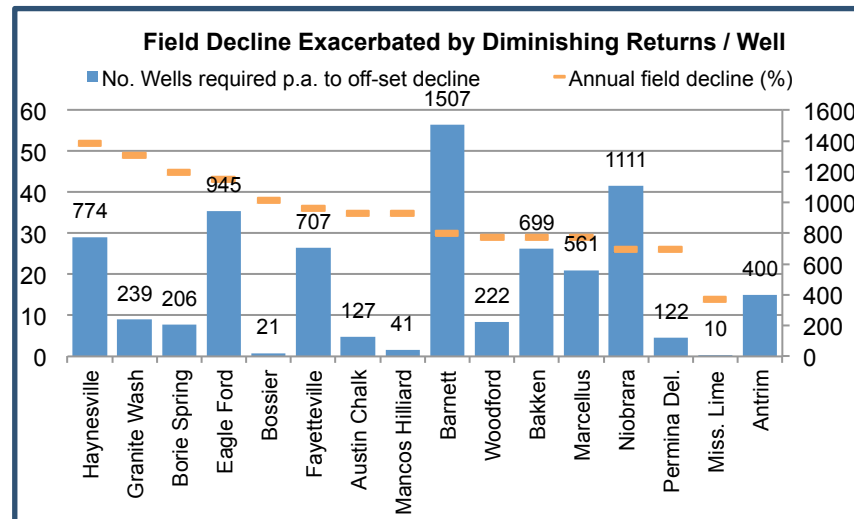
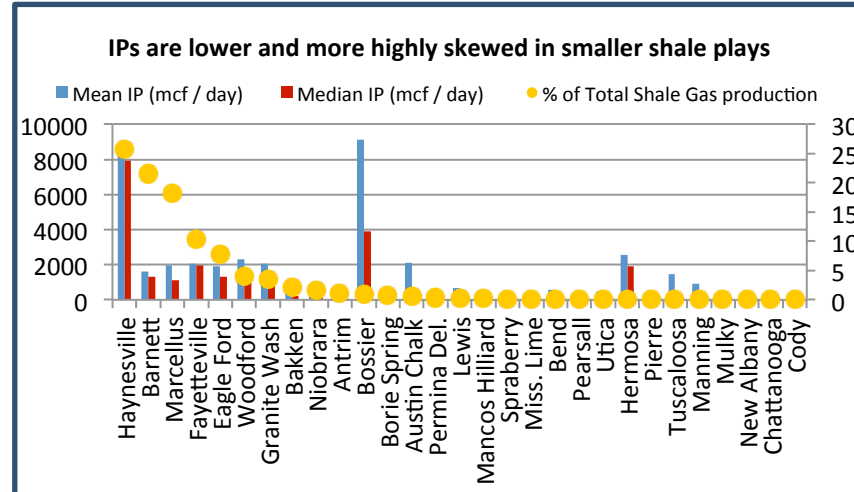


