**Responses by Tim Considine**

**DEFINITIONAL**

What constitutes a 'tight sand' formation?

***The lack of permeability/transmissibility of the formation.***

How does multi-stage fracking differ from traditional fracking?

***There is no difference between multi-stage fracking and conventional fracking—***

Please define "natural gas liquids" in chemical terms

are there other methods to extract the fuel from shale other than fracking?

***Natural gas liquids have nothing to do with fracking – these liquids are at reservoir conditions gaseous – in terms of their chemistry – they are linear chained hydrocarbons that are known as propane, butane and pentane. Propane is C3H8, butane is C4H10, and pentane is C5H12.***

What's the relationship between the proportion of natural gas liquids and what people refer to as "wet gas", if any?

***There is no relationship – the term wet gas means that liquids can be recovered from the gas – the processing of this gas is accomplished using methods such as cryogenics.***

­What are induced impacts?­

***Indusced impacts arise from workers hired directly and indirectly from Marcellus drilling go out and spend that income, thereby, inducing another round of economic stimulus.***

What does the phrase "gas migration event" connote?

***Natural gas moving from the wellbore to another formation.***

Please provide a link to the full report for the Manhattan Institute.

<http://www.manhattan-institute.org/html/eper_09.htm>

On slide 9, what were the units?

**The units are in billions of cubic feet.**

Actually, the tank on the right on the top of that figure was not to collect liquids. Instead, it is an additive that is injected into the well to prevent hydrate formation. Something that would interfere with the gas collection.

**The point is to illustrate how the well site looks after completion.**

Please comment on the process used in shale gas extraction vs that used in extraction from Canadian oil shale

***The process in Canada utilizes open-pit mining or heat to liquefy a tar-like substance. The extraction of natural gas from shale utilizes conventional drilling and completion techniques.***

**WATER LIQUIDS FRACK FLUIDS**

Used frack fluid (noting this is not just water) is being injected into wells in my county in Ohio. The toxicology of these chemicals is tightly protected. What are the typical compound being injected into these wells as used frack fluid?

***The components of frack-fluids are not a guarded secret. A list of these materials can be found on the PA DEP web-page. PA requires that a list of the materials used in hydraulic fracturing be included in the well’s completion report.***

Release of gases from fracturing is not limited to usable fuel. For instance, methane and radon are also being released as these gases occur naturally in the shale. How is this gas being kept out of the water supply by efficient fracturing systems?

***Any gas that is released from a shale well is vented to the atmosphere. Each well contains redundant strings of casing with cemented annular spaces that prevents the movement of gases into the water-supply.***

I live in southern MN and frac sand is a big business here. Along with that comes a lot of controversy on where and how this sand is being mined and used. Are there any new technologies coming to limit the use of this frac sand and use a different material?

***Sand from a variety of sources has been commonly used since the 1950’s. Other materials such as aluminate have been used. In general, conventional sand is used because it the least expensive of the proppants.***

With regard to the million gallons of water being used for well simulation, is it standard protocol to use potable water, or reclimated water not otherwise available for human consumption?

***Water from a variety of sources is used. For example, waste water from coal and water from sewerage treatment facilities are used. In PA, much of the water used in stimulation is recycled from one well to the other.***

where does the water and/or fluid come from? is it trucked in or is it local water supply? you showed the trucks with the pumps but you did not mention the source of the water

***See the previous question – in PA the source(s) of water are carefully documented by the DEP. Typically water from rivers/streams are collected during periods of high-flow and stored in lined pits for subsequent use. This water is augmented by the water recycled from previous stimulations. Moreover, the aggregate amount of water used in shale energy development is insignificant compared with other industrial and agricultural uses for water.***

What was the source of the information on the production decline curves shown on slide 7?

***Decline curves from unconventional reservoirs – shales – have been established from previous production from unconventional reservoirs and/or computer modeling. As such, the decline is approximated as hyperbolic. The decline curve presented is based upon data publsiged by Range Resources and Seneca Oil & Gas.***

But 98% of millions of gallons is still a LOT.

***Yes, but again the amount of water used for shale energy production is insignificant compared with other uses for water.***

You don't want detergents and lubricants in our water, surface or groundwater.

***We agree! Incidents of water contamination are few and far between, see out Manhattan study.***

Would like to hear more about the millions of gallons of water used to frack a well and how it is removed from the water cycle forever.

