony--EPA 11.30.2021--Environmental Protection Agency's public hearing regarding the Oil and Natural Gas proposed rule addressing the climate crisis and improving people's health through a proposed rule that would lead to significant, cost-effective reductions in emissions of methane and other harmful pollutants from the oil and natural gas industry.

Introduction: I am Dr. Brita Lundberg, Chair of the Board at Greater Boston Physicians for Social Responsibility, testifying in support of the proposed EPA rule. GBPSR is a group of nationally-recognized experts in public health, cancer epidemiology, occupational medicine,environmental health, emergency medicine, disaster preparedness and the health effects of climate change.

I am a medical doctor, trained in infectious diseases. As Chair of the Board at Greater Boston Physicians for Social Responsibility, I have been active in raising awareness among the medical community and the public to the threats to human health posed by the air and water pollution from oil and gas development. I have advocated and co-authored several reports on the health risks to local communities here in Massachusetts who are faced with the many health hazards of new compressor stations and pipelines; I have given talks before local boards of health around the state, and I am a co-author on a peer-reviewed article, the False Promise of Natural Gas, in the New England Journal of Medicine on the health and climate dangers of natural gas development.

BACKGROUND While many people are aware that natural gas extraction causes health problems due to air and water pollution where the drilling is done, many are not aware that this infrastructure is associated with human health at every stage of its life cycle.

The gas emitted at compressor stations or leaked in our streets or burned in our gas stoves or furnaces is a mixture of methane and hexane (a neurotoxin); but it is likely that many of the observed health outcomes are due to ***what travels with it:*** things like benzene and formaldehyde, both known carcinogens; metals and radionuclides from the Earth's crust that can include (depending on the geographic region from which methane is extracted) lead, mercury and radioactive radon, uranium and thorium that are highly harmful to human health; and the criteria air pollutants produced in the burning of methane gas, like ground level ozone and particulate matter.

LEAKAGE: This massive infrastructure leaks---and that is a problem, because the US has more than 2.5 million miles of natural gas pipeline, more than any other country in

the world. It leaks because it is an ageing infrastructure and an infrequently monitored one: 50% of US pipelines are over 50 years old; only 7% of transmission lines are inspected.

According to a recent study in PNAS, methane emissions in Massachusetts are SIX times higher than state estimates. In Texas, this study showed that there was more benzene leaking from pipelines than at the well pad or drill rig. There are roughly 14,000 leaks in Massachusetts alone, which release billions of cubic feet of gas each year--worth millions of dollars.

But the health effects of this leakage are more costly still. Since this infrastructure leaks, these carcinogens and toxins leak not just into the soil but into our water systems and air—contaminating the food we eat, the air we breathe, and the water we drink.

HEALTH CONSEQUENCES What are the health consequences of these exposures? A wealth of peer-reviewed studies document the health hazards of natural gas infrastructure: asthma, COPD, childhood acute lymphocytic leukemia, miscarriage, congenital heart defects and increased premature birth.These are best defined at the drill rig, where more babies being born prematurely; more babies with heart defects, more kids with asthma; more children diagnosed with leukemia. But there are many others: increased pneumonia in those living near natural gas infrastructure; increased heart disease; increased thyroid and bladder cancer.

The increased PM2.5--whose increase in the last 3 years in this country is chiefly associated with natural gas development--has been associated with an excess death due to air pollution on the order of about 10,000 in 2018 alone; the mortality cost of those deaths to society, according to a study by the Cambridge think tank, the National Bureau of Economic Research: an estimated 89 billion.

EQUITY: Natural gas wells, pipelines and compressor stations are sited disproportionately in low-income, minority communities where they provide little benefit, cause societal disruption, and lead to those populations bearing the brunt of the negative health impacts. Additionally, recent studies show an association between exposure to air pollution with increased mortality from COVID-19, which has affected communities of color disproportionately.

Like the lead that sickened hundreds of children who drank lead contaminated water in Flint Michigan, the health hazards due to natural gas infrastructure may not be apparent--methane leaks, unless you visualize them using an infrared lens, are invisible to the naked eye. So it is a stealth form of pollution--and a stealth killer.