# Executive Summary: Cost : Benefit Analysis of Fracking in Fermanagh

Dr Brenna O'Roarty

# Short-Term Benefit: Experience of the US

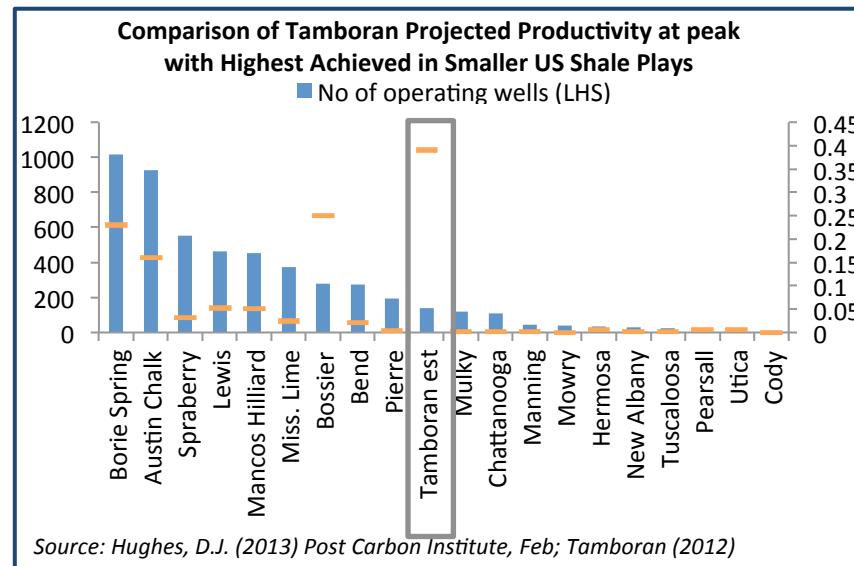
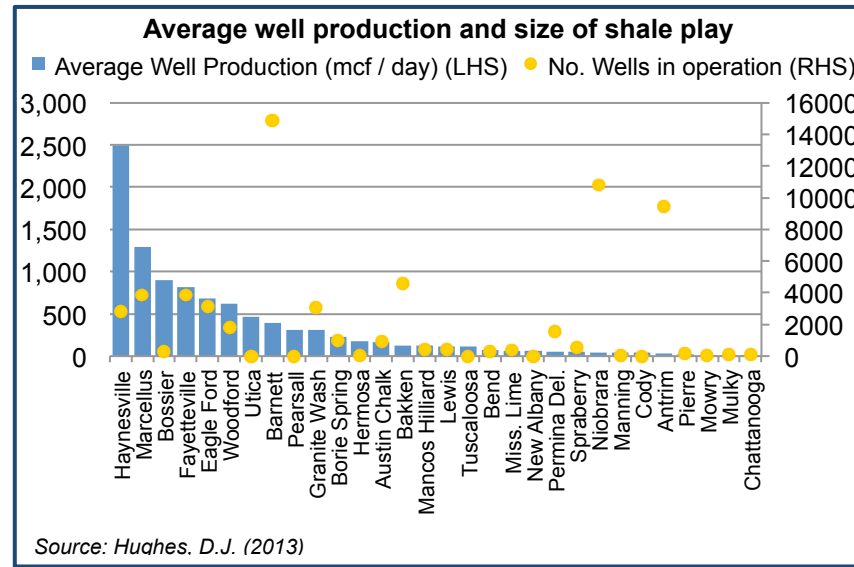
- Tamboran forecast 1.3 to 2.6 tcf of recoverable gas, equivalent to one year's gas supply for the UK. They have previously stated this represents a value of £6.6 bn in terms of royalties, VAT and tax revenues<sup>1</sup>. This represents a gross over-statement for a number of reasons:
  - estimates of recoverable gas based on unrealistic inputs
  - underestimation of costs of production
  - over-estimation of gas price
  - employment forecasts already reduced by 40%
  - is not netted down for economic displacement costs
- 'Recoverable' gas estimates usually include probable, possible and speculative reserves and overstate opportunity to include reserves that are not commercially viable due to inaccessibility, and / or scale.
- Unclear as to whether estimate represents size of recoverable resource or that extractable given the associated efficiency rate for HVHF gas of 13%<sup>2</sup>. This is considerably lower than the 75-80% associated with conventional gas.
- Recovery rates and absolute production are highly variable and unpredictable; in the US, 10% of all shale plays account for 65.6% of gas production and 20% of all shale plays account for 88%.
- This is mirrored in the productivity of wells within any one field. In the US, analysis of all shale plays indicate that on average, only 20% of wells are commercially viable. Well quality declines over the life-time of the play. More pronounced for smaller shale plays.
- IP (initial production) rates per well decline sharply, falling by between 75% to 95% within first three years of production.
- Results in law of diminishing returns. In the US, no of gas wells increased by 90% , while productivity per well fell by 38%<sup>3</sup>.
- 2% wells deliver in excess of 20 mmcf / day; 75% less than 10m mcf. Skew more marked for smaller plays.



