Shale Gas Taxation in Poland

Volume 3 - Revised and updated

Includes:

Report by an independent expert
Dr Pedro van Meurs
"Suggestions for shale gas terms in Poland"

June 2012

Contents

1. Introduction

The purpose of this updated report is to contribute to the discussion on the new regime of taxation for shale gas in Poland by presenting specific solutions that could be applied.

The initial report has been issued in May 2012. This is the revised and updated version.

Ernst & Young has been working continuously on the topic of upstream taxation and has already released several reports in that area[1]. In those reports we provided general overview of tax regimes in other jurisdictions with description of the key ingredients of a tax regime for upstream sector that could be implemented in Poland. We also indicated the criteria for selection of the fiscal system for upstream sector in Poland and possible development directions of fiscal regime.

Our conclusions are that the implementation of additional tax or royalty should be based on taxation of profits and a progressive form of taxation, but the prerequisite of the system would be that It takes into account the economics of shale gas projects and possible variations in geology terms. That would meet most criteria for an effective system of taxation which will provide revenue for government and will also attract investors.

Based on the international experience it seems that it is quite difficult to create a framework for a fiscal system that is adapted to the needs of the upstream sector, flexible for external factors, internationally competitive, transparent and simple to administer.

Due to the complexity of shale gas taxation, we have invited for cooperation an international oil & gas fiscal systems design expert - Dr Pedro van Meurs.

This document includes a separate report containing suggestions for shale gas terms in Poland developed by Dr Pedro van Meurs.

Dr Pedro van Meurs during the last 30 years has worked on fiscal oil and gas issues in more than 70 countries worldwide. Together with Barrows Inc., he developed PETROCASH, which is the most comprehensive integrated database and computer model for World Fiscal Systems for Oil & Gas. He is also co-author of the World Rating of Oil and Gas Terms 2011.

We would like to point out that the opinions expressed in the report are opinions of Dr Pedro van Meurs and although for the major part are consistent with our view, they do not represent Ernst & Young opinions.

---

1 E.g. Shale gas taxation In Poland – What are the criteria for the new fiscal regime?, Opodatkowanie gazu łupkowego w Polsce – część 2 – Kierunki rozwoju polskiego systemu opodatkowania wydobycia gazu łupkowego na bazie doświadczeń międzynarodowych (the second volume of Shale gas taxation In Poland – Polish version).

2. Executive summary

This section is a summary of key findings presented in a report "Suggestions for Shale Gas Terms in Poland", June 1, 2012 ("Report") prepared by Dr Pedro van Meurs, an experienced international expert engaged in large number of fiscal regimes studies around the World. The abovementioned Report is dedicated to the Polish shale gas fiscal regime and represents the independent view of Dr Van Meurs.

The Report by Dr Pedro van Meurs presents:

▶ Objectives of new fiscal system,

▶ Polish shale gas geology characteristics,

▶ Current fiscal regime assessment,

▶ New fiscal system suggestions.

Objectives of new fiscal system

Dr Van Meurs assumes that the government of Poland intends to introduce new, competitive and attractive fiscal legislation for shale gas in order to attract sufficient foreign investments to develop shale gas reservoirs in Poland. According to latest rough estimates 5 000 to 15 000 wells would be required to produce shale gas in Poland, leading to capital requirement of approximately $25 to $125 billion.

According to Dr Van Meurs fiscal provisions should not contain unnecessary hurdles for initial investments. Legislation and regulations should be as clear as possible, so investor can make decisions without facing uncertainty about implementation of the fiscal terms. There are several objectives of the new fiscal system:

▶ **Stability.** Stable fiscal systems limits investment risks and increases the competitiveness of the upstream activities.

▶ **Transparency.** Clear rules need to be introduced in order to encourage foreign investors.

▶ **Long term investment promotion**. Reinvestment decision should be made to maximize shale gas production in the subsequent periods.

▶ **Incentives for a large scale investments**.

Unknown geology of Polish shale gas

The most prospective areas for shale gas exploration are Baltic, Lublin and Podlasie basins. However, there is a large variation of geological structures among those basins. The details about geological structures are still unknown (i.e. the depth of the reservoirs could vary from 1 700 to 5 000 meters). Furthermore, the degree of maturation of the shale may also vary significantly across the basins (dry gas, wet gas, shale oil).

Abovementioned geological factors imply a big variation of possible well costs and gas production levels, and therefore upstream business economic conditions. According to Dr Van Meurs it is very likely that a large number of Polish shale gas concessions may only have marginal gas deposits. Some concessions may have wells of average quality and a very few may have very prolific wells.

It is certain that drilling conditions will differ among Polish basins. It implies the need of introducing "adaptive" fiscal systems. In order to achieve the objective of maximizing shale gas production, a very flexible fiscal systems in Poland needs to be applied. Such a system would enable to optimize production from all shale gas plays, including less prospective ones.

Shale Tax model – major assumptions

In order to assess current Polish fiscal regime Dr Van Meurs prepared a financial model which simulates varied upstream projects (assuming different geological conditions). The model projects future cash flows for different shale projects, assuming both:

▶ Maintaining current fiscal terms in Poland and

▶ Introducing advanced shale gas tax regime.

At this time there is very little information about possible shale gas production rates and well costs in Poland. Yet, it can be assumed that there will be considerable variety in production and costs among basins and projects.

In order to simulate shale gas production in Poland, Dr Van Meurs uses production and cost data from actual shale plays in North America. Seven North American wells were selected which represent a wide range of gas and liquid production and costs as well as well depth[2] (Table 1). The wells were selected from the Van Meurs Corporation data base and described in Volume 1 of the study World Rating of Oil and Gas Terms.

Table 1. Selected North American shale gas wells

	Well #1	Well #2	Well #3	Well #4	Well #5	Well #6	Well #7
Name	Barnett – T3	Marcellus	Eagleford	Bossier-core	Marcellus	Montney	Eagleford
Type of resources	Dry	Dry	Dry	Some liquids	Wet	Wet	Wet
Location	Texas	W. Virginia	Texas	Louisiana	Pennsylvania	Alberta	Texas
Total liquids production [Mbbl]	0	0	0	21	97	164	169
Total gas production [MMcf]	1000	2 500	4 000	4 875	3 420	5 457	1 688
Capital expenditures [$M]	2 250	4 100	5 700	7 100	4 200	5 550	5 700
Operating expenditures [$M]	700	2 000	2 000	2 438	3 420	4 639	2 701
Total measured well depth [m]	3 090	4 260	4 650	4 470	4 260	2 900	4 500

Source: Suggestions for Shale Gas Terms in Poland, Dr Pedro van Meurs

Contrary to Poland in North America economics and evaluations are typically done on a well by well basis. In Poland economics would be done rather on a project basis. Nevertheless, Dr Van Meurs uses the well characteristics of North America to prepare a model of a potential shale projects in Poland.

---

2   The well depth is the total measured depth, which is the vertical plus the horizontal depth measured along the well bore.

Dr Van Meurs performed financial and tax calculations for seven potential shale projects (based on 7 typical shale gas wells), as presented in the table below.

Table 2. Basic economics of potential shale gas projects in Poland[3] - (based on geological condition in North America)

	Project #1	Project #2	Project #3	Project #4	Project #5	Project #6	Project #7
Total number of Wells [#]	276	526	526	1 026	526	276	276
Capital expenditures [$/Mm³]	204.77	153.45	157.14	132.70	92.66	84.75	221.57
Operating expenditures [$/Mm³]	35.30	35.30	35.30	34.55	37.20	36.93	37.90
Total expenditures [$/Mm³]	240.07	188.75	192.44	167.25	129.86	121.68	259.47

Source: Suggestions for Shale Gas Terms in Poland, Dr Pedro van Meurs

Apart from key business assumptions mentioned in the previous section, there are also other factors affecting the profitability of the shale gas activities in Poland. The assumptions taken by Dr Van Meurs were as follows:

▶ **Project timing.** Geological, geophysical and geochemical work need to be done and afterwards exploratory drilling and appraisal drilling would be performed. The development phase starts after conducting pilot projects.

▶ **Well costs.** The initial well costs will be very high (400% of average US cost) due to the lack of availability of the drilling services in Poland. However, over the time, drillings will become more intensive in Poland. The economy of scale and competitiveness of the petroleum services would reduce the unit well costs significantly (down to 150% of average US cost).

▶ **Other project costs.** Additional capital expenditures will need to be incurred during the development and production period (e.g. surface facilities, separators, dehydrators, other equipment). Operating costs were assumed at $1 per Mcf equivalent ($35,3 per Mm³).

▶ **Hydrocarbon prices.** Gas price of a standard unit of thousand cubic meter is a 54% of the crude oil price per ton. The price for the crude oil was assumed to be on the $700 level flat. The final sales gas price (both wet and dry) is derived from the further thermal conversions and the transport and processing tariffs. Detailed prices are shown below (Table 3).

Table 3. Hydrocarbon prices

Dry gas [$/Mm³]	Wet gas [$/Mm³]	Crude oil [$/t]	Transport and gas processing tariff [$/Mm³]
342.21	372.42	700.00	35.30

Source: Suggestions for Shale Gas Terms in Poland, Dr Pedro van Meurs

▶ **Geological risk factor.** Due to the specificity of the upstream activities and the complex geology of Polish Basins it is assumed that only 25% of the initial exploration wells will be successful. Even if the first exploration well is successful, there is still considerable risk associated with the appraisal and pilot phase. This was taken into account by adding extra wells to the unrisked cash flow.

The economic analysis includes both "unrisked" and "risked" results. The unrisked results assume that the initial exploration well and subsequent appraisal and pilot project were successful. The risked results assume that in 75% of the cases the initial exploration well was unsuccessful.

---

3 Projects represent wide range of geological conditions found in North America. However, it is probable that shale projects in Poland would differ significantly from what has been experienced in North America.

Evaluation of the current fiscal regime in Poland

Dr Van Meurs performed analysis of the impact of current fiscal system on shale gas exploration and production.

The fiscal impact was assessed by several factors, including:

▶ Government take, calculated as a ratio of total payments to the government to the gross profit of the project.

▶ Internal Rate of Return.

▶ Net Present Value.

▶ Profit/Investment ratio (PIR).

▶ Payout time.

The economic results are presented in unrisked and risked scheme in the Table 4. and 5.

Table 4. Economic results of potential shale gas projects under current Polish fiscal system (unrisked)
- (based on geological condition in North America)

	Project #1	Project #2	Project #3	Project #4	Project #5	Project #6	Project #7
Government take @10% [%]	n/a	80.1	n/a	41.4	31.0	31.5	n/a
Internal Rate of Return [%]	4.1%	11.1%	9.9%	20.1%	26.2%	21.6%	8.3%
Net Present Value @10% [$MM]	-159	70	-9	1 764	1 299	898	-94
Profit/Investment ratio [-]	-0.294	0.049	-0.004	0.394	0.900	0.822	-0.079
Payout time [years]	23.8	17.8	19.4	14.4	12.9	13.7	19.7

Source: Suggestions for Shale Gas Terms in Poland, Dr Pedro van Meurs

The internal rate of return (unrisked) for 7 potential shale gas projects in Poland varies from 4,1% to 26,25%.

Table 5. Economic results of potential shale gas projects under current Polish fiscal system (risked)
- (based on geological condition in North America)

	Project #1	Project #2	Project #3	Project #4	Project #5	Project #6	Project #7
Government take @10% [%]	n/a	n/a	n/a	43.4	32.6	33.7	n/a
Internal Rate of Return [%]	3.3	9.8	8.9	18.1	22.2	18.8	7.2
Net Present Value @10% [$MM]	-52	-3	-31	406	301	203	-45
Profit/Investment ratio [-]	-0.354	-0.009	-0.055	0.352	0.784	0.686	-0.141
Payout time [years]	24.7	18.3	19.9	14.6	13.1	14.0	20.4

Source: Suggestions for Shale Gas Terms in Poland, Dr Pedro van Meurs

The internal rate of return (risked) for seven potential shale gas projects in Poland varies from 3.3% to 22.2%.

