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**Field Development Tax Incentives
for the UK Continental Shelf (UKCS)**

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and
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**Aberdeen Centre for Research in Energy Economics and
Finance (ACREEF)**

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NORTH SEA ECONOMICS

Research in North Sea Economics has been conducted in the Economics Department since 1973. The present and likely future effects of oil and gas developments on the Scottish economy formed the subject of a long term study undertaken for the Scottish Office. The final report of this study, The Economic Impact of North Sea Oil on Scotland, was published by HMSO in 1978. In more recent years further work has been done on the impact of oil on local economies and on the barriers to entry and characteristics of the supply companies in the offshore oil industry.

The second and longer lasting theme of research has been an analysis of licensing and fiscal regimes applied to petroleum exploitation. Work in this field was initially financed by a major firm of accountants, by British Petroleum, and subsequently by the Shell Grants Committee. Much of this work has involved analysis of fiscal systems in other oil producing countries including Australia, Canada, the United States, Indonesia, Egypt, Nigeria and Malaysia. Because of the continuing interest in the UK fiscal system many papers have been produced on the effects of this regime.

From 1985 to 1987 the Economic and Social Science Research Council financed research on the relationship between oil companies and Governments in the UK, Norway, Denmark and The Netherlands. A main part of this work involved the construction of Monte Carlo simulation models which have been employed to measure the extents to which fiscal systems share in exploration and development risks.

Over the last few years the research has examined the many evolving economic issues generally relating to petroleum investment and related fiscal and regulatory matters. Subjects researched include the economics of incremental investments in mature oil fields, economic aspects of the CRINE initiative, economics of gas developments and contracts in the new market situation, economic and tax aspects of tariffing, economics of infrastructure cost sharing, the effects of comparative petroleum fiscal systems on incentives to develop fields and undertake new exploration, the oil price responsiveness of the UK petroleum tax system, and the economics of decommissioning, mothballing and re-use of facilities. This work has been financed by a group of oil companies and Scottish Enterprise, Energy. The work on CO2 Capture, EOR and storage was financed by a grant from the Natural Environmental Research Council (NERC) in the period 2005 – 2008.

For 2016 the programme examines the following subjects:

- a. Decommissioning Tax Relief
- b. Further Research on Economics of EOR with Emphasis on Tax
- c. Collaborative Agreements among Licensees: Cluster Developments
- d. Collaborative Agreements among Licensees and Contractors
- e. Facilitation of Decommissioning Cost Reductions including by Collaboration
- f. Prospects for Activity in the UKCS to 2050

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Field Development Tax Incentives
for the UK Continental Shelf (UKCS)

Professor Alexander G. Kemp and Linda Stephen

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Field Development Tax Incentives **for the UK Continental Shelf (UKCS)**

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1. Introduction

The persistent collapse in the oil price has led to a major decline in exploration and new project investment in the UKCS. The aggregate net cash flows of the industry have been negative for some time. A significant number of producing fields are experiencing losses. The ONS has calculated that the pre-tax return on aggregate investment has fallen to 3.2% in the third quarter of 2015. Cost reductions have been implemented which have resulted in many thousands of job losses. Many prospective investment projects have been put on hold or even cancelled. The present majority view is that the current low levels of oil and gas prices could well persist for some months and perhaps for much longer.

This is the sombre context in which Budget 2016 should be seen as far as the UKCS is concerned. Of course, in Budget 2015 significant tax reductions were introduced, namely (1) a reduction in the rate of Petroleum Revenue Tax (PRT), levied on fields with development approval prior to 16th March 1993, from 50% to 35%, (2) a reduction in the rate of Supplementary Charge (SC) from 32% to 20%, and (3) the introduction of an investment allowance (IA) for SC at the rate of 62.5%. The total headline rates are now 67.5% on PRT-paying fields and 50% on other fields. But circumstances have changed markedly since Budget 2015 with further falls in both oil and gas prices. Investment in exploration and development has clearly stalled further. It is thus

appropriate to examine the question of whether further tax incentives could enhance new field activity levels. Accordingly the modelling work in this study concentrates on fields which are not subject to PRT.

2. Methodology and Data

The study has been undertaken with the employment of financial simulation models incorporating the tax system currently applicable to new field developments, plus several modifications to it. The specific variations from the present tax system are as follows:

1. Investment Allowance (IA) for Supplementary Charge allowed to be activated against a different project's income giving earlier effective relief
2. Interest on IA at the RFES rate to be allowed from the time when the IA can be activated but cannot be used because of insufficient income to absorb the allowance
3. Reductions in headline rate of SC with CT unchanged
4. Reductions in headline rate of CT with SC unchanged
5. Combinations of the above, particularly reductions in CT and SC rates

The modelling has been undertaken separately for investors in two different tax positions. The first is where he is currently in a tax-paying position and can claim relief for his investment costs against income from other fields. This situation is termed "ongoing investor" for short. The second is where he is not in a tax-paying position at the time of the investment. This situation is termed "project investor" for short. In this case the investor makes use of the Ring Fence Expenditure Supplement (RFES).

The study has been undertaken under 3 price scenarios for oil and gas, namely (1) \$30 and 30 pence, (2) \$50 and 40 pence, and (3) \$60 and 45 pence. All are in real terms.

The modelling has been conducted on a set of representative fields, designed to reflect field sizes, production profiles, and type (oil or gas), typical of approved developments over the last few years. Attention has also been given to the original cost estimates and to the cost reductions achieved over the last 18 months or so. The unit costs selected reflect estimated cost savings. They are linked to real projects which relate to a diversity of development types and, as a result, do not always reflect the economies of scale of any one development scheme. Assumptions for the key elements of the representative fields are shown in Table 1.

Table 1

Key Assumptions for Representative Fields

Average Devex/boe (\$)					
mmboe	10	20	30	50	100
CNS Oil	23.87	18.53	14.24	10.67	14.95
CNS Gas		15.82			10.67
NNS Oil	22.41	28.05		28.70	24.97
NNS Gas			15.41		
WoS Oil				21.17	20.06
WoS Gas					20.06
SNS Gas	23.88	22.62		16.04	

Average Opex/boe (\$)					
mmboe	10	20	30	50	100
CNS Oil	11.80	16.73	14.33	12.77	12.33
CNS Gas		10.85			7.85
NNS Oil	15.47	14.53		10.50	25.01
NNS Gas			15.38		
WoS Oil				18.64	18.21
WoS Gas					18.21
SNS Gas	11.63	12.05		9.43	

The model calculates pre-tax and post-tax returns to the projects. In the results emphasis is to pre-tax and post-tax NPV/pre-tax I ratios, employing 10% discount rate. This calculation is generally employed in the industry as a measure of capital productivity. Currently the industry is experiencing serious capital rationing, and particular attention is likely to be paid to the size of this ratio in making investment decisions. In the interpretation of the results attention is drawn to whether the calculated

NPV/I ratio exceeds or is less than 0.3 which could be a hurdle rate in the industry.

3. Results

(a) Pre-Tax Returns

In Charts 1-3 the pre-tax NPV / I ratios are shown under the 3 price scenarios. Under the \$30, 30 pence scenario it is seen that the ratios are generally negative. In only 1 case does the ratio exceed 0.3 which may be regarded as a threshold return by the industry.

In Chart 2 the pre-tax results are shown for the \$50, 40 pence case. In the CNS returns for the oil fields generally exceed 0.3, sometimes by a considerable margin. In the W of S, NNS and SNS the returns to all the projects are well below the 0.3 threshold and in quite a few cases are negative.

In Chart 3 the returns under the \$60, 45 pence scenario are shown. In the majority of cases the NPV/I ratio exceeds 0.3, sometimes by a considerable margin. It is noteworthy, however, that in the NNS and SNS the returns are mostly below the 0.3 threshold.

Chart 1

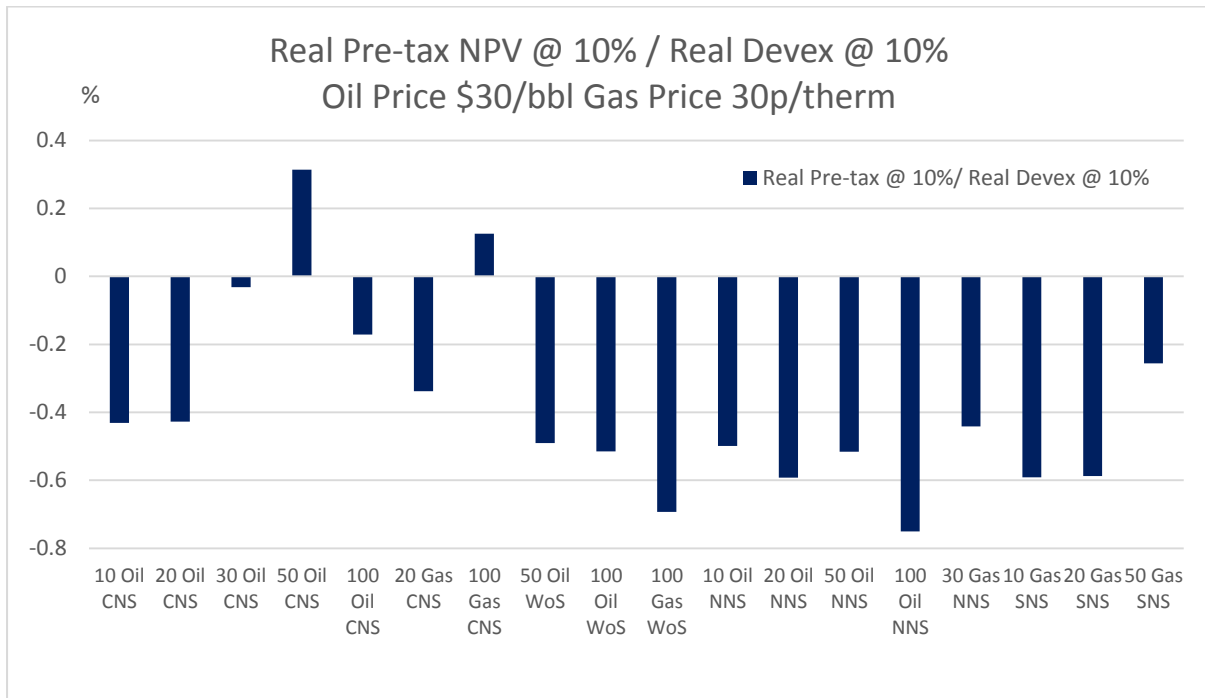


Chart 2

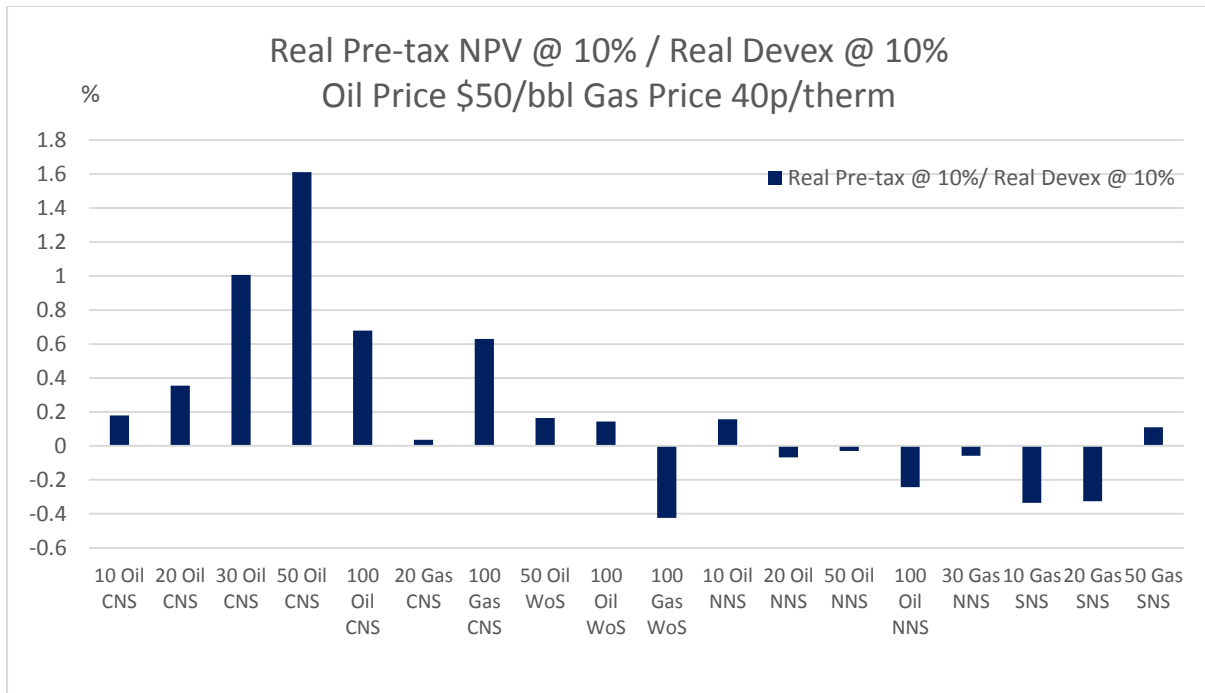
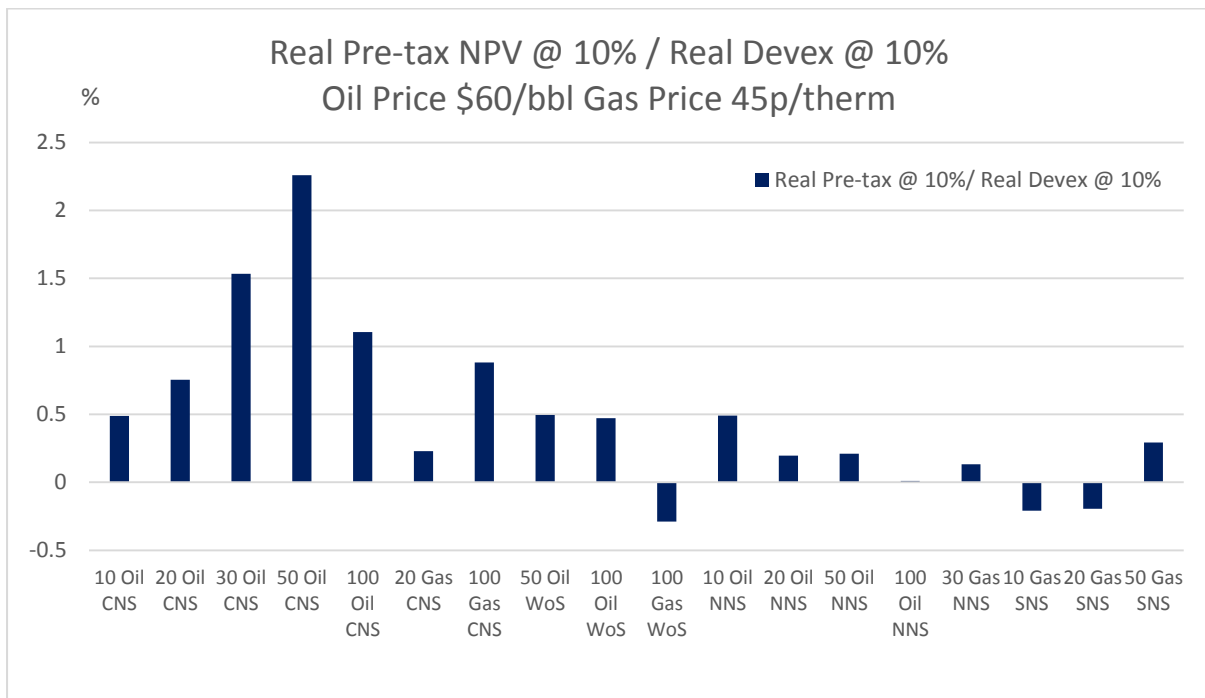


Chart 3



(b) Post-Tax Returns

(i) CNS – Oil

In Chart 4 the post-tax returns to the 10 mmbbls oil fields in the CNS are shown under the \$50, 40 pence scenario under a variety of tax rates of CT and SC with the existing allowances. In no case does the NPV/I ratio approach 0.3 but, as the pre-tax value, is also under 0.3 this is to be expected. Under the present tax system the ratio is below 0.2 for the ongoing investor and 0.11 for the project investor. The difference between the pre-tax and post-tax ratios is substantial for most tax combinations except the case of 0% SC. A noteworthy feature of the results is that, for a given combination of CT and SC rates, the returns to the investor are higher with a lower CT rate compared to the SC rate. This follows because the value of the investment allowance (IA) for the SC is reduced the lower the SC rate. With SC = 20% the value of the IA in terms of tax saved is

12.5% of the investment. If SC were 10% the value of the IA in terms of tax saved is 6.25% of the investment.

Chart 4

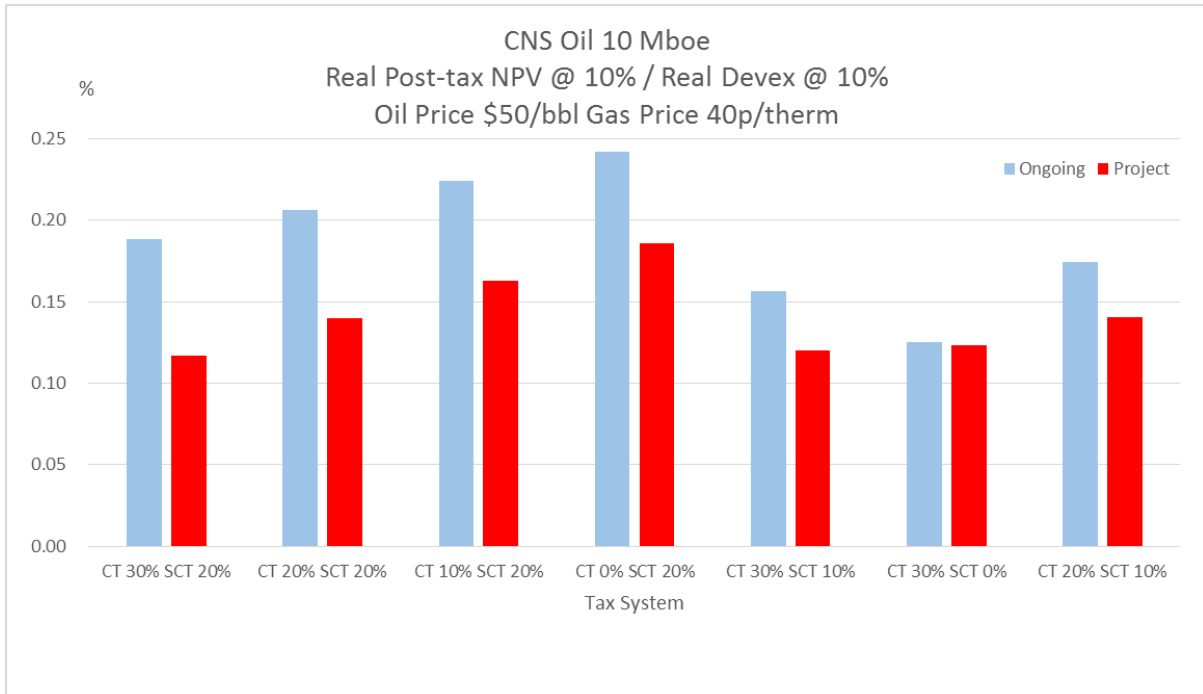
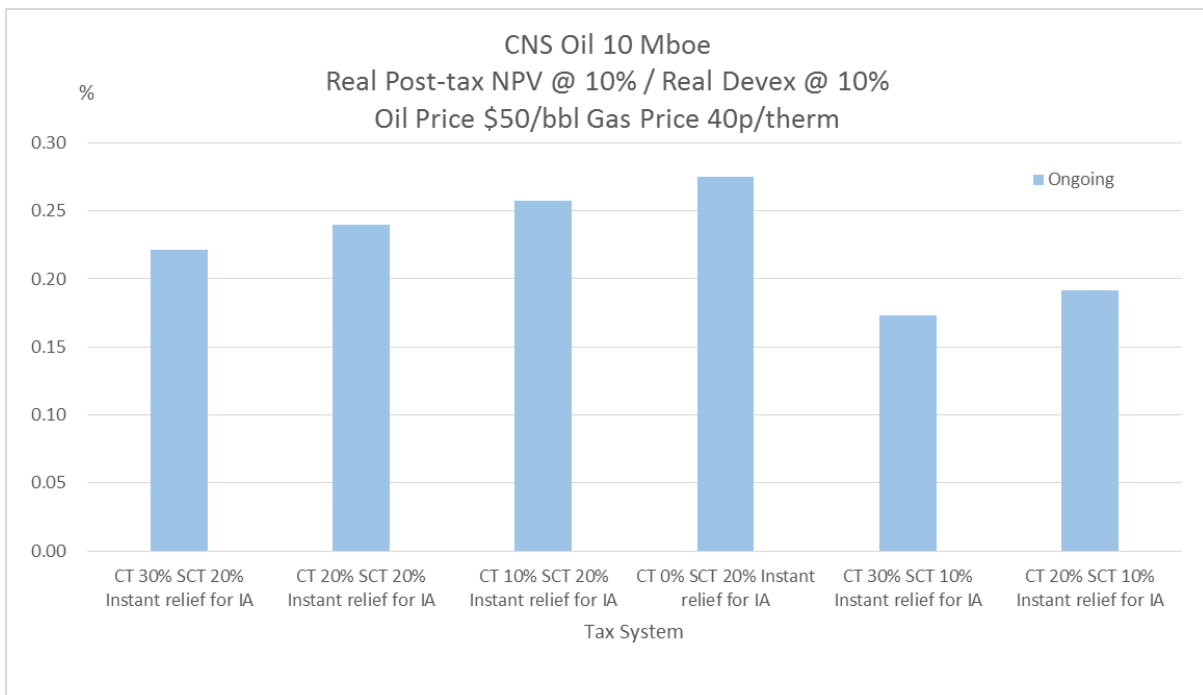


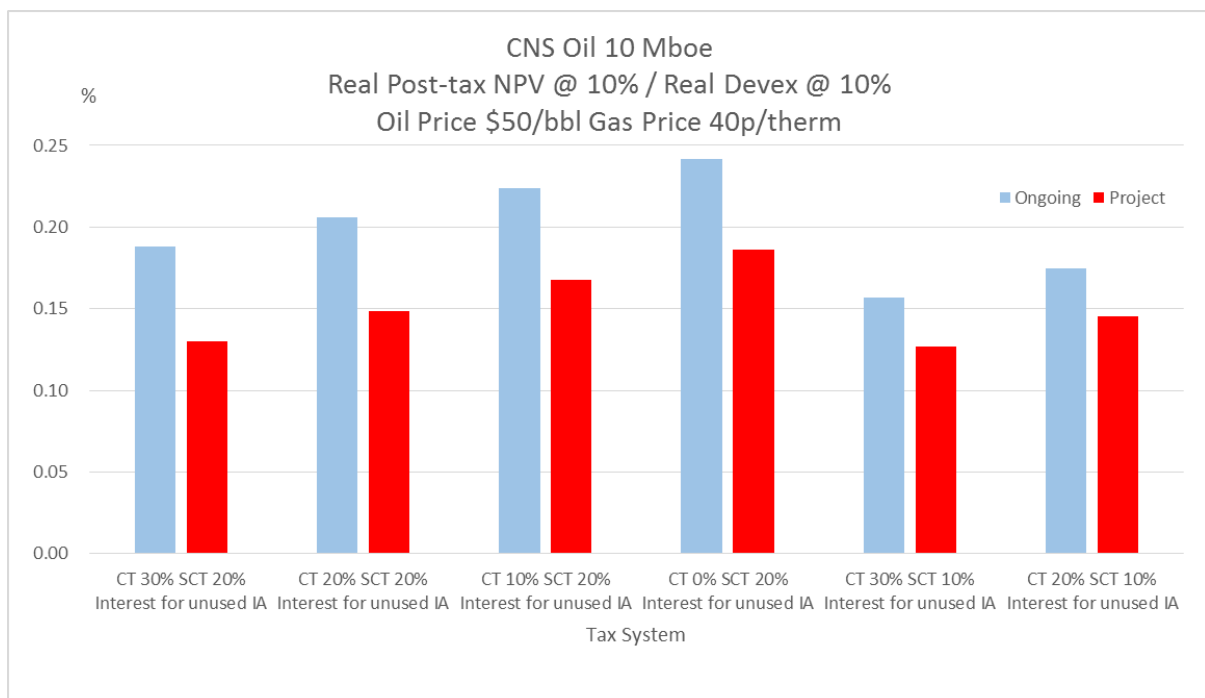
Chart 5



In Chart 5 the post-tax returns to the ongoing investor in the 10 mmbbls field with the \$50 price are shown when instant relief for the IA is available. Under the present tax system the effect is substantial. The NPV/I ratio increases from 0.19 to 0.22. With CT at 20% and SC at 20% there is a worthwhile increase from just over 0.21 to 0.24.

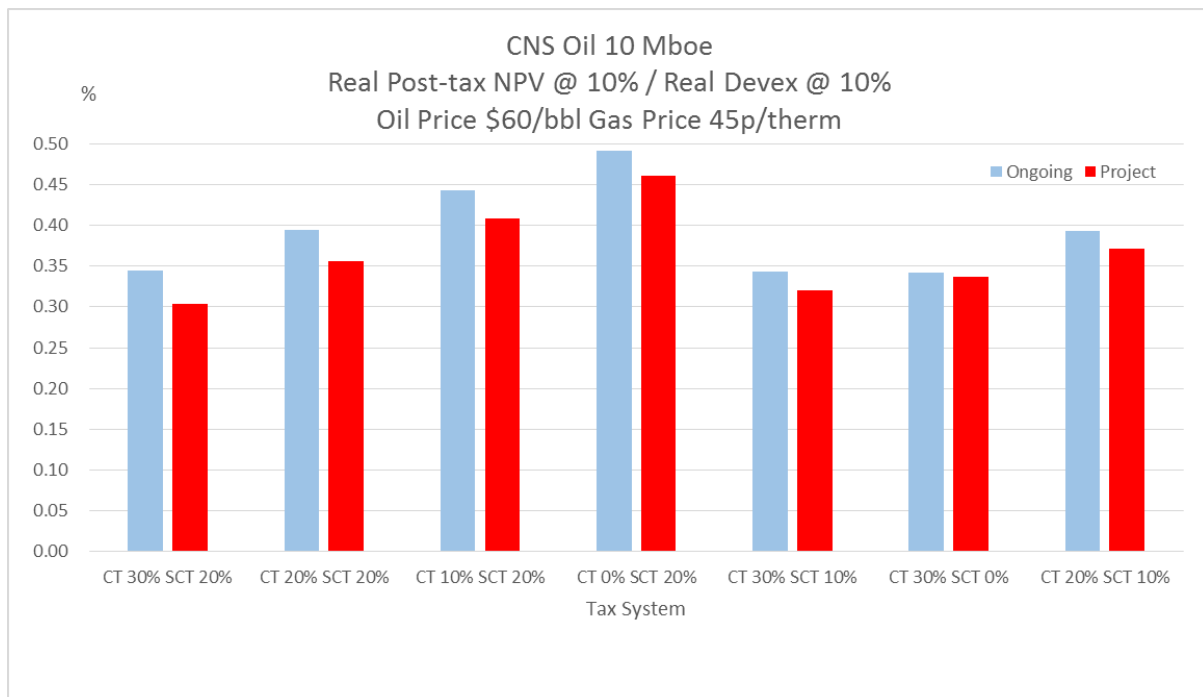
In Chart 6 the returns to the investor are shown when the interest at the RFES rate is available for any unused IA at the current time of its activation. For the ongoing investor the increase in returns is generally less than with instant relief for the IA. For the project investor, while there is some increase compared to the present tax system the ratio remains well below the pre-tax one.

Chart 6



In Chart 7 the post-tax returns on the 10 mmbbls field are shown with the \$60, 45 pence scenario under a variety of combinations of CT and SC rates. In this case the NPV/I ratios exceed 0.3 under the current tax system and with all the other tax rate combinations. The pre-tax ratio is 0.49 and in all cases the reduced tax rates leave the post-tax return well below this value except when CT 0% and SCT 20% for the ongoing investor. It is noteworthy that the differences between the ratios of an ongoing and project investor are relatively small under this price scenario, reflecting the greater importance of the increased value of the production revenues in determining the overall returns to the investment.

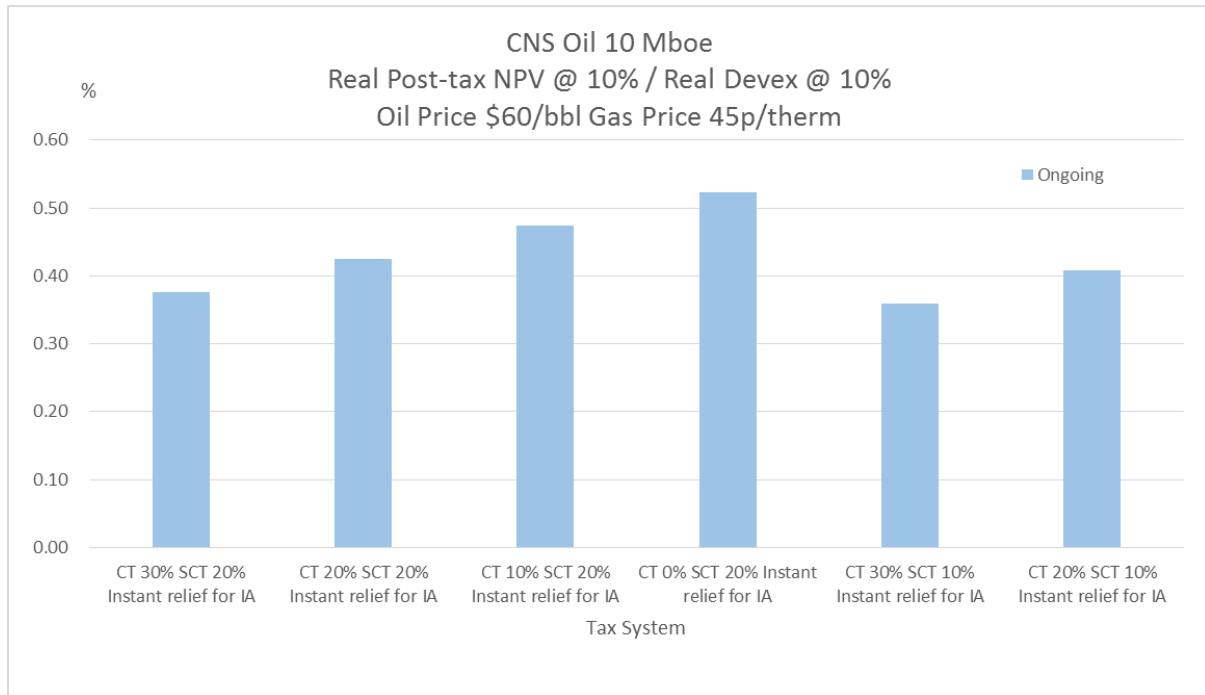
Chart 7



In Chart 8 the returns to an ongoing investor in the 10 mmbbls field at \$60, and 45 pence prices are shown for a variety of tax rates plus instant relief for the IA for the SC. Compared to the situation without the accelerated IA relief the returns are

increased to a worthwhile extent. With the present tax rates the ratio increases from under 0.34 to 0.38. All the results are well below the pre-tax value which is nearly 0.49.

Chart 8



In Chart 9 the results are shown for a variety of tax rates plus interest at the RFES rate for unused IA for both ongoing and project investors. With present tax rates the ratio for the ongoing investor is barely increased, but for the project investor the ratio increases from 0.3 to 0.32 which may be defined as a worthwhile improvement. In all cases the returns are well below the pre-tax value of just under 0.489.

