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**The Economics of PRT Redetermination
For Incremental Projects in the UKCS**

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Linda Stephen

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DEPARTMENT OF ECONOMICS

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.

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The Economics of PRT Redetermination for Incremental Projects in the UKCS

Professor Alexander G. Kemp and
Linda Stephen

<u>Contents</u>	<u>Page</u>
1. Introduction.....	3
2. Methodology and data	4
3. Results of PRT Relief	7
A. Low Price Case (\$40,30 pence)	
a) 10% discount rate	
i) Production	8
ii) Project Development Expenditures	11
iii) Operating Expenditures	12
b) 12.5% discount rate	
i) Production	13
ii) Project Development Expenditures	17
iii) Operating Expenditures	18
c) 15% discount rate	
i) Production	19
ii) Project Development Expenditures	23
iii) Operating Expenditures	24
B. Medium Price Case (\$60,50 pence)	
a) 10% discount rate	
i) Production	25
ii) Project Development Expenditures	27
iii) Operating Expenditures	27
b) 12.5% discount rate	
i) Production	29
ii) Project Development Expenditures	31
iii) Operating Expenditures	31

c) 15% discount rate	
i) Production	32
ii) Project Development Expenditures	35
iii) Operating Expenditures	35
 C. High Price Case (\$80,70 pence)	
a) 10% discount rate	
i) Production	36
ii) Project Development Expenditures	40
iii) Operating Expenditures	41
 b) 12.5% discount rate	
i) Production	43
ii) Project Development Expenditures	47
iii) Operating Expenditures	48
 c) 15% discount rate	
i) Production	49
ii) Project Development Expenditures	52
iii) Operating Expenditures	53
 4. Conclusions	54

The Economics of PRT Redetermination for Incremental Projects in the UKCS

**Professor Alex Kemp
and
Linda Stephen**

1. Introduction

In May 2008 a discussion was launched between the UK Government and the upstream oil industry on the case for removal from PRT of new incremental projects relating to PRT-buying fields. As far as the economic aspects are concerned, to obtain relief the industry has to demonstrate that projects are non-viable when PRT applies, but become viable when full PRT relief (redetermination) is given. The current general position is that for field developments started before 16th March 1993 PRT is payable, and this also applies to related incremental projects. The PRT rate is currently at 50% with capital allowances being available on 100% first year basis. As new incremental projects are occurring a long time after the initial field development no uplift will be available for the incremental investment. Similarly it is very unlikely that safeguard benefits will be available. But the oil allowance is still applicable in some PRT-paying fields and in principle this could be available to provide some PRT shelter for an incremental project. Corporation tax at 30% and Supplementary Charge at 20% are also applicable to incremental projects with capital allowances being available on 100% first year basis. The combined rate of tax is 75%.

The purpose of this paper is to examine (a) the returns to the incremental investments under the present tax system and (b) the returns after removal of PRT from the incremental project. Any national gains in terms of extra

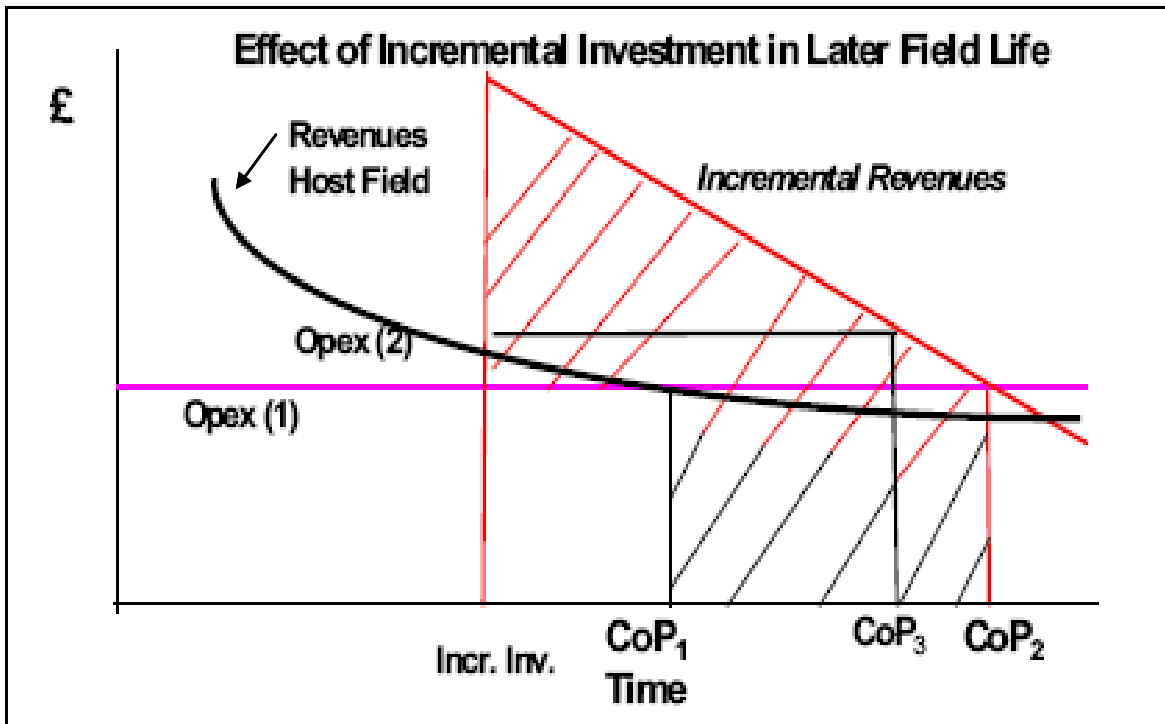
production emanating from the relief are highlighted. The extra investment and operating expenditures from projects triggered as a result of the relief are also shown.

2. Methodology and Data

The economic modelling of the returns to incremental projects is quite complex as it has to consider the interaction of the project with the host or mother field. In particular the incremental project could extend the life of the mother field involving further output from the mother field. The associated postponement of the decommissioning costs of the mother field facilities is also a benefit of an incremental project. In general the returns to the incremental project are measured by calculating the combined returns to the mother (M) plus incremental project (I) and then deducting from that the returns to the mother on its own. In symbols $(M + I) - M = I$.

The position in simplified form is shown in Chart 1 where, without the incremental project, cessation of production is at COP₁. When the incremental project proceeds and there is no extra operating costs for the combined operation cessation of production is at COP₂ which involves further production from the mother as well as the incremental project. In the more likely case that the new project involves extra operating costs cessation of production is at COP₃.

Chart 1



With respect to PRT on the incremental project it is possible that the volume allowance has not yet been fully utilised on the mother field. In that event the incremental project could benefit if the remaining annual production from the mother field is insufficient to absorb all the allowance. This effect has been taken into account in the modelling. The modelling also incorporates any extra PRT payable on the enhanced production from the mother field itself. The postponement of the decommissioning costs and any changes to the associated tax reliefs are also incorporated in the modelling.

The modelling was undertaken on a field database validated by the operators. This incorporated 131 incremental projects but many of these did not relate to PRT-paying fields and so were excluded from the analysis. Fifty-four projects had production income in principle subject to PRT. Four other projects related

to mother fields with pre-July 1975 gas contracts but where PRT was charged on tariff receipts. Other incremental projects involved no production, or no development costs or no PRT payable in practice because of inadequate profitability. In some cases the remaining PRT is negative because of the great importance of relief for decommissioning costs.

The modelling was undertaken under 3 oil and gas prices scenarios as shown in Table 1.

Table 1		
Future Oil and Gas Price Scenarios		
	Oil Price (real) \$/bbl	Gas Price (real) pence/therm
High	80	70
Medium	60	50
Low	40	30

With respect to the cost of capital and investment screening criteria the NPV/I ratio reflecting capital productivity was employed with the NPV being in post-tax terms and the I being pre-tax to reflect practice in the industry. Emphasis was given to minimum NPV/I ratios of 0.3 and 0.5 as investment hurdles but several more were calculated. Discount rates of 10%, 12.5%, and 15% in real terms were employed. The use of this range of discount rates and investment hurdles was felt appropriate in the context of the current state of the financial markets. It should be noted that the incremental projects are nearly all intended

to be executed over the next 3 years or so, and so the higher cost of capital could be a significant issue.

3. Results of PRT Relief

A. Low Price Case (\$40,30 pence)

a) 10% discount rate¹

Under this scenario, with all values of NPV/I of the 54 incremental projects whose income in principle is subject to PRT, 17 would actually pay, while 37 would pay zero or negative amounts. After PRT relief 46 pay zero or negative amounts but PRT is payable on the enhanced production from 8 mother fields.

(i) Production

The modelling found that under the \$40,30 pence case with 10% discount rate and minimum NPV/I ≥ 0.3 hurdle rate 7 qualifying incremental projects would gain with PRT redetermination. Of these 2 continued to fail the NPV/I ≥ 0.3 hurdle without PRT. Two failed the hurdle when PRT was payable but passed it with the relief. Three passed the hurdle under the current tax system.

In Chart 2 the position with respect to incremental oil production is shown. There is a total of 84.2 mm bbls of extra oil production emanating from PRT relief when the hurdle is NPV/I ≥ 0.3 . Of this 54.7 mm bbls constitutes the extra production emanating from projects which failed the hurdle when PRT was payable and passed it when PRT was removed.

If the hurdle was NPV/I ≥ 0.5 2 projects involving 29.2 mm bbls of oil fail the hurdle when PRT is payable but pass it when PRT is removed (Chart 3).

¹ Rate indicated for use by DECC

Chart 2

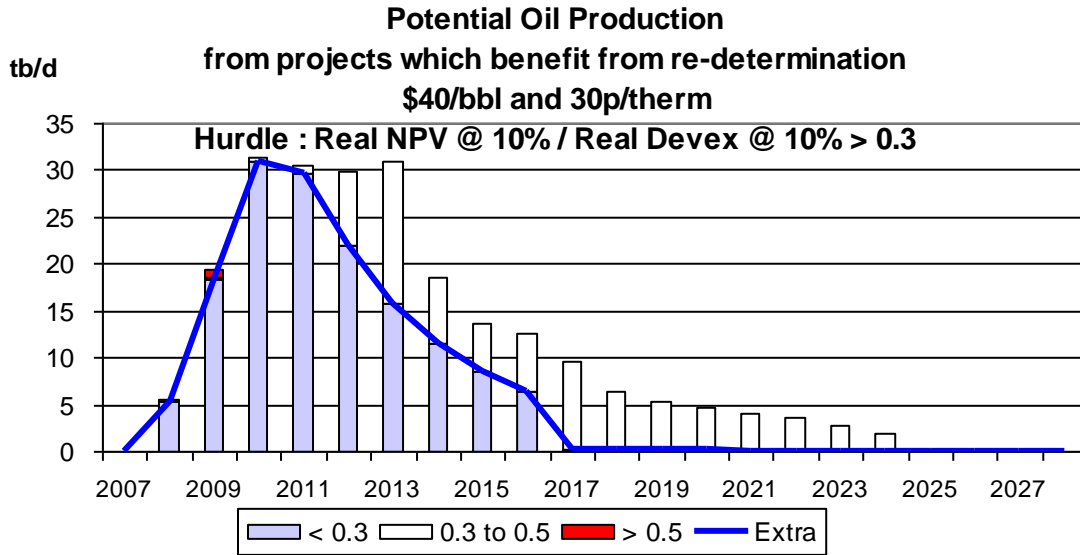
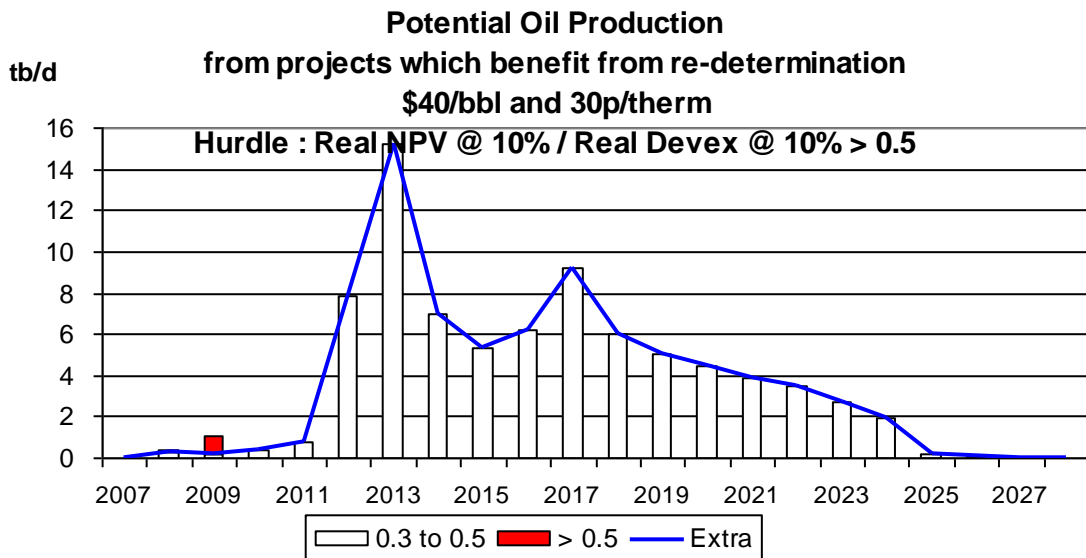


Chart 3



With respect to gas a total of 7.84 bcf extra production benefits from PRT relief but all result from projects which pass the $NPV/I \geq 0.3$ hurdle with PRT being payable (Chart 4). When the investment hurdle is $NPV/I \geq 0.5$ the extra production of 7.84 bcf all emanates from projects which fail the hurdle when PRT is payable but pass it when there is PRT relief (Chart 5).

Chart 4

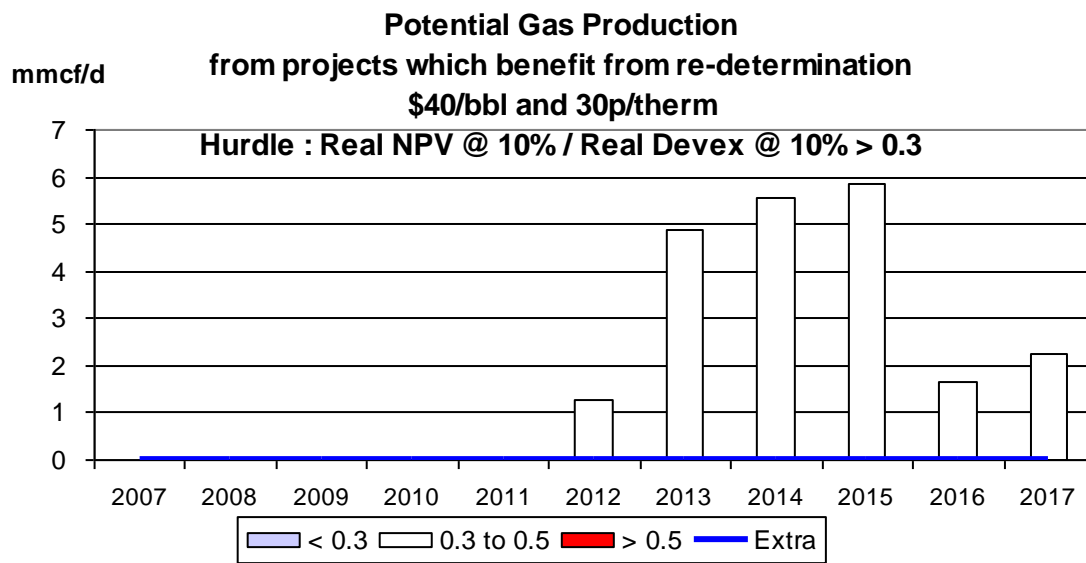
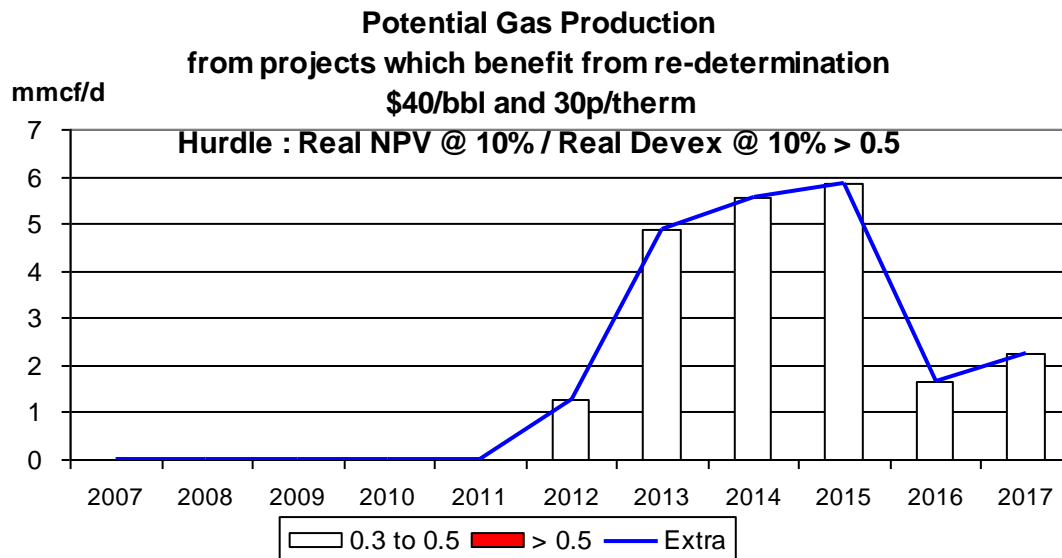


Chart 5



In line with the above results there is a total of 87.74 mmboe which benefits from PRT relief. Of that total 55.67 mmboe emanates from projects which fail the NPV/I ≥ 0.3 hurdle with PRT being payable and pass it when PRT is removed (Chart 6). When the hurdle rate is NPV/I ≥ 0.5 projects involving 32 mmboe benefit from PRT relief of which 31.7 mmboe emanates from projects which fail the hurdle when PRT is payable and pass it when relief is given (Chart 7).

Chart 6

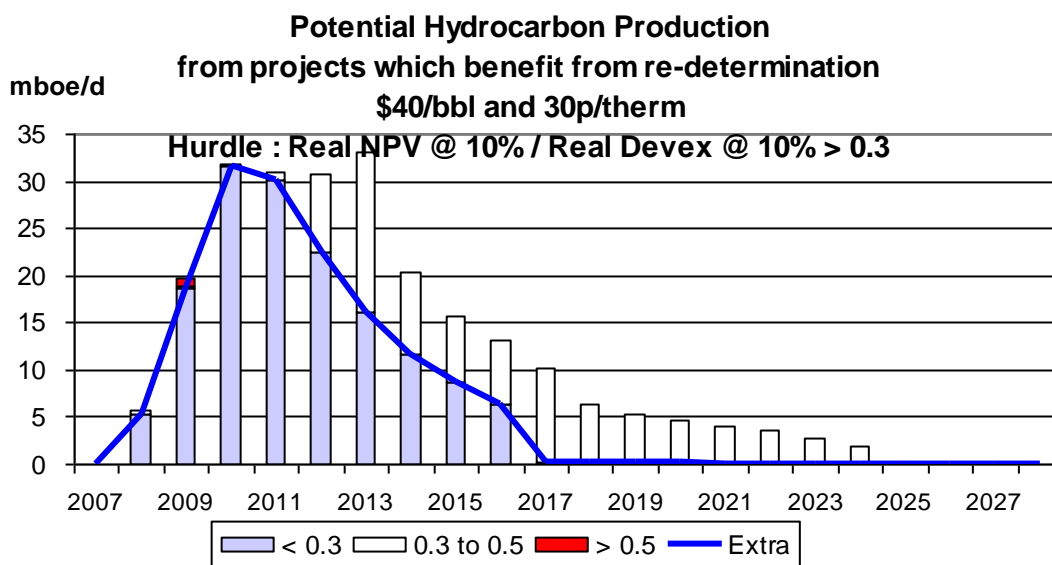
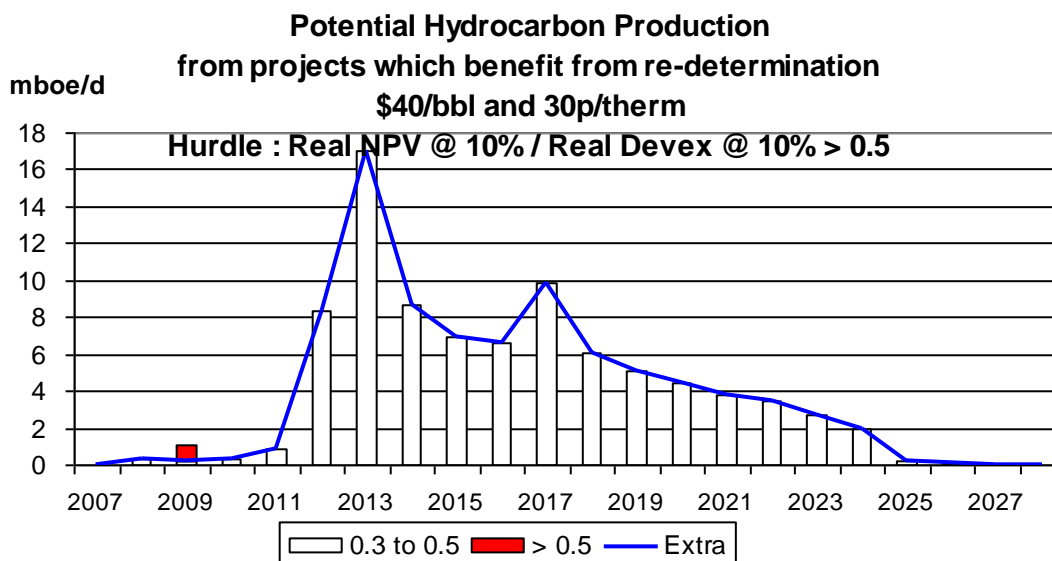


Chart 7



(ii) Project Development Expenditures

Projects involving total investment of £670 million (2008 values) benefit from PRT relief in the $NPV/I \geq 0.3$ hurdle case. Of this £457 million extra investment emanates from projects which fail the hurdle when PRT is payable but pass it when PRT relief is given (Chart 8). If the hurdle were $NPV/I \geq 0.5$ all of the £213 million of investment which benefits from tax relief emanates from projects which fail the hurdle when PRT is payable but pass it when PRT is removed (Chart 9).