Dr Van Meurs states also that the main drawback of the current fiscal system in Poland is orientation towards early revenues ("front end loading"). This would be disincentive for majority of Polish shale plays for which hydrocarbon production profitability would be rather low.

According to the financial projections made by Dr Van Meurs large number of shale gas projects in Poland will be uneconomic under current fiscal regime. That leads to the conclusion that if Polish government wants to achieve a maximum level of gas production, the fiscal regime should provide strong incentives for marginal cases, otherwise large areas of shale gas basins may remain undeveloped.

Recommendations for improvements in the current fiscal system

Dr Van Meurs provides several recommendation of amendments to current fiscal system that might help to attract foreign investors (by changing the fiscal system from "front end loaded" to "back end loaded").

The recommendations for improvements in the current fiscal system in Poland include the following

► **Extraction royalties.** Despite the fact that the extraction royalties might constitute a significant burden during the initial development of the shale gas project, no change in Polish tax system in that matter is recommended.

► **Usufruct fees.** Dr Van Meurs recommends to establish specific, not negotiable fees for exploration, appraisal and exploitation concession.

► **Property tax.** More detailed clarification of the tax calculation might be required.

► **Corporate Income Tax.** However, the tax rate is attractive, there are two factors that influences negatively on the investment decisions:

   a. **Loss carry forward.** At least 10 year loss carry forward period is crucial for upstream activities.

   b. **Depreciation.** Linear depreciation rate for wells at the level of 4,5% detached from the production profile significantly decreases profitability of the upstream projects and is the disincentive for reinvestment activities. A 20% linear or 25% declining depreciation rates are recommended.

Suggestions for new fiscal system

According to Dr Pedro van Meurs' analysis in order to provide rapid and profitable development of the shale gas in Poland it is essential that the cash flow created by the development wells from the initial period can be utilized to pay for drilling of the subsequent wells. Current "front end loaded" fiscal system implies much slower development and, consequently, limited long term government income.

Therefore, is essential to allow investors a fast recovery of capital expenditures incurred on development wells. This will ensure the fastest possible expansion of shale gas production in Poland.

Apart from recommendations for improvements in the current fiscal system (mentioned in the previous section) Dr Van Meurs suggests to introduce additional tax, called Shale Petroleum Production Tax ("SPPT"). SPPT will be additional, flexible burden, which is consistent with the government policy and attracts investors.

The SPPT would be paid quarterly and would be deductible for corporate income tax purposes. In order to maintain its flexible nature, each project should have to be treated separately. This approach, called ring fencing, allows SPPT to have a minimum impact on marginal projects and at the same time to collect significant incomes for government on the most profitable projects.

In the Report Dr Van Meurs analysis two variations of the SPPT:

► **Option 1 - Gross revenue sharing SPPT ("SPPT-GR").**

► **Option 2 - Profit sharing SPPT ("SPPT-PS").**

The tax rates calculated by Dr Van Meurs are only indicative. However, they are correct within order of magnitude.

Option 1 - Gross revenue sharing SPPT ("SPPT-GR")

According to Dr Van Meurs in order to provide incentives for reinvestment SPPT should be set on the very low level until 2028 (and later for first 6 years after the start of gas productionon each concession). During that period. A proposed tax level is 2% of value of shale gas (and/or oil) produced.

For the SPPT-GR, starting from the first year after the "tax holiday" period, would be determined as follows:

Tax percentage = Volume per well percentage + Price percentage

The volume per well percentage would range from 2% to 20% (linear) depending on the average well production (from 8 000 to 16 000 Mm³/daily). The average well production is the total production from the exploitation concession divided by the total number of wells in the exploitation area. For the expensive, deep wells the average well production bracket would be adjusted (multiplied by adjustment factor). If the average depth of the wells drilled in the exploitation concession is above 4 000 meters deep the adjustment formula would be determined as follows:

Adjustment factor = Total Average Well Depth / 4 000

The maximum adjustment factor would be 2 for a well of 8 000 meters or more.

The price percentage would be based on the linear scale between a negative -20% and +20% based on a minimum and maximum price of the gas and oil (Table 6). The price would be adjusted annually according to the consumer price index.

Table 6. Hydrocarbon prices for SPPT-GR calculation

	Minimum price	Maximum price
Gas [$/1000 m³]	150,00	550,00
Oil [$/ton]	700,00	1 150,00

Source: Suggestions for Shale Gas Terms in Poland, Dr Pedro van Meurs

In conclusion, for the SPPT-GR the minimum tax rate would therefore be 2% and maximum would be 35%, although due to the declining production profile it is unlikely that the total average share would at any time exceed 30%.

Option 2 - Profit sharing SPPT ("SPPT-PS")

For the second variation, Profit sharing SPPT ("SPPT-PS"), the share of the profits would be based on an R-factor determined as follows:

R = Cumulative gross revenues / Cumulative capital and operating expenditures

Dr Van Meurs suggests SPPT tax rates as follows:

Table 7. Tax rates for SPPT-PS calculation

R factor	Tax rate
R < 1.2	0%
R = 1.2	5%
1.2 < R < 2.5	linear increase from 5% to 30%
R >= 2.5	30%

Source: Suggestions for Shale Gas Terms in Poland, Dr Pedro van Meurs

According to Dr Van Meurs, the profit share would be determined by the operator at the level of the exploitation concession and would not be separate for each joint venture partner. Therefore any farm ins or other cost allocations among joint venture partners would have to be dealt with in the joint operating agreement.

SPPT Credits

Dr Van Meurs recommends introducing credits against the SPPT. These additional fiscal tools will be dedicated for five purposes:

▶ Encouraging environmental practices.

▶ Ensuring that the influence of SPPT on marginal exploitation concessions is minimal,

▶ To encourage geological, geophysical and geochemical exploration anywhere in Poland,

▶ To provide a recovery of dry hole costs regardless of whether these costs could be deducted from corporate income tax or not, and

▶ Encourage early development of the shale gas in Poland.

There would be an SPPT credit cap based on $50,000 per well per year in the exploitation area. Within this limit, the concession holder can charge 50% of the allowed costs. All companies shall pay a minimum SPPT based on net acreage granted initially as exploration concession prior to July 1, 2012. The minimum SPPT shall be 100,000 PLN per net square km of acreage held (amount adjusted for inflation). The minimum SPPT shall be reduced by 3 PLN for every m³ net gas production of such company from a given concession during the previous calendar year.

New fiscal system suggestion – Impact on shale gas projects economics

The assumptions of the new fiscal system were applied to the financial model. Dr Van Meurs presented the results of the analysis in his Report. The results for two variants of SPPT are shown below.

Table 8. Economic results of potential shale gas projects in Poland under new fiscal system – SPPT – Gross Revenue in USD (unrisked) - (based on geological condition in North America)

	Project #1	Project #2	Project #3	Project #4	Project #5	Project #6	Project #7
Government take @10% [%]	n/a	62.1	92.3	51.1	36.9	42.0	n/a
Internal Rate of Return [%]	4.9	12.2	10.3	19.3	25.8	20.8	9.2
Net Present Value @10% [$MM]	-134	133	29	1 473	1 188	760	-41
Profit/Investment ratio [-]	-0.247	0.093	-0.014	0.329	0.823	0.696	-0.035
Payout time [years]	22.3	16.7	18.7	14.1	12.8	13.6	17.8

Source: Suggestions for Shale Gas Terms in Poland, Dr Pedro van Meurs

Table 9. Economic results of shale gas projects in Poland under new fiscal system – SPPT – Profit Share in USD (unrisked) - (based on geological condition in North America)

|	Project #1	Project #2	Project #3	Project #4	Project #5	Project #6	Project #7
Government take @10% [%]	n/a	59.2	74.8	39.7	39.6	41.6	n/a
Internal Rate of Return [%]	4.9	12.4	11.1	21.5	26.1	21.3	9.5
Net Present Value @10% [$MM]	-132	143	97	1 816	1 136	765	-26
Profit/Investment ratio [-]	-0.245	0.100	0.045	0.405	0.788	0.700	0.022
Payout time [years]	22.2	16.4	17.7	13.8	12.6	13.4	17.2

Source: Suggestions for Shale Gas Terms in Poland, Dr Pedro van Meurs

Data presented above indicates that two systems would behave in a similar manner for seven different business cases. The SPPT based on Gross Revenues is slightly more favorable for two most marginal projects, while the SPPT based on Profit Sharing captures better additional profits from the most profitable fields.

The chart presented below compares IRR for projects developed under those two fiscal systems

The Report states also that, under high prices, the price sensitive component of the SPPT based on Gross Revenues performs better for government than the R-factor since the price sensitive component is more directly price linked. The SPPT based on Gross Revenues is more price progressive than the R-factor and therefore the IRR drops slightly under high prices compared to the SPPT-PS.

Chart 1. Internal Rate of Return for shale gas Projects in Poland
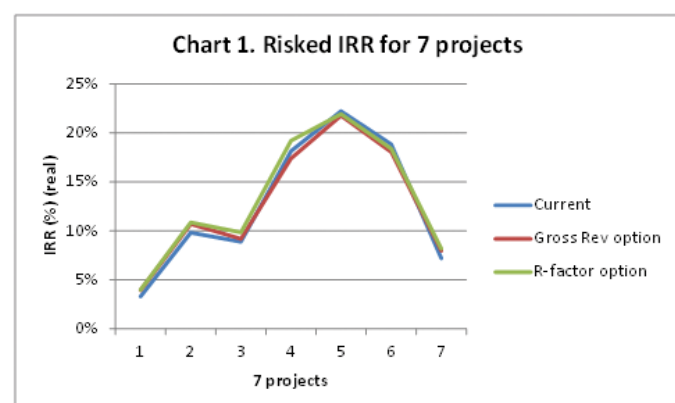
Source: Suggestions for Shale Gas Terms in Poland, Dr Pedro van Meurs

New fiscal system suggestion – Impact on Government Take

The Government Take is calculated over the duration of the project as follows:

$$GT = \text{Total Payments do Government}/(\text{Total Gross Revenues-Total Expenditures}) * 100\%$$

The analysis indicate that, on average, these two options provide for similar government take levels. The SPPT–GR results in less government take in the most profitable cases, since it is not profits based.

The level of Government take depends both on profitability of the project and discount rate applied (respectively undiscounted, 5% and 10%).

Table 10. Government take under SPPT-GR

[%]	Project #1	Project #2	Project #3	Project #4	Project #5	Project #6	Project #7
Government take @0%	32.9%	28.3%	33.6%	36.7%	29.9%	33.6%	28.6%
Government take @5%	n/a	36.3%	45.8%	42.3%	32.8%	36.6%	42.1%
Government take @10%	n/a	62.1%	92.3%	51.1%	36.9%	42.0%	n/a

Source: Suggestions for Shale Gas Terms in Poland, Dr Pedro van Meurs

Table 11. Government take under SPPT-PS

[%]	Project #1	Project #2	Project #3	Project #4	Project #5	Project #6	Project #7
Government take @0%	32.1%	29.3%	31.0%	33.2%	37.0%	37.3%	29.1%
Government take @5%	n/a	36.0%	39.2%	34.9%	37.5%	38.3%	40.0%
Government take @10%	n/a	59.2%	74.8%	39.7%	39.6%	41.6%	n/a

Source: Suggestions for Shale Gas Terms in Poland, Dr Pedro van Meurs

It should be noted that Government Take remains in the similar level in both options. Undiscounted Government Take varies from 28% to 37%. Government Take discounted @10% rises to about 37-92% depending on project economics (at 10% discount rate some shale gas projects remain uneconomic).