***It is a statement of fact that millions of gallons of water are removed from the water-cycle. We are trading an abundant resource for the energy necessary to sustain our standard of living.***

Is brine produced in drilling in the Marcellus and Utica shales?

***Brine is not produced during the drilling of shale-wells – it is produced with the natural gas during production***

How are the fracturing fluids disposed of? When introducing hydraulic fracturing, the speaker said that water is used. Actually, it is water plus sand plus many chemicals. I suppose he will correct this statement later on. IT IS NOT JUST WATER!

***Hydraulic fracturing fluids are recycled for subsequent use in future wells. When the fluids are disposed of, they are discharged to EPA approved disposal wells. It is a true statement, that it is water plus chemicals.***

what about the impacts from the quantity, not just quality) of water used in the process? (is any of it reused?)

***Much of the water is reused for subsequent wells.***

Did his economic impact look at local water supplies in terms of the community that gives up the millions of gallons of water to use in the fracturing stage?

***Yes it does, the water that is obtained from local water supplies is purchased. As such, it is included in the cost of the well.***

Why would agriculture sources affect the groundwater content of methane?? This man is not a scientist, right? How would he know?

***Most of the methane that is generated is biogenic. This means that it is associated with decomposition of organic materials – organic materials are associated with agriculture – also, methane is generated by the flatulence of live-stock.***

**GHG**

How are the costs of environmental contamination, such as greenhouse gas emissions, and emissions of H2S, accounted for?

***These costs are included, see our Manhattan study referenced above.***

Has anyone captured the cost of the energy inputs associated with this technology, including cost of treatment of water used, and enviornmental costs?

***See our Manhattan study referenced above.***

How does the lifecycle emissions (GHG) factor for unconventional natural gas compare with conventional natural gas? (ie total emissions including production and end-of-life burning)

***See our Manhattan study referenced above.***

so, increase in gas production is not leading to a decrease in coal production?

***Yes and no – the use of coal for the generation of electricity will decline with time. The use of Metallurgical grade coal will continue and of course, the Chinese will import every ton of coal that can be produced. This suggests any coal displaced in North America will be exported if governments allow it.***

How long does it take to frac a typical well? Is the 5-8 gallons used almost all at once, over over a longer time?­

***It may require 72 to 96-hours to frac a typical shale well. The water that is consumed is used over that period of time.***

**ENVIRONMENTAL**

Does Considine consider negative economic impacts in other sectors (agric, tourism, health, environment)?

***See our Manhattan study referenced above.***

On slide 26 (Mr. Considine) what health and social service jobs are added due to drilling?

**These jobs are related to the general expansion in economic growth in the region.**

Comment: Natural gas industry doesn't just displace other energy-related industries. Food/farming/land-based industries (such as tourism) will also likely be affected.

**Between 2008 and 2009, tourism in the shale drilling counties actually suffred less of of a decline in business than the no-shale producing counties (see attached). Moreover, most of the shale drilling occurs in heavily forested portions of Pennsylvania with limited large scale farming. Compensation of agricultural output losses presumably would be negotiated in mineral leases.**

in looking at the effects of lower NG prices, did you look at the possibility that research efforts to increase energy efficiency might lag?

***Research into the use of energy is ongoing and will be ongoing. The big issue is that natural gas will displace imported oil via CNG use in transportation, generating clean electricity electricity, the opening of new LNG export possibilities, and the creation of new industrial capacity that consume natural gas, such as ammonia and ethylene production. If the USA is wealthier from more production of clean natural gas, it is better able to afford research into energy efficiency.***

Are the hazards/impacts the same in suburban and uban communities,where there may be 10-25 acre parcel sizes available for drilling?

***Same impacts***

on environmental impacts, can you discuss the proprietary chemicals used in the process?

***These chemicals are by regulation reported.***

If possible, please speak to the policy of treating fracking operations as individual sites subject to lower levels of regulation than would be required if they were treated as agglomerations of activities and therefore regulated under the stricter provisions applied to large drilling/mining operations.

***The current regulations recognize that the impacts associated with drilling are very small as compared to that of mining and large industrial activities. As such, the agglomeration rule is not applied. It should be noted that for every major operator in the northeast, there are one-hundred small operators that drill a few wells per year and operate a comparatively small number of wells.***

Have any longitudinal studies been performed to determine if human or animal health problems have developed in fracking areas?

