PRELIMINARY REPORT ON FISCAL DESIGNS FOR THE DEVELOPMENT OF ALASKA NATURAL GAS

BY
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For

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Section 4.5

Sensitivity analysis: prices, yields, costs & fiscal terms

Part 4: Analysis of Alternative Upstream Fiscal Models for Alaska

4.5 Sensitivity analysis: prices, yields, costs & fiscal terms

The sensitivity of the economic performance and fiscal contributions of each of the ten hypothetical gas and oil fields modelled in this study is included in **Appendix 6** as a series of graphs and tables applying a wide range of production, cost, price, C5+ yield, timing and fiscal assumptions modifying the base-case values. This information makes it possible to evaluate the impact of a wide range of economic and fiscal variables applied to the ten gas and oil (with associated gas) hypothetical field sizes and types for this study.

In this section the sensitivity analysis of **gas field #4** is presented and discussed and the analyses of the other fields are referred to for comparison. Figures 4.5.1 and 4.5.2 show the sensitivity cases:

Input Variables	Base Case =1.00	1.00	0.40	0.50	0.60	0.70	0.80	0.90
Year 1 Gas Price ($/mmbtu)	Field # 4	7.5	3.0	3.8	4.5	5.3	6.0	6.8
Year 1 Oil Price ($ / Barrel)		80.0	32.0	40.0	48.0	56.0	64.0	72.0
Condensate Yield (barrels/mmcf)		20.0	8.0	10.0	12.0	14.0	16.0	18.0
Gas TT&T ($/ mcf)		4.5	1.8	2.3	2.7	3.2	3.6	4.1
Total Capex ($/boe)		4.37	1.75	2.18	2.62	3.06	3.49	3.93
Total Opex ($/boe)		3.05	1.22	1.52	1.83	2.13	2.44	2.74
Production Startup Accelerated (-) or Delayed (+) by Years		6					-2.0	-1.0

Figures 4.5.1 Downside sensitivity values applied relative to base-case values (factor =1.00) for seven variables. These range from 40% (factor adjustment = 0.4) to 90% (factor adjustment = 0.9) of the base-case values (e.g. gas prices from US$3/mmbtu to US$6.8/mmbtu and gas TT&T costs from US$1.8/mmbtu to US$4.1/mmbtu).

Input Variables	Base Case =1.00	1.00	1.20	1.40	1.50	2.00	2.50	3.00
Year 1 Gas Price ($/mmbtu)	Field # 4	7.5	9.0	10.5	11.3	15.0	18.8	22.5
Year 1 Oil Price ($ / Barrel)		80.0	96.0	112.0	120.0	160.0	200.0	240.0
Condensate Yield (barrels/mmcf)		20.0	24.0	28.0	30.0	40.0	50.0	60.0
Gas TT&T ($/ mcf)		4.5	5.4	6.3	6.8	9.0	11.3	13.5
Total Capex ($/boe)		4.37	5.24	6.12	6.55	8.74	10.92	13.11
Total Opex ($/boe)		3.05	3.66	4.27	4.57	6.10	7.62	9.14
Production Startup Accelerated (-) or Delayed (+) by Years		6	1.0	2.0	3.0			

Figures 4.5.2 Upside sensitivity values applied relative to base-case values (factor =1.00) for seven variables. These range from 120% (factor adjustment = 1.2) to 300% (factor adjustment = 3.0) of the base-case values (e.g. gas prices from US$9 mmbtu to US$22.5/mmbtu and gas TT&T from US$5.4 mmbtu to US$13.5/mmbtu).

Impacts on Producer NPV (Real) @ 10.0%		1.00	0.40	0.50	0.60	0.70	0.80	0.90	1.20	1.40	1.50	2.00	2.50	3.00
Gas Price	Producer NPV $ millions:	1508	-92	-1157	-465	79	586	1077	2242	2850	3111	4031	5146	6171
Oil Price	Producer NPV $ millions:	1508	959	1059	1156	1250	1339	1424	1672	1828	1904	2267	2594	2891
Condensate Yield	Producer NPV $ millions:	1508	1009	1096	1181	1264	1346	1427	1669	1825	1903	2284	2657	3020
Gas TT&T	Producer NPV $ millions:	1508	2626	2463	2291	2108	1917	1718	1042	513	242	-121	-89	-89
Capex	Producer NPV $ millions:	1508	2261	2140	2019	1894	1767	1640	1244	975	839	139	-594	-1363
Opex	Producer NPV $ millions:	1508	2759	2579	2389	2186	1971	1746	972	367	54	-116	-101	-105
Field #4														
Production Startup Accelerated (-) or Delayed (+) by Years		1508	Producer NPV $ millions:				2535	2001	1056	642	268			
		1,508				Years:	4	5	7	8	9			

Impacts Producer NPV (Real) $/boe 10.0%		1.00	0.40	0.50	0.60	0.70	0.80	0.90	1.20	1.40	1.50	2.00	2.50	3.00
Gas Price	Producer NPV $/boe:	5.5	0.0	-4.2	-1.7	0.3	2.1	3.9	8.2	10.4	11.3	14.7	18.7	22.5
Oil Price	Producer NPV $/boe:	5.5	3.5	3.9	4.2	4.5	4.9	5.2	6.1	6.7	6.9	8.3	9.4	10.5
Condensate Yield	Producer NPV $/boe:	5.5	3.9	4.2	4.5	4.8	5.0	5.3	5.9	6.4	6.5	7.5	8.2	8.9
Gas TT&T	Producer NPV $/boe:	5.5	9.6	9.0	8.3	7.7	7.0	6.3	3.8	1.9	0.9	0.0	0.0	0.0
Capex	Producer NPV $/boe:	5.5	8.2	7.8	7.4	6.9	6.4	6.0	4.5	3.5	3.1	0.5	-2.2	-5.0
Opex	Producer NPV $/boe:	5.5	10.0	9.4	8.7	8.0	7.2	6.4	3.5	1.3	0.2	0.0	0.0	0.0
Field #4														
Production Startup Accelerated (-) or Delayed (+) by Years		5.5	Producer NPV $/boe:				7.1	6.4	4.4	3.1	1.5			
		5.5				Years:	4	5	7	8	9			

Impacts Producer IRR (Real)		1.00	0.40	0.50	0.60	0.70	0.80	0.90	1.20	1.40	1.50	2.00	2.50	3.00
Gas Price	%	20.1%	0.0%	0.0%	6.0%	10.7%	14.5%	17.6%	24.0%	26.8%	28.0%	31.9%	35.6%	38.9%
Oil Price	%	20.1%	16.9%	17.5%	18.1%	18.6%	19.2%	19.6%	21.0%	21.9%	22.2%	24.1%	25.7%	27.0%
Condensate Yield	%	20.1%	17.2%	17.7%	18.2%	18.7%	19.2%	19.7%	21.0%	21.8%	22.2%	24.1%	25.8%	27.4%
Gas TT&T	%	20.1%	25.8%	25.0%	24.2%	23.3%	22.3%	21.3%	17.4%	14.0%	12.0%	0.0%	0.0%	0.0%
Capex	%	20.1%	36.1%	31.9%	28.6%	25.9%	23.6%	21.8%	17.4%	15.2%	14.3%	10.6%	8.0%	6.1%
Opex	%	20.1%	26.4%	25.6%	24.7%	23.7%	22.6%	21.4%	17.0%	12.9%	10.5%	0.0%	0.0%	0.0%
Field #4														
Production Startup Accelerated (-) or Delayed (+) by Years		20.1%	%				32.3%	24.9%	16.6%	13.9%	11.6%			
		20.1%				Years:	4	5	7	8	9			

