Appendix
D

Decision Element Analysis

Contents

The *Generic Decision Tree* included in this appendix identifies the decision trigger points used to map all possible elements of potential royalty regimes.

1. Royalty overview and trigger point options

Background

The Crown, as owner of the resource, is entitled to a share of well production (legally a profit a prendre) as royalty. This share vests in the Crown upon severance of the mineral from the land. The share remains undefined until it can be measured. Once measured and calculated, the royalty share of gas can be kept by the Crown, sold to the producer or sold by the producer as agent for the Crown.

Under the current natural gas regime, the natural gas and products shares are undefined until the products have been processed and measured as (generally) marketable products. The royalty share is then calculated and the product transferred to the producer or other royalty payer designated by the producer at a deemed price. The royalty payer is then liable to pay the deemed value of the royalty share. A cost for processing is then allowed as a deduction from the royalties on these products.

The point at which the share is calculated and the transfer made is the royalty trigger point. Currently this is (generally) at the plant gate, or technically at the first point of measurement within the production processing cycle of the marketable product.

The royalty formula for residue gas refers to the productivity of raw gas at a well. However, this is only a proxy for well operating costs and does not trigger the liability to receive the royalty share and pay for it at the wellhead.

Feasible Options

Three alternatives for the royalty trigger point are:

Option 1 Royalty trigger at the wellhead

Raw gas quantity (volumes of gas or GJ of heat) measured and transferred at the wellhead.

Option 2 Allocation of products

Raw gas or products (in volumes or heat) measured at the plant gate, allocated back to the wellhead, and transferred at the wellhead.

Option 3 Royalty trigger at the plant gate

Products measured and transferred at the plant gate

Option Analysis

Option 1 Royalty Trigger at the Wellhead

Description

Raw gas (measured in volume or heat) is measured, a royalty formula applied, and the royalty share transferred at that point at a deemed price. The deemed price could be one of a number of alternatives (see Element 8).

Assumptions

- Raw gas production is measurable in the units required.
- It is feasible for the Crown to receive one or more products at one or more facilities in-kind, rather than transfer the raw gas in its entirety at the wellhead.
- The Crown is prepared to forego the extra value of liquid products above their heat content and industry accepts the heat value of sulphur that may be above its actual value.

Issues

Issue 1 An economically viable process to measure volume and heat content must be developed that is sufficiently exact to be accepted by Crown and industry.

Required Information/Modeling:	Analysis of measuring technology
Technical/Economic Feasibility	Unknown

Issue 2 The Crown accepts the reduced value of liquids and products or industry accepts the distributional impact of increasing royalties to make up for these losses.

Required Information/Modeling:	Liquids values over time.

Issue 3 Process and reporting are reduced, so potentially some administrative savings. (benefit analysis)

Option 2 Allocation of Products

Description

Volumes of residue gas and products (mix or specification depending on plant operation) are measured at the plant outlet. The volumes are then allocated back to the individual wells based upon a composition analysis of the raw gas stream at each well or some other factor. The royalty product is defined and the royalty is calculated at the wellhead. This option could be applied to a product volume, GJ unit or raw gas unit, with cost variations.

Issue Administrative impacts need to be defined (benefit analysis).

Option 3 Royalty Trigger at the Plant Gate

Description Current system for volumetric.

Assumption Can be combined with various strategies to recognize costs.

Issue Process and reporting are the same as they are today.

Recommendation

Option 3: Royalty trigger at the plant gate

- An economic method to measure and convert wellhead volumes to heat content is not presently available and is not projected to be available in the foreseeable future.
- The extra costs of converting marketable products back to heat at the wellhead for royalty purposes are not justified, unless there are unrelated business reasons.

2. Establishing volumes

Background

Establishing volumes is a fundamental element in any wellhead royalty calculation algorithm. This decision element relates to the establishment of the volume that forms the basis of the wellhead royalty calculation.

An assumption common to the options described below is that there is an ownership data base established to determine royalty payment responsibility at the well event level.

Feasible Options

There are two alternatives for establishing the volumes at the well level.

Option 1 Measure raw gas volumes at the wellhead

Adjust for fuel, flare and metering differences.

Option 2 Measure residue gas and product volumes at the plant outlet

Allocate back to the wellhead.

Option Analysis

Option 1 Measure Raw Gas Volumes at the Wellhead

Description

Establish the volume of raw gas produced at the individual well level based upon measured volumes (or allocations) as reported on the current S-1 (or equivalent). These volumes are production volumes and need to be reduced for fuel, flare, shrinkage and other processing losses. This option provides a direct measurement of the production at the wellhead.

Assumption All raw gas production is reported on the S-1 and companies can easily generate this information in another fashion if the S-1 is eliminated.

Required Information/Modeling

None

Technical/Economic Feasibility

Process already exists

Issues

Issue 1 A process to adjust the raw gas volumes needs to be developed to account for loss/shrinkage that occurs between wellhead and the plant outlet. This adjustment could be province-wide, or facility specific depending upon the frequency/distribution of the occurrences.

Required Information/Modeling

Requires an analysis/simulation of the amount of loss/shrinkage that occurs between the wellhead and the plant outlet (where royalty volumes are currently established), in order to determine:

- if the calculation of a shrinkage factor is really necessary.
- the frequency and distribution of occurrence.

Technical/Economic Feasibility

A process needs to be established to apply the shrinkage adjustment factor on a well-by-well level. This process could easily be developed.

Issue 2 Metering at the wellhead and S-1 volumes are sufficiently accurate for Crown royalty purposes. Both industry and government accept this metering for allocations and other purposes.

Considerations

- It is generally accepted within industry that measurement accuracy declines the further the measurement is taken from the point of sale (custody transfer meter).
- Almost all gas measurement at the wellhead is done via orifice meters. Orifice meters are designed to measure either gas or liquids, but cannot accurately measure multi-phase production. These meters encounter problems when wet, dirty or sour gas is measured; a small problem with the meter can generate a significant error rate.
- Generation of accurate volumes at the wellhead may not be possible without installation of additional facilities, which requires incremental capital and operating costs. These incremental costs are likely to be prohibitive.
- Human error associated with installing, changing, reading, and translating charts is commonplace. The installation of electronic measurement equipment may alleviate many of these problems, but the incremental capital associated with this equipment is likely to be prohibitive.
- While the project team does not have metrics to support the accuracy or inaccuracy of wellhead meters, strong opinions from a number of metering professionals support the overall lack of accuracy associated with wellhead gas measurement.

Pro's

- Volumes are established from an existing process (no incremental administration).
- May allow for an earlier finalization of the royalty calculation.

- Crown is out of the business early.
- Allows the establishment of a single royalty rate at the wellhead.
- May allow elimination of NGL1 (use Gas Reference Price + uplift).

Con's

- Poor metering results in a questionable basis for establishing royalty.
- Significant cost to improve accuracy.
- Does not facilitate take-in-kind by the Crown.
- May be distributional impact.

Administrative Impact

The reporting process is already in place; therefore, there is no additional administrative costs associated with the implementation of this option.

Conclusion

The level of accuracy associated with current measurement of volumes at the wellhead in most cases is not acceptable to either the Crown or industry as a basis for establishing royalty obligation. Overcoming the inaccuracies is likely to be cost prohibitive.

Option 2 Measure Raw Gas Volumes at the Wellhead

Description

This involves the establishment of various royalty-triggering products at the plant outlet with subsequent allocation to the wellhead. This is the method that is presently operative.

Assumption The present collection of volumetric product data, along with well/ownership allocation data continues.

Required Information/Modeling

Unless there are changes made to the existing royalty algorithm, no modeling is required.

Technical/Economic Feasibility

Process already exists

Pro's

- Volumetric measurement of residue gas and products at the plant gate is conducted with the most precise technology available today or in the foreseeable future.
- There is an independent, third party confirmation of the measurement, i.e., shippers such as NOVA.

Con's

- Allocation to the wellhead is conducted using the same inaccurate measured wellhead data that was described in Option 1.

Conclusion

Industry and the Ministry concur that the use of volumes measured at the plant outlet is the only acceptable method for royalty purposes.

Recommendation

Option 2: Measure residue gas and product volumes at plant gate

- Systemic difficulties are associated with measuring wellhead raw gas volumes.

3. Establishing heat content

Background

Establishing heat content eliminates the administrative procedures required to measure all the components of raw gas for royalty purposes. This enables the royalty algorithm to be triggered early in the production process at the well event level.

Feasible Options

Within each of the two methods for establishing volume (see Element 2), there are a number of different options for determining heat content or, ultimately, the unit of measure that the royalty calculation is based on.