***These studies are ongoing.***

How do you define "minor" when it comes to minor instances of water contamination? What is the difference between minor and major? Area affected? Quantity? How do you define what is a major environmental impact vs. a minor environmental impact?

***The study defines the difference between minor and major. In Pennsylvania, the difference is the amount of fluid and whether the incident occurs in proximity to an environmentally sensitive area. See our Manhattan Institute study.***

What about the environmental impacts in the routine disposal of "produced" water which is an ongoing part of the process?

***There is no routine disposal of waste-water.***

Comment: The fact that the vast majority of reported incidents are minor is more of a reflection of the diligence with which suspected incidents are being reported than a measure of the likely risk. The more reports you have, the lower the percentage of reports end up being "major" incidents.

***This is very true. Regulating agencies use these reports to determine patterns and to identify specific trends of poor operating practices. The idea is to avoid major incidents.***

The "unavoidable impacts during drilling" heading does not include water consumption as an impact. Do you think that the value of the water been underestimated in estimating the total costs of shale gas development?

***The use of water is not considered to be an impact nor is the use of water for preserving grass on golf-courses. Numerous studies have indicated that the amount of water used in very small as compared to other activities.***

The problem is that the environmental problems are being borne by individuals and communities, and that is compared with benefits gained by society or the state as a whole. It's not a fair comparison.

**There are winners and losers for any market activity. Our point is that the winnings in the aggregate exceed the aggregate losses.**

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Scientific Solutions: IMPACTS OF GAS DRILLING ON HUMAN AND ANIMAL HEALTH

MICHELLE BAMBERGER, ROBERT E. OSWALD

Environmental concerns surrounding drilling for gas are intense due to expansion of shale gas­

But what about external costs, such as (a) increased health care costs for citizens in locales with degraded environments (especially air and water quality—not just from specific environmental events but those ongoing impacts that are inevitable when industry exists in residential zones) and thus long-term environmental health impacts and (b) costs that cannot be reduced to a dollar value, such as quality of life, perceptions of vulnerably and resulting stress, and community divisions?

***See our Manhattan Institute study.***

In many cases, such as in Pavillion WY, it has been acknowledged that the lack of proper baseline data for groundwater sources has severely limited our ability to tie contamination incidents to drilling activities. To what extent is this data problem skewing our notions of contamination incidents, in your opinion?

***The development of base-line data is included in the new-PA-regulations.***

There are health costs related to coal avoidance, but not health costs associated with the risks of fraking?

***As far as we know, so long as fluids associated with hydraulic fracturing are properly handled there are no health risks associated with the practice.***

 How compensate the relatively few landowners where there are accidents from the hydraulic fracturing and their water supply is irreversibly lost for household use or agricultural production?

***According to law, the landowner would be provided a water-source for ever and a day.***

I'd like to know a little more about recycling water what does that involve and why is it considered a best practice?

***Water is recycled to minimize the amount of water needed for the shale-gas development. As such it is a best practice given that it minimizes the amount of water needed.***

What is the environmental impact (for the costs column in previous slide) of cleaning/disposing/storing of the spent and chemical contaminated water coming from the fracking process?

***There is no environmental impact given that the water is stored in steel containers and the waste is disposed of in EPA approved disposal wells.***

­what is the cumulative impact of "minor" environmental mishaps?­

***See our Manhattan Institute study.***

­What factors are considered when assessing the impacts of forest loss and fragmentation?­

***The PA Bureau of Forestry assesses the impacts of forest loss and its fragmentation. Development is predicated on minimizing these impacts. Keep in mind that 1000’s of acres of forest are off-limits for development and that by law, Pennsylvania’s forests are multiple-use forest – logging, recreation, and natural gas development. In terms of forest fragmentation, the biggest issues are highway-construction and the construction of electric-transmission lines.***

­I am a hydrologist and it seems to me that the nature of the activity (forcing fluid into the bedrock) is to some extent uncontrollable, even if casing is tight and no accidents occur. ­

***Sixty-plus years of experience suggest that it is controllable.***

­What about studies by Anthony Ingraffea that suggest methane leakage will result in greater greenhouse gas emissions than standard coal?­

