



An Unconventional Conundrum

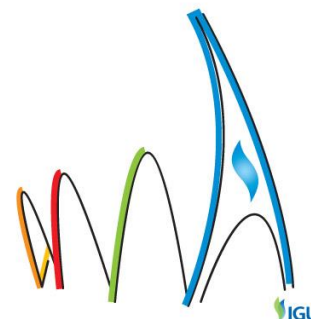
The taxation of unconventional oil and gas
resources

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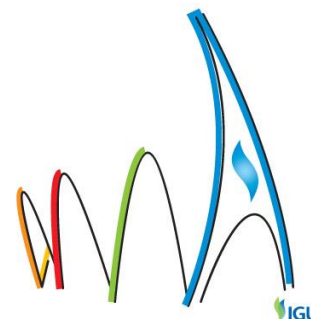
Overview

Production from unconventional oil and gas resources has had a transformative influence on North America's energy balance and its recovery from economic recession. Unconventional oil and gas resources exist in many other countries, many of whom are now eagerly hoping that industry investment will result in similar benefits for their economies¹. Some of these countries have well-established conventional oil and gas industries, others much less so. All them will need a transparent, well-designed and stable fiscal regime to enable successful exploitation of unconventional resources. Economically realistic fiscal terms for unconvensionals have become even more critical in the light of the recent fall in global oil prices, itself primarily a result of the growth of tight oil production in the USA.

Outside of North America, investment in unconventional resources has been very limited so far, and remains high risk. Argentina and China are most advanced in testing their unconventional plays but even there commerciality remains uncertain. Nevertheless, the potential 'size of the prize' is great, and industry interest is growing. Ineos, for example, in November 2014 committed to spend US\$1 billion in UK shale drilling, if it can secure licences.

Fiscal terms are only one of a number of challenges to be met in developing unconventional resources outside of North America. Others include geological uncertainties, market liquidity (for gas especially), absence of appropriate infrastructure and a 'fit for purpose' supply and service sector. Public and political opposition to unconventional recovery techniques is also strong in some areas.

The focus of this paper is on meeting the challenges of designing and implementing effective fiscal terms for unconventional resource development. We reviewed the range of current global practices and found that most countries have as yet no specific terms for this new type of upstream investment. The ones that do, tend to have applied modest incentives to