Chart 9

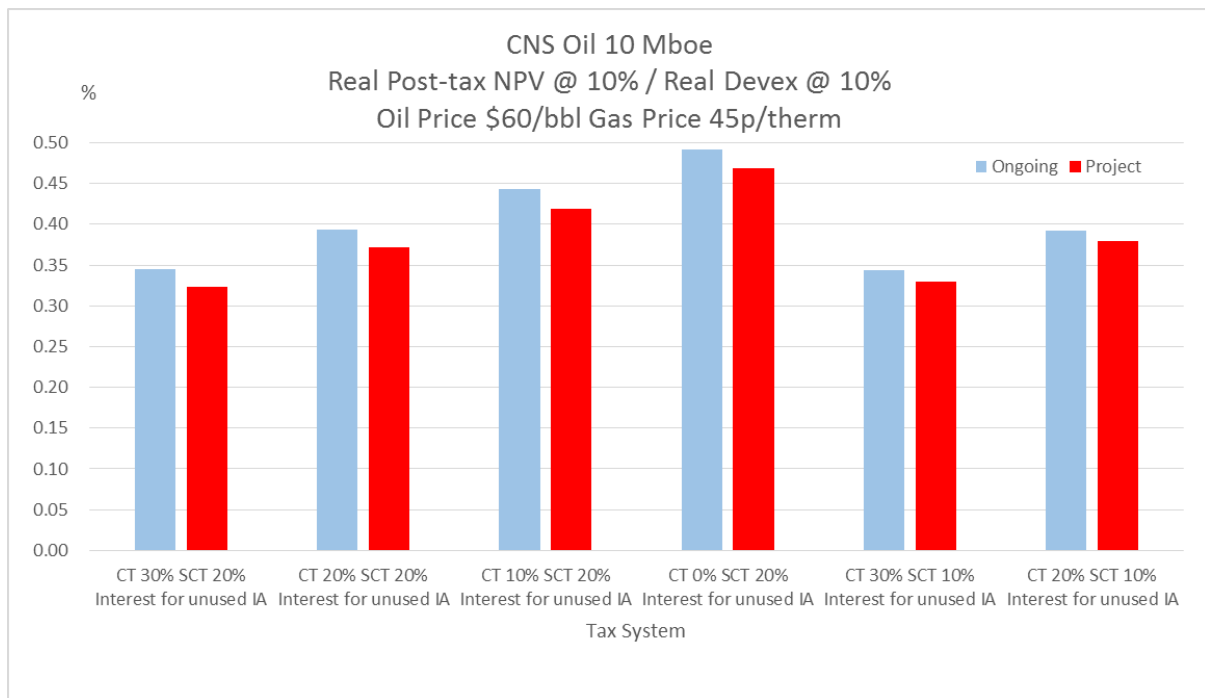
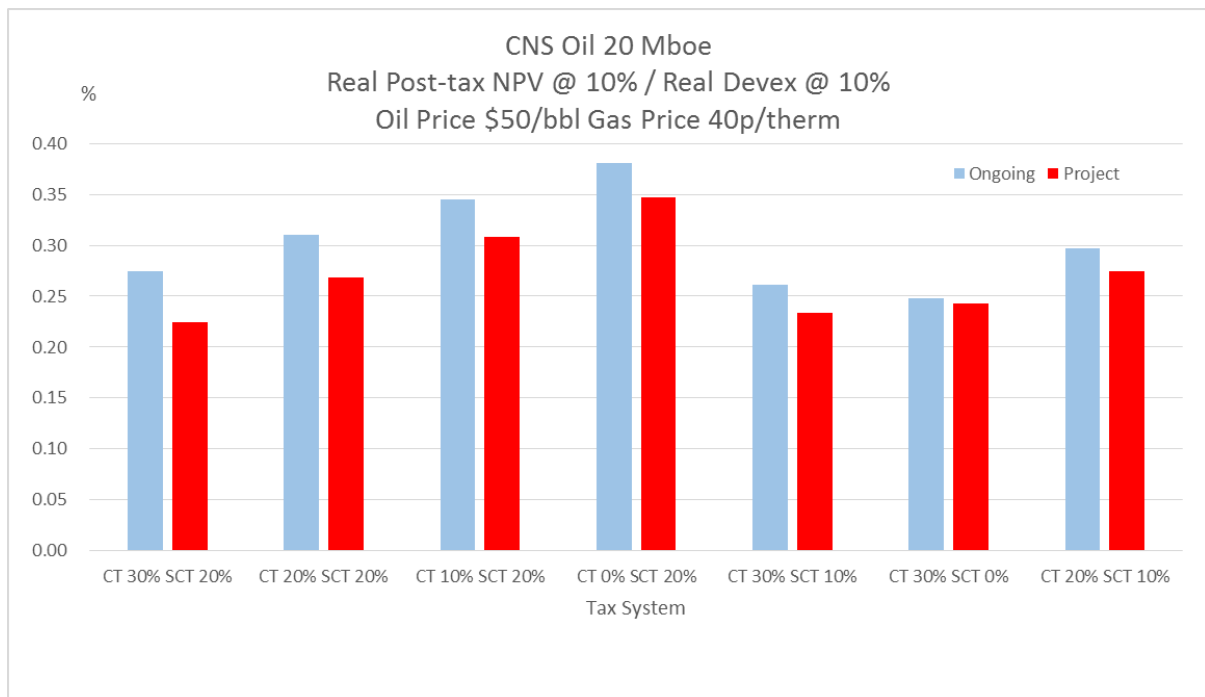


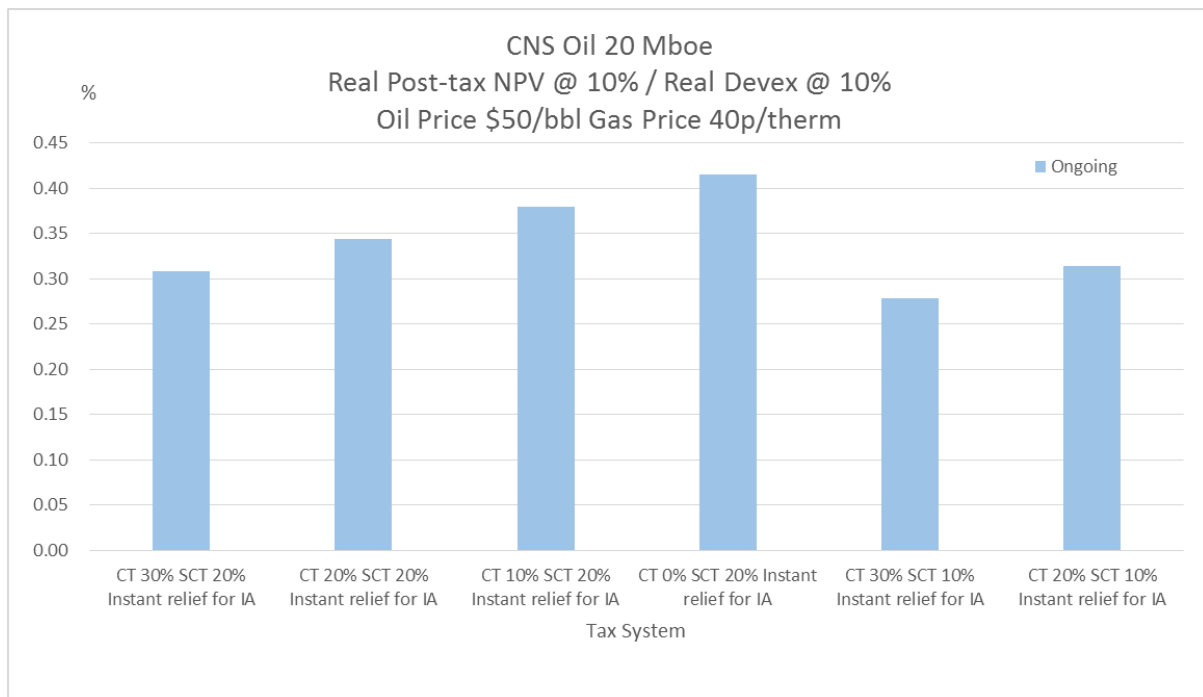
Chart 10



In Chart 10 the post-tax returns to the 20 mmbbls oil field in the CNS are shown under the \$50, 40 pence scenario for a variety

of CT and SC rates. Under the current tax system the ratio for the ongoing investor is 0.27 and for the project investor 0.2. Before tax it was 0.35. Reducing the CT rate to 20% brings the ratio comfortably above 0.31 for the ongoing investor and so could incentivise the project. But reducing SC to 10% with CT at 30% still leaves the ongoing investor with a ratio below 0.3. This also happens when the lower SC rate is combined with CT at 20% as well as when combined with CT at 30%. For the project investor an NPV/I ratio > 0.3 can only be obtained with CT at 10% and SC at 20%, apart from the unrealistic case of zero CT and 20% SC.

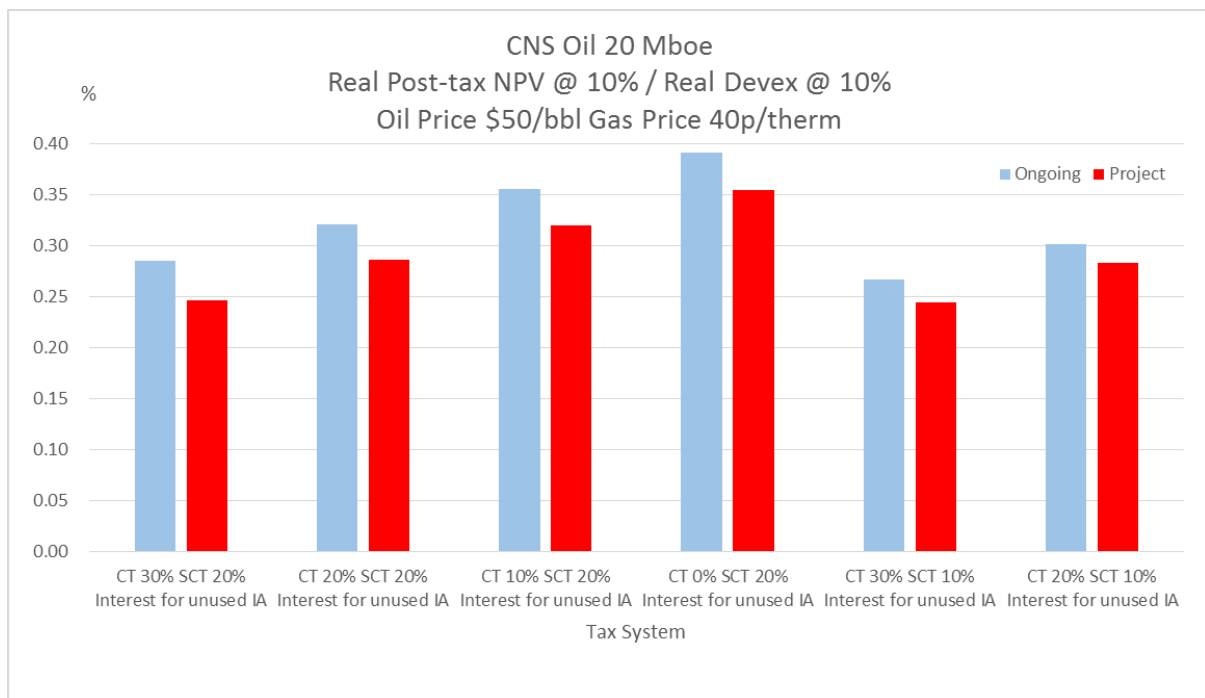
Chart 11



In Chart 11 the results for the 20 mmbbls oil field are shown for a variety of tax rates plus instant relief for IA for the ongoing investor at the \$50, 40 pence scenario. Interestingly, at current tax rates this extra relief is sufficient to tip the ratio from 0.27 to

just over 0.309. The extra relief could trigger the investment. With 20% CT and 20% SC the ratio becomes over 0.34 compared to under 0.31 without the relief. Similarly, with CT at 20% and SC at 10% the ratio comfortably exceeds 0.3 while it was just below this value without the extra relief.

Chart 12

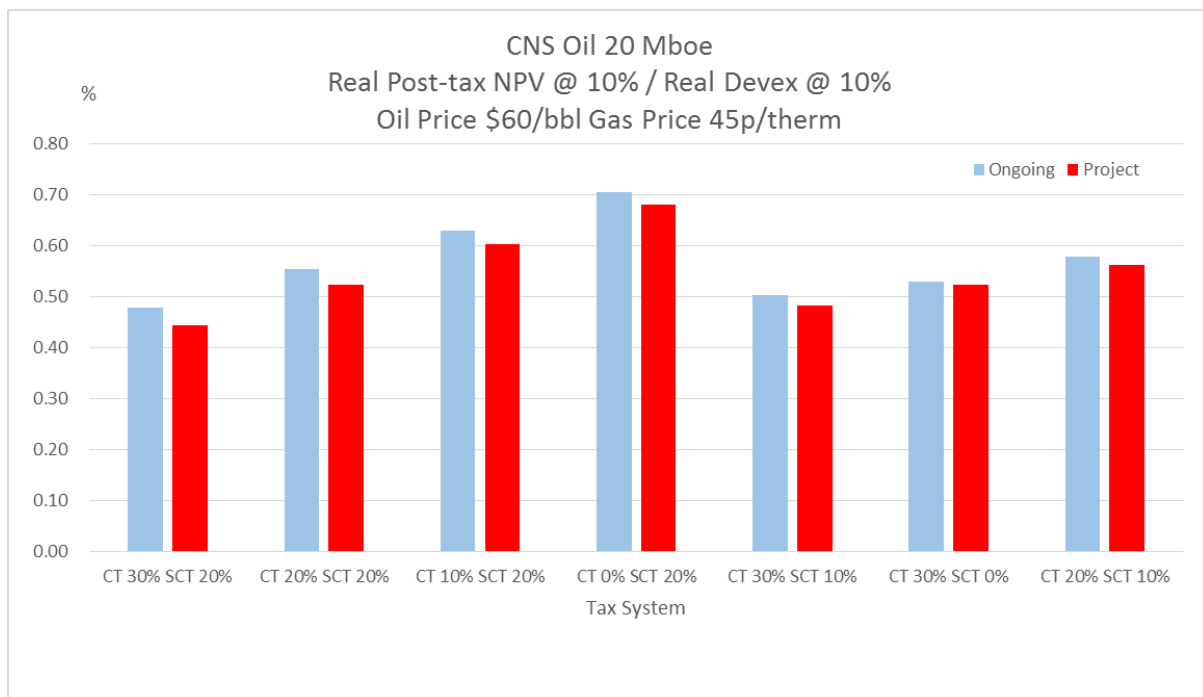


In Chart 12 the post-tax returns are shown for the 20 mmbbls field at the \$50, 40 pence scenario with a variety of tax rates plus interest at the RFES rate on unused IA. For the ongoing investor the increase in returns for the extra allowance is quite small. Under the present tax system the ratio remains well below 0.3. Only with a combination of CT at 20% and SC at 10% does the ratio reach 0.3. Without the allowance it was just under this value. Returns to project investors are enhanced to a more noticeable extent from the allowance under the present tax system. But it is noteworthy that, when lower SC rates are also

included, the increase in returns is very much less and in some cases it is negligible.

In Chart 13 the results are shown for the 20 mmbbls oil field at the \$60 price. In this case the NPV/I ratio under the current tax system is well in excess of 0.4 for both ongoing and project investors. It is noticeable that in this case reductions in headline rates, whether CT or SC, increase the ratios compared to the present tax system. This is because the extra income at the higher price has a stronger effect on post-tax returns.

Chart 13



In Chart 14 the post-tax returns are shown at \$60 price for the same field with various tax rates plus immediate relief for the IA for the ongoing investor. There is a worthwhile increase in the NPV/I ratios in all the situations examined compared to those without the extra concession.

Chart 14

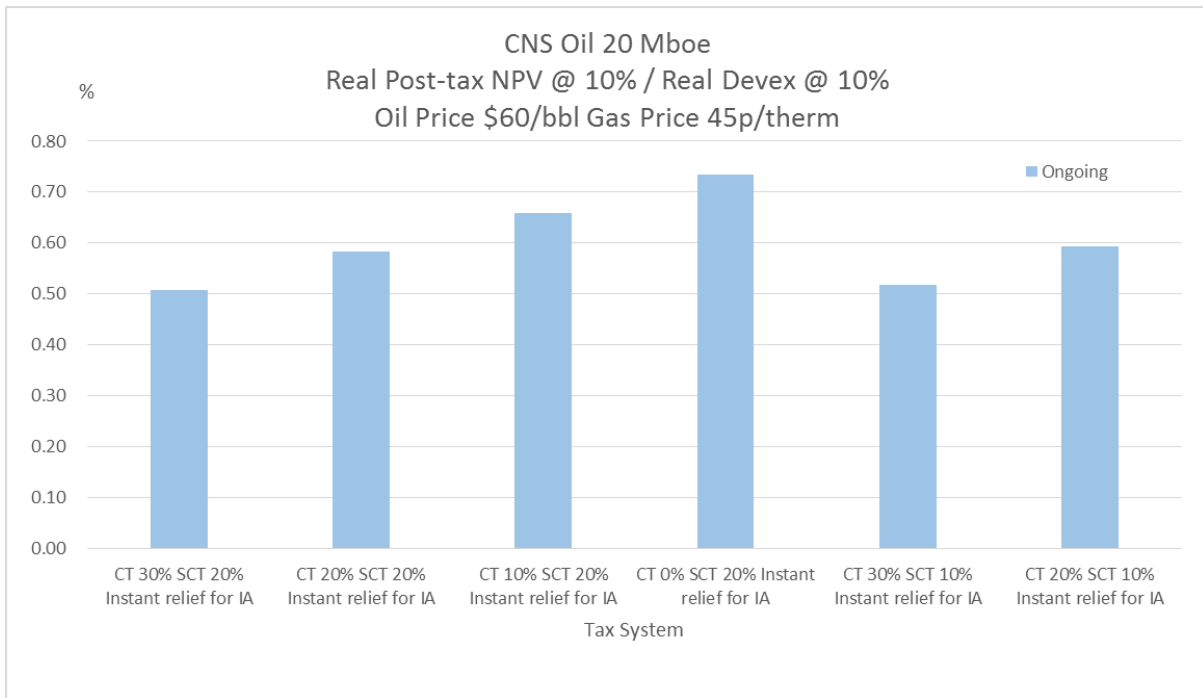
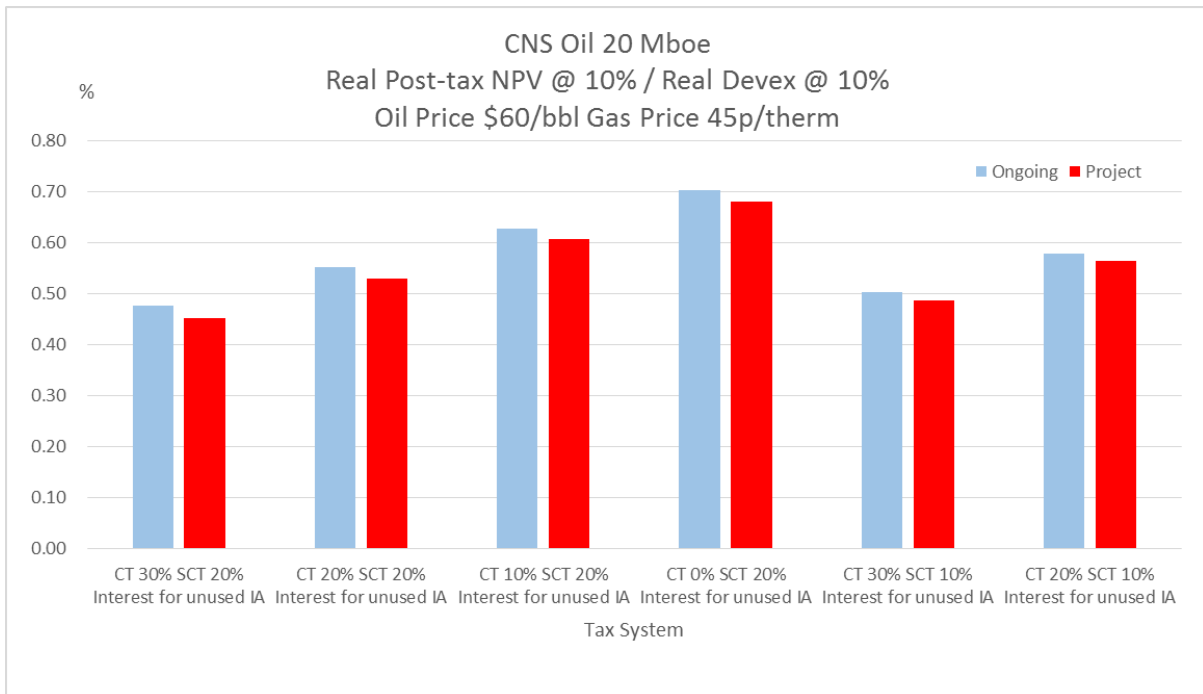


Chart 15



In Chart 15 the results are shown for the same field at the \$60 price with the addition of interest at the RFES rate for unused IA at the time of current eligibility for its use. For both the ongoing and project investors this makes little or no difference to the post-tax NPV/I ratios. This is because, at the \$60 price, there is generally adequate field income against which to set the IA without the need to carry forward unutilised amounts.

In Charts 16, 17 and 18 the returns to the 30 mmbbls field under the various assumptions discussed above are shown under the \$50 price. In this case the returns under the present tax system are clearly acceptable with the NPV/I ratio exceeding 0.61 for the ongoing investor and 0.58 for the project investor. Reductions in tax rates clearly enhance returns. It is again noticeable that reductions in the CT rate are more powerful than comparable reductions in the SC rate. It is seen that the introduction of instant relief for the IA increases returns to a worthwhile extent under the present tax system. When reduced rates of tax are also considered the increase in returns is relatively modest at the \$50 price. A comparison of Charts 16 and 18 indicates that the addition of interest on unused IA has negligible effect on returns as the higher income at \$50 price means that relief can more readily be attained without reverse to interest.

Chart 16

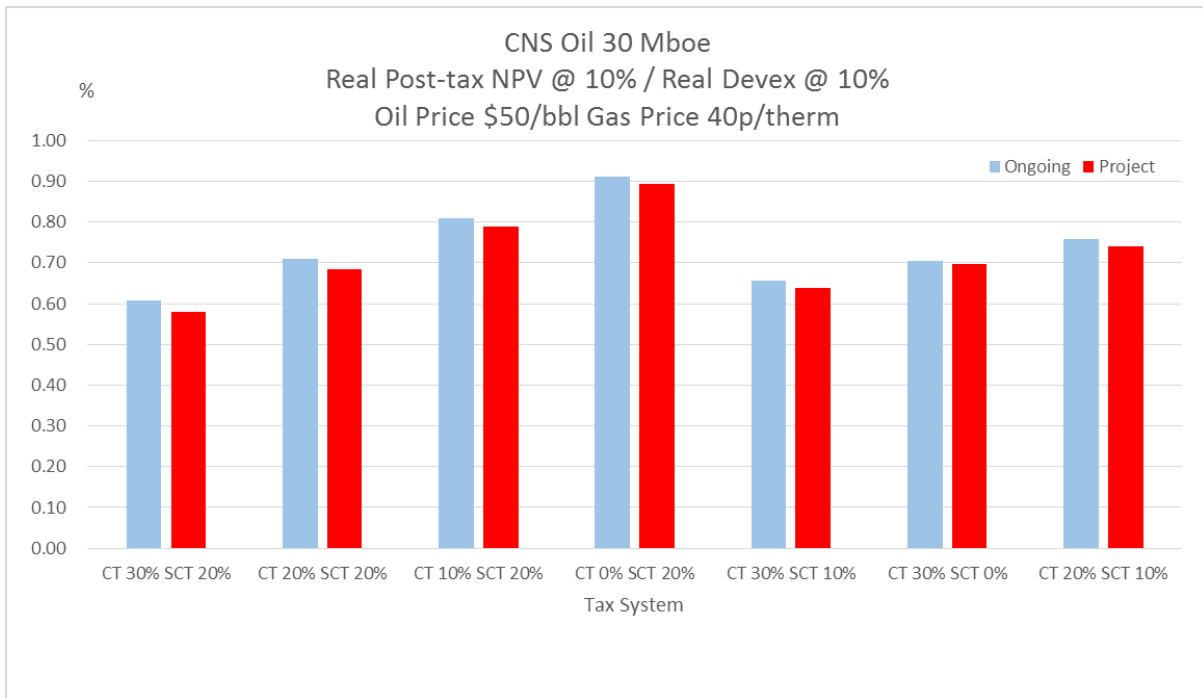


Chart 17

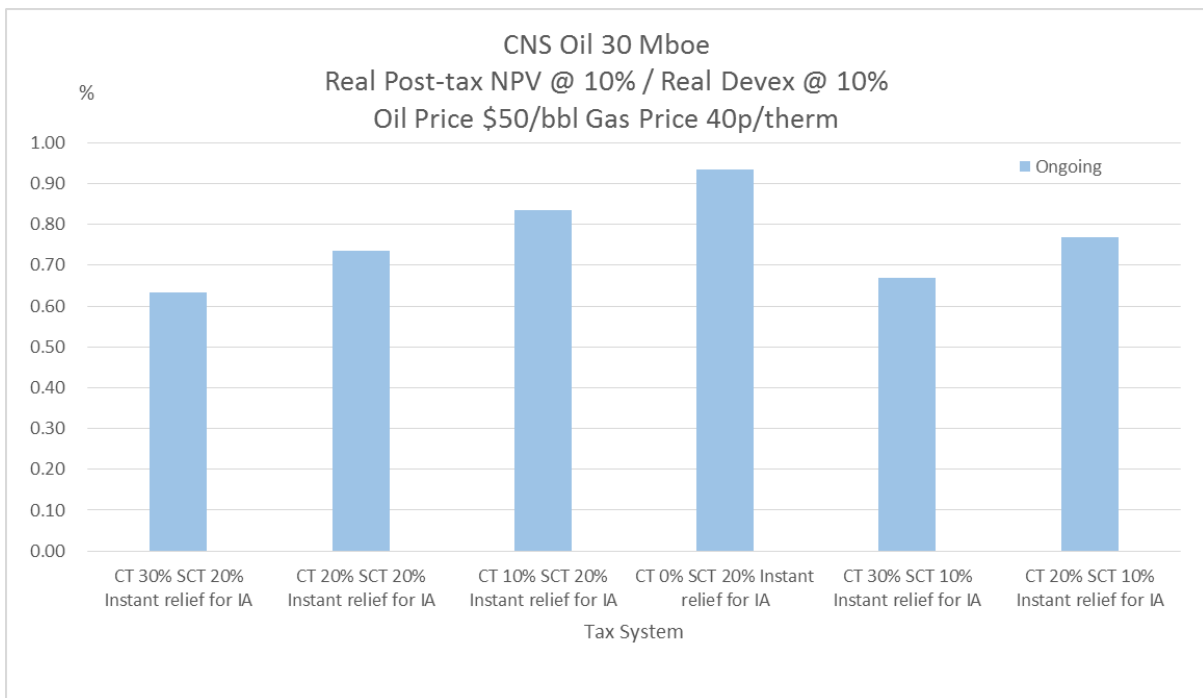
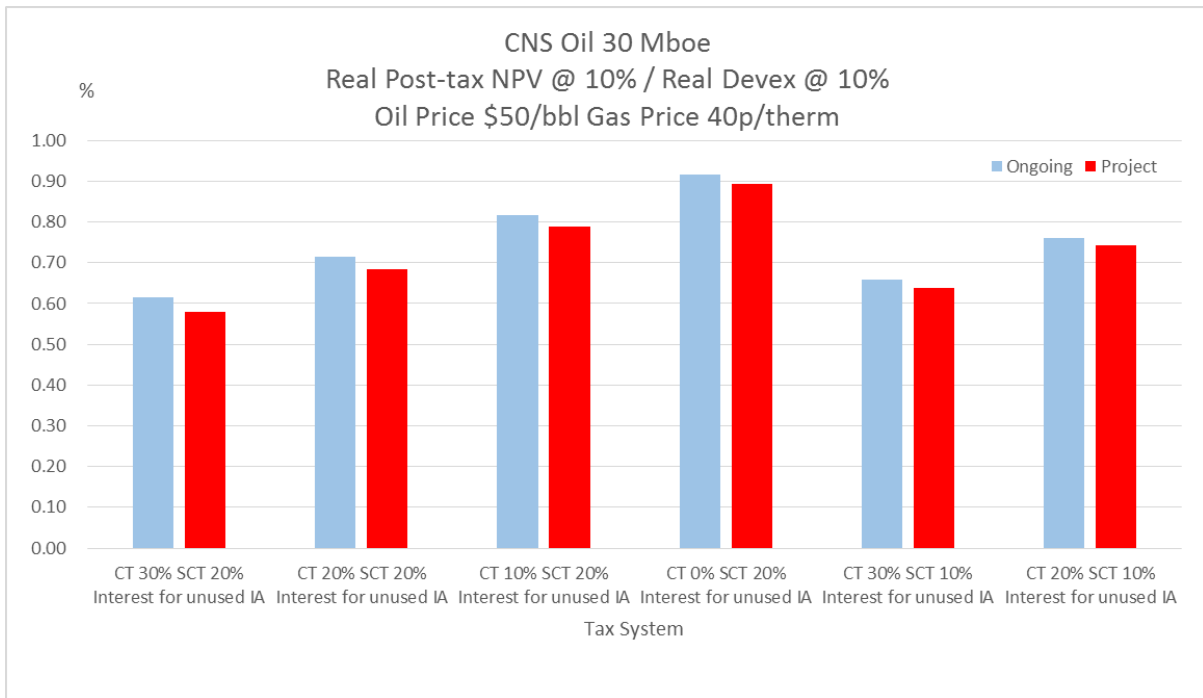


Chart 18



The returns to the 30 mmbbls oil field at the \$60 price under the various tax rate and tax allowance assumptions are shown in Charts 19, 20 and 21. The project is clearly profitable under the present tax system. Reductions in headline rates clearly increase the NPV/I ratios. Instant relief for the IA and interest on unused IA have negligible effects. This latter finding indicates that the extra allowances are progressive in their effects. Thus they can make a significant, positive difference to marginal projects but only a minor or even zero effect on quite profitable ones.