***The amount of natural gas that is released/leaked during oil-gas development/operation is small when compared to the amount methane that is released by natural-processes such as organic decay. With coal mining, methane is continuously vented to the atmosphere for reasons of safety. With natural gas, natural gas is the commodity of interest and as such, its leakage is minimized. In addition, see the study by Cornell engineers refuting the Howath study.***

­What are PA DEPs violation standards and how well reported are violations? Could you estimate how many violations, if any, went unreported or are were not discovered by the PA DEP.­

***We cannot answer the question – Pennsylvania has increased its number of inspectors and have put the fear-of-god into operators throughout the Commonwealth.***

­How was this activity able to begin in an experimental/learning phase without the usual required Environmental Impact Statement or risk assessments? It seems the industry already has it's foot in the door and it has "permission". how did that happen?­

***Oil and gas operations have been ongoing in the northeastern USA since 1859. The industry has continuously filed environmental impact statements for drilling, production and pipelining for decades.***

­I'm unfamiliar with benefits for wildlife due to forest fragmentation - could you elaborate on this statement in slide 18?­

***The presumed advantage of forest fragmentation is feed.***

When covering "Well Stimulation", the amount of sand was mentioned but the range of chemicals used was not emphasized -- it is about 30 chemicals or so.

***Yes***

What about costs of dealing with contaminated drinking water, such as in Dimock, PA?

***The issue of Dimock and its costs are well documented by PA DEP. Also, see outr Manhattan Institute study.***

Why are the environmental impacts not counted in the costs? Why are they treated as if they're in a separate category?

***See our Manhattan Institute study, environmental impacts are quantified and then valued, they are included as a cost. All human activity has a cost. Any land disturbance is accounted for in the cost of drilling the well.***

Minor events? If communities lose their drinking water, those are not minor effects.

***This is true***

can you discuss the potency of the "minor" events?

***I do not understand the use of the word potency. A minor event by definition has little “potency” or it would be a major event.***

I've heard that fracking can cause what feels like minor earthquakes. Is that true?

***Yes – it has happened in England***

Hold up, avoiding air pollution? What constituents are you considering. Natural gas produces carbon dioxide, too.

***Natural gas from shale produces little or no carbon-dioxide compared with coal and oil. Moreover, even if the USA had a carbon permit system, it is unlikely that the permit costs would be much more than the current European Union Emission Tarding System proice of roughly $10 per ton. See our Manhattan Institute study.***

For "avoided air pollution" and "avoided comm health impacts of coal": Can you explain? Some have assessed vented/flared/consumption emissions from nat gas to be as severe as those associate with coal.

***The combustion of natural gas yields water-vapor and carbon-dioxide. The combustion of coal yields materials such as mercuric-oxide. There is no comparison between the two. See our Manhattan Institute study.***

What about persistent contamination of forest soils with organics associated with diesel emissions?

***Diesels are used in the drilling and stimulation of gas-wells. That is it – there is no persistent use of diesel-engines for well-operations and as such, any contamination from diesel emissions are quite small.***

How do you account for the contribution of 4% total leakage to green house gases (more tha offsets emissions improvement according to Cornell)?

***We disagree with Cornell’s study that suggests 4-% total leakage.***

looked at unemployment by county; did you all look at the hospital visits for asthma attacks and other admissions due to negative air quality or water pollution?

***See our Manhattan Institute study, the public health impacts are implicit in our valuation of the emissions.***

How might the geography along the pipelines affect the total environmental costs? Have you looked at shipping hazards for exports?

***Not to this point in time.***

what was done to address the issue of shallow gas leaking into drinking water supply? I remember seeing a documentary on this issue a year ago and the drill companies were trying to deny involvement, but people were able to light their faucet water on fire.

***Natural gas is naturally occurring throughout the northeast in aquifers. Much of this gas results from poorly designed septic systems, agricultural activities or is naturally occurring. Natural gas is not a toxin and can easily be removed from domestic water sources.***

Did he look at the overall increase in climate change costs (diesel emissions, etc.) since there is an increase in climate change warming agents?

***Yes, see our Manhattan Institute study.***

Does he have stats on the average number of gallons of fuel used in each of the phases he mentions?