Under high prices SPPT based on Gross Revenues performs better for government than the R-factor since the price sensitive component is more directly price linked.

Under the SPPT based on Gross Revenues the investor is better rewarded for efficiency. Therefore this system provides a higher incentive to introduce new technology and make operations lower costs.

EY comment on proposed tax system changes

EY generally agrees with the recommendation of Dr Van Meurs regarding:

▶ Goals of tax system for shale gas exploration,

▶ Main structure of proposed SPPT tax and

▶ Methodology proposed by Dr Van Meurs to calculate tax rates.

However, we believe that tax rates indicated by Dr Van Meurs should be treated as indicative only and should be subject to detailed analysis.

New fiscal system suggestion – Summary

Both fiscal systems (Gross Revenues and Profit Sharing) would achieve the objective of ensuring significant investment in Poland and a rapid expansion of the gas production. The two systems are highly similar from a performance point of view.

Nevertheless, it can be recommended to adopt the SPPT based on Gross Revenues system because this system will be much easier to administer.

Both fiscal systems can be optimized further to provide for better overall performance for government and investors after more detailed analysis and with possible minor modifications to the systems and possible additional features.

Nevertheless, it can be recommended to adopt the SPPT based on Gross Revenues system because this system will be much easier to administer. Production information can be completely automated and electronic reports about the level of production can be automatically send to the SPPT collectors. Payments to government can be largely automated.

The SPPT based on Profit Sharing requires a considerable staff of government officials. Quarterly sign off of the preliminary profit share reports will require considerable attention. In fact, it may be required to have day-to-day cost monitoring in some of the larger concessions. Detailed audits have to be carried out. Another drawback of that system would have to be implemented immediately, since costs are already being incurred in the shale gas concessions.

The main benefit of the R-factor system would be that if shale gas operations turn out to be really profitable, the amount of revenues would be somewhat higher. Therefore it is important to have a sharing formula in place which results automatically in a higher share for government in case of favorable circumstances. However, in Poland, the SPPT can be adjusted upward by amending the legislation.

The main objective in the near and medium term is to get large scale shale gas activity going on the basis fiscal terms that ensures profitability for the widest range of shale gas projects. The SPPT based on Gross Revenues can, with the appropriate credits, ensure that the widest possible range of marginal gas projects will be economic.

The suggestions for new fiscal system must be treated as comprehensive solution – using only some elements of the described fiscal system while skipping others might be even detrimental to the development of shale gas in Poland.

3. Next steps

Due to the fact that the Polish shale gas sector is in the early stages of development, in our opinion, it should be possible to adjust fiscal terms to the high capital intensity and the unknown risk of the shale gas investment projects.

In our opinion, implementation of the new shale petroleum tax, regardless of its formula, will require a well-designed new law as a special act which will govern all regulatory issues. The special act should be well adapted to the fiscal system being currently designed.

It is necessary to point out that Dr Pedro van Meurs has made some suggestions as to clarification of the current fiscal terms and suggested two solutions for the shale gas specific regime that may be considered (a gross revenue sharing SPPT and a profit sharing SPPT). All of these suggestions should they be implemented in the Polish fiscal system will require specific steps and decisions to be made.

First of all a "special act" will need to be drafted and designed so as to cover the shale gas specific issues as far as possible in one well designed, internally cohesive regulation. Although in this report we are focusing mainly on the fiscal regime, the special act may also cover a plethora of regulatory issues, such as facilitation of sharing concessions with business partners.

In fiscal terms, the special act should contain all the definitions and formulas necessary to calculate the tax correctly, including the provisions on when from which start date or event the SPPT will be applicable.

The gross revenue sharing SPPT, would be slightly easier to draft into a law, as it will mostly be based on objective factors, i.e. volume per well, price component both adjusted by the average well depth factor. In order to measure the level of production there measurement point(s) in the exploitation concession. The only discussion would be about whether the meters at the well head should be taken into consideration or rather the meters at the point where gas left the area for transport directly, as depending on the size of the well pad these may differ (e.g. losses). There would be a need to set up the rules how the authorities may control the level of productions, e.g. check meters occasionally, rely on reports that are certified etc.

Similarly with the other factors i.e. number of wells and their depth – this data is quite objective and it would only need to be verified, what level of external audit procedures would be required and whether independent reports would be enough.

The price component in the gross revenue sharing SPPT would be slightly more complex – it should be the fair market value, less any transport costs, processing costs, conditioning costs and quality differentials.

The issue is how exactly we should determine the fair market value of gas taking into account that in Poland there is no gas market price at the moment?

Determination of the price will also have to be crucial for the profit sharing SPPT.

The implementation of the profit sharing SPPT will have also other hard parts, i.e. determination of costs and its allocation rules (ring fencing per concession).

Although a good and precise law introducing the a gross revenue sharing SPPT or a profit sharing SPPT should be pretty much a standalone regulation, in order to implement the changes, adaptation of a number of laws may be required, these include:

▶ CIT Act – CIT Act will require changes concerning the depreciation schemes for upstream assets, as well as changes to the loss carry forward rules; deductibility of the SPPT against CIT.

▶ Act on local taxes or even Construction Law – however, it would be best if the scope of Property Tax taxation for upstream business was also clearly defined in the Special Act, giving more transparency and stability for investors.

With the development of the Polish shale gas sector it may appear that due to technological progress or better knowledge of geological conditions, the terms of new shale petroleum tax should be adjusted to other circumstances. Therefore, in our opinion, it will be crucial to periodically review the new shale petroleum tax.

4. Comments of international oil & gas investors

The report has been reviewed by the international oil and gas investors in Poland. Below is the note prepared by the investors with initial comments to the report.

The Report by Dr Pedro van Meurs has been subject to an initial review by some of the international oil and gas investors ("the Investors") in Poland. The Investors do not endorse the proposals but stated that Dr van Meurs' analysis was helpful in demonstrating some of the major challenges faced by international investors in Poland.

Convergence with the Report

The Investors also agree with several of the major points made by Dr van Meurs and EY including:

▶ Shale gas is far less profitable than conventional oil and gas because of low gas volume per well and high unit costs

▶ Costs of operating in Poland are higher than in developed oil and gas regions such as the US

▶ The need to design a system to attract sufficient capital to develop the resource to its maximum potential

▶ The importance of legislation that is clear, to reduce uncertainty

▶ The importance of streamlining and clarifying the regulatory regime

▶ The importance of risk-based economics for investment decisions

The Report supports the Investors' view that the economics for Polish shale gas are extremely challenging and the majority of projects are likely to be, at best, marginal.

The Investors also noted that the Report demonstrates that the Government take is significantly higher than the headline tax rate and can range from 30% to 100% under the current regime.

The Investors are supportive of the Polish government restructuring its regulatory regime to enable shale gas development.

Divergence from the Report

The Investors commented that the Report underestimates both the impact of risk on investment decisions and the rate of return required to compensate for the high degree of risk.

The combination of risks, including the geological risk, the long time scale, the drilling challenges, the poor well productivity, marginal economics, gas price uncertainty, and the need to establish a highly competitive supply chain, is a significant obstacle to long-term, profitable shale gas development.

The geological basin is considered marginal and evidence thus far indicates that it will be difficult to achieve an economic development case under the existing fiscal regime. With higher Government take, marginal projects will become non-commercial to the investor and will not be developed.

The Investors have been surprised by the SPPT proposals in this report and recent information in the press that indicates high rates of hydrocarbon tax. These terms are significantly different than those offered at the initial investment stage and appear to be out of touch with the geological and economic reality.

The progressive nature of the proposed SPPT removes the potential for upside profitability. As a result it removes a strong incentive for industry to take the exploration risk and make the capital investments required to develop a challenging basin.

Without a highly supportive fiscal regime to encourage investment, there is a high likelihood that large areas of the shale gas basin will not be explored or developed.

Recommendations

Investors look forward to discussing proposed changes directly with government working groups prior to the finalization of a draft law. Investors believe that this will help ensure that a successful outcome is achieved.

Assuming the objective is to attract capital to develop the resource to its maximum potential, the Investors would propose a simple and modest reform to the existing system:

1. **Clear, simple and efficient regulatory framework**

   ▶ The right for the holder of the exploration concession to develop the hydrocarbons it may discover, having taken the exploration and investment risk

   ▶ Equal recognition of all venture participants in the mining usufruct

   ▶ Streamlined and flexible permitting process

2. **Simple, stable, predictable and unbiased fiscal regime**

   ▶ Limiting fiscal risk

   ▶ Encouraging confidence and long term investment

   ▶ Attracting new investment

   ▶ Easy to administer

   ▶ Avoid field-based or ring-fenced taxation

   ▶ An appropriate burden that reflects the geological and economic reality and low rates of return

3. **Retain and improve the existing corporate income tax system**

   ▶ Profits based taxation limits the distortion to project economics and reduces the risk of suboptimal investment decisions

   ▶ Front end loaded taxes such as asset taxes and royalties by contrast can render potentially economic projects, uneconomic

   ▶ Unlimited loss carry forward – consistent with international best practices

   ▶ Accelerated tax depreciation – to match the rapid depletion rate of shale gas wells and reflect the ongoing capital intensive nature of the industry

4. **Adaptation of Royalty and Real-Estate tax to the shale hydrocarbon dynamic**

   ▶ The production royalty could be adjusted as has been done for coal bed methane

   ▶ The real estate tax should be restricted to depreciated asset value of above ground assets

   ▶ The introduction of a credit for real estate tax against corporate income tax or royalties

The Investors would like to emphasize their willingness to participate in consultation during the development of a draft law.

5. Suggestions for Shale Gas Terms in Poland

Dr Pedro van Meurs, June 1, 2012
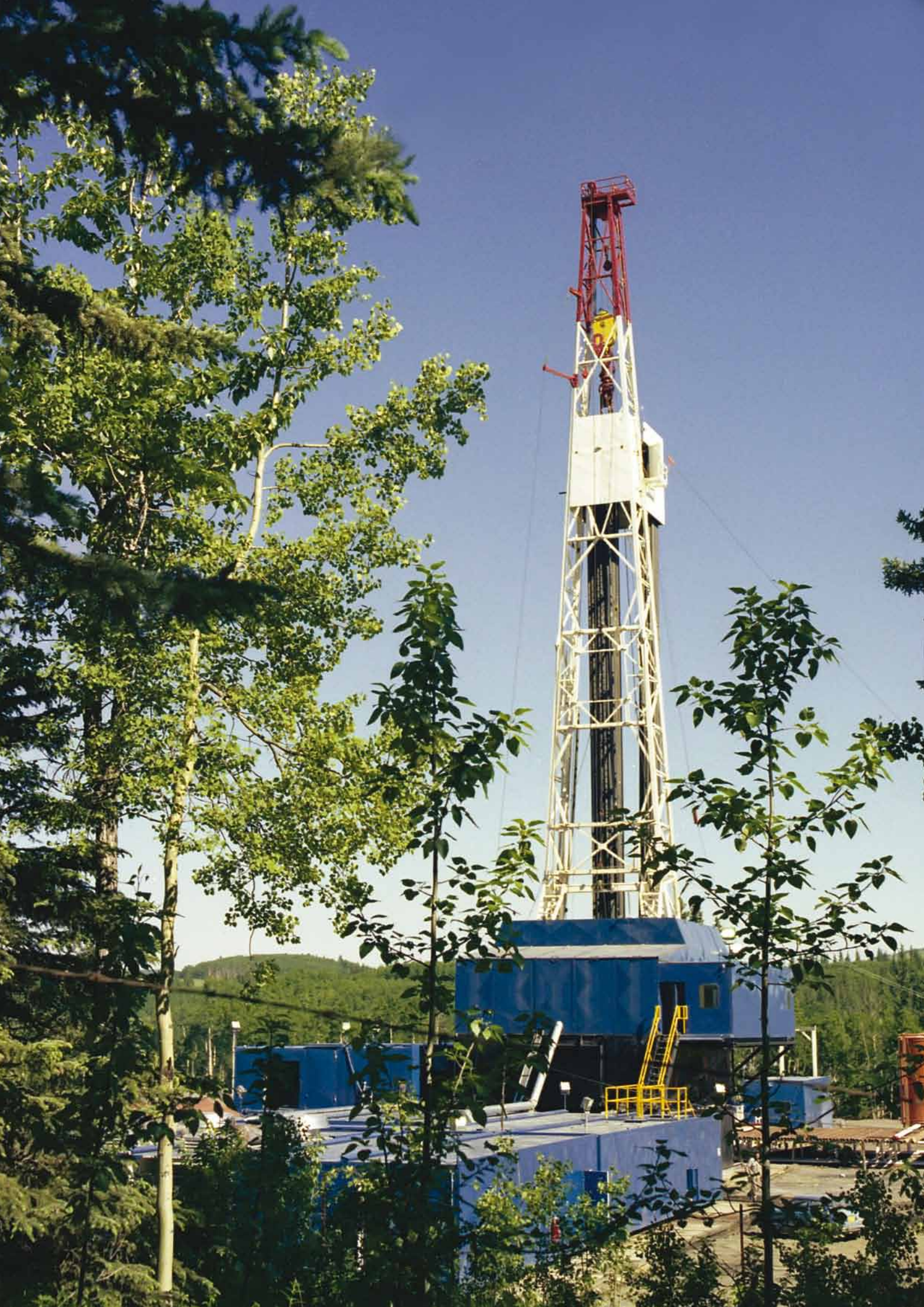
5.1. Introduction

