BUILDFORCE CANADA

Diversifying Alberta's Energy Economy

Economic and Employment Impacts of Proposed Diversification Projects

Prepared for:

RESOURCE DIVERSIFICATION COUNCIL

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EXECUTIVE SUMMARY

The Resource Diversification Council (RDC) is a non-profit association comprised of industry, post-secondary, and labour leaders that share a mutual interest in advancing Alberta's resource value added sector. The Council provides leadership, advocacy, and trusted information to ensure that Alberta is the number one destination for investment.

In May 2023, RDC partnered with BuildForce Canada to undertake an economic and construction impact analysis of potential refining and petrochemical projects. RDC and its participating members provided information for each project on the construction cost and schedule, the share of investment spent on machinery and equipment, the share of imported machinery and equipment from outside the province, the number of construction jobs, the number of operations jobs, and the output quantities and type of products produced.

Information for individual projects is confidential pending positive final investment decisions (FID) and, therefore, only aggregate or the total sum of all projects is presented in this analysis. The construction dates vary by project, with the first expected to start in 2023, and with all projects completed by 2030. Start-up and production dates follow the construction schedules, with the earliest project coming on stream in 2025, and the remaining projects expected to be in production by 2031.

The analysis encompasses a comprehensive evaluation of over $22 billion worth of proposed projects. These projects are currently at different stages of development, with some nearing an FID and others scheduled to commence construction as late as 2028. Various feedstocks are being utilized across these projects. Again, due to the diverse stages of development and pending FID for most of the projects, it is not possible to specifically identify each one. Therefore, this analysis has gathered and aggregated the data for each of these projects to maintain project anonymity.

The projects considered in this analysis primarily focus on three key areas: carbon sequestration, production of low-carbon fuels and polymers, and enhancing existing facilities to minimize carbon emissions within the manufacturing process. The projects included in the analysis were submitted by members of the Resource Diversification Council for consideration. These members were:

- **Dow Canada**
- **Inter Pipeline**
- **Keyera**
- **NOVA Chemicals**
- **Nutrien**
- **Pembina Pipeline**

The report summarizes the estimated construction and economic benefits of these projects for the

province of Alberta and Canada. The development of these projects will have a significant impact on the economies of both Alberta and Canada and support diversification of the provincial economy and job creation. The projects will create long-term, stable tax revenue for the province and provide thousands of direct full-time construction jobs and hundreds of highly paid manufacturing jobs, while expanding the production of fuels generating lower carbon emissions in Alberta, Canada, and amongst trading partners.

The proposed diversification of oil and gas, and manufacturing projects translate into significant contributions to Alberta's economy during both the construction and operation phases. When considering the indirect and induced spin-off effects, the impacts span well beyond the direct construction and manufacturing industries. Across the study period, these projects use the existing feedstocks and skilled workforce to expand Alberta's value-added industry by creating new investment as well as construction and operating employment opportunities.

Highlights of the construction and operational impacts include the following:

IMPACTS SUMMARY	**Construction**	**Operational**
Real GDP ($2023)	$18.5 billion*	$82 billion**
Municipal / personal / corporate tax	$3.5 billion*	$28.1 billion**
Direct full-time jobs	20,250	658
Average annual employment *(all industries: direct, indirect and induced)*	9,908	5,112
	** cumulative 2023–2030*	*** cumulative 2025–2044*

INTRODUCTION

Alberta's construction market has been through a transformative period since the peak of resource expansion in 2014. The province has recently experienced rapid growth as it recovered from the 2020 global pandemic, but more moderate growth is expected to prevail in the years ahead as construction activity is not expected to recover to the previous peaks reached in 2014.

While weaker growth in resource development is expected over the near term under lower oil prices, other opportunities are emerging to potentially boost Alberta's economy through the expansion of energy resource manufacturing industries. The Resource Diversification Council (RDC) is assessing the economic impacts associated with the investment for diversification projects that adds greater value to Alberta's natural resources while also taking the necessary steps towards lowering emissions in the economy. These projects take advantage of the abundance of local feedstock and available skilled workers to build on Alberta's advantage as the leading producer of oil and gas and chemical products in the country and create needed new investment and jobs to help steady and diversify Alberta's economy.