Impacts Producer Payback (Real / Discounted)		1.00	0.40	0.50	0.60	0.70	0.80	0.90	1.20	1.40	1.50	2.00	2.50	3.00
Gas Price	Years	10.83	40.00	40.00	40.00	17.69	13.38	11.71	9.86	9.34	9.15	8.68	8.38	8.16
Oil Price	Years	10.83	12.00	11.75	11.52	11.31	11.12	10.96	10.56	10.34	10.24	9.84	9.54	9.31
Condensate Yield	Years	10.83	11.86	11.64	11.44	11.26	11.10	10.95	10.57	10.35	10.25	9.85	9.53	9.27
Gas TT&T	Years	10.83	9.52	9.65	9.81	9.99	10.22	10.49	11.79	13.76	15.72	40.00	40.00	40.00
Capex	Years	10.83	8.45	8.80	9.13	9.57	9.95	10.37	11.75	12.81	13.44	17.84	40.00	40.00
Opex	Years	10.83	9.41	9.55	9.72	9.92	10.16	10.45	11.97	14.69	18.12	40.00	40.00	40.00
Field #4														
Production Startup Accelerated (-) or Delayed (+) by Years		10.83	Years				7.93	9.28	12.56	14.54	16.81			
		10.83				Years:	4	5	7	8	9			

Impacts Total Destination Value (MOD / Undiscounted)		1.00	0.40	0.50	0.60	0.70	0.80	0.90	1.20	1.40	1.50	2.00	2.50	3.00
Gas Price	$/boe	70.5	0.0	41.3	47.1	52.9	58.8	64.6	82.1	93.8	99.6	128.8	158.0	187.2
Oil Price	$/boe	70.5	63.2	64.4	65.6	66.8	68.0	69.2	72.9	75.3	76.5	82.6	88.6	94.7
Condensate Yield	$/boe	70.5	67.9	68.3	68.8	69.2	69.6	70.1	71.2	72.0	72.3	74.0	75.5	76.9
Gas TT&T	$/boe	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	0.0	0.0	0.0
Capex	$/boe	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5
Opex	$/boe	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	0.0	0.0	0.0
Field #4														
Production Startup Accelerated (-) or Delayed (+) by Years		70.46	$/boe				69.12	69.78	71.14	71.83	72.53			
		70.46				Years:	4	5	7	8	9			

Figure 4.5.3. Sensitivity analysis (for 0.4 to 3.0 adjustment factors) examples of output arrays for comparing the impact of changing individual variables for gas field #4. The base-case values for the variables are shown under the column headed 1.0. It is not surprising that low gas prices make the project uneconomic (and abandoned prematurely) and low opex, capex and gas TT&T improve project performance. It is the relative impacts that are instructive.

Gas field #4 is used because it holds large gas reserves (some 5 tcf) plus some 100 million barrels of associated oil (C5+). Total gas and oil (C5+) reserves produced from field #4, over a 17-year production period in the model constructed, amount to some 941 million boe.

The sensitivity calculations based upon the adjustments to values shown in Figures 4.5.1 and 4.5.2 to each sensitivity variable (one variable changed in each analysis run) are recorded in a series of arrays and tabulated for each field in Appendix 5. Figure 4.5.3 shows examples of part of these arrays documenting the sensitivity of producer NPV, IRR, payback and project destination value for Field # 4.

Impacts on Producer NPV (Real) @ 10.0%		1.00	1.20	1.40	1.50	2.00	2.50	3.00
Gas Price	Producer NPV $ millions:	1508	2242	2850	3111	4031	5146	6171
Oil Price	Producer NPV $ millions:	1508	1672	1828	1904	2267	2594	2891
Condensate Yield	Producer NPV $ millions:	1508	1669	1825	1903	2284	2657	3020
Gas TT&T	Producer NPV $ millions:	1508	1042	513	242	-121	-89	-89
Capex	Producer NPV $ millions:	1508	1244	975	839	139	-594	-1363
Opex	Producer NPV $ millions:	1508	972	367	54	-116	-101	-105
Production Startup Accelerated (-) or Delayed (+) by Years		1508	1056	642	268			
		1,508	7	8	9			

Field # 4

Figure 4.5.4. Sensitivity analysis reveals natural gas prices have the most impact on this variable for Field #4

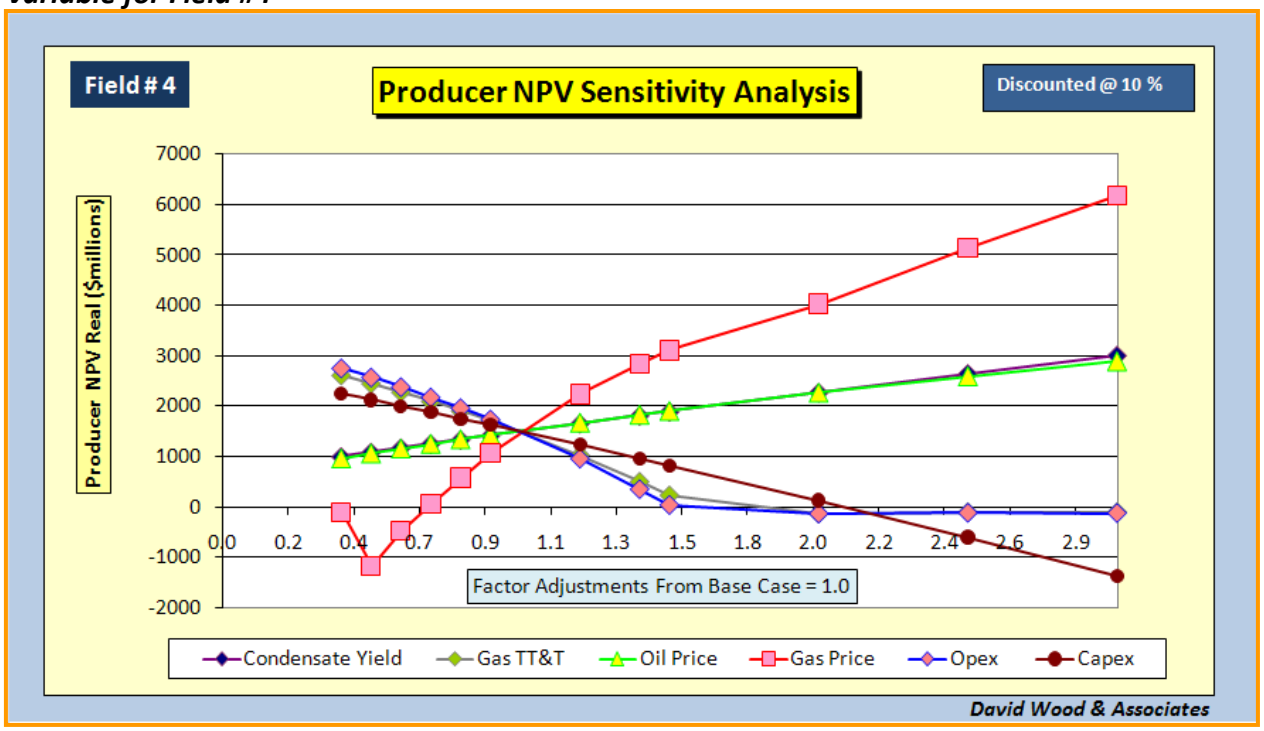

Figure 4.5.5. Spider diagram for sensitivity of producer NPV reveals that of the economic variables analysed natural gas prices have the greatest impact on this variable for gas field #4. Producer NPV is more sensitive to opex and gas TT&T costs than it is to capex. The reason for that is the impact of the investment credit which moderates increases and decreases in capex. The impact of varying rates of specific fiscal instruments from the base case to adjust government take are presented in this Section 4.5 (see Figures 4.5.10 to 4.5.16). Clearly

prevailing economic conditions and fiscal take together will determine whether or not a specific field is economic or not for a producer.

