

**Adding Value to Alberta's
Propane Resources**



Prepared for:
Neil Shelley

Prepared by:
Stantec Consulting Ltd.

June 2, 2015

Sign-off Sheet

This document entitled Value of Value Add was prepared by Stantec Consulting Ltd. ("Stantec") for the account of Alberta's Industrial Heartland Association (the "Client"). It is a conceptual analysis and should not be relied on for investment purposes. The document is intended to show the additional value that a particular scenario of petrochemical facility might bring to the Province. Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by 

(Signature)

Ian Morrison

Reviewed by 

(Signature)

Debbie Pietrusik

Table of Contents

1.0	INTRODUCTION	1
2.0	METHODOLOGY	1
3.0	RESULTS	2
3.1	DIRECT BENEFITS.....	3
	Base case: Royalty from shipping propane out of Alberta.....	3
	Value Added Case: Royalty from shipping propane out of Alberta.....	4
	Summary	5
3.2	INDIRECT BENEFITS	5
4.0	CONCLUSION	5

1.0 INTRODUCTION

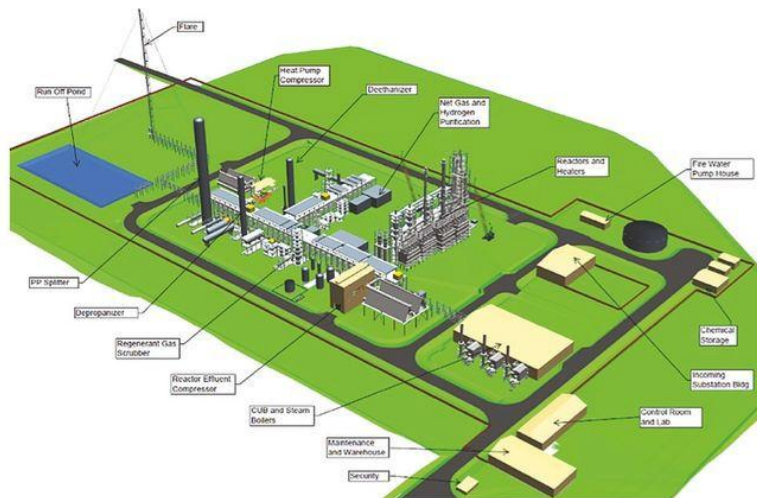
How can Alberta maximize the value captured from the extraction and processing of its natural resources? If energy products are extracted and immediately shipped for sale outside Alberta the value associated with refining of these products is lost. For oil and gas products, finding the right position in the value chain is imperative for economic prosperity in Alberta. Using Stantec's technical experience in engineering, industrial project development, and economics, a high level economic analysis to estimate the benefit to the Province of taking Alberta propane and converting it into both propylene as well as polypropylene was conducted. This report outlines the results of this analysis.

2.0 METHODOLOGY

To determine the direct benefit of the project to Alberta in the form of incremental taxes, the incremental cash flow to Alberta from a new polypropylene (PP) facility was determined. For this analysis, two sources of taxable income were considered, the construction and operating companies and workers who are directly involved with and work on the project.

To construct the model to evaluate the benefit, several assumptions were made in regards to the size, technology and configuration of the facility. These assumptions form the basis of the analytical methodology. Stantec assumed the facility would be a world class industrial plant including both propane dehydrogenation (PDH) and polypropylene (PP) plants. An image of a typical facility of this nature is depicted below.

Figure 2.1: Sample PDH and PP facility



May 15, 2015

The process assumed for this analysis is that raw propane is first converted into propylene via a PDH plant. Propylene produced at this plant is then sold to a polypropylene plant at market value. It is assumed the product is shipped via rail car to the west coast for sale in Asian markets. The following table outlines the main characteristics of each of the two plants. Note that all cost estimates were developed using conceptual estimating techniques, AACE Class 5 (FEL 1).

Table 2.1: Plant Characteristics

	PDH	PP
Technology Provider	UOP Honeywell	
Capacity (lbs./year)	1.1 Billion	
Total Capital Investment (\$CAD)	~\$990 Million	~\$630 Million

With these assumptions, Stantec proceeded in creating the value added estimation models. As mentioned earlier, income is generated from the companies' corporate tax and the personal income tax of the workers employed on the project. Revenue from these sources will be recognized during two separate phases of the project: Construction and Operations.

For the construction phase, a forecast employing typical industry ratios based on historical data from past projects was applied to the capital cost of the project to provide the approximate taxable income generated during this phase.