- **Measure Raw Gas Volumes**

  Option 1A Do not convert to heat content; establish royalty based on raw gas volume.

  Option 1B Status Quo: calculate heat content based on allocated plant production.

  Option 1C Measure heat content directly.

  Option 1D Calculate heat content based on periodic analysis of raw gas production.

  Option1 E Allocate inlet analysis of components to wells.

  Option 1F Use a standard conversion to calculate heat content at the well level, i.e., pool gas analysis.

- **Allocate Residue Gas and Product Volumes to Well Events**

  Option 2A Use a standard conversion algorithm (GPA) to calculate heat content.

  Option 2B Do not convert to heat content; establish royalty based on volume of residue gas and product.

Option Analysis

Option 1A Do not convert to heat content; establish royalty based on raw gas volume.

Description

Royalty is calculated as a single product, raw gas volume. No conversion is required.

Option 1B Status Quo: Calculate heat content based on allocated plant production

Description

See Option 2A; Option 1B and Option 2A are the same method of determining heat content at the wellhead.

Option 1C Measure heat content directly

Description

This option requires that a direct measurement be made on a periodic basis (timing to be determined) of the heat content produced by the well. Measurement is made using a calorimeter. This periodic analysis of the heat content of the well could be used to establish a heat conversion factor that is applied to the monthly well production in order to determine the total heat content produced by the well. The total heat content could be used in the royalty calculation. Alternatively, a requirement could be established to measure and report heat content on a monthly basis and this monthly measurement provides the heat content for the royalty calculation.

Assumptions

- The assumption of variability of the heat content on a well-by-well basis within a given pool share needs to be tested.
- Heat content varies significantly enough from well to well within a pool so as to warrant a periodic analysis of the raw gas production from each well.
- There is valid reason for using calorimeters at each wellhead to determine the specific heat content of the well event.
- Raw gas heat from a particular well is stable over time (days/months).

Technical/Economic Feasibility

- The technology exists to do a direct measurement of heat content.
- The requirement to base royalty on heat content calculations requires a significant investment in equipment. This increases transitional costs to the point that this option is not feasible.

Administrative Impact

- Additional administrative processes are required by industry to gather and report the measured heat content.
- Incremental administration is incurred by both industry and the Crown relating to the managing of the heat content reporting. This gives rise to reconciliation issues, etc.

Option 1D Calculate heat content based on periodic analysis of raw gas production

Description

This option requires that an analysis of a sample of the raw gas production from all wells in the province be made on a periodic basis (timing to be determined). This analysis establishes a heat content conversion factor for each well. This conversion factor is applied to the raw gas production at the well to determine the heat content of the production. Once established, the factor remains in place until a new sample is taken and a new conversion factor is applied. The result is heat content at the well that is not adjusted for fuel, flare or loss.

Assumptions

- The requirement to sample and have an analysis completed on the effluent from all wells could prove onerous and costly (cost-benefit analysis)
- The Crown incurs additional costs to manage all well analysis information (cost-benefit analysis).

Considerations

- Performing well-event analysis is a common industry practice that is performed on an as-needed basis to satisfy ownership and engineering (business) requirements.
- Over time, the composition of the effluent from a well-event changes.
  - The elapsed time over which it changes is influenced by the nature of the composition and by other factors such as the existence of a gas cap, solution gas vs. gas, coning ,etc.
  - The elapsed time in south east Alberta may well be 5+ years. In Bonnie Glen or Wapiti it may be monthly, or even more frequently depending on circumstances and concerns.
- A requirement, although not aggressively enforced, exists today requiring the filing of gas density measurements at a well-event level. The frequency is in accordance with well event characteristics.
  - For example gas wells in south east Alberta shallow pools (e.g., Medicine Hat formation, Milk River formation, Second White Specks formation) require density testing every second year.
  - Wells producing from a cycling scheme require density testing on a 6 month basis. Refer to EUB IL93-1 for further detail.
  - Observation by EUB (Berni Brunsch) that such analysis is not expensive. Consequently he does not agree with the assumption that the cost is high and thus onerous (cost benefit analysis).
- Gas analysis is not necessarily required by the EUB although such analysis is frequently done by industry for their own purposes. Industry are of the opinion that adequate well effluent analysis exists today to allow them to do their business. Any incremental requirement (enforcement) would be seen to be for purposes other than delivering their business. Additional rigor may be required if the S-1 volumes are to be used in the calculation of Crown royalty. That is the gas density, a factor used in the orifice calculations

- Generally there are no frequency standards (minimum requirements) depending on the initial known compositions and/or mineral ownerships, working interest ownerships and royalty ownership. The one exception is in a miscible flood and the purpose is to monitor the flood.
- If there is a decision that '*if it is good enough to provide revenue/shipper splits it should be good enough for the Crown'*, then measures need to be taken on a structured basis in those cases where the well-event had only one working interest owner.
- Industry and the Crown may have different objectives for the outcomes of the various allocations that occur at a particular gas processing facility. Industry is concerned that they each receive the appropriate proportion of the processing facilities net production. The Crown is focussed on ensuring that Crown royalty reflects a percentage of the product or value of a particular well-event.
- Well analysis as it exists today does not appear to have the necessary rigor (timeliness, assurance/validation) to facilitate the use of a well-event specific heat content to deliver Crown royalty at the well-event level.
- Crown may well see increased costs from maintaining the well event specific data on a current valid basis. There is, however, a suggested benefit in that the production profiles that will then be available enhance overall recoveries.
- Solution gas has different characteristics.

Outcome

The composition of well-event effluent changes over time. As such, effluent requires periodic analysis to ensure proper determination of well-event *heat*. Periodic means different elapsed times depending on the particular circumstances. As industry does not appear amenable to increased rigor in terms of well event effluent analysis, it appears that this method of ascribing well-event heat is unavailable.

Issues

- Currently industry analysis efforts and processes work adequately to see massive revenue/commodity movements. Why will it not work for purposes of Crown royalty given the noted caveat regarding 100% ownership.
- Under what circumstances (given the noted caveat) will Crown requirements exceed those of the working interest owner?
- Solution gas.

Option 1E Allocate inlet analysis of components to wells

Description

This option requires plant operators to do a component analysis of the raw gas stream at the inlet to the facility and allocate each of the components identified in the analysis back to the well on a standardized basis. The components are converted to heat content using standard conversion tables (GPA Tables). The result is a heat content at the well level that is not adjusted for fuel, flare, losses, etc., which typically occur within a gas processing facility.

Assumptions

- A standardized allocation methodology could be implemented within industry.
- A compositional analysis of the inlet gas stream is completed for all facilities.

Required Information/Modeling

- An analysis of the amount of loss/shrinkage that occurs between the well and the plant inlet.
- The assumption that a compositional analysis of the inlet stream is completed must be tested.

Technical/Economic Feasibility

- Requires the maintenance of some form of standardized allocation report.
- Developing and gaining acceptance for a common industry practice for allocation could be difficult, time consuming and result in increased transitional costs.
- A process for allocation beyond the point that the operator has the information must be implemented. This has the potential to extend the timeline for establishing the heat content and delays the royalty calculation process.

Administrative Impact

The option results in incremental administration associated with the allocation process, and will likely result in managing reconciliations, etc.

Conclusion

Option 1E is determined to be not feasible.

Option 1F Use a standard conversion to calculate heat content at the well level, i.e., pool gas analysis

Description

This option uses the pool gas analysis that is currently maintained by the EUB on a pool-by-pool basis as the standard heat content conversion. This standard heat content conversion is applied to production from all wells within the pool in order to establish the heat content of the production. The heat content forms the basis of the royalty calculation.

Assumptions

- The process to establish the pool gas analysis is already in place. Pool gas analysis exists for all pools in the province, and an updating mechanism is already in place. However, the quality of the current data/process needs upgrading to meet royalty requirements.
- Accuracy of the existing pool gas analysis needs to be reviewed. Is it truly representative of all wells in the pool? There are specific types of wells where this

analysis is unlikely to be accurate. The first step in this verification is to determine the number of gas pools in Alberta and of those the breakdown of pools that have 6 different characteristics: gas and solution wells, miscible floods, retrograde, sweet, sour, and south east Alberta above Mannville.

Required Information/Modeling

Simulation to determine distribution impacts and assist with the design of a mitigation strategy should be conducted in conjunction with Option 2: Establishing Volumes. Modeling is not feasible in this project's time frame.

Technical/Economic Feasibility

The process is already in place and supported by industry; therefore, there are no transitional issues.

Administrative Impact

There are no incremental administrative costs.