Many other economic performance variables can be recorded and studied in this manner (see Appendix 5). However it is more meaningful to look at trends graphically to identify which variables have the greatest impact on economic performance metrics. Two main types of graphic are used in this study for illustrating the results of sensitivity analysis: spider diagrams and tornado charts. The information they provide can be interpreted from the array data, but it is somewhat easier to interpret the graphs in most cases. For example, Figure 4.5.4 shows part of the sensitivity matrix (for adjustment factors 1.0 to 3.0) for producer NPV real US$ millions.

All the gas fields show similar trends to Figure 4.5.5 with increasing condensate yields having greater positive influence on returns than oil price on the upside. Not surprisingly capital costs have a slightly greater influence on producer NPV than operating costs for the smaller gas fields, but the reverse is true for the larger gas fields (Figure 4.5.5), due to investment credits moderating the very high capital costs. In contrast producer NPV for the oil fields is most sensitive to oil price (Figure 4.5.6)

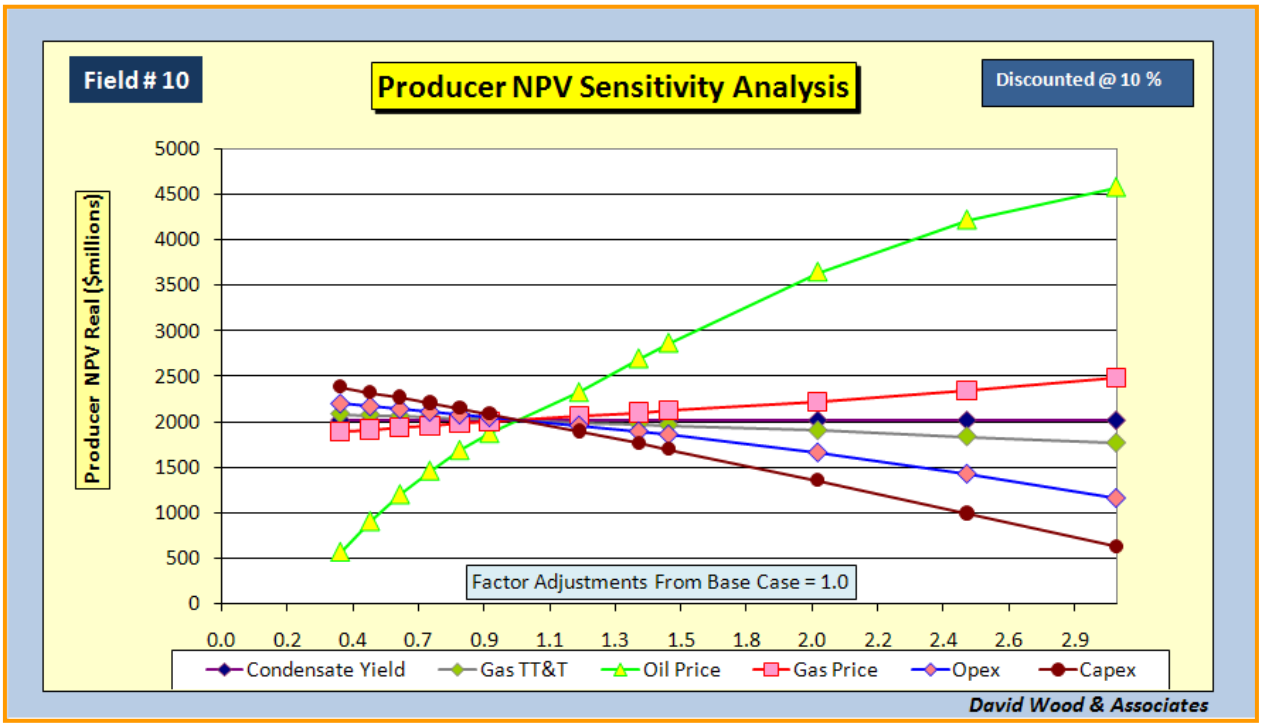

Figure 4.5.6. Spider diagram for sensitivity of producer real NPV for field #10 reveals that oil price is the dominant controlling factor. It is relatively insensitive to natural gas prices, less so than to capex and opex. The moderating impact on rising NPV of CPT at very high oil prices shows the moderating impact on producer NPV above about US$150/barrel. All the oil fields studied show similar trends.

Spider diagrams clearly indicate in which direction higher and lower values of each variable cause the economic variables to move and how significantly. For example, it is clear that high prices, low costs and high NGL yields cause values to increase, thereby confirming that the model is behaving logically. An alternative display, the tornado chart, does not reveal trends but compares the ranges of impacts that the different variable can have on selected economic metrics.

Figure 4.5.7 shows the major influence of gas prices on large gas field values such as field #4. Figure 4.5.8 shows that costs are as important as gas prices for smaller gas fields on the downside. For oil fields oil price is dominant, with capital expenditure becoming more significant for the smaller fields, as should be expected (Figure 4.5.9).

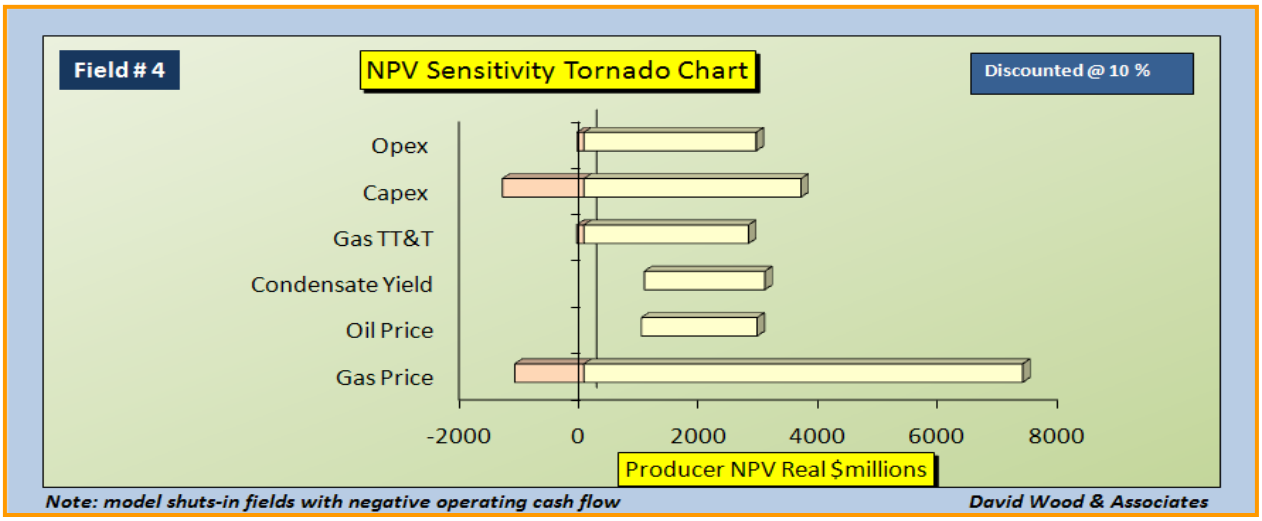

Figure 4.5.7. Tornado chart for producer NPV for gas field #4. Note because the model automatically shuts fields down when operating cash flow becomes significantly negative opex stops at zero, incorrectly implying from this display that fields are more sensitive to capex than opex.

