MEMORANDUM REGARDING DEVELOPMENTS CONCERNING THE RISKS OF SHALE GAS DEVELOPMENT SINCE FALL 2012

November 1, 2013

Set forth below in detail are four areas in which scientific understanding and evidence from case studies and scientific research regarding the risks of fracking have advanced substantially over the past year.

Evidence linking water contamination to fracking-related activities has increased.

New scientific evidence linking water contamination to fracking has come from across the U.S. in recent years. Even prior to the recent floods that resulted in significant spills and leaks, Colorado state data show more than 350 instances of groundwater contamination resulting from more than 2,000 oil and gas spills over the past five years.[1] In North Dakota, the Department of Mineral Resources is concerned about an increasing number of blowouts (23 incidents in the past year) that result in spills and public safety threats.[2] In Pennsylvania, the *Scranton Times-Tribune* released details of an investigation that revealed at least 161 cases of water contamination from fracking between 2008 and the fall of 2012, per Department of Environmental Protection records.[3] Meanwhile, operator-wide statistics show that 6-7% of new wells drilled in Pennsylvania over the past three years suffer from compromised structural integrity or outright well-casing failures, which could result in ground water contamination.[4]

In June, Duke University released a study linking fracking with elevated levels of methane, ethane, and propane in nearby groundwater.[5] In July, it was reported that regional EPA officials concluded that methane and other gases from fracking had created "significant damage to the water quality" in Dimock, PA.[6] In August, a University of Texas at Arlington study of drinking water found elevated levels of arsenic and other heavy metals in some samples from private

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[1] Bruce Finley, *Drilling spills reaching Colorado groundwater; state mulls test rules*, THE DENVER POST (Dec. 9, 2012), http://www.denverpost.com/environment/ci_22154751/drilling-spills-reaching-colorado-groundwater-state-mulls-test#ixzz2EihHU2fg ("Oil and gas have contaminated groundwater in 17 percent of the 2,078 spills and slow releases that companies reported to state regulators over the past five years").

[2] Amy Dalrymple, *More blowouts a concern for N.D.*, THE JAMESTOWN SUN (Sep. 3, 2013), *available at* http://www.ndnewsfeed.com/jamestown/more-blowouts-a-concern-for-nd/.

[3] Laura Legere, *Sunday Times review of DEP drilling records reveals water damage, murky testing methods*, THETIMES-TRIBUNE.COM (May 19, 2013), http://thetimes-tribune.com/news/sunday-times-review-of-dep-drilling-records-reveals-water-damage-murky-testing-methods-1.1491547.

[4] Anthony Ingraffea, PhD., P.E., *Fluid Migration Mechanisms Due to Faulty Well Design and/or Construction: An Overview and Recent Experiences in the Pennsylvania Marcellus Play*, PHYSICIANS SCIENTISTS & ENGINEERS FOR HEALTHY ENERGY (Jan. 2013), *available at* http://www.psehealthyenergy.org/data/PSE__Cement_Failure_Causes_and_Rate_Analaysis_Jan_2013_Ingraffea1.pdf.

[5] Robert Jackson et al., I*ncreased stray gas abundance in a subset of drinking water wells near Marcellus shale gas extraction*, PNAS EARLY EDITION (Jun. 3, 2013), *available at* http://catskillcitizens.org/learnmore/dukedocument_ew_01.pdf.

[6] Susan Phillips, *LA Times: EPA Not in Agreement Over Dimock*, STATEIMPACT (Jul. 27, 2013), http://stateimpact.npr.org/pennsylvania/2013/07/28/la-times-epa-not-in-agreement-over-dimock/.

drinking water wells located within 5 km of active natural gas wells.[7] Researchers concluded that these compounds could be due to fracking-related activities in the Barnett shale.[8] In October, a study published in the journal *Environmental Science and Technology* found a toxic legacy of radiation in the Allegheny River—with concentrations of radium 200 times above normal levels in the sediments as a result of fracking wastewater disposal.[9]