Option 2A Use a standard conversion algorithm (GPA) to calculate heat content

Description

This option is only directly applicable if the option of allocating gas and product volumes is selected as the method for the determination of volume. These allocated volumes are converted to heat content using standard engineering conversions as published in the GPA Handbook. The calculated heat content forms the basis of the royalty calculation.

Assumptions

- A standardized volumetric allocation methodology is not required for royalty purposes.
- Compositional information is available for all wells in the province.
- A process for allocating volumes beyond the point that the operator has information in place.
- The conversion of volumes to heat content is an accepted process and the conversion factors are standard for the entire industry.

Required Information/Modeling

No further information is required, providing a standardized allocation methodology is not required.

Technical/Economic Feasibility

- The conversion of volumes to heat content is an accepted process and the conversion factors are standard for the entire industry.

- The issues relate to the processes for allocating volumes.
  - Lack of standardization of allocations within industry.
  - High cost of gathering compositional information at the well in order to do an accurate allocation.
  - Need to maintain an allocation process beyond the point that the operator has information.
  - Need to maintain standardized allocation reports.

Administrative Impact

There is little in the way of incremental administrative costs associated with the conversion of the allocated volumes to heat content. The process to allocate volumes and a move to standardized allocations could result in incremental administration; there will definitely be no administrative savings.

Option 2B Do not convert to heat content; establish royalty based on the volume of residue gas and products

Description

This is essentially the existing process in which volumes (and heat content) of gas and volume of natural gas liquids are allocated back to the well level via the OAS form. This option continues the current system of calculating royalty on discrete products.

Recommendation

Option 2B: Allocate gas and product volume without conversion to heat

- Conversion to heat adds no value to the royalty calculation process, although there may be other business reasons to collect this data.

2a and 3a Treatment of Hydrogen Sulphide (H_2S)

Background

In each of the two wellhead strategic alternatives where a rate is used to calculate royalty value and/or allowable costs, the volume of H_2S in the gas stream becomes an issue. The royalty value and/or allowable cost value is over- or under-stated depending on how the volume of H_2S is handled.

Feasible Options

Wellhead

Option 1 Include H_2S in the volumes and calculate heat content using actual conversions.

Option 2 Gross-up the heat content on the H_2S component of the raw gas based on a theoretical conversion factor.

Plant Outlet

Option 3 Exclude H_2S in volumes and heat content wellhead measure; allocate and convert sulphur measured at plant outlet to heat equivalent or grossed-up heat equivalent.

Option 4 Report actual sulphur volumes allocated at the back end of the plant.

Option Analysis

Option 1 Wellhead: Include H_2S in the volumes and calculate heat content using actual conversions.

Assumptions The H_2S volumes must continue to be included in the raw gas volumes on the S-1's or equivalent data capture mechanisms.

Issues If heat content is the volumetric that is used for the royalty algorithm, H_2S has very little heat content. Therefore, in most pricing scenarios sulphur does not bear a fair share of the royalty burden.

Required Information/Modeling

Models to be run to determine the distribution effect.

Technical and Economic Feasibility

This option should require little or no change from present reporting.

Administrative Impact

Appears to move in the direction of less administration.

Option 2 Wellhead: Gross-up the heat content on the H_2S component of the raw gas based on a theoretical conversion factor.

Assumptions

- The distributional impact is less than for Option 1.
- Theoretical conversion factors could be developed to offset the large distribution effects. This should be assessed for technical feasibility.

Required Information/Modeling

Models to be run to calculate the theoretical conversion factor and the distributional impact.

Administrative Impact

Appears to move in the direction of less administration. Estimates are required (cost benefit analysis).

Option 3 Plant Outlet: Exclude H_2S in volumes and heat content wellhead measure; allocate and convert sulphur measured at plant outlet to heat equivalent or grossed-up heat equivalent.

Assumptions

A method of calculating the volume of H_2S in the raw gas could be developed. One way to do this is to continue reporting the sulphur on the OAS (or replacement) and convert it theoretically to H_2S.

Required Information/Modeling

- Petroleum engineering staff should be contacted to validate this assumption.
- Models should be run to calculate the distribution impact.

Administrative Impact

Appears to move in the direction of less administration. Estimates are required (cost benefit analysis).

Option 4 Plant Outlet: Report actual sulphur volumes allocated at the back end of the plant.

Assumptions

A reporting process is needed to allocate plant outlet sulphur production to wellheads.

Required Information/Modeling

This is the process used now so no modeling is required.

Administrative Impact

Requires the most administrative resources but provides the fairest burden for sulphur royalties.

Recommendation

Option 4: Royalties based on actual sulphur volumes

4. Royalty ownership interest

Background

Crown interest and ownership interests of other parties in Alberta mineral rights is base data. This information exists and is publicly available whether or not a particular parcel of land is or has been targeted for exploration or development. Crown mineral interest and all instances of freehold mineral interest are a factor in the Alberta Crown and freehold royalty calculations. In addition, these data elements are used in the assessment of freehold mineral rights tax and to determine the party responsible for discharging the freehold mineral rights tax.

Feasible Options

Option 1 Status quo in that Crown interest and freehold interest are established at the well event level or in the case of unitized lands as per the agreement reflected in Exhibit A of the Unit Agreement.

Option 2 Establish Crown interest and, by inference, appropriate multiple freehold interests at pool level. The pool is identified and defined after technical review/evaluation by EUB.

Option 3 Establish Crown interest and freehold interest at the well-bore level to unitize the zones producing from a single well bore.

Option Analysis

Option 1 Status Quo

Pro's
- Is operative with well defined rules and a basis in real property law.
- Properly reflects beneficial ownership of the mineral right producing the royalty due hydro carbon.

Con's No known factor

Assumption No mass expropriation of freehold mineral rights will occur.

Technical/Economic Feasibility

This option is operative

Administrative Impact

No change.

Option 2 Establish Crown interest and freehold interests at the pool level

Pro's Facilitates levying of royalty at the pool level.

Con's
- — Accuracy of pool delineation increases over time; substantial reworks are required.
- — Seriously complicates the mineral right disposal/acquisition process.
- — Results in ongoing mineral right ownership disputes.

Assumptions
- — EUB can provide full pool identification and definition prior to production occurring.
- — Establishing the mineral ownership interests at the pool level in time to ensure correct royalty interest distribution is not technically feasible.

Technical/Economic Feasibility

Establishing the mineral ownership interests at the pool level in time to ensure correct royalty interest distribution is not technically feasible. The uncertainty and resulting reworks and legal disputes make this option` inoperative.

Required Information/Modeling

Can the EUB provide full detailed pool delineation information to an acceptable degree of accuracy before any royalty-due production (Crown or freehold) occurs? The consensus of the team is that this cannot occur to the necessary degree of accuracy in such a timeframe.

Option 3 Establish Crown interest and freehold interest at the well-bore level

Pro's
- — Facilitates levying of royalty at the well-bore level.
- — May simplify the integration of Crown royalty and freehold mineral rights tax.

Con's
- — Requires well bore unitization; implications of level of effort are unknown.
- — Complicates the mineral right disposal/acquisition process.
- — Results in ongoing production source and ownership and royalty/tax determination disputes.
- — Creates a need to establish a fictitious indication of mineral ownership.
- — Requires rework or re-determination each time a subsequent zone is completed.

Assumptions
- — EUB can provide full pool identification and definition.
- — Establishing the mineral ownership interests at the pool level in time to ensure correct royalty interest distribution is not technically feasible.

Technical/Economic Feasibility

Establishing the mineral ownership interests at the pool level in time to ensure correct royalty interest distribution is not technically feasible. The uncertainty and resulting reworks and legal disputes make this option inoperative.

Required Information/Modeling

Can the EUB provide full detailed pool delineation information to an acceptable degree of accuracy before any royalty-due production (Crown or freehold) occurs? The consensus of the team is that this cannot occur to the necessary degree of accuracy in such a timeframe.

Recommendation

Option 1: Establishing royalty interest at the well event level consistent with the establishment of working interest ownerships (strongly recommended)

5. Vintage

Background

Vintage is a factor in the Alberta royalty calculation based (with some minor exceptions) on date of discovery of a pool. Wells with different vintages are assessed different royalty rates. Generally, *Old* vintage wells are wells in pools discovered prior to 1974, i.e., prior to the change in world pricing patterns that occurred in 1973. They were made subject to a higher royalty rate than *New* wells (1974 and later) to share in windfall gains from the change in the world pricing mechanisms.

A *third tier* for oil was introduced in 1992 to recognize that oil pools remaining to be discovered were diminishing in size because the larger pools have already been found as they are the easiest to find and most attractive to locate.