Chart 8

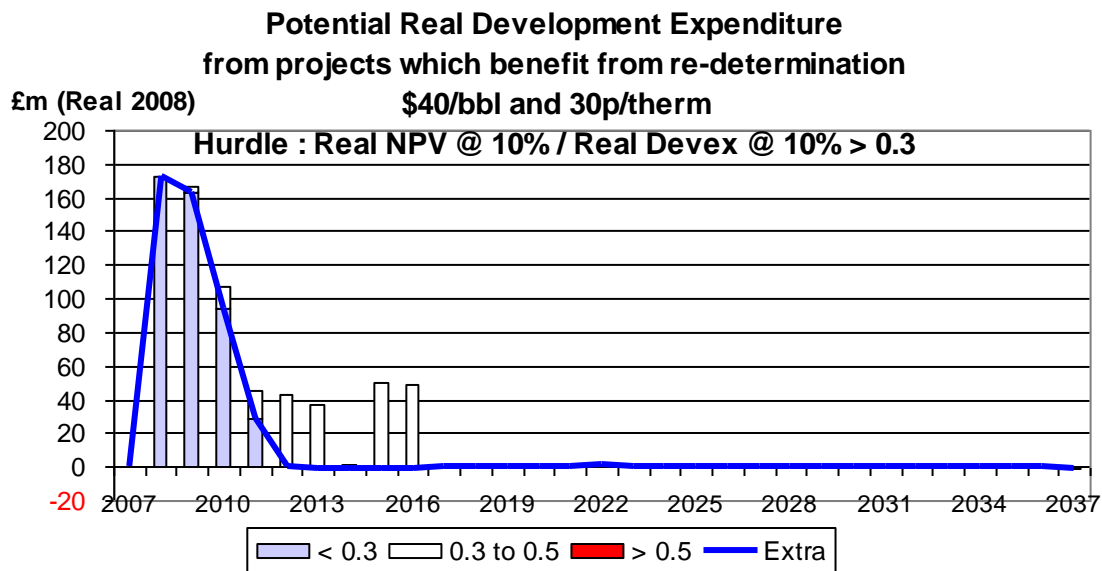
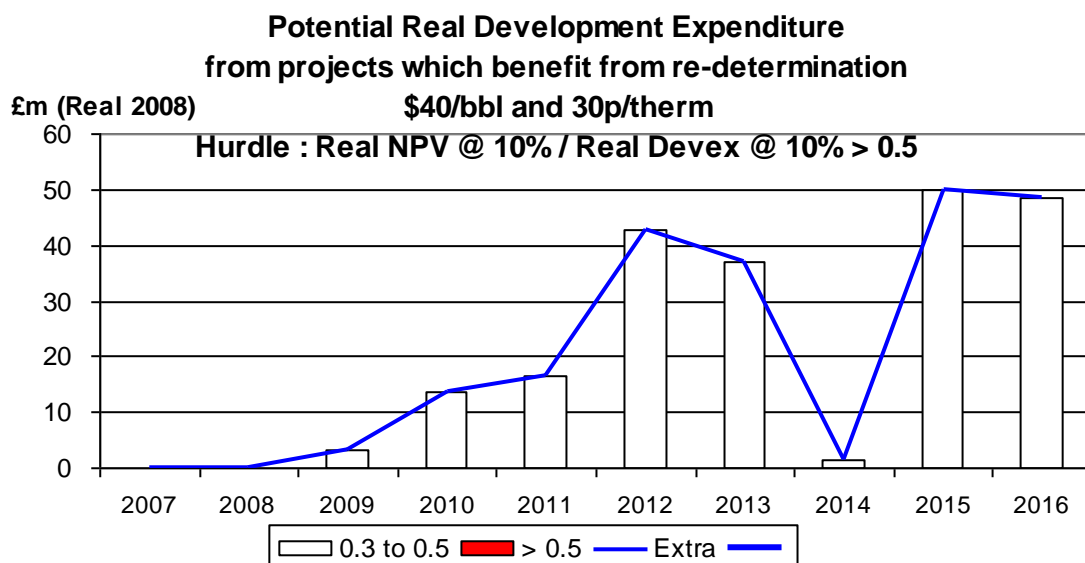


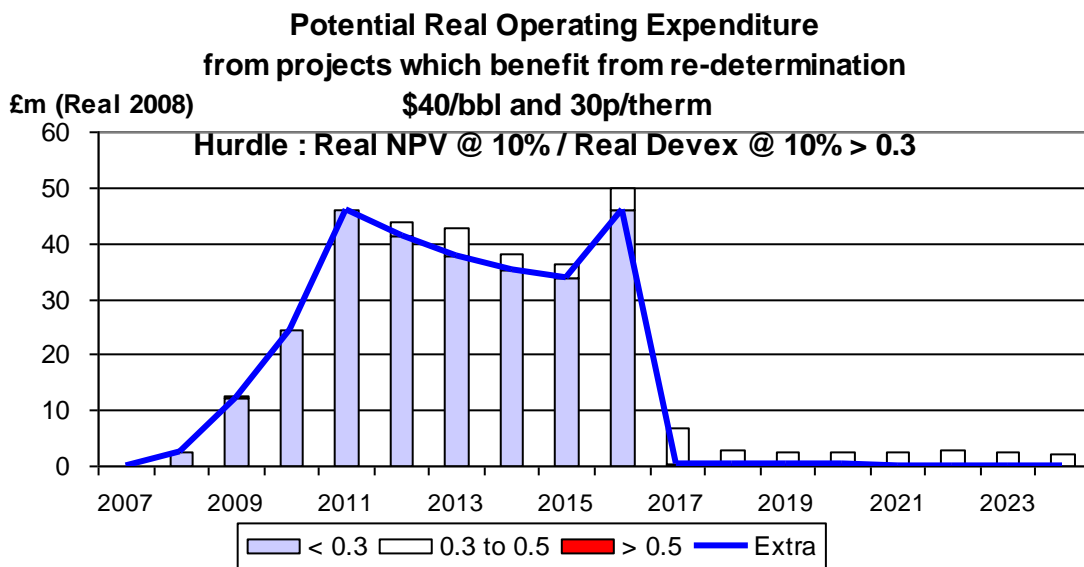
Chart 9



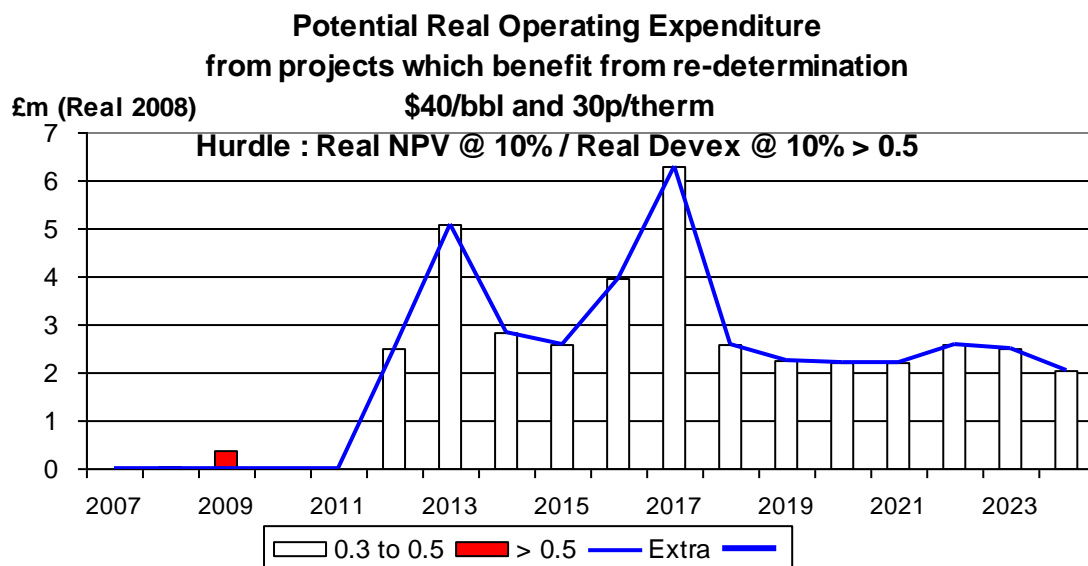
(iii) Operating Expenditures

There is an aggregate of £321 million of operating expenditures attached to projects which gain when PRT is removed and the hurdle is $NPV/I \geq 0.3$. Of this £281 million emanates from projects which fail the hurdle when PRT is payable and pass it when it is removed (Chart 10). When the hurdle is $NPV/I \geq 0.5$ there is an aggregate of £40 million attached to projects which gain when PRT is removed. Virtually all of this relates to projects which fail the hurdle when PRT is payable and pass it when it is removed (Chart 11).

Chart 10



b) Chart 11



b) 12.5% discount rate

Under this scenario, with all values of NPV/I, of the 54 incremental projects whose income in principle is subject to PRT, 14 would actually pay, while 40 would pay zero or negative amounts. After PRT relief 47 pay zero or negative amounts but PRT is payable on the enhanced production from 7 mother fields.

(i) Production

With 12.5% discount rate 7 qualifying projects benefit from PRT relief but 1 fails the $NPV/I \geq 0.3$ hurdle even with relief. However, 3 projects fail the hurdle under the current tax system but pass it with PRT relief. A further 3 projects pass the hurdle without PRT relief. Thus with this hurdle 86 mm bbls of extra oil production would accrue with PRT relief and, of this, 56 mm bbls emanates from projects which fail the hurdle with PRT payable but pass it with relief (Chart 12).

When the hurdle is raised to $NPV/I \geq 0.5$ projects involving a total of 26.3 mm bbls benefit from the PRT relief. Of these 2 projects involving 26 mm bbls fail the threshold when PRT is payable and pass it when PRT is removed (Chart 13).

Chart 12

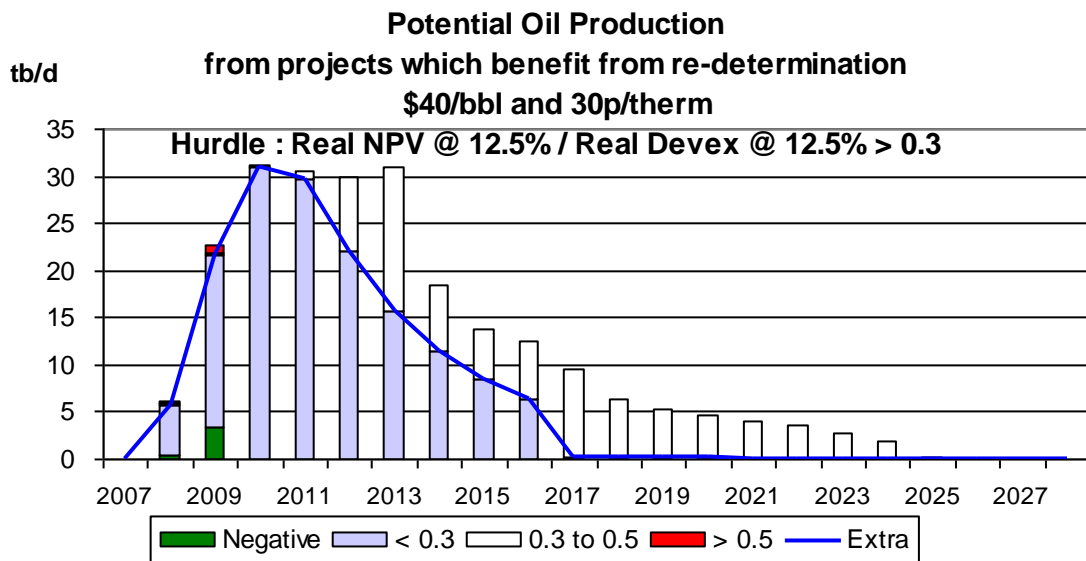
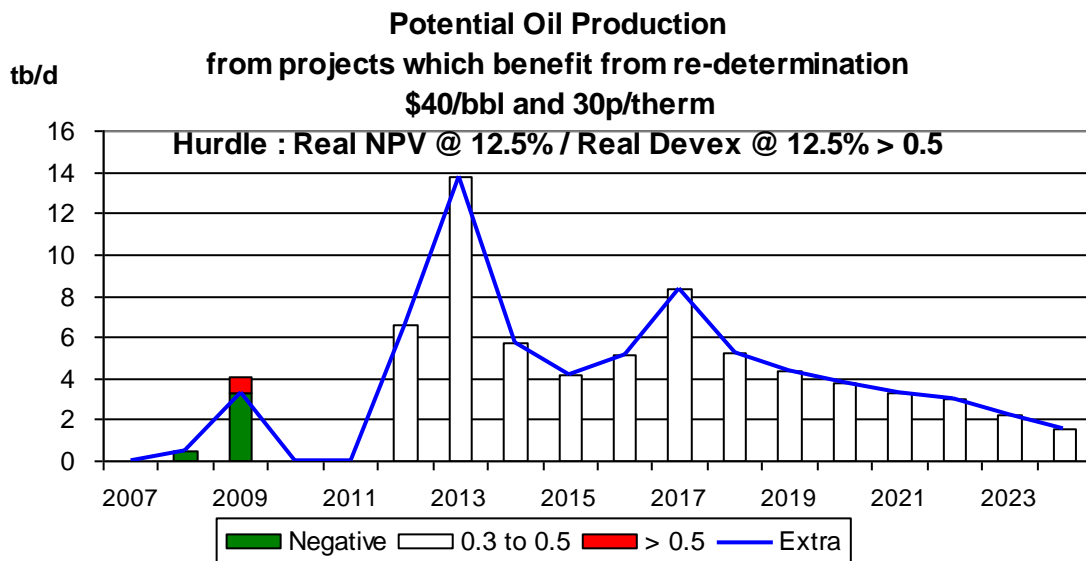


Chart 13



With respect to gas, projects involving total production of 7.84 bcf benefit from PRT relief with the hurdle of $NPV/I \geq 0.3$, but none emanates from projects which fail the hurdle with PRT being payable and pass it when PRT is removed. If the hurdle were $NPV/I \geq 0.5$, projects involving the 7.84 bcf fail the hurdle when PRT is payable but pass it when PRT is removed (Chart 14).

Following from the above, projects involving a total of 89 mm boe benefit when PRT is removed and the hurdle is $NPV/I \geq 0.3$. Of this total 3 projects incorporating reserves of 57 mm boe fail the threshold when PRT is payable and pass it when PRT is removed (Chart 15). When the hurdle is raised to $NPV/I \geq 0.5$ projects involving 29 mmboe gain when PRT is removed. Nearly all of these emanate from 2 projects which fail the hurdle when PRT is payable and pass it when PRT is removed (Chart 16).

Chart 14

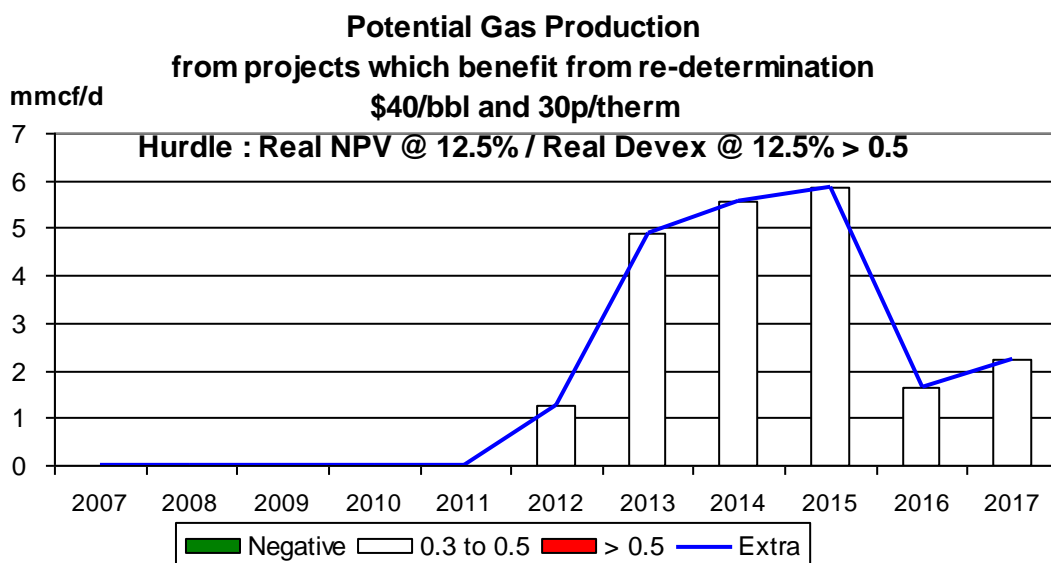


Chart 15

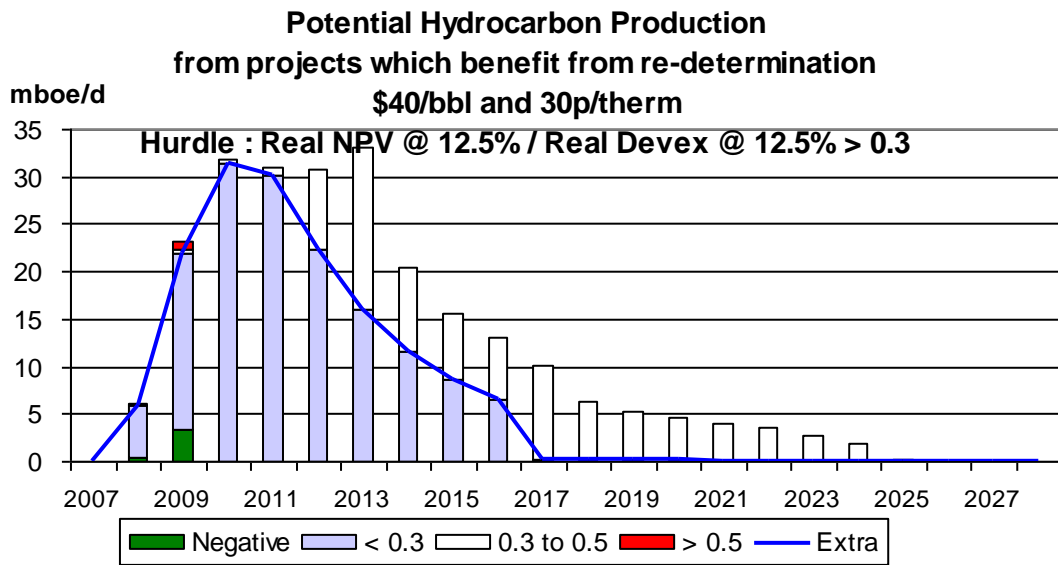
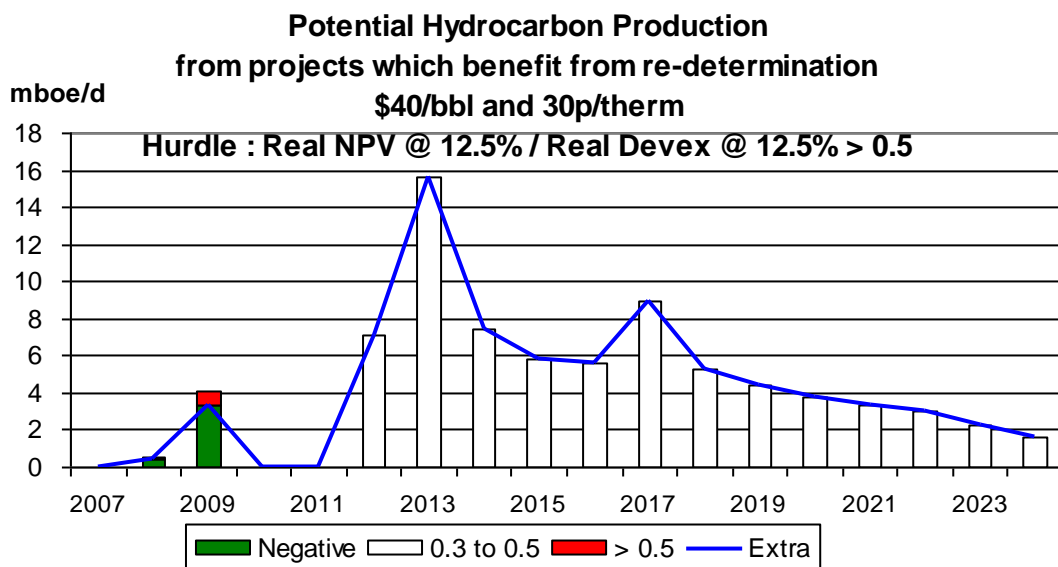


Chart 16

(ii)



(ii) Project Development Expenditures

Total investment of £672 million relates to projects which benefit from PRT relief under the $NPV/I \geq 0.3$ hurdle. Of this total £459 million involves 3 projects which fail the hurdle when PRT is payable and pass it when PRT is removed (Chart 17). When the hurdle is $NPV/I \geq 0.5$ 2 projects involving investment of £177 million benefit from PRT relief. The projects fail the hurdle when PRT is payable and pass it when PRT is removed (Chart 18).