Chart 19

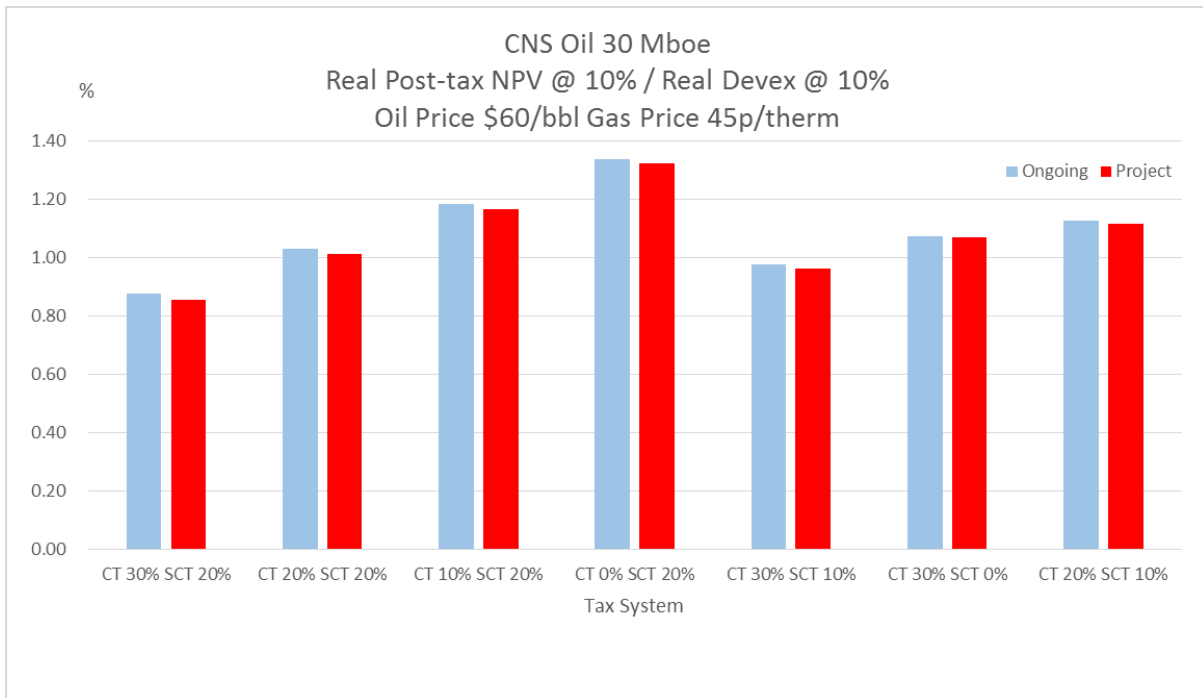


Chart 20

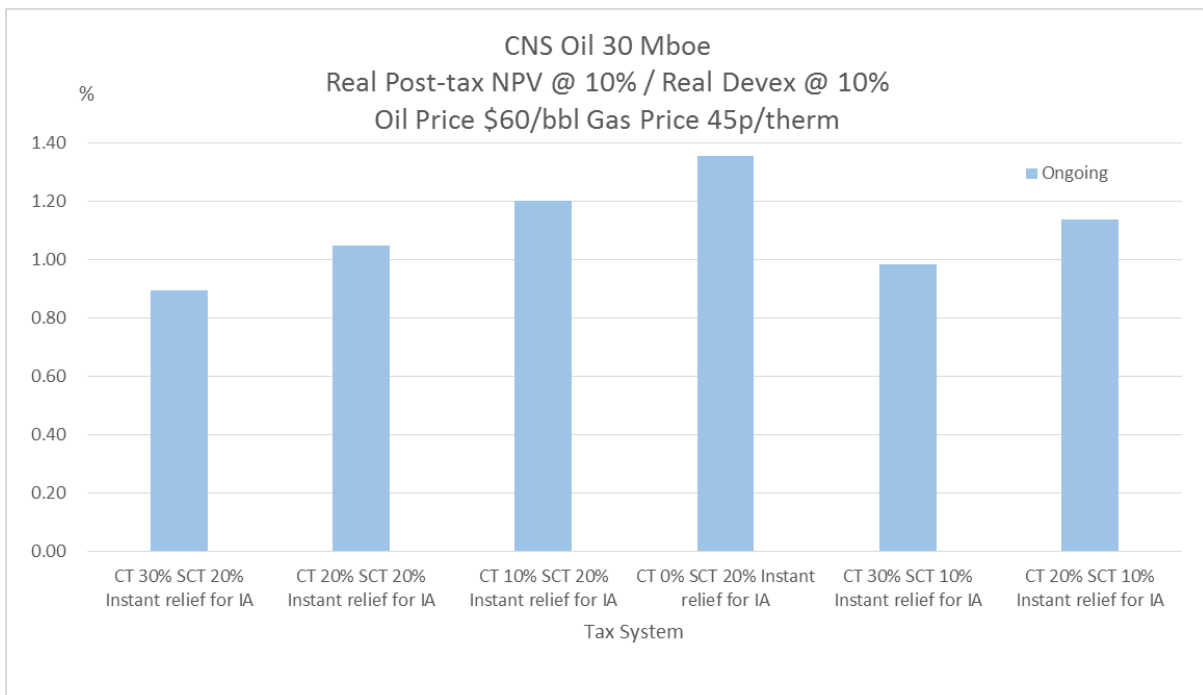
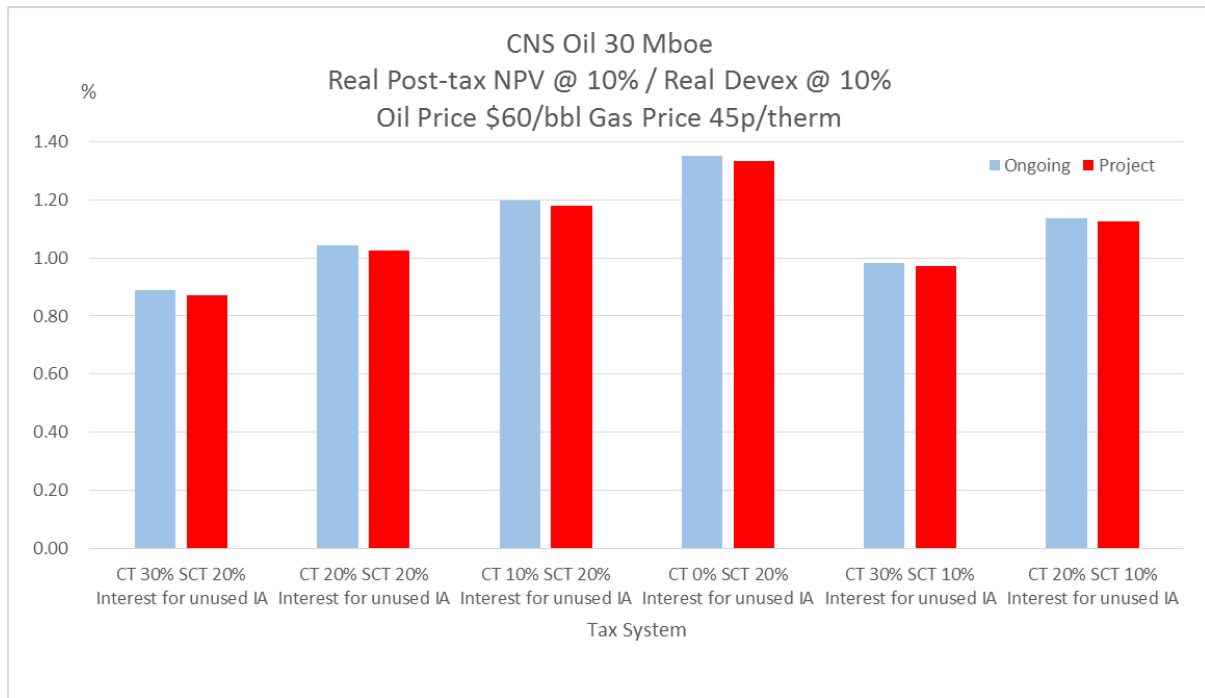


Chart 21



In Charts 22, 23 and 24 the returns to the 50 mmbbls oil field under the various tax arrangements are shown at the \$30 price. Very unusually, this is a project which exhibited a pre-tax NPV/I ratio just exceeding 0.3. Under the present tax system the ratio is 0.25 for an ongoing investor and 0.19 for the project investor. It is seen from Chart 22 that only major reductions in the CT rate can produce a ratio exceeding 0.3 for the ongoing investor, while some of the rate changes examined bring the ratio close to 0.3 for the project investor. It is also seen from Chart 23 that the availability of instant relief for the IA produces a substantial improvement to the ratio for the ongoing investor, but it remains short of the 0.3 threshold unless CT is less than 30% and SCT is 20%. However, it is noteworthy that a combination of 20% CT and 20% SC plus instant relief for the IA is sufficient to produce returns clearly in excess of 0.3. See Chart 23. The availability of interest on unused IA is not so

powerful and the 0.3 threshold is only achieved when, in addition, there are major reductions in the CT rate. See Chart 24.

Chart 22

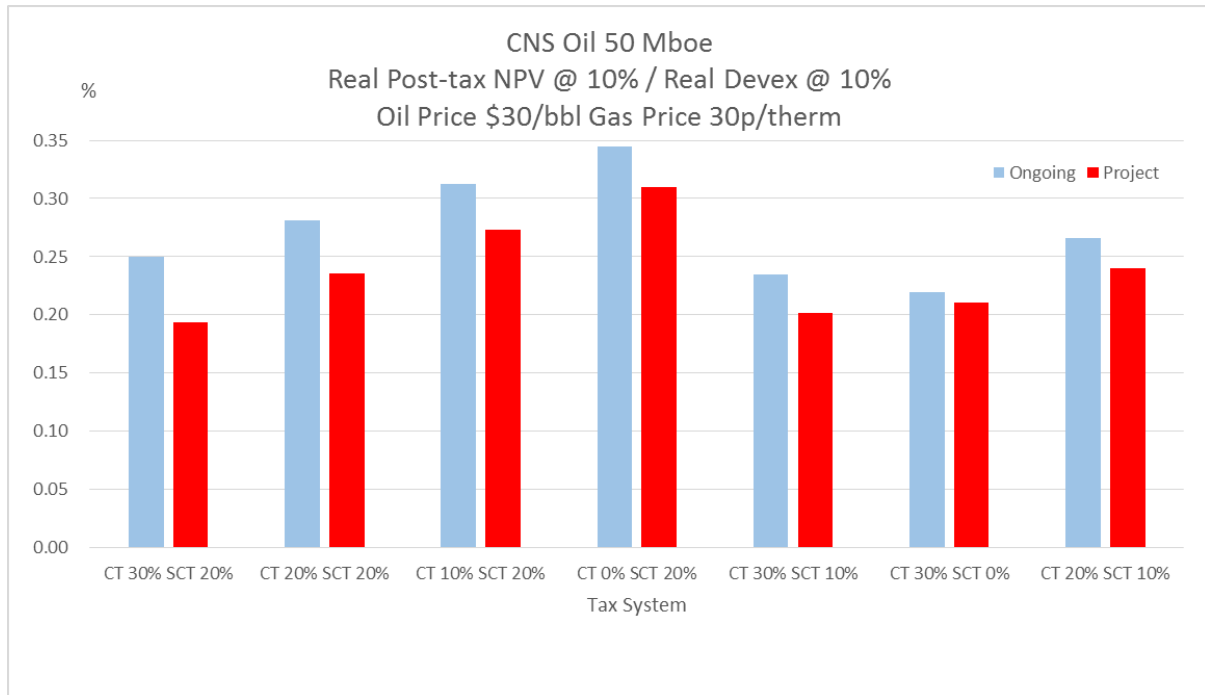


Chart 23

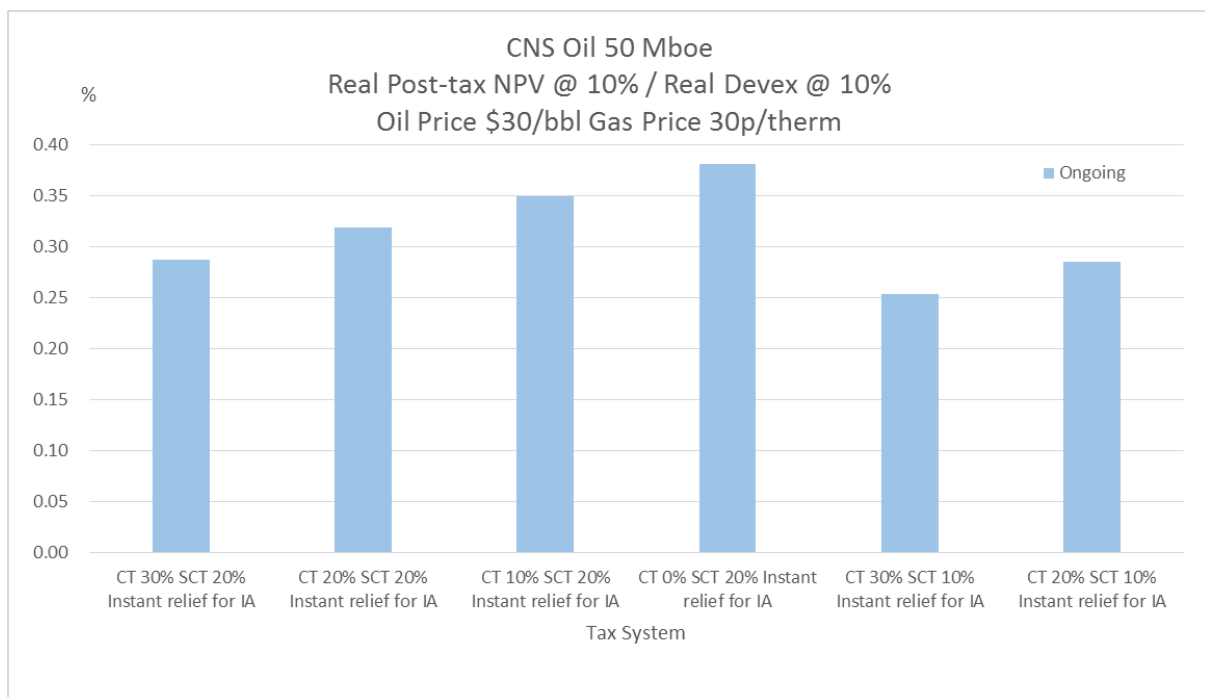
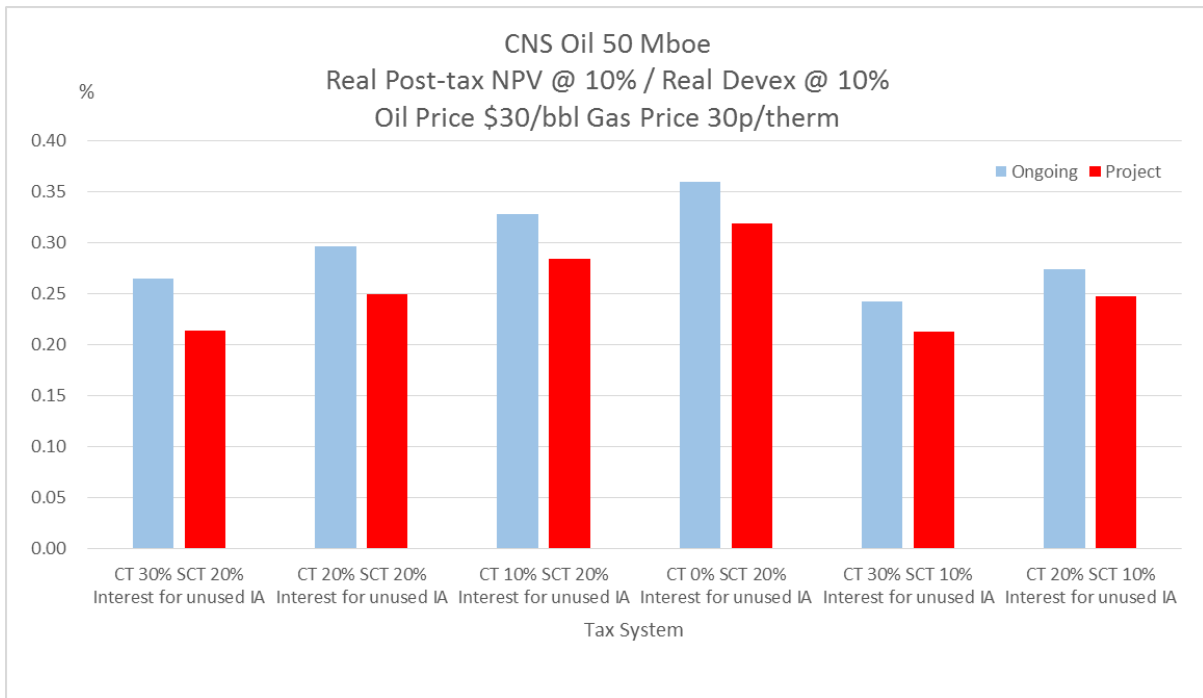


Chart 24



In Charts 25, 26 and 27 the returns to the 50 mmbbls oil field are shown at \$50 prices. This project is clearly profitable under the present tax system. It is noticeable that the provision of instant relief for IA makes virtually no difference to the NPV/I ratios. It is also noteworthy that the difference in NPV/I ratios between ongoing and project investors becomes very small when interest on unused IA is included. See Chart 27. For completeness the results under the \$60 oil price are shown in Charts 28, 29 and 30. The project is clearly profitable under the present tax system. It should again be stressed that this is a very unusual but realistic case in the CNS.