<sup>1</sup> Tamboran Resources Pty Ltd (2012) Northern Ireland PL2/10 Progress Update and Project Overview, Presentation on 11 January; <sup>2</sup> EIA (2012), Annual Energy Outlook, US Department of Energy; <sup>3</sup> David-Hughes, J (2013) Drill, Baby Drill: Can unconventional views usher in a new era of energy dependence? Post Carbon Institute, February; EIA (2013) Annual Energy Outlook;

# Short-Term Benefit: Projections of resource deeply flawed

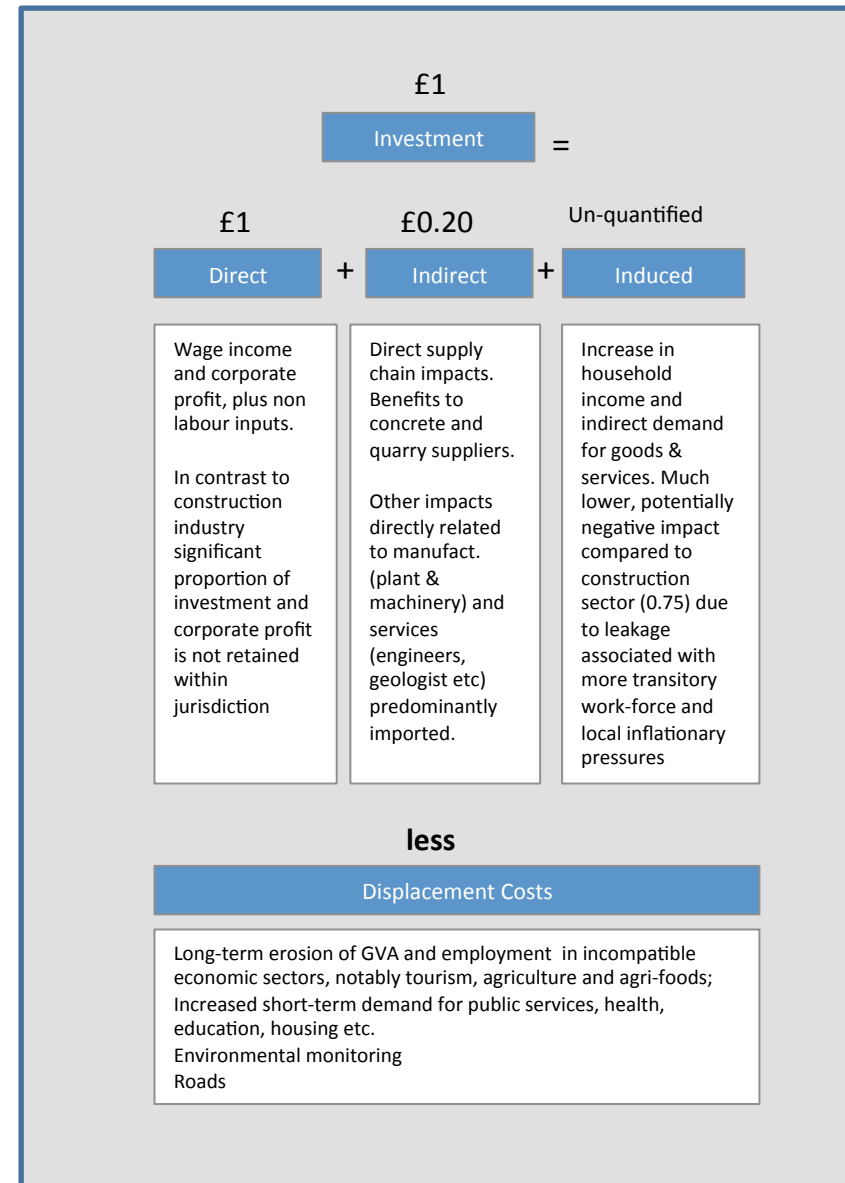
- Tamboran's estimate based on projected average production of 15.56 mmcf per day, representing an exceptional rate of production, second only to the Haynesville which is incomparable in scale<sup>4</sup>.
- Average lifespan of wells in US is 5 years, Tamboran adopt a 7.5 year lifespan
- Tamboran's decline rate is considerably less steep than that experienced in the US, adopting a hyperbolic decay rate of 1.5 v less than 1.0
- Tamboran project no decline in well quality, indeed productivity increases
- Tamboran adopt a controlled cost of well production
- Achieved EURs in the US have fallen short of initial projections by approximately 50% due to shorter than expected life-span of wells and unforeseen decline in well quality
- In the US, even the EIA has revised estimates of reserves down by some 42%.
- **Projections of recoverable resource likely to be grossly over-estimated and further exacerbated by profitability**
- Evidence of financial bubble in US energy markets due to:
  - a) over-exuberance of analysts and falling price of gas: full cycle break even cost of production is \$8.31 to \$8.78 per mcf while Henry Hub price is currently \$3.75 and forecast to remain below \$6 to 2035<sup>5</sup>.
  - b) Diminishing returns per well increase life-cycle costs per unit.
- Reflected in write downs of shale assets by energy companies.
- Shell have suggested that while prices for export are higher (circa \$12), they do not compensate for the additional costs of liquifying, transporting, storing and re-gassing shale gas.