Because highly toxic chemicals are associated with fracking operations, leaks and spills are deeply troubling. This point was underscored in August by a joint United States Geological Survey and U.S. Fish and Wildlife Service study that linked a fracking wastewater spill to the widespread death of fish in Kentucky.[10] At the same time, concern is growing about high levels of naturally occurring radiation in wastewater—as much as 300 times the Nuclear Regulatory Commission limit for industrial discharge and thousands of times the federal limit for drinking water.[11]

Earlier this month, evidence of a link between fracking and water contamination prompted both Tom Jacobus, managing director of the Washington Aqueduct, and George Hawkins, general manager of Washington D.C.'s water supply to call for the prohibition of fracking near the Nation's capital.[12] In the words of Mr. Jacobus, "[a]lthough studies on the technique are still needed in order to fully understand the potential impact on drinking water, enough study on the technique has been done and information has been published to give us great cause for concern about the potential for degradation of the quality of our raw water supply as well as impact to the quantity of the supply."[13] Both the Army Corps of Engineers and the Fairfax County Water Authority have called for a ban on fracking in the George Washington National Forest within the Washington DC watershed.[14]

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[7] Brian Fontenot et al., *An evaluation of water quality in private drinking water wells near natural gas extraction sites in the Barnett Shale Formation*, ENVIRONMENTAL SCIENCE AND TECHNOLOGY (Jul. 25, 1983), *available at* http://blogs.star-telegram.com/files/uta-water-study.pdf.

[8] *Id.*

[9] Jim Efstathiou Jr., *Radiation in Pennsylvania Creek Seen as Legacy of Fracking*, BLOOMBERG BUSINESSWEEK (Oct. 2, 2013), http://www.businessweek.com/news/2013-10-02/radiation-in-pennsylvania-creek-seen-as-legacy-of-fracking-waste.

[10] USGS, *Hydraulic Fracturing Fluids Likely Harmed Threatened Kentucky Fish Species* (Aug. 28., 2013), *available at* http://www.usgs.gov/newsroom/article.asp?ID=3677.

[11] Rachel Morgan, *Fracking wastewater can be highly radioactive*, TIMESONLINE.COM (Jan. 24, 2013), http://www.timesonline.com/news/local_news/fracking-wastewater-can-be-highly-radioactive/article_ac1dd0e8-5a2f-57aa-8c5d-1d80273e261e.html.

[12] Aaron Wiener, *Experts Worried Fracking Could Harm D.C. Area's Water Supply*, WASHINGTON CITY PAPER (Aug. 30, 2013), http://www.washingtoncitypaper.com/blogs/housingcomplex/2013/08/30/experts-worried-fracking-could-harm-d-c-areas-water-supply/; Aaron Wiener, *DC Water Chief Urges Agriculture Secretary Not to Allow Fracking Near D.C.*, WASHINGTON CITY PAPER (Sep. 20, 2013), http://www.washingtoncitypaper.com/blogs/housingcomplex/2013/09/20/dc-water-chief-urges-agriculture-secretary-not-to-allow-fracking-near-d-c/.

[13] *Id.*

[14] Darryl Fears, *U.S. Forest Service set to decide on fracking in George Washington National Forest*, THE WASHINGTON POST (Sep. 7, 2013), http://www.wpost.com/national/health-science/us-forest-service-set-to-decide-on-fracking-in-george-washington-national-forest/2013/09/07/cb7228aa-1644-11e3-a2ec-b47e45e6f8ef_story.html.

The disposal of fracking wastewater has been causally linked to earthquakes.