***Yes, see our Manhattan Institute study.***

How about the costs of disposing of the liquid wastes from hydraulic fracturing that are not allowed to be emitted into public wastewater treatment works but must be disposed of in deep wells? Nothing mentioned about deep-well disposal problems, as the earthquakes in NE OH.

***These costs are included in the cost of operating wells.***

what are your thoughts on the call for increased regulation/fees in Ohio by the attorney general?

***We support the increase in fee if these fees are used to hire additional field inspectors.***

Did he look at the life cycle of this type of drilling such as were the waste water goes and its association with earthquakes (at least in Youngstown)?

***No***

what about the earthquakes in the Youngstown area?

***They occurred.***

there have been some reports of possible links to earthquakes, which would obviously have econ and ecological impacts. Could you please comment?

***We have not studied the events associated with the possible links to earthquakes – it has been reported that there was seismic events associated with hydraulic fracturing in England. With respect to Youngstown, it is our understanding that it was associated with waste-water disposal.***

Comment: If methane were so valuable, we would see more emission capture technologies being used by drilling operators than we do. We don't see that.

***Little gas is emitted during well drilling --***

In your presentation, environmental impacts were only 20% of your discussion. Environmental impacts based on violations seriously underestimates the costs of environmental impacts. Being in the environmental consulting area for decades, I can tell you that your environmental impacts are seriously underestimated, especially with groundwater contaminants which migrate throughout an aquifer. Also, the use of 5-8 million gallons per well will destroy fishery and aquatic habitat, if from surface water. Air impacts are really soil contaminans via fugitive dust emissions and they migrate as well. Again, your environmental impacts section displays a lack of knowledge of environmental impacts in the installation and operation of wells.

***Yes, see our Manhattan Institute study. Without getting into a debate, the impact on groundwater is quite small given modern technology – in terms of the amount of water that is used – the source and use of water are regulated by the Commonwealth – In terms of fugitive dust, there is little question that dust is generated – it is trivial when compared to any industrial/agriculture/construction activity. Certainly, all human activity results in an impact on the environment. The question that needs to be answered is this – we need energy to sustain our standard of living – where do we get this energy?***

Are there plans to look into the human and animal health impacts and costs of shale gas?

***See our Manhattan Institute study for human health impacts.***

Did you consider the impact of fragmenting the landscape on ecoysstems with the required pipelines? Also, how much energy is produced in comparison to the energy it takes to drill? You mentioned that it requires a lot of diesel fuel.

***The net must be positive given that wells are drilled to yield a profit.***

Did he look at the economic costs to local communities in regard to road repair/building due to increased use from heavy duty diesel vehicles?

***Roads are bonded – any damage is repaired.***

What about frac sand mining and transportation environmental impacts?

***We did not consider the mining of frac-sand --***

Comment: The fact that it's "mostly" water and sand doesn't have anything to do with whether or not it's a risk. Small quantities of harmful toxins can have outsized effects.

***The design of the well and the practices employed during its drilling preclude the introduction of these toxins into the environment.***

Comment: I saw a lot of weaknesses in this presentation with how the environmental costs or risks were assessed. A lot. Not in terms of how the risks or costs that were addressed were assessed in terms of magnitude, but rather a whole bunch of costs and risks that weren't mentioned at all.

Dr. Theo Colburn and her colleagues have done much research on human health impacts, see TEDX.org.

It's not true that "most" companies in Ohio are doing proper EPA-certified baseline testing, Tier I II III. We can't count on them to do it.

***See our Manhattan Institute study. In PA, the tests of the water – base-line – can only be performed by state-certified labs.***

Are the environmental impacts valued as a fraction of cost based on statistical likelihood, or as a total cost of remediation for possible events such as groundwater contamination, long-term health impacts, earthquakes, etc?

***See our Manhattan Institute study.***

I'm troubled by the speaker's continuing to downplay damage to water supplies, and to air quality around drilling sites and condensing sites.

***See our Manhattan Institute study.***

Biological materials are not going to be hundreds of feet down, to affect drinking water. Gas wells are, however.

***See our Manhattan Institute study.***

**ECONOMICS**

­To prevent decreased prices associated with a glut of natural gas, would it be prudent to pace ourselves with respect to exploiting the available reserves?­

**The market price of natural gas will perform that function much better than any regulatory scheme.**

The presenter listed a number of jobs created by the natural gas industry. However, many have concerns that the majority of jobs related to construction and production are high-skilled jobs that are conducted by workers from Texas or Arkansas. Thus, there may be very few jobs added within any given community, and very low tax revenue generated while at the same time the communities surrounding these drilling sites have to provide services for all these workers without receiving increased tax revenues to provide said services. Does this concern reflect reality in localities you have studied?