Chart 17

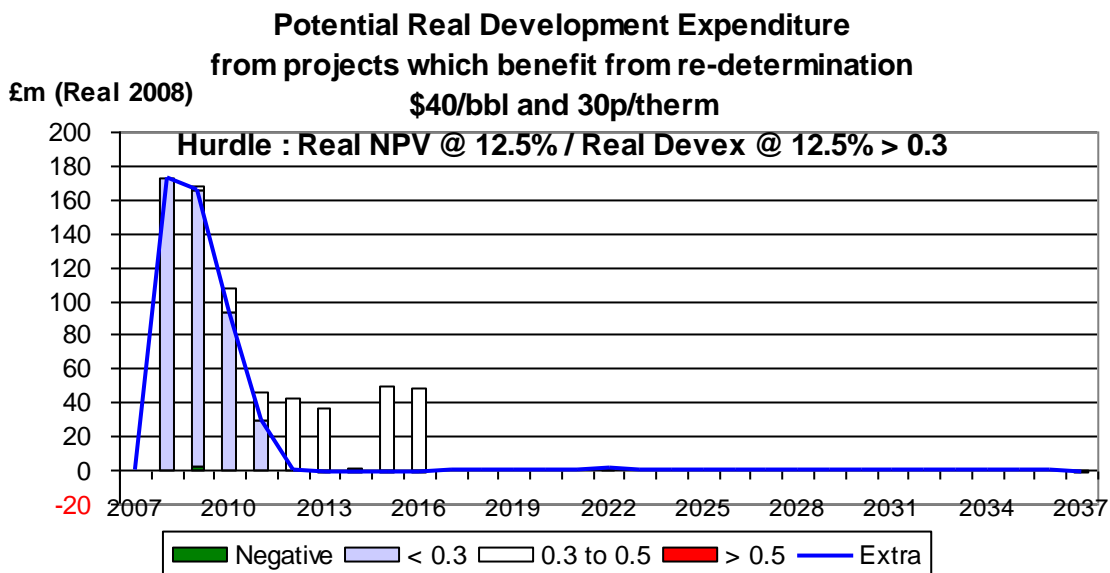
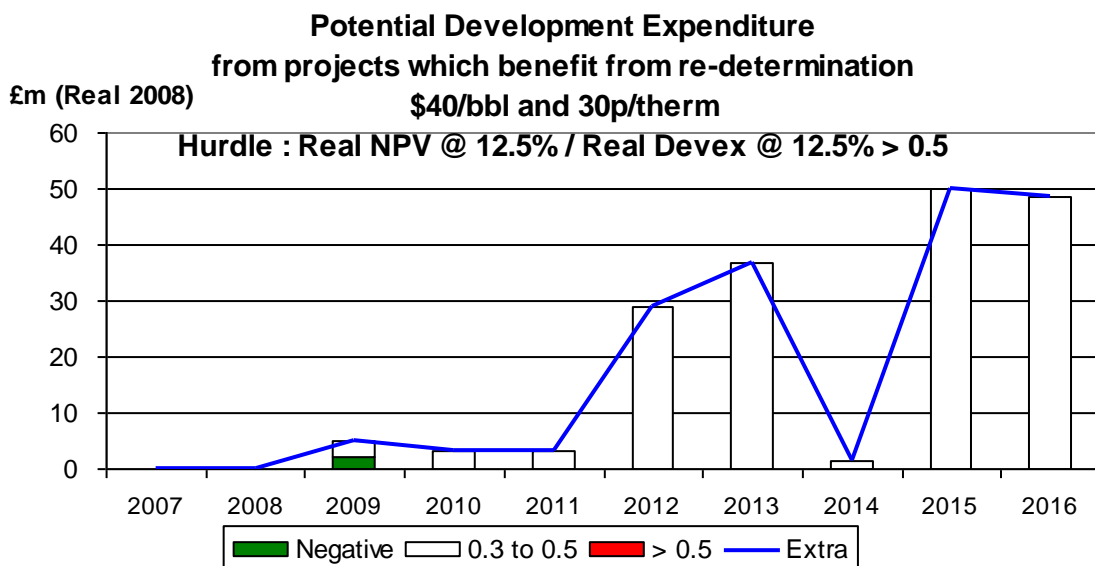


Chart 18



(iii) Operating Expenditures

Operating expenditures involving £344 million relate to projects which benefit from PRT relief with the hurdle of $NPV/I \geq 0.3$. Of these 3 projects involving expenditures of £304 million fail the hurdle when PRT is payable and pass it when it is removed (Chart 19). When the hurdle is $NPV/I \geq 0.5$ projects involving operating expenditures of £64 million benefit from PRT relief. Of these 2 projects involving £63 million of operating expenditures fail the hurdle when PRT is payable and pass it when PRT is removed (Chart 20).

Chart 19

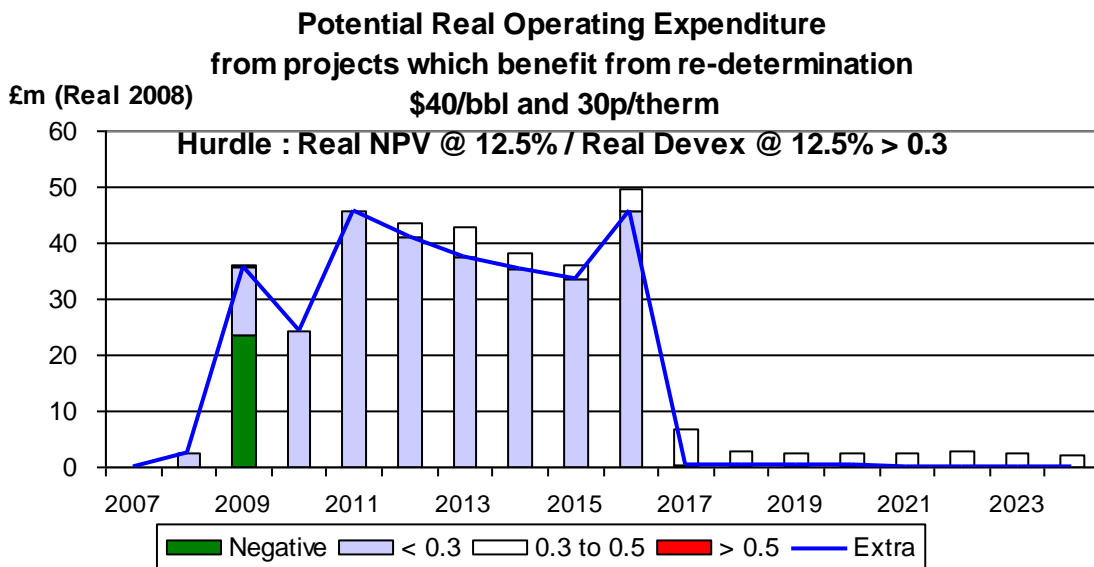
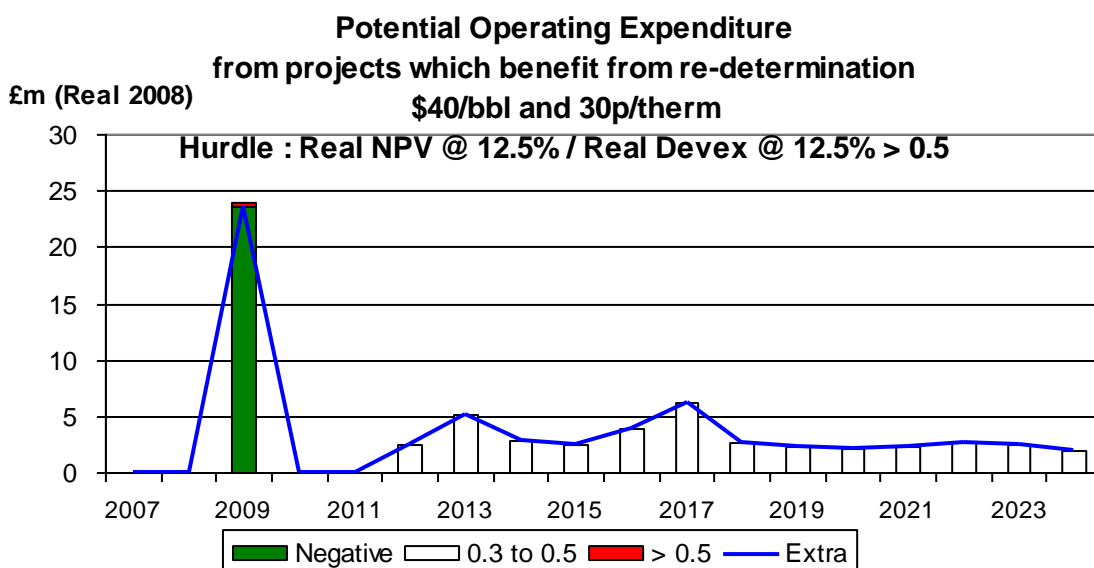


Chart 20



c) 15% discount rate

Under this scenario, with all values of NPV/I, of the 54 incremental projects whose income in principle is subject to PRT, 17 would actually pay, while 37 would pay zero or negative amounts. After PRT relief 47 pay zero or negative amounts but PRT is payable on the enhanced production from 7 mother fields.

(i) Production

Under this scenario 7 projects benefit from PRT relief but 2 of them fail the $NPV/I \geq 0.3$ hurdle even when PRT is removed. A further 2 projects fail the hurdle when PRT is payable and pass it when it is removed. Another 3 projects pass the hurdle when PRT is payable.

With respect to oil production projects with total reserves of 83 mm bbls benefit from PRT relief. Of these, 2 involving 54 mm bbls fail the hurdle when PRT is payable and pass it when PRT is removed (Chart 21). If the hurdle is $NPV/I \geq 0.5$ 2 projects fail the threshold when PRT is payable but pass it when PRT is removed. Four projects fail the hurdle both when PRT is payable and when it is removed. One project passes the hurdle with PRT being payable. Thus 2 projects involving 26 mm bbls of oil fail the hurdle when PRT is payable and pass it when PRT is removed (Chart 22).

Chart 21

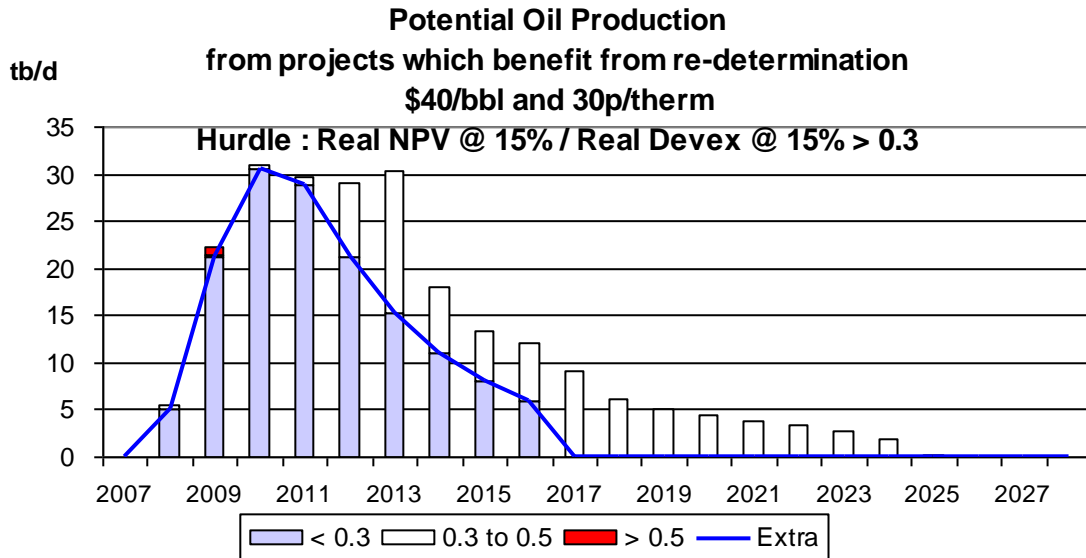
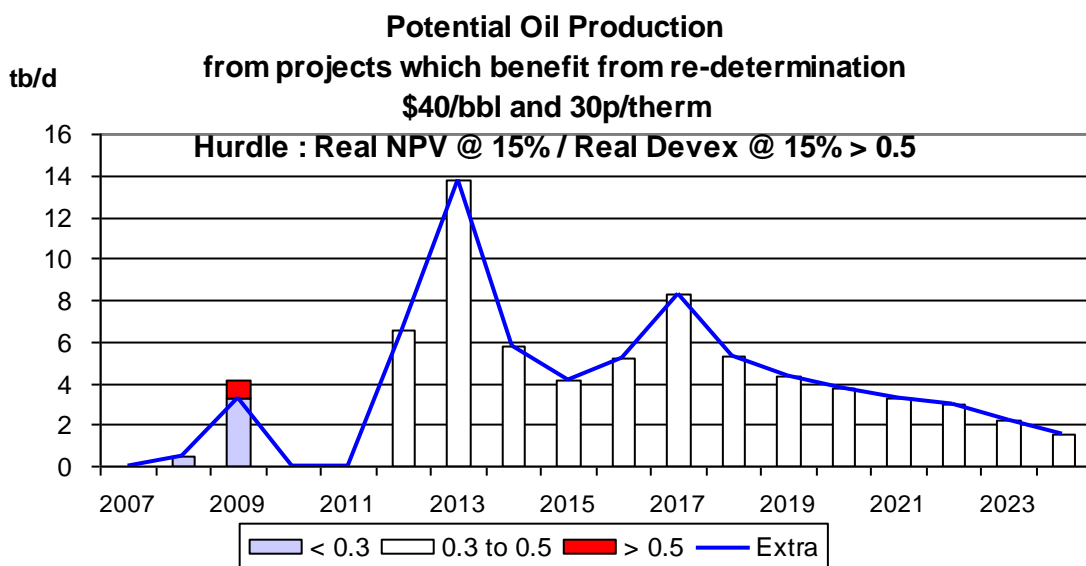


Chart 22



There were no incremental gas projects which failed the hurdle of $NPV/I \geq 0.3$ when PRT was payable and passed it when PRT was removed. When the hurdle is $NPV/I \geq 0.5$ 2 projects involving 7.84 bcf failed the threshold when PRT was payable but passed it when PRT was removed (Chart 23).

From the above, projects involving total production of 87 mm boe benefited from PRT relief and passed the $NPV/I \geq 0.3$ hurdle. Two of them, involving 55 mmboe, failed the hurdle when PRT was payable but passed it when PRT was removed (Chart 24). When the hurdle was raised to $NPV/I \geq 0.5$ 2 projects involving over 28 mm boe failed the hurdle when PRT was payable and passed it when PRT was removed (Chart 25).

Chart 23

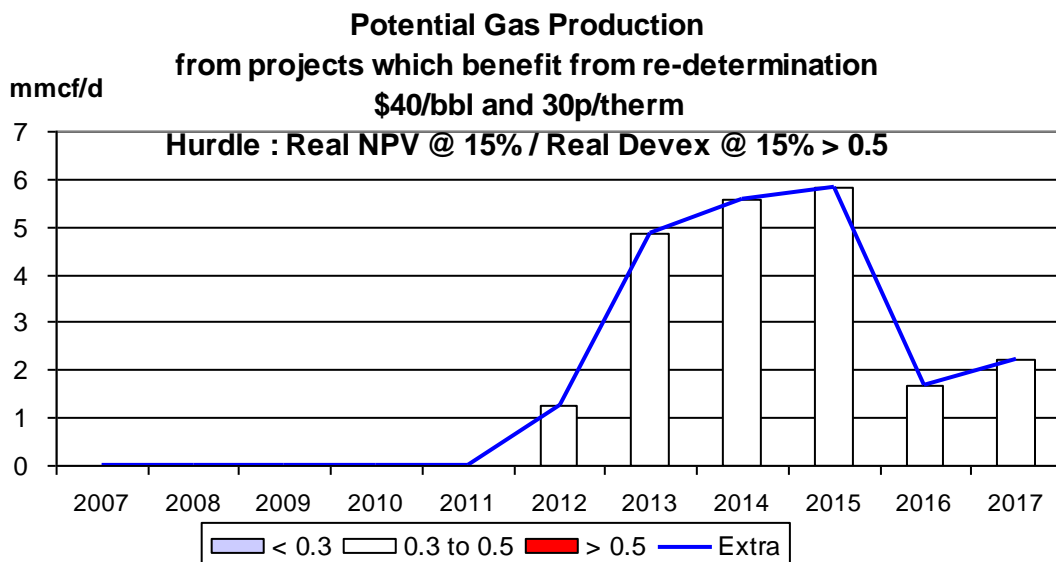


Chart 24

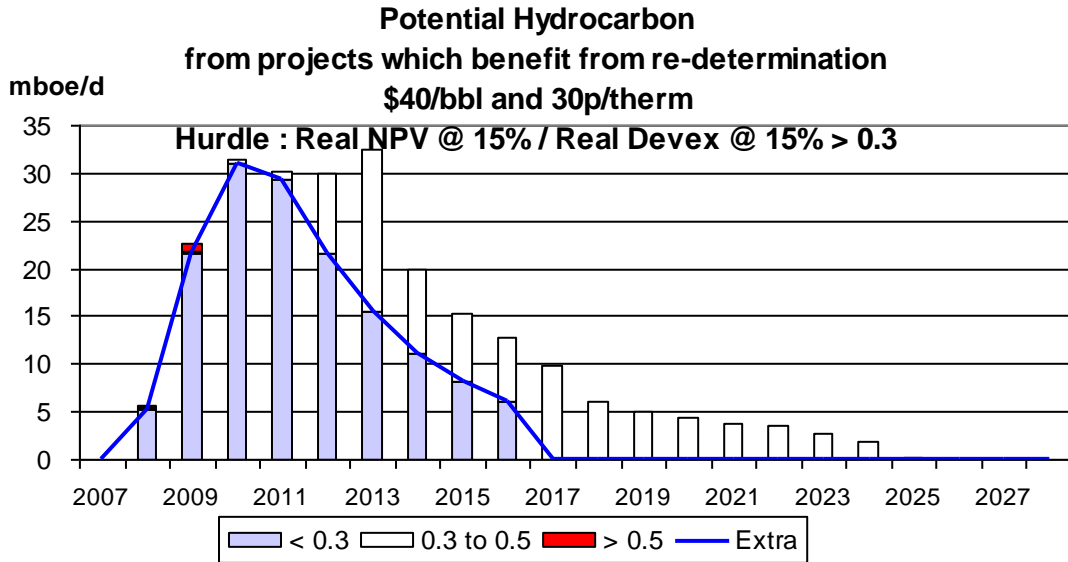
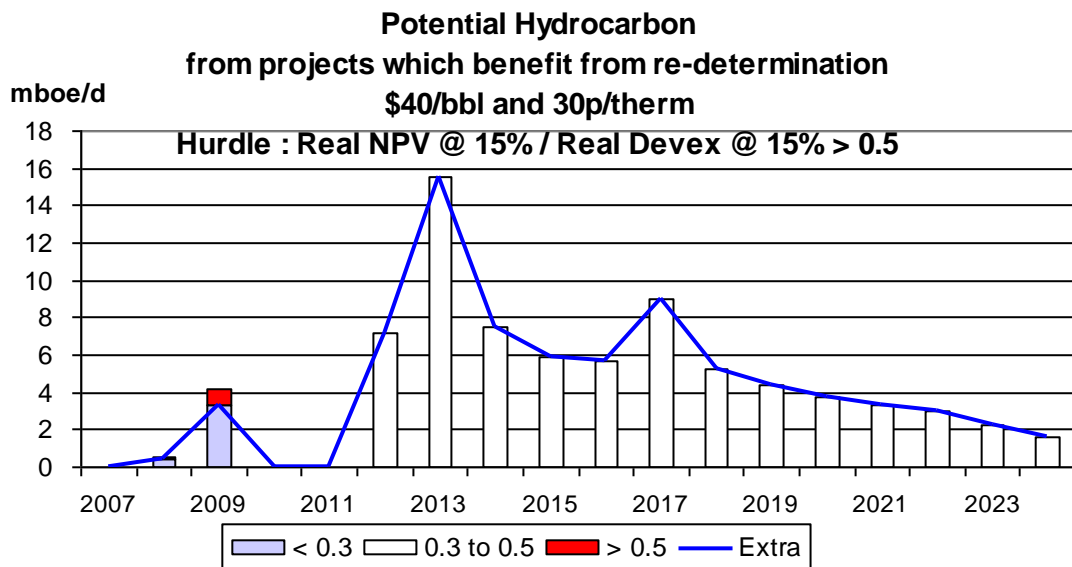


Chart 25



(ii) Project Development Expenditures

Projects involving investment expenditures of £661 million benefit from PRT relief under the $NPV/I \geq 0.3$ hurdle. Of these 2 projects with investment of £448 million fail the hurdle when the PRT is payable and pass it when PRT is removed (Chart 26). When the hurdle is $NPV/I \geq 0.5$ 2 projects involving £177 million of investment fail the hurdle when PRT is payable and pass it when PRT is removed (Chart 27).

Chart 26

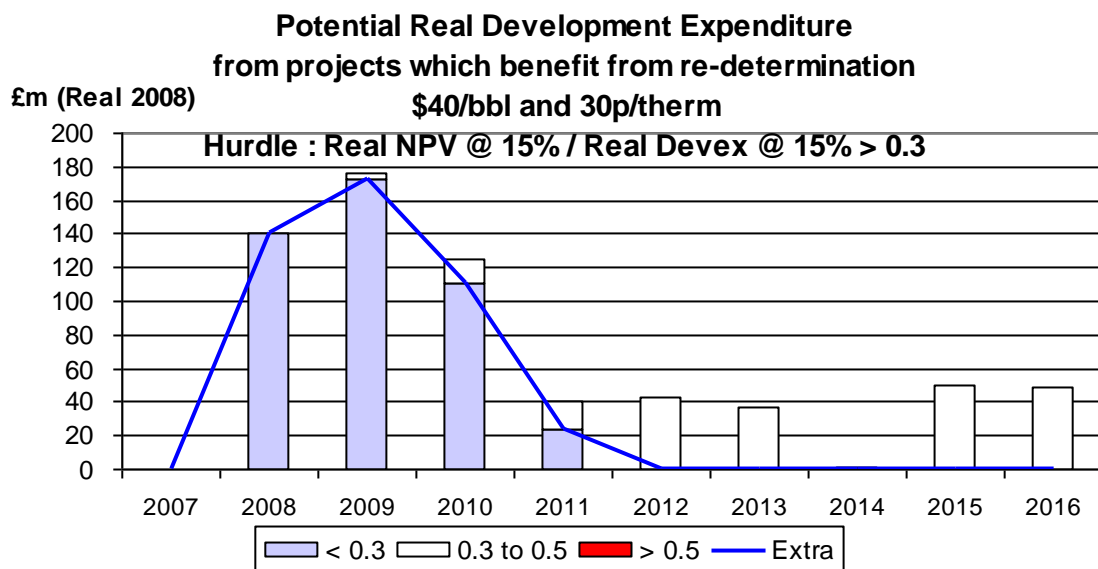
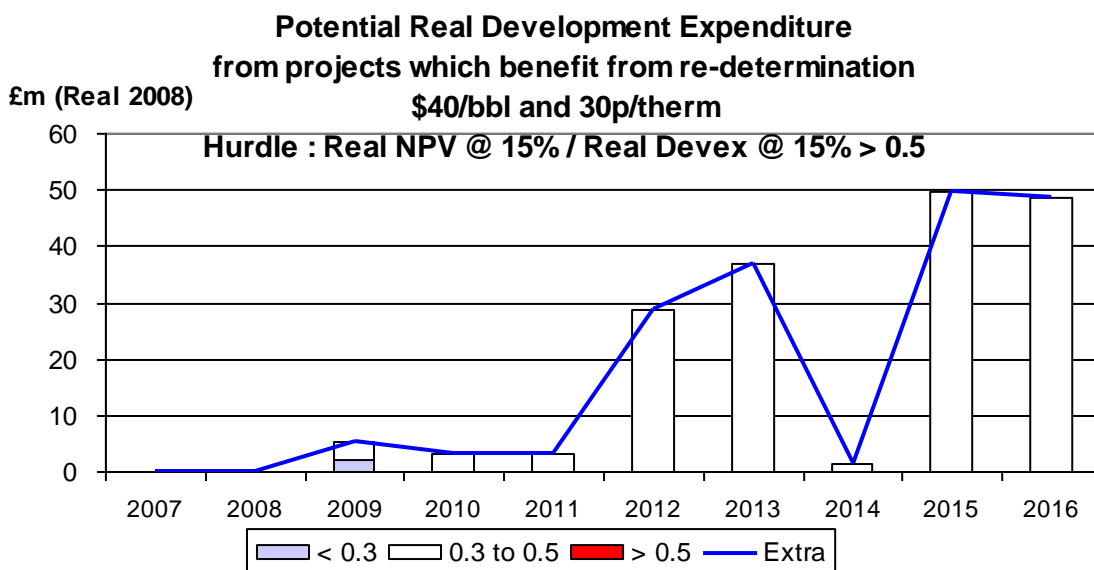


Chart 27



(iii) Operating Expenditures

When the hurdle is $NPV/I \geq 0.3$ projects involving operating expenditures of £337 million benefit from PRT relief. Of these 2 projects involving expenditures of £297 million fail the threshold when PRT is payable and pass it when PRT is removed (Chart 28). When the hurdle is raised to $NPV/I \geq 0.5$ 2 projects involving expenditures exceeding £63 million fail the threshold when PRT is payable and pass it when PRT is removed (Chart 29).