High-volume hydrofracking generates high volumes of toxic liquid waste. Its safe containment is an ongoing problem without a good solution.[15] One common practice is to inject these fluids into porous bedrock via deep disposal wells. However, this method has the potential to cause induced earthquakes. In July, a new study in *Science* by Columbia University's Lamont-Doherty Earth Observatory showed that deep-well injection of fracking waste can stress geological faults in ways that make them vulnerable to slipping. The research showed that distant natural earthquakes triggered swarms of smaller earthquakes on these critically stressed faults.[16] These findings are supported by scientific evidence and observations in other states across the country where fracking waste disposal is commonly practiced. In Oklahoma, scientists linked a 2011 swarm of earthquakes to fracking waste disposal in that state.[17] This includes a magnitude 5.7 earthquake—the largest ever cause by wastewater injection—that injured two people, destroyed 14 homes, and was felt across 17 states.[18] In Texas, a 2008-2009 swarm of earthquakes in the Dallas-Fort Worth area, where the Barnett Shale is being developed, was also linked to produced water disposal wells.[19] And in Ohio, yet another recent study link more than 100 earthquakes to fracking disposal wells.[20] Similar rashes of earthquakes in Arkansas motivated the Arkansas Oil and Gas Commission to shut down a disposal well and enact a permanent moratorium on future disposal wells in a nearly 1,200 square-mile area in the Fayetteville Shale.[21]

In light of the growing body of science linking oil and gas infrastructure to seismic activity, it is important to recall that the New York City Department of Environmental Protection ('DEP') has, on numerous occasions, raised serious concerns about the impacts of potential seismic activity from fracking-related activities on New York City's water supply infrastructure.[22, 23, 24] The

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[15] NRDC, *In Fracking's Wake: New Rules are Needed to Protect Our Health and Environment from Contaminated Wastewater* (May 2012), *available at* http://www.nrdc.org/energy/files/fracking-wastewater-fullreport.pdf.
[16] Sharon Begley, *Study raises new concern about earthquakes and fracking fluids*, REUTERS (Jul. 11, 2013), http://www.reuters.com/article/2013/07/11/us-science-fracking-earthquakes-idUSBRE96A0TZ20130711.
[17] Mark Drajem & Jim Efstathiou Jr., *Quake Tied to Oil-Drilling Waste Adds Pressure for Rules*, BLOOMBERG (Mar. 27, 2013), http://www.bloomberg.com/news/2013-03-26/oklahoma-earthquake-in-2011-tied-to-wastewater-wells-in-fracking.html.
[18] Michael Behar, *Fracking's Latest Scandal? Earthquake Swarms*, MOTHER JONES (Mar./Apr. 2013), http://www.motherjones.com/environment/2013/03/does-fracking-cause-earthquakes-wastewater-dewatering?page=1.
[19] Cliff Frohlich et al., *The Dallas–Fort Worth Earthquake Sequence: October 2008 through May 2009*, BULLETIN OF THE SEISMOLOGICAL SOCIETY OF AMERICA, vol. 101, issue 1, at 327-340 (2011).
[20] Bill Chameides, *Fracking Waste Wells Linked to Ohio Earthquakes*, SCIENTIFIC AMERICAN (Sep. 5, 2013), http://www.scientificamerican.com/article.cfm?id=fracking-waste-wells-linked-to-ohio.
[21] Caroline Zilk, *Permanent disposal-well moratorium issued*, ARKANSASONLINE (Jul., 31, 2011), http://www.aogc.state.ar.us/notices/Ex.%201B%20-Permanent%20Disposal%20Well%20Moratorium%20Area.pdf.
[22] The City of New York, *New York City Comments on dSGEIS for Oil, Gas, and Solution Mining Regulatory Program*, 47 (Dec. 22, 2009), *available at* http://www.nyc.gov/html/dep/pdf/natural_gas_drilling/nycdep_comments_final_12-22-09.pdf.
[23] New York City Department of Environmental Protection, *Comments on the Revised Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program (September 7, 2011)* (Jan. 11, 2012), *available at* http://www.nyc.gov/html/dep/pdf/natural_gas_drilling/nycdep_comments_on_rdsgeis_for_hvhf_20120111.pdf.
[24] New York City Department of Environmental Protection, *Comments on the Revised High-Volume Hydraulic Fracturing Regulations (November 30, 2012)* (Jan. 7, 2013), *available at*

DEP's questions remain unanswered, as do questions about the potential impacts of seismic activity on water supplies across the state.[25]

Air quality impacts from fracking-related activities are clearer than ever. They include the release of pollutants such as ozone, benzene, and silica dust that are linked to costly, disabling health problems.