This report is prepared at the request of Ernst & Young, Warsaw, Poland in order to serve as background for current discussions regarding a new fiscal regime for shale gas in Poland. However, the entire report represents my independent views as a fiscal advisor to governments.

Based on recent evaluations Poland may have 346 to 768 billion m³ of recoverable shale gas. The policy of Poland is to encourage the production of this gas as soon as possible on a significant scale.

Using typical international well productivities, it may require 5 000 to 15 000 wells to produce this gas over the next 40 years. Total capital requirements may be in the order of $ 25 to $ 125 billion. Poland will have to attract large scale foreign investment in order to be able to commit such large amounts of capital. This means the fiscal system for shale gas needs to be competitive and attractive to investors. Fiscal provisions should not contain unnecessary hurdles for initial investment and for re-investment in the expansion of the production. Legislation and regulations should be as clear as possible, so investor can make decisions without facing uncertainty about implementation of the fiscal terms. Also the regulatory system should permit an efficient and rapid implementation of activities by investors.

The government of Poland intends to introduce new fiscal legislation for shale gas. This report provides a scoping of possible terms based on discussion with the Ministries of Finance, the Treasury and Foreign Affairs of Poland and the petroleum industry.

Prior to discussing these terms the geological and technical information will be reviewed.

5.2. Geological and technical framework

It is likely that most of the economic shale gas resources will be contained in three main basins: the Baltic Basin, Lublin basin and the Podlasie Basin. There is a very large variation in the basic framework for shale gas. The depth of the reservoirs could be from 1 700 to 5 000 meter. This means that there will be a very large variation in well costs. The organic matter content of the various shale formations varies considerably, which means that uneconomic, marginal as well as prolific wells may be encountered. The degree of maturation of the shale also varies across the various basins, which means dry gas, wet gas and even shale oil is present in the shale formations.

The shale rocks vary widely in their geological characteristics. This indicates that in some areas it may be possible to successfully frack the formations and get good gas production while in other areas gas or oil may not flow to the well. Large and numerous fault zones cut through the formations in the basins, which may affect the ability to drill long horizontal sections. This in turn may reduce well production and profitability.

In total 109 shale gas exploration concessions have been granted over 92 764 km2. It is likely that a large number of these concessions will not have economic shale gas. Many of the concessions may only have marginal gas deposits.

Some concessions may have wells of average quality and a few may have very prolific wells. Therefore, in order to achieve the objective to maximize shale gas production, a very flexible fiscal systems needs to be introduced which makes a wide variety of gas deposits economic. The system should provide for a low fiscal burden on marginal gas wells and could have a tougher burden for the prolific wells. This will ensure maximum gas production and create a high level of activity and employment. Unfortunately, such a system will be more complex than a simple flat royalty or profit share.

5.3. Current fiscal terms

There is some uncertainty about the precise determination of some of the fiscal terms in Poland. However, for economic analysis, it was assumed that the fiscal system would be as described below.

Mining Usufruct Fees. Usufruct fees are payable upon the granting of an exploration concession, an appraisal concession and an exploitation concession. These fees are negotiated. For modeling purposes it was assumed that $ 148 000 would be payable upon the grant of the exploration concession, $ 200 000 upon the grant of the appraisal concession and $ 500 000 upon the grant of the exploitation concession.

Exploration and appraisal fee. For shale gas these fees are PLN 211.62 ($ 67.72) per square kilometer for a one time fee payment upon the approval of the exploration and the appraisal area.

Extraction royalties. Extraction royalties for oil are PLN 34.89 per ton ($ 11.16 per ton). For high methane gas the royalties are PLN 5.89 per 1 000 m³ ($ 1.88 per 1 000 m³). For low methane gas the royalties are PLN 4.90 per 1 000 m³ ($ 1.57 per 1 000 m³). The high methane gas amounts are used for shale gas. Coal bed methane has an extraction royalty of 0.

Property tax. There is a property tax of 2% each year of the original value of assets which are plants, facilities and fixed equipment. Buildings are taxed at a low rate per square meter.

Corporate Income Tax. The tax rate is 19%. Geophysical and geological costs can be expensed. Dry holes can be written off as a loss. Successful exploration wells and development wells were assumed to be depreciated straight line at 4.5% from the date such assets are in active use. There are various depreciation rates for facilities. An average depreciation of 10% from the date such assets are in active use was assumed. Abandonment costs can be expensed. Losses can be carried forward for 5 years. However, only 50% of a past loss can be written off in any year. Therefore, a past loss has to be recovered over two years, if at all possible.

Other taxes. Other taxes, such as possible import duties, sales taxes or unrecovered VAT were not taken into account in the modeling.

5.4. Economic assumptions

General model

At this time there is very little information about possible shale gas production rates and well costs in Poland. Yet, it can be assumed that there will be considerable variety in production and costs. In order to simulate this situation, it is best to compare with well results in North America. Seven North American wells were selected which represent a wide range of gas and liquid production and costs as well as well depth as provided in Table 1.

The well depth is the total measured depth, which is the vertical plus the horizontal depth measured along the well bore. The wells were selected from the Van Meurs Corporation data base and described in Volume 1 of the study World Rating of Oil and Gas Terms. Contrary to Poland in North America economics and evaluations are typically done on a well by well basis. In Poland economics would be done on a project basis. Nevertheless, we can use the well types of North America to make a model for hypothetical projects in Poland.

Table 1. Selected North American shale gas wells

	Well # 1	Well # 2	Well # 3	Well # 4	Well # 5	Well # 6	Well # 7
Name	Barnett-T3	Marcellus	Bagleford	Bossier-Core	Marcellus	Montney	Eagleford
Type of resources	Dry	Dry	Dry	Some liquids	Wet	Wet	Wet
Location	Texas	W. Virginia	Texas	Louisiana	Pennsylvania	Alberta	Texas
Total liquids production (thousand bbls)	0	0	0	21	97	164	169
Total gas production (Million cubic feet)	1 000	2 500	4 000	4 875	3 420	5 457	1 688
Capital expenditures (thousand $)	2 250	4 100	5 700	7 100	4 200	5 550	5 700
Operatina expenditures (thousand $)	700	2 000	2 000	2 438	3 420	4 639	2 701
Total measured well depth (meters)	3 090	4 260	4 650	4 470	4 260	2 900	4 500

Based on these seven well types, seven typical projects were modeled based for conditions in Poland. All production data were converted to thousand cubic meters and tons.

Project timing

Table 2 illustrates the time frame of development assuming an exploration concession was granted on January 1, 2012. First geological, geophysical and geochemical work needs to be done. Subsequently exploratory drilling and appraisal drilling takes place. Then pilot projects are created. Finally development starts.

It is assumed that 20% of the development wells would be dry. Actually, there are few really "dry wells" in a shale play. However, due to fracking problems, fault zones or other technical problems several wells will produce less than the planned production.

Well costs

Initially costs will be very high because drilling rigs and drilling services will not be easily available and need to be mobilized and demobilized. It is therefore estimated that exploration wells will cost about 400% of North American wells, which means initial exploration wells will have a cost in the range of $ 9 to $ 29 million. Over time, as drilling becomes more intensive in Poland, costs will come down because drilling and petroleum services become more readily available and costs will be more competitive.

During the development stage, wells can be drilled one after another and fracking can also be done in sequence. This reduces costs significantly. However, it is likely that in Poland well costs will always be somewhat more expensive than in North America. Therefore, well costs during the last phases of development may still be 150% of North American costs. The wells costs as a percentage of North American costs are also indicated in Table 2.

For modeling purposes three different sizes of projects were assumed, with 276 526 and 1 026 wells.

It is possible that a significant share of the shale gas in Poland may be in one or two profitable projects. Therefore, Table 3 includes a large project example. However, due to the enormous variability of the geology it is more likely that most projects in Poland will be in the range of 100 to 500 wells.

Table 2. Timing of geophysical work and number of wells drilled in each year

Year	Project # 1	Project # 2	Project # 3	Project # 4	Project # 5	Project # 6	Project # 7		Cost level
2012	0	0	0	0	0	0	0	Geophysical work	
2013	0	0	0	0	0	0	0	Geophysical work	
2014	1	1	1	1	1	1	1	Exploration Well	400%
2015	1	1	1	1	1	1	1	Exploration Well	400%
2016	4	4	4	4	4	4	4	Appraisal Wells	300%
2017	4	4	4	4	4	4	4	Appraisal Wells	300%
2018	8	8	8	8	8	8	8	Pilot Wells	300%
2019	8	8	8	8	8	8	8	Pilot Wells	300%
2020	20	20	20	40	20	20	20	Pre-production development wells	250%
2021	20	40	40	80	40	20	20	Pre-production development wells	250%
2022	20	40	40	80	40	20	20	Development wells	200%
2023	20	40	40	80	40	20	20	Development wells	200%
2024	20	40	40	80	40	20	20	Development wells	200%
2025	20	40	40	80	40	20	20	Development wells	150%
2026	20	40	40	80	40	20	20	Development wells	150%
2027	20	40	40	80	40	20	20	Development wells	150%
2028	20	40	40	80	40	20	20	Development wells	150%
2029	20	40	40	80	40	20	20	Development wells	150%
2030	20	40	40	80	40	20	20	Development wells	150%
2031	20	40	40	80	40	20	20	Development wells	150%
2032	10	40	40	80	40	10	10	Development wells	150%
Total:	276	526	526	1 026	526	276	276		

Total project costs

The total costs for the seven projects are provided in Table 3. The capital expenditures include in addition to the well costs also costs for surface facilities, such as separators, dehydrators and other equipment in order to make gas suitable for transport by pipeline to a gas processing plant or directly to the market. Operating costs were taken at $ 1 per Mcf equivalent or $ 35.3 per thousand m³ equivalent.