Chart 28

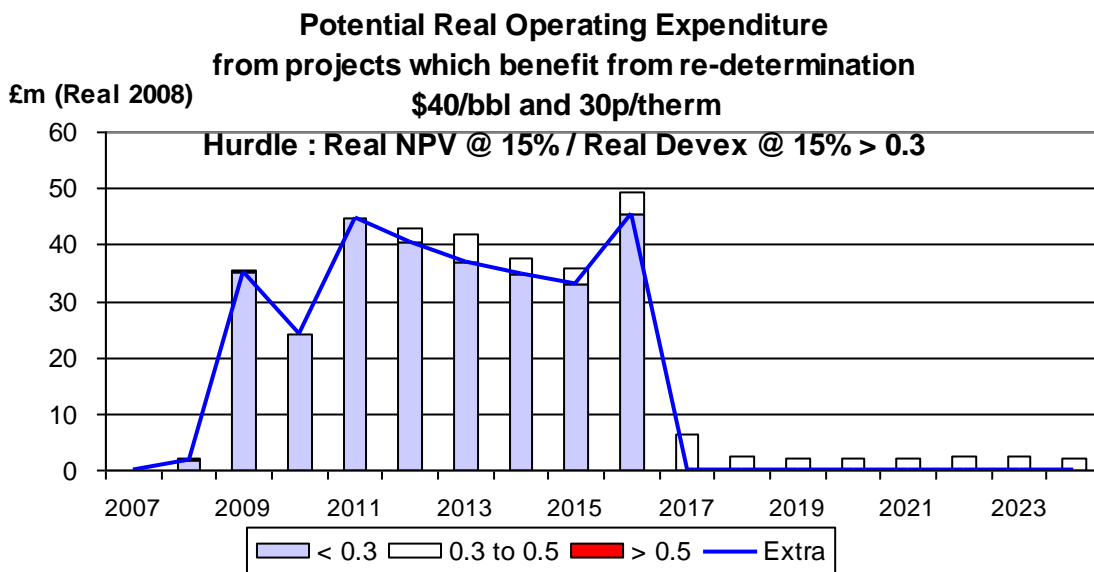
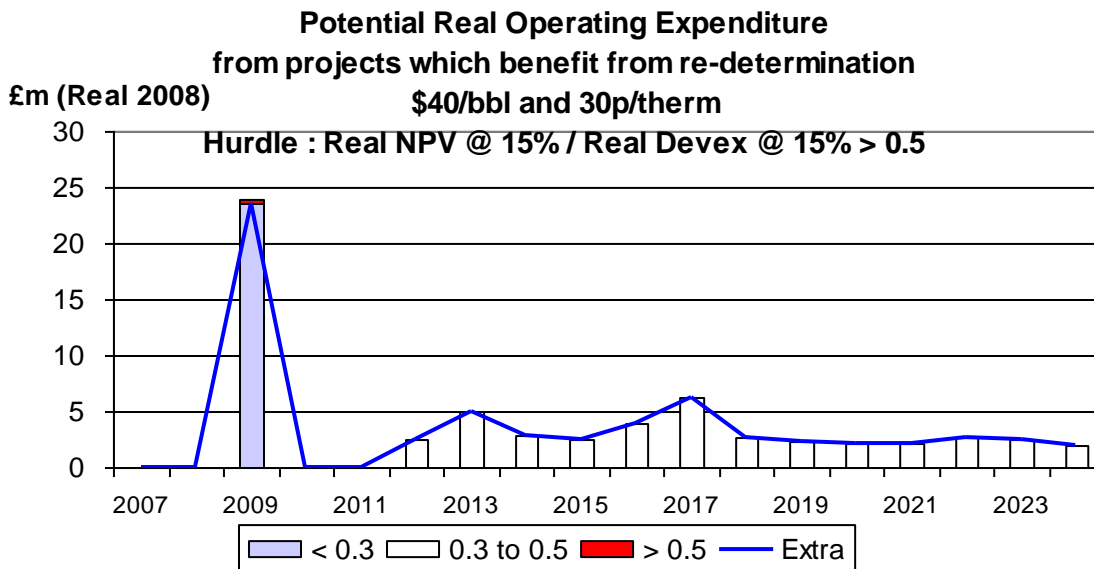


Chart 29



B. Medium Price Case (\$60,50 pence)

a) 10% discount rate

Under this scenario, with all values of NPV/I, of the 54 incremental projects whose income in principle is subject to PRT, 25 would actually pay, while 29 would pay zero or negative amounts. After PRT relief 39 pay zero or negative amounts but PRT is payable on the enhanced production from 15 mother fields.

(i) Production

Under the \$60,50 pence price case with the hurdle of $NPV/I \geq 0.3$ 12 projects benefit from PRT relief. But 3 fail the hurdle even when PRT is removed. The remaining 9 pass the hurdle when PRT is payable. Thus there were no projects where the payment of PRT resulted in the project failing the hurdle while its removal resulted in the projects passing it.

When the hurdle was increased to $NPV/I \geq 0.5$ 9 projects received benefits from PRT relief involving reserves of 103 mm bbls of oil. Of these, 2, involving reserves of 2 mm bbls, failed the hurdle when PRT was payable and passed it when relief was given. The other projects passed the hurdle when PRT was payable (Chart 30).

With respect to gas, projects involving 58 bcf received benefits when the hurdle was $NPV/I \geq 0.3$ but all of them passed the hurdle when PRT was payable. Similar results applied when the $NPV/I \geq 0.5$ hurdle was used.

From the above, when the hurdle was $NPV/I \geq 0.3$, while projects involving 116.2 mmboe of reserves received benefits from PRT relief, they all passed the threshold when PRT remained payable. When the hurdle was raised to $NPV/I \geq 0.5$ projects involving the same reserves received benefits from PRT relief. Of

these 2 projects involving 55 mm boe fail the threshold when PRT is payable and pass it when PRT relief is given (Chart 31).

Chart 30

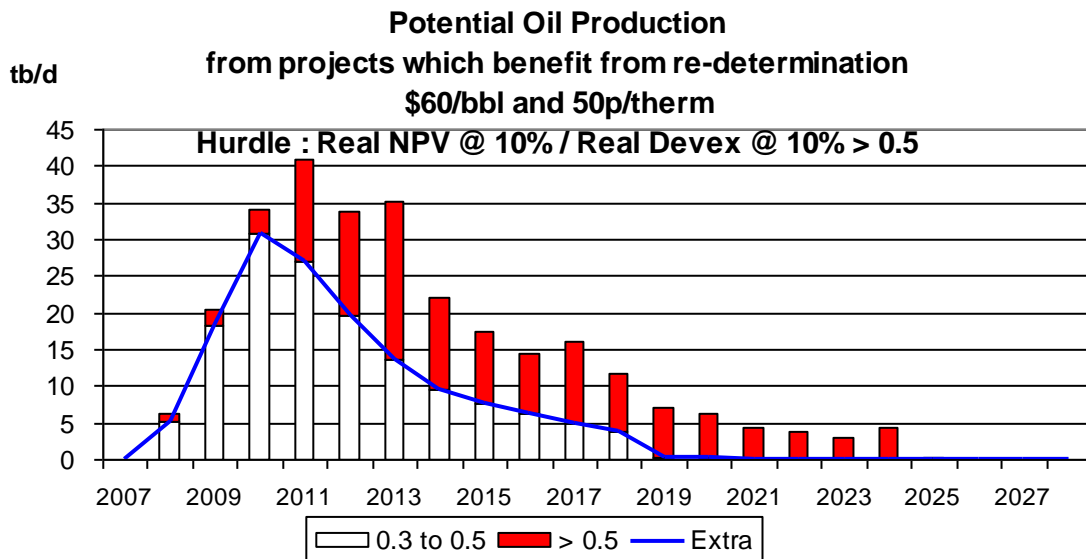
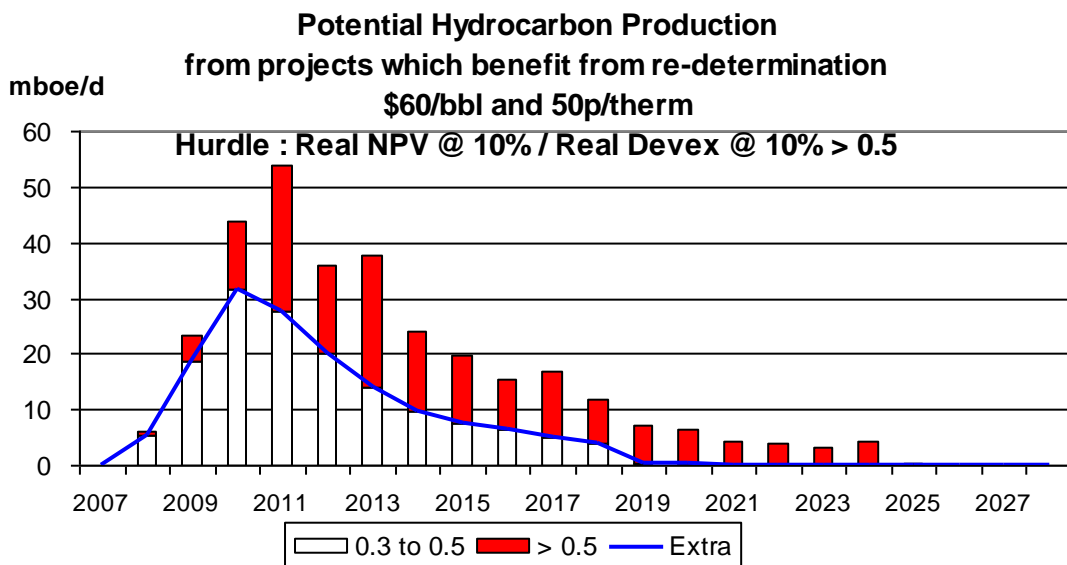


Chart 31



(ii) Project Development Expenditures

When the investment hurdle is $NPV/I \geq 0.3$ projects involving development expenditures of £747 million receive benefits from PRT relief. But they all pass the hurdle when PRT remains payable. When the hurdle is increased to $NPV/I \geq 0.5$ projects involving the same amount of expenditures receive benefits from PRT relief, but in this case 2 projects involving investment of £457 million fail the hurdle when PRT is payable and pass it when relief is given (Chart 32).

(iii) Operating Expenditures

When the investment hurdle is $NPV/I \geq 0.3$ projects involving £701 million in operating expenditures benefit from PRT relief, but all of these pass the hurdle when PRT remains payable. When the hurdle is raised to $NPV/I \geq 0.5$ projects involving the same £701 million of operating expenditures benefit from PRT relief. In this case, however, 2 projects involving expenditures of £256 million fail the threshold when PRT is payable and pass it with PRT relief (Chart 33).

Chart 32

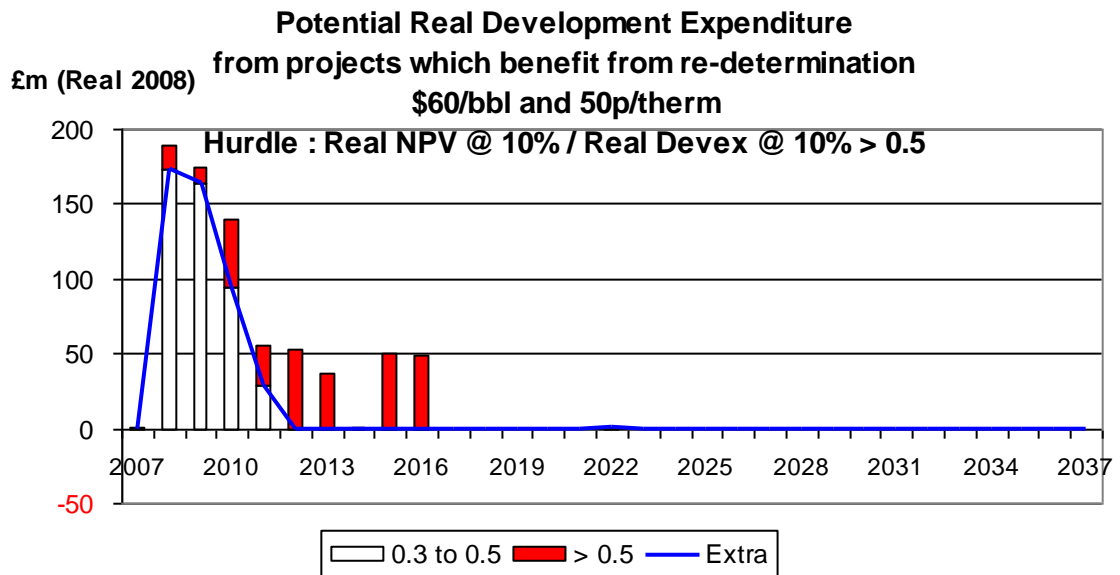
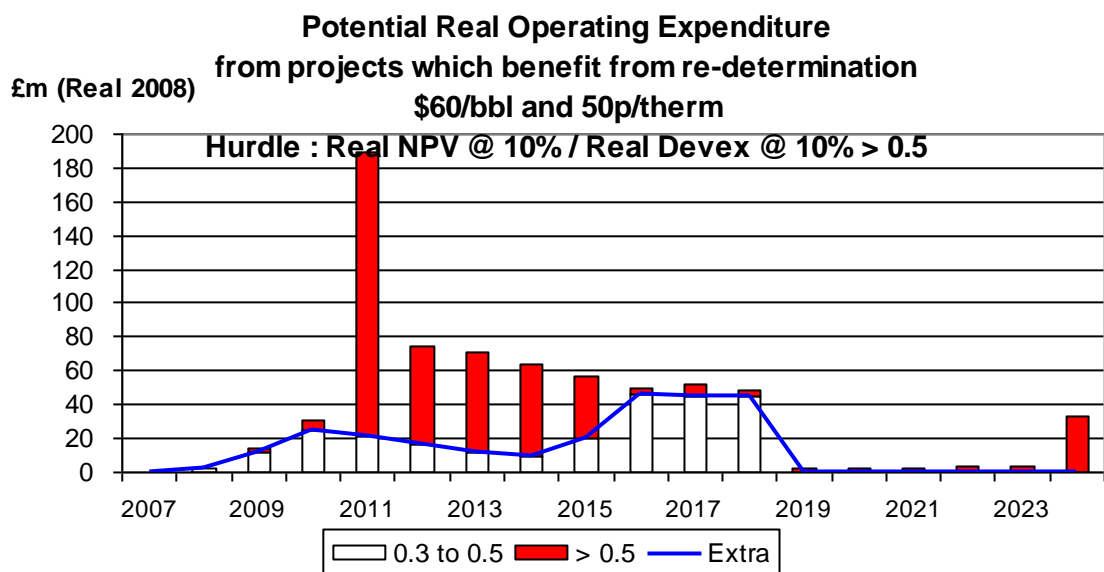


Chart 33



b) 12.5% discount rate

Under this scenario, with all values of NPV/I of the 54 incremental projects whose income in principle is subject to PRT, 25 would actually pay, while 29 would pay zero or negative amounts. After PRT relief 40 pay zero or negative amounts but PRT is payable on the enhanced production from 14 mother fields.

(i) Production

With 12.5% discount rate and the investment hurdle of $NPV/I \geq 0.3$ 12 projects would benefit from PRT relief. But 3 of these fail the hurdle both before and after PRT relief, and the other 9 pass the hurdle before PRT relief. However if the hurdle were $NPV/I \geq 0.5$ the position is different, and projects with reserves of 103 mm bbls of oil reserves benefit from the relief. Two with reserves of 54 mm bbls fail the hurdle when PRT is payable and pass it with PRT relief (Chart 34).

With respect to gas, projects with reserves of 58 bcf benefit from PRT relief but with hurdles of $NPV/I \geq 0.3$ and $NPV/I \geq 0.5$ all pass the threshold when PRT is payable.

Following from the above, projects involving total hydrocarbon reserves of 116 mmboe benefit from PRT relief, but, under the $NPV/I \geq 0.3$ hurdle all pass the threshold with PRT payable. When the threshold is $NPV/I \geq 0.5$ 2 projects fail the hurdle when PRT is payable but pass it with PRT relief. The result is extra production of 55 mm boe (Chart 35).

Chart 34

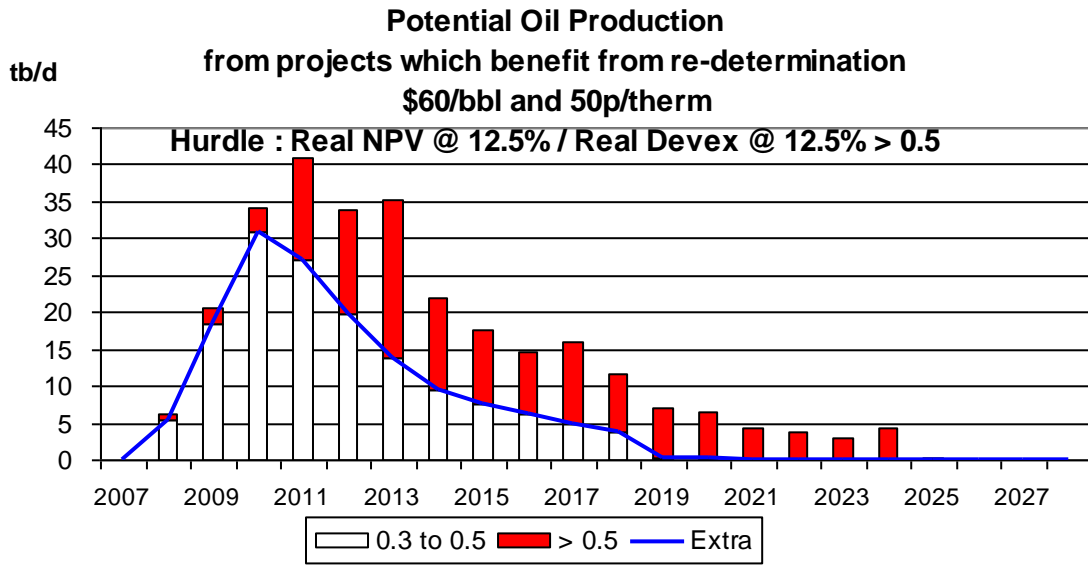
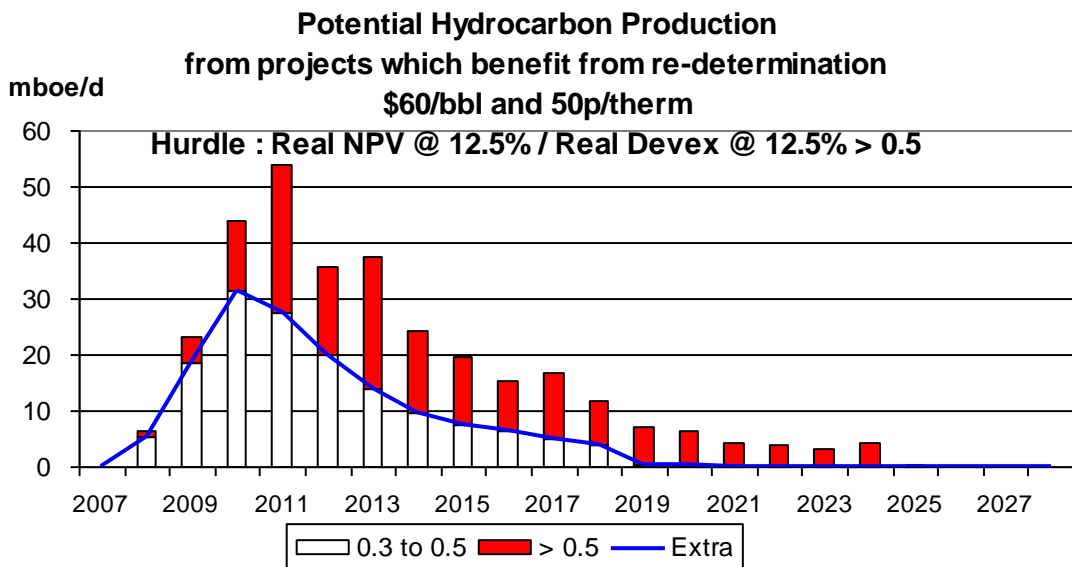


Chart 35



(ii) Project Development Expenditures

With an investment hurdle of $NPV/I \geq 0.3$ projects involving development expenditures of £747 million benefit from PRT relief, but all pass the hurdle with PRT payable. When the investment hurdle is $NPV/I \geq 0.5$ 2 of the projects with investment totalling £457 million fail the threshold when PRT is payable but pass it with PRT relief (Chart 36).