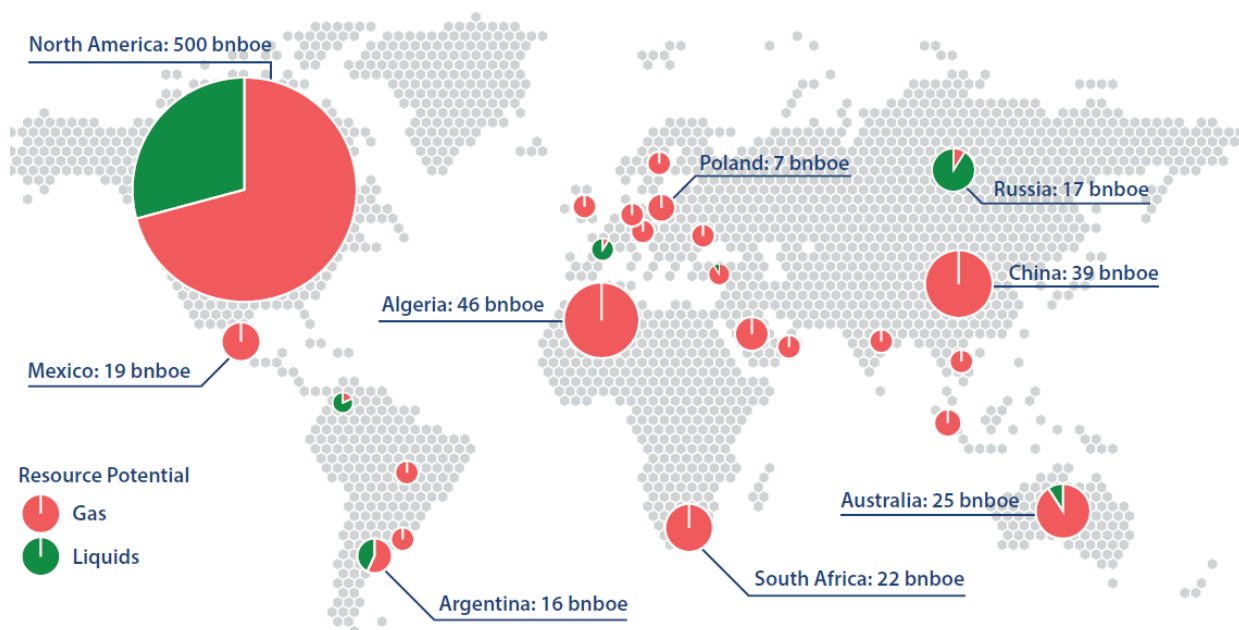


existing terms. However, using Wood Mackenzie's databases, it is clear that there are some fundamental differences in the 'economic footprints' of conventional and unconventional resource developments. These differences mean that some well-established conventional fiscal mechanisms will be hard to apply to unconvensionals, and dictate the need for new thinking.

Unconventional resource development outside of North America is at an embryonic stage of development, and there is certainly no universal best practice for the design of fiscal terms. However, there are some clear issues to be tackled, and it is those that we address in this paper, drawing together a set of design principles that can act as a starting point for unconventional fiscal innovations in future.

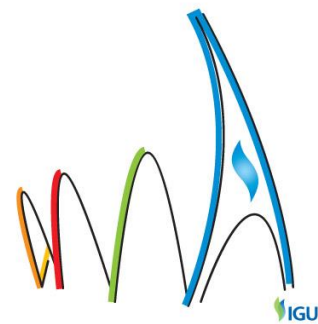
Global unconventional resources

Figure 1 – Global unconventional resource potential (including commercial reserves)²



Source: Wood Mackenzie
 Resource potential is a measure of the play if all the accessible and prospective land is drilled up and produced based on a reasonable assumption of well spacing.
 Country-level estimates only includes plays covered in Wood Mackenzie's Unconventional Play Service

Figure 1 shows that unconventional resource potential exists around the world, but only really in North America has investment proved to be commercial. Over 40% of the total estimated recoverable unconventional volumes in North America are currently considered to be commercial. The figure is far lower in all other countries where the successful exploration and appraisal activity level has been much less. If the North American experience is repeated elsewhere, some plays will prove to be very profitable for early entrants. But others will be marginal, at best, especially if the recent decrease in the oil price is sustained. The projected returns from investment in any unconventional play are, therefore, highly



uncertain.

Against this background, governments must provide the fiscal and regulatory framework required to encourage investment in unconventional plays to proceed. Some countries with unconventional potential already have a conventional oil and gas business while for other countries investment in unconventional resources could result in their first oil and gas production. The challenge for all governments is to establish a fiscal system that is appropriate for the characteristics of unconventional resource investment.

Conventional and unconventional resource investments: the same, but different

In other papers³ we compared the similarities and differences between investment in conventional and unconventional exploration and development projects and concluded:

- Unconventional resources carry investment risks which are similar in nature to exploration risks in the early concept/pilot/ramp-up/ exploitation stages of a play, but don't have the same 'hit-or-miss' characteristics of conventional wildcat wells. The record of early investment in the US plays bears this out.
- Unconventional resource production tends to have lower operating margins than conventional resources because of higher drilling, gathering and transportation costs (on a per boe basis) and is, therefore, more exposed to cost overruns and price decreases.
- Unconventional projects have lower capital exposure because production follows quickly on from drilling, compared to offshore conventional projects, which have long periods of capital outlay before production starts.
- Capital costs – particularly drilling and completion costs – are spread out over a much longer period in an unconventional project than an offshore conventional project.
- The well-by-well nature of the unconventional resource investment process means activity quickly increases or reduces in response to changes in the price and cost environment.

While the above are valid trends, unconventional resources are widely varied in extent and potential economic attractiveness - much the same as conventional resources.

Review of global fiscal terms for unconventional oil and gas resources

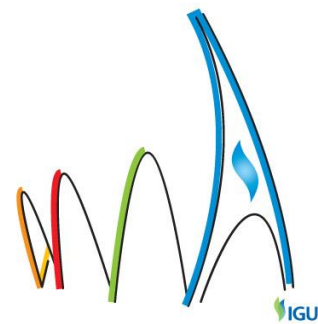
We conducted a review of the fiscal terms in each country with significant unconventional resources potential. The key observations that emerge are:

- Most countries with unconventional resource potential do not have specific fiscal terms for development of these resources and apply conventional petroleum fiscal terms.
- Where there are fiscal adjustments for unconventional resources, the most common changes are incentives in the form of lower royalty rates, and these are often limited to a specific time period (e.g. Alberta, Russia).
- Where natural gas prices are regulated by government, the price for unconventional gas

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production is allowed to be higher and, in China, even subsidised.