***See our Manhattan Institute and Penn State studies. Even if there are migrant workers they take up residence in Pennsylvania and start paying taxes.***

Will the dependency of the US on foreign oil supply be removed by expansion of shale oil production?

***Yes***

Slide 42 - Where are the public health costs? ­

***See our Manhattan Institute study.***

Costs. What are the projected long-term impacts associated with the large amount of water used in the hydrofracturing process? Here in the Barnett region, we are in exceptional drought, and water use for drilling/fracking is becoming an issue.­

***The use of water is regulated by the Commonwealth of PA***

­I don't understand how the water pollution value is calculated. Please comment more. (Same with air pollution).­

***See our Manhattan Institute study.***

­In the regulation front, what sorts of things can citizens do, where they feel that regulatory agencies and state legislatures are not fully protecting the public?­

***No comments***

­Are there plans to look into the human and animal health impacts and costs of shale gas?­

***See our Manhattan Institute study.***

­Has the impact of water usage been evaluated? Where does the water for drilling come from? Are increases in water supply costs expected? Should this be evaluated within the environmental cost?­

***Yes it has. Water comes from a variety of sources that are closely regulated by the Commonwealth. There has been no increase in water-supply costs associated with hydraulic-fracturing. See our Manhattan Institute study.***

­Do your cost calculations consider long-term effects, e.g. costs of resulting public health issues?­

***See our Manhattan Institute study.***

­Are groundwater and surface water samples taken in the area before and after drilling/fracking and analyzed for pollutants and if so, are the results available to the public? If no samples are analyzed, why not?­

***Groundwater and surface water samples are collected to establish a baseline and are analyzed for its contents. Given that the analysis is for a property owner’s well, the results are not publicized. A recent study has indicated that approximately 30-40-% of domestic water wells produce water that fails to meet federal freshwater drinking standards. These wells were in areas with no gas-activity. Pennsylvania has no regulations with respect to the fabrication/construction of water wells.***

­Does your model consider the costs and risks in treating the chemical wastewater?­

***The costs associated with the treating of waste-water are included in the costs of drilling the wells.***

­What are the potential for recycling produced water?­

***Produced water is currently being recycled.***

­Recommendations for handling impacts to existing infrastructure associated with drilling? (Damage to roads in particular)­

***Roads are bonded – any damage is paid through the bonding program.***

­Disclosure? What organizations, etc funded today's program? Thank you.­

 ­

**The Manhattan Institute, the American Petroleum Institute, the Marcellus Shale Coalition, and the School of Energy Resources at the University of Wyoming.**

­Your cost benefit ratio did not include the damages caused by the 20% of drilling failures. If you take the average damage costs associated with those failures, what happens to your cost benefit ratio?

***See our Manhattan Institute study. The averages are based upon the probabilities of incidences of various accidents.***

On slide 9, what were the units?

**Billion cubic feet.**

Has anyone captured the cost of the energy inputs associated with this technology, including cost of treatment of water used, and enviornmental costs?

**These costs are captured in the production costs.**

Why did NG production reduce price of electricity in PA. I thought their EGUs were predominantly Coal burners? Is it due to the overall grid use of NG and price impacts on prices beyond PA too?

***Natural gas is also used in PA to generate electricity – and yes, there is an impact from the overall grid.***

So why do we hear so much from people living near these things and the pollution of their ground water and comprimising of their health? Is human health and ecosystem integrity REALLY worth it?

***Yes – the purpose of environmental regulations is to protect the citizens from the deleterious impacts of any industry. See our Manhattan Institute study.***

Can you please explain the water cost more thoroughly?

***See our Manhattan Institute study.***

water pollution using household values - what does this represent? You said the value of clean water. What does that mean? Does this include the cost of extending water utility piping to a home with a contaminated well?

***See our Manhattan Institute study.***

How high is relatively high for oil prices?