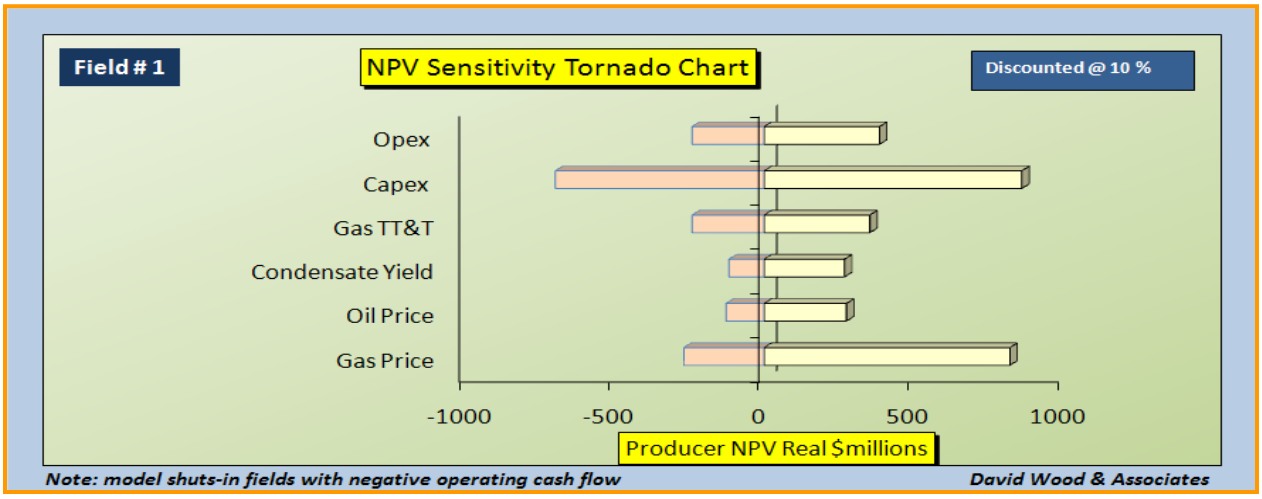

Figure 4.5.8. Tornado chart for producer NPV for gas field #1.

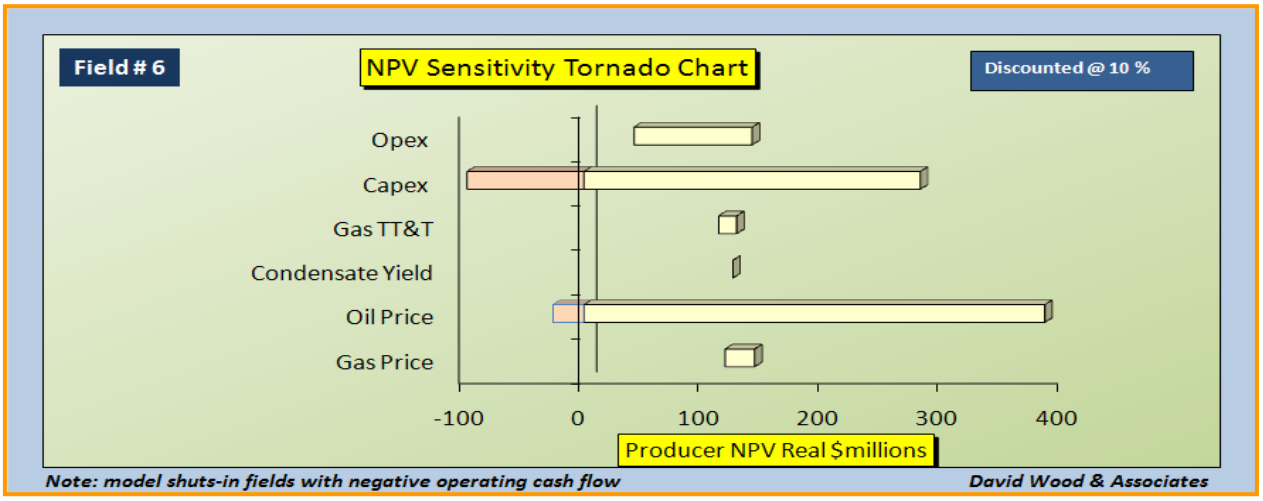

Figure 4.5.9. Tornado chart for producer NPV for oil field #6.

Fiscal Instrument Sensitivities

The base-case analysis and price, cost and yield sensitivities considered so far are all based upon the prevailing Alaska fiscal terms, including the production tax reforms signed into law in 2006 & 2007. (Figure 4.5.10).

Base Case Fiscal Terms Applied to Sensitivity Runs:	
Royalty Rate (%)	12.50%
Alaska Basic Production Tax (%)	25.00%
Investment Credit (%) of Capex	20.00%
Approximate Alaska CIT Rate (%)	9.40%
Federal Corporate Income Tax Rate (%)	35.00%
Combined Federal + State CIT Rate (%)	41.11%
Oil (CPT) Progressivity Threshold ($/boe)	30.00
Oil (CPT) Progressivity First Rate (%)	0.40%
Oil (CPT) Progressivity Upper Band ($/boe)	92.50
Oil (CPT) Progressivity Second Rate (%)	0.10%

Figure 4.5.10. Alaska's prevailing fiscal terms applied to base-case analyses and price, cost and yield sensitivities of all fields with gas and oil revenue stream combined to provide PTV $/boe for CPT calculations (see Appendix 5). Note the combined federal income tax and Alaska corporate income tax rate approximation is shown in the above table, but not used in the model.

In order to evaluate the economic importance of individual fiscal instruments in the functioning of a fiscal design it is also necessary to conduct sensitivity analysis on the rates and thresholds applied to these individual instruments. The second part of this section of the report addresses this type of sensitivity analysis.

