

Visual Impact

Correspondence between

Richard Moorman and Eddie Mitchell in May 2012



Eddie Mitchell

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to Tom, Richard, Aedin

Hi Tom And Richard

I would see the a different question here. Its not so much the costs that concern me but the roll out. I am wondering about the speed at which the project could develop. Richard , you have said you will use 3 rigs drilling 1 well/mouth each. How did you arrive at this conclusion. Is this related to expected production flows into a future gas network. If in the future there is a large find with a good return for investors I imagine the gas field will be developed in parallel with the networks ability to sell on the gas into the Market. What part will interconnection into the British and European play.

Regards

Richard Moorman richard.moorman@tamboran.com

May
16

to me, Tom, Aedin

Hi Eddie - Drilling pace (and thus rig count) is planned to find a balance in how quickly the project must be developed to optimise the balanced between production, facilities and economics; for example, drill too few wells per year, and not enough gas supply is created. Also, additional financial value would be created then by drilling more wells per year. Drill too many wells per year, and as you appear to have suggested, you could get out of sync with facility development and would need much bigger facilities than might be available on a cost-effective basis.

I'll be sending the model this weekend. The model shows how many wells we plan to drill each year. Of course, these are all projections - any eventual planning permission would dictate the actual pace of development.

All produced gas will be sold into the existing distribution network, which is the shortest path to market. Natural gas is currently imported (100% of demand) into Northern Ireland and over 95% into Ireland through three interconnectors from Scotland. Any gas produced in NI and Ireland would simply reduce the amount of natural gas that must be purchased for import via the interconnectors. There won't be a situation where there would be enough gas in NI and Ireland to justify the expense of reversing the flow of those interconnector pipelines - at best we can eliminate all imports in NI and most imports in Ireland for a while. This will strictly be domestic gas supply and consumption.

Best regards

Eddie Mitchell

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to Richard

Thanks Richard

Eddie Mitchell

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to Richard, Tom, Aedin

Hi Richard, Tom and Aedin.

This is my understanding to the initial area of interest bearing in mind that Richards figures for the development are based on 200,000 acres with gas of the Bundoran shale and the encircled area is 100,000 acres reduced down to 80,000. I am interested in your comments Richard. Am I breaking down the areas probably. I do realize that this is early days but this is my understanding based on conversations with you and my own research.

Initial area (Fermanagh and Leitrim)	120,000Acres
Pads to initial area (large pad design)	187.5No
Pad size at development stage (large pad design)	14Acres
Pad size after completion and in production phase	9Acres
wells/ pad for minimum land impact	16No
Additional laterals or wells to access other levels	48Laterals or wells
Acres developed underground / well	40Acres
Stages/ well at 1000m length proposed	5No
length of stage	200M
Size of spacing for 16well/multiwell pad	640Acres
Wells total initial area (Bundoran shale)	3000No
Additional wells or laterals in other Shales or tight Sandstones	6000up to this no with no additional
Total wells in Initial area of interest. Up to	3000to 9000wells or laterals dependent

Regards

Eddie Mitchell

to me, Tom, Aedin

Eddie, here are my edits based on our currently published program from the Engineers Ireland presentation and the February 1 press releases (your recollection is close to actual, as sometimes things are lost in translation):

1. 80,000 acres total (40,000 in each country) (Also, meaning 80,000 developed out of a 100,000 acre region - so 20% set aside as undrillable due to special areas of conservation, etc)
2. Max 120 pads (60 pads on each side) if we stay with 1 km horizontal laterals. We expect to move this to longer laterals (perhaps 2 km someday), meaning fewer pads per given area (or larger area, if geology allows - project could be up to 3 times bigger (280,000 acres possible), but only if geology cooperates (we won't know that until extensive drilling takes place over the next five years)
3. Initial pad size 7 acres at first drilling for 24 wells. We are working to make this smaller (with GPS on drill bit)
4. Final pad size 4 acres after removal of tanks and water pond. We are working to make this smaller (with GPS on drill bit)
5. 24 wells per pad (2 layers of Bundoran shale drilling plus 1 layer of Dowra Sandstone drilling)
6. 1 lateral per well (so 24 laterals per pad)
7. Still have 80 acre spacing in each layer = so 8 wells per 640 acres (= 1 square mile), therefore each well 200 m apart if looking down from space, but 3 layers (2 Bundoran + 1 Dowra)
8. 6 stages (500 feet per stage) = 3,000' (approx 1 km lateral)
9. 640 acres developed per pad
10. Expected case: total wells approximately 120 pads x 24 wells = 2,880 (except where future 3D seismic shows fault risks)
11. Highest case: could someday be up to 3 times as much (call it 9,000, except for faulted areas), but has to be justified by shallower drilling. All initial drilling will take place below 750 m to 1,500 m. If (and only if) shown to be safe to move upwards without any risk to groundwater or faults, will drill shallower at 500m or deeper. Will most likely take 5 to 10 years to gather enough data to reach confidence in that decision.
12. Not on your list, but wanted to mention that we still expect to use a total of 1 million gallons of water per well with 1 million pounds of sand per well. Water will be initially sourced with rainwater and supplemented, if necessary, with groundwater from wellpad. Looks very favourable to do all test drilling and fracking with 100% rainwater and 100% recycling. After first well, we will re-use all recovered water (which is expected to be 25% of water injected), so water use per well will drop to 0.75 million gallons per well.
13. Additionally, Tamboran will operate this project at all times. Planning permission will establish acceptable operating parameters (no chemicals in fracking etc), so this will never be allowed to change. We may accept a partner company someday in Ireland to own 40% to 50% of the project, if we believe the partner is suitable for the project and the community, but we will retain control at all times.