- Indian and Indonesian production sharing contract (PSC) systems are being modified, particularly for coal bed methane (CBM) projects, to include revenue-sharing terms, rather than conventional profit-sharing.
- Several fiscal terms for unconventional production include some measure of progressivity, but these tend to be based on physical parameters, such as production rates. Linking fiscal rates to project profitability – which is common in fiscal terms for conventional production – is extremely rare in unconventional terms.

We conclude that the development of fiscal terms for unconventional resources – like the understanding of the economic potential of the resources - is in its infancy in most countries. A number of interdependent themes are emerging, however, which future fiscal policies will need to address.

Figure 2 – Countries with unconventional resource potential and differentiated fiscal terms



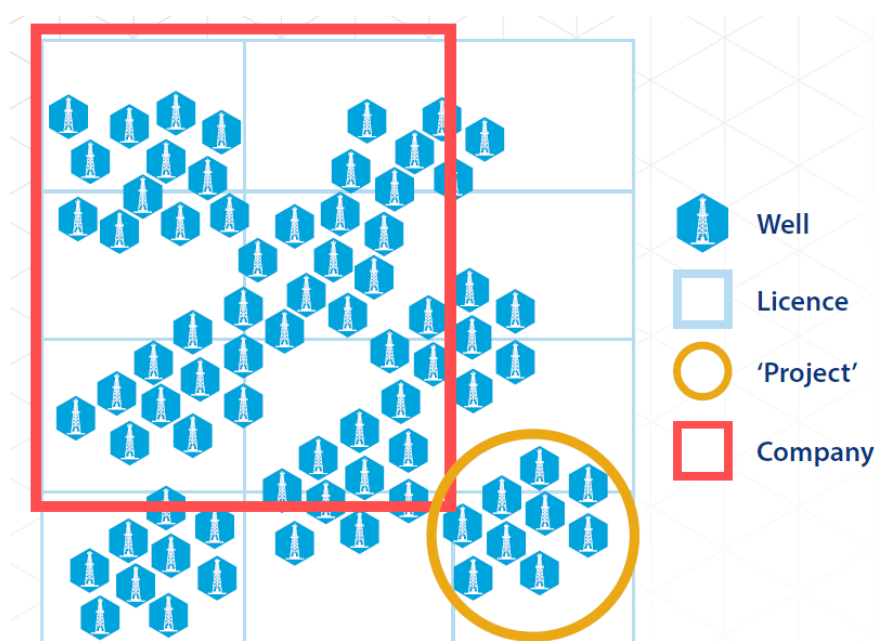
Unconventional fiscal themes

Fiscal entity

A key challenge for unconventional resource fiscal systems is defining the entity that will be subject to the fiscal term(s). The definition of the fiscal entity is referred to as the 'ring fence' and there are various 'ring fence' options: wells, fields or 'projects', licence areas or consolidated company activity. The decision has a significant influence on the timing and

extent of government revenues from oil and gas production and, therefore, its economic attractiveness to investors. In general, the wider the ring fence is, the more the government shares in the risk because new investment costs can be deducted from existing taxable income. If the government does not want its fiscal revenue to be diluted by new investment, it establishes a ring fence around each activity.

Figure 3 – Fiscal entity: ‘ring fence’ options



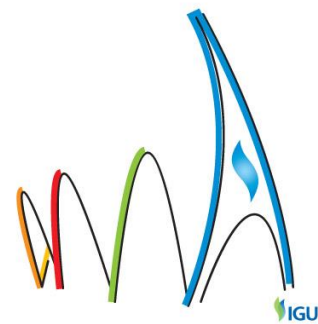
Wells: it is extremely rare for fiscal terms to be applied on a well-by- well basis. The only significant example is royalty in Western Canada. Wells in Alberta, for example, pay royalty at rates which vary according to the well’s production rate and prevailing prices. Unconventional wells pay royalty at lower rates than conventional wells. The variability in performance of unconventional wells creates an argument in favour of a well-based approach to fiscal terms, so that the fiscal burden is lower on poor wells. But this would require significant modification to existing terms in other countries and would add significantly to fiscal administration. Moreover, any fiscal term levied on wells would likely have to target revenue, rather than profits, because many costs are not specific to a well and it would be difficult to allocate these to individual wells.

