[PS]Applying Economic Lessons from Unconventional Plays Back to Conventional Projects*

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Abstract

The traditional metric for capital efficiency goes by various names (P/I, DPI, PVI), but it usually involves dividing net present value (NPV) by the present value of the pre-tax capital spend (PV(Investment)). When unconventional resources began to draw attention some years ago, an economic paradox became apparent. When measured by P/I, unconventional plays almost always look terrible. Yet, many companies pursuing these plays were clearly making money and getting a respectable return on their investment. This was not the first instance of good projects rating poorly under certain metrics; projects with very long time horizons (e.g., infrastructure projects, LNG plants, etc.) often do not measure up well under P/I, largely because NPV undervalues long-term projects. With unconventional projects, however, the problem is a combination of the long time horizon (often >40 years) reducing NPV, and the fact that heavy capital expenses continue throughout project life as hundreds of wells are drilled, thereby increasing the P/I denominator.

So how were companies making money? Quite simply, the projects become self-funding after a few years. Even though PV(Investment) is very large, only a small percentage of the total capital must be provided out-of-pocket by the operator. Many companies found that NPV/(Max Cash Out), where “Max Cash Out” is the maximum cumulative negative after-tax cash flow, is a much more useful measure of capital efficiency for unconventional resources.

This paper argues that the revised version of the P/I metric – NPV/(Max Cash Out) – is a more appropriate capital efficiency metric for ***all*** projects, conventional or unconventional. In the traditional P/I, PV(Investment) is based on the pre-tax capital spend profile. This drastically underestimates the capital efficiency not only of unconventional projects, but also of projects in fiscal regimes with a high tax rate and generous tax deductions for investment, coupled with ring fences that allow for immediate realization of those deductions against tax paid on current production. NPV/(Max Cash Out) allows for a fair comparison between these projects and ones in fiscal regimes in which tax deductions cannot be taken until project first oil.

Capital efficiency metrics should give an idea of how much value can be created per current dollar of capital resources invested. NPV/(Max Cash Out) measures this far better than does the traditional P/I.

Applying Economic Lessons from Unconventional Plays Back to Conventional Projects

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Economic Metrics

Energy companies measure major capital projects along a number of metrics. Common ones are net present value (NPV), reserves, rate of return (ROR), and capital efficiency (which is variously abbreviated P/I, DPI, or PVI; in this paper, P/I will be used). There are often trade-offs between these metrics. Smaller projects with modest NPVs frequently have higher P/I ratios than do multi-billion-dollar mega-projects; development alternatives that maximize reserves rarely offer the highest economic value. Competing objectives of this type are the norm, and decision makers routinely find themselves in the position of weighing how much of one metric they are willing to give up in exchange for a gain along another metric.

A mistake made by many companies is to try to simplify this situation by applying blanket thresholds across some of these metrics (usually ROR or P/I). Thus, a project with an ROR of 16% will be rejected if the company's threshold is 18% and a P/I of 1.24 gets a thumbs-down if the threshold is 1.30 – regardless of how attractive the other metrics might be. This relieves the decision maker of the responsibility to make the trade-off judgment, but that's not necessarily a good thing. The whole point of using multiple metrics is to recognize that an optimal portfolio is built from a heterogeneous collection of projects, some of which add value along one or two metrics, others of which add value along different ones. Applying universal thresholds across individual projects results in sub-optimal performance at the portfolio level.

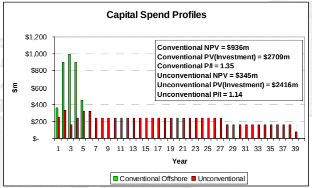
The Capital Efficiency Paradox

A second mistake is commonly made in the calculation of the capital efficiency metric, P/I. For years, companies calculated P/I as NPV/PV(Investment) + 1, where PV(x) equals the present value of x. In other words, the before-tax capital spend profile is discounted to the current date (to capture the time value of money), and this figure is then divided into the NPV (which is the after-tax cash flow, also discounted to the current date); 1 is then added to this ratio. Thus, if NPV equals one-third of the discounted capital investment, P/I = 1.33 (one plus one-third). Most companies still calculate P/I in this manner.

But when the industry began to develop unconventional plays (e.g., shale gas), a strange thing happened: the P/I values for these developments invariably were terrible. If one believed the validity of the metric as calculated, one had to come to the conclusion that unconventional plays are a horribly inefficient allocation of capital. Yet many of the operators who were active in these plays were obviously making money. The plays were profitable, but for some reason, the P/I metric wasn't capturing this profitability.

A comparison between "typical" hypothetical capital spend profiles for conventional and unconventional developments reveals the culprit (Figure 1). In conventional plays, the lion's share of the capital spend is up front (including the drilling of most production wells), followed by a long revenue stream requiring minimal additional capital investment. In unconventional plays, significant capital spending (in the form of drilling wells) continues at a high rate throughout field life; given the high decline rates of individual wells, continuous drilling is the only way to maintain production at profitable levels. Even discounted to today's dollars, the total capital requirements of an unconventional development are much, much larger than the NPV of the project.

Figure 1 – Conventional vs. Unconventional



How can unconventional plays be profitable?

So how were operators making money? The answer was simple: the projects become self-funding after a few years. The revenue being generated is more than enough to fund the ongoing drilling campaign. The money spent drilling the hundreds of wells in an unconventional play is more closely analogous to the ongoing operating expenses of an oil field than they are to the up-front capital investment in a conventional project.