Issue

The delivery of vintage is not an issue for single wells. It is simply one Crown royalty curve (formula) versus another. The application of the rules around units does, however, appear to be an issue. When new wells are added to a pool, the vintage of the unit production is ratioed in proportion to the increased reserves that the new wells have been seen to contribute to the unit. There is considerable administration around this particular aspect of vintage and some producers believe there may be significant mis-statements of such vintage co-existence factors.

Feasible Options

Option 1 Status Quo

Option 2 Remove *Old* designation from oil and gas wells

Option 3 Remove *Old* designation on end-of-life or low productivity oil and gas wells

Option 4 Add the *third tier* designation for gas from land sold after June 1, 1998

Option Analysis

Option 2 Remove *Old* designation from oil and gas wells

Assumptions
- Maintaining records on Old and New and calculating on Old and New rates entails extra administration that has an incremental cost.
- The Crown royalty share on Old gas or oil being higher than on New skews economic decisions toward investing in New oil or gas investments.
- The Crown share on Old gas is too high for marginal projects involving Old gas to go ahead.

Required Information/Modeling
- Administration assumption should be tested by a review of filing requirements.

— Skewing assumption may be tested by multiple project size model with Old and New gas or oil streams involved or by analysis of a large number of actual investment decisions.

— Rate assumption is correct (by definition of marginal), and assessment of impact is required, i.e., how many projects can be expected to meet this marginal definition in the future.

— Distributional modeling: a first cut at the impact of removing the Old rate shows approximately $58 million annually is shifted from Old gas owners to New gas owners (if revenue neutral to the Crown).

— Economic modeling: assessment of the number of marginal projects is required.

Technical/Economic Feasibility

This alternative is easily done, with no technical problems or additional costs to industry. There is a cost to substantially modify the existing gas royalty processing system (MRIS).

Administrative Impact

Appears to move in the direction of less administration. Estimates are required (cost benefit analysis).

Option 3 Remove Old designation on low productivity oil and gas wells

Assumption Generates a proportional share of the benefits of removing Old entirely.

Required Information/Modeling

— Administration assumption should be tested by a review of filing requirements.

— Assessment of number of future marginal projects with Old end-of-life or low productivity wells is required.

— Distribution modeling: the impact of removing the Old rate is substantially less if only applied to low productivity or end-of-life wells.

Technical/Economic Feasibility

This alternative can be done, with few technical problems or additional costs to industry once the rules are established and a determination of the wells moved to New vintage has been made. There is a cost to substantially modify the existing gas royalty processing system, MRIS (cost analysis).

Administrative Impact

May move in the direction of less administration. Estimates are required. There may be increased administration for continual movement of wells and for resolving disputes. It is likely that the pressure to increase the envelope of wells included will involve further analysis and consultation with industry (benefit analysis).

Option 4 Introduction of third tier gas

Assumptions — Removal of allowable cost calculations for a new tier of gas reduces administration for that tier of gas.

— No additional administration is added to existing gas; only volumes would change.

— Minimal impact on economic decisions involving multiple tiers of gas already producing a positive impact on investment in exploration and development.

— Bonus bids for potential third tier properties ensure full collection of Crown share.

— Bonus bid differentials are large enough to account for full change in costs.

Required Information/Modeling

— Administration assumption should be tested by a review of filing requirements.

— Assessment of number of projects involving third tier gas and the impact it would have on decision making.

— Distribution modeling: by definition, 0 distribution impact.

— Economics modeling: impact on bonus bid and on economics is required.

Technical/Economic Feasibility

This option can be done with few technical problems or additional costs to industry once the rules are established. There is a cost to substantially modify MRIS (cost analysis).

Administrative Impact

May move in the direction of more administration in the short run, with less in the long run. Estimates are required (benefit analysis).

Recommendation

Option 1: Status quo for vintage

- The distribution impact of removing it is substantial and the projected administrative benefits do not appear to justify the distribution impact.

6. Price and production sensitivity

Background

One of the project's non-negotiables is that the system must maintain some element of appropriate rent capture, i.e., remain sensitive to price and productivity level and appropriate to the resource.

Feasible Options

Option 1 Maintain current gross royalty formulas

This results in minimum distribution impact between industry and the Crown and between royalty payers.

Option 2 Replace with a flat royalty rate

This results in a simpler mathematical calculation of royalty but it does not satisfy the non-negotiable noted above.

Option 3 Replace with a flat rate on pools in early life and a lower or 0 rate on pools as they near the economic limit.

This does not satisfy the non-negotiable noted above.

Option 4 Make changes to the productivity relationship to lower the royalty and administrative burden on the lowest producing wells.

Option Analysis

Option 1 Current gross formulas

Pro's Stability of system – maintains matching of economic rent expected with bonus bids paid and economics of decisions already made and assets invested.

Con's

Assumption Basis of bonus bids and current business decisions.

Technical/Economic Feasibility
Current system; no further analysis required.

Required Information/Modeling
Current system; no further analysis required.

Option 2 Flat royalty rate

Pro's Simpler mathematics

Con's
- Shuts in a large number of lower productivity wells.
- Requires a second system to deal with marginally economic wells and pools to emulate the current system in some fashion.
- Does not meet non-negotiable stipulation of tying royalty to economic rent.

Assumption — Simpler mathematics reduces administration and improves ability to forecast.

Option 3 Flat rate royalty rate reducing to 0 as wells become uneconomic

Pro's
- Extends life of old reservoirs.

Con's
- Not necessarily connected to actual profitability of the reservoir if an arbitrary rule, but administratively complex if no arbitrary rule.
- Not sufficiently tied to rent available, so fails non-negotiables.

Assumption — Simpler mathematics reduces administration and improves ability to forecast.

Option 4 Reduced royalty for low productivity wells

Pro's
- Extends the life of marginal properties.
- Reducing some wells to 0 could have a small administrative gain impact on companies with only very low productivity wells.

Con's
- Distribution impacts.
- Reduced revenue with no reduction in administration cost for Crown.
- May require increased surveillance effort in spite of lesser revenues.

Assumptions
- Reduction of cost (royalty) allows longer well life, which results in longer pool life.
- No royalty on low rate wells reduces some administration in industry.
- Production reporting is maintained at minimal necessary amount.
- No negative impact on well abandonments.

Required Information/Modeling
- Economics of low productivity wells – is royalty a significant factor?
- Effect on abandonment decisions.
- Whether any administration would be reduced.

Conclusions

The administration eliminated from the Crown side is limited to a possible reduction in the number of invoices issued each month. All activity relative to volumetrics continues to be necessary and there is a distinct possibility that the surveillance effort will increase. The possible reduction in the number of invoices is driven by the fact that royalty source (low productivity well event) is being suggested for elimination. However, there is a high probability that an invoice is being issued to the same payer for other wells; therefore, there is no administrative benefit gained by not invoicing the royalty associated with the low producing well. In this scenario there is no administrative gain but the Crown foregoes revenue.

A related variation is to forgive royalty assessments (by payer) below a specific dollar amount (monthly or annually). This is Solution #28a of the royalty regimes under consideration. This provides some royalty payers motivation to play legal games to get below the hurdle. Also, the anticipated surveillance costs required to stem this leakage may be high.

Recommendations

- Option 4: Reduced royalty for low productivity wells
  - Has potential for mitigating distribution impacts.
  - Has a slight potential administrative gain. As such it should be considered for use as a mitigating strategy.

- Overall, the present royalty curve concept is the recommended strategy for defining the Crown's royalty share of resource value.
  - Minimizes distributional impact .
  - Not identified as an issue in the consultation process.

7. Allowable cost adjustment to gross royalty rates (gross royalty adjustment)

Background

The gross rate adjustment is an optional factor in the Alberta royalty calculation on any of wellhead, plant inlet or plant outlet royalty. It is used to adjust the gross Crown royalty curve to provide for standard allowable costs instead of using more precise allowable cost numbers, such as actuals. The rationale for using this adjustment is the elimination of the administration on allowable costs and the elimination of the uncertainty surrounding the present complex allowable cost regime.

Feasible Options

Implementation Options

Recognize allowable costs by adjusting the gross Crown royalty rate.

- One adjustment for all of Alberta.
- EUB facility specific adjustment.
- Plant type adjustment.
- Area or producing horizon adjustment.
- Type of gas adjustment, i.e., sour, wet, sweet, dry.
- Status quo - for the status quo, all of the above options could apply, as well as a specific adjustment for each product or any combination thereof.

Updating Options

A number of options for updating the gross royalty rate have been identified.