Chart 25

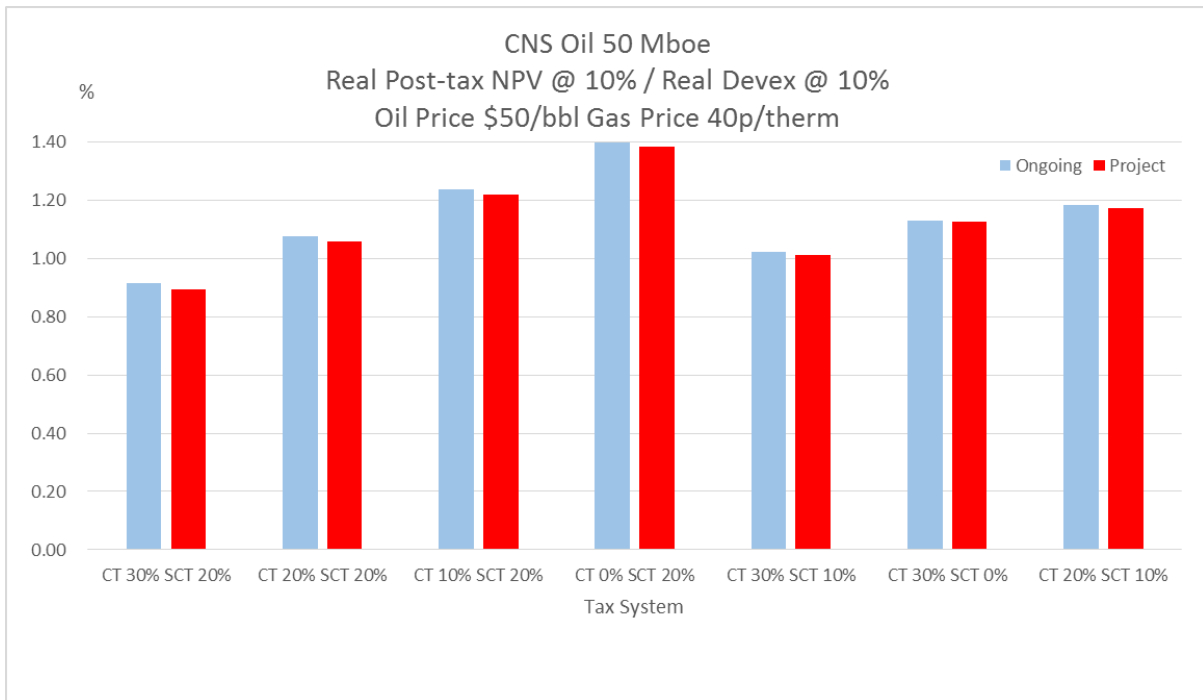


Chart 26

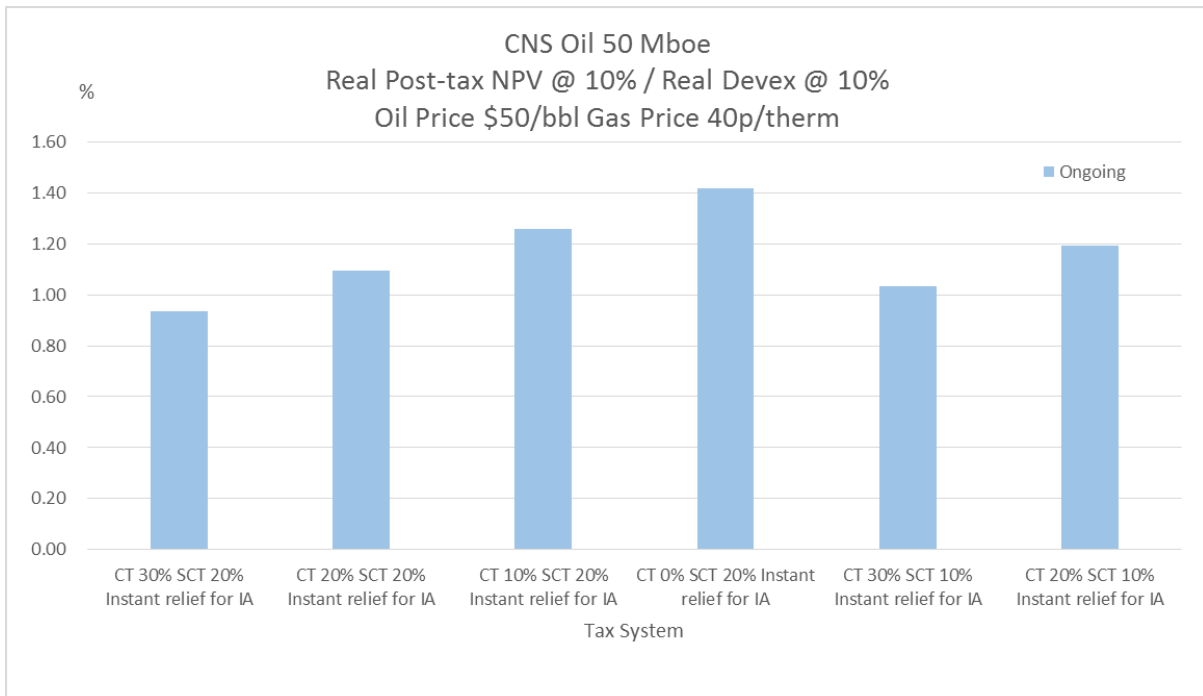


Chart 27

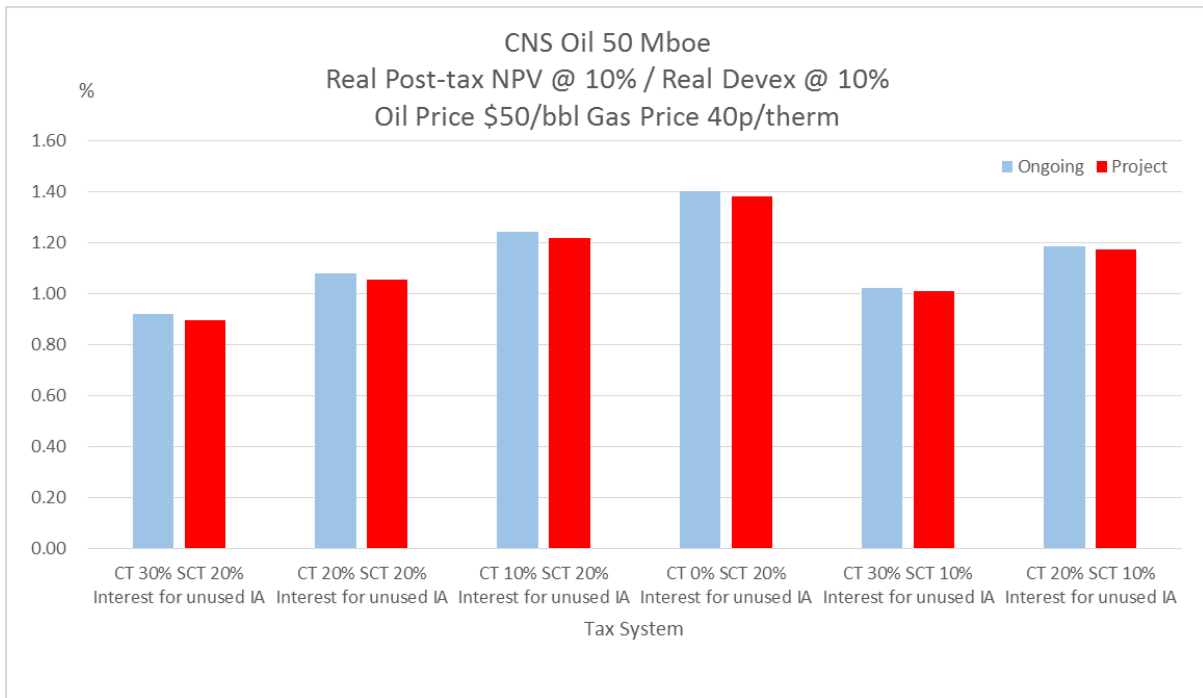


Chart 28

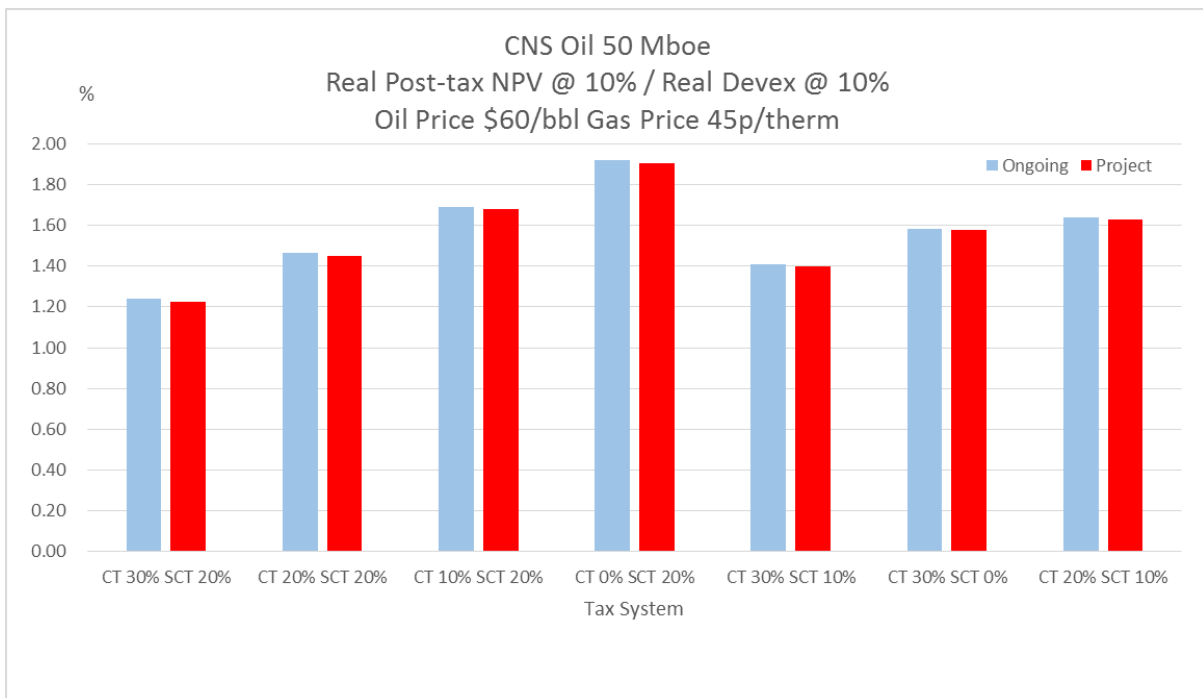


Chart 29

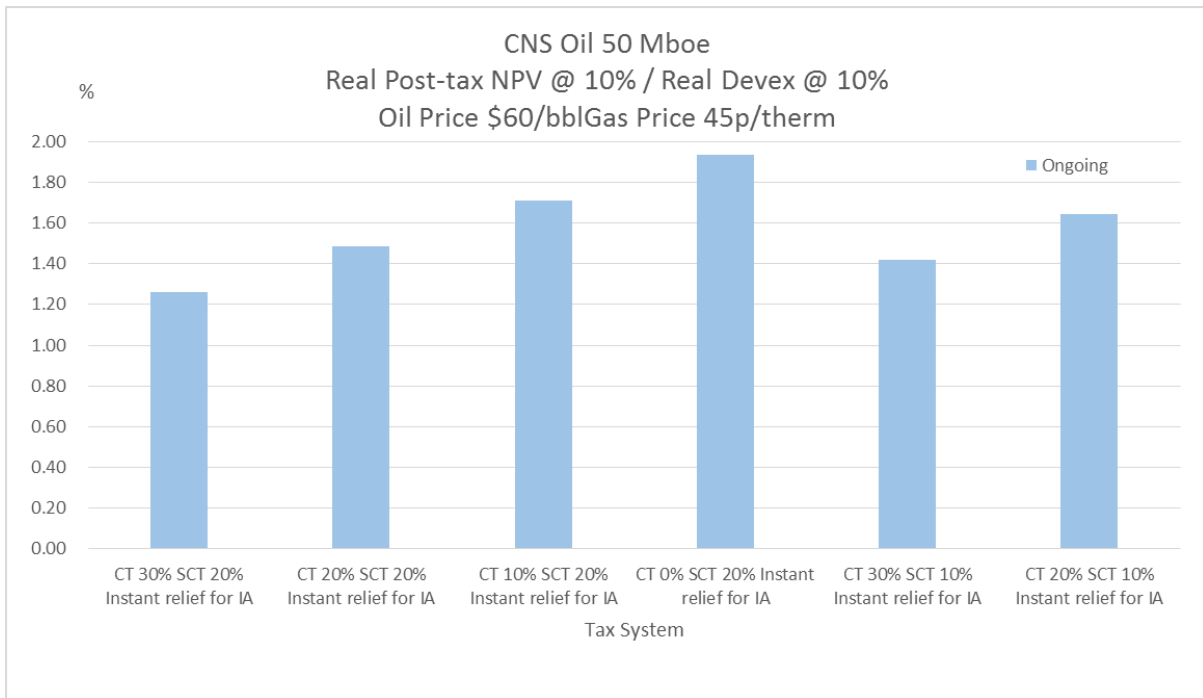


Chart 30

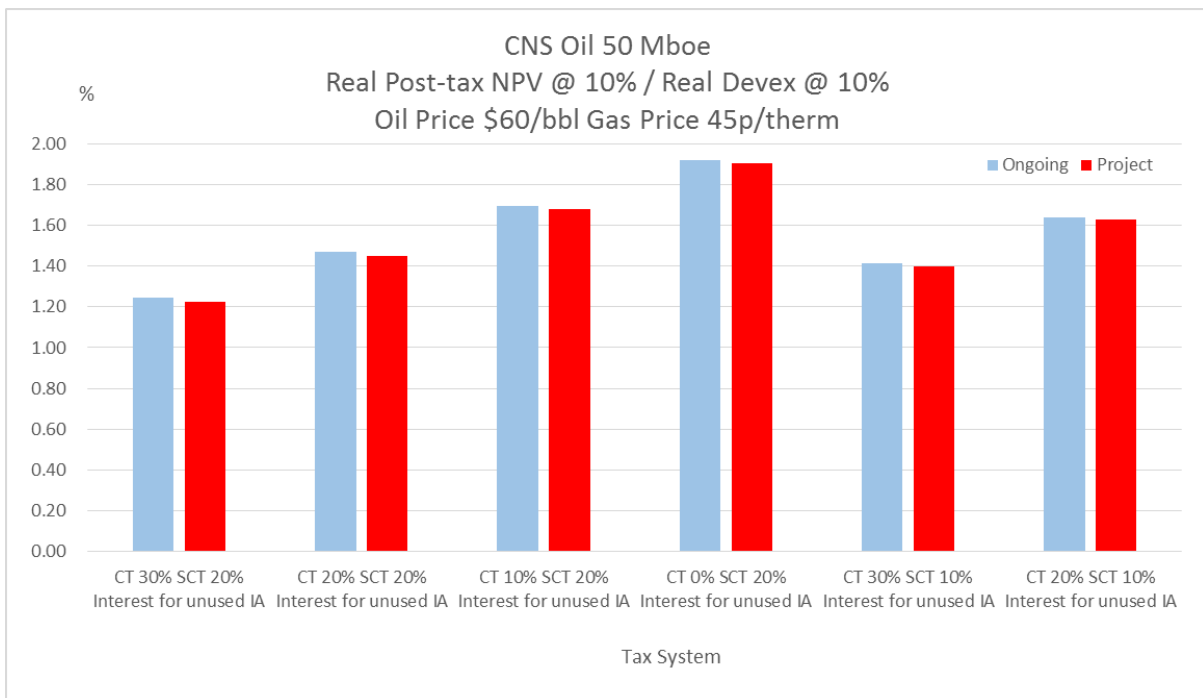


Chart 31

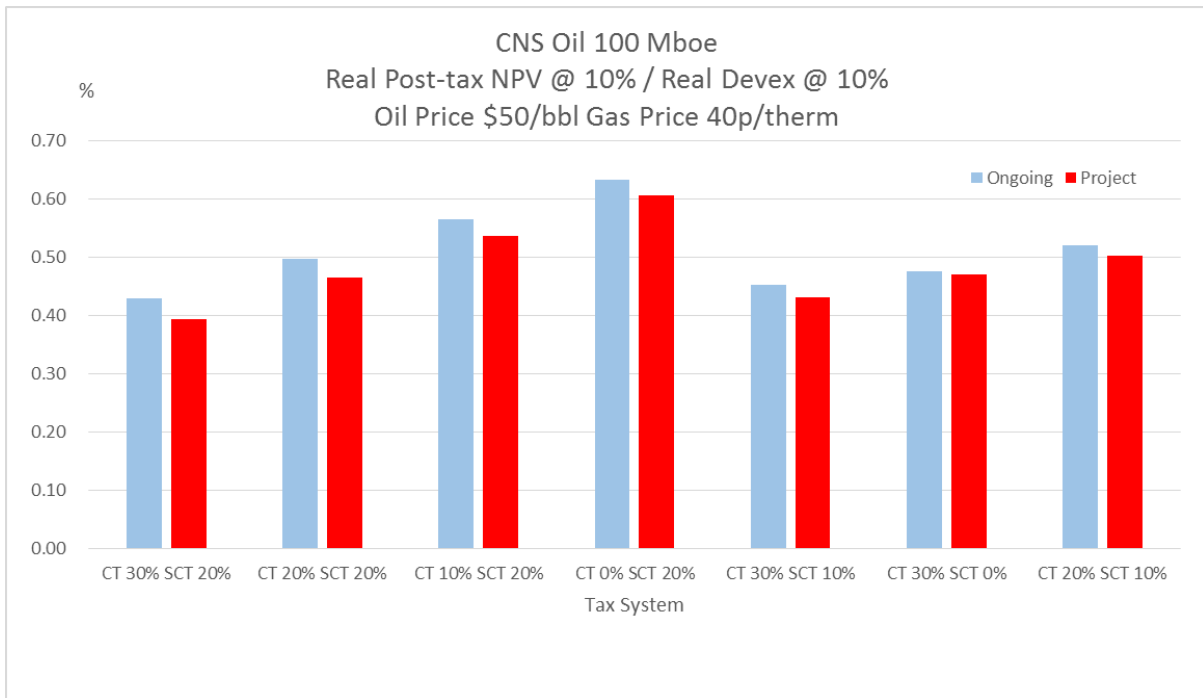


Chart 32

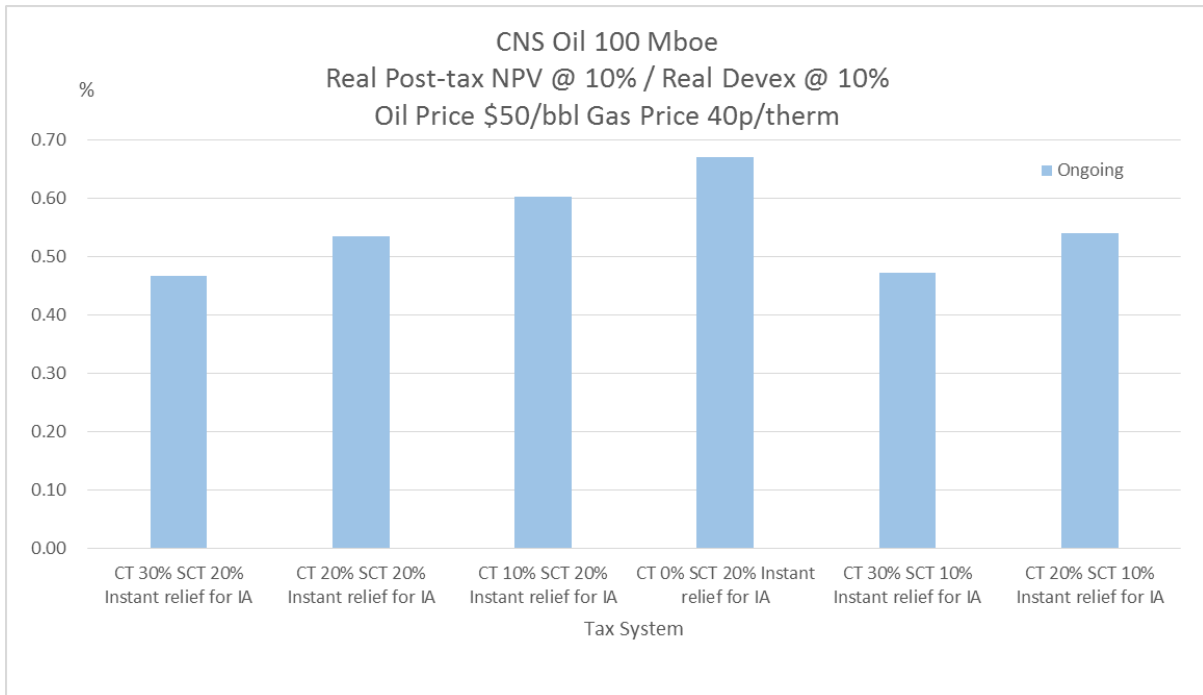
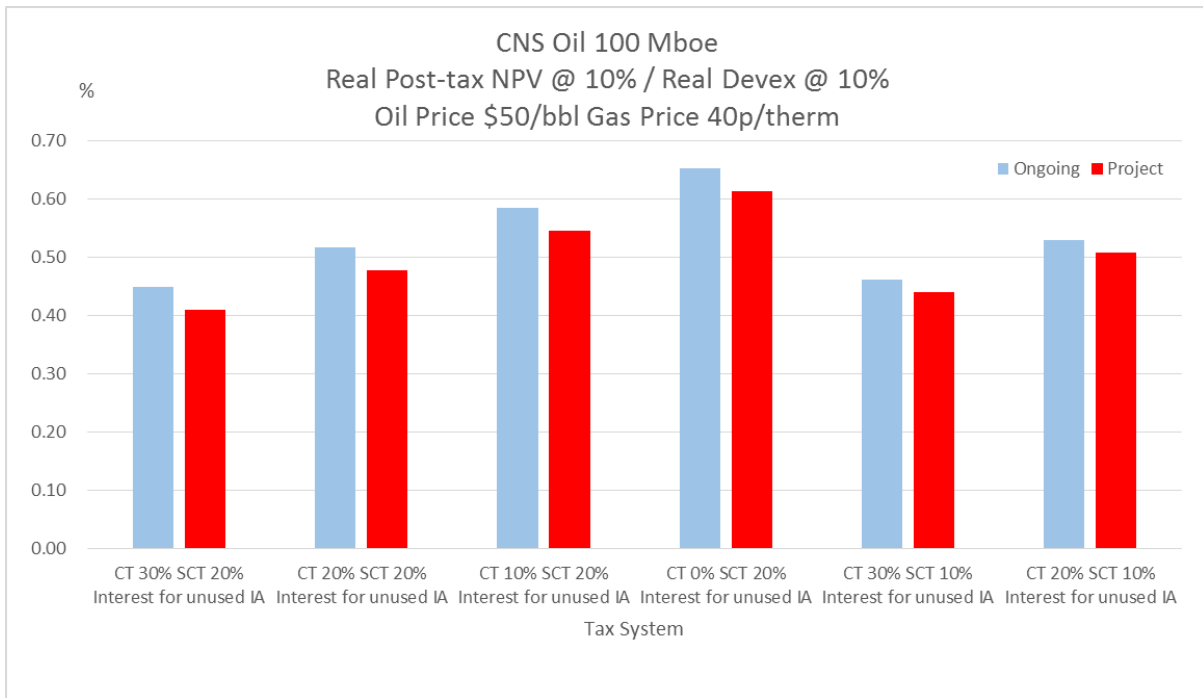


Chart 33



A more typical unit cost situation is now shown for the 100 mmbbls oil field in the CNS. This has a negative pre-tax NPV/I ratio at \$30 price. At the \$50 price the pre-tax NPV/I ratio is 0.68. The post-tax returns are shown in Charts 31, 32 and 33. Under the present tax system the project is acceptable. Reductions in tax rates enhance the returns. Availability of instant relief for the IA on its own improves returns to a worthwhile extent. Interest on unused IA enhances the returns to the project investor to a modest extent.

Chart 34

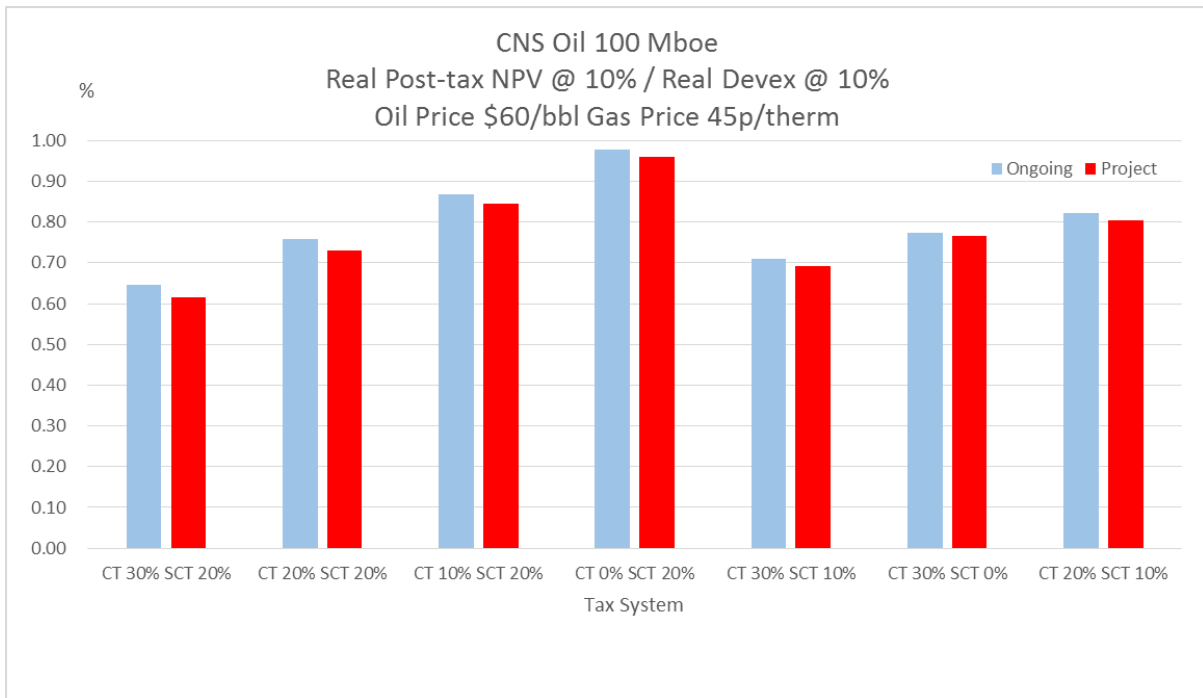


Chart 35

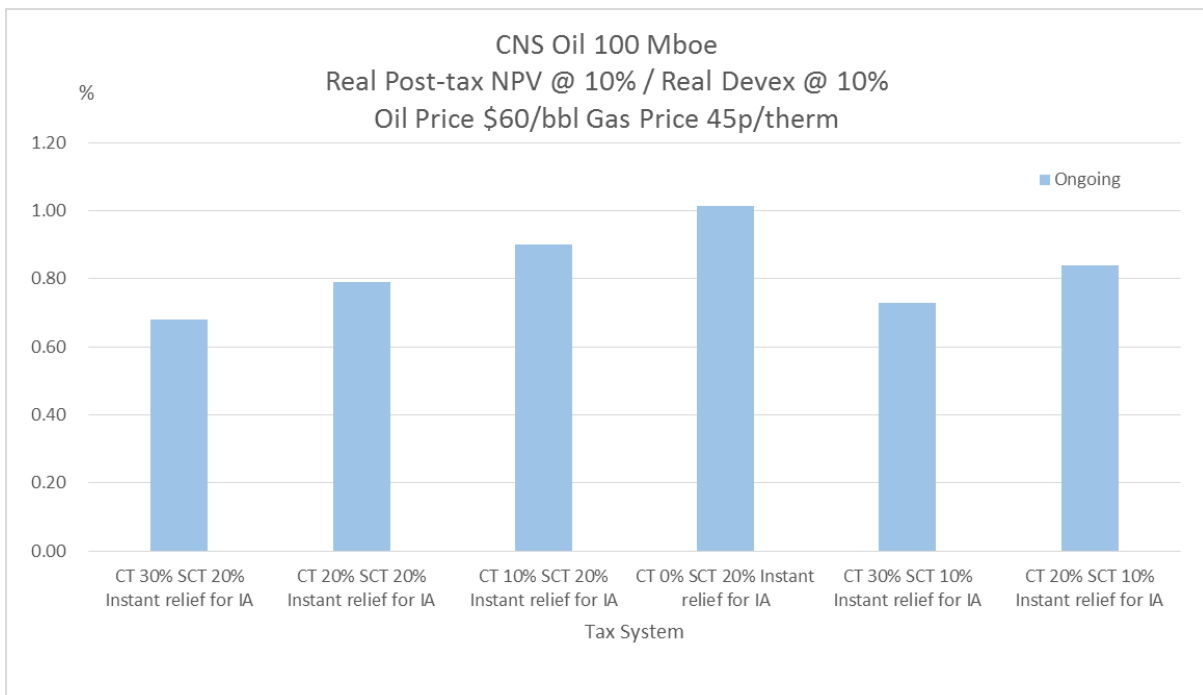
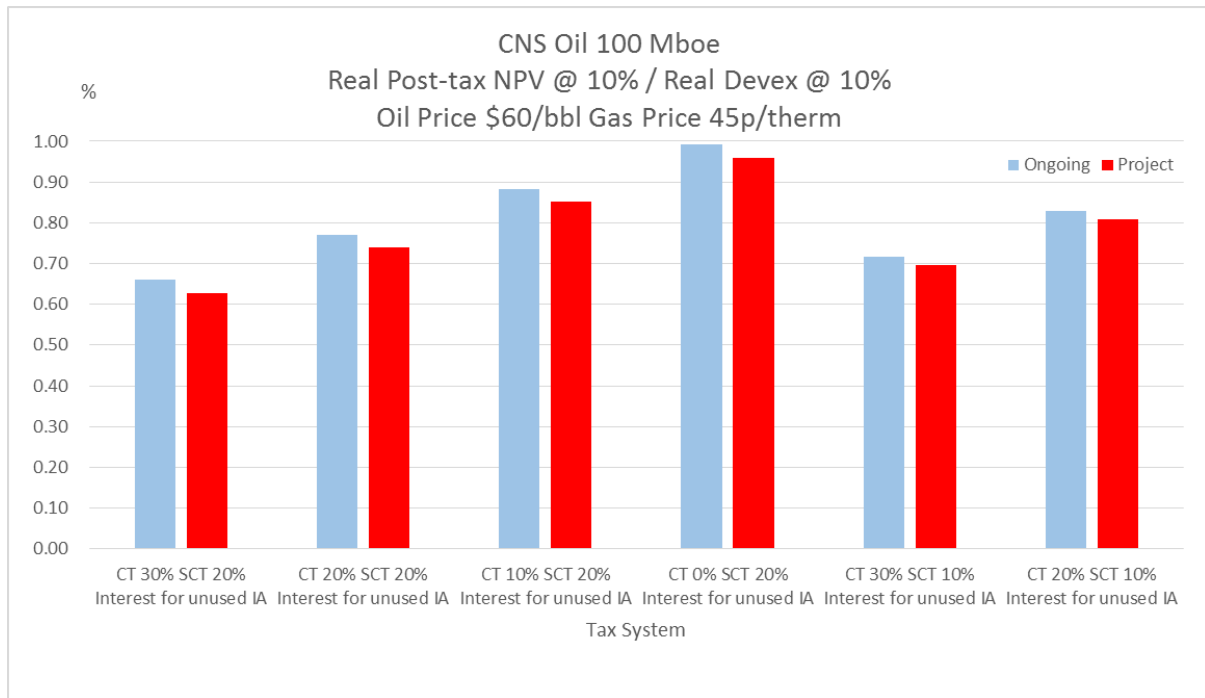


Chart 36



The post-tax returns to the 100 mmbbls project at the \$60 price are shown in Charts 34, 35 and 36. The project is clearly profitable under the present tax system. The extra reliefs for IA by themselves do not make much difference to the overall prospective returns.

(ii) CNS – Gas

The returns to representative gas fields in the CNS are now considered. The first is a field of 20 mmboe. At a price of 30 pence per therm the pre-tax NPV/I ratio is very clearly negative. See Chart 1. Under the 40 pence price it is just positive. See Chart 2. Post-tax returns are shown in Charts 37, 38 and 39. Under all the combinations the project is clearly non-viable. At the 45 pence price the pre-tax NPV/I ratio is 0.2. The post-tax returns are shown in Charts 40, 41 and 42. The risk and cost sharing features of the tax system are highlighted in the results.

But the project does not pass the threshold return likely to be required.

Chart 37

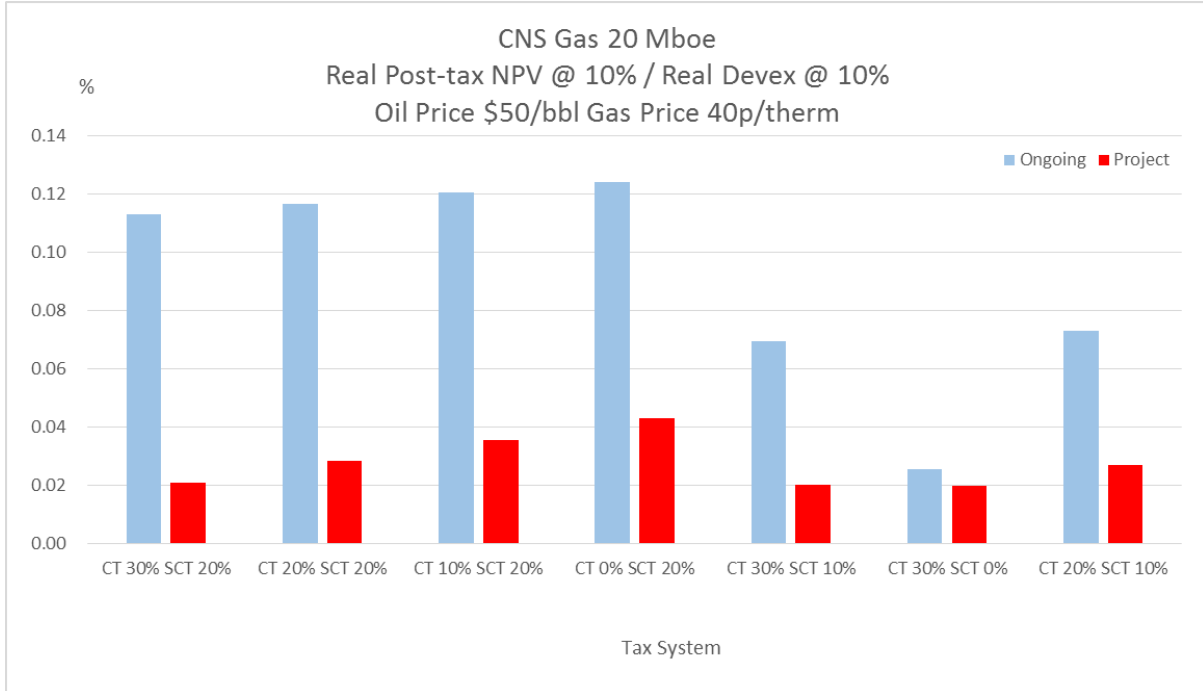


Chart 38

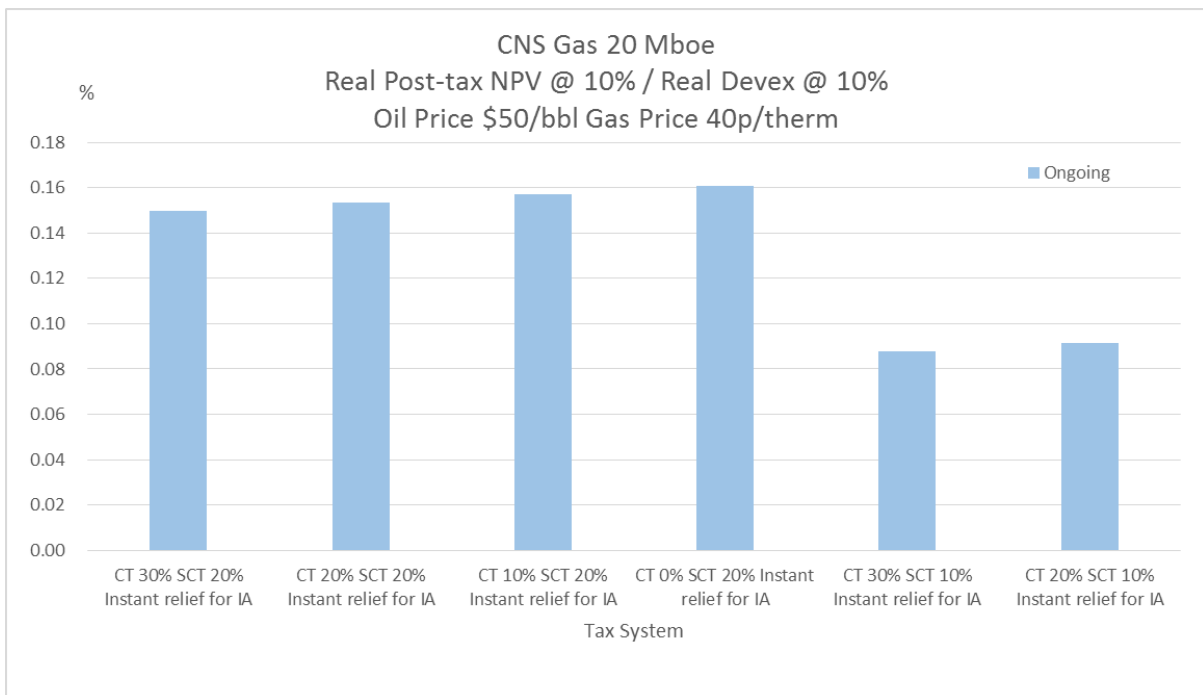


Chart 39

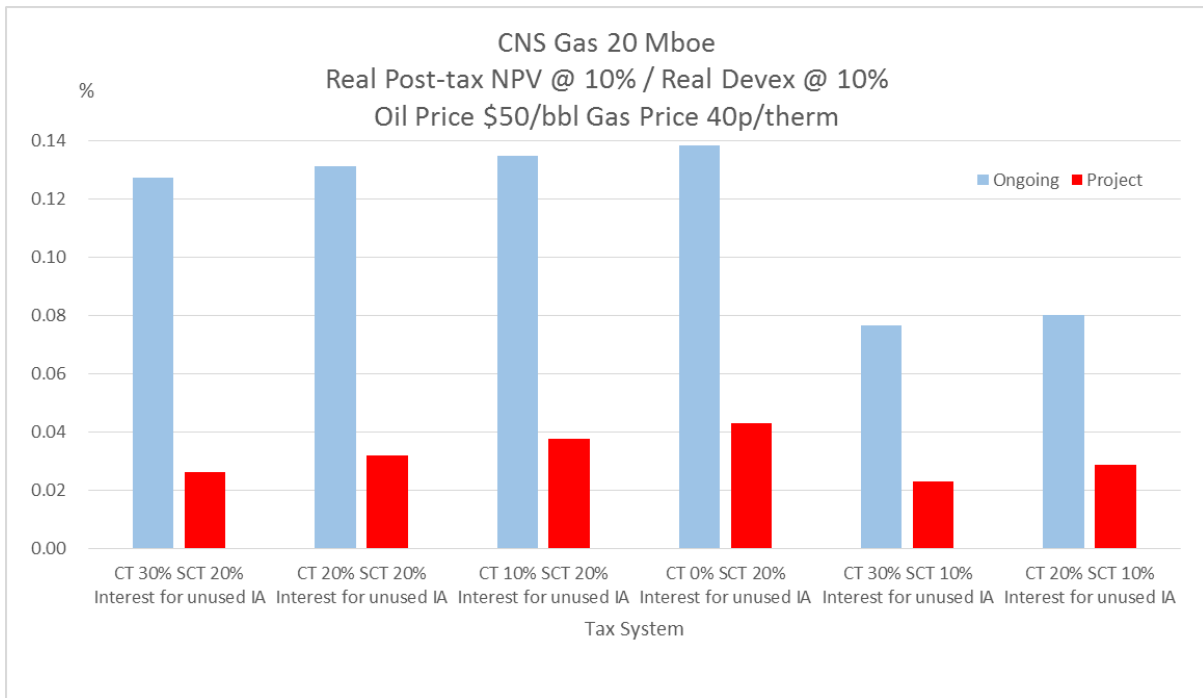


Chart 40

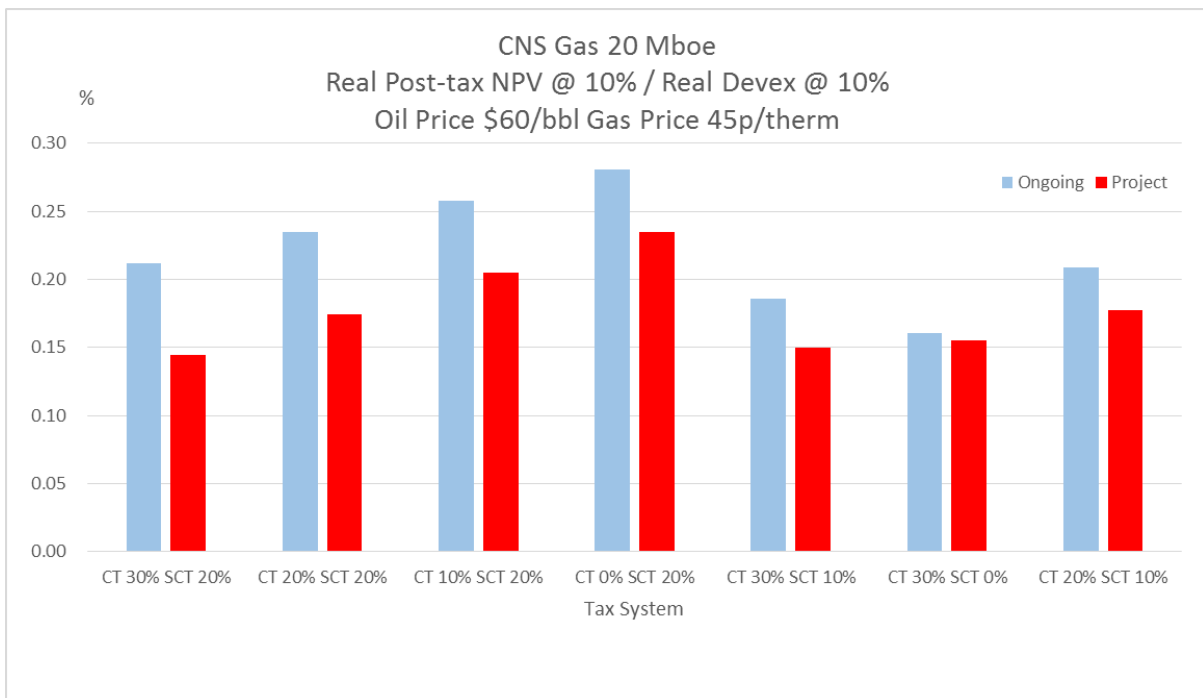


Chart 41

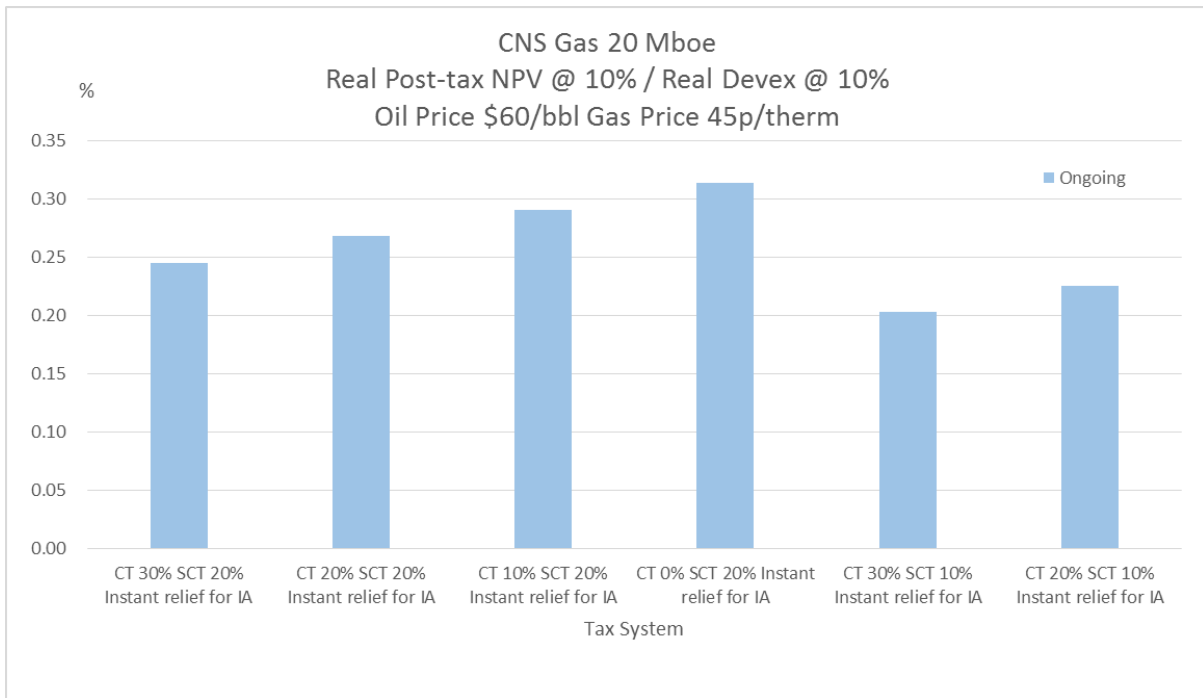
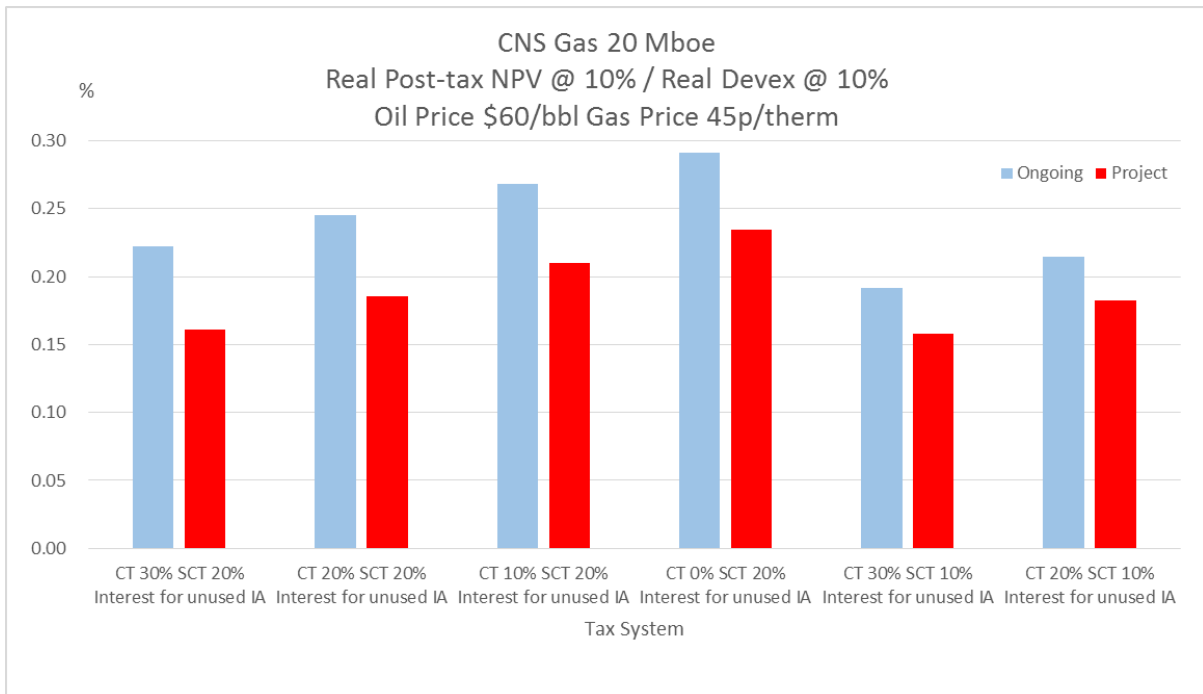


Chart 42



The results for the 100 mmboe gas field at the 30 pence price indicate a pre-tax NPV/I ratio of 0.135. Post-tax returns are shown in Charts 43, 44 and 45. While the cost and risk sharing features of the tax system are highlighted, especially with instant relief for the IA, the NPV/I ratios are generally well below the threshold of 0.3.