Input Variables Base Case =1.00	1.00	0.40	0.50	0.60	0.70	0.80	0.90
Year 1 Gas Price ($/mmbtu)	8	3.0	3.8	4.5	5.3	6.0	6.8
Year 1 Oil (C5+) Price ($ / Barrel)	80	32.0	40.0	48.0	56.0	64.0	72.0
Royalty Rate (%)	12.5%	5.0%	7.5%	9.0%	10.0%	11.0%	12.0%
Basic Petroleum Profits Tax Rate	25.0%	15.0%	17.5%	20.0%	22.0%	23.0%	24.0%
Progressivity Tax (CPT) First Base ($/boe)	30.00	10.00	15.00	20.00	24.00	26.00	28.00
Progressivity Tax (CPT) First Tranche rate (%)	0.40%	0.20%	0.25%	0.30%	0.34%	0.36%	0.38%
Progressivity Tax (CPT) Second Base ($/boe)	92.50	30.00	40.00	50.00	60.00	70.00	80.00
Progressivity Tax (CPT) Second Tranche rate (%)	0.10%	0.02%	0.04%	0.05%	0.07%	0.08%	0.09%
Investment Credit Rate (%)	20.0%	5.0%	10.0%	12.0%	14.0%	16.0%	18.0%
Alaska CIT Rate (%)	9.40%	5.00%	7.00%	7.50%	8.00%	8.50%	9.00%
Sensitivity Case Number (for graphic displays):	0	-6	-5	-4	-3	-2	-1

Figure 4.5.11 Decrease to sensitivity values applied relative to base-case values (factor =1.00) for ten variables. These range from 40% (factor adjustment = 0.4) to 90% (factor adjustment = 0.9) of the base-case price values (e.g. oil prices from US$32/barrel to US$72/barrel and gas prices from US$3.0 mmbtu to US$6.8/mmbtu). Eight fiscal variables are reduced in more modest steps not by the larger factors applied to prices.

Input Variables Base Case =1.00	1.20	1.40	1.50	2.00	2.50	3.00
Year 1 Gas Price ($/mmbtu)	9.0	10.5	11.3	15.0	18.8	22.5
Year 1 Oil (C5+) Price ($ / Barrel)	96.0	112.0	120.0	160.0	200.0	240.0
Royalty Rate (%)	13.0%	14.0%	15.0%	16.0%	17.5%	20.0%
Basic Petroleum Profits Tax Rate	26.0%	27.0%	28.0%	30.0%	32.5%	35.0%
Progressivity Tax (CPT) First Base ($/boe)	32.00	34.00	36.00	40.00	50.00	60.00
Progressivity Tax (CPT) First Tranche rate (%)	0.50%	0.60%	0.70%	1.00%	2.00%	3.00%
Progressivity Tax (CPT) Second Base ($/boe)	95.00	100.00	110.00	120.00	130.00	150.00
Progressivity Tax (CPT) Second Tranche rate (%)	0.15%	0.20%	0.25%	0.30%	0.40%	0.50%
Investment Credit Rate (%)	22.0%	24.0%	26.0%	28.0%	30.0%	35.0%
Alaska CIT Rate (%)	10.00%	10.50%	11.00%	11.50%	12.00%	15.00%
Sensitivity Case Number (for graphic displays):	1	2	3	4	5	6

Figures 4.5.12 Increase to sensitivity values applied relative to base-case values (factor =1.00) for ten variables. These range from 120% (factor adjustment = 1.2) to 300% (factor adjustment = 3.0) of the base-case values (e.g. oil prices from US$96/barrel to US$240 barrel and gas prices from US$9.0 mmbtu to US$22.5/mmbtu). Eight fiscal variables are increased in more modest steps not by the larger factors applied to prices.

The sensitivity calculations based upon the adjustments to values shown in Figures 4.5.11 and 4.5.12 to each sensitivity variable (one variable changed in each analysis run) are recorded in a series of arrays and tabulated for each field in Appendix 5. Figure 4.5.13 shows examples of

these arrays documenting the lower-factor sensitivity cases for total government and Alaska state take of undiscounted MOD cash flow in terms of percent, NPV real US$/boe and NPV real US$ millions for field # 4.

Many other economic performance variables can be recorded and studied in this manner (see Appendix 5). However, it is more meaningful to look at trends graphically to identify which fiscal instruments have the greatest impact on economic performance metrics and to establish how such impacts compare with that of gas and oil prices. Spider diagrams are used here to make such comparisons.

The impact of varying the rates and thresholds applied to fiscal instruments involved in Alaska's fiscal design are illustrated in three spider diagrams (Figures 4.5.14, 4.5.15, and 4.5.16) where the negative numbers on the horizontal axis represent progressive (step) reductions in variable values (downside in most cases) and positive numbers on the horizontal axis represent progressive (step) increases in variable values (upside in most cases).

Figure 4.5.14 shows the sensitive analysis in terms of its impact on total government take percentage (Alaska take plus FIT) of undiscounted MOD cash flows for gas field #4. Reductions in the BPT rate have the biggest negative impact on total government (and Alaska) take. As gas price goes down and project cash flows decline to zero or become negative, the royalty and property tax components still accrue to the Alaska take and therefore the total government share of profits increases in low gas price environments. This is a characteristic of regressive fiscal designs. On the upside, gas prices dominate for modest increases above the base rate. However, when the first tranche rate of the combined progressivity tax (CPT) rises above 1% (the base case rate for the first tranche CPT is 0.4%, see Figure 4.5.10) for every $ increase in $/boe PTV, that tax becomes the most significant in increasing government take. CPT is clearly highly sensitive to the rate factors applied beyond rates of about 0.75%/US$/boe PTV. Reducing the threshold rate for the first tranche CPT below US$30/boe PTV also has a significant positive impact on total government take.

Impacts on Total Gov Take of Undisc. Mod Cash Flow (%)	Case:	0	-6.00	-5.00	-4.00	-3.00	-2.00	-1.00
Gas Price	%	65.5%	100.0%	98.0%	71.6%	67.8%	66.1%	65.2%
Oil Price **Field # 4**	%	65.5%	65.3%	65.2%	65.2%	65.2%	65.3%	65.4%
Royalty Rate	%	65.5%	61.8%	63.0%	63.8%	64.3%	64.8%	65.3%
Basic Petroleum Profits Tax Rate	%	65.5%	60.7%	61.9%	63.1%	64.1%	64.5%	65.0%
Progressivity Tax (CPT) First Base ($/boe)	%	65.5%	69.7%	68.7%	67.6%	66.8%	66.3%	65.9%
Progressivity Tax (CPT) First Tranche rate (%)	%	65.5%	65.0%	65.1%	65.2%	65.3%	65.4%	65.4%
Progressivity Tax (CPT) Second Base ($/boe)	%	65.5%	64.7%	65.5%	65.5%	65.5%	65.5%	65.5%
Progressivity Tax (CPT) Second Tranche rate (%)	%	65.5%	65.5%	65.5%	65.5%	65.5%	65.5%	65.5%
Investment Credit Rate	%	65.5%	66.6%	66.2%	66.1%	65.9%	65.8%	65.7%
Alaska CIT Rate	%	65.5%	63.8%	64.6%	64.8%	65.0%	65.1%	65.3%
		65.5%						

Impacts on Alaska Take of Undisc. Mod Cash Flow (%)	Case:	0	-6.00	-5.00	-4.00	-3.00	-2.00	-1.00
Gas Price	%	46.6%	100.0%	93.9%	55.1%	49.7%	47.3%	46.0%
Oil Price **Field # 4**	%	46.6%	46.2%	46.0%	46.0%	46.0%	46.2%	46.4%
Royalty Rate	%	46.6%	40.9%	42.8%	43.9%	44.7%	45.4%	46.2%
Basic Petroleum Profits Tax Rate	%	46.6%	39.2%	41.1%	42.9%	44.4%	45.1%	45.8%
Progressivity Tax (CPT) First Base ($/boe)	%	46.6%	53.0%	51.4%	49.8%	48.5%	47.9%	47.2%
Progressivity Tax (CPT) First Tranche rate (%)	%	46.6%	45.7%	45.9%	46.2%	46.3%	46.4%	46.5%
Progressivity Tax (CPT) Second Base ($/boe)	%	46.6%	45.3%	46.6%	46.6%	46.6%	46.6%	46.6%
Progressivity Tax (CPT) Second Tranche rate (%)	%	46.6%	46.6%	46.6%	46.6%	46.6%	46.6%	46.6%
Investment Credit Rate	%	46.6%	48.3%	47.7%	47.5%	47.3%	47.0%	46.8%
Alaska CIT Rate	%	46.6%	43.9%	45.1%	45.4%	45.7%	46.0%	46.3%
		46.6%						