Projects: many conventional fiscal systems establish the ring fence around each oil or gas field, which enables fiscal rates to vary with project performance, creating flexibility and predictability. But as the UK government recently acknowledged, *“Conventional oil and gas reserves are found in discrete fields or reservoirs. In contrast, unconventional hydrocarbons cover large areas with indistinctly defined boundaries. As a result, it is difficult to identify an unconventional oil or gas field.”*⁴ Thus, conventional terms levied on a field basis will be very difficult to apply to unconventional projects and very few systems currently attempt this. The UK has introduced a tax allowance for each ‘pad’ (i.e. drilling and extraction site)

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as a proxy for a conventional oil or gas field within an unconventional play⁴.

In many unconventional plays, however, companies are likely to regard the 'project' to include many drilling sites and may seek consolidation of all of these activities to represent the true nature of their investment.

Licence area: the most commonly used 'ring fence' in conventional fiscal systems is the licence (or lease or contract) area. Licence areas are well defined, but the wide geographical range of unconventional plays means that many licences may be included in the development of a play. This has been an issue in the US, where leases are often combined (or 'pooled') to enable the drilling company to conduct operations efficiently across wide areas. It has also resulted in royalty, which has been negotiated at high rates in expectation of high performing wells, being payable by poor wells and making these potentially uneconomic.

In countries which use the PSC fiscal system, the 'ring fence' is normally the contract area, although some terms may be applied at the field level. It is very unusual for activities in different PSCs to be consolidated for fiscal purposes.

Consolidated company activity: The consolidation of a company's entire economic activity is normal for corporate income tax (CIT) calculations. Some countries, notably the North Sea jurisdictions, also consolidate all upstream activity for the purposes of special petroleum taxes. Defining the ring fence at the corporate level implies an 'holistic' approach to the taxation of the resources, with all activity combined. This could be particularly appropriate for unconventional developments, where significant portions of production revenue from one well will likely be invested in subsequent wells.

The definition of the 'ring fence' can have a significant impact on the likely returns from investment in unconventional resources. In establishing the 'ring fence' for each fiscal term, policy makers must simultaneously address another conundrum: whether to target production revenue or profits. The tighter the 'ring fence', the more likely the fiscal term will be based on revenues, which is in the government's interest, but could result in reduced investment.

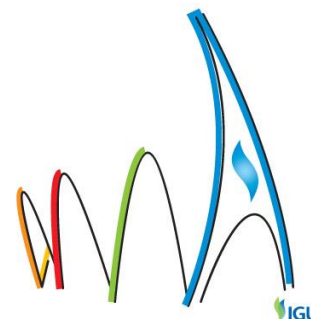
Revenue or profit sharing?

Fiscal terms are usually targeted on revenues or profits (i.e. revenue less cost deductions). Revenue-based terms, such as royalty, have a similar impact on project economics as an additional cost or a reduction in price. These terms are regressive, i.e. they generate a higher share of value for the government from marginal projects than highly profitable ones, as shown in Figure 4. Fiscal terms which are levied on profits, like income tax, are neutral and much less likely to deter investment.

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Figure 4 – Regressive impact of royalty

US\$/bbl	Base Case	Low Price	High Costs
Price / Revenue	100.0	50.0	100.0
Costs	40.0	40.0	70.0
Gross margin	60.0	10.0	30.0
Tax impact on gross margin			
Tax @ 35% of gross margin	21.0	3.5	10.5
Company net margin	39.0	6.5	19.5
Tax % gross margin	35%	35%	35%
Royalty impact on gross margin			
Royalty @ 20% of revenue	20.0	10.0	20.0
Company net margin	40.0	0.0	10.0
Royalty % gross margin	33%	100%	67%

But governments prefer revenue-based terms, such as royalty, because this guarantees them income. Profit-based terms may generate little income for government if costs are high, relative to revenue. And this is expected to be true in many unconventional plays.