Chart 43

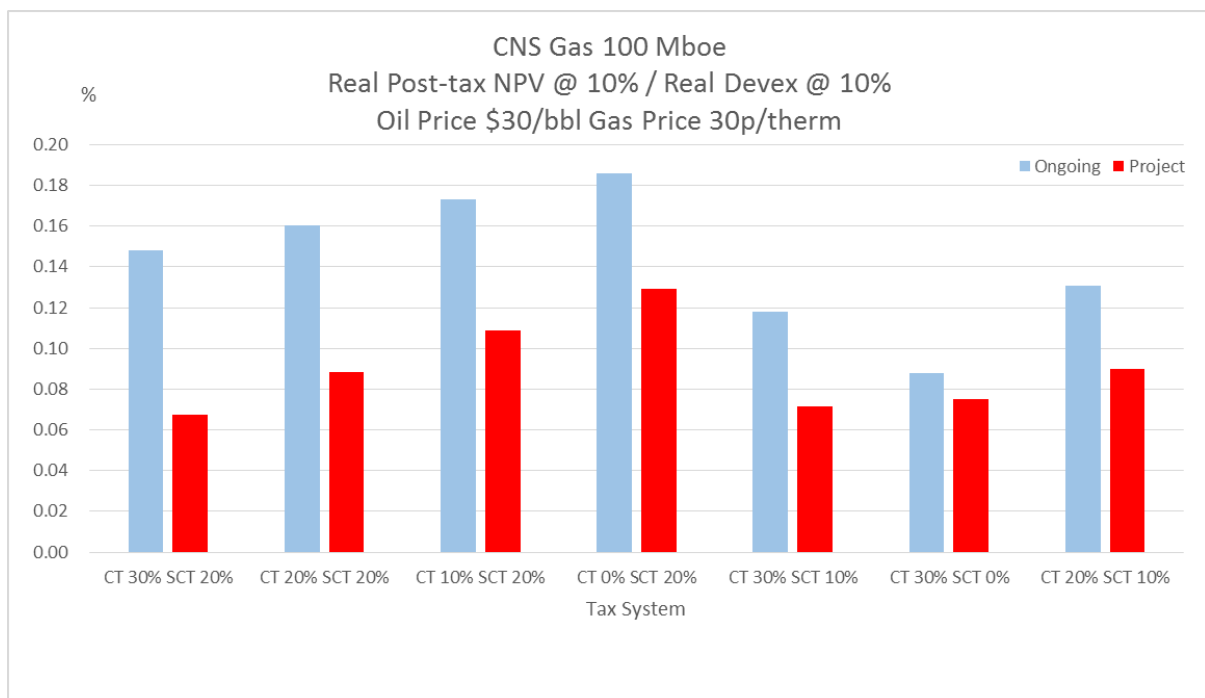


Chart 44

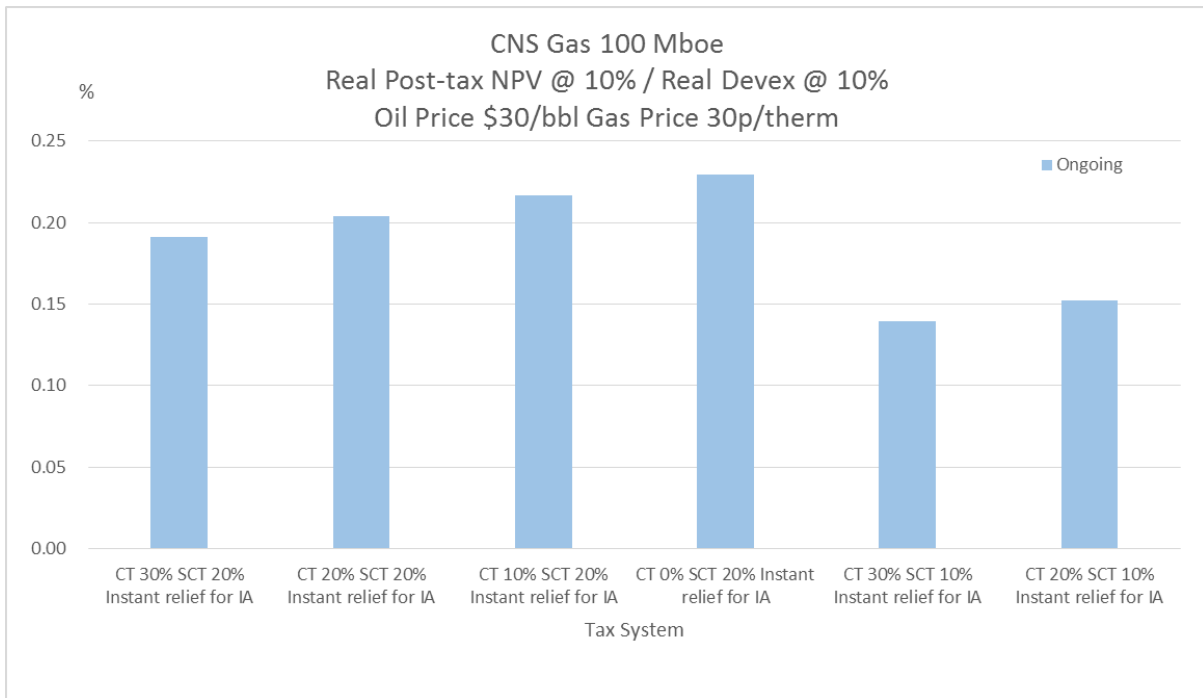
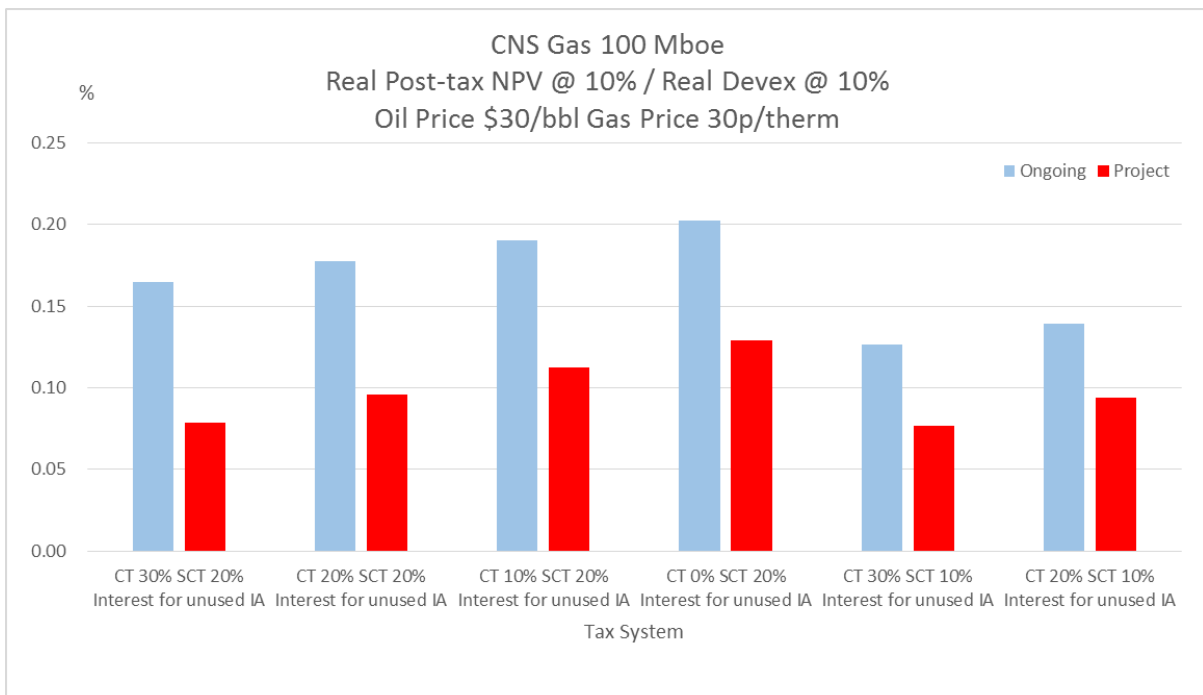


Chart 45



The pre-tax returns for the 100 mmboe gas field under the 40 pence price produces an NPV/I ratio in excess of 0.6. The post-tax returns are shown in Charts 46, 47 and 48. It is seen that the project produces NPV/I ratios comfortably exceeding 0.3 under the present tax system for both ongoing and project investors.

Chart 46

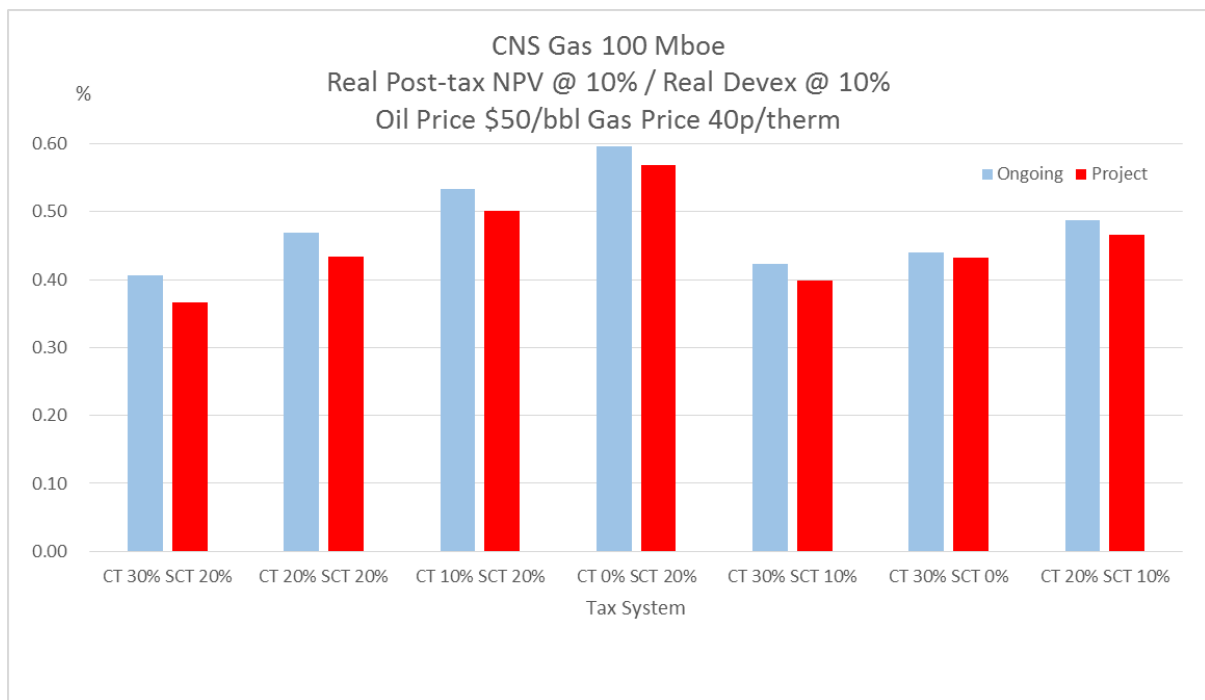


Chart 47

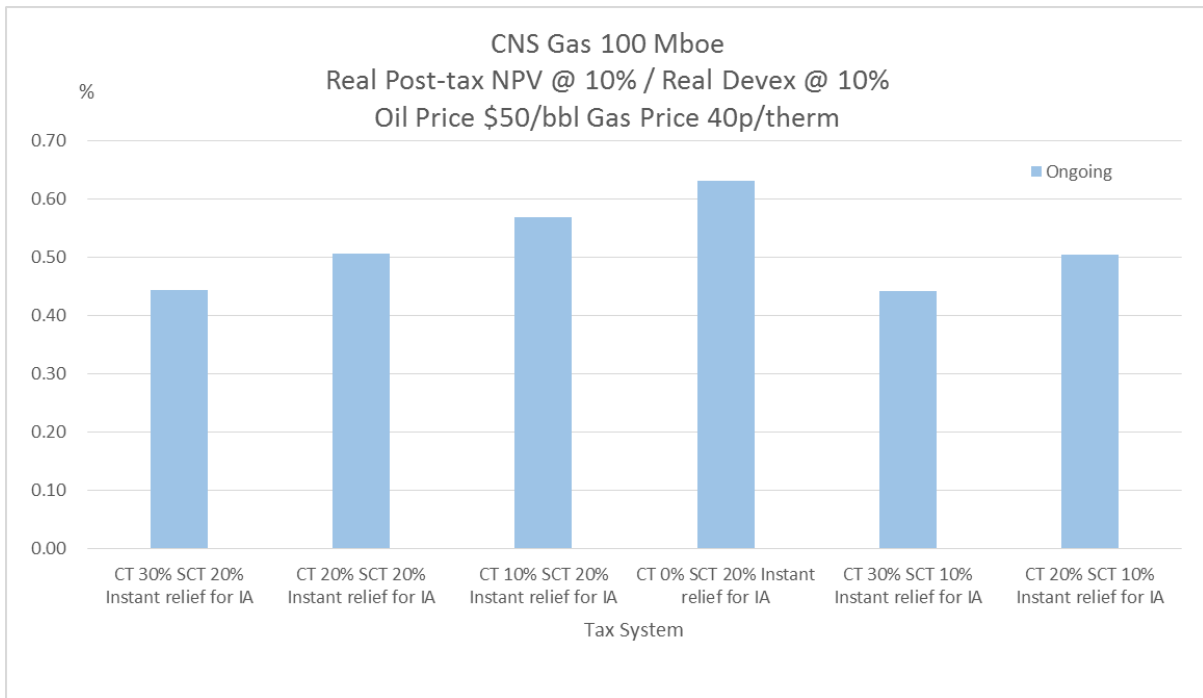
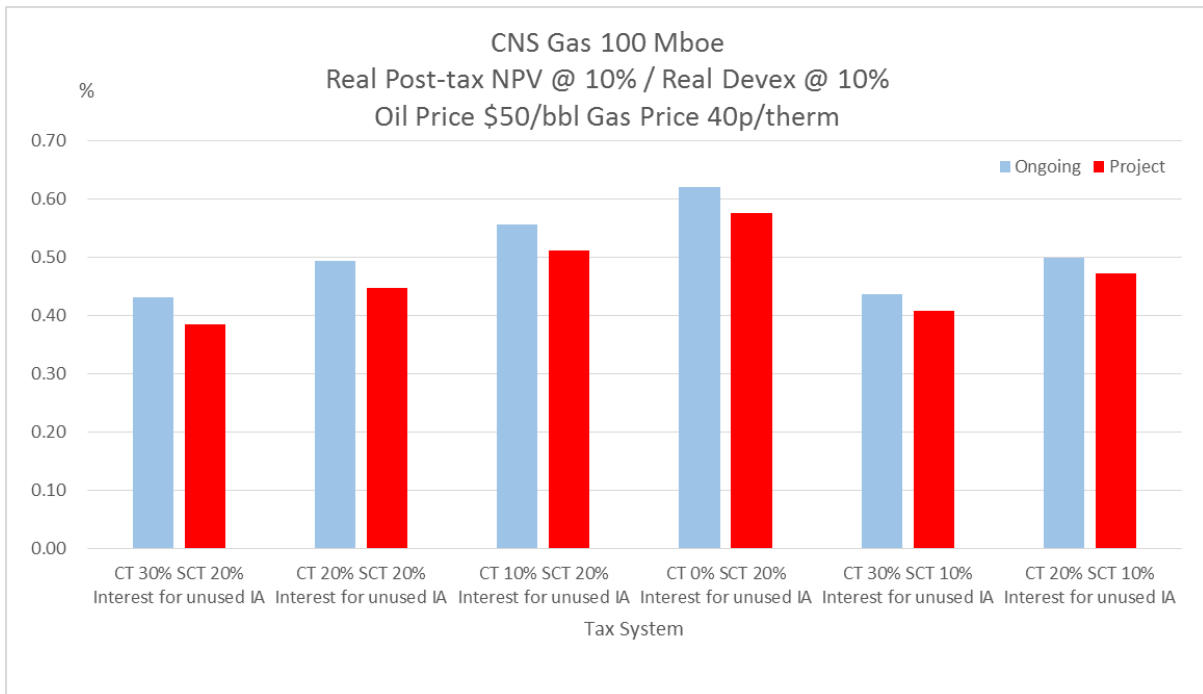


Chart 48



Under the 45 pence price case the 100 mboe field produces a pre-tax NPV/I ratio of 0.88. The Charts 49, 50 and 51 it is seen that, under the present tax system, the post-tax ratio for an ongoing investor is 0.54 while for a project investor it is 0.5.

Chart 49

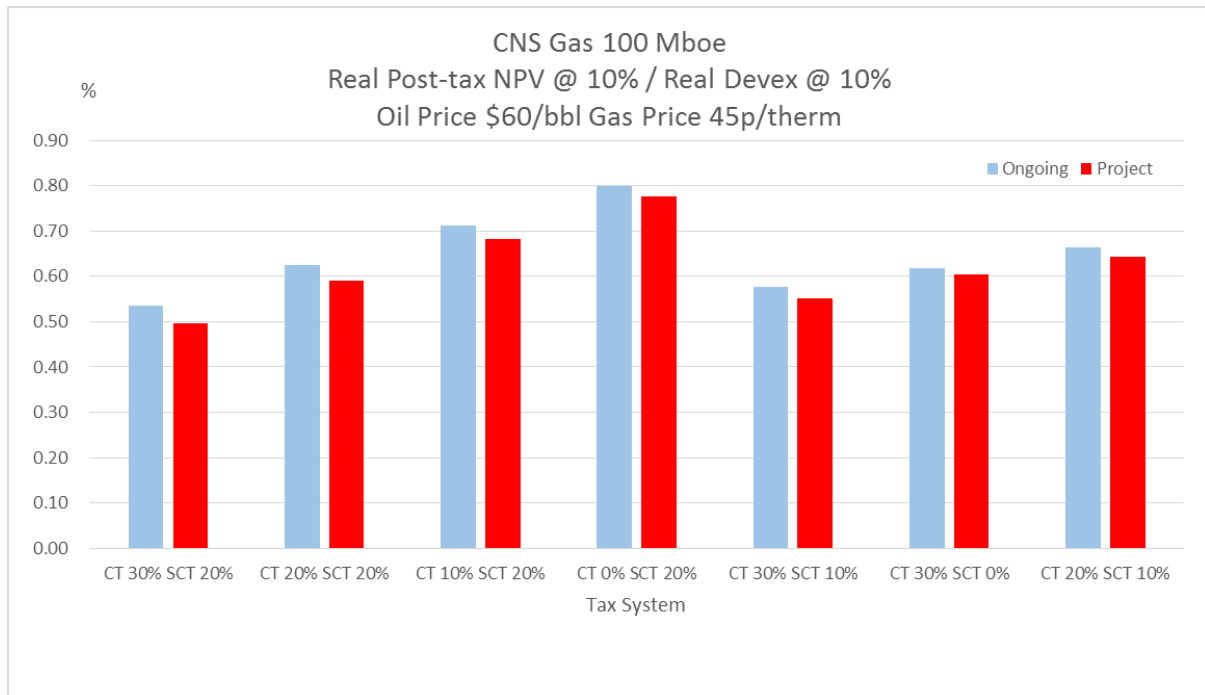


Chart 50

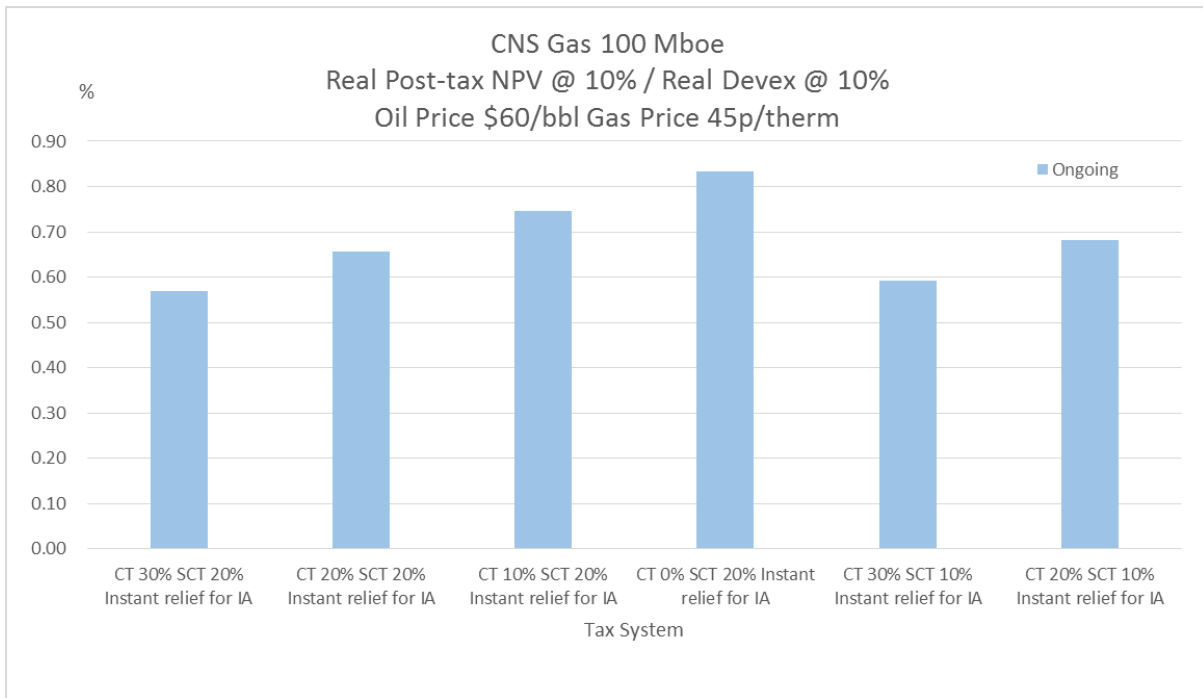
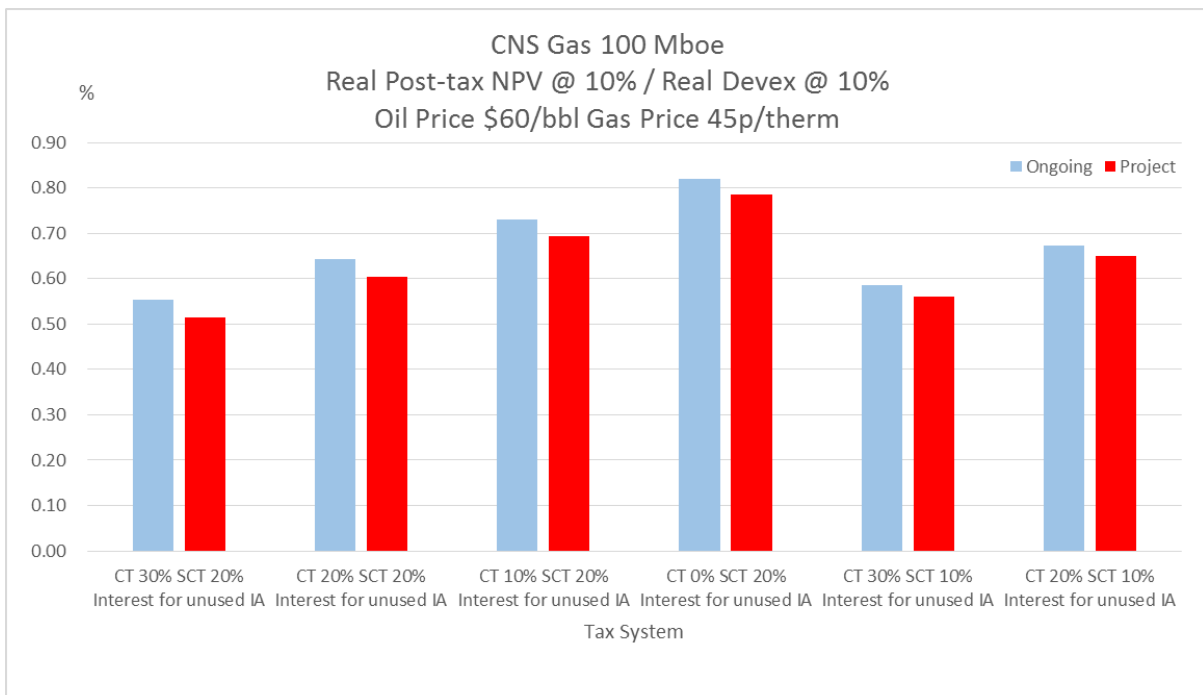


Chart 51



(iii) W of S – Oil

The case of oil fields in the W of S region is now considered. The field of 50 mmbbls was found to be uneconomic before tax at \$30 price. The NPV/I ratio is seriously negative. See Chart 1. At the \$50 price, however, the pre-tax NPV/I ratio exceeds 0.165. See Chart 2. The post-tax returns are shown in Charts 52, 53 and 54. Under the present tax system the NPV/I ratio is 0.171 for an ongoing investor and less than 0.1 for a project investor. Tax rate reductions do not always enhance NPV/I ratios because the reductions in the rate of relief for the investor (including the IA) are worth more than the reduced rate of tax on the income. Only major reductions in the CT rate can enhance returns compared to the present tax system. The returns to project investors are far below those to ongoing investors.

Chart 52

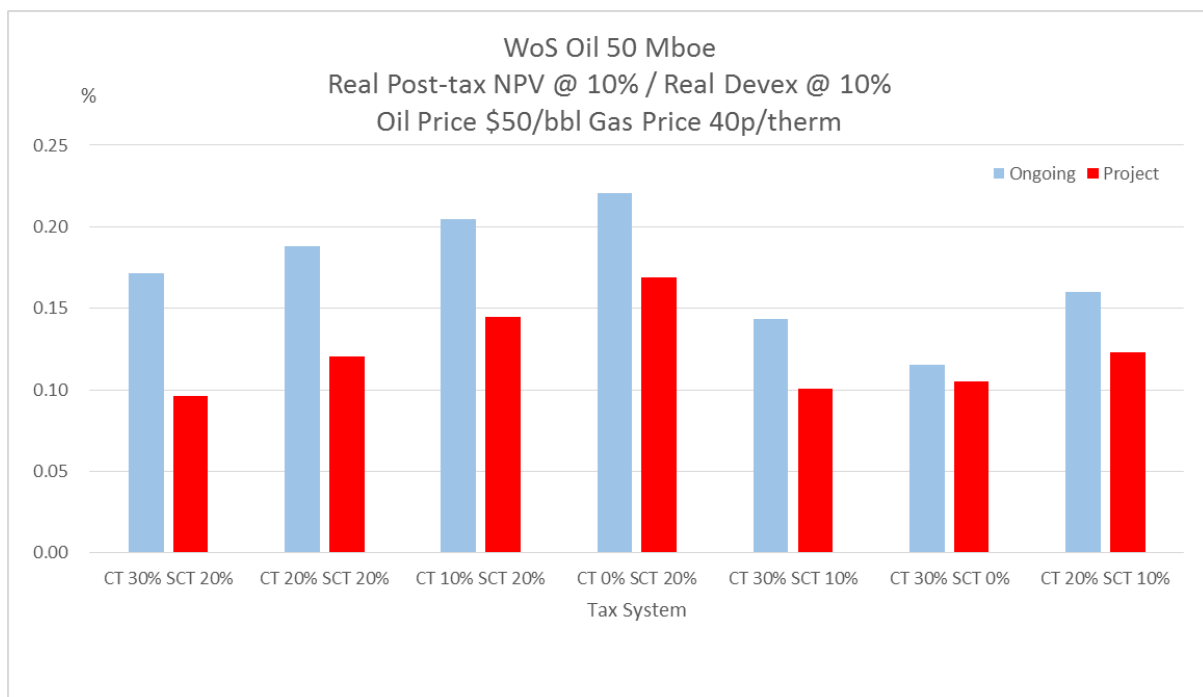


Chart 53

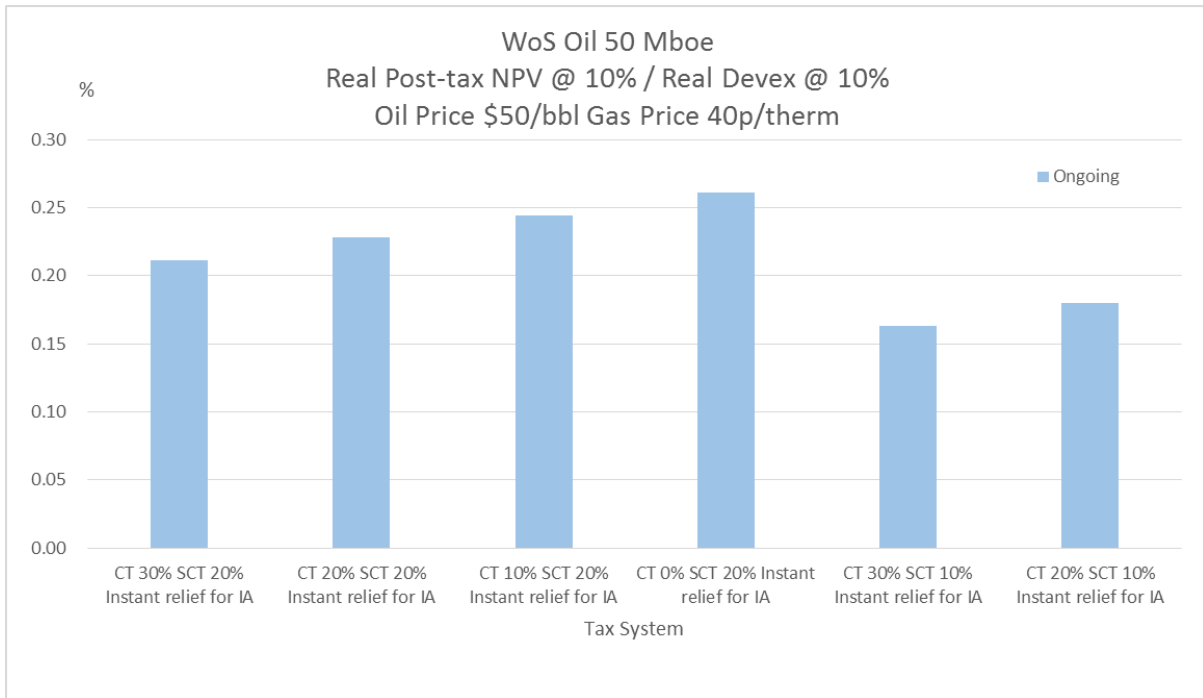
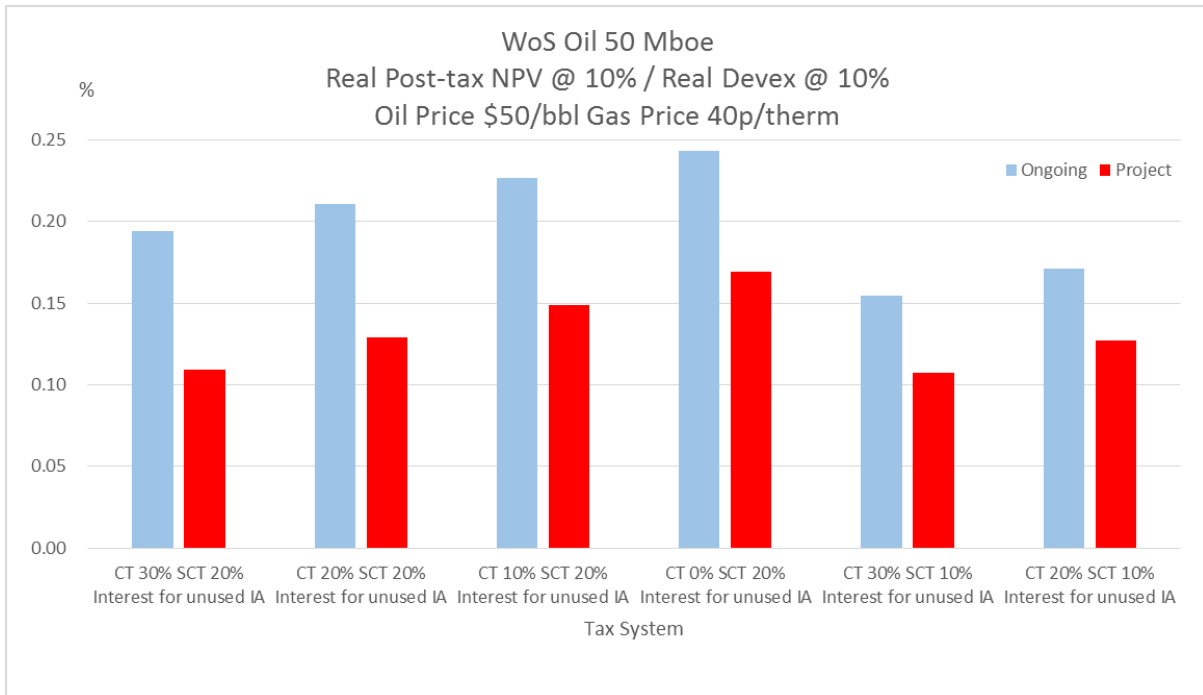


Chart 54



In Charts 55, 56 and 57 the returns to the 50 mmbbls oil field at \$60 price are shown. Under the present tax system the NPV/I ratio is over 0.34 for an ongoing investor and 0.3 for a project investor. Before tax the ratio was 0.5. It is seen from Chart 55 that a reduction in the CT rate to 20% increases the ratio to 0.39 for the ongoing investor and 0.356 for the project investor. Instant relief for the IA results in an NPV/I ratio of 0.38 under the present tax system. It is also seen from Chart 57 that interest on unused IA results in the ratio for the project investor being significantly enhanced above the 0.3 level achieved with the present tax system.