- No updates.
- Annually update gross royalty curve by some published inflator such as CPI or GDP.
- Periodically update gross royalty based on actual costs (statistical sampling or full reporting).
- Update gross royalty annually based on actual findings.
- Identify and implement a correlation analysis between throughput and unit costs and adjust the curve annually.
- Do not adjust the royalty curve for new or deferred environmental costs.
- Update gross royalty curve periodically based on actual costs (statistical sampling or full report).
- Handle environmental costs *off-line*, i.e., separate submissions and process or remove from royalty regime to environmental.

Option Analysis

Implementation Options

The following analysis applies to all implementation options

Pro's — The gross rate adjustment eliminates all allowable cost reporting for Crown purposes, as well as eliminating the uncertainty of the allowable cost deduction for economic analysis.

Con's — Distribution impacts may be significant. For all options, the Crown must develop a methodology to calculate these factors. For modeling purposes, historical data could be used to calculate these factors. Problems arise due to the fact that the Crown only has actual operating costs on the largest 38 plants. An updating strategy for these factors on an ongoing basis must also be established, i.e., actual costs or some sort of updating algorithm.

Required Information/Modeling

Distribution modeling of the effects of the different options must be run.

Technical and Economic Feasibility

As stated above, the methodology aspects of calculating these adjustments must be researched. Depending on the updating process selected, there may be an ongoing cost to the Crown and industry.

Administrative Impact

Appears to move in the direction of less administration. Estimates are required (benefit analysis).

Updating Options

- **No updates**

  Pro's
  - Simple as no further effort is needed.
  - Certainty as the rate remains constant for each level of pricing and production.

  Con's
  - Lower gross royalty curve becomes out of step with actual costs.
  - Increase or decrease in actual unit cost experiences provides risk to the Crown or the industry.

- **Annually update gross royalty curve by some published inflator such as CPI or GDP**

  Pro's
  - Simple to implement and administer.
  - Producers know what to expect.
  - Recognizes some cost escalation.

Con's
- Inflator may not relate to producer costs.
- Unit costs are a function of throughput and not inflation, which creates winners and losers (Crown and/or producers) each year of updates.

- **Periodically update gross royalty based on actual costs (statistical sampling or full reporting)**

Pro's
- Risks to producers and Crown around actual costs are removed on a periodic basis.
- Minimizes winners and losers.

Con's
- Creates administration as a system is still needed to report costs even if only every two, three , five or whatever years.
- Creates audit issues as the Crown needs to satisfy itself the reported costs are accurate.
- Training issues as the process is once over a longer period and needs to be relearned each submission date.

- **Update gross royalty annually based on actual findings**

Pro's
- Well understood as it is what we do today.
- Eliminates risks and reduces distribution.

Con's
- Heavy administration.
- Rules are not clear and some do not work.

- **Identify and implement a correlation analysis between throughput and unit costs and adjust the curve annually**

Pro's
- Could be applied at the plant level and materially reduce distribution.
- Could be easily inflated to recognize rising costs.
- Recognizes relationship between costs and volume and is fairer to all parties.

Con's
- Nobody has ever found a correlation that worked in all cases (or even in most cases).

- **Do not adjust the royalty curve for new or deferred environmental costs**

Pro's
- Simple and easy to administer.

Con's
- Unfair to producers.
- Royalty rates become artificially high.

- **Update gross royalty curve periodically based on actual costs (statistical sampling or full report)**

  Pro's
  - Risks to producers and Crown around actual costs are removed on a periodic basis.
  - Minimizes winners and losers.

  Con's
  - Creates administration as a system is still needed to report costs even if only every two, three, five or whatever years.
  - Creates audit issues as the Crown needs to satisfy itself the reported costs are accurate.
  - Training issues as the process is once over a longer period and needs to be relearned each submission date.

- **Handle environmental costs *off-line*, i.e., separate submissions and process or remove from royalty regime to environmental.**

  Pro's
  - Does not complicate the royalty curve process.
  - Still provides a vehicle for proper cost sharing.

  Con's
  - Creates administration.
  - Creates audit activity as Crown needs to satisfy itself costs are correct.
  - May create difficulty classifying certain costs as environmental or operating.

Recommendation

This method of recognizing costs deductions is not recommended.

- None of the above implementation options has benefits that exceed risks and costs.

8. Wellhead royalty and product in-kind

Background

One of the viable alternatives identified during the current royalty review is a form of wellhead royalty. This is probably based on calculating the Crown royalty on heat measured/deemed at the wellhead.

Benefits

While it is still preliminary in scope and format and far too premature to make definitive assumptions, the initial benefits of such a royalty regime are:

- Theoretically it can be delivered in a very simple manner: S-1 volumes converted to heat. Crown factors at each well and working interest splits are known. Allowable costs are factored into the royalty curve or as a reduction in the value applied for Crown royalty purposes. There may be zonal or pool permutations (heat) depending on re-distribution impacts and associated mitigation strategies.
- Crown can still invoice for royalties.
- Crown royalties are calculated with increased certainty and considerably less amendments and rework.
- Crown royalties are known, billed and financially recorded in the industry and government much earlier than under any of the recent regimes.
- Crown is removed from industry's business processes at the earliest possible point reducing business, accounting and systems complications.
- Significant reduction in related systems capability/requirements.
- Reporting requirements are minimized for all stakeholders.
- Administration costs are reduced.

Issues

Some potential risks and issues with this option are:

- Distributional impacts may be unacceptably high and reasonable mitigation strategies may not be available.
- May result in Crown liability for environment and reclamation costs being eliminated from this point forward (historic portions are still hinged to title holder).
- Crown surrenders title on raw gas at the wellhead and this may make lifting products in-kind difficult or possibly illegal.
- Issues around the following need to be resolved:
  - Pricing.
  - Cost recognition.
  - Volumetric to heat conversion factors.
  - Heat measurement, accuracy and frequency
- Reduced reporting levels might make Crown policy difficult to analyze and implement.

The wellhead option does not readily lend itself to facilitating a future decision by the Crown to lift product in-kind. The in-kind scenario may range from some products from some producers at some plants to all products from all producers at all plants or any permutation and combination thereof. If a wellhead royalty were considered to be the optimal royalty regime, then the issue remains as to how the Crown would be able to properly identify royalty share in order to lift its share of product in-kind. Three alternatives are discussed below.

Feasible Options

Option 1 Tie into existing industry to industry reporting.

Option 2 Develop new reporting structures to facilitate in-kind decisions.

Option 3 Maintain a simplified and streamlined Owner Activity Statement document with the wellhead royalty.

Option Analysis

Option 1 Tie into existing industry to industry reporting

Description

Industry is anticipated to continue the process of allocating product to the production entity (well, unit, or well groups). This may mean allocation to a stream operator and then subsequent re-allocation to a production entity. In either case, it is likely the product is attributed to an individual well or production entity.

Benefits

- Reporting is already in place (industry allocation statements).
- Does not require incremental effort from the industry.
- Does not require incremental implementation effort.

Issues

- There is no standardization in industry to industry allocation statements, which means the Crown needs to dedicate resources to interpret each statement, as does the industry.
- Industry tends to allocate natural gas liquids (NGL's) mix to a well, but royalties are based on discrete products.
- The wellhead option may or may not properly compensate industry for the Crown taking product in-kind. This may result from a composite price where the heat includes compensation for NGL's at the wellhead. How this price is re-adjusted needs consideration, especially if it is decided that the Crown will lift from some producers, some products at some plants. This may result in an uneven playing field in these instances.

- The wellhead option is most likely to be based on heat. If the Crown lifts NGL's in-kind, then a process must be put in place to reduce the heat at the wellhead for impacted facilities, owners, etc, but not necessarily for all owners at all facilities.

- Crown needs to re-employ auditors and may need to address the issues of dispute and settlement or resolution similar to the pre-1994 regimes.

- Will Crown processing, fractionation and/or transportation take priority over that of the producer?

- Crown allowable cost considerations, whether standard or direct, may need to be reviewed. The Crown should not expect to receive subsidized costs similar to today's allowable costs while competing directly for markets.

Option 2 Develop new reporting structures to facilitate in-kind decisions

Benefits

Protects the Crown's right to take royalty volume in-kind.

Issues

- More reporting and administration for all parties.
- Requires lead time to develop and implement.
- Requires reconciliation and associated audit activity.
- The wellhead option may or may not properly compensate industry for the Crown taking segregated product in-kind. This may result from a composite price where the heat includes compensation for NGL's at the wellhead. How will this price be re-adjusted, especially if it is for some producers with some products at some plants or a combination thereof?
- The wellhead option is most likely to be based upon heat. If the Crown lifts NGL's in-kind, but not residue gas, then a process must be put in place to reduce the heat at the wellhead for the impacted facilities, owners, etc.
- Crown needs to re-employ auditors and may need to address the issues of dispute and settlement similar to the pre-1994 regimes.
- Will Crown processing, fractionation and/or transportation take priority over that of the producer?
- Crown allowable cost considerations, whether implicit or direct, may need to be reviewed. The Crown should not expect to receive subsidized costs similar to allowable costs today while competing directly for markets.