Indonesia has recently introduced a 'Gross PSC' option for coal bed methane (CBM) which has no cost recovery mechanism. Companies decide whether to use the Gross PSC or the conventional 'Net PSC', which includes cost recovery. Whether a company would prefer Net or Gross PSC terms will depend on its assumptions of future prices and its ability to control costs.

In Figure 5 the company's net margin has been calculated under both PSC types, with hypothetical terms that generate the same base case contractor cash flow under both options. The chart shows that if the project experiences price or cost downside, the contractor would prefer the Net PSC, for the protection of the cost recovery mechanism. But the opposite is true if prices are higher or costs are lower. The PSC calculations are included in the Appendix.

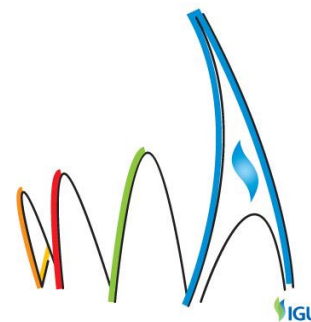
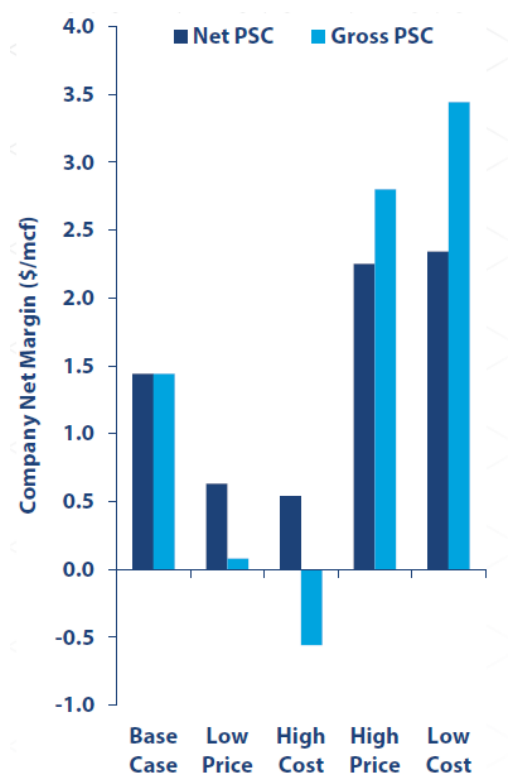


Figure 5 – Impact of Net and Gross PSC terms under different price and cost assumptions



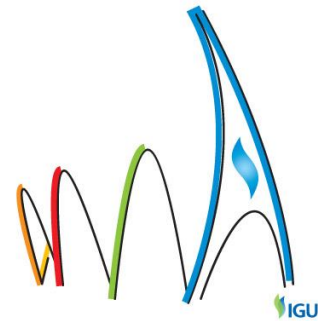
Under both PSC types, changes in prices impact both the government and contractor revenue. But when cost assumptions change the government's revenue is unchanged under the Gross PSC. The entire gross margin lost (or gained) as a result of cost increases (or decreases) is borne by the contractor.

Consequently, the decision whether to base fiscal terms on sharing revenue or profit will depend fundamentally on whether investors are happy to accept cost risk or not. Current oil price volatility and the relatively high unit costs expected for unconventional production means it is likely that most investors will seek fiscal systems for unconventional resources that emphasise profit-based taxes.

Tangible or intangible drilling costs?

Drilling and completion costs comprise the majority of capital expenditure ('capex') in unconventional projects. In conventional oil and gas projects, drilling is also a major cost item, but facilities form a more significant percentage of the capex profile, particularly offshore. Fiscal terms normally treat different items of capex differently:

- 'Tangible' capex is expenditure on items which normally have a longer life than the



current tax year, e.g. offshore platforms, well gathering stations and pipelines. This expenditure is normally deducted for tax purposes over a number of years, with between four and ten years being normal for oil and gas assets.

- 'Intangible' capex is the cost associated with the creation of tangible assets which has no on-going value in itself, e.g. wages, repairs, site preparation. 60%-80% of drilling and completion costs is normally regarded as 'intangible' and this expenditure is usually allowed as an immediate deduction for tax purposes.

Companies will be keen for drilling costs to be treated as intangible, because of the earlier deduction of the costs. And this will be particularly the case for unconventional wells, where the bulk of revenue is expected to be generated in the first few years of production. If well costs have to be depreciated over many years then some of the costs will be claimed when the well is producing very little revenue and will need to be deducted from another well's taxable income.