CLIMATE EFFECTS DUE TO THE EXPONENTIAL INCREASE IN METHANE DUE TO OIL AND GAS DEVELOPMENT Few people realize how much methane levels have been rising globally. Methane levels have increased exponentially-- an astounding 250% since the pre-industrial age (Changes in atmospheric carbon dioxide, methane and nitrous oxide from 0 to 2005: IPCC Climate Change 2007: TS2.1.1 ipcc.ch)--with the majority of that increase in the last 20 years, according to NBER, from natural gas development

and infrastructure. The fact that the leakage/flaring from the Bakken shale development can be seen from outer space --and lights up brighter than the city of Minneapolis -- offers visual evidence of this exponential growth.

ADDRESSING AIR POLLUTION HAS IMMEDIATE HUMAN HEALTH BENEFITS

Unlike second hand smoke from tobacco, that from natural gas is inescapable.

But when gas emissions from any source—gas leaks from well pads, pipelines, compressor stations, power plants-- are reduced or avoided, we experience immediate health benefits right here in the US--with decreased strokes, asthma rates, heart attacks--as was seen in the first months of the COVID pandemic or during the Olympic games in Atlanta--because of lower levels of air pollution from fossil fuel combustion and leakage.

The negative health effects that result from methane leakage of a natural gas infrastructure that has ballooned during the past 20 years--and the epic climate events they unleash--continue to accumulate all around us. I commend the EPA for showing leadership on this issue. Failure to act has come at a steep cost to the health of the children and adults you heard testify tonight. GBPSR supports effective controls on methane leakage now. Thank you.

Health and Environmental Hazards of Natural Gas.*		
Category Pathways and Mechanisms Established and Potential Health Hazards		
Local hazards		
Water contamination Ground and surface water at gas wells is contami- Many fracking chemicals are toxic: 25% are carcino- nated with fracking chemicals. gens; 75% are dermal, ocular, respiratory, and gastrointestinal toxins; 40 to 50% have toxic nervous, immune, cardiovascular, and renal effects; 30 to 40% are endocrine disruptors		
Air pollution	Heavy trucks, construction equipment, and drill rigs emit diesel exhaust, oxides of nitrogen, and particulates; sand piles release silica dust; gas venting and flaring produce volatile organic compounds (benzene, 1,3-butadiene, and form- aldehyde).	Exacerbation of asthma and COPD; increased risk of cardiovascular disease and diabetes; increased risk of prematurity and low birth weight; volatile organic compounds increase risk for leukemia and lym- phoma

Noise pollution Heavy equipment and gas flaring generate nearly continuous noise; sound levels can reach 70 A-weighted decibels, which exceeds EPA com- munity guidelines.		Sleep disturbance; stress (associated with increased cardiovascular disease risk); cognitive deficits in children
Light pollution	High-intensity illumination and gas flaring generate bright light day and night	Sleep disturbance; stress
Radionuclide releases Some shale formations contain naturally occurring radionuclides such as radon, principally in Pennsylvania and Texas.		Cancers, chiefly lung cancer
Earthquakes	Seismic activity is increased near fracking sites and up to 30 miles away.	Injuries; anxiety; loss of property value
Community disruption Poor and minority communities are disproportion- ately exposed to noise, toxic chemicals, and ex- plosion hazards.		Mental health problems; substance abuse; sexually transmitted diseases
Regional hazards		
Fires and explosions Pipeline explosions occur every year in the United States and recently occurred in Armada Township, MI; Refugio, TX; Salem, PA; Watford City, ND; and Merrimack Valley, MA.		Injury; death
Air pollution from gas combustion	Gas combustion in stoves, boilers, and furnaces generates oxides of nitrogen.	Increased asthma risk; exacerbation of COPD and car- diovascular disease
Global hazards		

Contributions to climate change	Use of natural gas causes methane leakage and gas combustion generates carbon dioxide.	Heat waves; extreme weather events; droughts; floods; wildfires; expanded ranges of vectorborne diseases; compromised food supplies resulting in famine, migration, conflict, and mental distress

* COPD denotes chronic obstructive pulmonary disease, and EPA Environmental Protection Agency. Sources of information are listed in the Supplementary Appendix, available at NEJM.org.

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