A Colorado School of Public Health study found air pollutants near fracking sites linked to neurological and respiratory problems and cancer.[26] Likewise, last December, a new study linked a single well pad to more than 50 airborne chemicals, 44 of which have known health effects.[27] Similarly, in January, a second National Oceanic and Atmospheric Administration study identified emissions from oil and gas fields in Colorado as a significant source of pollutants that contribute to ozone problems.[28, 29] Exposure to elevated levels of ground-level ozone is known to worsen asthma and has been linked to respiratory illnesses and stroke and heart attack risk.[30]

Reports of symptoms from these types of exposures have been documented in shale-heavy states like Pennsylvania, where a 2012 study of more than 100 state residents living near gas facilities found that reported health symptoms closely matched the scientifically established effects of chemicals detected through air and water testing at those nearby sites, and occurred at significantly higher rates at households closer to the facilities than those further away.[31] Additionally, medical experts at a rural clinic in one Pennsylvania county report case studies of 27 individuals with acute symptoms that could be linked to air contaminants.[32, 33]

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http://www.nyc.gov/html/dep/pdf/natural_gas_drilling/revised_high_volume_hydraulic_fracturing_regulations_comments_letter_010713.pdf.

[25] Casey Seiler, *Tkaczyk, Avella question DEC's seismic work*, CAPITOL CONFIDENTIAL (Feb. 8, 2013), http://blog.timesunion.com/capitol/archives/178040/tkaczyk-avella-question-decs-seismic-work/.

[26] Colorado School of Public Health, *Study shows air emissions near fracking sites may have serious health impacts*, @THEFOREFRONT (Mar. 19, 2012), http://attheforefront.ucdenver.edu/?p=2546&utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+theforefront+%28%40theForefront%29.

[27] Lisa Song, *Hazardous Air Pollutants Detected Near Fracking Sites*, BLOOMBERG (Dec. 3, 2012), http://www.bloomberg.com/news/2012-12-03/hazardous-air-pollutants-detected-near-fracking-sites.html.

[28] Jeff Tollefson, *Methane leaks erode green credentials of natural gas*, NATURE (Jan. 2, 2013), http://www.nature.com/news/methane-leaks-erode-green-credentials-of-natural-gas-1.12123.

[29] EPA, *Our Nation's Air: Status and Trends through 2010*, 14 (Feb. 2012), *available at* http://www.epa.gov/airtrends/2011/report/fullreport.pdf (methane contributes to ozone formation).

[30] American Lung Association, *Ozone Pollution* (last visited Oct. 31, 2013), http://www.stateoftheair.org/2013/health-risks/health-risks-ozone.html.

[31] N. Steinzor et al., *Investigating Links Between Shale Gas Impacts and Health through a Community Survey Project in Pennsylvania*, New Solutions, Vol. 23(1) 55-83 (2013), *available at* http://www.earthworksaction.org/files/publications/SteinzorSubraSumiShaleGasHealthImpacts2013.pdf.

[32] Lindsay Abrams, *Fracking's real health risk may be from air pollution*, SALON (Aug. 26, 2013), http://www.salon.com/2013/08/26/frackings_real_health_risk_may_be_from_air_pollution/.

[33] Larysa Dyrszka et al., *Statement on Preliminary Findings from the Southwest Pennsylvania Environmental Health Project Study*, Concerned Health Professionals of NY (Aug. 27, 2013), *available at* http://concernedhealthny.org/statement-on-preliminary-findings-from-the-southwest-pennsylvania-environmental-health-project-study/.