Chart 55

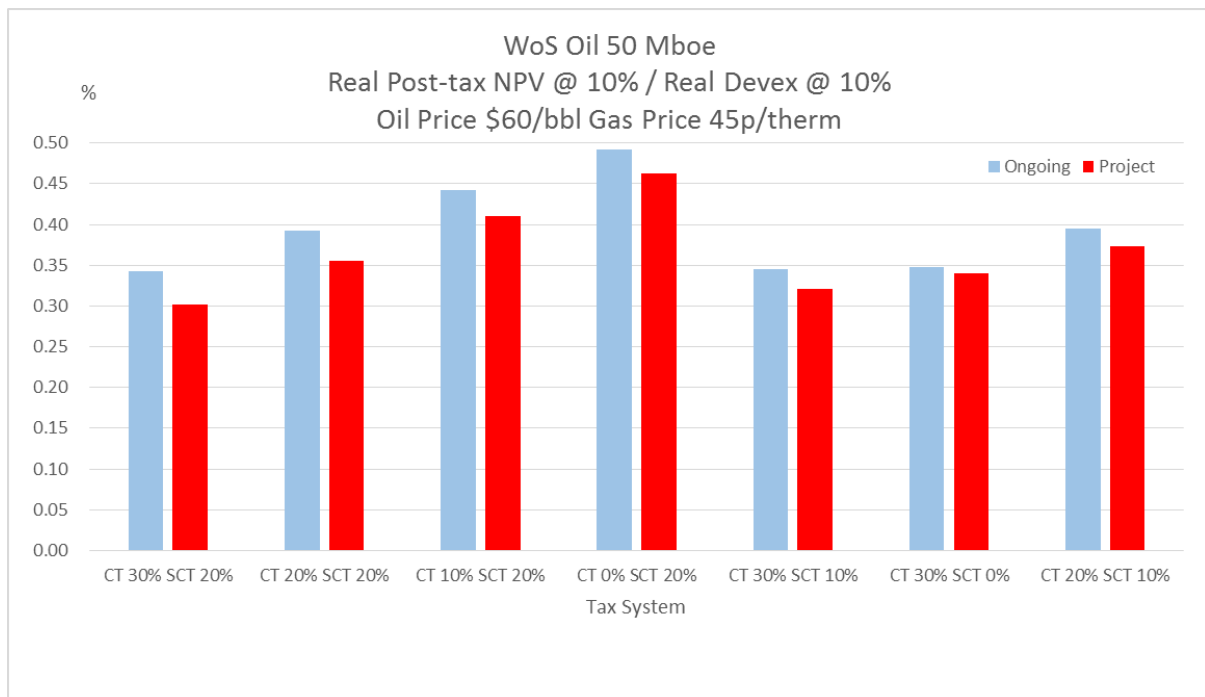


Chart 56

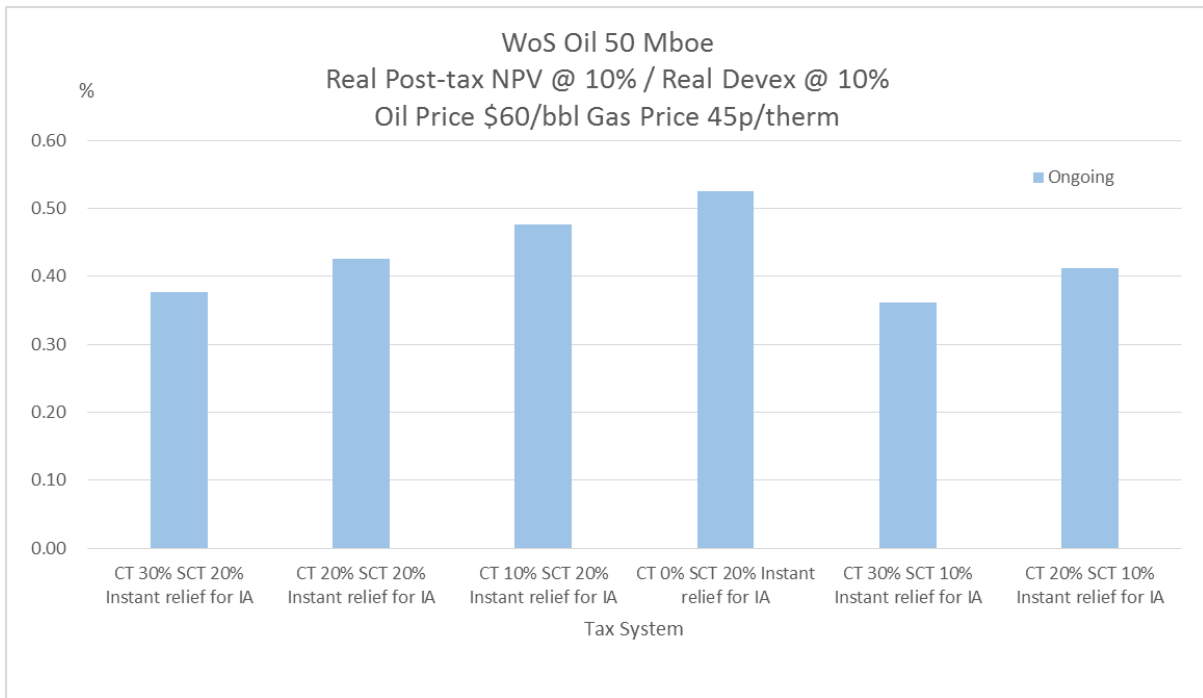
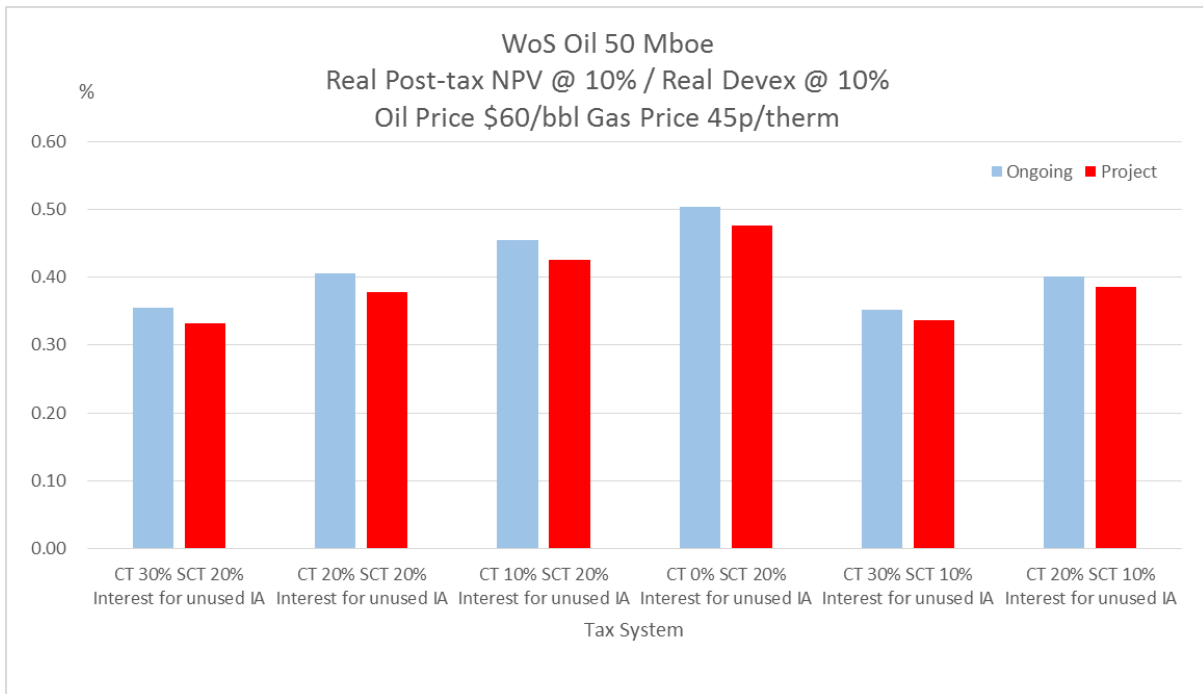


Chart 57



The post-tax returns to the 100 mmbbls oil field at \$50 price are shown in Charts 58, 59 and 60. This field had a pre-tax NPV/I ratio of 0.14. Under the present tax system the ratio is 0.156 for the ongoing investor and 0.079 for the project investor. Major CT rate reductions can improve the ratio significantly for both investors but the project remains uncommercial. It is noteworthy that SC rate reductions are not nearly so effective in raising the return due to the loss of value of the tax allowances. For the ongoing investor instant relief for the IA brings significant benefits. Interest on unused IA brings relatively low benefits particularly to the project investor who remains unable to take full advantage of the relief.

Chart 58

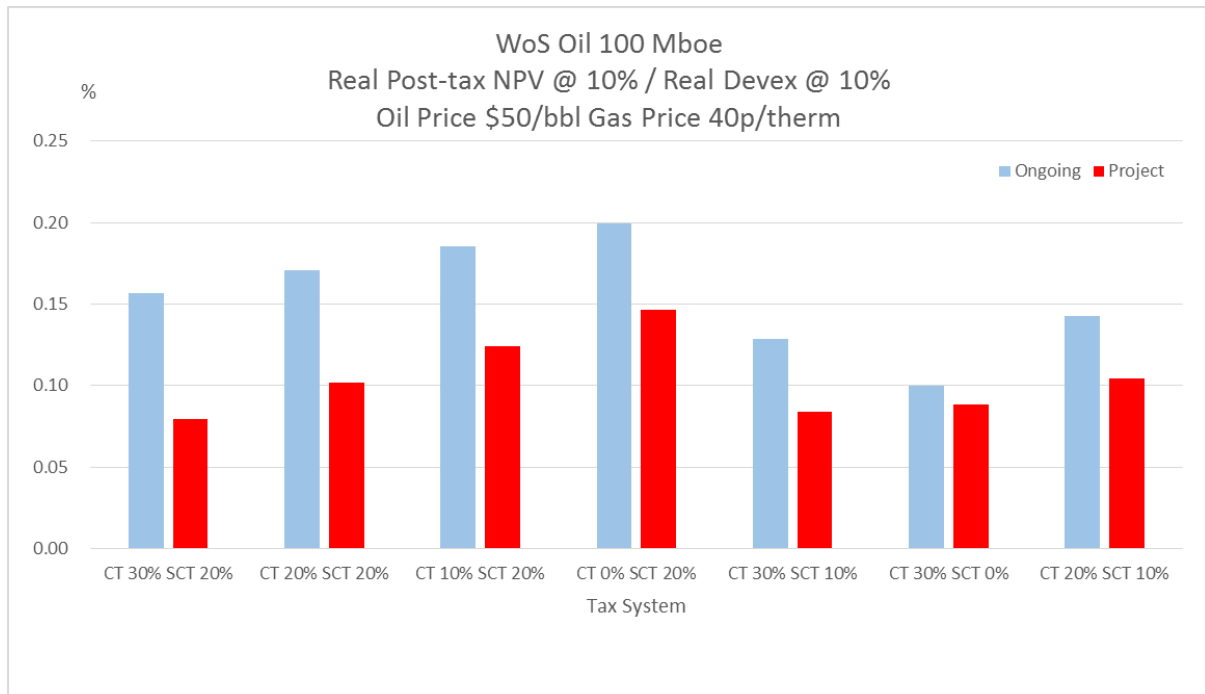


Chart 59

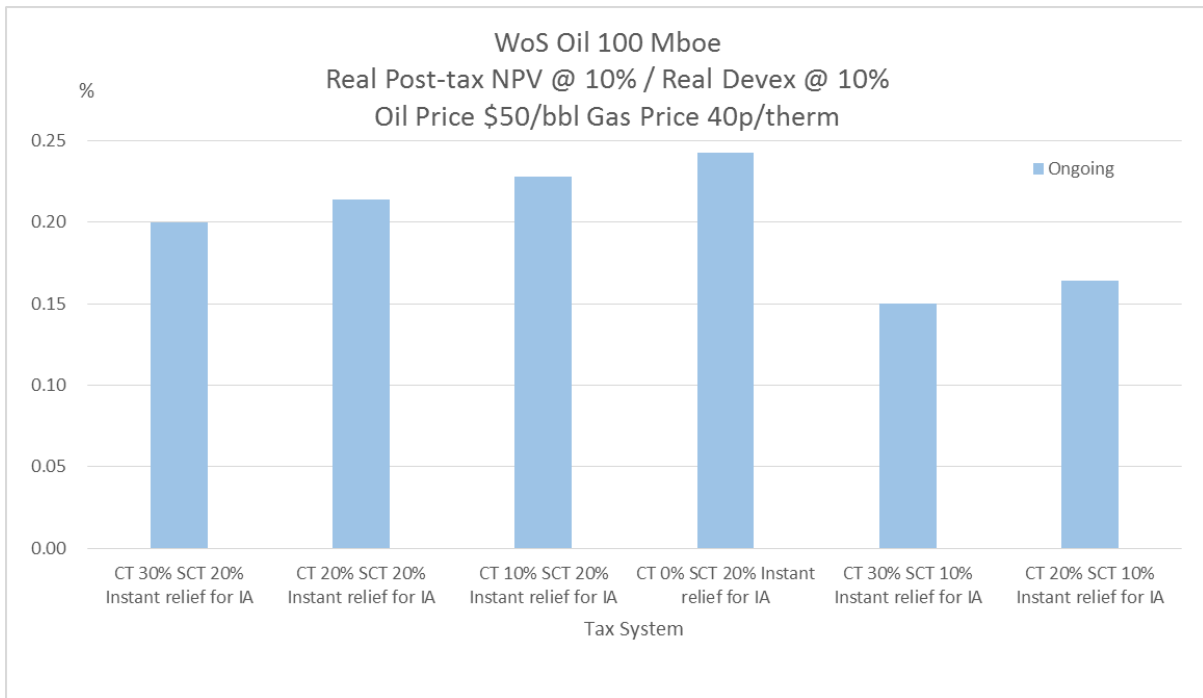
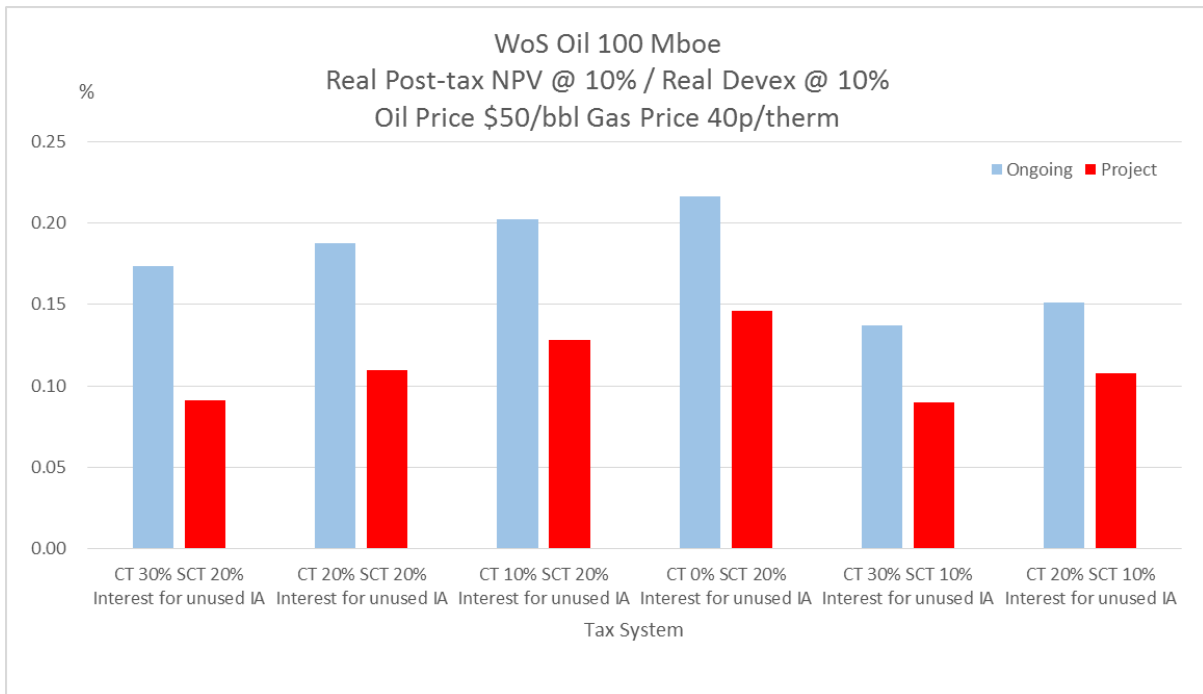


Chart 60



The post-tax returns to the 100 mmbbls oil field at \$60 price are shown in Charts 61, 62 and 63. The pre-tax NPV/I ratio is 0.47. The post-tax ratio under the current tax system is 0.325 for the ongoing investor and for the project investor it is 0.28. From Chart 61 it is seen that reducing the CT rate to 20% increases these ratios to 0.37 and 0.33 respectively. Reducing the SC rate to 10% or even 0% does not have such a strong effect on the NPV/I ratios. It is seen from Chart 62 that instant relief for IA has quite a strong effect on the returns to the ongoing investor. From Chart 63 it is seen that interest on unused IA has a very worthwhile effect on returns to the project investor. He can now take fuller advantage of the relief with the larger income received at \$60 compared to \$50 oil price.

Chart 61

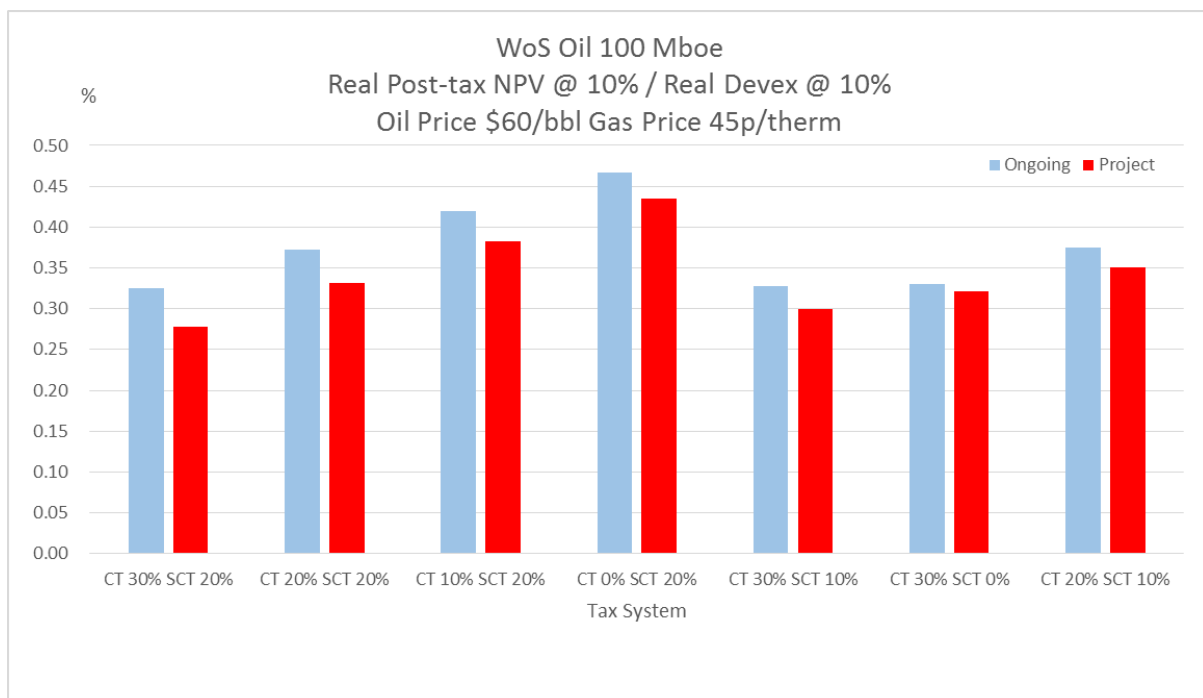


Chart 62

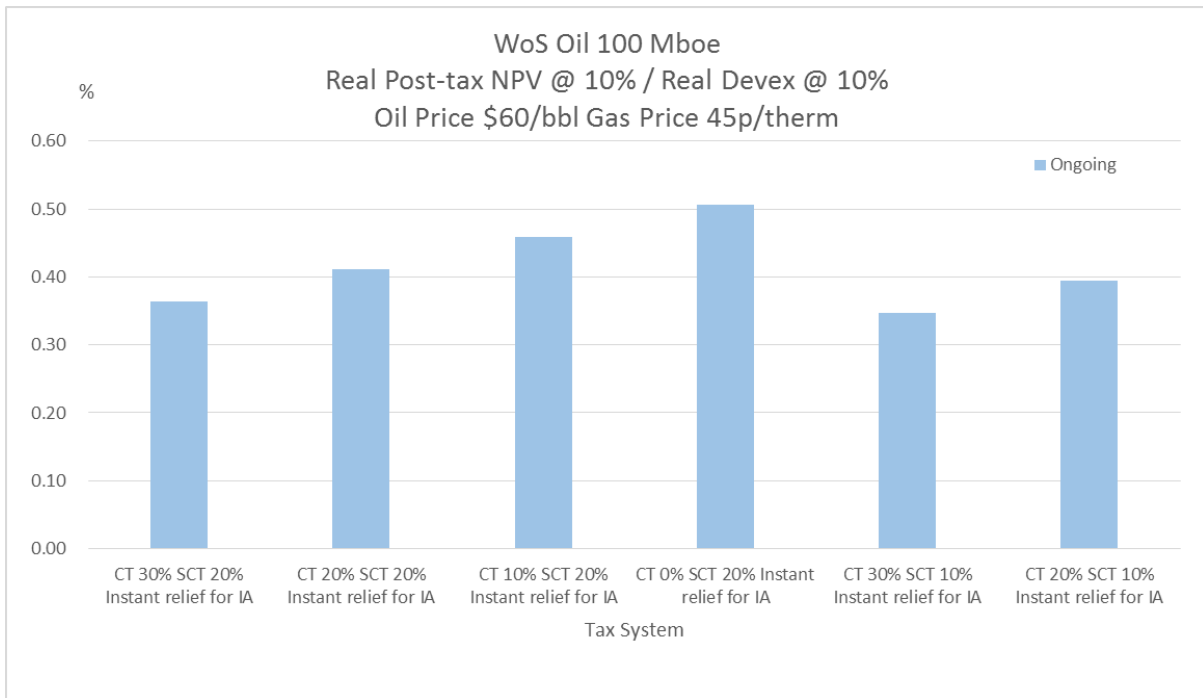
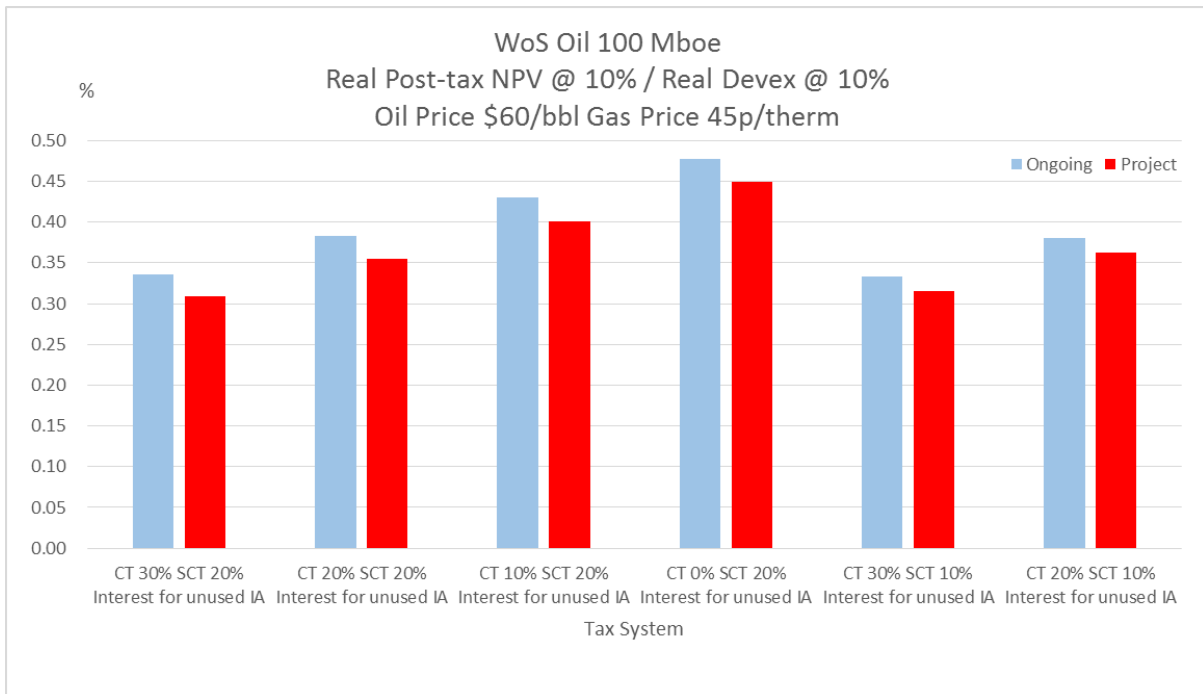


Chart 63



(iv) W of S – Gas

The returns for the 100 mmbbl gas field were found to be negative under all 3 prices of 30 pence, 40 pence and 45 pence. See Charts 1, 2 and 3 for pre-tax returns.

(v) NNS – Oil

The post-tax returns to the 10 mmbbls oil field in the NNS are shown in Chart 64, 65 and 66 for the \$50 price. The pre-tax NPV/I ratio is 0.158. It is seen from Chart 64 that the post-tax ratio for the ongoing investor is 0.18. But It is only 0.1 for the project investor. Major tax rate reductions, particularly to CT, increase the returns but they remain uneconomic. From Chart 65 it is seen that instant relief for the IA has a substantial beneficial effect on returns to the ongoing investor. From Chart 66 it is seen that interest on unused IA has little effect on the returns to the project investor because he has inadequate income against which to obtain the full relief.