Option 3 Maintain a simplified and streamlined Owner Activity Statement (OAS) document with the wellhead royalty

Benefits

- In kind scenarios can be implemented readily.
- OAS already exists and is generally understood.

Issues

- OAS is completed until and if the Crown elects to take in-kind, but it is a form that has no legitimate business purpose until then.
- Creates administration that could not be justified.
- Requires reconciliations and associated audit activity.
- The wellhead option may or may not properly compensate industry for the Crown taking product in-kind. This may result from a composite price where the heat includes compensation for NGL's at the wellhead. How will this price be re-adjusted, especially if it is for some producers with some products at some plants or a combination thereof?
- The wellhead option is most likely to be based upon heat. If the Crown lifts NGL's in-kind, then a process must be put in place to reduce the heat at the wellhead for the impacted facilities, owners, etc.
- Crown needs to re-employ auditors and may need to address the issues of dispute and settlement similar to pre-1994 regimes.
- Will Crown processing, fractionation and/or transportation take priority over that of the producer?
- Crown allowable cost considerations, whether implicit or direct, may need to be reviewed. The Crown should not expect to receive subsidized costs similar to today's allowable costs while competing directly for markets.

Recommendation

A wellhead royalty does not lend itself easily to the possibility of a Crown decision to take product in-kind. It can be done, but many issues need to be resolved and many questions answered. Also, there is the potential for a sharp increase in administrative costs and effort for both sides if such a decision is taken.

9. Pricing the Crown's royalty share

Background

Reference price is a valuation process for gas and liquids in the current regime. Industry, pipelines, purchasers, and direct gas sellers supply price and transportation data. The Department of Energy calculates a reference price for each month and supplies information to industry 45 days after the end of each production month. Any adjustments that must be made are rolled into the current month.

Feasible Options

Option 1	Provincial reference price	(all products) (units)
Option 2	Provincial reference price	(residue gas) ($/GJ)
Option 3	Provincial composite reference price	($/GJ)
Option 4	Zone reference price	(residue gas) ($/GJ)
Option 5	Zone composite reference price	($/GJ)
Option 6	Pool-wide reference price	(residue gas) ($/GJ)
Option 7	Pool-wide composite reference price	($/GJ)
Option 8	Pool-wide reference price	(residue gas) ($/GJ)
Option 9	Plant-wide composite reference price	($/GJ)

Option Analysis

Common Assumptions

- For all proposals the information gathering process for reference price remains as it is now.
- Corporate average pricing (CAP) filing ceases.
- All royalty clients have to become reference price filers.
- In order to maintain integrity of reference price, compliance and deadline policy and procedures must continue.
- Existing submissions by pipeline companies, purchasers and direct gas sellers still have to be submitted to the government.
- The reference price could not be determined earlier than it is currently being done in order to have a reasonably accurate reference price determination.

Common Suggestion

A three month deposit could be held by the Department of Energy. This allows sufficient time to establish the actual reference price versus an estimated reference price, followed by future adjustments. The extra one-month deposit is fair to all parties and reduces the rework.

Common Consideration

The project team expects that SEPAC companies will still like the flexibility to elect reference price or corporate average price filing as they do not get prices for their gas and liquids that meet or exceed posted reference prices. Sulphur requires some investigation

because currently there are no GJ'S applied. The reference price is issued for sulphur on a monthly basis. A mitigation strategy needs consideration.

Option 1 Provincial reference price (all products) (units)

Pro's — As this is the status quo option, all data is available today. Furthermore, the consultation process has not identified any issues relating to it.

Con's — None known.

Assumptions — Common assumptions apply.

Technical/Economic Feasibility

No issues

Administrative Impact

Some reduction for the royalty payers using CAP today (benefit analysis).

Required Information/Modeling

Distributional modeling is required. Mitigation strategy could be considered.

Option 2 Provincial reference price (residue gas) ($/GJ)

Pro's — Simple data already available.

Con's — Crown does not get fair share of liquids (heat content on liquids in raw gas state not equal to market value of LPG's).

Assumptions

- Common assumptions apply.
- Reference price is based on residue gas and applied back to raw gas GJ'S at a well level.
- Assume no GJ uplift for liquids.

Technical/Economic Feasibility

This alternative could be done with no technical issues or concerns because basic data is readily available

Administrative Impact

Administration for industry is less. However, the same reporting standards and time restraints on industry to supply information will not change (benefit analysis).

Required Information/Modeling

- Administration should be tested to see if increased or decreased.
- Economics should be tested to see who are winners and losers.

— Distributional modeling: to determine who are winners and losers if revenue to Crown is neutral.

— Economics - will this make some properties uneconomical?

Option 3 Provincial composite reference price ($/GJ)

Pro's — Simple data already available

Con's — Any one having dry gas does not have a fair reference price on which to pay their royalties.

Assumptions

— Common assumptions apply.

— Reference price is based on a weighted average of gas and products and applied back to raw gas GJ'S at a well level.

— There is a GJ uplift applied to the well as the heat content on liquids in raw gas state does not equal market value of liquids.

Technical/Economic Feasibility

This alternative could be accomplished as the information is already available.

Administrative Impact

Administration may be reduced. However, the reporting standards are the same and put extra pressure on liquid purchasers as they do not always have their information at the same time as gas. Some deadline changes may have to occur—perhaps 3 month deposit as mentioned in Common Consideration above (benefits analysis).

Required Information/Modeling

— Administration should be tested to see if there is any change to present.

— Distributional modeling: to determine impact on royalty clients and Crown, if any.

Option 4 Zone reference price (residue gas) ($/GJ)

Pro's — Preparation for the future deregulation of the pipeline industry.

Con's — Need for arbitration to determine changing zones to get a more favorable reference price.

Assumptions

— List of common assumptions apply as well as Option 1 assumptions.

— Zones within province have to be determined.

— Transportation rates have to be zone specific and calculated into the reference price for each zone.

Technical/Economic Feasibility

— This option could be done providing zones are determined.

— Most other data is in system.

Administrative Impact

Appears to have more administration attached to it (cost analysis).

Required Information/Modeling

Distributional modeling is required. Mitigation strategy could be considered.

Option 5 Zone composite reference price ($/GJ)

Pro's — Preparation for the future deregulation of the pipeline industry.

Con's — Need for arbitration to determine changing zones to get a more favorable reference price.

Assumptions
- — List of common assumptions apply as well as Option 1 assumptions.
- — Zones within province have to be determined.
- — Transportation rates have to be zone specific and calculated into the reference price for each zone.

Technical/Economic Feasibility
- — This option could accomplished providing zones are determined.
- — Most other data is in system.

Administrative Impact
- — Appears to have more administration attached to it.
- — Reporting standards are the same and will put extra pressure on liquid purchases as they do not always have their information at the same time as gas.
- — Some deadline changes have to occur.

Required Information/Modeling

Distributional modeling is required. Mitigation strategy could be considered.

Option 6 Pool-wide reference price (residue gas) ($/GJ)

Pro's — Aids in introducing pool/zonal processing cost allowances (postage stamps).

Con's
- — Very high initial cost to determine a large number of pools' (15,000) reference prices.
- — Contracts could be affected where the delivery point is not the same as where gas changes ownership.

Assumptions
- — List of common assumptions apply as well as Option 1 assumptions.

— Individual pools or pools brought up to higher level (e.g. Glauc. A,B,C,D,E etc.) could be rolled up to Glauconitic - has to be determined.
— Large number of pools (3,000) to be determined.
— Transportation rates have to be pool specific.

Technical/Economic Feasibility

— This is a highly encumbered system.
— System modifications will be high (cost analysis).

Administrative Impact

Heavy workload increase in determining reference price (cost analysis).

Required Information/Modeling

— Distributional modeling is required. Need to determine reference price pool-wide - not available. Mitigation strategy could be considered.
— Need to gather data regarding pools.

Option 7 Pool-wide composite reference price ($/GJ)

Pro's

Aids in introducing pool/zonal processing cost allowances (postage stamps).

Con's

— Need for arbitration to determine changing zones to get a more favorable reference price.
— Very high initial cost to determine a large number of pools' reference prices.
— Contracts could be affected where the delivery point is not the same as where gas changes ownership.