RDC has engaged BuildForce Canada to carry out an impact assessment of the regional opportunities and benefits that would flow from the diversification projects currently under consideration. The next section provides a description of the methodology used to conduct the impact assessment. This is followed by the economic impact assessment of proposed diversification projects in terms of economic growth, construction and operation jobs, and municipal, personal, and corporate income taxes.

IMPACT ANALYSIS

The approach adopted to assess the economic impacts of expanding and diversifying resource manufacturing industries in Alberta is to compare the impacts generated by a series of proposed diversification projects against a "base case" outlook scenario that assumes that the projects do not take place, including projects currently underway.

To do this, BuildForce partnered with Stokes Economics. Stokes Economics maintains detailed national and provincial economic models that can be used to measure the economic impact of changes in investment (e.g., proposed diversification projects) on the overall economy, including employment and government revenues.

A more detailed description of the macroeconomic model is provided in Appendix A.

Estimating economic impacts

The first projection is referred to as the "base case." It is the reference projection against which other projections that adopt different assumptions can be compared. The base case projection is created by making assumptions about the future performance of the key inputs to the Alberta macroeconomic model. Such assumptions include the economic performance of Alberta's major trading partners, commodity prices, and government policy.

Making changes to the assumptions included in the base case projection creates the projection for each of the diversification projects under consideration. The assumptions that are changed are those related directly to the characteristics of the projects for Alberta.

The "base" assumptions are then revised to estimate the economic impacts for each of the proposed diversification projects being assessed. The project assumptions include the following:

- construction value and proposed schedule (start and end dates)
- proportion of investment that is machinery and equipment versus construction
- proportion of the machinery and equipment that would be purchased in Alberta versus imported (from other provinces or outside Canada)
- estimated number of construction jobs
- expected production start date
- number of operations jobs
- value of production (output)

Several modifications are made to these assumptions to convert them to an accounting basis that can be used in the macroeconomic model. For example, to adjust for the effects of inflation, the macroeconomic model is based in 2012 constant dollars. This is used to calculate the real physical year- to-year change of expenditures, factoring outgrowth (change) due to increases in prices. Data provided for project

expenditures and revenues are converted to this basis. Once the model is run, the estimates of real GDP impacts are then adjusted to $2023 to better reflect today's value. There are no suitable deflators that can be applied to convert tax revenue from current or nominal dollars to real $2023. For this reason, the municipal, personal, and corporate tax impacts are reported in current or nominal dollars (i.e., not adjusted for inflation).

Once the assumptions are established for each diversification project, they are entered into the system and the model is run separately for each project to create new economic projections. The results for key economic and fiscal variables in each projection are then reviewed and compared to the base case outlook to determine the incremental impacts for each project.

In comparing the projections, a distinction is sometimes made between the direct, indirect, and induced impacts. The direct impacts are those associated directly with the project such as the number of workers hired or the value of the construction expenditures. The indirect and induced impacts are those generated by the direct impacts. For example, an increase in construction activity leads to increased expenditures in other industries, or indirect impacts, while new jobs and workers spending labour income on goods and services generates induced impacts, and so on. The sum of the direct, indirect, and induced impacts represents the total impact of a development project. The results are then summed and presented as the total impacts on the Alberta economy for the combined diversification projects.

Using the macroeconomic model for this analysis allows the economic impacts to be tracked over time, considering potential price impacts and scarcity on the factors of production – labour, capital, and energy and non-energy materials. This enables substitutability between factors of production when the costs of one factor increase relative to others. This compares to an input-output model used for impact analysis that is static, in that a static model does not include a time dimension and assumes no scarcity of resources, which can lead to only stronger positive economic impacts, as all factors of production are assumed to be in infinite supply. In reality, when a large project or group of projects takes place, the availability of workers is typically diminished, and wages are expected to grow more rapidly to attract the needed labour. When labour costs rise faster than capital costs, firms tend to invest in more productive capital, and vice versa when labour is abundantly available, or labour costs are rising slower than capital costs.