(iii) Operating Expenditures

Projects with operating expenditures totalling £701 million benefit from PRT relief when the hurdle is $NPV/I \geq 0.3$ but all of them pass the threshold when PRT is payable. When the investment hurdle is $NPV/I \geq 0.5$ 2 projects with operating expenditures totalling £256 million fail the threshold when PRT is payable but pass it when relief is given (Chart 37).

Chart 36

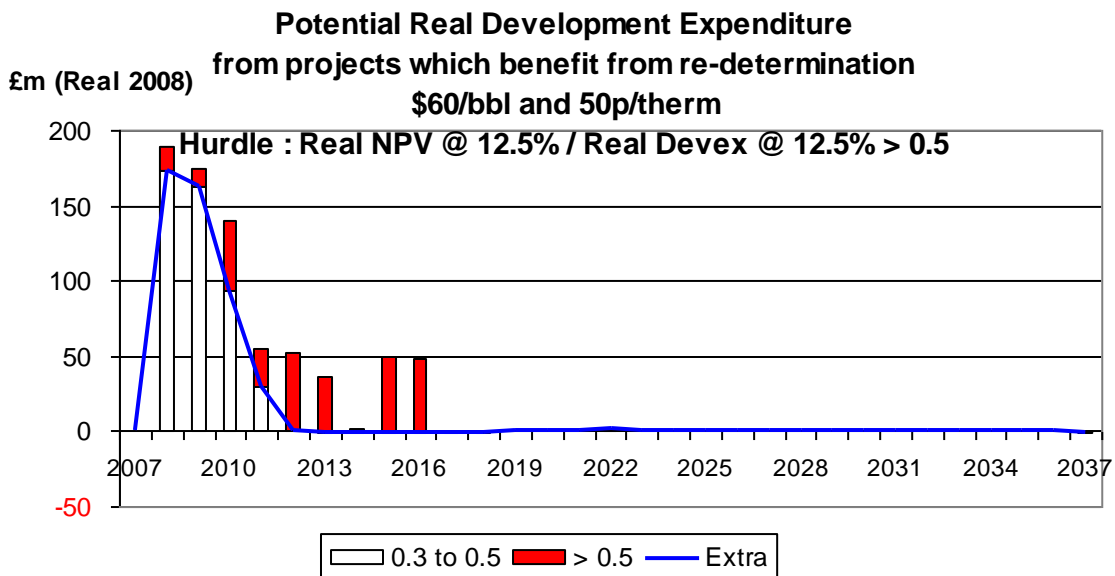
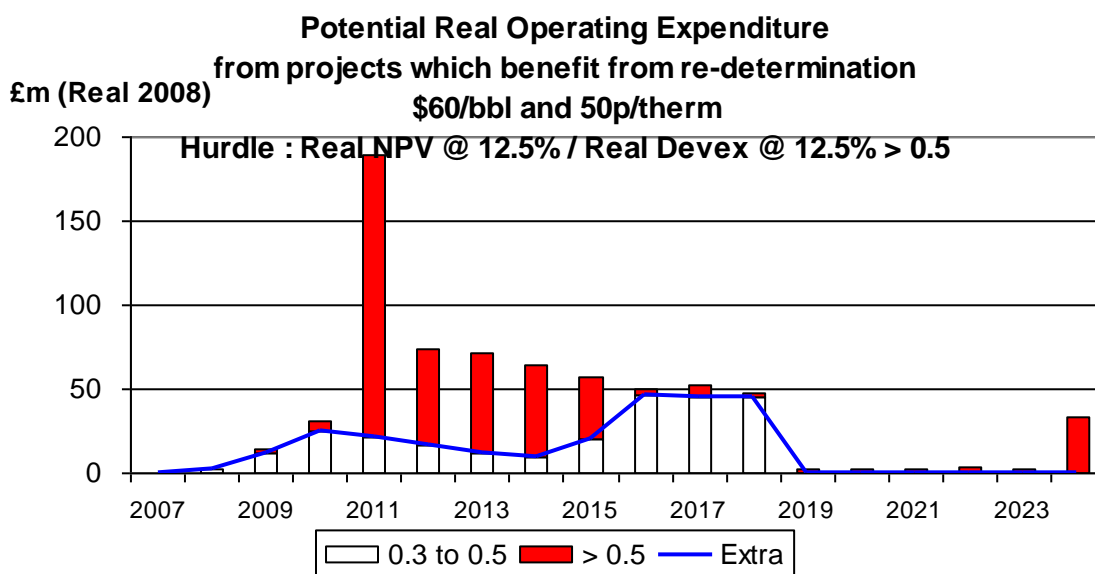


Chart 37



c) 15% discount rate

Under this scenario, with all values of NPV/I, of the 54 incremental projects whose income in principle is subject to PRT, 25 would actually pay, while 29 would pay zero or negative amounts. After PRT relief 39 pay zero or negative amounts but PRT is payable on the enhanced production from 15 mother fields.

(i) Production

With this discount rate 12 projects involving 103 mm bbls of oil benefit from PRT relief when the investment hurdle is $NPV/I \geq 0.3$ but only 1 with reserves of 2.3 mm bbls fails the hurdle when PRT is payable and passes it with PRT relief (Chart 38).

When the investment hurdle is $NPV/I \geq 0.5$ 3 projects fail the threshold both before and after PRT relief. Seven projects pass the hurdle with PRT payable, and 2 projects involving reserves of 54 mm bbls fail the hurdle when PRT is payable but pass it with PRT relief (Chart 39).

Chart 38

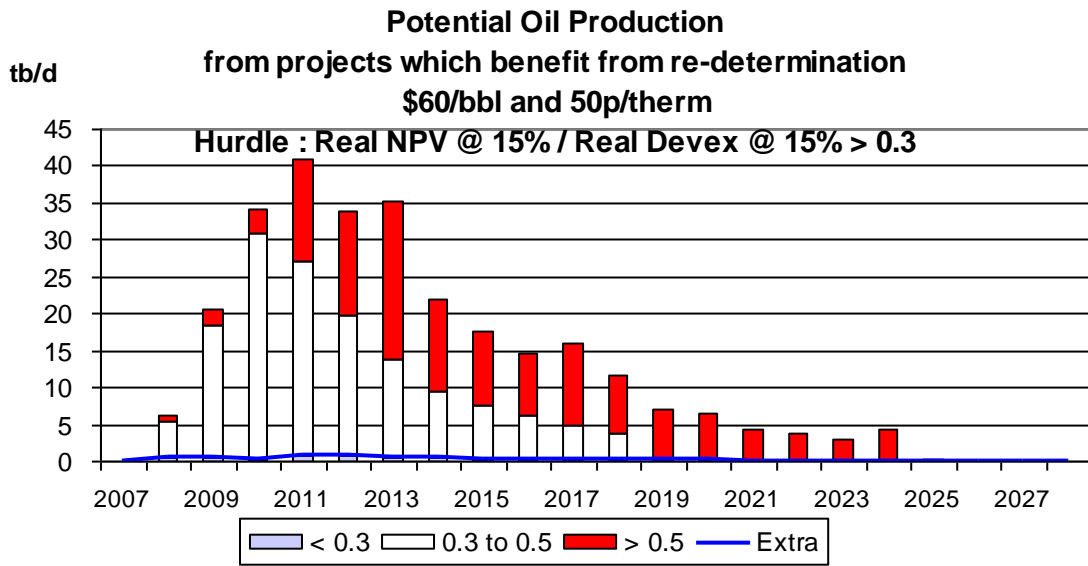
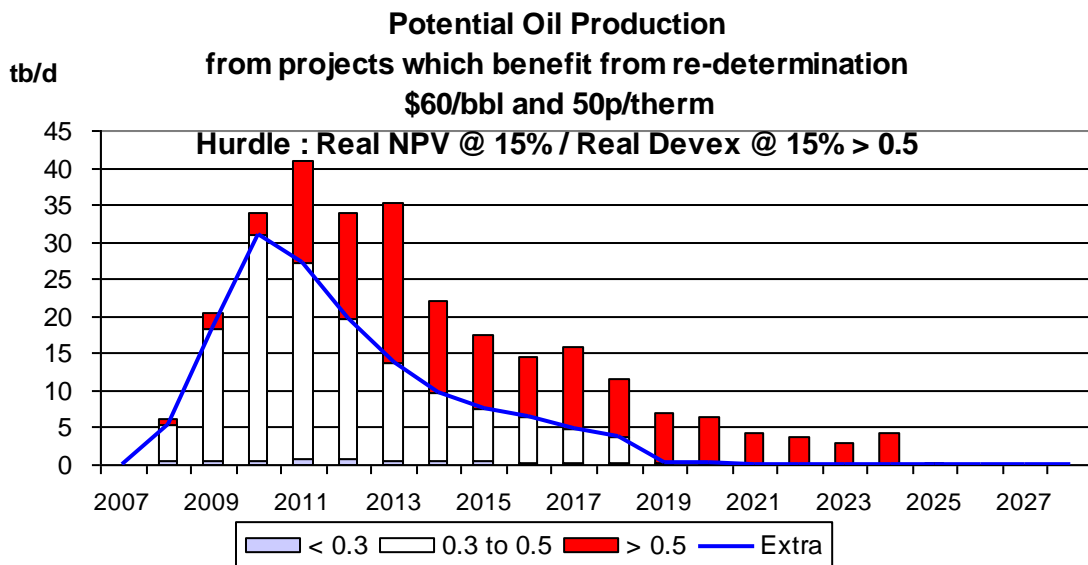


Chart 39



With respect to gas, projects involving 58 bcf benefit from PRT relief under the two hurdles but in each case the threshold is attained when PRT is payable.

From the above, projects involving a total of 116 mmboe benefit from PRT relief when the hurdle is $NPV/I \geq 0.3$, but only 1 project involving 2.35 mmboe fails the hurdle with PRT payable and passes it with PRT relief (Chart 40). When the hurdle is $NPV/I \geq 0.5$ projects with reserves of 116 mm boe benefit from PRT relief, and 2 of them with reserves of 55 mmboe fail the threshold when PRT is payable and pass it when relief is given (Chart 41).

Chart 40

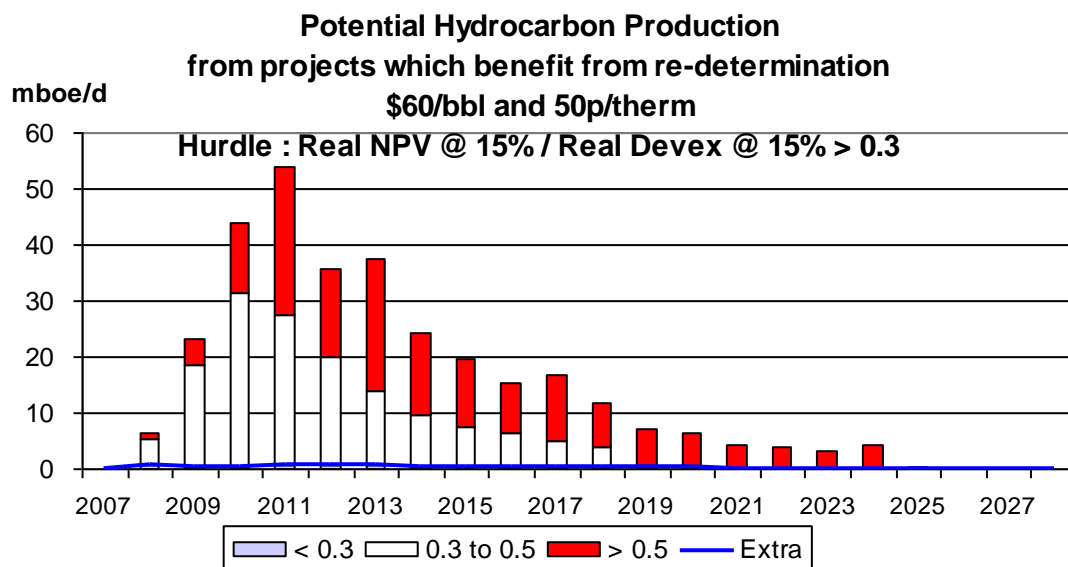
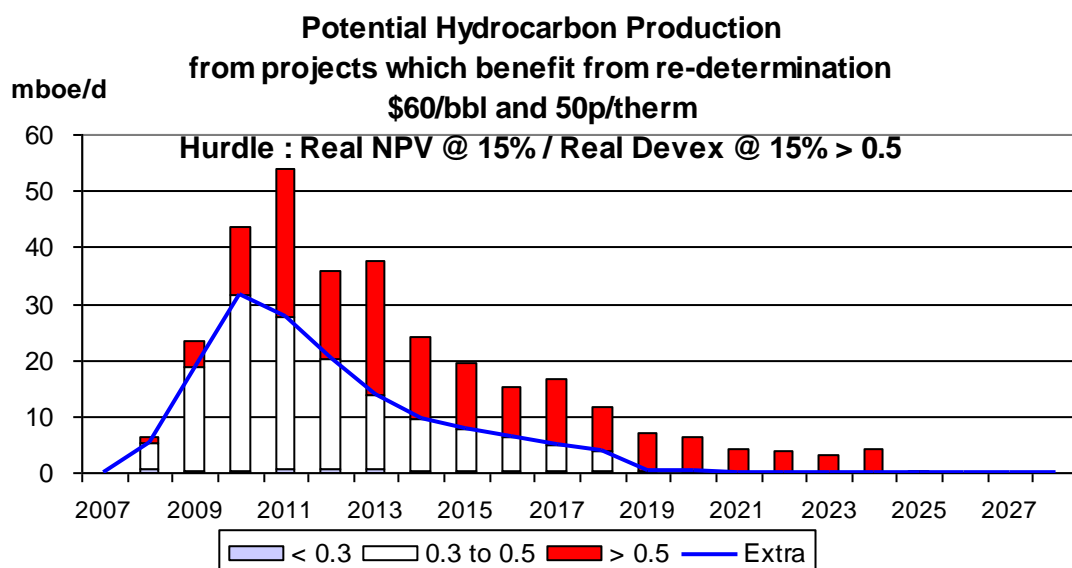


Chart 41



(ii) Project Development Expenditures

When the hurdle is $NPV/I \geq 0.3$ projects involving development expenditures of £747 million benefit from PRT relief but only one project involving investment of £11.2 million fails the hurdle when PRT is payable and passes it with PRT relief. When the hurdle is raised to $NPV/I \geq 0.5$ 2 projects with capital expenditure of £457 million fail the threshold with PRT payable and pass it when PRT relief is given (Chart 42)

(iii) Operating Expenditures

Projects involving £701 million of operating expenditures benefit from PRT relief when the hurdle is $NPV/I \geq 0.3$ but only 1 project involving expenditures of £7.4 million fails the threshold when PRT is payable and passes it when relief is given. When the hurdle is raised to $NPV/I \geq 0.5$ 2 projects involving operating expenditures of £256 million fail the threshold when PRT is payable and pass it when PRT relief is given (Chart 43).

Chart 42

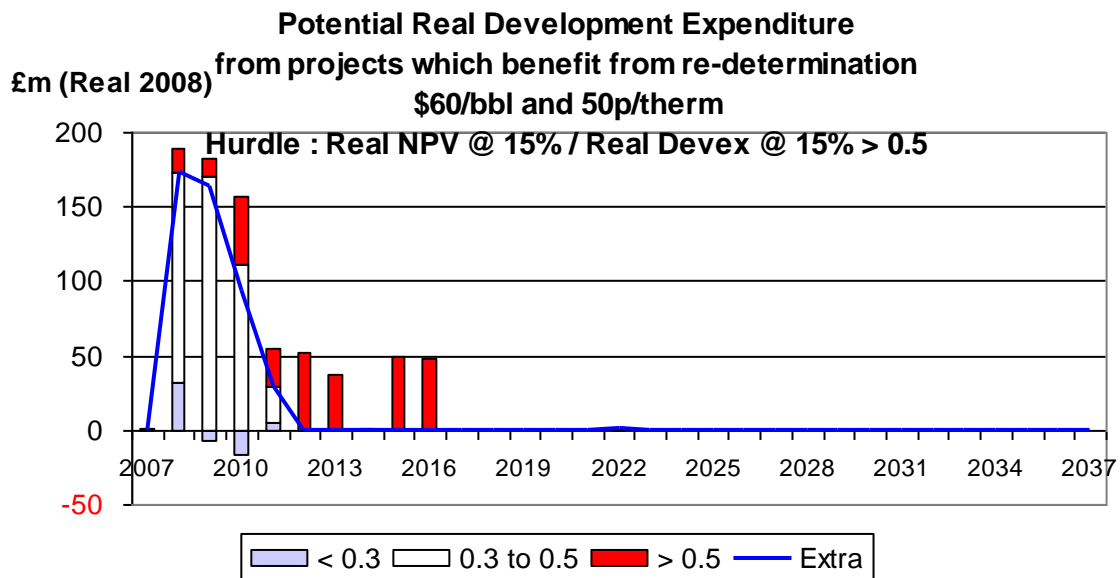
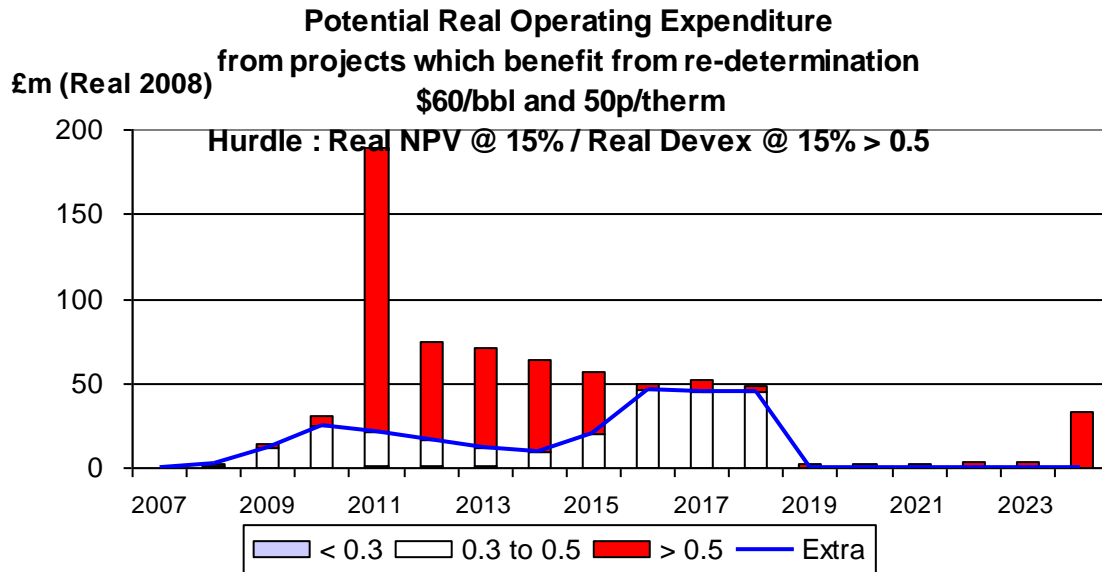


Chart 43



C. High Price Case (\$80,70 pence)

a) 10% discount rate

Under this scenario, with all values of NPV/I, of the 54 incremental projects whose income in principle is subject to PRT, 33 would actually pay, while 21 would pay zero or negative amounts. After PRT relief 41 pay zero or negative amounts but PRT is payable on the enhanced production from 13 mother fields.

(i) Production

Under the \$80,70 pence price scenario a substantial number of projects benefit from PRT relief, but 1 fails the $NPV/I \geq 0.3$ hurdle even after PRT relief. Projects with reserves of 125 mm bbls of oil pass the hurdle but 12 of them pass it with PRT being payable. Three projects with reserves of 13.4 mm bbls of oil fail the hurdle with PRT payable and pass it with PRT relief (Chart 44).

When the hurdle is increased to $NPV/I \geq 0.5$ 4 projects fail it even with PRT relief. Eleven pass the hurdle with PRT payable, and 1 small project with 1 mm bbl fails the threshold when PRT is payable and passes it when relief is given (Chart 45).

Chart 44

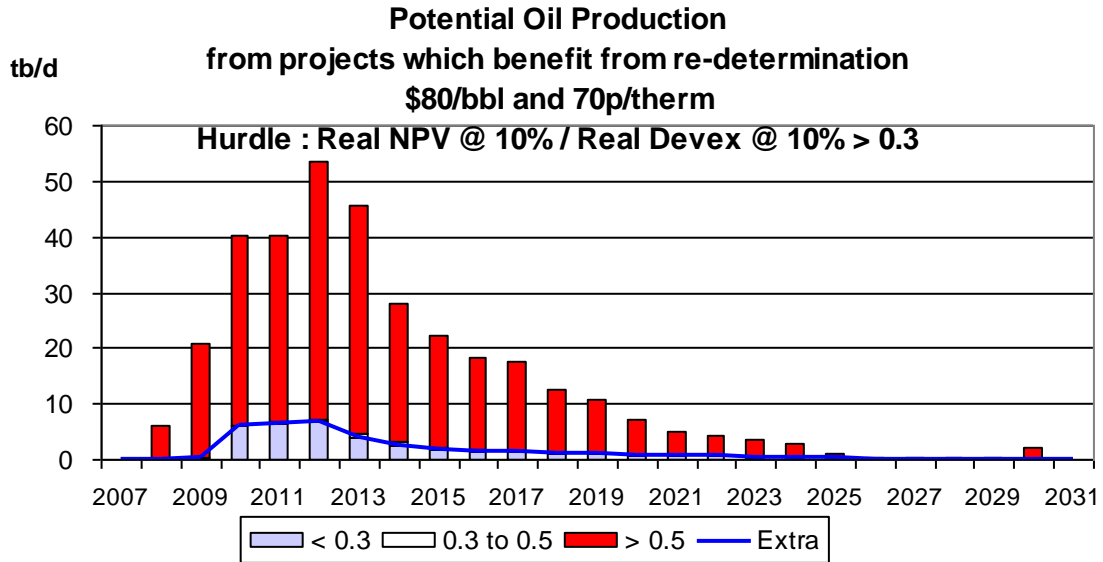
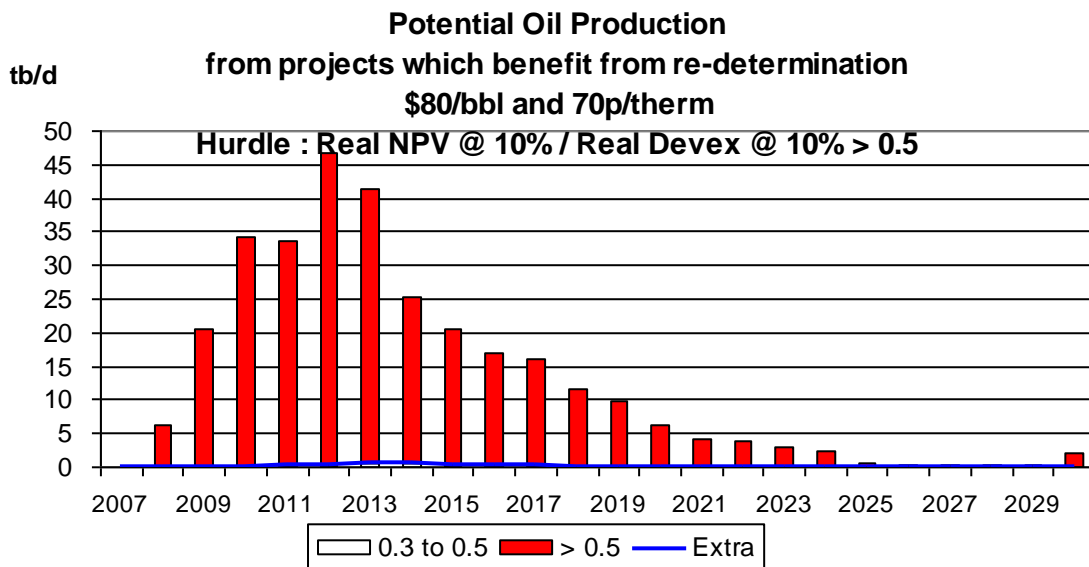


Chart 45



With respect to gas, projects involving reserves of 236 bcf benefit from PRT relief under the $NPV/I \geq 0.3$ hurdle, and 3 of them with reserves of 125 bcf fail the threshold when PRT is payable and pass it with PRT relief (Chart 46). When the hurdle is raised to $NPV/I \geq 0.5$ projects involving reserves of 111 bcf benefit from PRT relief. One project involving 49 bcf of reserves fails the hurdle with PRT being payable and passes it with PRT relief (Chart 47).