Impacts on Alaska NPV Real ($/boe)@ 5.0%	Case:	0	-6.00	-5.00	-4.00	-3.00	-2.00	-1.00
Gas Price **Field # 4**	$/boe	11.40	0.00	3.06	4.18	5.81	7.53	9.30
Oil Price	$/boe	11.40	8.85	9.23	9.63	10.05	10.48	10.94
Royalty Rate	$/boe	11.40	9.94	10.43	10.72	10.91	11.11	11.30
Basic Petroleum Profits Tax Rate	$/boe	11.40	9.69	10.11	10.54	10.89	11.06	11.23
Progressivity Tax (CPT) First Base ($/boe)	$/boe	11.40	12.98	12.59	12.19	11.87	11.71	11.56
Progressivity Tax (CPT) First Tranche rate (%)	$/boe	11.40	11.22	11.26	11.31	11.35	11.37	11.38
Progressivity Tax (CPT) Second Base ($/boe)	$/boe	11.40	11.12	11.40	11.40	11.40	11.40	11.40
Progressivity Tax (CPT) Second Tranche rate (%)	$/boe	11.40	11.40	11.40	11.40	11.40	11.40	11.40
Investment Credit Rate	$/boe	11.40	11.93	11.75	11.68	11.61	11.54	11.47
Alaska CIT Rate	$/boe	11.40	10.74	11.04	11.12	11.19	11.27	11.34
		11.40						

Impacts on Alaska NPV Real ($ million) @ 5.0%	Case:	0	-6.00	-5.00	-4.00	-3.00	-2.00	-1.00
Gas Price **Field # 4**	$millions	5629	4	1510	2063	2870	3718	4591
Oil Price	$millions	5629	4370	4557	4753	4959	5174	5400
Royalty Rate	$millions	5629	4907	5147	5292	5388	5484	5581
Basic Petroleum Profits Tax Rate	$millions	5629	4784	4993	5204	5374	5459	5544
Progressivity Tax (CPT) First Base ($/boe)	$millions	5629	6409	6213	6017	5861	5783	5706
Progressivity Tax (CPT) First Tranche rate (%)	$millions	5629	5537	5560	5583	5601	5611	5620
Progressivity Tax (CPT) Second Base ($/boe)	$millions	5629	5491	5629	5629	5629	5629	5629
Progressivity Tax (CPT) Second Tranche rate (%)	$millions	5629	5629	5629	5629	5629	5629	5629
Investment Credit Rate	$millions	5629	5887	5800	5765	5730	5695	5662
Alaska CIT Rate	$millions	5629	5303	5451	5488	5525	5562	5599
		5629						

Figure 4.5.13. Sensitivity analysis examples of output arrays for comparing the impact of varying individual values of fiscal instruments and gas and oil prices for gas field #4. If the first rate of the combined progressivity tax (CPT) is increased from its base case value of 0.4% to above 1%, that tax becomes the most significant in increasing government take. Reducing the BPT rate has the most negative impact on Alaska's fiscal take among the fiscal terms analyzed.

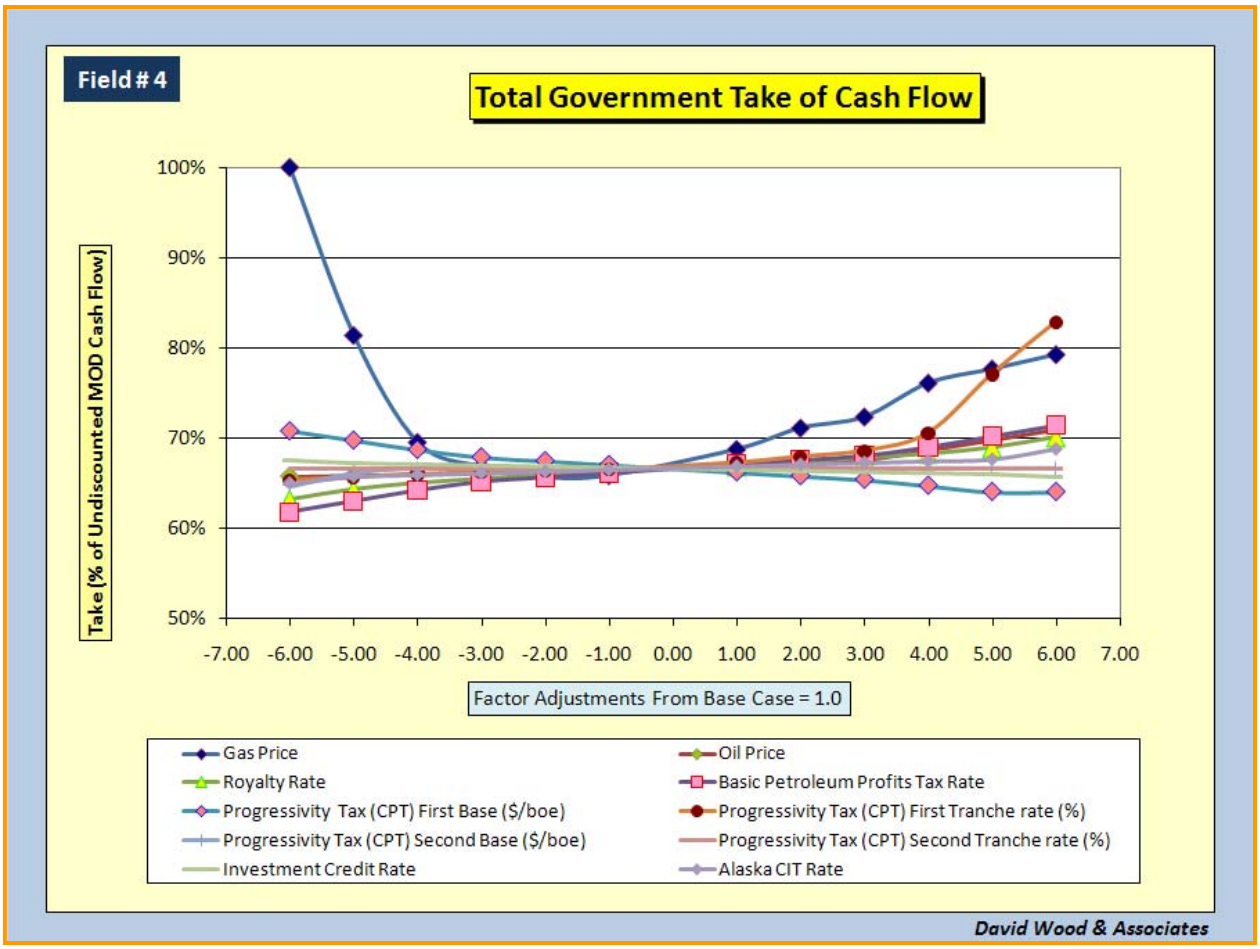

Figure 4.5.14. Spider diagram for sensitivity of government take (%) reveals that natural GPT rates and threshold prices have the greatest impact on this variable, together with gas price and PPT rate for gas field #4. Smaller gas fields show similar trends, but regressive gas price impacts become more pronounced at low prices (e.g. gas field #1 see Appendix 5).