Best regards,

Richard

Eddie Mitchell

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to Richard, Tom, Aedin

Hi Richard

Thanks for putting the time into replying to my queries.

In my research I found many different well densities in use but where operators could they employed 40acres/well and tighter as in forth worth. On examination of your 16 well pad design shown in September it appears to reflect a 40 acre spacing. I asked you before if you taught a 80 acre spacing was viable and you agreed. That ties into what you have stated here again.

1 Can you explain if there is a change away from a 40 acre spacing shown in September (albeit from my interpretation of the 3d diagram and your explanation of it).

2 There is a big difference between the impact of 40 and 80 wells/acre spacing (if laterals remain the same length). Will Laterals run in both directions away from a 8 well muti-wellpad or will they be grouped together as doubles to further reduce surface impact.

3 Nearly all of your proposals from chemical free fracking to 24-48 wells/multi-wellpad seam to be aspirational. Your water treatment solution appears to be just at the beginning of its development. Can you tell me where I might find an image of a multiwellpad with 24-48 wells on it.

Thanks again Good night

Richard Moorman richard.moorman@tamboran.com

May 20 (12 days ago)

to me, Tom, Aedin

Hi Eddie

To answer your questions:

1. Wells will be drilled in up to 3 layers - two Bundoran Shale horizontal layers (because it is so thick, we need multiple wells to try to capture the gas) and one Dowra Sandstone layer.
2. Each layer will be drilled on 80 acre spacing. Each layer will come from a separate (distinct) wellbore at surface, so 24 wells on a single pad would be 8 per layer. 80 acre spacing works out to 200 m between each of the 8 wells in each layer for a total of 1,600 m in one direction (which is equal to a mile). So, a 24 well pad would be the optimum development condition for a square mile.
3. We could drill in two separate directions from a single pad, per one of our drawings, but it would likely be easier to drill them all the same direction if we were going to drill 24 of them.
4. I'm not sure where the 40 acre spacing thoughts came from. While some projects in the US shales are on 20 to 40 acre horizontal spacing, I can't imagine needing such close spacing in a shallow shale, since the rock is slightly more porous and permeable in shallow shales (and thus easier to drain) than in deeper shales, where you need tighter spacing.
5. I will send you a separate note with an overview of our entire planned chemical-free process. The process has been utilised extensively in the US on at least 500 wells from our preferred vendor and likely 1,000 or more wells from the industry in total over the past few years, so it is neither aspirational nor untested.
6. I'm not sure what's out there for multi-wellpad photos. Nearly all shales in the US are only thick enough to have one layer of drilling, so 16 wells on a site is about all you'll find (which means 8 wells in two directions in a single layer). There are a few shales in Canada that are thick enough to have multiple layers, but they have only been underway since 2008.

Ireland's geological advantage is a thick shale plus a sandstone, so this gives us the opportunity to combine multiple projects into a single site to reduce surface impact.

Here is a link I grabbed from Google for multi wellpad sites (note that every site is different and most large multi-wellpad sites are happening in in Canada since we have similar mineral rights ownership by the state as that found in Ireland and NI): http://www.citizenscampaign.org/images/multi_well_pad_site.jpg (20 wells)

I also attached a picture from: <http://www.integraenergy.net/gallery/default.asp> (16 wells)

From the pictures, you can hopefully see how you could just extend the length of the pad, or add a third row, etc, according to what makes the most sense to share facilities and minimise impact.

Cheers