Increasing evidence of chemical air emissions from drilling and fracking operations is cause for alarm, especially as more and more people who live downwind report ill health effects.[34, 35] For example, in Texas, new air monitoring data in the Eagle Ford Shale area reveal that residents there could be exposed to dangerous levels of air pollution, including both benzene and hydrogen sulfide gas.[36] Because any chronic illnesses can take years to manifest, impacts related to exposure to air contaminants such as ozone, radon, formaldehyde, and diesel exhaust could be significant in years to come. Furthermore, exposure to chemical mixtures may present a higher risk as was seen in new research that found an elevated cancer risk when two or more carcinogens were present at "safe" levels.[37]

Meanwhile, the oil and gas industry reports an annual occupational fatality rate seven times higher than the national average.[38] As new studies show, jobs in the gas field not only carry high risks for blunt trauma and vehicular fatalities, but also involve exposure to carcinogenic silica dust that far exceeds OSHA limits for safety and is not adequately mitigated dust masks.[39] Silica dust exposure is linked to disabling silicosis as well as lung cancer. Notably, a May 2013 poll showed that two-thirds of Pennsylvanians support a moratorium on fracking because of concern about negative health impacts.[40]

The economic benefits of the fracking boom have been challenged as being over-hyped and short-lived.

New economic analyses show results that fall far short of what the industry promised and still claims. In a September 2013 feature titled "Pa. fracking boom goes bust," *The Philadelphia Inquirer* covers new data from the independent Keystone Research Center detailing "flat at best" job growth, plunging prices and royalty payments, and sharp production declines.[41] These findings continue a trend: as previously documented by the Keystone Research Center, the gas industry's claim of 48,000 jobs created between 2007 and 2010 is a far cry from the real number of only 5,669 jobs—many of which are out-of-state hires.[42]

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[34] *See* Pennsylvania Alliance for Clean Water and Air, *List of the Harmed* (last visited Oct. 31, 2013), http://pennsylvaniaallianceforcleanwaterandair.wordpress.com/the-list/.
[35] Lynne Peeples, *Fracking Pollution Sickens Pennsylvania Families, Environmental Group Says*, HUFFINGTON POST (Oct. 18, 2012), http://www.huffingtonpost.com/2012/10/18/fracking-pollution-pennsylvania_n_1982320.html.
[36] Sharon Wilson et al., *Reckless Endangerment While Fracking the Eagle Ford Shale*, Earthworks (Sep. 19, 2013), *available at* http://www.earthworksaction.org/library/detail/reckless_endangerment_in_the_eagle_ford_shale#.UkGi-4Y3uSo.
[37] John Davis, *Researchers Find Cancer Risks Double When Two Carcinogens Present at 'Safe' Levels*, TEXAS TECH TODAY (Jun. 28, 2013), http://today.ttu.edu/2013/06/researchers-find-cancer-risks-double-when-two-carcinogens-present-at-safe-levels/#sthash.B6ORtVnp.dpuf.
[38] CDC, *Oil and Gas Extraction: Occupational Safety and Health Risks* (last visited Oct. 31, 2013), http://www.cdc.gov/niosh/programs/oilgas/risks.html.
[39] Robert Iafolla, *Workers' Silica Exposure at Fracking Sites Far Exceeds OSHA Limit, NIOSH Study Finds*, BLOOMBERG BNA (Aug. 1, 2013), http://www.bna.com/workers-silica-exposure-n17179875594/.
[40] Susan Phillips, *Poll Shows Support for a Drilling Moratorium in Pennsylvania*, STATEIMPACT (May 14, 2013), http://stateimpact.npr.org/pennsylvania/2013/05/14/poll-shows-support-for-a-drilling-moratorium-in-pennsylvania/.
[41] Will Bunch, *Pa. fracking boom goes bust*, PHILLY.COM (Sep. 12, 2013), http://articles.philly.com/2013-09-12/news/41974274_1_fracking-boom-penn-state-marcellus-center-marcellus-shale.
[42] Stephen Herzenberg, *Drilling Deeper into Job Claims*, Keystone Research Center (Jun. 20, 2011), *available at* http://keystoneresearch.org/sites/keystoneresearch.org/files/Drilling-Deeper-into-Jobs-Claims-6-20-2011_0.pdf.