Gas price

It is assumed that the gas price of a standard unit of thousand cubic meter would be 54% of the crude oil price per ton. The energy content in this report of a standard cubic meter is based on 1 MMBtu per Mcf. It is assumed that the energy content of wet sales gas would be 1.08 MMBtu per Mcf. In other words 8% is added to the price per 1000 m³ in order to take this extra heating value into account for projects 4 through 7. It is assumed that the transport and gas processing tariff to reach the market would be $ 1 per Mcf or $ 35.3 per thousand cubic meter. This amount is subtracted from the gas sales proceeds. For the base case calculations it was assumed that the crude oil price would be $ 700 per ton. For this crude oil price, the net back value of the gas to the measurement point in the gas project is $ 342.21 per 1000 m³ for dry gas and $ 372.42 per 1000 m³ for wet gas.

Geological Risk Factor

Due to the complex geology of Poland it is likely that only a limited number of projects will be economic. It is assumed that after the drilling of the first exploration well only 25% of the projects will be considered sufficiently attractive to continue further exploration and appraisal drilling. This means 75% of the exploration wells will result in failure. It should be noted that even after drilling a successful exploration well, subsequent appraisal drilling and pilot projects may still result in a project to be abandoned. This subsequent risk is taken into consideration by including in the cash flow about three times the wells for appraisal and pilot projects than may actually be drilled.

The economic analysis includes "unrisked" and "risked" results. The unrisked results assume that the initial exploration well and subsequent appraisal and pilot project were successful. However the unrisked results include the risk of failure or appraisal and pilot projects through the inclusion of additional wells.

The risked results assume that in 75% of the cases the initial exploration well was unsuccessful.

Table 3. Total Project Costs and revenues

		Project # 1	Project # 2	Project # 3	Project # 4	Project # 5	Project # 6	Project # 7
Total liquids production	(million tons)	0.0	0.0	0.0	2.4	6.0	4.8	5.1
Total gas production	(billion m³)	7.7	29.8	43.4	109.3	43.4	32.4	10.3
Gross Revenues	(million $)	2 631	10 212	14 841	41 667	18 893	13 974	6 858
Capital expenditures	(million $)	1 574	4579	6815	14 825	4 583	3 152	3 412
Operating expenditures	(million $)	271	1 053	1 531	3 860	1 840	1 373	584
Total measured well depth	(meters)	3 090	4260	4 650	4 470	4 260	2 900	4 500
Number of wells		276	526	526	1 026	526	276	276
Capital expenditures	($/Thm3e)	204.77	153.45	157.14	132.70	92.66	84.75	221.57
Operating expenditures	($/Thm3e)	35.30	35.30	35.30	34.55	37.20	36.93	37.90
Total expenditures	($/Thm3e)	240.07	188.75	192.44	167.25	129.86	121.68	259.47
Cost/Price Ratio	(ratio)	70.2%	55.2%	56.2%	44.8%	34.0%	32.4%	58.3%

5.5. Economic analysis of current fiscal terms

Economic criteria

The economic analysis is based on 2012 constant US $. The constant dollar cash flow was generated by first creating a nominal cash flow based on 2% escalation and subsequently discounting this cash flow based on an inflation rate of 2%. The Profit/Investment ratio is based on discounted NPV divided by discounted before tax capital expenditures over the total duration of the project. The payout time is calculated from the granting of the exploration concession. NPV and PIR are determined on a 10% discount rate.

The Government Take is calculated over the duration of the project as follows:

$$GT = \frac{\text{Total Payments to Government}}{\text{Total Gross Revenues} - \text{Total Expenditures}} \times 100\%$$

The Government Take is determined undiscounted, 5% discounted and 10% discounted. Investors may typically use 10% to discount cash flows in order to determine whether a project is economic.

It is assumed that the government of Poland would use a 5% discount rate to optimize government income streams. The reason for the lower rate is that the alternative to early revenues from shale gas for Poland is to borrow on the basis of long term bonds. Due to the health of the economy Poland compared to other European nations, the long term bond rate would be well below 7% nominal (5% real). In other words "the cost of capital" to Poland is 5% or less and therefore a discount rate of 5% is a conservative estimate.

Economic results

Based on a minimum 10% real discount rate, table 4 illustrates how projects #1, # 3 and # 7 would be uneconomic on an unrisked basis. On a risked basis table 5 illustrates how project # 2 would also be uneconomic.

Projects # 4, # 5 and # 6 would be rather attractive on a risked and unrisked basis.

As can be easily understood, with costs in the $ 120 to $ 250 per 1000 m^3 equivalent range and prices of $ 342 and $ 372 per 1000 m^3, the economic results are very sensitive to cost and price variation. Under lower prices and higher costs, the results rapidly deteriorate. Under lower costs and higher prices, the results rapidly improve.

It is clear that if Poland wants to achieve a maximum level of gas production, it is imperative to improve the economics of the uneconomic and marginal cases, otherwise large volumes of gas will remain undeveloped.

The economic analysis shows a remarkable difference between undiscounted and discounted government take. Due to the low tax rate on an undiscounted basis, the government take is among the lowest in the world. Yet, mainly due to the excessively slow depreciation for tax purposes for development wells, the 10% discounted government take is much higher. For instance, for Project # 4 (unrisked), the undiscounted government take is 25.4%, while the 10% discounted government take is 41.4%. In other words, for investments in shale gas, the benefit of the low tax rate is completely offset by the disadvantage of the slow depreciation, which creates a relatively unfavorable fiscal regime in total.

This means that the current system of Poland is excessively "front end loaded". The system is oriented towards early revenues from the extraction royalties and corporate income tax.

Table 4. Economic results in constant 2012 US$ (unrisked)

		Project # 1	Project # 2	Project # 3	Project # 4	Project # 5	Project # 6	Project # 7
Total net cash flow	(million $)	481	3 236	4 576	17 141	9 597	7 332	1 988
Net Present Value @10%	(million $)	-159	70	-9	1 764	1 299	898	-94
Profit/Investment @10%	(ratio)	-0.294	0.049	-0.004	0.394	0.900	0.822	-0.079
Internal Rate of Return	(%)	4.1%	11.1%	9.9%	20.1%	26.2%	21.6%	8.3%
Payout time	(years)	23.8	17.8	19.4	14.4	12.9	13.7	19.7
Government Take @0%	(%)	38.7%	29.3%	29.6%	25.4%	23.0%	22.4%	30.6%
Government Take @5%	(%)	n/a	42.7%	45.7%	31.9%	26.4%	25.9%	52.2%
Government Take @10%	(%)	n/a	80.1%	n/a	41.4%	31.0%	31.5%	n/a

Table 5. Economic results in constant 2012 US$ (risked)

		Project # 1	Project # 2	Project # 3	Project # 4	Project # 5	Project # 6	Project # 7
Total net cash flow	(million $)	106	785	1 110	4 245	2 372	1 807	472
Net Present Value @10%	(million $)	-52	-3	-31	406	301	203	-45
Profit/Investment @10%	(ratio)	-0.354	-0.009	-0.055	0.352	0.784	0.686	-0.141
Internal Rate of Return	(%)	3.3%	9.8%	8.9%	18.1%	22.2%	18.8%	7.2%
Payout time	(years)	24.7	18.3	19.9	14.6	13.1	14.0	20.4
Government Take @0%	(%)	41.9%	30.0%	30.2%	25.6%	23.2%	22.7%	31.7%
Government Take @5%	(%)	n/a	45.7%	49.1%	32.5%	27.0%	26.6%	59.6%
Government Take @10%	(%)	n/a	n/a	n/a	42.4%	32.6%	33.7%	n/a

5.6. Fiscal design strategy for Poland

Of fundamental importance to Poland for the design of fiscal terms is the very high cost/price ratio of the shale gas plays in Poland, as illustrated in Table 3. The costs of the best example are 32% of the revenues. The costs of the worst example are 70% of the revenues

This cost/price ratio compares very unfavorably with most current conventional oil and gas projects around the world. Good conventional projects have a cost price ratio of about 10% while poor projects have a cost/price ratio of about 40%, with a typical level of about 20%.

Cost/Price Ratio		
	Best	Worst
Conventional Oil and Gas	10%	40%
Shale Gas in Poland	32%	70%

It will not be possible to make a project with a cost/price ratio of 70% economic. However, unless Poland find ways to make projects of a 55% cost price ratio economic, it is unlikely that there will be significant shale gas development in Poland. Therefore in designing fiscal terms, Poland cannot compare with terms for conventional oil and gas, because the typical cost/price ratio of shale gas will be about two and a half times that of conventional oil and gas.

Instead, Poland should take fiscal systems of unconventional oil and gas developments with a similar high cost/price ratio as a guide. These are, for instance, the fiscal terms for shale gas in Alberta and British Columbia, oil sands in Alberta or coal bed methane in China.

Poland should be able to attract significant investment to shale gas by levering its strong financial position. Poland does not need urgently government income from shale gas to stay afloat as a nation. As indicated before, the national discount rate is 5% or less. Therefore, Poland has the possibility to change the fiscal system for shale gas from a "front end loaded" system to a "back end loaded" system. This means that Poland can permit investors to recover their investment first and reach payout before requiring significant payments to the government of Poland. The system that will best attract investment will be a system that requires only very low payments to government in the first six years of commercial production of a concession. Afterwards, significant payments to Poland could start in order to ensure that the fiscal benefits to Poland are optimized.

In other words the overall strategy would be to first create significant shale gas production with the related employment and economic growth. Subsequently, Poland can extract its fair share of the project benefits. This is the strategy that Alberta employed very successfully in the development of the oil sands, which have a similar cost/price ratio as shale gas in Poland.

5.7. Recommendations for improvements and clarifications in the current fiscal terms

Following are specific recommendations based on the above fiscal design strategy.

Extraction royalties

The extraction royalties are a rather significant burden during the initial development of the shale gas project. Nevertheless no change is recommended.

Usufruct Fees

The concept of negotiating usufruct fees when granting concessions is not in the national interest. Usufruct fees should not be used to extract economic rent. Royalties and taxes should be used for this purpose. The fact that these fees are negotiated has a negative impact on investment, since it creates an environment of uncertainty with respect to the granting of exploration, appraisal and exploitation concessions. In particular the fact that the fee is based on the "value of the resource" and that there does not seem to be a clear procedure as to how this value is determined, creates significant uncertainty. There is no possibility for estimating the amounts involved.

Furthermore, it creates the impression that Poland is trying to get an unfair payment out of investors at the moment when these investors are in a weak bargaining position when applying for an exploitation concession, after having done considerable exploration and appraisal work. This is not the way to promote investment.

However, it is not uncommon to levy fees for granting a concession in order to cover the related administration costs.

If Poland wants to levy some fees for granting concessions, such fees should be specific amounts, for instance $ 100 000 for an exploration concession, $ 200 000 for an appraisal concession and $ 500 000 for a exploitation concession. It can be recommended to establish such specific amounts by law or regulation.

Property tax

A 2% property tax for municipalities is reasonable. It is actually a favorable feature of the fiscal system in Poland for shale gas. It gives local municipalities a direct financial interest in the shale gas operations. This is important in order to overcome what otherwise may become local opposition to the operations.

Nevertheless, it might be useful to clarify the calculation of this tax in more detail. The tax should apply to fixed assets on the surface, but not to holes in the ground or fractures.

Therefore, it might be clarified that the tax would apply to:

▶ Any fixed surface facilities and equipment, such as separators, tanks, dehydrators, field stations, measurement stations and other related equipment used for and related to the production operations, and

▶ Gathering lines and pipelines.

The tax on these wells and facilities should apply regardless of whether this equipment is placed in a building or not.

The tax would not be applicable to the cost of the services of drilling, fracking and logging and the cost of casing and cementing in the well and the related materials and equipment.

Corporate Income Tax

The corporate income tax rate is attractive. However, two features of the corporate income tax are highly detrimental: the loss carry forward provisions and the slow depreciation of wells.