For operations, a net revenue production model was developed. Revenue equals the output of each plant multiplied by forecast prices of propylene and polypropylene. Annual cost of production included the capital cost and a required return on capital as well as all the variable and fixed costs associated with the operation of the plant. It was assumed that the plant had a long term return on capital in of 13% which aligns with industry norms.

Taxable income during operations was determined through a parametric analysis of a typical petrochemical plant of this size, (total Invested Capital), producing the forecasted revenue. A corporate income tax rate of 12% and a personal income tax of 10% were applied to the corporate and employee revenue streams respectively.

3.0 RESULTS

Adding value to propane in the province provides significant direct and indirect benefits compared to the case of shipping the propane out of the province. The large volumes of propane that are forecast to be available over the near to long term provide the opportunity for a stable, low cost feedstock for petrochemical facilities. Ample supplies remain for local commercial and residential needs. All financials figures are stated in Canadian Dollars (\$CAD).

3.1 DIRECT BENEFITS

Base case: Royalty from shipping propane out of Alberta

The by-product royalty rate for propane is a fixed rate of 30% of the produced volume. The value of the Crown royalty share of the gas products produced and recovered in a month is determined based on reference price for each distinct product in the month. Propane is valued using the product reference price less transportation. The Crown deducts allowances for capital costs, operating costs and custom processing fees that are incurred and paid in Alberta for the compression, gathering, and processing its royalty share of the gas product. The Crown calculates a Facility Effective Royalty Rate (FERR) to determine the Crown's share of eligible costs eligible costs which are deducted from the royalties paid monthly. Eligible costs cannot exceed royalties payable and unused costs cannot be carried forward. For the purposes of this evaluation an effective royalty rate for the propane used by the facility of 20% was assumed which corresponds with current royalty rates.

Table 3.1: Alberta Natural Gas Royalty Rate with Liquids (Millions \$)

Year	Gross Production Revenue (\$)	Crown Production Revenue (\$)	Crown Gross Royalty (\$)	Low Productivity Well Allowance (LPWA) (\$)	Holiday Amounts (\$)	Royalty Net of LPWA and Holidays (\$)	Royalty Rates Before GCA & other Deductions (%)
2001	3,746	3,119	1,016	0.40	8	1,008	32.32%
2002	3,099	2,609	849	0.30	13	836	32.04%
2003	3,850	3,194	1,034	0.40	14	1,020	31.93%
2004	4,441	3,657	1,193	0.50	17	1,176	32.16%
2005	5,683	4,720	1,552	1.50	37	1,514	32.07%
2006	5,880	5,001	1,640	3.30	44	1,593	31.85%
2007	5,968	5,104	1,672	4.20	55	1,613	31.60%
2008	7,378	6,452	2,123	5.70	62	2,055	31.86%
2009	4,359	3,818	1,335	-	36	1,299	34.02%
2010	5,300	4,647	1,624	-	158	1,466	31.54%
2011	6,080	5,337	1,737	-	97	1,640	30.73%
2012	5,313	4,713	1,525	-	165	1,360	28.86%
2013	7,397	6,600	1,701	-	249	1,452	22.00%