Low gas prices and disappointing wells have led major companies to write down oil and gas shale assets by billions of dollars.[43] Meanwhile, Chesapeake Energy is coping with its financial woes in Pennsylvania by shifting costs to landowners who are now receiving drastically reduced royalty payments.[44] In West Virginia, more than half of landowners with shale wells on their property report problems including damage to the land, decline in property values, truck traffic and lack of compensation by the oil and gas company.[45]

New evidence reveals negative impacts of shale gas extraction on property values.[46, 47] In August, The Atlantic Cities and MSN Money noted that fracking operations may be damaging property values and may impair mortgages or the ability to obtain property insurance.[48, 49] Additional new research corroborates earlier findings that link fracking to significant road damage, increased truck traffic, crime, and strain on municipal and social services. Data from the past ten years on the social costs of fracking including truck accidents, arrests, and higher rates of sexually transmitted diseases are cause for alarm.[50] These costs are ultimately born by local residents and communities.[51, 52, 53] Overall, the industry-promised hundreds of thousands of jobs in Pennsylvania haven't materialized, nor have the promised waves of new industries. Local media have asked, "what boom?" as unemployment has increased and the state fell to 49th in the nation for job creation last year.[54]

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[43] Matthew Monks, *Shale Grab in U.S. Stalls as Falling Values Repel Buyers*, BLOOMBERG (Aug. 18, 2013), http://www.bloomberg.com/news/2013-08-18/shale-grab-in-u-s-stalls-as-falling-values-repel-buyers.html.
[44] Abraham Lustgarten, *Unfair Share: How Oil and Gas Drillers Avoid Paying Royalties*, PROPUBLICA (Aug. 13, 2013), http://www.propublica.org/article/unfair-share-how-oil-and-gas-drillers-avoid-paying-royalties.
[45] Alan Collins & Kofi Nkansah, *Divided Rights, Expanded Conflict: The Impact of Split Estates in Natural Gas Production*, (2013) http://ageconsearch.umn.edu/bitstream/150128/2/Collins_Nkahsah_Split%20estate.pdf.
[46] Bob Downing, *Ohio Utica Shale: Survey says home values hurt by fracking at drill sites*, AKRON BEACON JOURNAL ONLINE (Aug. 22, 2013), http://www.ohio.com/blogs/drilling/ohio-utica-shale-1.291290/survey-says-home-values-hurt-by-fracking-at-drill-sites-1.422838.
[47] Danielle Muoio, *Duke researchers show dip in home value caused by nearby fracking*, THE CHRONICLE (Nov. 16, 2012), http://www.dukechronicle.com/articles/2012/11/16/duke-researchers-show-dip-home-value-caused-nearby-fracking.
[48] Roger Drouin, *How the Fracking Boom Could Lead to a Housing Bust*, THE ATLANTIC CITIES (Aug. 19, 2013), http://www.theatlanticcities.com/politics/2013/08/how-fracking-boom-could-lead-housing-bust/6588/.
[49] Jason Notte, *Fracking leaves property values tapped out*, MSN MONEY (Aug. 21, 2013), http://money.msn.com/now/post--fracking-leaves-property-values-tapped-out.
[50] Brendan Gibbons, *Environmental groups calculate social cost of natural gas boom*, THETIMES-TRIBUNE.COM (Sep. 25, 2013), http://thetimes-tribune.com/news/environmental-groups-calculate-social-cost-of-natural-gas-boom-1.1558186.
[51] *See Increased Gas Drilling Activities Bringing New Challenges to Local Governments in Pennsylvania*, P.R. NEWSWIRE, (May 24, 2013), http://www.prnewswire.com/news-releases/increased-gas-drilling-activities-bringing-new-challenges-to-local-governments-in-pennsylvania-94774764.html.
[52] *See, e.g.*, Zack Needles, *Must crime follow Pennsylvania's gas drilling boom?*, PITTSBURGH POST-GAZETTE (Aug. 15, 2011), http://www.post-gazette.com/stories/business/legal/must-crime-follow-pennsylvanias-gas-drilling-boom-310373/.
[53] *See, e.g.*, Steve Reilly, *Document estimates fracking's toll on N.Y. roads: Repairs could cost hundreds of millions annually, it states*, PRESSCONNECTS.COM (Jul. 26, 2011), http://www.pressconnects.com/article/20110726/NEWS01/107260384/Document-estimates-fracking-s-toll-N-Y-roads.
[54] Rachel Morgan, *What boom? Industry pundits claim thousands of jobs will be created, but numbers don't quite add up*, TIMESONLINE (May 4, 2013), http://keystoneresearch.org/media-center/media-coverage/beaver-county-times-what-boom-industry-pundits-claim-thousands-jobs-will.