Oil fields analysed using these set of fiscal elements indicate that oil price and BPT rates have the greatest impact on government take. Oil price trends are also quite regressive for oil fields, particularly the small fields (e.g. field #6 see Appendix 5).

Figure 4.5.15 shows the sensitive analysis in terms of its impact on total Alaska state take percentage (i.e. total government take excluding FIT) of undiscounted MOD cash flow for gas field #4. The trends are similar to total government take reinforcing the points already discussed. This spider diagram also highlights that Alaska state take is more sensitive to BPT rates than it is to royalty rates. Similar trends are also observed for all the oil fields studied (i.e. BPT versus royalty).

Figure 4.5.16 shows the sensitive analysis in terms of its impact on total Alaska state take (i.e. total government take excluding FIT) expressed in unit value term, i.e. NPV real US$/boe, for

gas field #4. Such diagrams highlight the dominant role of gas price (and oil prices for oil fields) in determining the value of the Alaska state's share of profits.

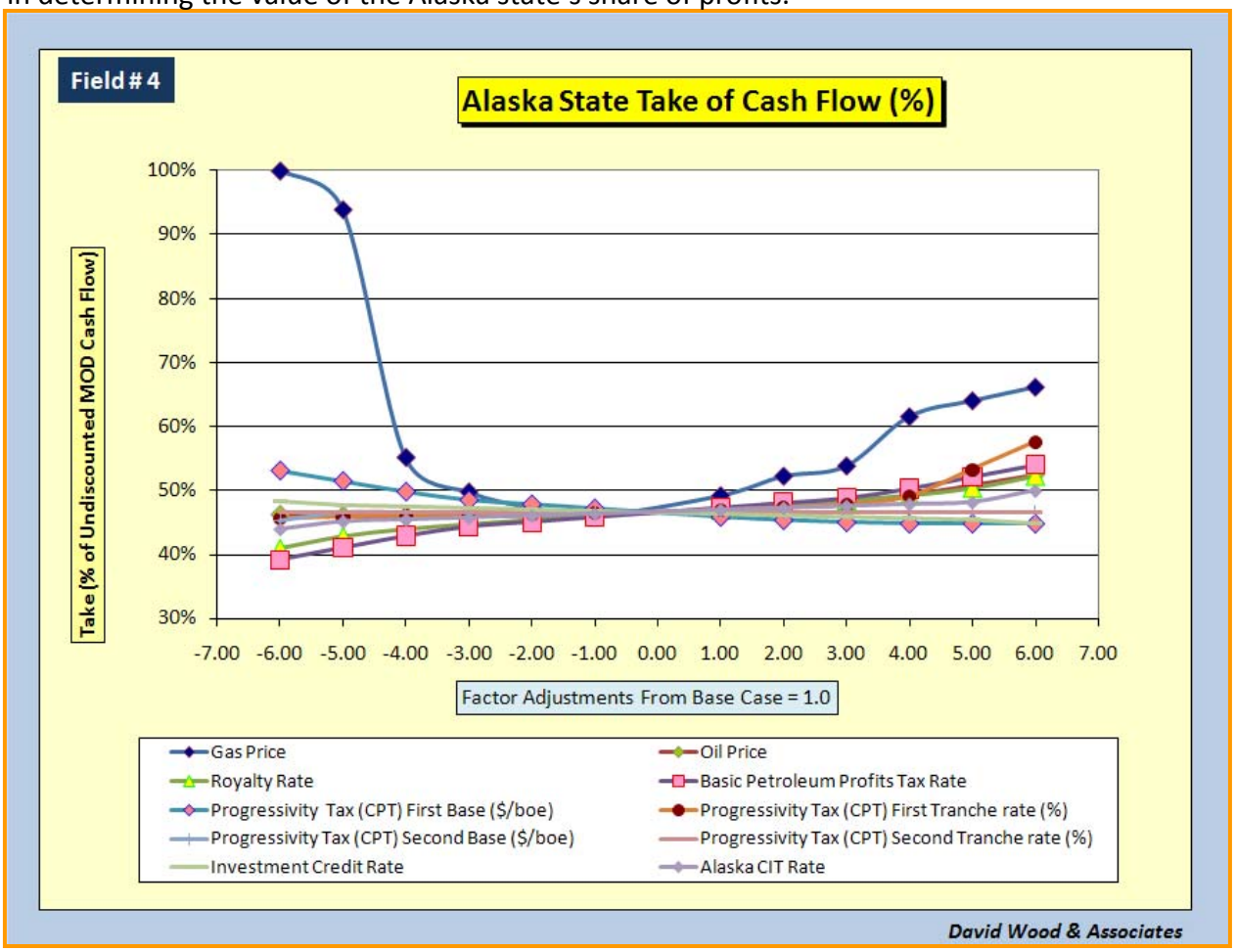

Figure 4.5.15. Spider diagram for sensitivity of Alaska state take (%) reveals that CPT rates and threshold values have the greatest impact on this variable, together with gas price and BPT rate for gas field #4. Smaller gas fields show similar trends, but regressive gas price impacts become more pronounced at low prices (e.g. gas field #1 see Appendix 5).

Changes to individual fiscal elements have relatively minor influences on the unit value of Alaska state share relative to gas and oil prices. For the oil fields studied oil price is the dominant influence on Alaska state take (NPV real US$/boe). In order to focus on the impact of the fiscal instruments Figure 4.5.17 repeats Figure 4.5.16 with the gas and oil price trends removed. It is clear from Figure 4.5.17 that varying BPT rate and the PTV per-unit boe at which the first tranche of the CPT tax applies are the two fiscal elements that have the greatest impact on Alaska's fiscal take. However, once the first tranche CPT rate reaches 0.75% then further increases dramatically increase Alaska's take. It is for this reason that detailed sensitivity analysis described in Section 4.6 focuses on production tax and progressivity.

More detailed sensitivity analysis in the form of scenarios for alternative fiscal designs (i.e. combinations of rate changes, alternative structures for progressivity taxes, and the addition of new fiscal instruments and incentives) is required to highlight the benefits and shortcomings of certain designs. The single-element sensitivities presented here are just a first step to more detailed sensitivity and scenario analysis of specific alternative fiscal designs.