<sup>4</sup> Tamboran Resources Pty Ltd (2012) Northern Ireland PL2/10 Progress Update and Project Overview Presentation on 11 January; David-Hughes, J (2013) Drill, Baby Drill: Can unconventional views usher in a new era of energy dependence? Post Carbon Institute, February; EIA (2013) Annual Energy Outlook; <sup>5</sup> Berman, A and Pittinger, L (2011) US Shale Gas: Less Abundance, Higher Cost, The Oil Drum, August; Bloomberg (2013) September

# Short-term Benefit: Employment?

- Projections of job creation from Tamboran have been highly volatile and arguably, mis-leading. In April 2012 Tamboran projected that 300 FTEs would be supported by 2025 within Fermanagh. The projection assumed that, employment levels decline by a mere 25% from 2025 to 2031, despite production decline of 50% over the same period. Employment levels remain constant from 2031 to 2049 throughout the period of exponential production decline. More recently, Tamboran have revised employment projections down by some 40% to 180 FTEs.
- Projections continue to overstate job numbers. They are based upon a conventional gas hyperbolic decay constant of 1.5 for a duration of 8.5 years and assume well productivity is homogenous. With IP rates declining by up to 95% within three years and the average life-cycle of wells five years, the life-cycle of the play is considerably shorter. Using available data from Tamboran as to planned drilling, this suggests a maximum of sixteen years productivity across the play. However, it is likely to be considerably shorter as there is financial pressure to front-load drilling activity.
- By nature the industry is labour intensive during the development phase and capital intensive during the production phase.
- Approximately 98% of jobs associated with well development are short-term, low-skilled and predominantly filled by a transient work-force experienced in the industry<sup>6</sup>.
- The production phase accounts for 2 to 5% of jobs which remain more local and predictable. Given Tamboran's job projections, this accounts for 3.6 to 9 FTEs.
- Tamboran have suggested a Type 1 multiplier of 5.0, but provide no basis for the assertion. In contrast, the Scottish Executive calculated a Type 1 multiplier of 1.2 for their oil & gas industry, while building construction is associated with a Type 1 multiplier of 2.09. The direct supply chain associated with the construction industry tends to be more local while beyond concrete, and gravel for road building, supplies of specialist equipment and plant & machinery to the oil & gas industry are imported.
- Research in the US demonstrates that employment impacts are modest, while the earnings impact is more significant<sup>7</sup>. The latter is skewed by a transitory labour force that results in strong inflationary pressures at the local level, especially in rented accommodation.
- Associated jobs are not accretive. That is, the industry has significant displacement costs.