Chart 64

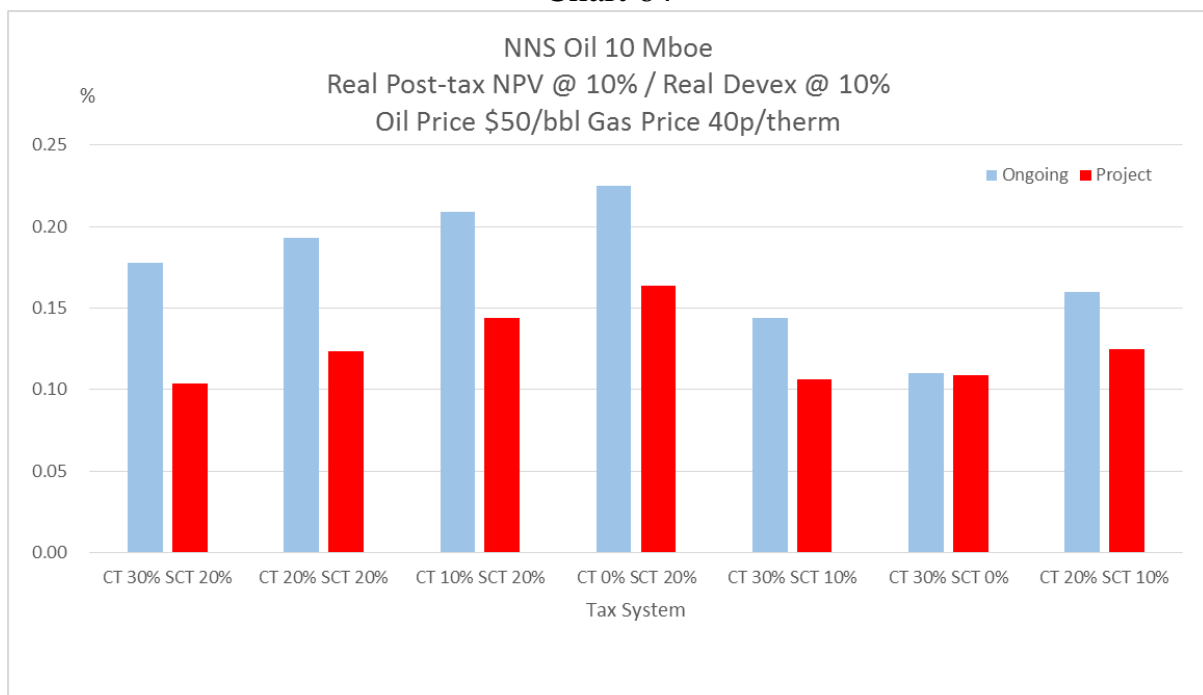


Chart 65

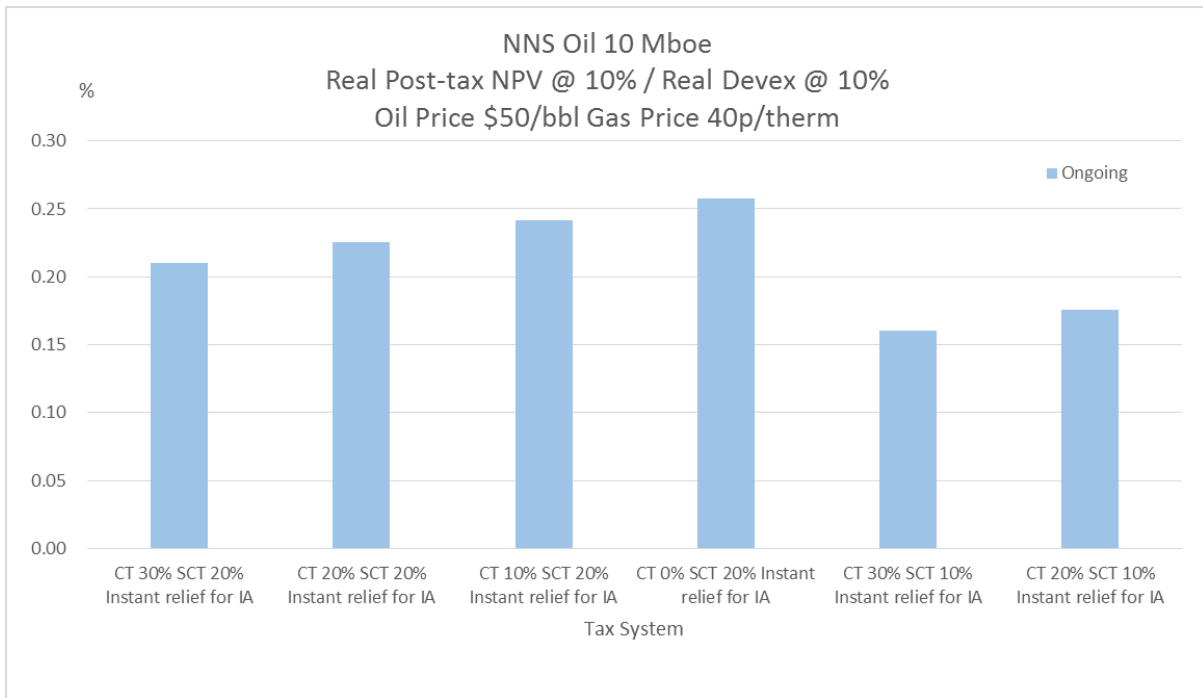
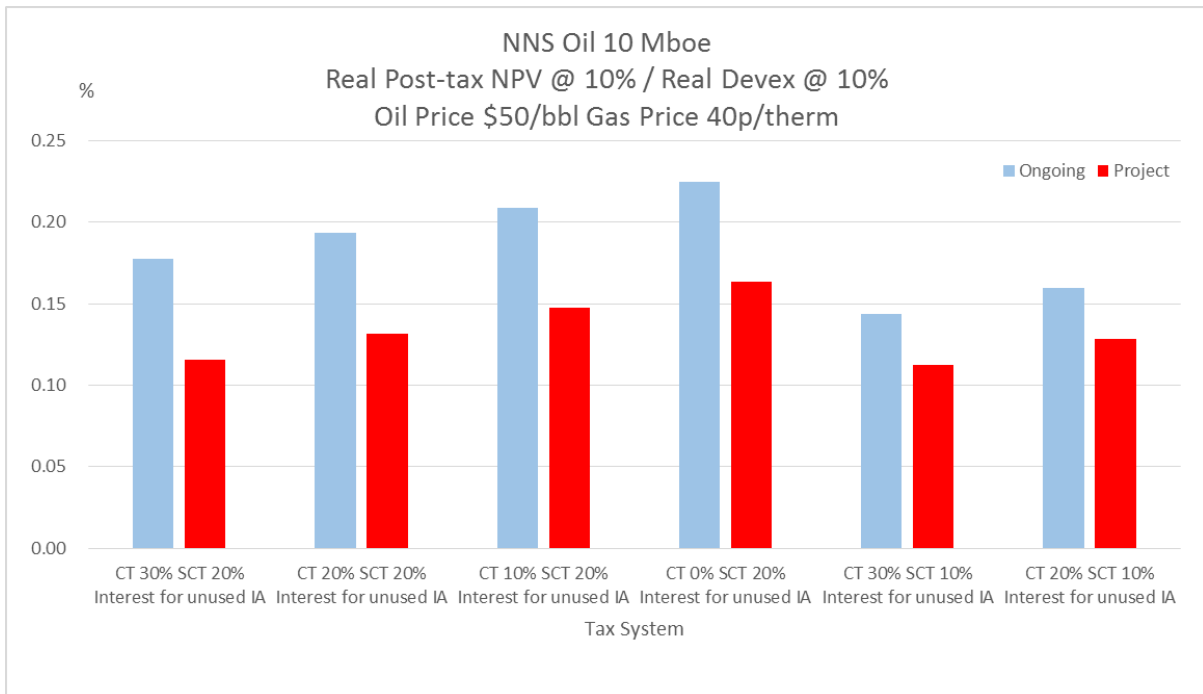


Chart 66



The post-tax returns to the 10 mmbbls oil field with \$60 price are shown in Charts 67, 68 and 69. The pre-tax NPV/I ratio is nearly 0.5. It is seen from Chart 67 that the ongoing investor can obtain a post-tax NPV/I ratio of nearly 0.35. The project investor has a ratio of 0.3. Tax rate reductions increase the returns to a worthwhile extent for both investors. From Chart 68 it is also seen that immediate relief for IA significantly enhances the returns to ongoing investors. From Chart 69 it is seen that interest on unused IA can ensure that the returns to the project investor comfortably exceed 0.3.

Chart 67

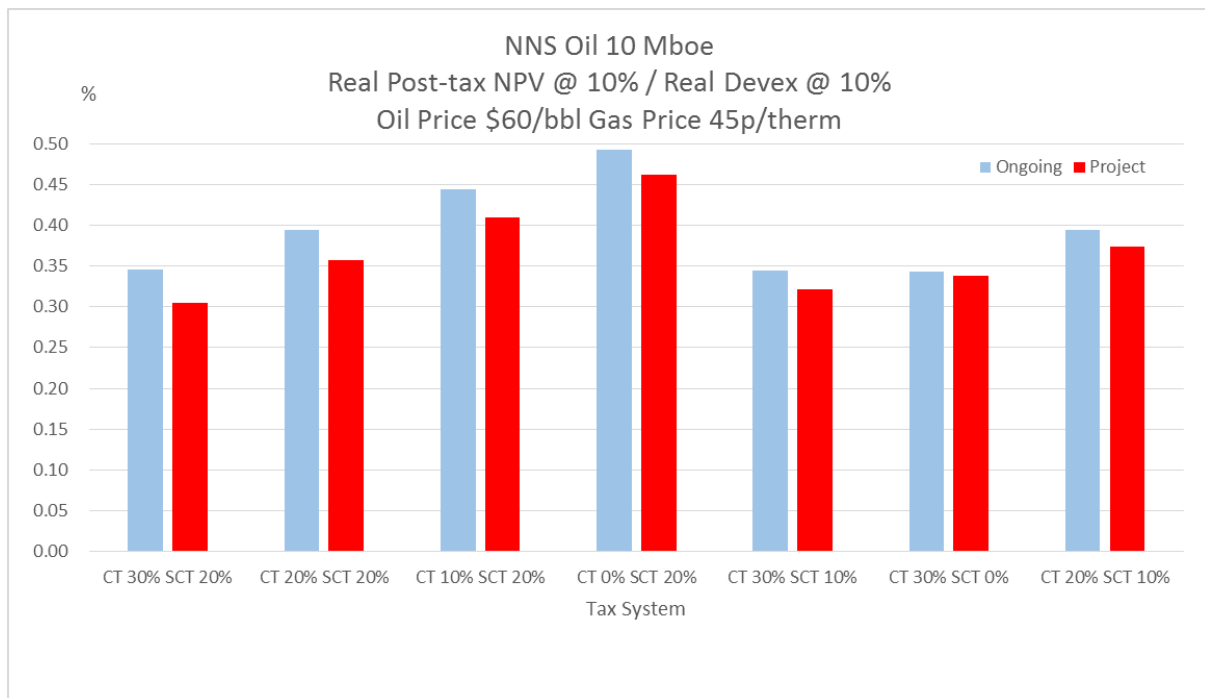


Chart 68

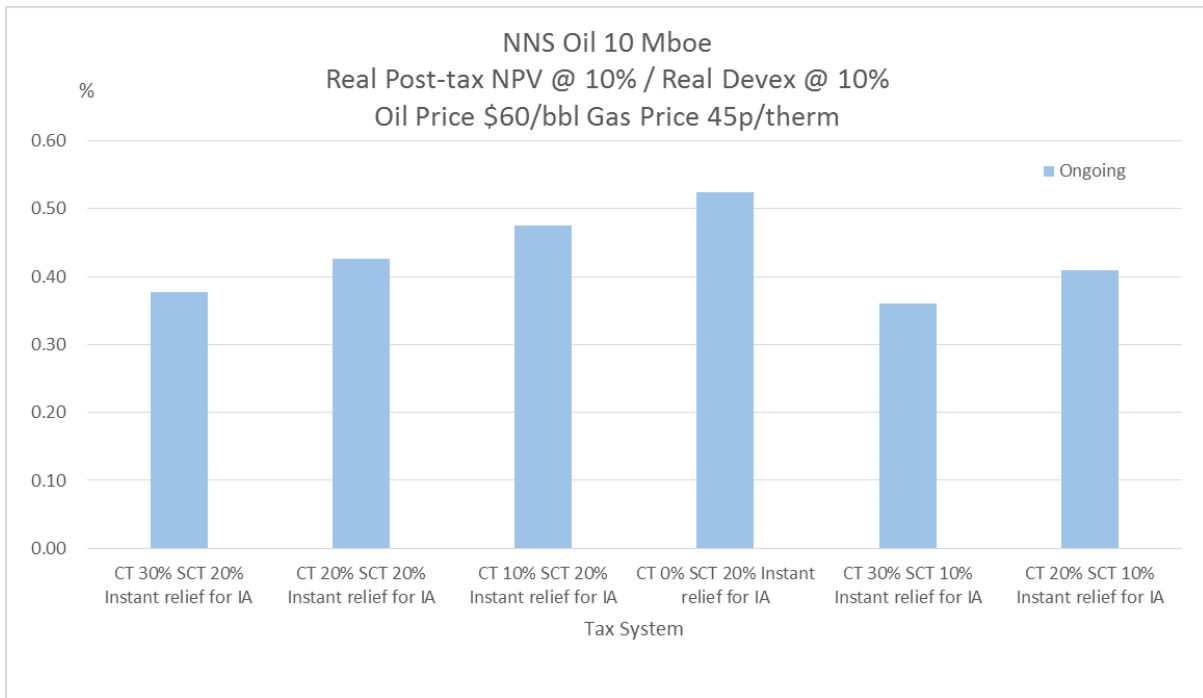
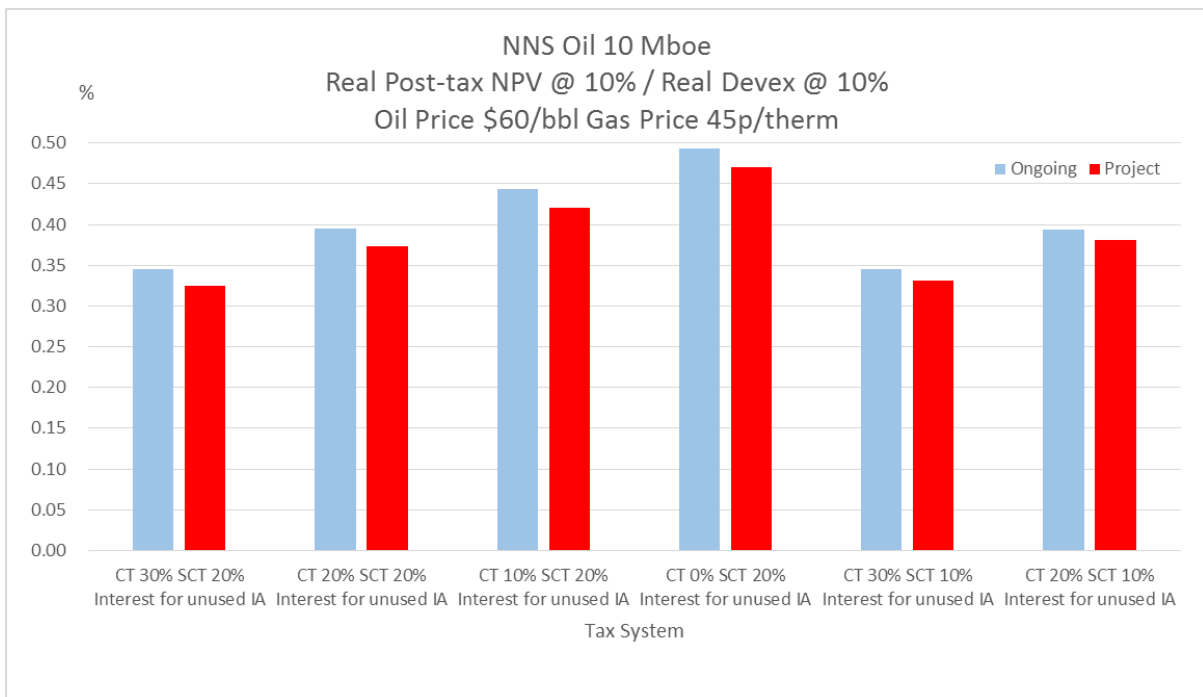


Chart 69



The returns to the 20 mmbbls oil field in the NNS were negative before tax under both the \$30 and \$50 price scenarios. Under

the \$60 price returns are positive. The post-tax returns are shown in Charts 70, 71 and 72. Under the present tax system the NPV/I ratio is 0.19 for the ongoing investor and only 0.12 for the project investor. Major CT rate reductions increase the returns significantly but the projects remain uncommercial. From Chart 71 it is seen that immediate relief for IA significantly increases the returns to the ongoing investor. Interest on unused IA helps the project investor to a moderate extent.

Chart 70

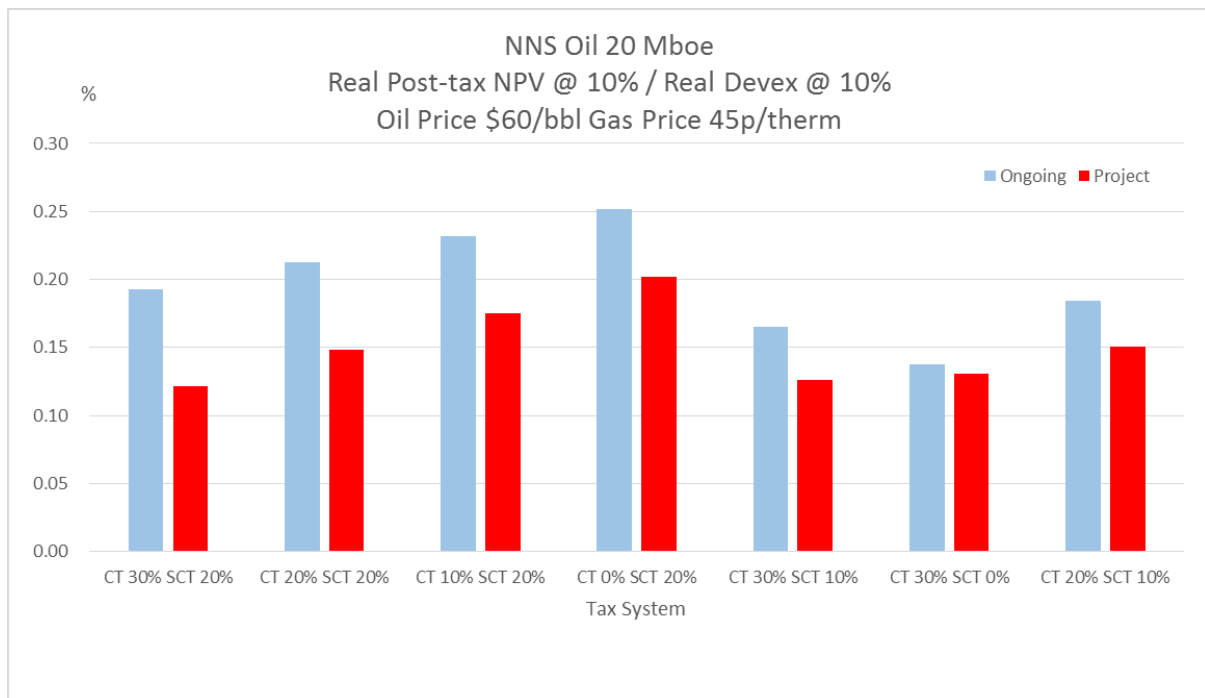


Chart 71

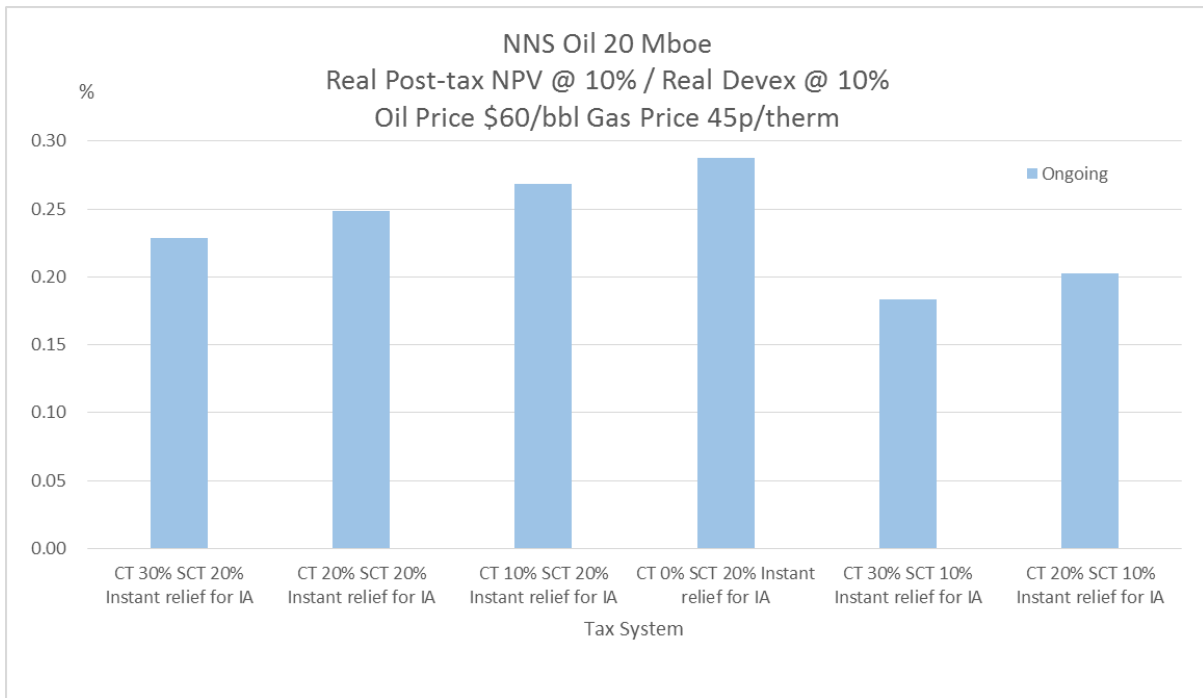
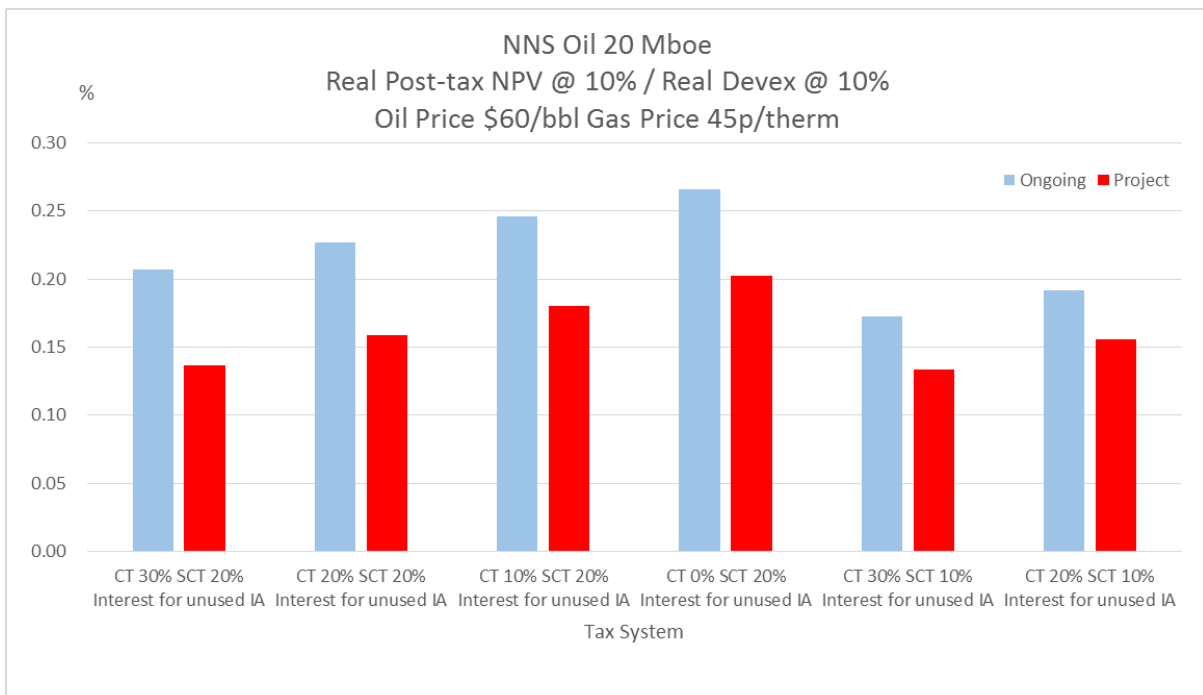


Chart 72



The 50 mmbbls oil field was found to be uneconomic at \$30 and \$50 prices. At \$60 price the returns are positive but non-commercial. The post-tax NPV/I ratios are shown in Charts 73, 74 and 75. The ratio for the ongoing investor under the current tax system is 0.19 and for the project investor 0.12. Major CT rate reductions enhance the returns but they are still uncommercial. Again it was found that instant relief for IA substantially enhanced returns for the ongoing investor.

The 100 mmbbls oil field was found to be uneconomic at \$30 and \$50 prices. At \$60 prices, while post-tax NPVs at 10% were positive, the NPV/I values were extremely low and far below the 0.3 threshold.

Chart 73

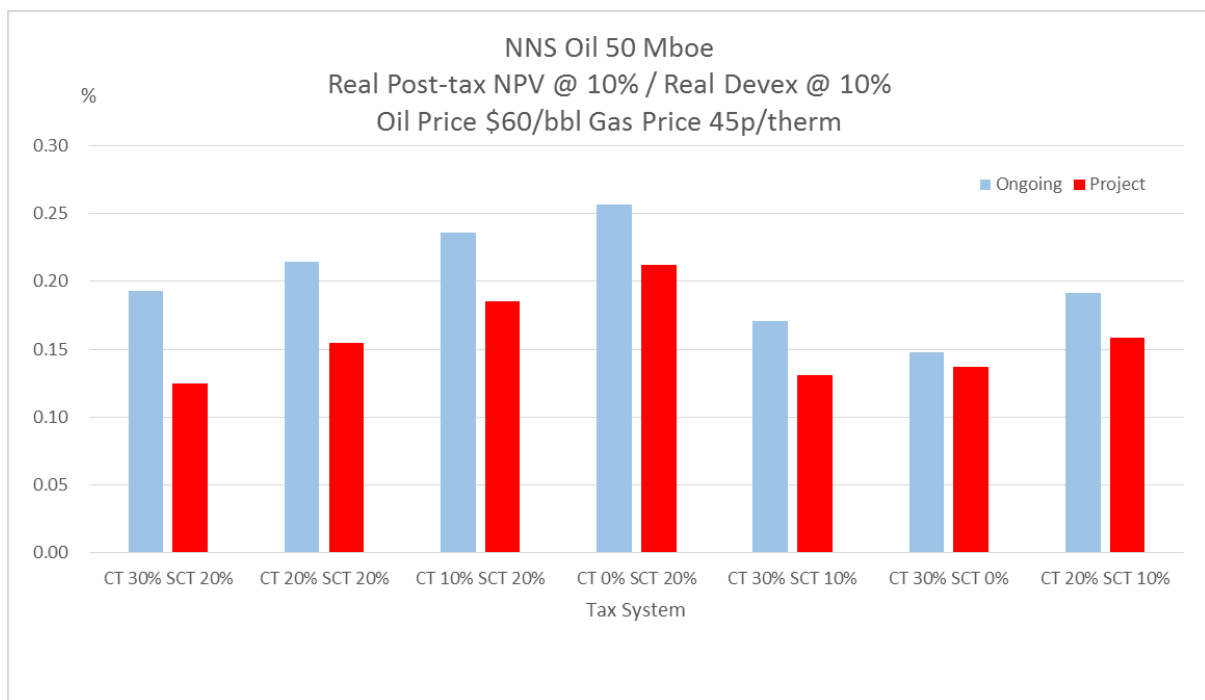


Chart 74

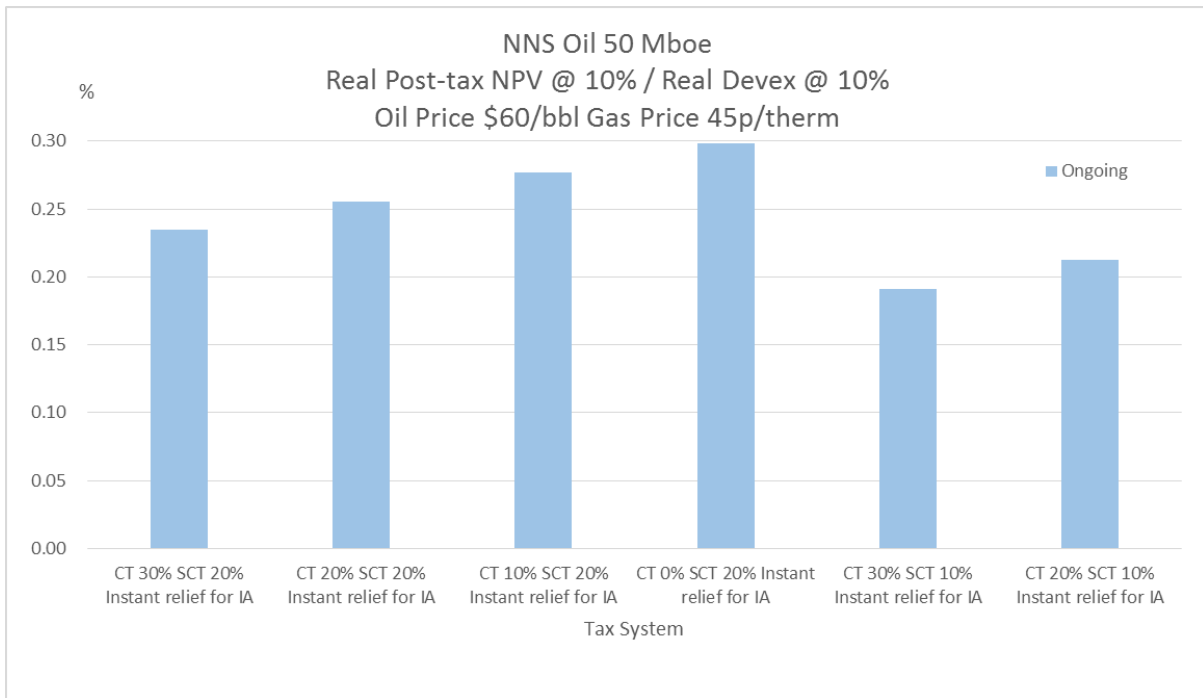
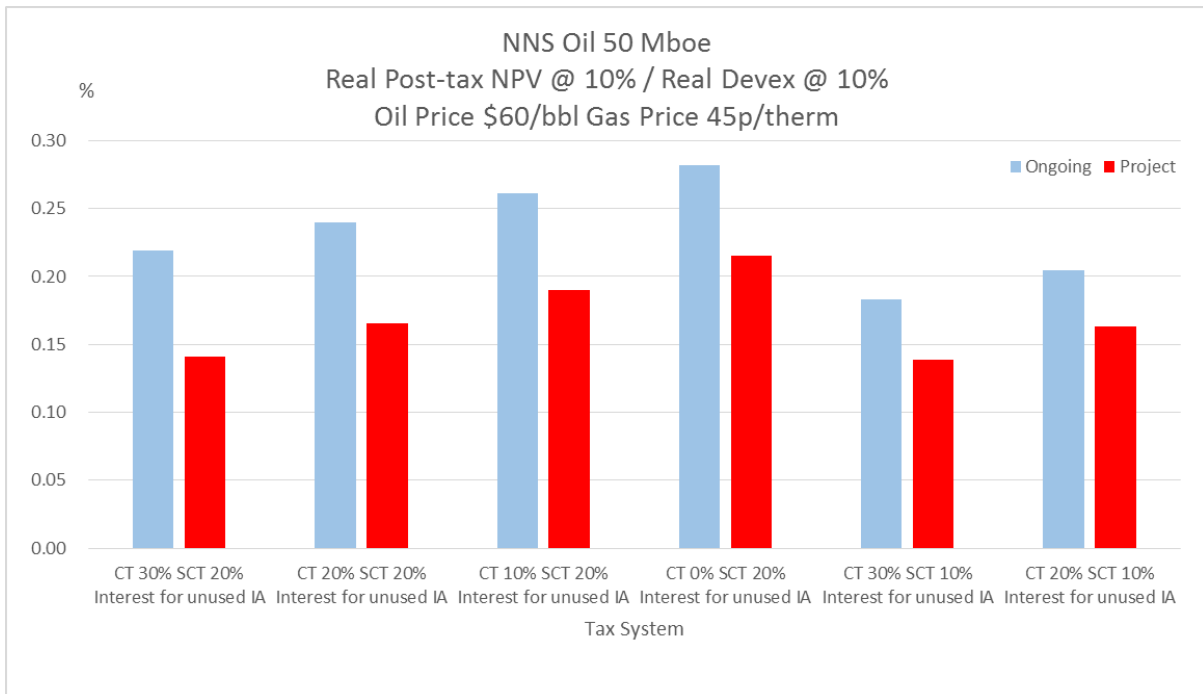


Chart 75



(vi) NNS – Gas

The 30 mmboe gas field in NNS was found to generate negative or very low returns at 30 pence and 40 pence prices. At 45 pence price the NPVs at 10% are positive but the NPV/I ratios are very low. The results are shown in Charts 76, 77 and 78. It is seen that, under the present tax system, the NPV/I ratio is 0.16 for an ongoing investor and 0.076 for a project investor. Major reductions to the CT rate can enhance returns. For the ongoing investor instant relief for the IA brings substantial benefits.