With the introduction of scarcity amongst the factors of production in a macroeconomic model, investment from any given project can potentially "crowd out" other developments in the economy, as the cost of capital is inflated during the projects' construction phase. This can lead to a lower level of GDP in the immediate years after a large project has been constructed, as the increase in the cost of capital leads to less investment in the rest of the economy. These types of economic transitions are not captured in a static input-output model analysis.

Diversification project assumptions

The identification and assumptions of the diversification projects included in this analysis were based on information provided by the RDC and individual members. Any missing data related to individual projects were developed by BuildForce and Stokes Economics based on similar projects or industry trends.

For each project, RDC and its participating members provided information on the construction cost and schedule, the share of investment spent on machinery and equipment, the share of imported machinery and equipment from outside the province, the number of construction jobs, the number of operations jobs, and the output quantities and type of products produced. The information for individual projects is confidential pending FID and was, therefore, aggregated for the purpose of this analysis. The construction dates vary by project, with the first starting in 2023, and with all projects assumed to be completed by the end of 2030. Start-up and production dates follow the construction schedules, with the earliest project coming on stream in 2025, and with all projects expected to be in production by 2031. Project data was compiled as of July 2023 and may be subject to change as FIDs are finalized.

The output quantities or production were used to estimate the value of gross output for each project. The macroeconomic model expresses all real economic variables in base year or constant dollars – in this case, $2012. Base year prices were applied to the products in question to estimate the output value from each project in $2012. Industry value-added shares were used for estimating the value of gross domestic product (GDP).

The distribution of construction employment was allocated across the project schedules based on planned investment expenditures, by year. Operations employment is assumed to reach full employment at start-up, once the construction phase is complete.

Stokes Economics applied deflators to estimate real $2012 machinery and equipment investment and construction investment. The reported GDP impacts were revised to $2023 as reported in the economic impact tables. Stokes Economics applied depreciation rates for the industry-specific capital generated for each project for the purposes of estimating the required sustaining investment expenditures to maintain these projects at full productive capacity during their operational life cycle. The price deflators and depreciation rates used for these purposes are sourced from Statistics Canada and from Stokes Economics' recent *Alberta Provincial Forecast* for estimating $2023 GDP.

ECONOMIC IMPACTS

This section presents the combined impacts on Alberta's economy from construction and operations of the considered diversification projects, with impacts reported separately for the construction and operations phases. The measures of performance used to examine the impacts include selected economic indicators, including GDP, employment (all industries), and tax revenue generated for municipalities and personal and corporate income taxes. Government revenues for personal and corporate income taxes are separated into provincial and federal.

Construction phase impacts

The impacts of constructing the proposed projects are concentrated in the construction industry, but the overall impacts span many industries through the indirect and induced impacts. The aggregate impacts are presented in Table 1.

Table 1 shows the impacts for individual years for the project construction period 2023–2030. The construction timing of individual projects varies across the period, with the first project to be completed by 2024 and the final project expected to be completed by the end of 2030. The results report the cumulative difference and average annual change for the selected key indicators. GDP is measured in millions of $2023, while tax revenues are measured in millions of nominal dollars (unadjusted for inflation). Employment impacts reported by the macroeconomic model used for the analysis uses Statistics Canada's Labour Force Survey employment data, which includes both full-time and part-time employment as opposed to full-time equivalent or person years of employment. Assuming total employment impacts across the analysis period are full-time equivalent jobs may overstate their impact, therefore, cumulative employment is not reported in summary impacts tables.