Loss carry forward. A 5 year loss carry forward is a major disincentive for operations that may have a payout time of 13 to 25 years after the granting of a concession.

It should be noted that the loss carry forward system (including the 50% limitations) of Poland is the most restrictive system compared to any nation in the world. It is puzzling to understand what the national interest might be of such draconian obstacles to sustained long term foreign investment. It can be strongly recommended that Poland adopts – as a general tax measure – a loss carry forward period that is more typical of the average of OECD countries. For instance, a 10 years loss carry forward without percentage restrictions would be appropriate.

However, even a loss carry forward of 10 years may not be adequate to stimulate shale gas operations. In addition, a special provision for shale gas should be introduced. This provision would permit shale gas operators to capitalize all geophysical, geological and geochemical expenses, expenses for dry holes and any other pre-production operating costs. The tax payer should then be permitted to deduct these amounts at a moment decided by the tax payer, in effect creating an unlimited loss carry forward for these expenditures. Such a measure will ensure that shale gas operators will be able to reasonably deduct all costs incurred for tax purposes.

The loss carry forward mainly impacts on geological and geophysical as well as dry hole losses. All other capital costs can be depreciated with a depreciation schedule which starts when the asset is in active use. Therefore, it is likely that most capital costs can be recovered. Also it is permitted in Poland to take less than the maximum level, so depreciation streams can be managed to coincide with available taxable income.

In addition to the above mentioned tax improvements, it is recommended to create a special credit against the SPPT to be discussed below.

Slow depreciation. Another provision which is highly detrimental is the excessively slow depreciation for wells of 4.5% per year straight line. This is the slowest depreciation for petroleum wells in the world. It should be noted that a typical shale gas well will produce 50% of the production in the first four years. Therefore, having such a slow depreciation is a major disincentive. It means that only 18% of the cost of the well can be depreciated during the initial four years.

A 20% straight line or 25% declining balance depreciation would be reasonable and consistent with international rates of depreciation. Such rates can be recommended.

The slow depreciation of wells is not in the national interest for two reasons: it inhibits strong re-investment in shale gas production and it is contrary to the above mentioned strategy of back end loading of the fiscal terms.

Table 2 clearly illustrates how shale gas development depends on sustained long term drilling programs. In order to be able to rapidly and profitably develop the shale gas it is therefore essential that the cash flow created by the first set of development wells can be fully used to pay for drilling the subsequent wells. If most of the cash flow is hived off in term of royalties and taxes, the pace of development will slow down considerably and the profitability will be considerably less. It is therefore essential for Poland to permit a fast recovery of investment on development wells. This will ensure the fastest possible expansion of shale gas production.

5.8. Analysis of recommendations for the current fiscal terms

Table 6 and 7 show the results based on a 10 year loss carry forward and 20% straight line depreciation.

The impact of the improvement in these two features is indeed very remarkable. Projects # 2 and # 3 are now economic on an unrisked and risked basis.

The discounted government take is now much lower. For instance, for project # 4 the 10% discounted government take is now 31.3% instead of 41.4%. As a result the benefit of the low tax rate of 19% is now being felt more strongly.

It is therefore that it can be anticipated that these fiscal improvement will strongly encourage the marginal shale gas projects. Since most of the projects can be anticipated to be marginal this will be a strong support for the highest possible gas production.

Table 6. Economic results for recommended royalty and CIT terms in constant 2012 US $ (unrisked)

		Project # 1	Project # 2	Project # 3	Project # 4	Project # 5	Project # 6	Project # 7
Total net cash flow	(million $)	565	3 510	4 963	17 954	9 889	7 507	2 168
Net Present Value @10%	(million $)	-132	163	128	2075	1399	973	-16
Profit/Investment @10%	(ratio)	-0.244	0.113	0.060	0.464	0.971	0.891	-0.013
Internal Rate of Return	(%)	5.0%	12.6%	11.4%	22.2%	27.5%	22.7%	9.7%
Payout time	(years)	22.2	16.4	17.7	13.8	12.6	13.4	17.2
Government Take @0%	(%)	30.9%	25.1%	25.5%	22.9%	21.4%	20.8%	25.1%
Government Take @5%	(%)	100.0%	31.9%	33.8%	25.9%	23.0%	22.5%	35.7%
Government Take @10%	(%)	n/a	54.1%	67.0%	31.3%	25.7%	25.8%	n/a

Table 7. Economic results for recommended royalty and CIT terms in constant 2012 US $ (risked)

		Project # 1	Project # 2	Project # 3	Project # 4	Project # 5	Project # 6	Project # 7
Total net cash flow	(million $)	127	853	1 207	4 448	2 445	1 851	517
Net Present Value @10%	(million $)	-45	20	3	484	326	221	-25
Profit/Investment @10%	(ratio)	-0.308	0.052	0.006	0.420	0.850	0.750	-0.079
Internal Rate of Return	(%)	4.1%	11.1%	10.1%	19.9%	23.2%	19.7%	8.4%
Payout time	(years)	22.9	16.8	18.2	14.0	12.8	13.6	18.1
Government Take @0%	(%)	33.3%	25.6%	26.0%	23.1%	21.5%	21.1%	26.0%
Government Take @5%	(%)	n/a	34.2%	36.3%	26.4%	23.5%	23.1%	40.7%
Government Take @10%	(%)	n/a	70.7%	95.1%	32.8%	27.1%	27.7%	n/a

5.9. Proposals for a Shale Petroleum Production Tax

General concepts

As can be analyzed in Tables 6 and 7, there are attractive profits under projects # 4, # 5 and # 6 that can be taxed with further taxes, provided such taxes have a minimal impact on projects # 1, # 2, # 3 and # 7.

For convenience, the additional tax will be called in this report the Shale Petroleum Production Tax ("SPPT"). The SPPT would be established under national legislation and regulations. The SPPT could therefore be changed if technical improvements or other economic or political conditions would make such a change in taxation desirable. In other words, the SPPT would not be a fiscally stable share of petroleum, contractually agreed with the concession holder.

The SPPT would be paid quarterly.

The SPPT would be deductible for corporate income tax purposes.

In order for the SPPT to have a minimum impact on marginal projects and at the same time collect significant taxes on very profitable projects, the tax will have to be ring fenced project by project. The best would be to tax separately the shale petroleum from each exploitation concession. The tax would only apply to upstream activities. Gas processing, gas conditioning, oil refining or pipeline transportation would not be activities that would be taxed under the SPPT.

Gross revenues for the tax would be determined at the measurement point(s) in the exploitation concession, where gas leaves the area for transport directly to markets or to gas processing or gas conditioning plants. Similarly, for oil the measurement points would be at the points where the oil is measured prior to transportation by truck or pipeline.

The gross revenues would be determined on the basis of the netback methodology. The value of the oil and gas would be the fair market less any transport costs, processing costs, conditioning costs and quality differentials.

SPPT variations

In this report two variations will be suggested for the SPPT:

▶ A gross revenue sharing SPPT, and

▶ A profit sharing SPPT.

The proposed gross revenue sharing SPPT is very similar to a simplified version of the Alberta royalty system applicable to shale gas. The profit sharing SPPT is based on an R-factor sliding scale.

In order to ensure that under both systems investors can strongly re-invest in further drilling operations, the first six years after the start of production should have a very low tax rate. This is achieved with a low level of gross revenue sharing during which the rate is fixed at 2% during the first six years of commercial production. With profit sharing SPPT this can be achieved with a profit share based on permitting expensing of all capital costs, so no payment to government are due until payout is reached.

The percentages used in the two variations of the SPPT are calibrated in such a manner that they give rather similar results for the PIR10 and the Government Take discounted at 5%. So from a government perspective one system is not necessarily more attractive than the other system in terms of the amount and timing of revenues. From an investor perspective the profitability of the two systems is similar

Gross Revenue Sharing SPPT option

The gross revenue sharing SPPT option would consist of a percentage of gross revenues.

For the first six years of production from the exploitation concession, the percentage for oil and for gas would be 2%. The six years would count from the start of regular commercial production. Production from earlier pilot projects could also be charged at 2%.

However, to stimulate the earliest possible regular commercial production of shale gas it is recommended that in general the 2% would apply until end of 2028. Therefore, projects that would be initiated before 2022would benefit from a longer period of a low rate. It should be noted that this is reasonable in view of that fact that it is likely that the earlier projects will have start up difficulties and may have to build their projects in phases.

After the termination of the six year period the percentage would be determined as follows:

Gross Revenue percentage = Volume per well percentage + Price percentage

The volume per well would be easy to determine. It is the total production from the exploitation concession divided by the total number of wells in the exploitation area.

A well would be a separately cased hole which could have several tubular strings and side tracks or laterals. All wells in the exploitation area will be counted. This includes dry holes, exploration wells, appraisal wells, pilot project wells and development wells regardless of whether these wells have been abandoned or not. Also wells drilled in the original exploration concession, from the exploitation concession was derived, and which are not located in any exploitation concession will also be included. The reason to include all wells is to absorb in the formula the geological risk.

The applicable percentage would range from 2% to 20% on a linear sliding scale from a minimum level of well production to a maximum level of well production. For gas the minimum production would be 8 000 cubic meters per well and the maximum production would be 16 000 cubic meters per well. This would apply to raw gas before this gas is processed in gas processing plants at the field measurement point. For oil the minimum production would be 4 tons per day per well and the maximum production would be 8 tons per day per well.

However, to account for expensive deep wells, the volume percentage would be adjusted if the average depths of the wells drilled in the exploitation concession is deeper than 4 000 meters. The depth would be the total measured depth along the well bore. The adjustment formula is simple:

$$\text{Adjustment factor} = \frac{\text{Total Average Well Depth}}{4\,000}$$

The maximum adjustment would be 2 for a well of 8 000 meters or more. For such a well twice the volumes indicated above would apply.

The price percentage would also be based on a linear scale for gas between a negative -20% and 20% based on a minimum price and a maximum price. The price would be adjusted yearly for the consumer price index. The minimum price for gas would be $ 150 per thousand m^3 and the maximum price would be $ 550 per thousand m^3.

The importance of the negative price percentage is that under low price conditions even the attractive projects # 4, # 5 and # 6 will become marginal and therefore support is needed to ensure continued drilling. The concept of a negative price percentage is also used in Alberta. This enabled the Alberta shale gas industry to survive the low Henry Hub prices better than in the many US states with fixed royalties.

For oil the minimum price would be $ 700 per ton and the maximum price would be $ 1150 per ton. The price percentage would range from 0% to 20%.

Profit sharing SPPT option

The profit sharing SPPT would consist of a share of the profits. The share of the profits would be based on an R-factor. The R-factor would be defined as follows:

$$R = \frac{\text{Cumulative gross revenues}}{\text{umulative capital and operating expenditures}}$$

The profits would be determined by expensing all capital costs.. Costs would be applied as incurred. It should be noted that this would only apply to the SPPT. This would not impact on the depreciation rates recommended earlier for the corporate income tax.

Below an R-factor of 1.2, the share would be 0%. At an R-factor of 1.2, the rate click in at 5%. For an R factor of 2.5 the share would be 30%. For higher R-factors the share would remain 30%. Between an R-factor of 1.2 and 2.5 the rate would adjust linearly.

The gross revenues would be based on the gross revenues from the volume and value of oil and gas production as determined at the measurement point.

The profit share would be ring fenced per exploitation concession. However, any wells located in the exploration concession from which the exploitation was derived and which have not been allocated to other exploitation areas can also be included in the expenditures.