In 2009, the US government proposed to repeal the intangible drilling costs ('IDC') allowance for federal income tax. This allows producers to claim 70%-100% of IDC against taxable income in the year incurred. Under the government's plan, IDC would be treated as tangible capex and depreciated over the standard seven year period. The industry vigorously objected to the proposal, stressing that removal of the allowance could "*jeopardize the advances that are responsible for some of the US's biggest and latest oil and natural gas plays, such as shale oil and natural gas*"⁵. The government eventually dropped the proposal.

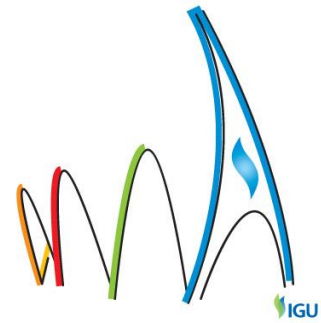
But treating drilling and completion costs as intangible capex may not always be in the producer's interests. In some fiscal systems, 'uplift' allowances exist, where a percentage of tangible capex is granted as an additional allowance before tax is payable. Such an allowance has recently been introduced for shale gas projects in the UK, for example, and also exists in Indonesian PSCs. In these systems, companies would seek the inclusion of intangible capex as eligible for uplift in addition to tangible capex.

The fiscal treatment of drilling and completion costs could be highly influential in determining the economic attractiveness of unconventional wells and may require alternative terms to those in place for conventional projects.

Progressive fiscal terms

Many conventional fiscal systems include 'progressive' terms which increase the fiscal rates as a project's performance improves, as measured by production rates, price levels or the profitability of the project (IRR or 'R factor' (i.e. cumulative revenue / cumulative costs)). Alberta's royalty rates for unconventional resource production vary according to well production and/or price levels. But fiscal rates which are determined by project profitability will be more difficult to apply to unconventional production, given the ambiguity around what defines an unconventional 'project'.

Without a clearly defined oil or gas field it will be problematic to calculate the IRR of an unconventional 'project', as the combination of rapidly depleting wells and ongoing drilling expenditure could result in several negative cash flow periods, which makes the IRR



calculation impossible. If the ring fence was established at the well level, it might be possible to calculate an IRR for each well, but will be subject to debate around which costs can be included in the calculation.

'R factor' calculations are less complex because they basically compare dollars earned with dollars spent within the ring fence. Currently, the only fiscal system for unconventional which varies rates with profitability is the first PSC to be signed for shale gas operations in China. The profit-sharing rates are understood to be determined by both production rates and the 'R factor' for the contract area.

Thus, applying progressive fiscal rates for unconventional resources is possible but the definition of the fiscal entity will influence whether this is appropriate.

Gas prices and fiscal terms

In most countries gas prices are usually regulated by government and/or agreed under long term contracts. The impact of these gas pricing policies must be taken into consideration when establishing fiscal terms. A very attractive fiscal system will not attract investment if gas prices are kept at too low a level. Conversely if gas prices are allowed to rise to market rates, high levels of royalty/tax could negate this incentive to invest.

The manipulation of gas prices can also work in the producer's favour, however, if the government adds a subsidy to the market price received by the producer. Government subsidies of gas production are very rare but the Chinese government has introduced a direct subsidy for CBM production, as an incentive to develop these resources.

Consequently, fiscal policy must be developed simultaneously with gas pricing policy as both will have a significant impact on the viability of investment in unconventional gas resources.

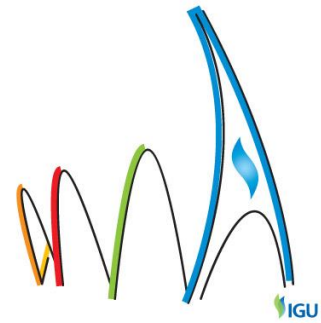
Local community compensation

Local opposition to unconventional drilling operations can be intense, particularly in Europe, and can result in operations being significantly delayed or even forbidden. In the US, private landowners negotiate their own royalty terms with the companies, and this has contributed to the success of the unconventional resource industry there. But such rights do not exist in other countries, where local communities must rely on central or local government for compensation for hosting petroleum activities.