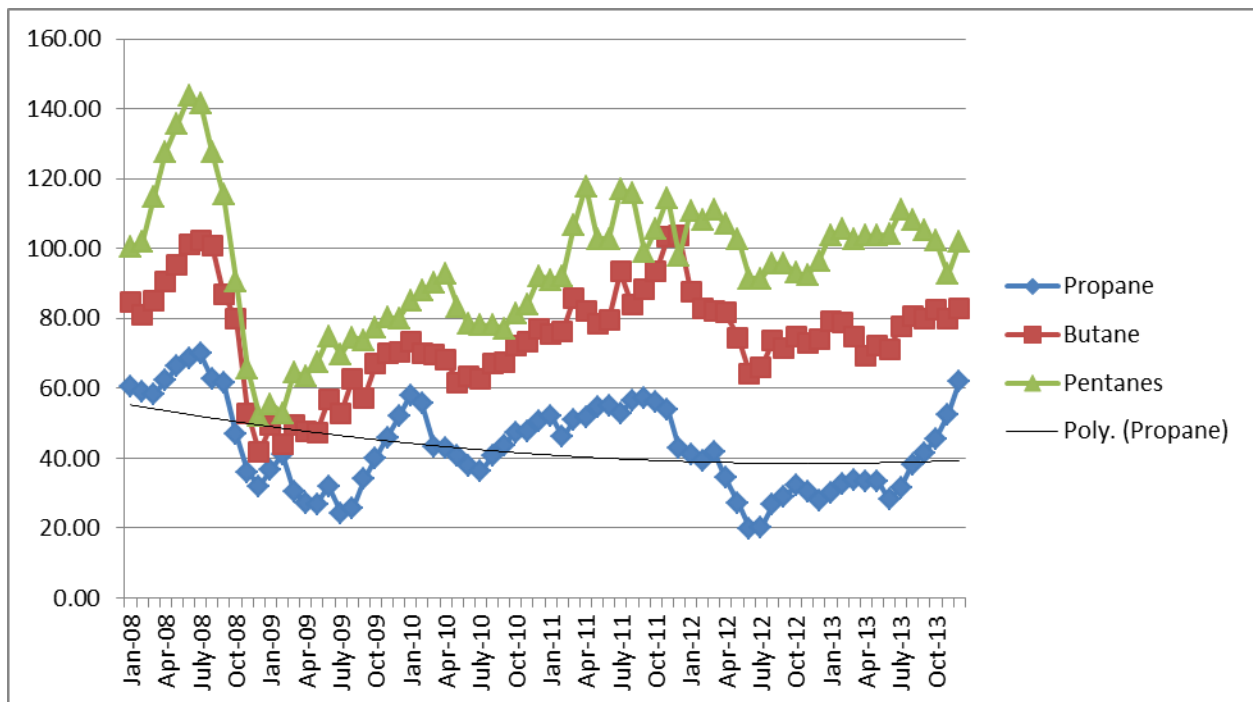
Source: Alberta Energy

The plant will consume approximately 8 million barrels of propane per year at a forecast real cost of \$40/bbl (Figure 3.1 Government of Alberta propane reference price). Although current prices have been considerably lower than this historical trend price it is felt that with elasticity of

May 15, 2015

price given the addition of a large polypropylene plant that this historical trend was appropriate to use. The use of this propane price provides for a conservative Base Case Royalty Revenue. This equates to a cash flow of approximately \$320 MM per year for propane feedstock. With an effective royalty rate of 20% on this feedstock the royalty accruing to the government on a yearly basis (2015 dollars) equals approximately \$64 MM. For the base case it is assumed that all propane that would otherwise be consumed by the plant is sold directly to foreign markets and only the royalty is collected.

Figure 3.1: Historical Reference Price Trend for Propane (\$/CND)



Source: Alberta Energy

Value Added Case: Royalty from shipping propane out of Alberta

A combined propane dehydrogenation and polypropylene facility of the type presented in this analysis would add an additional tax stream to the Alberta Government. During the two year construction phase, it is estimated that the project will generate a total of \$42 MM or \$21 MM in taxes for each of the two years of construction. This is based on the tax from the construction profit plus tax on Alberta labour. Once operations begin a real average yearly tax cash flow of \$64 MM will accrue to the government. This was based on a parametric analysis of the tax on a typical petrochemical installation of size and output. **These values are incremental to the base case as the government will continue to collect the royalty on the propane throughout the life of the project.**

Summary

The table below represents the real, before inflation, cash flows to the government through a selection of years in the project lifecycle. Construction occurs in years one and two with full operation commencing at the beginning of year three. This real cash flow in 2015 dollars continues until the plant discontinues service, conservatively estimated at 20 years.

Table 3.2 Royalty and Tax to Alberta Government

Case	Year 1	Year 2	Year 3	Year 4	Year 5	Year 20
Base case royalty revenue	\$64	\$64	\$64	\$64	\$64	\$64
Additional incremental tax revenue from the plant	\$21	\$21	\$65	\$65	\$65	\$65

3.2 INDIRECT BENEFITS

The International Finance Corporation, (IFC), calculates that for each direct job in the oil and gas industry the total number of jobs (additional direct, indirect, induced), added to the economy is between 7.5 in the U.S. to 13.4 in Scotland. The Chemical Industry Association of Canada indicates that the upgrading of propane to polypropylene has a value multiplier in the economy of 16.6 times. These represent significant benefits to the economy in both additional jobs, increase in GDP and tax flows to the Government. These benefits are in addition to the significant tax cash flows derived in the above analysis.

4.0 CONCLUSION

Based on the analysis above, it is certain that the addition of a world class polypropylene facility adds significant value to the propane resources of Alberta. This conclusion is driven by the large volumes of available propane feedstock to be used to produce a stable supply of jobs, tax revenues and additional GDP for the Province. Adding value to the nonrenewable resources of Alberta benefits all the people in the province. Direct benefit comes to the Province in the form of increased cash flow as a result of taxes on the value added associated with the construction and operation of the facility. Further additional indirect benefits also represent a significant gain in both jobs and revenue.