Accounting regulations would determine the layout of the chart of accounts that needs to be used and the basic specifications of the required management information system to which the government officials would have access. A number of costs would not be deductible in the determination of the cash flow profits. These costs would include items such as:

▶ Interest and financing expenses for loans

▶ Costs for which there is no acceptable documentation

▶ Costs incurred prior to the start of the exploration concession

▶ Costs downstream of the measurement point

▶ Costs in excess of fair market value for such costs, to the extent of such excess, and

▶ Costs for fines and penalties.

At the same time there would be credits against costs as follows:

▶ Sale or transfer of assets to third parties or to other exploitation concessions

▶ Sale of geological and other information

▶ Recovery of insurance costs and refunds

▶ Revenues from services, such as revenues from other exploitation concessions where such concessions use the facilities of the operator.

The accounting regulations will have allocation procedures for:

▶ Allocation among overall costs of the operator and concession specific costs

▶ Allocating costs among exploration and appraisal concession areas

▶ Allocating costs among exploitation concessions.

The profit share would be determined by the operator at the level of the exploitation concession and would not be separate for each joint venture partner. Therefore any farm ins or other cost allocations among joint venture partners would have to be dealt with in the joint operating agreement.

The accounting procedures would provide for special audit procedures separate from the audits for corporate income tax purposes. There would also be a quarterly procedure for provisional approval of profit share amounts.

SPPT Credits

It can be recommended to have credits against the SPPT. These would be for five purposes:

► To strongly encourage sound environmental practices and a high level of social responsibility in the local communities, and

► To ensure that the SPPT on marginal exploitation concessions is nil or minimal,

► To encourage geological, geophysical and geochemical exploration anywhere in Poland,

► To provide a recovery of dry hole costs regardless of whether these costs could be deducted from corporate income tax or not, and

► Encourage early development of the shale gas in Poland.

There would be an SPPT credit cap based on $ 20 000 per well per year in the exploitation area (the same number of wells as for the gross revenue sharing SPPT). This cap would be adjusted for inflation.

With the SPPT credit cap as a limit, the concession holder can charge 80% of the following items:

► All costs related to environmental protection, such as:
  ► Environmental planning and monitoring
  ► Costs of wells for obtaining fracking water or to dispose fracking fluids
  ► Costs for installation and operation of recycling of fracking fluids
  ► Cost of micro-seismic and other surveys to determine the extent and success of fracking
  ► Landscaping
  ► Reclamation of sites
  ► Environmental measurement equipment
  ► Earth quake monitoring

► All costs related to acquisition or leasing of lands in the concession area for the wells and project facilities

► All costs related to compensation for damage, such as:
  ► Damage to agricultural and other land
  ► Road repair

► All costs related to creation of infrastructure in or related to the concession area, such as:
  ► Construction of roads and access ways
  ► Construction of well pads
  ► Construction of water lines
  ► Installation of communication equipment
  ► Construction of field office buildings

► Cost of social responsibility programs, such as:
  ► Establishing local offices in the communities affected by the operations for creation of local employment and business opportunities
  ► Contributions to local social events and programs
  ► Training of employees and contractors
  ► Contribution to scientific programs and universities to enhance knowledge about shale gas and shale oil operations
  ► Costs of geological, geophysical and geochemical studies incurred anywhere in Poland and not previously credited for SPPT purposes
  ► Costs of dry holes incurred anywhere in Poland and not previously credited for SPPT purposes, and
  ► The costs of all pre-production development wells drilled in any concession prior to 2020 and not previously credited for SPPT purposes.

Where actual credits exceed the credit cap, such credits can be carried forward for crediting into the following quarter. There is no limit on carry forwards other than the end of the concession, including any renewals of the concession due to ongoing production.

Minimum SPPT

All companies shall pay a minimum SPPT based on net acreage granted initially as exploration concessions prior to July 1, 2012. The net acreage shall be the gross acreage held by such company multiplied by the working interest of such company in any joint ventures applicable to such acreage. The minimum SPPT shall be 100,000 PLN per net square km of acreage held. This amount will be adjusted for inflation. The minimum SPPT shall be applicable on July 1, 2023 and any subsequent anniversary of this date for a period of five years. The minimum SPT shall be reduced by 3 PLN for every m^3 net gas production of such company during the previous calendar year. Net gas production shall be the production of gas at the measurement points of the concessions multiplied by the working interest of the company. The above mentioned SPPT credits cannot be credited against the minimum SPPT.

The minimum SPPT shall not click in where production operations are unable to start as a result of force majeure and other conditions established in the regulations.

5.10. Analysis of the SPPT - recommendations

Analysis

Table 8 and 9 provide the overview of the economic results for the SPPT based on the SPPT Gross Revenue option and tables 10 and 11 based on the R-factor profit share option. As can be seen both SPPT options on an unrisked basis would make all projects economic except # 1 and # 7, based on a 10% real IRR. Project # 2 would also remain economic on a risked basis, but # 3 would be uneconomic under both options.

Comparing Tables 4 and 8, and 4 and 10, the proposed terms would improve the terms for marginal projects and at the same time increase the government take on profitable projects. This is therefore the system that would result in the widest possible production of shale gas, while increasing significantly government revenues on profitable projects.

Table 8. Economic results for SPPT-Gross Revenue based variation in constant 2012 US $ (unrisked)

		Project # 1	Project # 2	Project # 3	Project # 4	Project # 5	Project # 6	Project # 7
US/Canada Wells used for Projects In Poland:		Bernett-T3	Marcellus	Eagleford	Bossier-Core	Marcellus	Montney	Eagleford
Type of resources		Dry	Dry	Dry	Some liquids	Wet	Wet	Wet
Total net cash flow	(million $)	527	3 284	4 314	14 538	8 737	6 275	2 043
Net Present Value @10%	(million $)	-134	133	-29	1 473	1 188	760	-41
Profit/Investment @10%	(ratio)	-0.247	0.093	-0.014	0.329	0.823	0.696	-0.035
Internal Rate of Return	(%)	4.9%	12.2%	10.3%	19.3%	25.8%	20.8%	9.2%
Payout time	(years)	22.3	16.7	18.7	14.1	12.8	13.6	17.8
Government Take @0%	(%)	32.9%	28.3%	33.6%	36.7%	29.9%	33.6%	28.6%
Government Take @5%	(%)	n/a	36.3%	45.8%	42.3%	32.8%	36.6%	42.1%
Government Take @10%	(%)	n/a	62.1%	92.3%	51.1%	36.9%	42.0%	n/a
Gross Revenue shares	(mllion $)	0	123	561	3 727	1 222	1 427	77

Table 9. Economic results for SPPT-Profit Share based variation in constant 2012 US $ (unrisked)

		Project # 1	Project # 2	Project # 3	Project # 4	Project # 5	Project # 6	Project # 7
US/Canada Wells used for Projects In Poland:		Bernett-T3	Marcellus	Eagleford	Bossier-Core	Marcellus	Montney	Eagleford
Type of resources		Dry	Dry	Dry	Some liquids	Wet	Wet	Wet
Total net cash flow	(million $)	533	3 236	4 483	15 347	7 861	5 924	2 031
Net Present Value @10%	(million $)	-132	143	97	1 816	1 136	765	-26
Profit/Investment @10%	(ratio)	-0.245	0.100	0.045	0.405	0.788	0.700	-0.022
Internal Rate of Return	(%)	4.9%	12.4%	11.1%	21.5%	26.1%	21.3%	9.5%
Payout time	(years)	22.2	16.4	17.7	13.8	12.6	13.4	17.2
Government Take @0%	(%)	32.1%	29.3%	31.3%	40.1%	41.8%	41.4%	36.8%
Government Take @5%	(%)	n/a	36.0%	39.2%	34.9%	37.5%	38.3%	40.0%
Government Take @10%	(%)	n/a	59.2%	74.8%	39.7%	39.6%	41.6%	n/a
Gross Revenue shares	(mllion $)	0	208	389	2 835	2 374	1 914	129

Charts 1, 2 and 3 compare the Current Terms with the Proposed Terms for both options. The charts deal with the Risked IRR, the Risked Profit to Investment Ratio discounted at 10% ("PIR10") and the Risked Net Present Value discounted at 10% ("EMV10"). The Proposed Terms will improve slightly the marginal projects and reduce somewhat the profitability of the profitable projects.
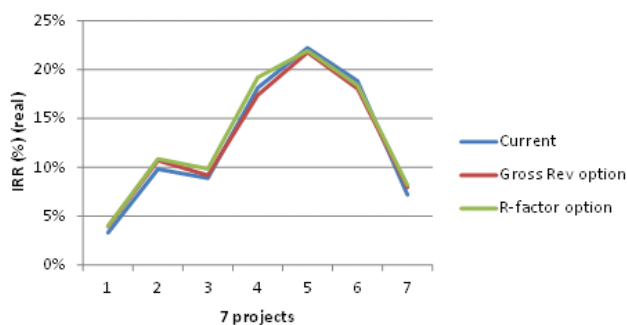

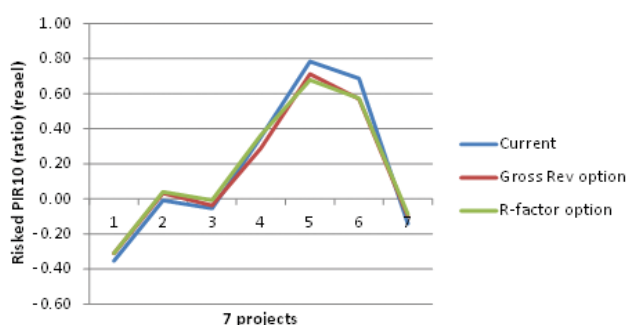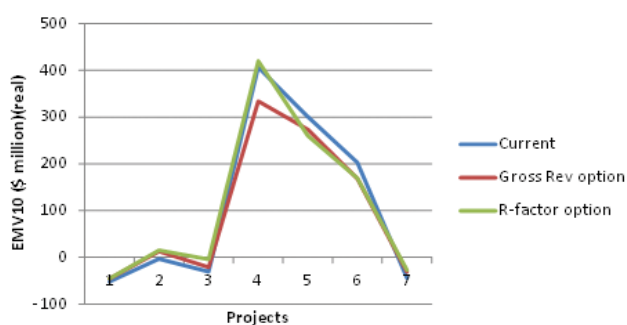Chart 1. Risked IRR for 7 projects

Chart 2. Risked PIR10 for 7 projects

Chart 3. EMV10 for 7 Projects

Charts 4,5 and 6 provide a comparison of the government take.

The charts illustrate how the Government of Poland would receive significant more revenues from the three profitable projects under both options. This is on an undiscounted basis ("GT0") as well as a 5% discounted basis ("GT5"). This means that taking the time value of money to Poland into account, Poland would be better off with the back end loaded proposals, since in total more revenues will be earned by government.

Under a hypothetical very high price scenario, Poland would be significantly better off under both proposals, but the Gross Revenue based option provides for stronger price progressivity.