Assumptions

— List of common assumptions apply.
— Weighted average of gas and products at pool level and apply back to raw gas at a well level.
— GJ uplift needs to be applied.

Technical/Economic Feasibility

— This is a highly encumbered system.
— System modifications will be high (cost analysis).

Administrative Impact

Heavy workload increase in determining reference price (benefit analysis).

Required Information/Modeling

— Distributional modeling is required. Mitigation strategy could be considered.

— Need to gather data regarding pools.

— Need to determine a weighted average reference price pool-wide.

Option 8 Pool-wide reference price ($/GJ)

Pro's

Aids in introducing plant specific postage stamp cost allowance for all volumes.

Con's

— Very high initial cost to determine a large number of individual plant reference prices.

— Transportation rates could be a factor.

— Not all gas is delivered to a plant. Gas can also be sold into a gathering system and compressor sales line and, in some cases, can be disposed of at a battery while raw gas can be sold at a well level.

— No specific network standardization in gas delivered for sale.

Assumptions

— List of common assumptions apply as well as Option 1 assumptions.

— Individual plants' reference prices have to be determined.

— Large number of plants (approximately 1000).

Technical/Economic Feasibility

— This is a highly encumbered system.

— System modifications will be high (cost analysis).

Administrative Impact

Heavy workload increase in determining reference price (cost analysis).

Required Information/Modeling

— Distributional modeling is required. Mitigation strategy could be considered.

— Need to gather data to a plant level.

— Need to determine reference price to a plant level.

Option 9 Plant-wide composite reference price ($/GJ)

Pro's

Aids in introducing plant specific postage stamp cost allowance for all volumes.

Con's

— Very high initial cost to determine a large number of individual plant reference prices.

— Transportation rates could be a factor.

— Not all gas is delivered to a plant. Gas can also be sold into a gathering system and compressor sales line and, in some cases,

can be disposed of at a battery level while raw gas can be sold at a well level.

— No specific network standardization in gas delivered for sale.

Assumptions

— List of common assumptions apply.

— Individual plants' weighted average reference prices have to be determined.

— Large number of plants (approximately 1000).

Technical/Economic Feasibility

— This is a highly encumbered system.

— System modifications will be high (cost analysis).

Administrative Impact

Heavy workload increase in determining reference price.

Required Information/Modeling

— Distributional modeling is required. Mitigation strategy could be considered.

— Need to gather data to a plant level.

— Need to determine reference price at a plant level.

Recommendation

Option 1: provincial reference price by segregated product (status quo)

- The process is working well today.

10. Deduction of gathering, compressing and processing costs from the Crown's royalty share

Background

A method of deducting gathering, compression and processing costs from the Crown's royalty share is required in each of the alternative royalty regimes, either implicitly or explicitly depending on the method of determining and delivering the Crown's share of gas and gas by-product gathering, compression and processing costs. Allowable costs may be calculated:

- On actual experience based on commonly understood principles for individual production facilities, or on areas, zones, plant type or potentially other groupings.

OR

- Allowable costs can be based on averages over time and/or geographical, geological or processing category groupings.

The rationale in Element 10 is to adjust the Crown's net royalty share for differing royalty trigger points to account for allowable costs incurred between the Crown royalty trigger point(s) and the points where the gas and gas by-products are valued.

Feasible Options

	Operating Costs	Capital Costs
Option 1	Status Quo Postage – plant type and designated	Actual
Option 2	Postage – plant type and designated	Postage – plant type and designated
Option 3	Postage – plant type	Postage – plant type
Option 4	Postage – plant type and zone	Postage – plant type and zone

For all above alternatives, clarified principles of allowable or eligible costs should be developed and communicated to all stakeholders.

Option Analysis

Option 1 Streamline current regime - postage stamp for operating costs on 5 plant types and 38 designated facilities and actual capital for all facilities

Features

- Crown allowable cost guidelines expanded consistent with industry Generally Accepted Accounting Principles (GAAP).
- Crown publishes updates to allowable cost rules resulting from audits and appeals.

- Effective rate for allowable cost deductions reverts to actual effective rate for royalty entity (i.e., well or unit) replacing Corporate Effective Royalty Rate (CERR).
- Royalty holidays revert to net royalty from gross royalty, eliminating gross-up factors.
- Custom processing adjustment factor (CPAF) is replaced by postage stamp uplift factor for custom users (based on historical data and not updated).
- Capital costs allocated by energy adjusted gas equivalent volume (EAGEV) on royalty entity, (i.e., well or unit) effective rate, consistent with operating cost deduction.
- The cost rate updating process is improved by applying adjustments to the affected production period, avoiding large distortions in rates caused by rolling volumes and cost adjustments forward into the next period.
- OAS process can be simplified, including elimination of plant to plant accounting.

Pro's

- Distribution is minimized through continued use of 38 designated plants where actual operating costs are filed, and continued use of actual capital for all facilities.
- New investment recognized for all facilities.
- Reduced audit costs through enhanced policy guidelines.
- Enhanced understanding of cost guidelines through published rulings, expanded guidelines.
- Enhanced understanding and predictability of royalty for economics or budgeting by elimination of CERR.
- Better alignment with requirements of other stakeholders (Indian, freehold, custom).
- Reduction of custom processing accounting through postage uplift for custom processors.
- Enables return to net royalty holidays, resulting in more certainty in benefit.
- More closely matches royalty costs to production by simplifying rate updating.

Con's

- No reduction of number of allowable cost submissions by facility operators.
- Audit still required for cost submissions.
- No reduction of Crown cost submission administration.
- Potential distribution impact regarding today's custom fees that exceed the agreed postage stamp.

Option 2 Partial postage stamp system – capital postage for 5 plant types and actual capital for 38 designated plants

Features

- Must create capital postage stamp costs for the 5 plant types, which are the non-designated facilities, using the 1994-96 annual cost capital submissions. Continued reporting of capital costs for the current 38 designated facilities.
- Crown allowable cost guidelines expanded consistent with industry Generally Accepted Accounting Principles (GAAP).

- Crown publishes updates to allowable cost rules resulting from audits and appeals.
- Effective rate for allowable cost deductions reverts to actual effective rate for royalty entity (i.e., well or unit) replacing Corporate Effective Royalty Rate (CERR).
- Royalty holidays revert to net royalty from gross royalty, eliminating gross-up factors.
- Custom processing adjustment factor (CPAF) is replaced by postage stamp uplift factor for custom users (based on historical data and not updated).
- Capital costs allocated by energy adjusted gas equivalent volume (EAGEV) on entity effective rate, consistent with operating cost deduction.
- The cost rate updating process is improved by applying adjustments to the affected production period, avoiding large distortions in rates caused by rolling volumes and cost adjustments forward into the next period.
- OAS process can be simplified, including elimination of plant to plant accounting.

Pro's

- Eliminates capital reporting for non-designated plants.
- Preserves specific capital deductions for major facilities (designated plants).
- Eliminates annual cost auditing on non-designated facilities.
- Further reduces audit costs through enhanced policy guidelines.
- Enhanced understanding of cost guidelines through published rulings, expanded guidelines.
- Enhanced understanding and predictability of royalty for economics and budgeting by elimination of CERR.
- Better alignment with requirements of other stakeholders (Indian, freehold, customs).
- Reduction of custom processing accounting through postage uplift.
- Enables return to net royalty holidays, resulting in more certainty in benefit.
- More closely matches royalty costs to production by simplifying rate updating.

Con's

- Potential distributional impacts on plant type costs and custom fee uplift.
- Difficulty in changing plant type as operations/use changes.
- Does not recognize age (accumulated depreciation) of plants for plant types.
- Virtually impossible to recognize capital additions for plant types.
- Annual cost reporting still required for designated plants.
- Audit still required for designated plant capital (acquisition, disposal, allocation).
- Difficulty in updating capital postage rates because of lack of current information.

Option 3 Full postage stamp

Features

- Must add operating and capital costs from 38 plants into the 5 plant types or create a 6^{th} (or if necessary more) plant type to absorb the designated plants.

- Use 1994-96 actual annual cost submissions to arrive at the average capital and operating postage stamps.
- Effective rate for allowable cost deductions reverts to actual effective rate for royalty entity (i.e., well or unit) replacing Corporate Effective Royalty Rate (CERR).
- Royalty holidays revert to net royalty from gross royalty, eliminating gross-up factors.
- Custom processing adjustment factor (CPAF) is replaced by postage stamp uplift factor for custom users (based on historical data and not updated).
- Capital costs allocated by energy adjusted gas equivalent volume (EAGEV) on entity effective rate, consistent with operating cost deduction.
- The cost rate updating process is improved by applying adjustments to the affected production period, avoiding large distortions in rates caused by rolling volumes and cost adjustments forward into the next period.
- OAS process can be simplified, including elimination of plant to plant accounting.