Chart 76

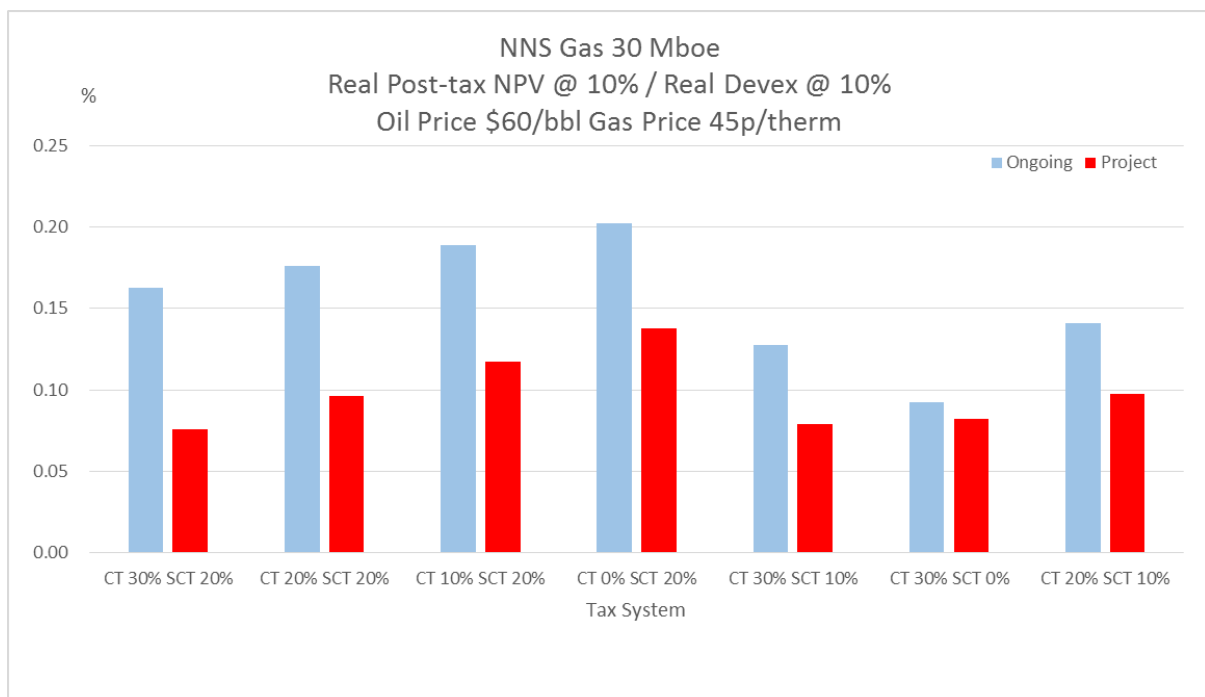


Chart 77

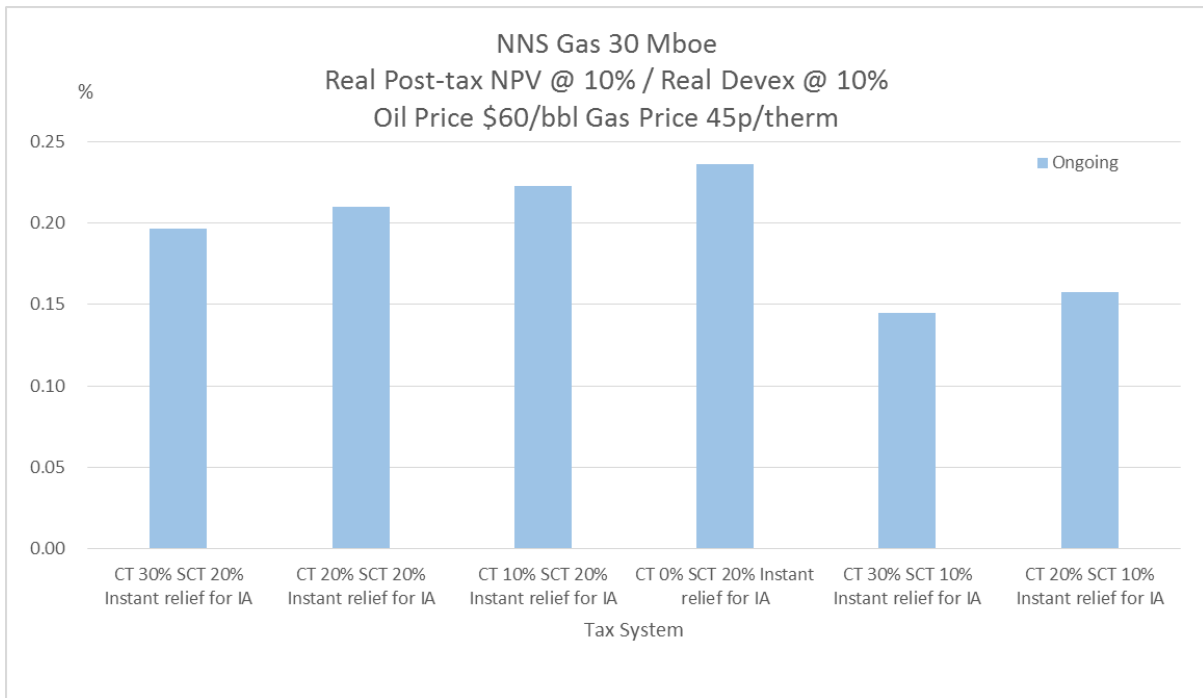
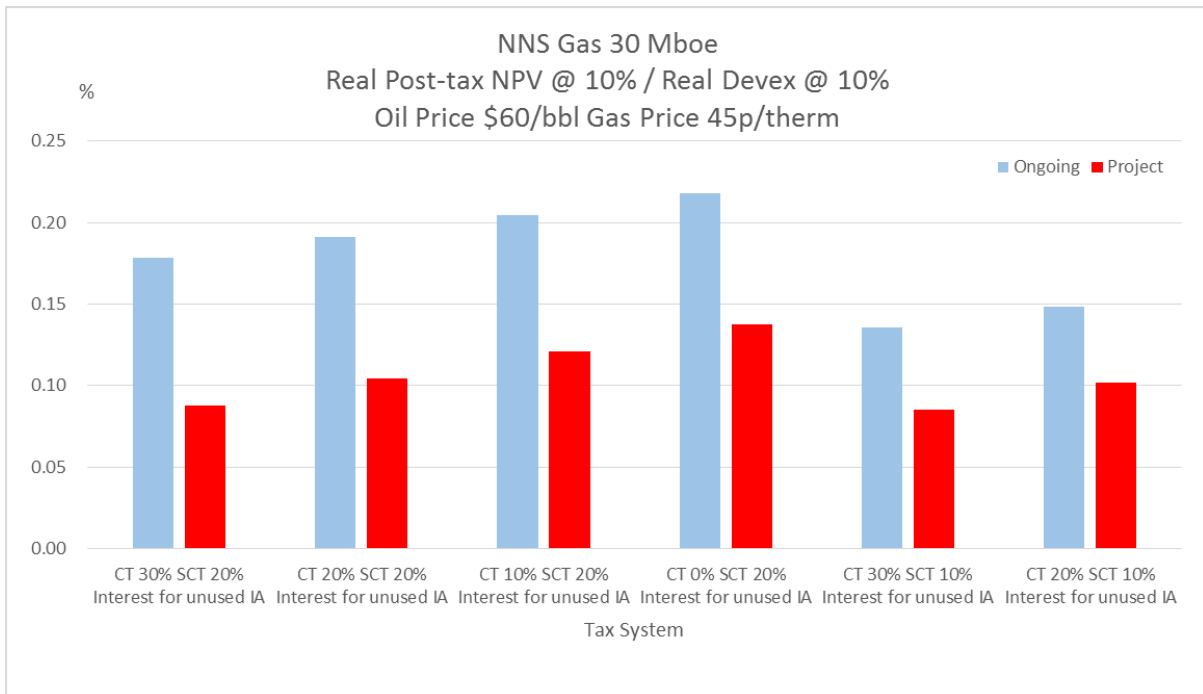


Chart 78



(vii) SNS – Gas

It was found that the returns to the 10 mmboe and 20 mmboe fields were negative at 30 pence, 40 pence and 45 pence in terms of pre-tax NPV/I ratios. The 50 mmboe gas field produced negative NPV/I ratios at 30 pence. At the 40 pence price the NPVs at 10% are positive, but NPV/I ratios are very low. They are shown in Charts 79, 80 and 81. Under the present tax system the NPV/I ratio is 0.14 for an ongoing investor and 0.06 for a project investor. Major reductions to CT ratios improve the returns, but they remain well below a likely threshold. Again it was found that immediate relief for IA brings notable benefits to the ongoing investor. The project investor cannot effectively utilise interest on unused IA.

Chart 79

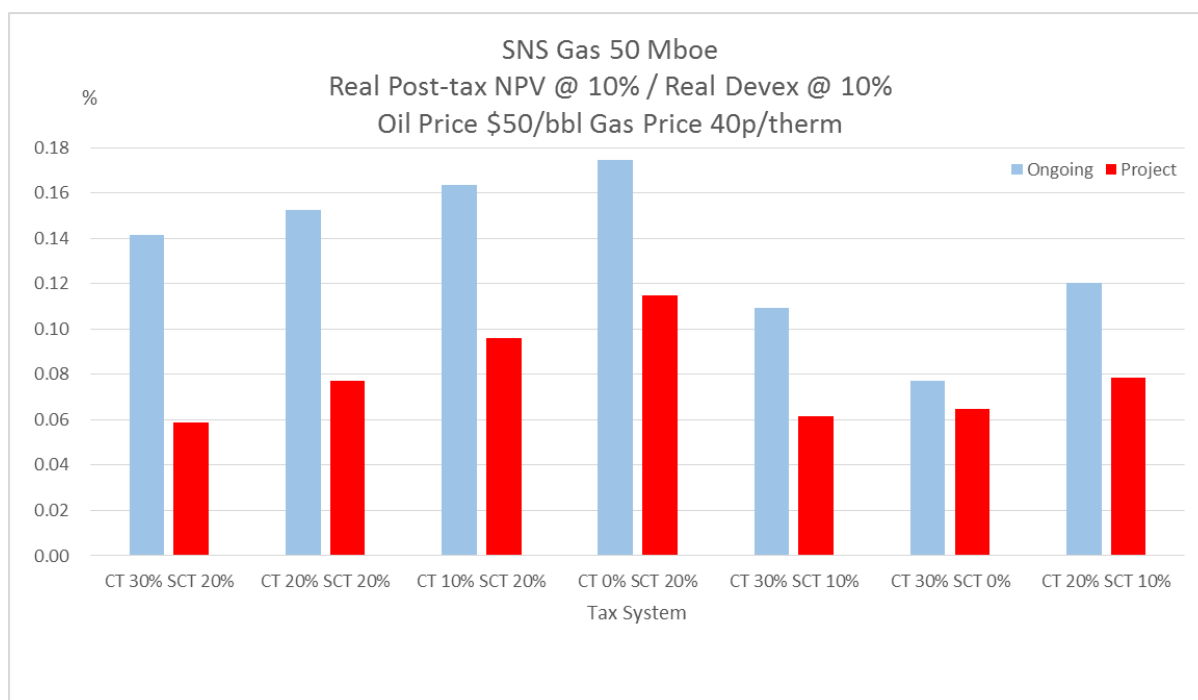


Chart 80

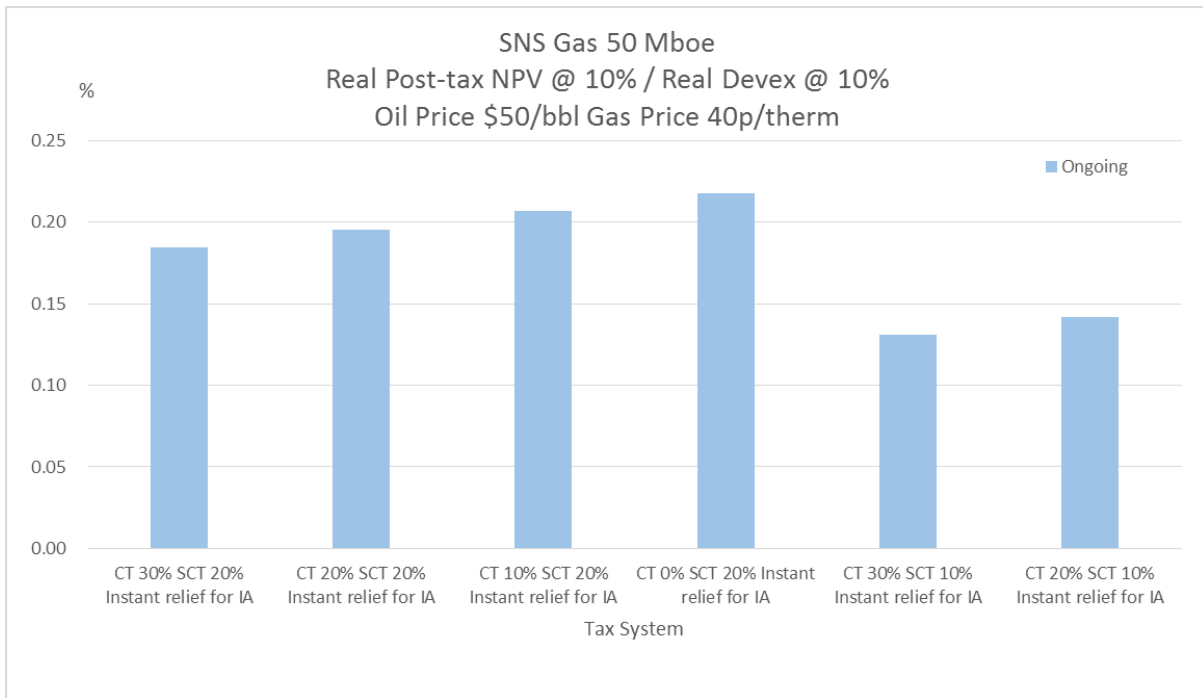
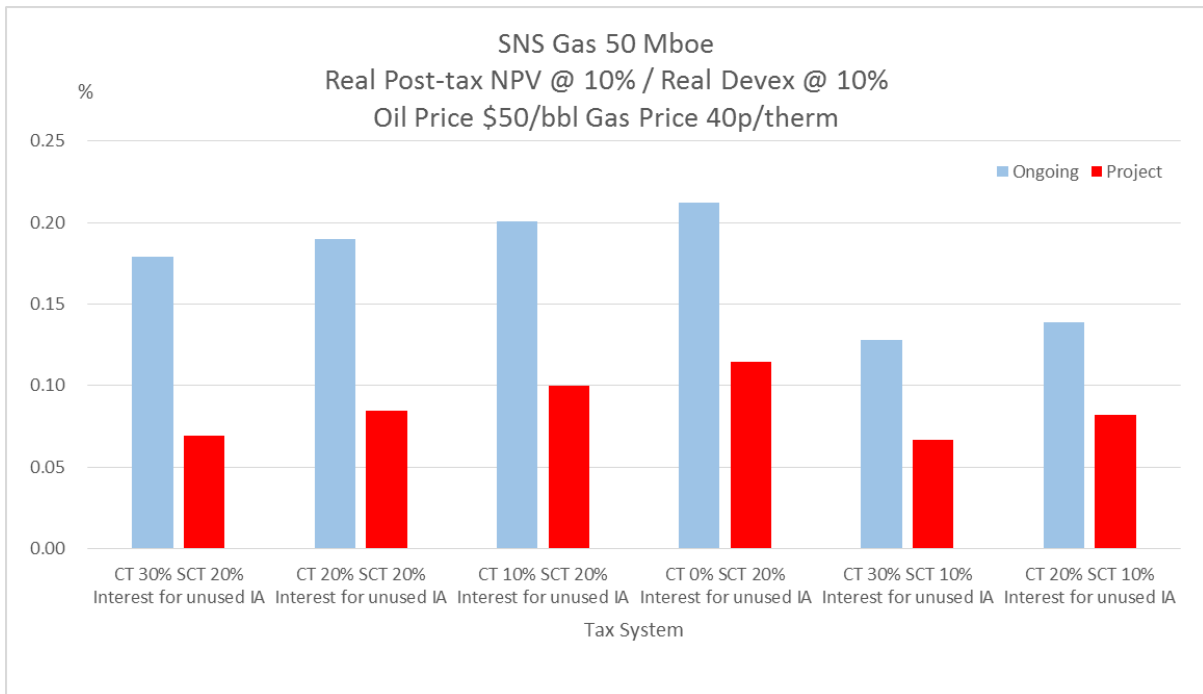


Chart 81



The post-tax returns to the 50 mmboe gas project with 45 pence price are shown in Charts 82, 83 and 84. Under the present tax system the ratio is 0.24 for the ongoing investor and 0.178 for the project one. Large reductions in CT rates can enhance returns, but probably not to make projects commercial. It is noteworthy that instant relief for IA significantly helps the ongoing investor. The project investor obtains worthwhile help from interest on unused IA.

Chart 82

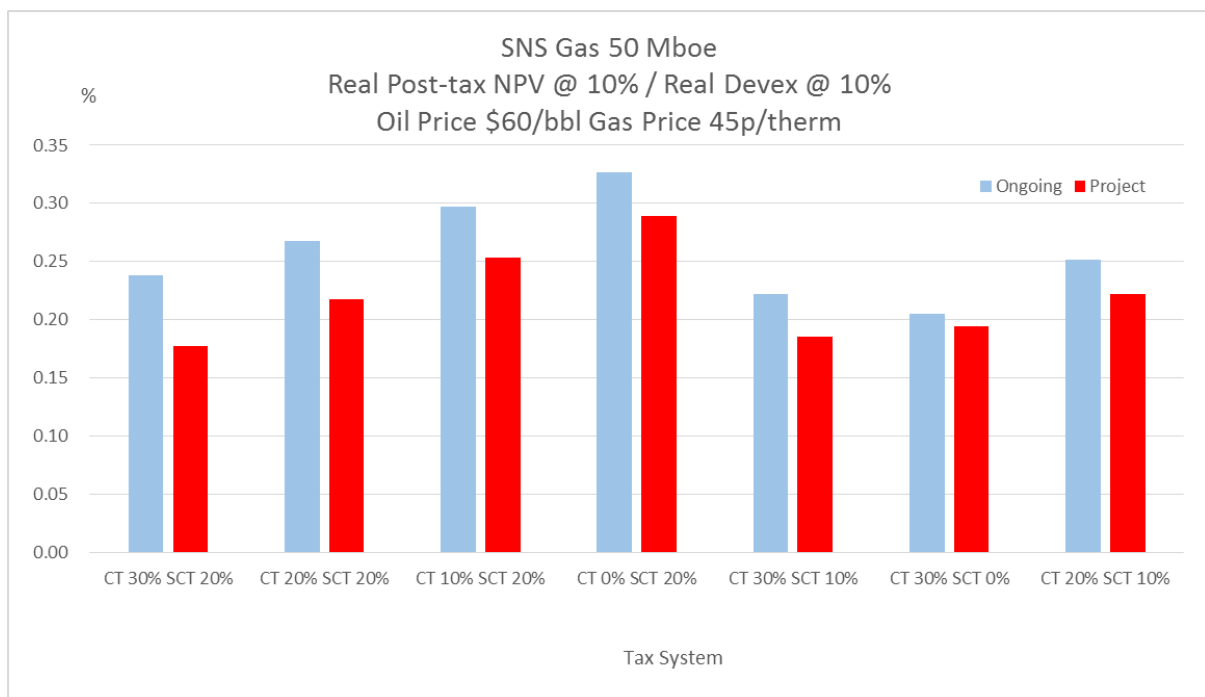


Chart 83

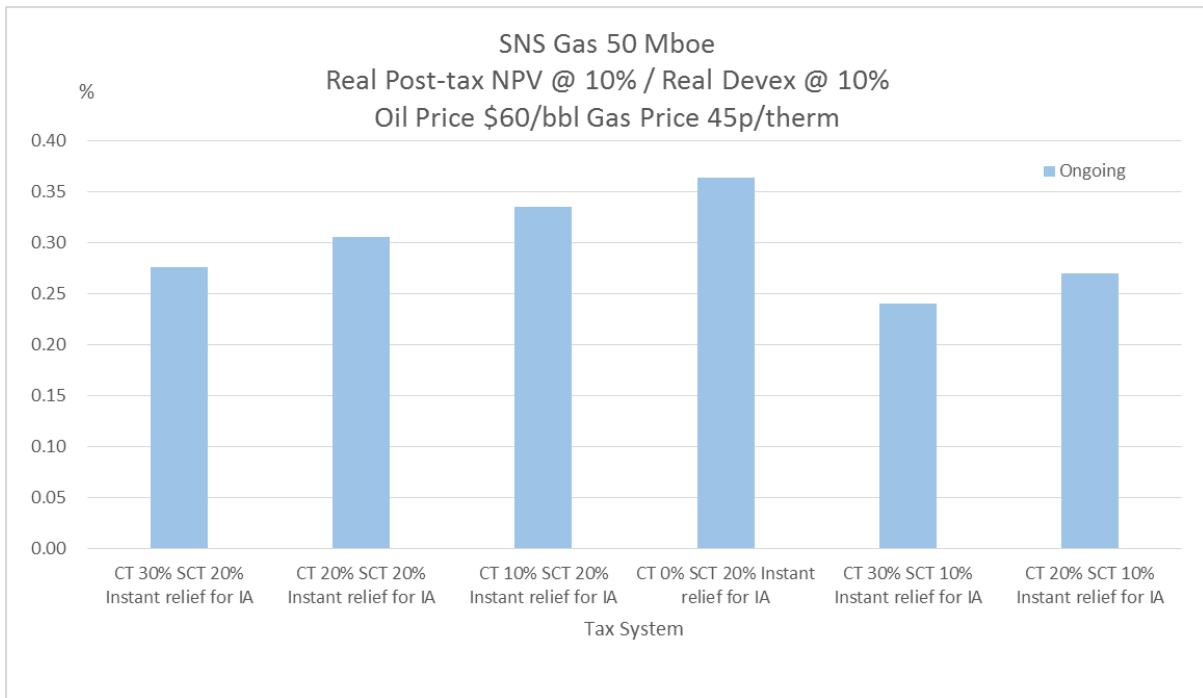
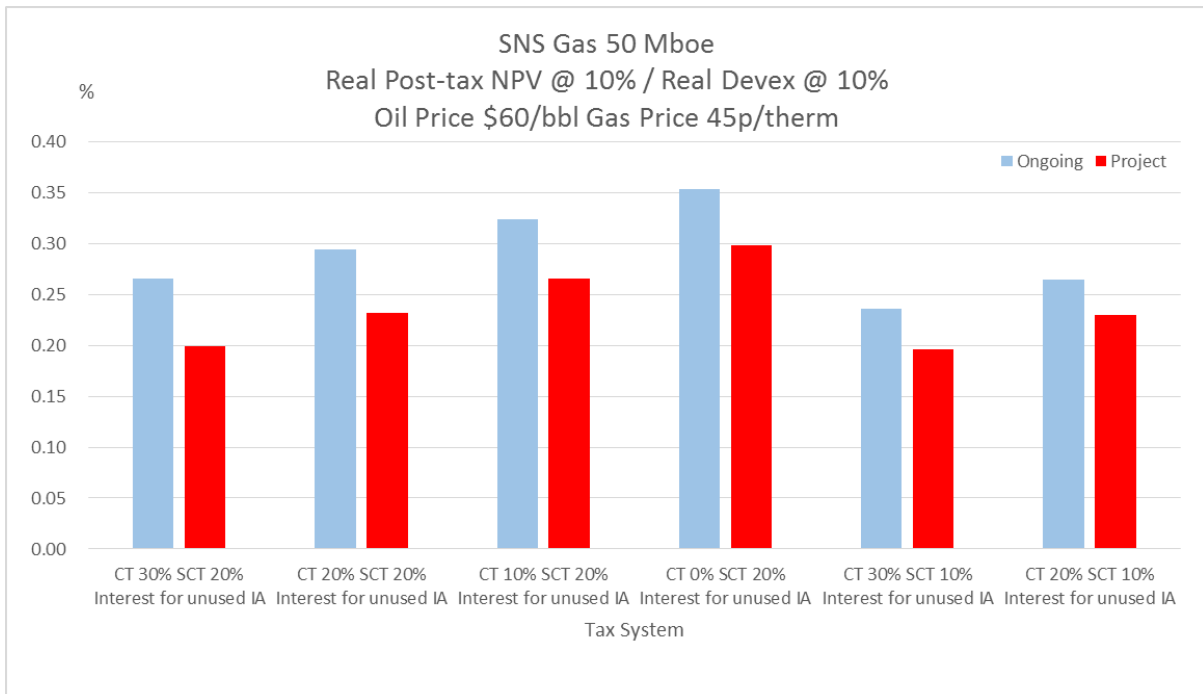


Chart 84



4. Conclusions

In this study the prospective pre-tax and post-tax returns for a representative number of new oil and gas fields in the UKCS have been modelled under a range of oil and gas prices and various tax schemes. The sizes of the representative fields are based on those given development approval over the past few years in the 4 main regions of the UKCS, namely Central North Sea (CNS), Northern North Sea (NNS), West of Shetlands (W of S), and Southern North Sea (SNS). The development and operating costs for the fields have been adjusted to reflect the cost reductions undertaken by the industry. Altogether 18 fields were modelled, with the objective being to separately reflect the current conditions in the 4 main sectors of the UKCS.

Three oil and gas price scenarios were employed in the modelling. These are (1) \$30 per barrel and 30 pence per therm, (2) \$50 and 40 pence, and (3) \$60 and 45 pence. All are in real terms.

Several tax schemes were modelled. Apart from the present system the following were also modelled:

1. Investment Allowance (IA) for Supplementary Charge allowed to be activated against a different project's income giving earlier effective relief
2. Interest on IA at the RFES rate to be allowed from the time when the IA can be activated but cannot be used because of insufficient income to absorb the allowance
3. Reductions in headline rate of SC with CT unchanged
4. Reductions in headline rate of CT with SC unchanged
5. Combinations of the above, particularly reductions in CT and SC rates

The financial modelling calculates pre-tax and post-tax returns for all the fields under the various price and tax conditions. Returns were measured in terms of net present values (NPVs), internal rates of return (IRRs), and NPV/I ratios. A 10% real discount rate was employed. In the study the presentation of the results highlights the NPV/I ratios. In the current investment climate with capital rationing being a considerable problem NPV/I ratios appropriately emphasise the capital productivity of investments and enable ready comparisons to be made. In the industry a value of post-tax NPV@10% / pre-tax I@10% of 0.3 is often regarded as a threshold.

The detailed results of this study are complex, reflecting the varied returns to the projects before tax and the complexities of the tax arrangements. Thus at \$30 and 30 pence prices the great majority of projects are found to be uneconomic before tax. The tax system shares in the losses through the various allowances.

At the \$50 price several of the representative oil fields in the CNS were found to be commercially viable before tax. After tax the 10 mmbbls field remained extremely marginal even with major reductions in tax rates. The 20 mmbbls field was clearly viable before tax but exhibited NPV/I ratios below 0.3 under the present tax system. Reductions to the CT rate and instant relief for the IA were found to raise returns above the 0.3 threshold. The representative 30 mmbbls field was found to be viable under the present tax system. The 50 and 100 mmbbls fields were found to be viable before and after the current tax at the \$50 price. The 20 mmboe gas field was found to be non-viable at 40 pence before tax. The tax system shares in the losses.

The 100 mmboe gas field was found to be viable before tax at the 40 pence price and remained so after the present tax.

In the W of S region at the \$50 price both the 50 and 100 mmbbls fields were found to be non-viable. The tax system shares in the losses. A similar finding applies to the 100 mmboe gas field at the 40 pence price.

In the NNS the 10, 20, 50 and 100 mmbbls oil fields were found to be uneconomic before tax as was the 30 mmboe gas field.

In the SNS it was found that the 10, 20, and 50 mmboe gas fields were uneconomic before tax at the 40 pence price.

At the \$60 price it was found that in the CNS the 10, 20, 30, 50 and 100 mmbbls oil fields were all viable before tax. After the current tax system the 10 mmbbls field remained commercially viable for the ongoing investor but marginal for the project investor. Instant relief for the IA helped the ongoing investor significantly as did interest on unused IA for the project investor. These extra allowances could incentivise the development of this field. The 20, 30, 50 and 100 mmbbls fields were found to be viable after the present tax at the \$60 price. The 20 mmboe gas field in the CNS remained very marginal at the 45 pence price. But CT rate reductions plus instant relief for the IA and interest on unused IA considerably enhanced post-tax returns compared to the present tax system.

At the 45 pence price the 20 mmboe gas field was found to be very marginal for the ongoing investor and clearly sub-marginal for the project

investor. Major CT rate reductions plus immediate relief for IA and interest on unused IA improve the project returns but they remain below the 0.3 threshold. The 100 mmboe gas field is clearly profitable after the current tax with the 45 pence price.

At the \$60 price the 50 mmbbls oil field in the W of S region was found to achieve an NPV/I ratio of 0.34 for the ongoing investor and 0.3 for the project investor under the current tax system. CT rate reductions plus immediate relief for IA significantly enhance the returns. For the project investor interest on unused IA can ensure that the development becomes commercial. The 100 mmbbls oil field was found to produce an NPV/I ratio of 0.325 for the ongoing investor and 0.278 for the project investor. Immediate relief for the IA enhances the return to the ongoing investor while interest on unused IA brings the return to the project investor to a ratio of 0.31.

In the NNS at \$60 price the 10 mmbbls oil field produces an NPV/I ratio of 0.346 for the ongoing investor and 0.3 for the project investor. Immediate relief for IA helps the ongoing investor to a worthwhile extent while interest on unused IA ensures that the ratio becomes 0.32. The project becomes more clearly acceptable to investors.

The 20 mmbbls oil field in the NNS was found to be uncommercial at \$60 price under the present tax system. The NPV/I ratio was particularly low for the project investor. Reductions in the CT rate plus instant relief for IA for the ongoing investor improves the returns substantially, but left the project still very marginal with the NPV/I ratio being below 0.3. The returns to the project investor remain well below this threshold. Similar findings were made for the 50 mmbbls oil field in the NNS regions.

In the SNS it was found that at the 45 pence gas price the 10 and 20 mmboe gas fields were uneconomic. The 50 mmboe gas field remained uneconomic with the present tax system. Major reductions in the CT rate plus immediate relief for IA enhances the returns but they remain marginal and below the 0.3 threshold.

The conclusions to be drawn from the detailed analysis are that there are many marginal and sub-marginal new development projects in the UKCS under likely oil/gas price scenarios, cost conditions, and field sizes. The evidence from the modelling is that a combination of headline tax rate reductions plus immediate relief for the IA plus interest on unused IA can have a significant positive effect on investment in new fields. Immediate relief for the IA and interest on unused IA are progressive in their effects. That is, they produce relatively more benefits to marginal projects or those of relatively low profitability, than to higher profitability ones. Reductions in the rate of CT are clearly more powerful than equivalent reductions in the SC rate. A package incorporating lower CT rate, immediate relief for IA, and interest on unused IA is thus recommended.