Chart 46

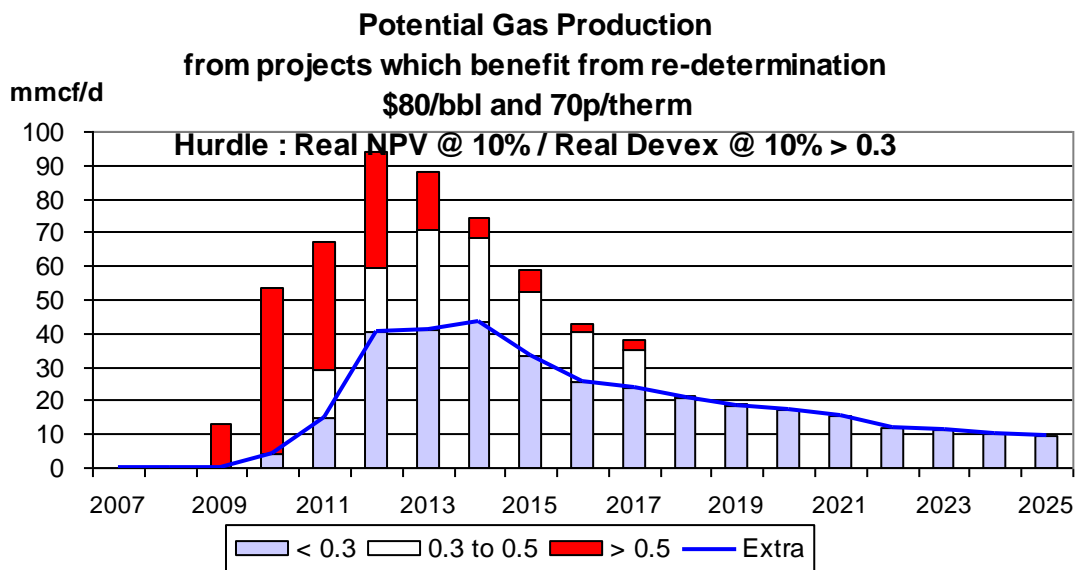
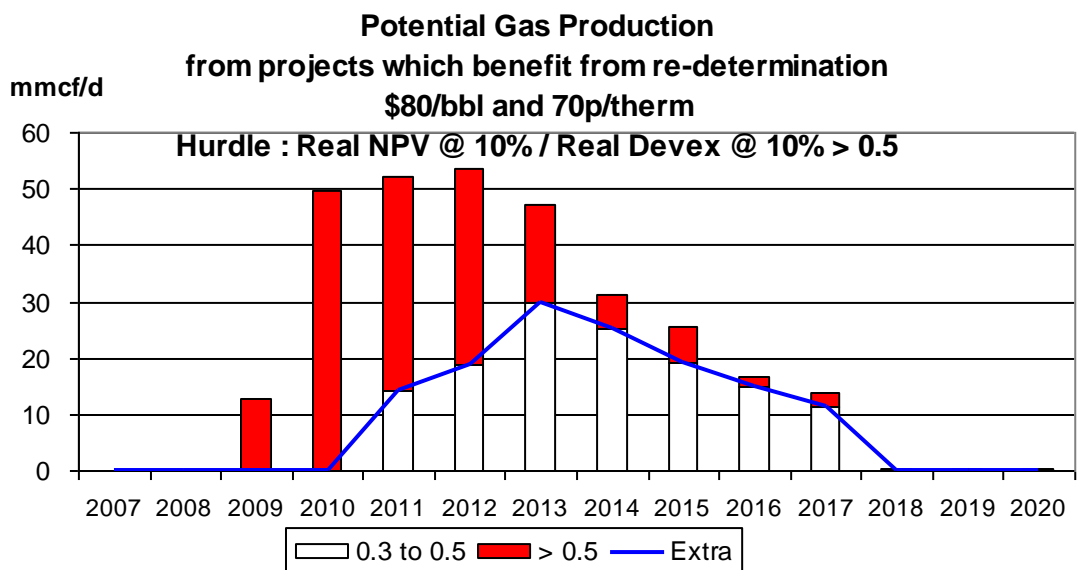


Chart 47



From the above, projects with reserves of 175 mmboe benefit from PRT relief when the threshold is $NPV/I \geq 0.3$, and 3 of them with reserves of 39 bcf fail the threshold with PRT payable and pass it when relief is given (Chart 48). When the hurdle is raised to $NPV/I \geq 0.5$ projects involving reserves of 136 mmboe benefit from PRT relief, and 1 involving reserves of 11 mmboe fails the threshold when PRT is payable and passes it with PRT relief (Chart 49).

Chart 48

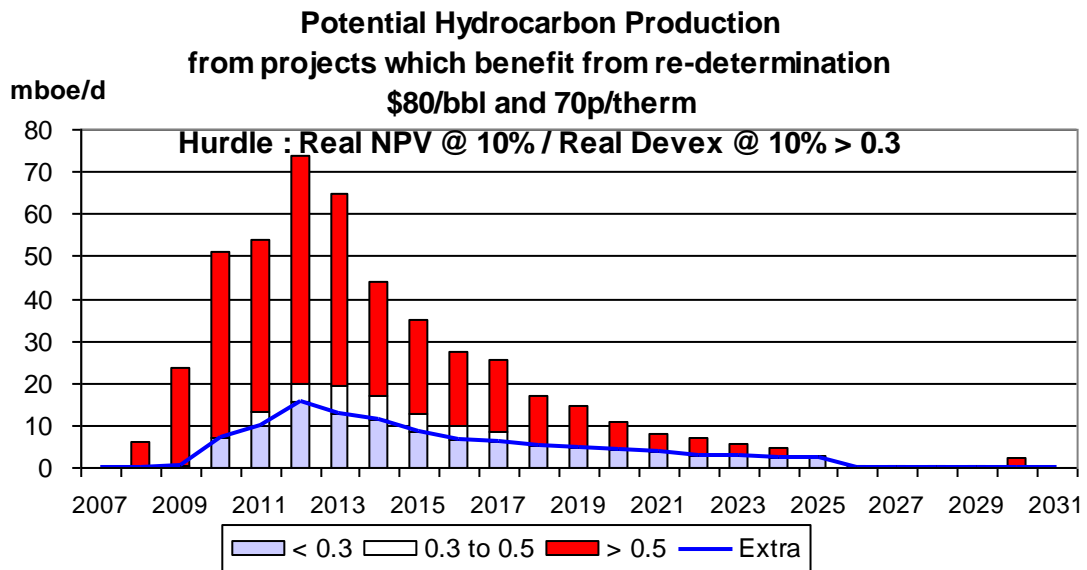
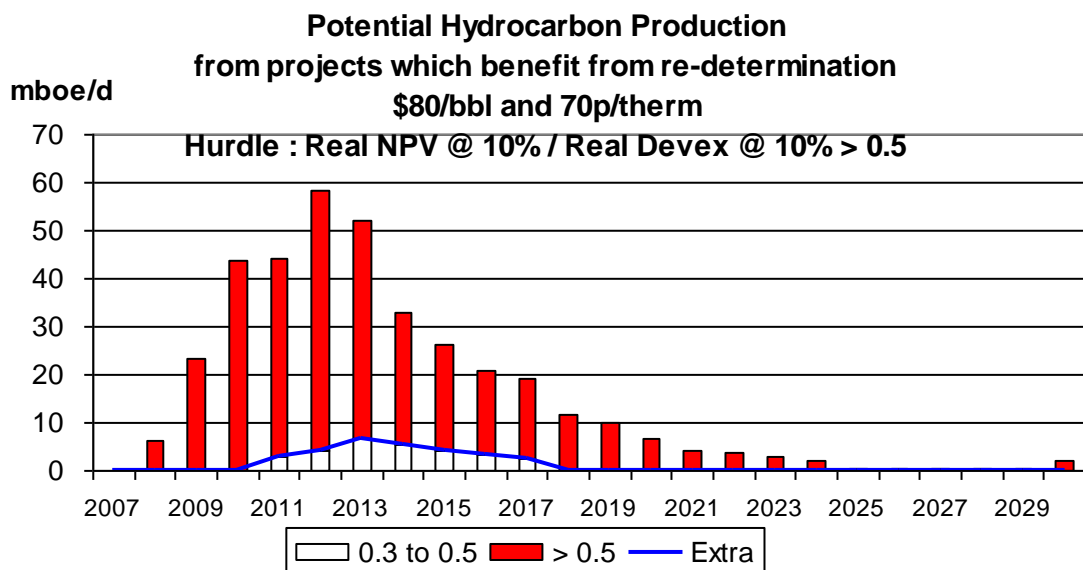


Chart 49



(ii) Project Development Expenditures

Under the $NPV/I \geq 0.3$ hurdle projects involving development expenditures of £1.1 billion benefit from PRT relief. Of these 3 projects involving investment of £333 million fail the hurdle with PRT payable and pass it with PRT relief (Chart 50).

When the hurdle is raised to $NPV/I \geq 0.5$ projects involving investment of £803 million benefit from PRT relief. One of these with an investment of £39 million fails the threshold when PRT is payable and passes it with PRT relief (Chart 51).

Chart 50

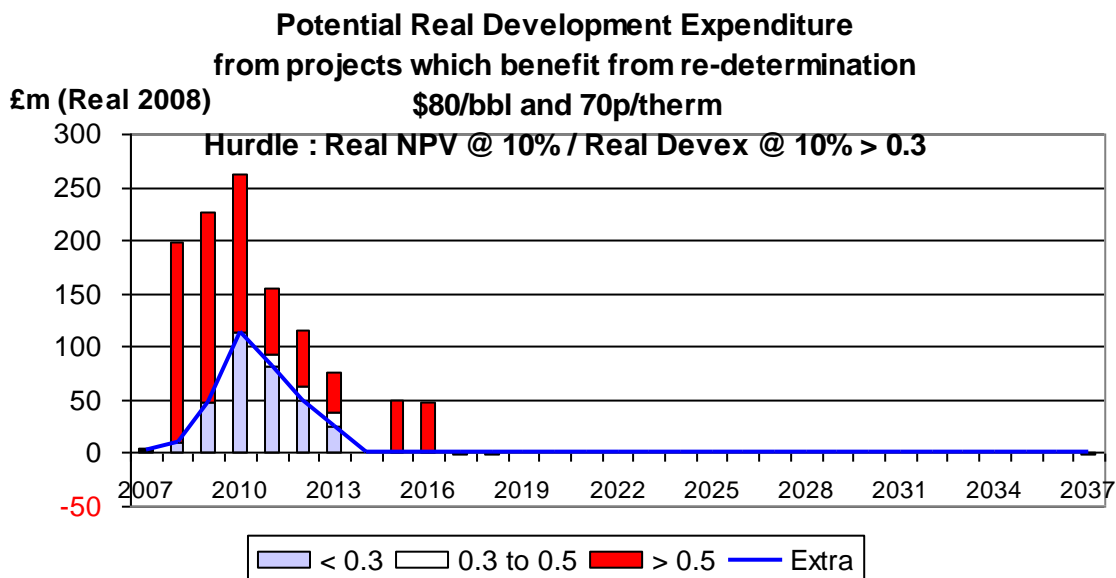
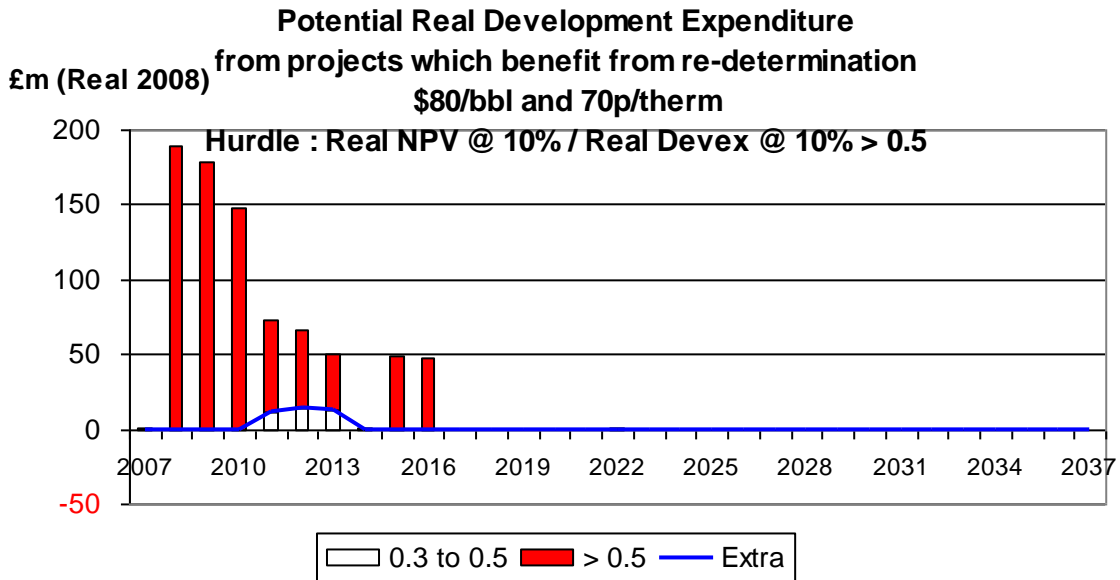


Chart 51



(iii) Operating Expenditures

When the hurdle is $NPV/I \geq 0.3$ projects involving operating expenditures of £1.2 billion benefit from PRT relief. Of these 3 involving expenditures of £105 million fail the hurdle when PRT is payable and pass it with PRT relief (Chart 52). When the threshold is raised to $NPV/I \geq 0.5$ projects involving £1.1 billion benefit from PRT relief. One involving expenditure of £55 million fails the hurdle when PRT is payable and passes it with PRT relief (Chart 53).

Chart 52

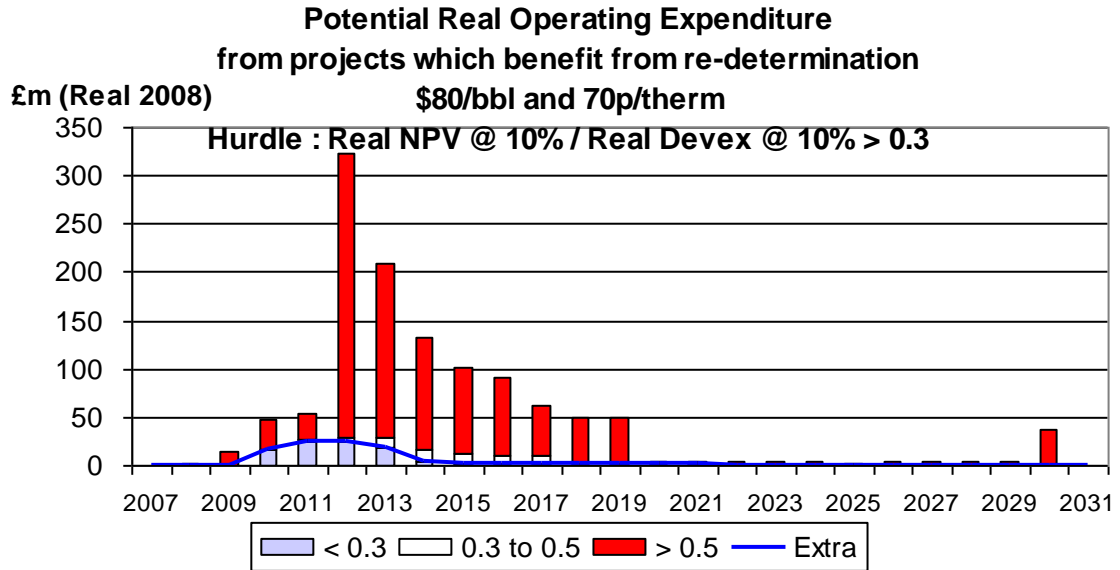
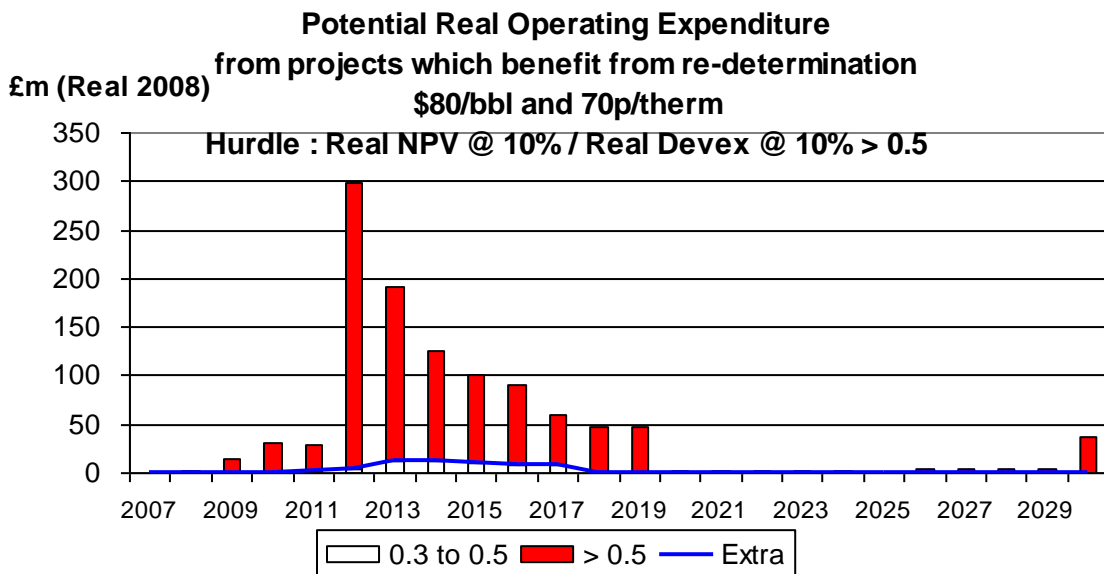


Chart 53



b) 12.5% discount rate

Under this scenario, with all values of NPV/I, of the 54 incremental projects whose income in principle is subject to PRT, 33 would actually pay, while 21 would pay zero or negative amounts. After PRT relief 41 pay zero or negative amounts but PRT is payable on the enhanced production from 13 mother fields.

(i) Production

With a discount rate of 12.5% 16 projects would benefit from PRT relief but 2 of them fail the $NPV/I \geq 0.3$ hurdle with PRT relief. Twelve pass the hurdle with PRT payable, and 2 involving reserves of 13 mm bbls of oil fail the threshold when PRT is payable and pass it with PRT relief (Chart 54). This compares to a total of 125 mm bbls of oil which would benefit from relief while passing the hurdle. When the hurdle is raised to $NPV/I \geq 0.5$ projects involving 112 mm bbls of oil benefit form PRT relief, and 1 involving 1 mm bbls fails the threshold with PRT payable and passes it when relief is given (Chart 55).