In contrast, clean energy jobs have been growing consistently and in many cases far outpacing job growth in other energy sectors. As the *Los Angeles Times* noted about a Bureau of Labor Statistics report, clean energy jobs have been growing four times faster than others.[55] In another example, Massachusetts has seen double digit clean energy jobs growth for the second year in a row,[56] and has more jobs in clean energy than Pennsylvania has in natural gas.[57] The latest reports from the Department of Energy on national growth in wind and solar are very encouraging, showing that renewable energy is rapidly expanding, prices are falling, and smart public policies and incentives work.[58, 59] Solar power grew tremendously in 2012 and became more competitive, while there is still significant room to reduce the cost of solar and expand solar across the country with better policies. The United States led the world in new installed wind power capacity in 2012, with 70 percent of U.S. wind power components manufactured in the U.S.[60] U.S. Energy Information Administration statistics show that energy efficiency measures are having a significant impact, with plenty of room still to improve.[61] Meanwhile, New York has made strides in clean energy and efficiency, but research shows that our state has the potential to do much more, which would help the economy while protecting public health, safeguarding the environment, and working to address climate change.[62]

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[55] Don Lee, *Green jobs grow four times faster than others*, LA TIMES (Mar. 19, 2013), http://articles.latimes.com/2013/mar/19/business/la-fi-mo-green-jobs-20130319.

[56] Massachusetts Clean Energy Center, *Governor Patrick Announces 11.8 Percent Clean Energy Job Growth* (Sep. 17, 2013), http://www.masscec.com/news/governor-patrick-announces-118-percent-clean-energy-job-growth.

[57] Greentech Media, *MA Has Double the Jobs in Clean Energy That PA Has in Natural Gas*, BREAKING ENERGY (Sep. 19, 2013), http://breakingenergy.com/2013/09/19/ma-has-double-the-jobs-in-clean-energy-that-pa-has-in-natural-gas/.

[58] *See* Cai Steger, *Solar Powers Ahead With Record 2012 Numbers*, NRDC SWITCHBOARD (Aug 13, 2013), http://switchboard.nrdc.org/blogs/csteger/august_is_turning_out_to.html.

[59] *See* Nathanael Greene, *Dazzling dozen show how clean energy policy work for solar*, NRDC SWITCHBOARD (Jul. 25, 2013), http://switchboard.nrdc.org/blogs/ngreene/dazzling_dozen_show_how_clean.html.

[60] Cai Steger, *The Power of Wind Compels You to Read This Report*, NRDC SWITCHBOARD (Aug 7, 2013), http://switchboard.nrdc.org/blogs/csteger/the_power_of_wind_compels_you.html.

[61] *See* Ralph Cavanagh, *Great Energy News: What's America's Most Productive, Cost-Effective Resource?*, NRDC SWITCHBOARD (Oct. 8, 2013), http://switchboard.nrdc.org/blogs/rcavanagh/great_energy_news_whats_americ.html.

[62] Stacy Clark, *Can New York State Power its Way to a Sustainable Future?*, HUFFINGTON POST (Mar. 12, 2013), http://www.huffingtonpost.com/stacy-clark/mark-z-jacobson-renewable-energy_b_2859518.html.