Pro's

- Eliminate all capital and operating annual cost reporting.
- Eliminate all annual cost audits.
- Reduction of custom processing accounting through postage uplift.

Con's

- New capital investments not recognized for owners who make investments.
- Potentially a major distributional impact if designated plant status eliminated.
- Potential distributional impact regarding today's custom fees that exceed the agreed postage stamp.
- Loss of data base negates any future return to an actual cost system.
- Difficulty in changing plant type as operations/use changes.
- Difficulty in updating capital rates.

Recommendations

- The option to improve industry/Department of Energy alignment on interpretation of allowable cost rules should be pursued if the chosen royalty regime requires continued submission of actual (some or all) allowable costs, i.e., it is a stand-alone concept that should proceed even if there is no change in royalty regime

- Option #2 has some merit if a capital base postage stamp is used for the 38 designated facilities and an average postage stamp for the other 5 plant types. The pre-1994 operating cost postage stamp mechanism showed a lesser distribution when this was employed.

  The administrative benefit of Option 2 (and of Option 1: Status Quo) is lost if the regime resorts to extremely complex updating rules, i.e., estimating volumes that affect the capital and operating rate base yearly on the designated and 5 plant type facilities and transfers or facility (plant) type changes,

Implications

- The analysis of distributional effects is critical as major producers have made extremely large capital investments in facilities (gathering, compression and processing) and even a small percentage change in allowable costs could result in financial losses many times more than the entire cost of the current administration.

- The analysis of custom processing impacts is critical for the many producers who do not own their own processing capacity.

11. Discharging Crown charges and other royalty liabilities

Background

Liability for Crown charges of all sorts rests with the corporate entities or individuals responsible by virtue of their mineral right ownership in the production or their working interest ownership in the well/unit producing the hydrocarbon. Clients include both the working interest owners and freehold mineral right owners. Although the mineral right owners are liable for freehold mineral rights tax, business processes tend to see the working interest owners discharge this liability and reconcile the proportionate tax payment sharing via the freehold royalty statements. The exceptions are PanCanadian and perhaps one or both of Mobil and Amoco. These mineral right owners remit the tax payments.

Working interest ownership is recognized in two ways:

- The lease ownership (registered with the Crown).
- The division/allocation of produced products or gross revenue from produced products from the subject property.

Freehold ownership is established by way of the freehold certificate of title to the mineral rights underlying a particular land area, and is a matter of public record via the Northern and Southern Alberta Land Titles Offices.

Feasible Options

Option 1 Status Quo – Crown royalty driven by volume allocations

Determine working interest ownership based on the allocated ownership of produced products. This is the status quo option for gas royalty and is achieved using allocated owner level reporting of volumetric information.

Corollary to Option 1: Determine freehold mineral right (royalty) ownership based on land titles records and establish the obligation to discharge the related Crown charge in accordance with standard industry business practices. This sees the working interest owner discharge the mineral tax liability on behalf of the freehold mineral right owner with the noted exceptions.

Option 2 Crown charges invoiced to registered working interest owner

Determine working interest ownership based on registered lease ownership. This implies allocations of production are not of interest to the Crown nor to the freehold mineral right owner in terms of looking to a particular party to satisfy royalty payment. Rather the obligation to discharge liability rests with the person with the legal right to the production or share of production.

Option Analysis

Option 1: Status Quo – Crown royalty driven by volume allocations

Pros

- System is currently in place in the industry.
- Industry uses the same system for allocation of production/distribution of revenue; therefore, royalty liability tends to track revenue realization.
- No training or education is required.

Cons

- The operator can trigger any Crown royalty charge against any other party through the preparation and filing of the OAS.
- Safeguards do not exist to limit the filing of OAS documents. Anyone with EDI capacity and knowledge of facility and client codes can file an OAS. Kiting of liability may arise.
- More than 10% of the necessary OAS's are either not filed or are improperly prepared and thus rejected each month. August 1997 provisional assessment was $38 million. This suggests problems with the OAS:
  - It may not fit all Crown royalty situations.
  - Industry does not yet have the necessary skills/training to properly use what has devolved into a Crown royalty volumetric reporting tool.
- Crown may be collecting or attempting to collect royalty from a party with no true (legal) obligation.

Assumptions

- Crown charge liability continues to be based on volumetric allocations/liftings.
- Legal issues surrounding financial liability are clear and resolved.
- This mechanism works with the various viable alternatives, i.e., heat content wellhead, specification product allocations, tweaking of the current system.

Required Information/Modeling

- Assumption 1 need not be tested.
- Assumption 2 need not be tested as it clearly works today partially because of the Crown's right to declare a lease to be in default and make third party demands for payment.
- Assumption 3 should be tested by team review of business processes.
- Modeling is required for the related business processes of each viable alternative except the status quo.

Technical and Economic Feasibility

This option is working today.

Administrative Impact:

No gains or losses exist.

Option 2 Crown charges invoiced to registered working interest owner

Pros

- Financial obligations follow legal rights.
- Crown is not party to industry business transactions that involve the buying-selling of working interests (except if different royalty variables exist –CERR or costs).
- Helps in arriving at Crown charge certainty.
- Fits well with the concept of a shared information registry.
- Fits with the concept of a wellhead royalty where the operator discharges the Crown obligations via one industry/Crown transaction. Consensus of the project team is that operators accepting full royalty liability is a non-starter.

Cons

- There are instances where income and royalty charges are out of sync. For example, working interest owners lift production in excess of (or less than) their working interest share. Irrespective, Crown royalty is invoiced to the legally entitled working interest owner and the Crown looks to this party for payment.
- Requires substantial training and education, not to mention industry process overhaul.

Consideration

Legal documentation is sometimes not completed in a timely manner. With data registry information slightly out of sync, the Crown may invoice charges to the previous working interest owner. As a result, industry necessarily has Crown charge related adjustments on closing. Today with various costs and with CERR's, the Crown is by necessity involved in the resulting re-filings.

Note: this is a consequence under any set of business rules.

Assumptions

- Assumption 1: Crown charge (royalty) liability legally rests with and is borne by the registered working interest owner. Alternatively, Crown charge (mineral tax) liability rests with the freehold mineral right owner, frequently not an industry working interest owner. The assumption is that an agency relationship is implemented such that the working interest owner has an obligation to initially discharge the Crown charge of freehold mineral rights tax.
- Assumption 2: Crown should not be party to adjustments on closing when working interests change hands. Note: it is recognized that as long as royalty variables are company specific, the Crown will be involved.
- Assumption 3: Heat content is predetermined, valuation is predetermined via a reference price mechanism of some sort, and the Crown charge is client indifferent, i.e., there is no CERR.

- Assumption 4: Adequate measures are taken to ensure timely and accurate maintenance of the working interest ownership data.

Required Information

Assumption 1

The input of the affected parties.

- Will non-industry freehold mineral right owners accept an agency agreement?
- Alternatively, the resource allowance implications of the current freehold mineral right tax (it is an ownership tax) may need to be included in the transition plan and/or as tools of mitigating distributional impacts.

Assumption 2

Does not need to be tested; rather a decision needs to be taken. All indications are that industry's belief that the Crown need not be involved in adjustments on closing is a widely held perspective.

Assumption 3

Will be validated or refuted by the decisions driven out of the modeling exercise.

Assumption 4

Need not be tested; rather business rules need to be established.

Modeling

Modeling is required for the related business processes.

Technical and Economic Feasibility

Option 2 sees its greatest value contribution if it is implemented in conjunction with the implementation of a shared information registry for working interest ownership. Such a registry is technically feasible, but are all of the stakeholders prepared for the technical and economic implications?

Administrative Impact

- Crown realizes revenue certainty sooner as the invoice is property rather than person specific.
- There is substantially less effort required in Crown charge revisions as the Crown is involved in the outcomes of buy/sell adjustments. Reallocations of volumes require refilings as Crown/freehold splits may well be a consideration.
- Crown could see substantially less involvement as this model fits with the concept that the well operator is responsible for discharging Crown charge obligations.

- Industry effort associated with financial adjustments on closing of a sale or when there are volumetric reallocations reduced by the amount of the interface with respect to Crown charge changes.

Recommendation

A recommendation is contingent on the other business process decisions taken. However, Option 2 appears most favourable from the perspectives of revenue certainty, administrative simplicity, and reduced government involvement. The benefit, however, does not appear to outweigh the costs associated with the changes and the related education and training. Unless new information surfaces, the current volumetric approach (Option 1) appears to be the methodology of choice.