Chart 54

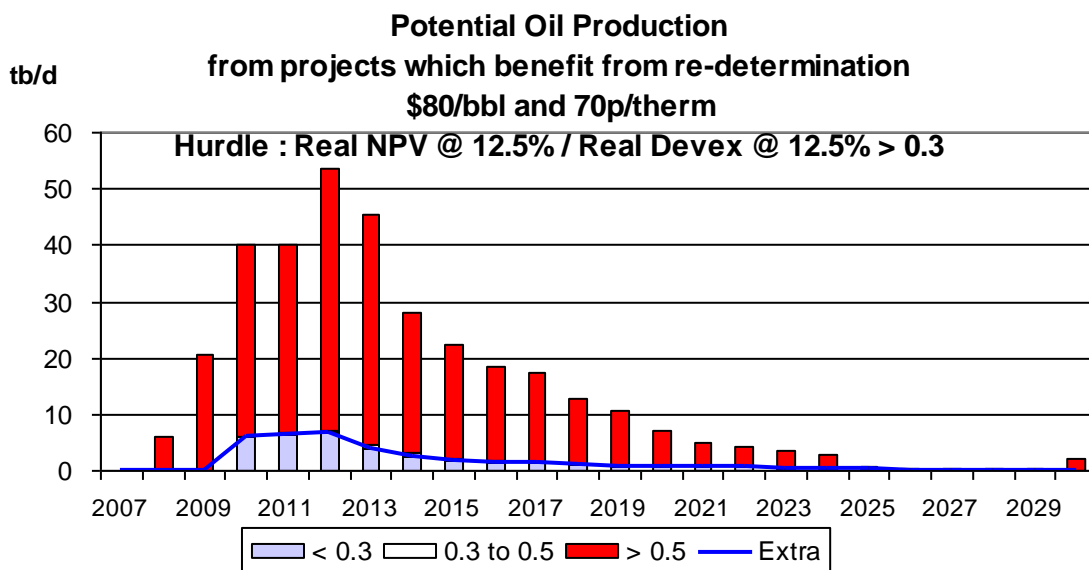
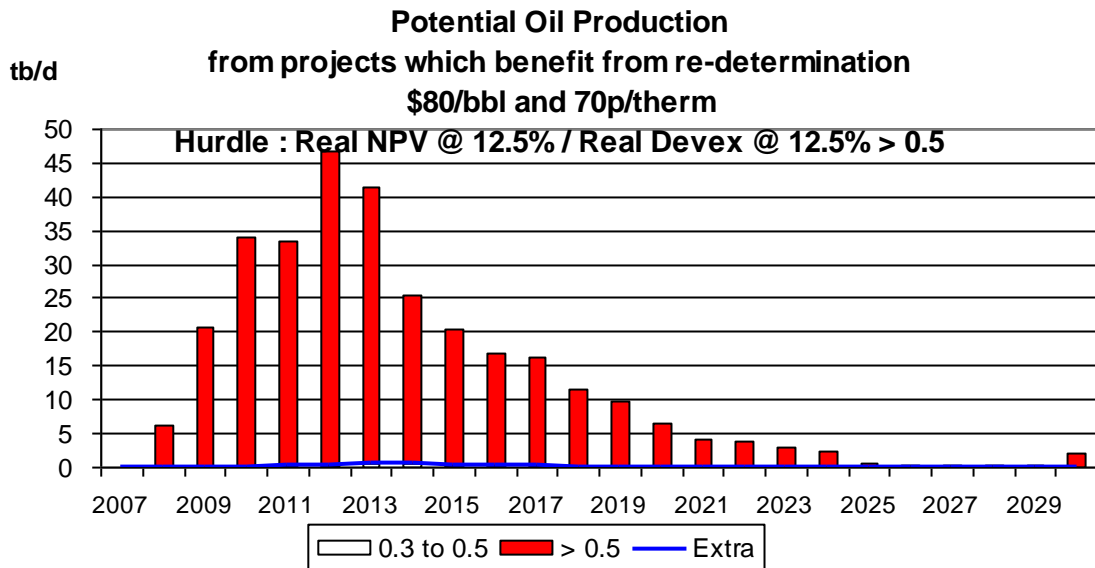


Chart 55



With respect to gas, projects involving 236 bcf benefit from PRT relief when the hurdle is $NPV/I \geq 0.3$, and 2 of these with reserves of 125 bcf fail the hurdle when PRT is payable and pass it when relief is given (Chart 56). When the hurdle is raised to $NPV/I \geq 0.5$ projects involving 111 bcf of gas benefit from PRT relief, with one involving 49 bcf failing the threshold when PRT is payable and passing it when PRT relief is given (Chart 57).

Chart 56

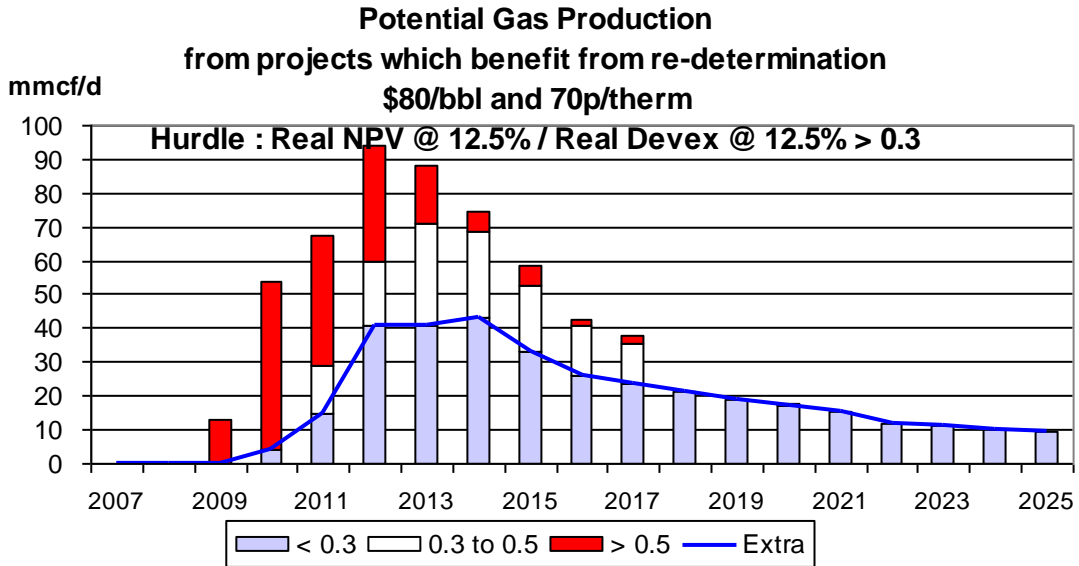
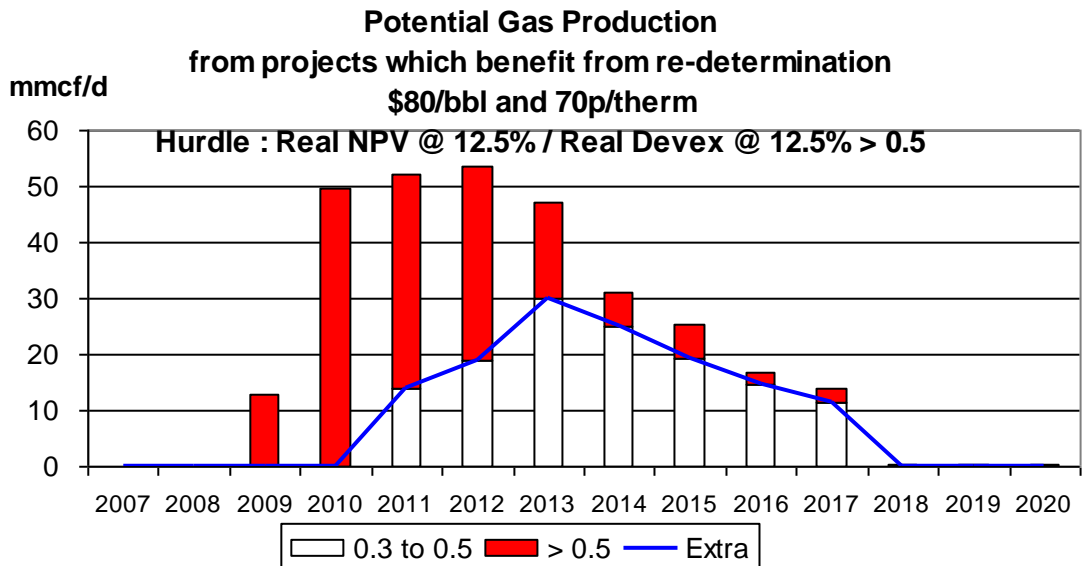


Chart 57



From the above, projects involving 175 mm boe benefit from PRT relief when the hurdle is $NPV/I \geq 0.3$, and 2 of them with reserves of 39 mmboe fail the threshold when PRT is payable and pass it with PRT relief (Chart 58). When the hurdle is raised to $NPV/I \geq 0.5$ projects involving reserves of 136 mmboe benefit from PRT relief, with 1 of them involving reserves of 11 mmboe failing the hurdle when PRT is payable and passing it with PRT relief (Chart 59).

Chart 58

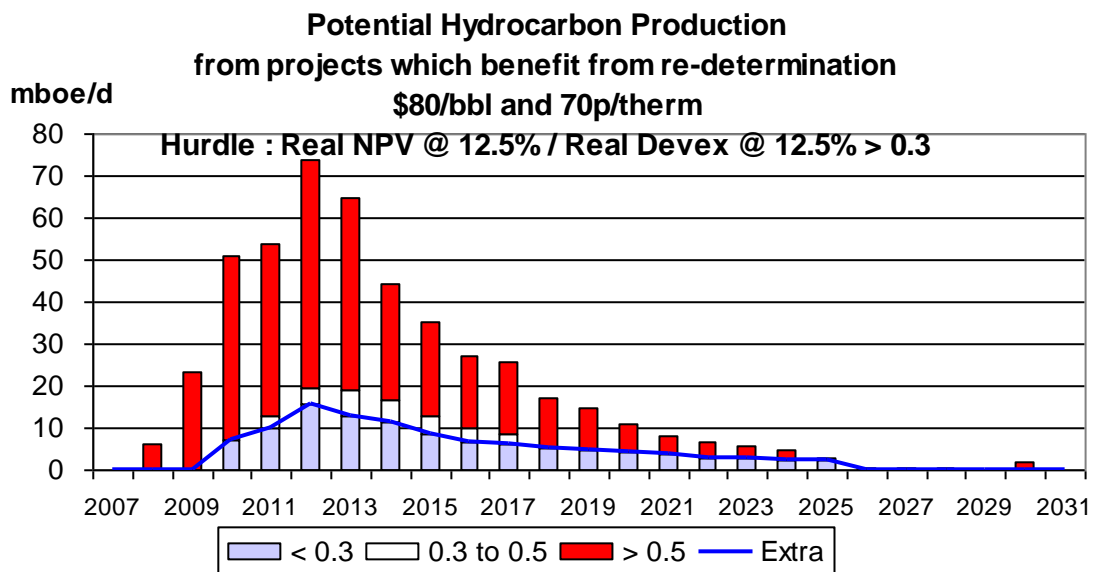
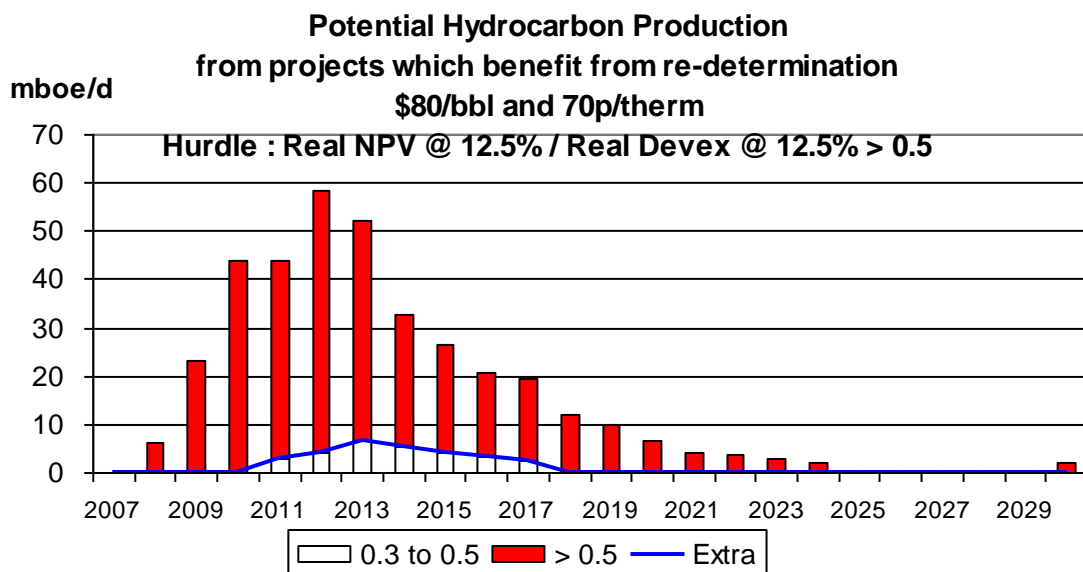


Chart 59



(ii) Project Development Expenditures

With a hurdle of $NPV/I \geq 0.3$ projects involving £1.1 billion of investment benefit from PRT relief. Two of them involving expenditures of £328 million fail the hurdle with PRT payable and pass it with PRT relief (Chart 60). When the hurdle is raised to $NPV/I \geq 0.5$ projects involving investment of £504 million benefit from PRT relief. One with an investment of £39 million fails the threshold with PRT payable and passes it with PRT relief (Chart 61).

Chart 60

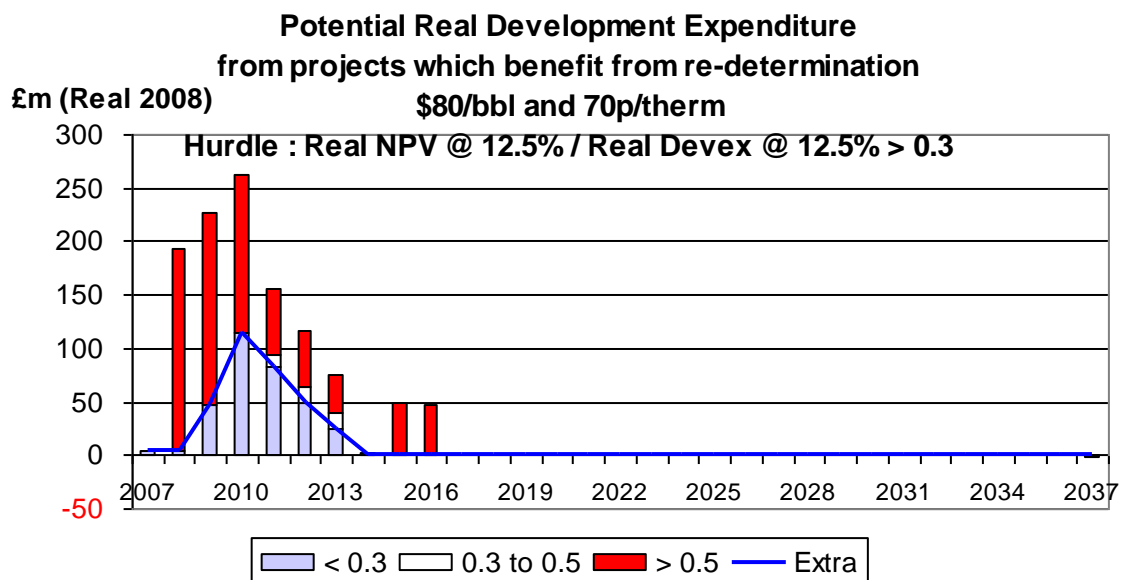
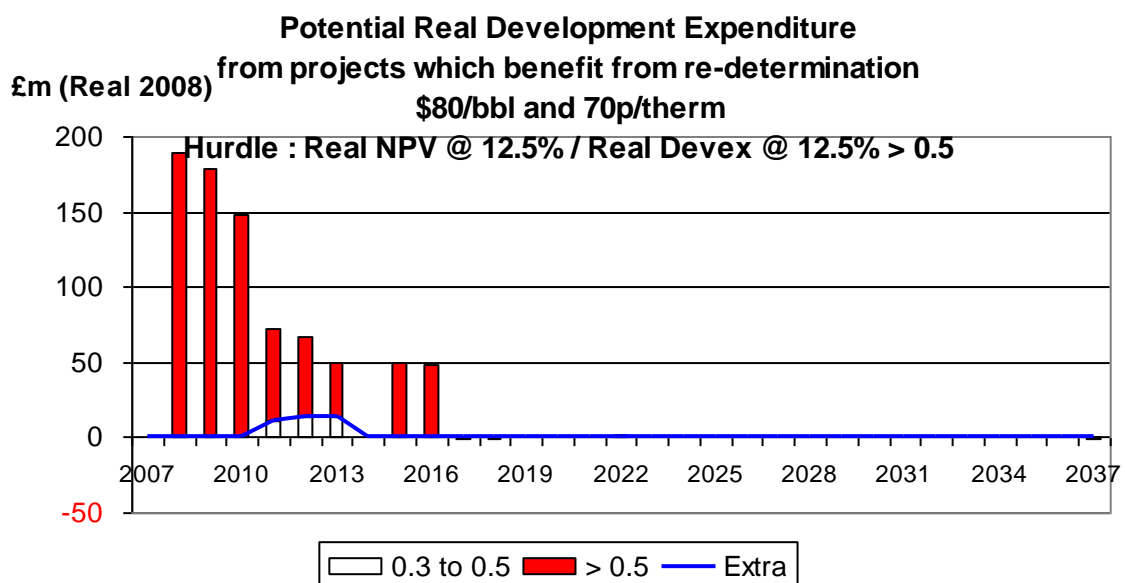


Chart 61



(iii) Operating Expenditures

With a hurdle of $NPV/I \geq 0.3$, projects involving expenditures of £1.2 billion benefit from PRT relief. Two of them with expenditures totalling £104 million fail the threshold with PRT payable and pass it with PRT relief (Chart 62). When the hurdle is raised to $NPV/I \geq 0.5$ projects involving expenditures of £1.1 billion benefit from PRT relief. One of them with expenditures of £55 million fails the threshold when PRT is payable and passes it with PRT relief (Chart 63).

Chart 62

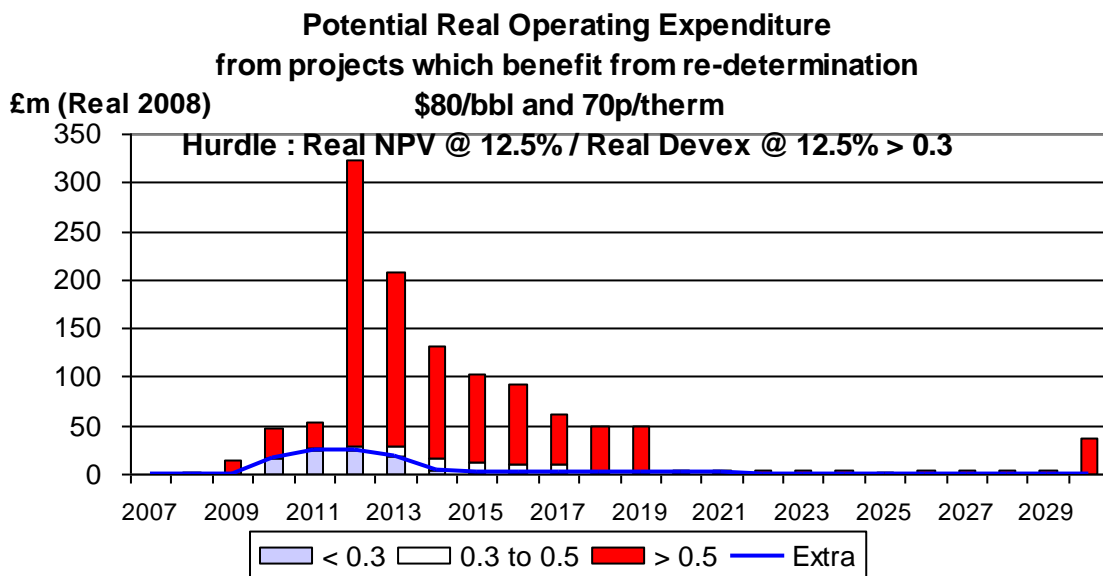
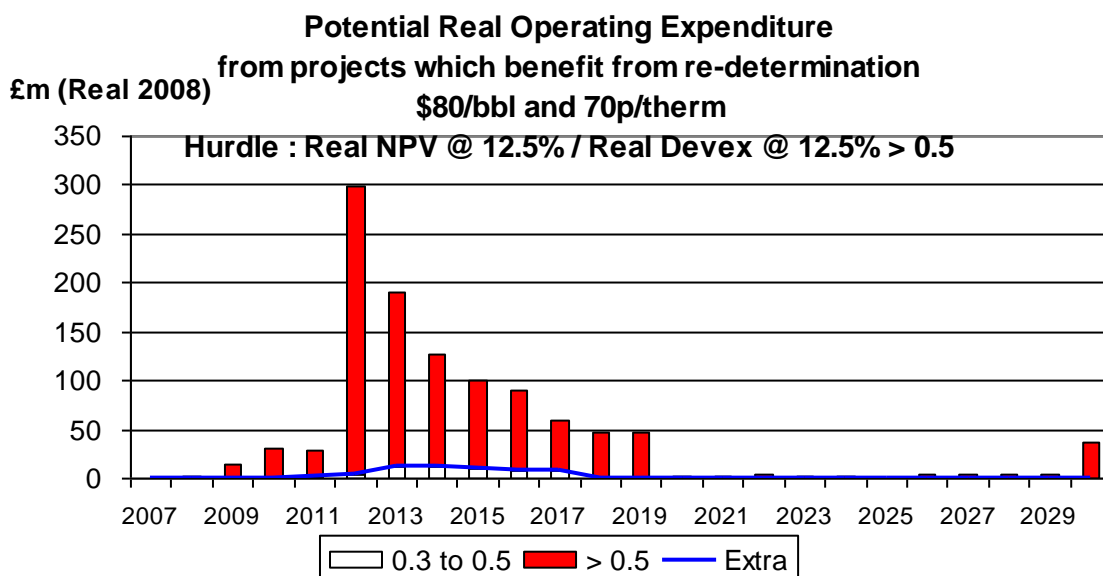


Chart 63



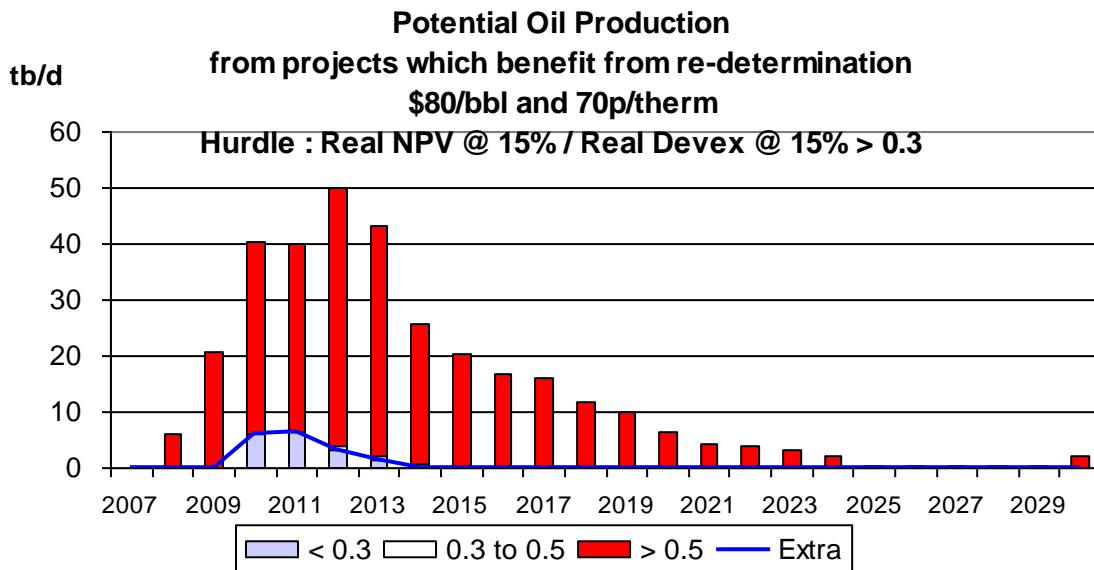
c) 15% discount rate

Under this scenario, with all values of NPV/I, of the 54 incremental projects whose income in principle is subject to PRT, 33 would actually pay, while 21 would pay zero or negative amounts. After PRT relief 41 pay zero or negative amounts but PRT is payable on the enhanced production from 13 mother fields.