<sup>6</sup> Jacquet, J (2011) Workforce development Challenges in the Natural Gas Industry, CARDI Reports, Issue 14, September; <sup>7</sup>Weinstein, A (2013) The Economic Value of Shale in Ohio, Agricultural, Environmental and Development Economics, The Ohio State University, July 19

# Short-term cost outweighs short-term gain

## Road Damage

- A Texas Dept of Transport (TxDOT) survey in 2012 revealed that:
  - 1,184 loaded lorries required to bring a well into production
  - 353 are required for annual maintenance
  - 997 are required to re-frack each well
- Equivalent to 8 mn car journeys for development and a further 2 mn cars p.a. per well for maintenance.
- In US, cost of Road Damage relative to revenues raised from fracking industry represents a net cost to public finances:
- TxDOT estimate rad damage in 2012 at \$4 bn v revenues of \$3.6 bn
- Research indicates that **Fracking activity reduces the life-cycle of roads by 75%** (from 20 to 5 years) in every state where drilling has occurred<sup>8</sup>.

## Economic Displacement

- Displacement of economic activity in tourism & Agriculture
  - Availability and cost of accommodation and related services
  - Displacement of low cost workers due to rising cost of living and inflationary pressure on private rented sector
- Reduced employment in tourism and agriculture
- New investment in manufacturing sector deterred due to rising cost base (eg transport, labour) and cost of living

<sup>8</sup>Rogers, D (2013) Externalities of Shale: Road Damage, April,

# Long-Term Cost: Impact on Dominant Industries

## Shale industry is incompatible with dominant sectors of economy in Fermanagh and of vital importance to N. Ireland Economy

- USP of Fermanagh is its environmental purity and underpins tourism, agriculture and agri foods. To this end, shale activity is simply incompatible with the principal economic sectors in the county. In short, shale gas exploration would replace existing economic activity. It is not accretive. The destruction of the natural landscape is irreversible within even a long-term horizon.
- This environmental economy was identified as early as 2005 in a specially commissioned report as a growth sector for N Ireland and accounted for 32,749 jobs and £573 mn of GVA. This data has not been updated, but is expected to have increased given the growth in tourism numbers.
- The N Ireland tourism industry generated consumption of £683 mn in 2012, representing strong growth of 7% year on year. Underlying this was 19% growth in the number of visitors holidaying. Beyond Belfast, the Fermanagh Lakelands represented the second most visited destination within the region.
- The environmental degradation, whether real or perceived will reduce demand for agricultural products and agri-foods from the island of Ireland.
- The loss of economic output is long-term and even on a purely economic basis outweighs the potential gain from shale activity whether considered in terms of tax revenues, employment, direct, indirect or induced GVA. The devastating impact of the industrialisation of the landscape on the tourism sector is long-term.
- The annual contribution of the environmental economy must be capitalised. Even using 2005 figures and a conservative 8.5% capitalisation rate this outweighs Tamboran's headline revenue projections, which are subject to greater risk and uncertainty.
- Any scare associated with the food supply chain would impact on the agriculture and agri food sector across the island of Ireland as experienced during the foot and mouth crisis. DARD estimates indicate that the Food Processing Sector enjoyed a gross turnover of £3.7 billion in 2010 (an increase of 8.3%). Gross-value added in the sector was estimated at £608.2 million in 2009, an increase of 8.6% over the previous year. Net employment in the sector in 2010 was 19,700 FTEs, an increase of 1.1% over the previous year.
- In the republic of Ireland, the value of agri food exports within the dairy sector alone amounted to €3 bn in 2012. This includes the export of baby milk formula, for which the Republic of Ireland has a global market share of over 20%. Underlying this success is the quality of the environment with relative environmental purity being the key criteria used by Chinese buyers in selecting trade partners for this product.