In countries with a federal government system, states/ provinces have the power to levy royalty and taxes as they wish. Several states in the US and provinces in Canada have now introduced differentiated terms for unconventional resources.

Pennsylvania (US) has introduced an 'impact fee' (in \$000) which is payable to the state by the producer of each shale gas well. Argentina has also recently passed legislation which will enable provinces which govern unconventional resource development to set their own royalty rates.

There is also a trend for governments to establish rules which allocate petroleum tax revenues to different layers of local administration, with particular benefits for communities



affected by drilling operations. For example, North Dakota state (US) has one of the highest levels of unconventional production in the world (from the Bakken formation). The state expects to collect more than US\$5 billion between 2013 and 2015 in severance tax payments. This is allocated to various funds⁶ and a percentage goes to the communities where production takes place.

In the UK, the Onshore Operators Group (UKOOG) published 'Community Engagement Charter: Oil and Gas from Unconventional Reservoirs' which establishes various principles to govern their operations. Included in the Charter is the commitment to provide GBP£100,000 (c. \$165,000) per well site to the local community where the drilling takes place and 1% of production revenue to the local community.⁷ Volunteering 1% of revenue to local communities is unusual, but is significantly less than the 20%-30% royalty rates that some private landowners in the US have negotiated with oil companies.

To progress unconventional operations in many countries, formal recognition of the impact of drilling operations on local communities, and compensation for this, should become an integral component of fiscal policy. Whether this compensation is allocated from central government revenue, collected directly by local authorities or volunteered by the industry will have different implications for tax administration and fiscal stability. As local politics and attitudes toward unconventional resource investment differ across the world, there will likely be a wide range of outcomes to this particular issue.

What next for unconventional fiscal terms?

In order for any fiscal system to be stable and sustainable, it must strike a balance that meets both the government's and investors' fundamental objectives:

- secure a 'fair share' of the value of the resources for government, given a wide range of possible outcomes of production rates, costs and prices;
- enable investors to make acceptable returns from high risk investments and not deter investment in projects which would be economic on a 'pre-tax' basis;
- be competitive with other countries offering similar investment opportunities;
- be stable, predictable, transparent and reasonably simple to understand and administer.

Government and investors may well disagree about what constitutes a 'fair share' for government or 'acceptable returns' for investors. And this is particularly true for investment in unconventional resources, where the likely investment required and returns generated remain highly uncertain around the world.

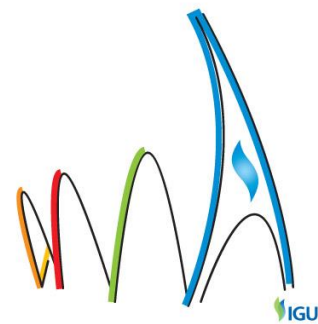
The design of fiscal systems to achieve the balance of fundamental aims, whether through modifying existing conventional terms, or through entirely new structures, will start with addressing competing principles:

- **'Keep it Simple'**: reduce the fiscal system to a minimum number of simple, well understood terms (such as a royalty and CIT), with fixed rates, applicable to all projects;

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- **'Make it Flexible'**: fluctuate the level of Government Share with the profitability of investments, so it is low from marginal projects but significantly higher if production turns out to be highly profitable.

Simple fiscal systems are easily understood and transparent, but a 'one-size-fits-all' fiscal system may not be flexible enough for investment in unconventional resources, which have a very wide range of pre-tax profitability. Stability and predictability are, therefore, less likely to be assured by simple fiscal systems.

Progressive systems, which link the Government Share to project profitability, are more flexible, but introduce complexities, and there are additional challenges in establishing the demarcation of a 'project' in unconventional plays.

Whichever path the unconventional fiscal system takes, a number of core issues must be addressed:

- **Fiscal entity**: wells (or well 'pads') are the effective units of investment in unconventional resource plays, and well performance is expected to be highly variable. Thus, there is a strong argument for framing a significant part of the fiscal system at the well (or well 'pad') level. The royalty system in Alberta provides a useful precedent. But for other countries this would require a radical change to fiscal legislation and administration.

For this reason, we expect most countries to want to develop terms based on conventional 'ring fence' definition i.e. oil and gas fields. But this is problematic for unconventional resource plays and targeting fiscal terms on consolidated activity is more likely, either at the licence or company level.