(i) Production

With this discount rate 16 projects benefit from PRT relief but 3 of them fail the hurdle of $NPV/I \geq 0.3$ before and after PRT relief. Thirteen projects involving oil reserves of 118 mm bbls pass the hurdle and benefit from PRT relief, but 12 pass the hurdle with PRT payable. One project involving reserves of 6.4 mm bbls of oil fails the hurdle when PRT is payable and passes it when PRT relief is given (Chart 64). When the threshold is raised to $NPV/I \geq 0.5$ projects involving reserves of 112 mm bbls benefit from PRT relief, and 1 with reserves of 1 mm bbls fails the hurdle with PRT payable and passes it with PRT relief.

Chart 64



With respect to gas, projects involving 122 bcf benefit from PRT relief when the hurdle is $NPV/I \geq 0.3$, but only 1 project involving reserves of 11 bcf fails the threshold when PRT is payable and passes it when relief is given (Chart 65). When the threshold is raised to $NPV/I \geq 0.5$ projects involving reserves of 111 bcf benefit from PRT relief, with 1 project involving 49 bcf failing the hurdle with PRT payable and passing it with PRT relief (Chart 66).

Chart 65

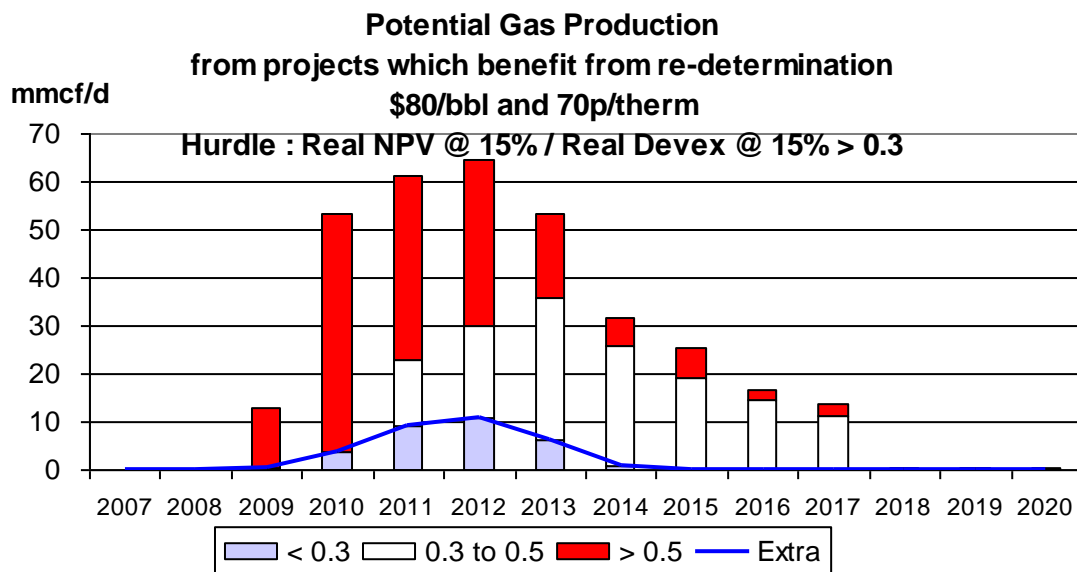
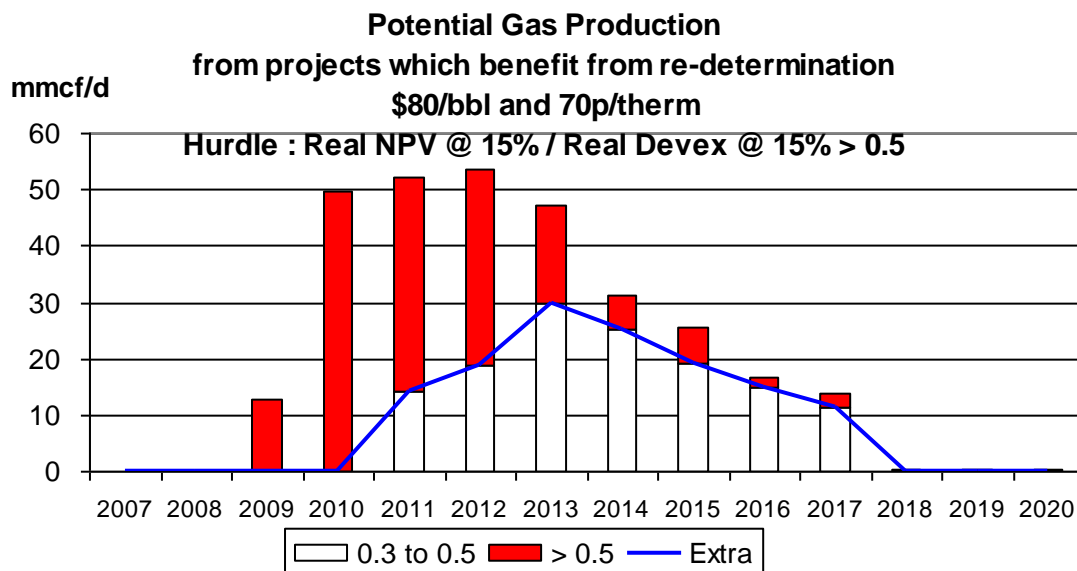


Chart 66



Following from the above it was found that projects involving 145 mmboe would benefit from PRT relief when the hurdle was $NPV/I \geq 0.3$. One project involving 9 mmboe fails the threshold when PRT is payable and passes it when relief is given (Chart 67). When the hurdle is raised to $NPV/I \geq 0.5$ projects with reserves of 136 mmboe benefit from PRT relief. One project with reserves of 11 mmboe fails the threshold when PRT is payable and passes it when relief is given (Chart 68).

Chart 67

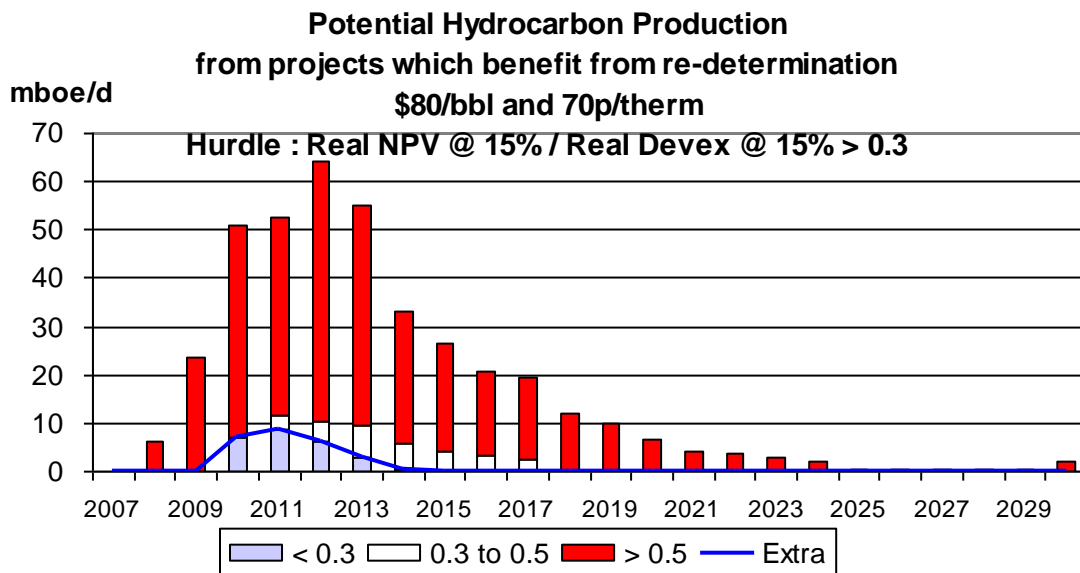
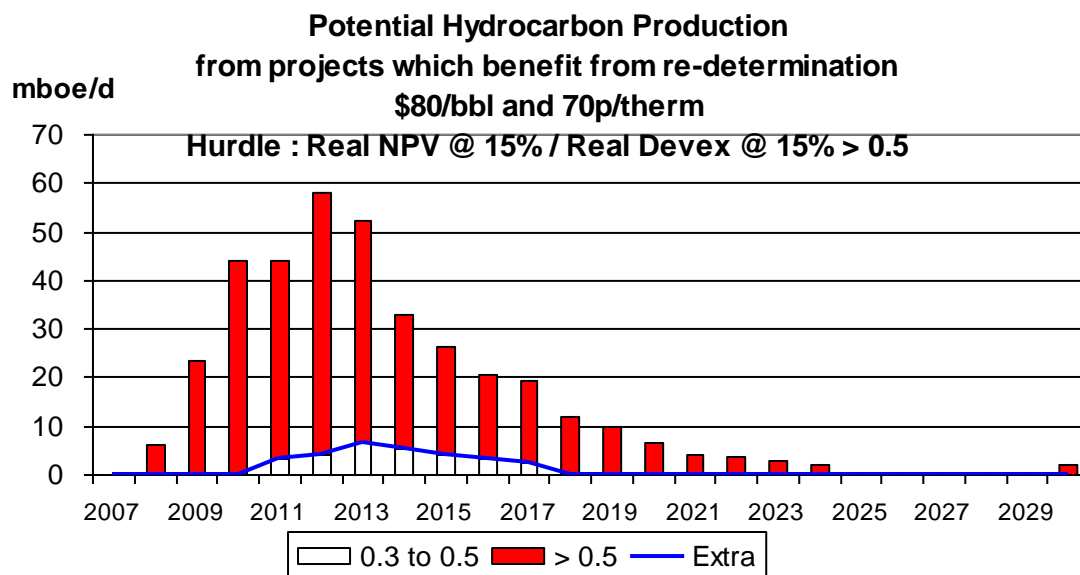


Chart 68



(ii) Project Development Expenditures

When the hurdle is $NPV/I \geq 0.3$ projects involving investment of £943 million benefit from PRT relief. One with an investment of £139 million fails the hurdle when PRT is payable and passes it when relief is given (Chart 69). When the hurdle is raised to $NPV/I \geq 0.5$ projects involving investment of £804 million benefit from PRT relief. One with an investment of £39 million fails the hurdle when PRT is payable and passes it with PRT relief (Chart 70).

Chart 69

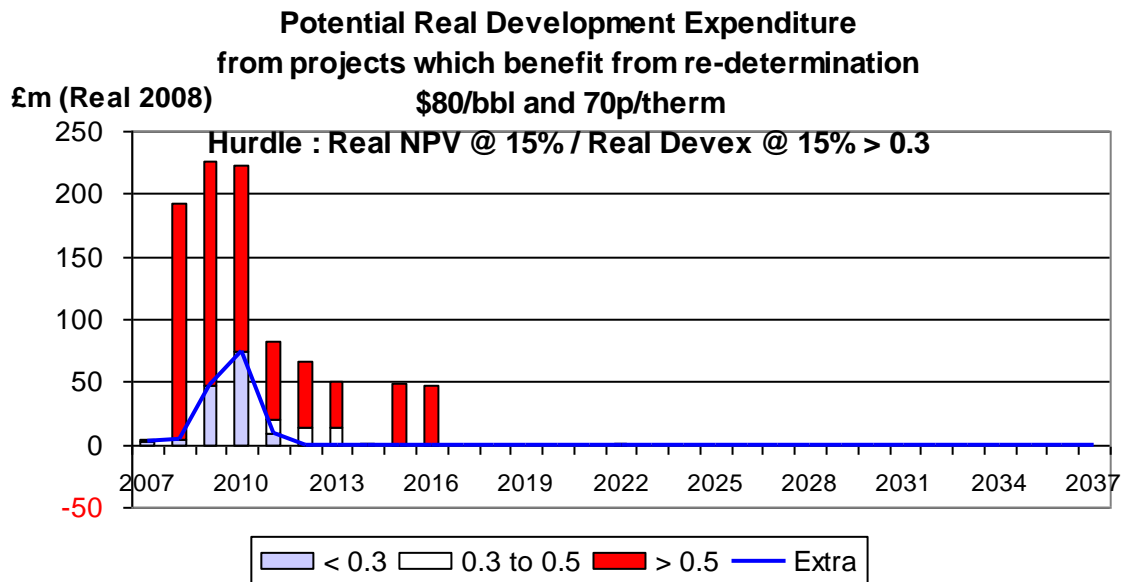
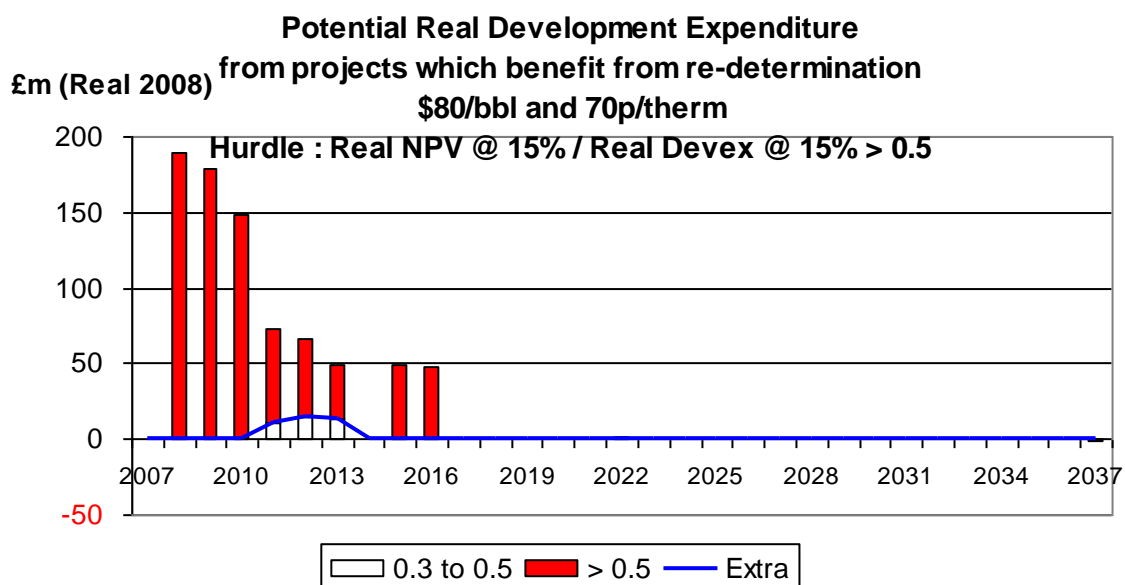


Chart 70



(iii) Operating Expenditures

With the $NPV/I \geq 0.3$ hurdle, projects involving £1.2 billion of expenditures benefit from PRT relief. One involving expenditures of £80 million fails the hurdle when PRT is payable and passes it when PRT relief is given (Chart 71). When the hurdle is increased to $NPV/I \geq 0.5$ projects involving expenditures of £1.1 billion benefit from PRT relief. Of these 1 with expenditures of £56 million fails the hurdle when PRT is payable and passes it with PRT relief (Chart 72).

Chart 71

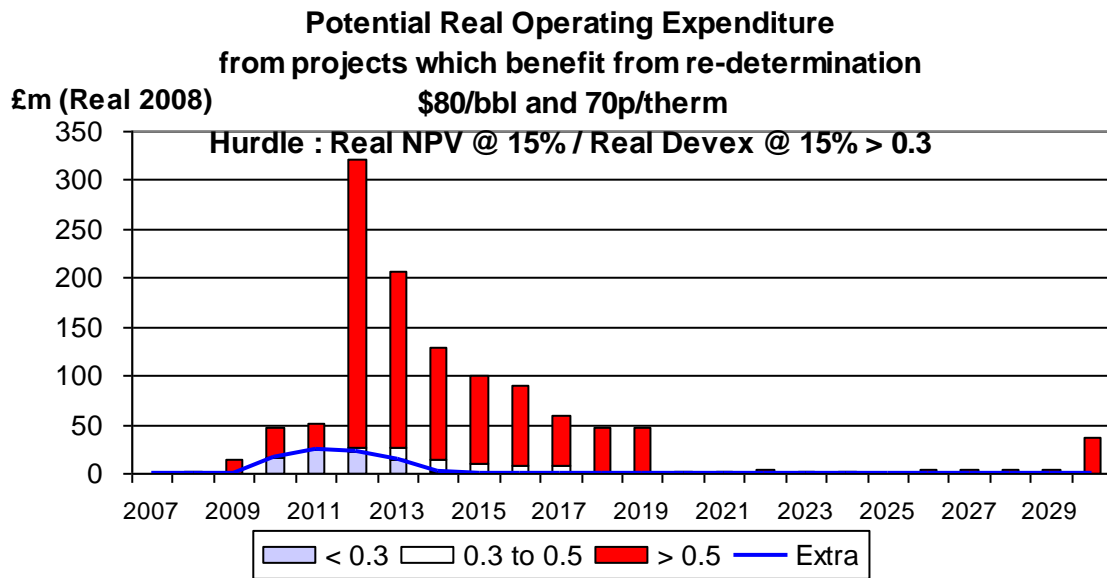
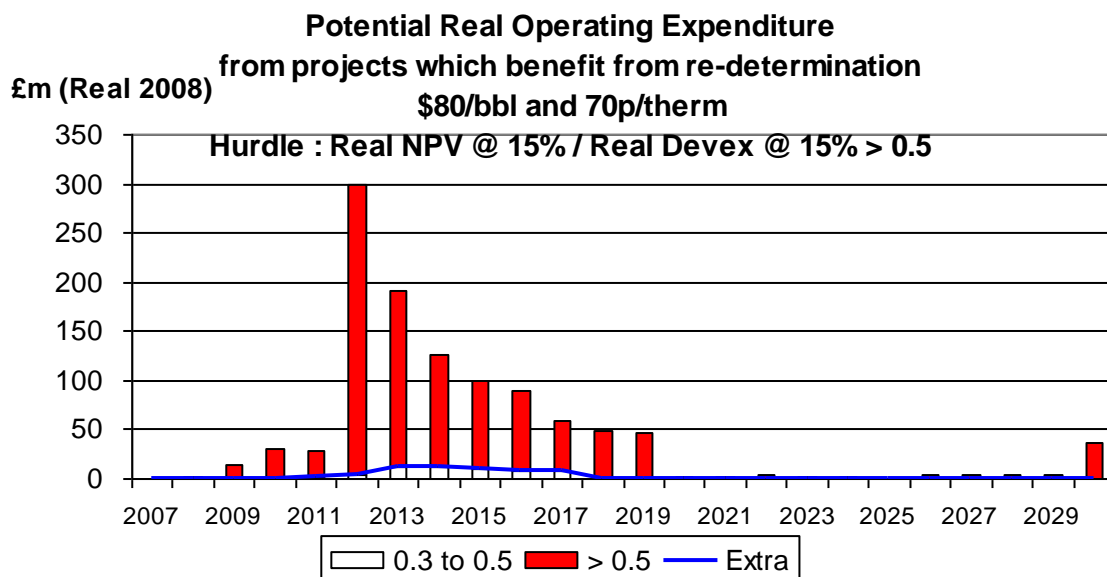


Chart 72



4. Conclusions

In this paper the investment economics of incremental projects in the UKCS currently subject to PRT have been modelled under a number of oil and gas price scenarios, costs of capital, and investment hurdle rates. The range of prices reflects those felt likely to be employed for investment decision-making. Similarly the values for cost of capital and investment hurdle rates are believed to reflect the appropriate range given current circumstances in financial markets and commonly employed procedures by the industry for allocating investment funds.

The results of the modelling indicate that the presence of PRT can deter some projects under all the price scenarios considered. In the low price case many incremental projects are unattractive even without PRT. In the medium and high price scenarios there is evidence that projects can be deterred by the imposition of PRT. In general the case for some relief is established from the modelling. An interesting further finding was the significant number of cases where the presence of incremental projects enhanced recovery from the mother fields which in turn increased the amount of PRT payable from those mother fields. Thus in some cases PRT relief on incremental projects produced extra PRT from the associated mother fields.

The current procedure for obtaining relief is that investors have to demonstrate to the satisfaction of the Government that projects are being inhibited by PRT. Given the range of plausible oil/gas prices, the cost of capital, investment hurdle rates, and the findings of this study, agreement between investors and the Government will not be straightforward. There are, of course, further

uncertainties relating to reserves and to investment and operating costs. These can well be treated differently by different parties which adds to the difficulty of reaching agreement on the circumstances when PRT is clearly inhibiting an investment. Thus an investor may put a risk premium on his cost of capital for discounting purposes and may also have his own techniques for handling the risks relating to reserves and costs. Partners in a group will also have their own individual ways of assessing risks. With respect to reserves there may well be differences of view on what constitutes incremental production as distinct from that which would occur in the absence of incremental project. Proving or disproving, separation of an accumulation from the mother field reservoir may not be easy.

Given the above, demonstration that a project is being inhibited by PRT may well not be easy in practice, and the problems encountered in earlier years in demonstrating that the presence of royalty was inhibiting maximum economic recovery/incremental investments may be repeated. In these circumstances there is some merit in having a formula which would clearly demonstrate the circumstances under which relief would be available. This would greatly reduce the uncertainty regarding the circumstances when relief would be given, and would clearly improve the investment environment. The provision of a formula inevitably involves judgement on the part of the Government, but this is not fundamentally different to the judgement involved in setting the rates for taxes and the related capital allowances.

It is noteworthy that the establishment of a formula for PRT relief for incremental projects could bring further national gains by encouraging licensees to seek out and bring forward for consideration further incremental projects.

The wide uncertainty regarding the possibility of PRT relief is not encouraging in this respect, and a typical reaction would be to discount the possibility of obtaining relief. In turn this could reduce the effort put into seeking out new incremental projects.