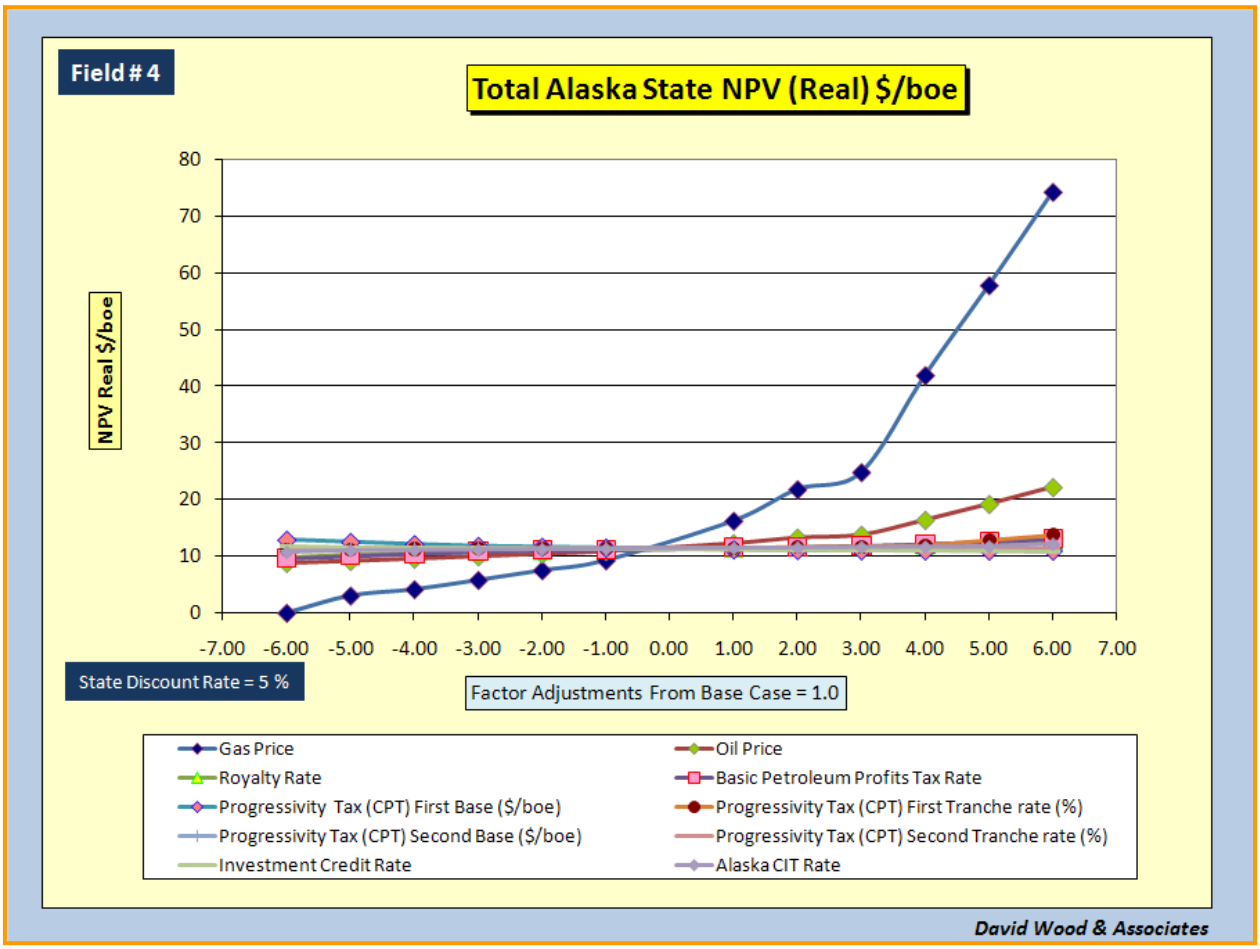

Figure 4.5.16. Spider diagram for sensitivity of Alaska state take (NPV real US$/boe) illustrates that gas price, and to a much lesser extent oil price, have the greatest influences on the boe unit value of the state's take.

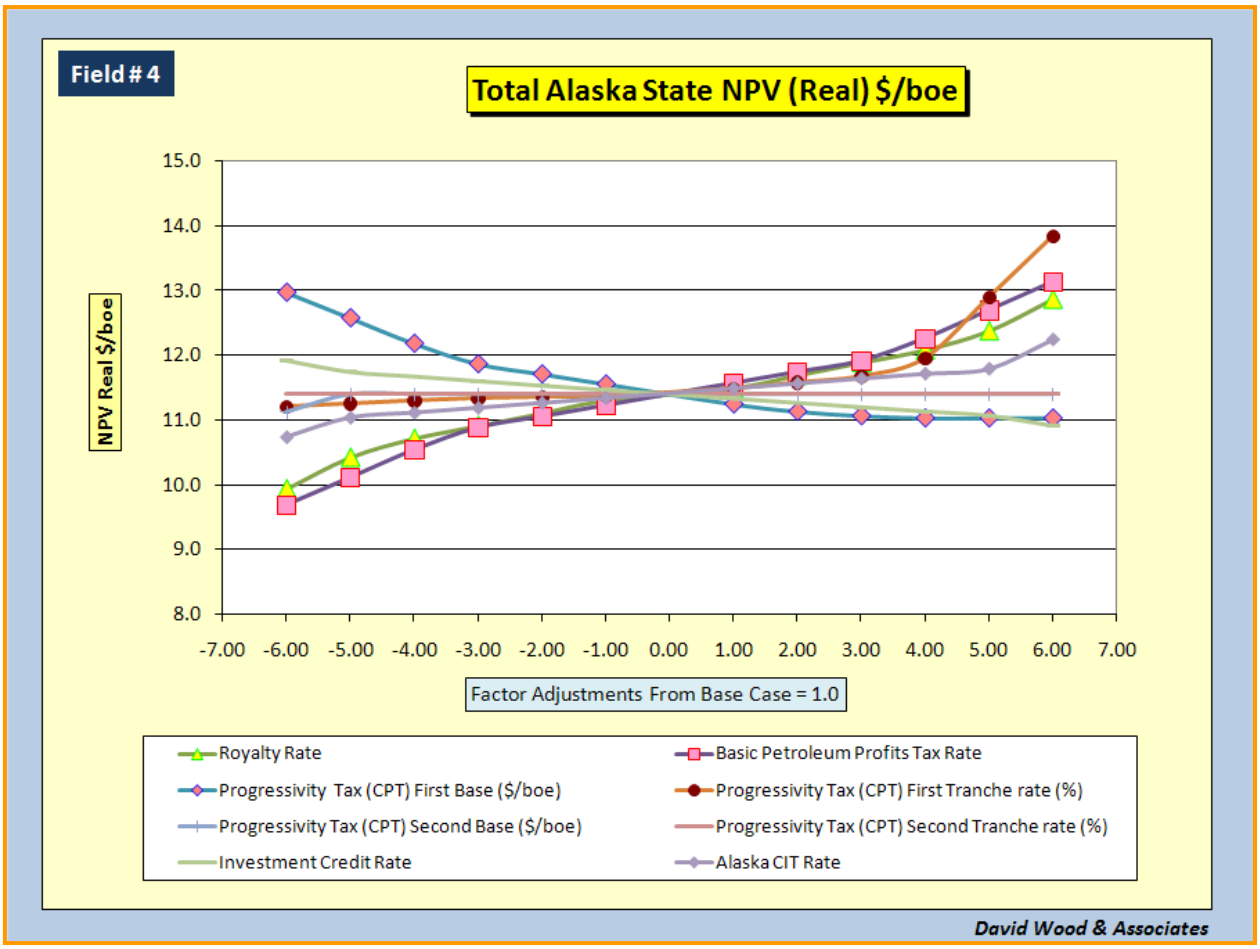

Figure 4.5.17. Spider diagram for sensitivity of Alaska state take (NPV real US$/boe) for fiscal elements only. Varying the BPT rate, the PTV per-unit boe at which the first tranche of the CPT tax applies and the rate of that tranche are the instruments with the most impact.