Answers to Questions posed by participants of the Basque Government (with the City Hall of Vitoria and the Province of Alava) Technical Conference on Unconventional Gas.

What methods are used to evaluate dispersed emissions en the vast areas of shale gas development?

What is your opinion about the well in the North Sea Elgin-Franklin platform that has been emitting gas for more than a month at a grand scale and could continue to do so for another 6 months?

Are such incidences taken into account in your calculations?

My calculations did not take into account dispersed leakages of the kind that are naturally occurring in basins and over gas fields. For example you cannot see the central part of the Ekofisk field because it is obscured by a cloud of gas rising naturally from the field. There is a good deal of natural gas leaking from strata in New York State, methane fires under water falls etc. I do not take these natural leakages into account because they would occur whether we tap the gas or not. One could argue that human extraction might reduce natural hydrocarbon leakage, but probably not by much. I just consider leakage that attends the recovery of gas (during drilling, operations, and delivery) and can be considered “extra” or on top of the leakage that occurs naturally.

I do not take into account gas leaks of the kind going on at the Elgin-Franklin platform. I expect that if the sum of all such leaks were to be divided by the total yearly gas production, these leaks would turn out to be a very small addition to the 1.5% of total production leakage that is (to me) the best current estimate.

Considering the flaws in Howarth’s work, are the greenhouse gas effects cited in the European Union report Valid? (Table 5 of the report used Howarth’s data) – Altman said that they used Howarth’s data, but not his methodology in their report.

I am not sure what was in the European Union report, but if it is based on Howarth’s logic or his numbers I believe it is invalid. Two things are important: First is the issue of short term impact of methane leakage, and here it is critical to know how much methane is leaking as a fraction of total methane production. Second is the issue of long term impact, and this depends on how much CO2 is put into the atmosphere by the burning of fossil fuels; the leakage rate is not important.

Howarth suggests that around 9% of total natural gas production may leak into the atmosphere. If this is so, natural gas is as bad as coal when used to generate electricity (and twice as bad if used for heat- a false comparison because coal is not used for heating). The best numbers on total leakage I can find indicate that natural gas leakage is ~1.5% of total production, and for this leakage natural gas reduces warming (from the start- e.g., immediately upon substitution) by ~40% of what the substitution of low or zero carbon fuels could achieve. The short term (e.g., 20 to 40 year) impact depends on the leakage numbers, and Howarth’s leakage numbers are way too high. If you leak enough methane, natural gas is a bad idea in the short term, but we are not leaking this much, so natural gas is a good deal from the greenhouse point of view even in the short term.

The greenhouse benefit of natural applies in the long term regardless of the leakage rate. In the long term we will stop burning fossil fuel because we will have run out of coal, oil, and gas, and at this point
any methane we have put into the atmosphere will have either already come out of the atmosphere or will rapidly do so over the next 10 years or so. At this point we will be left with the heritage of the CO2 we have put into the atmosphere by burning fossil fuels, and this heritage will stay with us and warm us for a very long time because CO2 comes out of the atmosphere very slowly. When we stop burning fossil fuels, the warming effects of methane will quickly disappear. If we have substituted natural gas for coal, we will at this point get the 40%-of-low-carbon-fuels-fast reduction in greenhouse warming. Even if there is so much short term methane leakage that substituting natural gas for coal and some oil in transportation does not provide greenhouse benefit in the short term, the benefit of using gas will be realized in the longer term because we will have put much less CO2 into the atmosphere because of the substitution. Because of its longevity CO2 is the damaging gas and everything we can do to put less into the atmosphere while supplying the energy we need will be beneficial in the long run.

So the leakage numbers matter in the short term, but in the long term they don’t. Howarth’s analysis is simplistic on this short-term long-term issue because he uses the simplistic and therefore flawed Global Warming Potential metric. Howarth’s leakage numbers are grossly inflated and distort his short term conclusions. For reasonable numbers, using natural gas will be of greenhouse benefit in the short and the long term. The issue of leakage is a valid one. Basque production and delivery should be designed to leak as little methane as possible. But to suggest that the leakage will be at a level that will remove the very substantial greenhouse benefit of using natural gas as a transition to low carbon fuels seems to me a manufactured concern that fails both of the short term leakage numbers and on the longer term logic. I believe the greenhouse argument of Howarth and the numbers he uses is simply invalid (now are especially in new operations and pipeline facilities), and of course they remain invalid even if repeated in a European Union report.

Although you have said no funding was received for answering to Howarth, et al, can you explain for how long you have been receiving fundings from the Gas Research Institute or any other oil and gas related companies? Can you explain if for the next researches are you going to receive more fundings from those companies?

I am a resource geologists so I have of course received research funds from the Gas Research Institute (this is how I learned and developed models and theories on capillary sealing- the project was about 8 years in duration and ended about 10 years ago), the DoE (a major project on present gas filling of reservoirs in the Gulf of Mexico, and to develop an advanced chemistry basin model- also of significant but less duration and ended 10 years or so ago), and oil companies for specific projects of a wide variety (some only distantly related to hydrocarbons such as nanoparticle tracers). On several occasions I have done consulting work for companies (none at the moment). I have collaborations with Norwegians that have company funding. It is quite likely I will receive funds from companies in the future. I have a nanoparticle project where the next logical step is a field test, and only a company could help with this. Also, I have a PhD student who will be looking into leakage from gas wells and the role of capillary seals. We may well look for funding/collaboration from industry on this topic. I worked for an oil company (25 years ago) and a mining company (even longer ago- this is where I learned about well plumbing, etc). I was educated at one great university and have worked at two others, learning a great deal in the process. And, I might point out, I have received funding from purely academic sources such as the NSF as well. It is because of this funding and experience that I can comment on issues like shale gas in a useful way.