**$100 and above but even at $70 the economics look good for oily shale plays.**

Do your environmental costs include the consumptive use of water in the fracking process?

you mentioned that downstream industries take a while to develop --how long will the "cheap" natural gas which supports these industries be around/

**Given the current trends in the production of associated natural gas, i.e. by-product gas from producing oil and liquids from shales, the odds are good for a prolonged period of low natural gas prices.**

The list of environmental costs seems to be limited. Have you considered expanding these costs to include: long-term restoration costs, pollution and runoff from roads, life-cycle emissions for all industries assumed to develop because of gas production in the next half century, true impact down watershed of water pollution and water uptake?

***See our Manhattan Institute study.***

How does the presenter feel about crowd out? Will investing in natural gas and it's infrastructure slow down the innovation, development and installation of clean, renewable energy?

***Renewable energy is currently dependent on tax-benefits and the move by politicians to require their use. Clean is a relative term given the other impacts associated with renewable energy – for example, the impact of wind-power cannot be overstated given its impact on the costs associated with pest control by the agricultural sector of PA’s economy – research will continue; but hopefully it will be financed by the private sector rather than the bankrupt public secotr.***

In terms of economic impacts, what about property values for those affected by horizontal drilling either by means of water contamination or the drilling taking place in close proximity to underground water supplies?

***Spotting of wells near water suppliers is strictly regulated by the Commonwealth. The presence of a horizontal well should have little or no impact on surrounding property given that it has no impact on its surface.***

Can the speaker say more about the logic behind the benefits v. costs model? If the gas would be coming from another source if not from these new wells, isn't the relevant benefit just that in excess of what we'd otherwise have? Another slide said this increased production drops price, so that's a benefit, but the weighting of these benefits isn't clear to me.

***See our Manhattan Institute study.***

Please talk about cost benefit analysis as regards earthquakes.

**See comments above.**

What has to be done to make regulations transparent? What does that look like, especially to the public?

***In Pennsylvania, all meetings are public and all regulations published in the PA register.***

Can you address the dollar impact on land values of surrounding properties and loss of land & water use due to contamination?

***See our Manhattan Institute study.***

Seems to me that the speaker has made no effort to assess real impacts on communities. Heavy truck traffic, wear and tear on roads, social impacts (increased crime?). Economic benefits are often not accruing to the same people who are suffering the costs.

***See our Manhattan Institute study.***

We have seen a comparison of costs versus environmental impacts between fracking and coal. Could you provide similar comparisons between fracking and solar, biodiesel, wind, etc?

***No but see our Manhattan Institute study and the California study that is attached.***

Why weren't decreased property values of homes whose well water was contaminated by the results of fracking included in the cost benefit alalysis. Also the loss of livestock, medical bills associated by the affected families.

***See our Manhattan Institute study.***

Was the environmental cost or impact on the source waters or disposal of frack water taken into account in the cost/benefit analysis?

***See our Manhattan Institute study.***

Is New York state right to go slowly on this issue or is the state going to left behind PA and Ohio if we do not move fast?

***New York is New York. See our Manhattan Institute study.***

What about Shale Gas Drilling running its course and reserves are depleted? What are economic impact predictions for a booming business based upon a diminishing resource?

***We estimate that there are at least a 100-year supply of gas from shale.***

I missed the first few opening slides, did he disclose the level of industry funding in his research?

***See above and*** [***http://www.energyindepth.org/tag/professor-timothy-considine/***](http://www.energyindepth.org/tag/professor-timothy-considine/)

**The Marcellus Shale Coalition, the American Petroleum Institute, the Manhattan Institute, and the School of Energy Resources at the University of Wyoming have funded our research. Many analysts, often funded by non-governmental environmental organizations have resorted to ad hominem attacks, dismissing our report not on the merits, but as a reflexive reaction to its funding source.**

**Some of the most important research ever conducted in this country – and indeed, around the world — has been made possible through the financial support of industry.**

**Certainly Bell Laboratories stands as the most obvious example of this phenomenon, with public-private partnerships helping to fuel the research that ultimately gave us the laser beam, the transistor, and C++ programming – netting seven separate Noble prizes in the process (including one by our current Secretary of Energy). Earlier this decade, Stanford University received a grant of nearly a quarter of a billion dollars from ExxonMobil to fund research on climate change and energy sustainability. Does anyone genuinely believe that Stanford’s work is no longer “reliable” or “independent” because of its acceptance of that grant? Of course not.**