This means that the up-front capital required to embark on an unconventional development isn't even close to the PV(Investment) calculation (which, remember, uses before-tax capital spend). It makes no sense to measure the capital efficiency of a project by dividing NPV by a number that bears no resemblance to the actual amount of capital required to implement the project; therefore, standard P/I values bore no resemblance to the real capital efficiency of unconventional developments.

As such, the industry searched for a different capital efficiency metric – one that would be applicable to these new unconventional developments. It found such a metric in NPV/(Max Cash Out), where Max Cash Out is the largest negative value found in a cumulative after-tax cash flow chart.* This represents the actual amount of capital required to implement the project (Figure 2).

*Some companies discount this value to today's dollars as well, calculating PV(Max Cash Out), but because the negative cash flow is always in the first couple years of the project, discounting makes little difference. For simplicity's sake, this paper will use the basic Max Cash Out.

Figure 2 – Conventional vs. Unconventional Cum ATCF

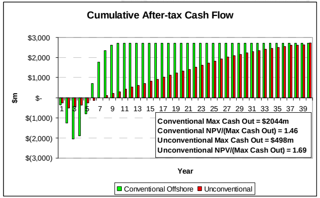


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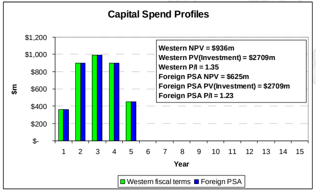
Figure 3 – Western Fiscal Regime vs. Foreign PSA Identical Before-tax Capital Spend Profiles



Applications Beyond Unconventional

Unfortunately, the energy industry has been surprisingly slow to realize that the superior capital efficiency metric for unconventional projects is actually the superior metric for all projects.

Consider two conventional projects with identical before-tax capital spend profiles and identical production profiles (Figures 3 & 4). The first is in a hypothetical fiscal regime with a royalty of 12.5%, a tax rate of 35%, and six-year straight-line depreciation. The project sits on its own; it is not ring-fenced with any ongoing production. Therefore, depreciation cannot be put against taxes until production begins at first oil. This type of fiscal regime is typical in many Western nations.

The second project comes under a production sharing agreement (PSA) in a developing nation and is ring-fenced with a number of producing assets. Royalties and taxes are calculated across the entire ring fence, not just on the project under consideration. The royalty is 20%, and taxes are applied in two tiers. Tax 1 is quite high (80%), but the first $20/bbl of revenue is exempt from taxation. In addition, any capital investment may be put immediately against revenue, and six-year depreciation is also subtracted before Tax 1 is calculated. Operating expenses are also deducted. Since the project is ring-fenced with producing assets, these tax deductions are put against current revenue from those assets. Tax 2 is also high (62%), but any tax paid under Tax 1 is deductible from the basis for Tax 2 (as well as the usual deductions of royalties, opex, and depreciation).

Such fiscal regimes are not uncommon. They are designed to generate large amounts of revenue for the government through high tax rates while encouraging operators to invest heavily in the area by allowing generous deductions for such investments.

Figure 4 – Western Fiscal Regime vs. Foreign PSA Identical Production Profiles

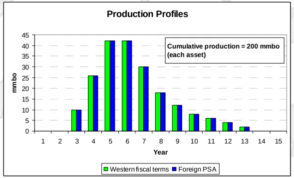
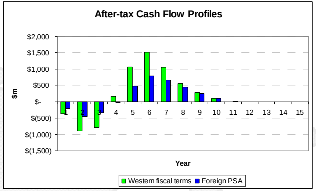


Figure 5– Western Fiscal Regime vs. Foreign PSA ATCF

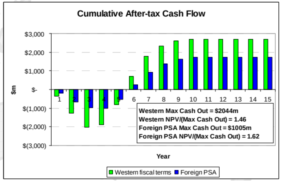


A Superior Capital Efficiency Metric for All Projects

As noted above, the before-tax investment profile and production profile are identical to those of the project in the Western fiscal regime. However, the after-tax cash flows of the two projects look nothing alike (Figure 5). This is because during the early years of high capital investment in the foreign PSA, the vast majority of that capital is immediately refunded to the operator in the form of tax deductions against ongoing production elsewhere in the ring fence. Thus, as with the unconventional project, the metric PV(Investment) bears no resemblance to the actual amount of capital required to implement the project. It over-estimates that value by a factor of more than two-and-a-half.

A far better capital efficiency metric to use is the one used on unconventional plays: NPV/(Max Cash Out). When P/I is measured in this manner, a much more realistic comparison can be made of the relative capital efficiencies of the conventional project in the Western fiscal regime vs. the one in the foreign PSA (Figure 6). In fact, the foreign PSA has the higher capital efficiency.

Figure 6– Western Fiscal Regime vs. Foreign PSA Cum ATCF



SUMMARY

A measure of capital efficiency should answer the question, "With $XXX dollars to spend, how much value can I create?" The traditional calculation of P/I grossly underestimates the value that can be created in any situation in which the maximum cash out-of-pocket on an after-tax basis is significantly different from the maximum cash out-of-pocket on a before-tax basis. Unlike the traditional "NPV/PV(Investment)" calculation, the "NPV/(Max Cash Out)" calculation appropriately captures the capital efficiency of ***all*** projects – those in which the before- and after-tax maximum cash out-of-pocket figures are similar, and those in which they are very different. It should become the industry's standard measure of capital efficiency.