Chart 4. Risked GT0 for 7 Projects
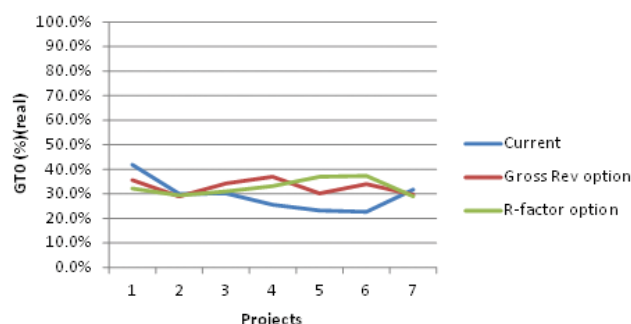
Chart 5. Risked GT5 for 6 Profitable Projects
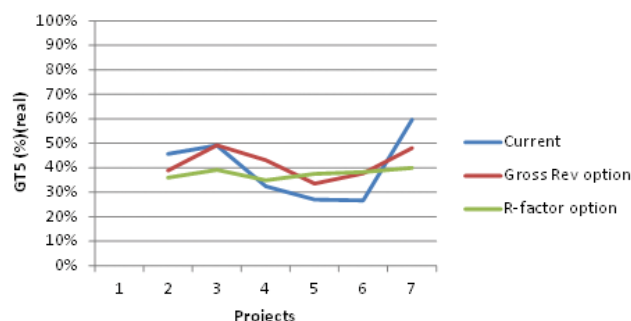
Chart 6. Risked GT0 for $ 1300 per ton for 7 projects
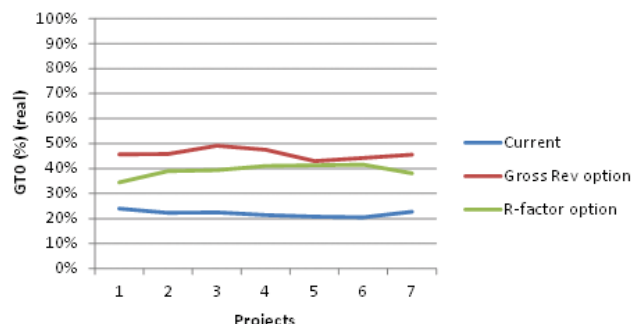
Charts 7 and 8 provide a price sensitivity analysis of Project # 4. As can be expected the Current Terms would provide more upside under high price scenarios. For Project 4, the Gross Revenue option results in a much better overall government take under high prices, due to the strongly price progressive nature of the price feature in the formula.

Chart 7. Risked IRR Price Sensitivity for Project 4

Chart 8. Risked GT0 Price Sensitivity for Project 4
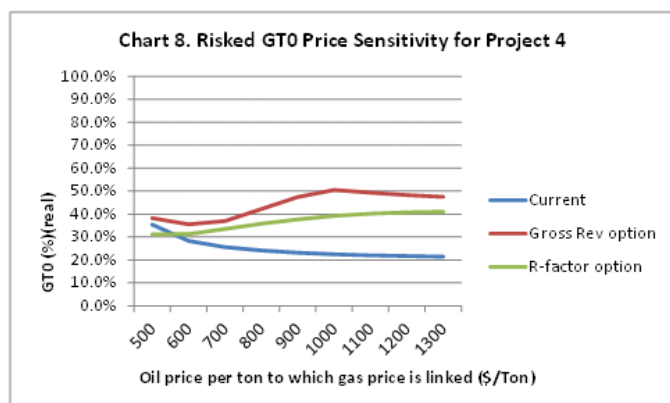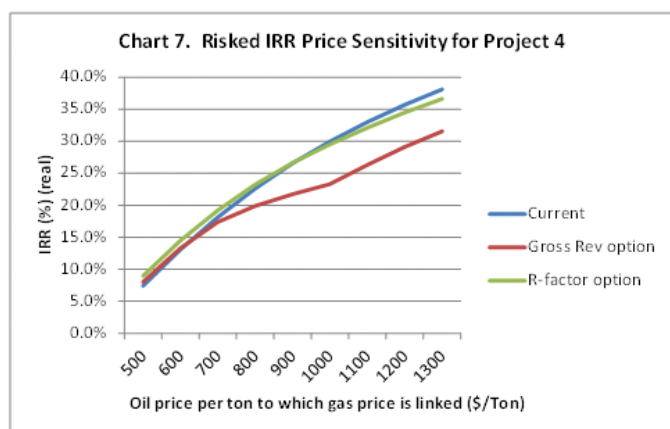
Charts 9 and 10 compare the cost sensitivity analysis of Project # 4. The charts illustrate how the proposed system options would assist a marginal project under high cost conditions. The R-factor Profit Sharing option results in a higher government take under low costs due to the profit progressivity of this system. The Gross Revenue based approach is by definition regressive.

However, the Gross Revenue based option provides a much stronger incentive to reduce costs. Once costs have been brought down to this level by about 2028 or so, the Government of Poland could review the fiscal terms and see whether further changes need to be made.

Chart 9. Risked IRR Cost Sensitivity for Project 4

Chart 10 GT0 Cost Sensitivity for Project 4
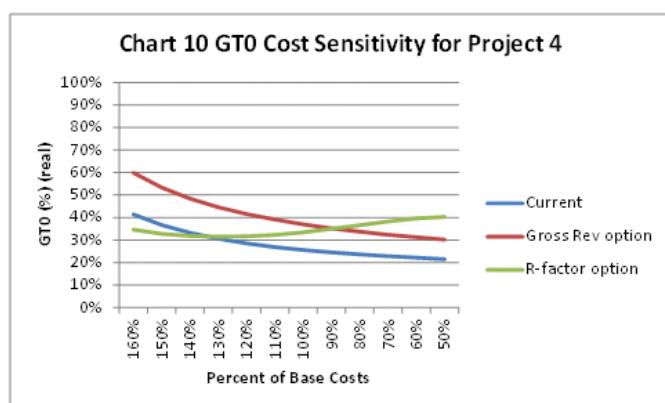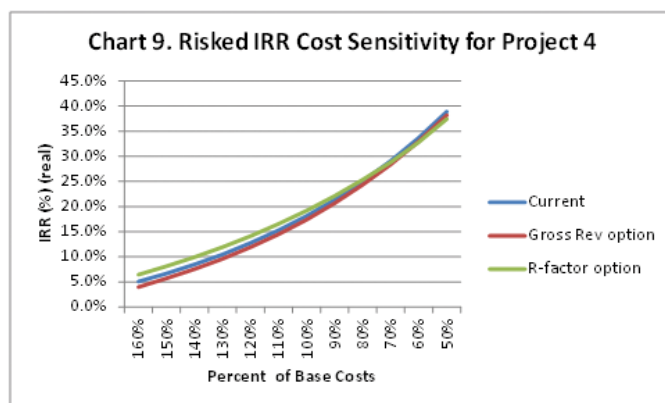
Chart 11 shows the cost savings index for the most profitable project 5. This index illustrates how much an investor keeps in case the investor saves costs and is efficient. For instance if the cost savings index is 40% the investor keeps $ 0.40 for every dollar saved. In this case the Gross Revenue based system and the Current Terms provide a strong incentive to save costs.

Nevertheless, the R-factor Profit Sharing proposal is highly acceptable from an international perspective and therefore the R-factor is robust enough to avoid "gold plating" or other negative side effects.

Chart 11. Cost Savings Index for Project 5
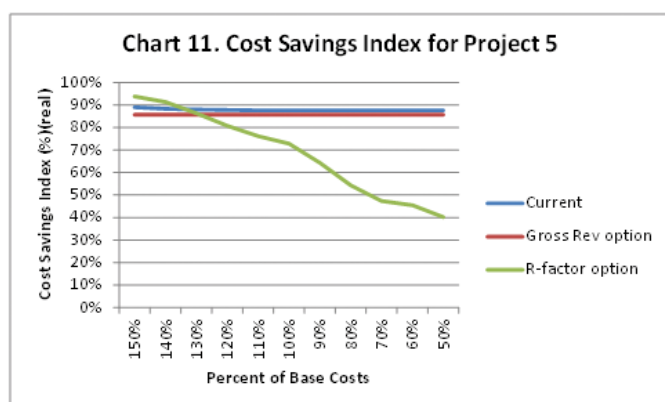
Total Fiscal Package Recommendations

In order to create a viable shale gas industry in Poland the earlier recommendations on usufruct fees, property taxes and corporate taxes would have to be implemented as a single fiscal package together with the recommendations for the SPPT. The following SPPT recommendations are therefore based on this assumption.

Both SPPT systems would achieve the objective of ensuring significant investment in Poland and a rapid expansion of the gas production. The two systems are highly similar from a performance point of view.

It can be recommended to adopt the SPPT based on Gross Revenues system because this system will be much easier to administer. Production information can be completely automated and electronic reports about the level of production can be automatically send to the SPPT collectors. It is likely that the entire SPPT based on Gross Revenues collection for all of Poland can be done by 2 or 3 government officials. Payments to government can be largely automated. The main disputes which may arise are over gross revenue determination. Meters may have to be checked occasionally. Independent engineering reports are required to certify the number of wells and their depth. These are very simple reports to prepare. The government revenue collection system can be developed and installed when it is anticipated that commercial production is about to commence.

The SPPT based on Profit Sharing requires a considerable staff of government officials. Quarterly sign off of the preliminary profit share reports will require considerable attention.

In fact, it may be required to have day-to-day cost monitoring in some of the larger concessions. Detailed audits have to be carried out. It is extremely difficult to check whether operators would charge fair market value for their costs since well costs and drilling costs could vary considerably well by well. Cost allocation problems could be very significant. It is likely that numerous conflicts may arise. It should be noted that the same operator may have a concession with a high profit rate and one or more with a low profit rate. In this case, it would be very advantageous to start allocate maximum costs towards the high profit rate concession, since this would minimize the base on which profits would be determined. At the same time, it would slow down the increases in R-factor.

Another problem is that this system would have to be implemented immediately, since costs are already being incurred in the shale gas concessions.

The main benefit of the R-factor system would be that if shale gas operations turn out to be really profitable, the amount of revenues would be somewhat higher. This is a crucial benefit in production sharing agreements which are subject to fiscal stability. Often in such contracts terms cannot be changed for 25 years or more. Therefore it is important to have a sharing formula in place which results automatically in a higher share for government in case of favorable circumstances in such production sharing agreement. However, in Poland, the SPPT can be adjusted upward by amending the legislation. Therefore, if it appears that shale gas profits far exceed expectations, due to technological progress or unusually profitable geological conditions, Poland can adjust terms if this is considered desirable from a government perspective.

The main objective in the near and medium term is to get large scale shale gas activity going on the basis fiscal terms that ensures profitability for the widest range of shale gas projects. The SPPT based on Gross Revenues can, with the appropriate credits, ensure that the widest possible range of marginal gas projects will be economic.

The proposed SPPT based on Gross Revenues is based on making shale gas projects with a cost/price ratio of 55% marginally economic and projects with lower costs profitable. This system would, in comparison with the current terms:

▶ Enhance the economics of marginal projects and therefore stimulate shale gas production in Poland,

▶ Encourage exploration through the credits for exploration expenditures and dry holes against the SPPT, and

▶ Significantly increase government revenues for Poland on profitable projects, even when discounted at a rate of 5%.

Therefore, the proposed system of a SPPT based on Gross Revenues is recommended.

The proposed system has the potential to create significant activity. Such activity may bring cost down. The lower costs may significantly expand the available shale gas supplies as is illustrated in Chart 12. In this conceptual chart the economic shale gas reserves would expand from 250 to 400 billion m³.

Chart 12. Conceptual supply curves for a fiscal system designed for a Cost/Price Ratio of 55%
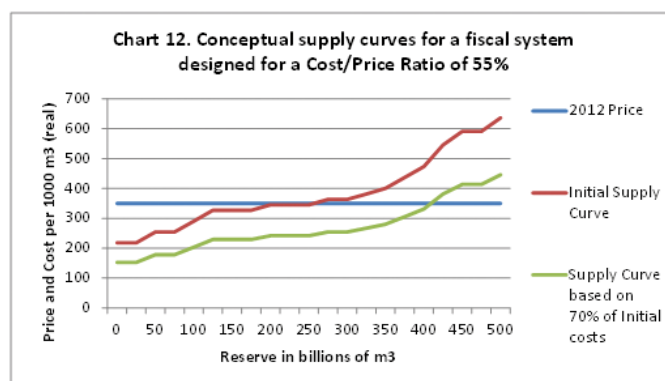
Once costs are below 70% of the initial costs assumed in this report, the Government of Poland may review the fiscal terms again and see whether adjustments are in the national interest, taking into account the development of the gas price at that time.