- **Revenue / profit sharing**: whether fiscal terms should target revenues or profits is a particularly sensitive issue for unconventional investments, because operating margins are generally likely to

be lower than for conventional resources. Targeting revenues is simpler, but is regressive, and could deter investment. But calculating profitability is complex where there is no standard definition of an unconventional 'project'.

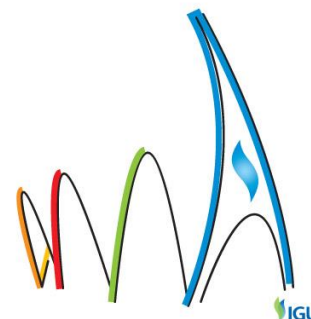
This also creates obstacles to using progressive fiscal rates in the system. Investors' perceptions of future prices and their ability to control costs will strongly influence the degree to which they insist that terms are based on profits, rather than revenues.

- **Drilling and completion costs**: these costs dominate investment commitments in unconventional resource plays and their fiscal treatment is particularly important. Conventional fiscal terms may need to be modified to enable unconventional drilling costs to benefit from both accelerated depreciation and any investment allowances.
- **Co-ordinated policies**: finally, fiscal terms must be developed in conjunction with natural gas pricing and local community compensation policies. Investors will regard all of these policies together as a package and determine if the overall regulatory and fiscal environment created can support the investment required. The clarity and predictability of the package will significantly impact investors' perception of the attractiveness of unconventional resource investment opportunities.

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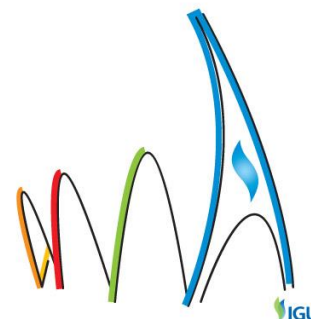
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Appendix

Appendix A: Net v Gross PSC calculations

Indonesia CBM PSC options

Note: Contractor revenue share in the Gross PSC has been chosen to generate the same result as the Net PSC in the base case and does not reflect actual PSC terms



		Base Case		
	All US\$/mcf	Calculation	Net PSC	Gross PSC
1	Price / Revenue		8.00	8.00
2	Costs		4.00	4.00
3	Gross Margin	1 - 2	4.00	4.00
4	First Tranche Petroleum	10% * 1	0.80	n/a
5	Cost Recovery	MIN (2, (1 - 4))	4.00	n/a
6	Profit Gas	1 - 4 - 5	3.20	n/a
7	Company Share		45%	n/a
8	Company Profit Gas	6 * 7	1.44	n/a
9	Company Revenue Share		n/a	68%
10	Company Revenue	Net: 5 + 8 Gross: 1 * 9	5.44	5.44
11	Government Revenue	1 - 10	2.56	2.56
12	Company Net Margin	10 - 2	1.44	1.44

		High Price		Low Price		High Cost		Low cost		
	Net PSC	Gross PSC	Net PSC	Gross PSC	Net PSC	Gross PSC	Net PSC	Gross PSC	Net PSC	Gross PSC
10.00	10.00	6.00	6.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
4.00	4.00	4.00	4.00	6.00	6.00	2.00	2.00	2.00	2.00	2.00
6.00	6.00	2.00	2.00	2.00	2.00	6.00	6.00	6.00	6.00	6.00
1.00	n/a	0.60	n/a	0.80	n/a	0.80	n/a	0.80	n/a	n/a
4.00	n/a	4.00	n/a	6.00	n/a	2.00	n/a	2.00	n/a	n/a
5.00	n/a	1.40	n/a	1.20	n/a	5.20	n/a	5.20	n/a	n/a
45%	n/a	45%	n/a	45%	n/a	45%	n/a	45%	n/a	n/a
2.25	n/a	0.63	n/a	0.54	n/a	2.34	n/a	2.34	n/a	n/a
n/a	68%	n/a	68%	n/a	68%	n/a	68%	n/a	68%	68%
6.25	6.80	4.63	4.08	6.54	5.44	4.34	5.44	4.34	5.44	5.44
3.75	3.20	1.37	1.92	1.46	2.56	3.66	2.56	3.66	2.56	2.56
2.25	2.80	0.63	0.08	0.54	-0.56	2.34	3.44	2.34	3.44	3.44