Table 1: Construction phase economic impacts

CONSTRUCTION PHASE	2023	2024	2025	2026	2027	2028	2029	2030	Cumulative 2023-2030	Annual average
Real GDP at Market Price ($2023 millions)	49	565	2,135	4,129	5,468	3,752	1,666	771	18,535	2,317
% difference	*0.01*	*0.13*	*0.48*	*0.92*	*1.18*	*0.80*	*0.35*	*0.16*		
Employment (000s)	251	2,417	8,666	17,626	23,644	15,539	7,547	3,576	NA	9,908
% difference	*0.01*	*0.10*	*0.35*	*0.70*	*0.91*	*0.59*	*0.28*	*0.14*		
Municipal Taxes ($millions)	0	1	11	51	108	98	62	42	373	47
% difference	*0.00*	*0.01*	*0.09*	*0.38*	*0.80*	*0.69*	*0.42*	*0.28*		
Personal Income Tax ($millions)	6	68	267	593	871	637	325	177	2,942	368
% difference	*0.01*	*0.15*	*0.55*	*1.19*	*1.67*	*1.18*	*0.58*	*0.31*		
Provincial Personal Income Tax	2	19	76	170	250	181	94	50	842	105
Federal Personal Income Tax	4	49	191	424	620	455	231	127	2,101	263
Corporate Income Tax ($millions)	5	59	276	242	46	-151	-146	-135	195	24
% difference	*0.02*	*0.26*	*1.09*	*0.82*	*0.15*	*-0.47*	*-0.46*	*-0.44*		
Provincial Corporate Income Tax	0	5	44	38	7	-24	-23	-22	27	3
Federal Corporate Income Tax	4	53	232	203	38	-127	-123	-114	168	21

Note:

- *"% Difference" refers to the percent difference to the base scenario, excluding the proposed diversification projects.*
- *Cumulative employment impacts are not reported due to data being for both the full-time and part-time employment concept.*

The analysis shows net positive impacts across the construction period. The impacts are largest in both levels and percentage difference in the years where multiple projects are under construction or large projects reach peak activity. Investment expenditures on construction reach a peak in 2027 followed by reductions in expenditures as some of the largest projects approach completion.

Total construction expenditures for all eight proposed projects are estimated at slightly more than $22 billion in $2023. The cumulative real GDP impacts are moderately lower than the total investment amount at just over $18.5 billion. This net negative result is partially caused by import leakages as a portion of the machinery and equipment is imported from outside the province. Additionally, most of the projects in this analysis rely on fewer construction workers per dollar expended when compared against other major industrial projects. For example, the number of direct construction jobs per million dollars spent is closer to one or lower in this case, while it can often require closer to two jobs per million dollars expended. This results in fewer direct jobs during the construction phase and reduces the indirect and induced impacts from those workers' incomes and expenditures. With a higher share of project expenditures associated with material inputs to construction, there is a greater chance of leakages as products are sourced from other sectors which may import their inputs to production from outside of the province. The modelling assumes that indirect sector demand follows the historical pattern for imports for each industry. As these projects will rely on a significant number of manufactured products in their construction phase, the leakages in the province's manufacturing sector will contribute significantly to this negative impact.

Overall, the positive impact from additional construction employment that generates economic activity across the provincial economy is partially outweighed by the negative impact of import leakages as a portion of the machinery and equipment and other construction inputs are imported from outside the province.

Municipal taxes are estimated to increase by $47 million per year over the construction phase. These taxes are primarily sourced from additional permit and license revenues generated by the higher level of activity in both residential and non-residential construction sectors as economic activity increases. The residential construction sector experiences stronger demand for new housing and renovations, driven by higher levels of household income and additional migration to the province. The changes in income and migration also stimulate growth in the business and government sectors, resulting in further demand for new permits and licenses. The cumulative municipal taxes across the 2023–2030 construction period is estimated at $373 million.

Personal income taxes are expected to increase by just over $368 million annually, driven largely by the overall positive impact from employment and wages on Alberta's tax base through higher labour income. As expected, personal income taxes are largest in the years where the employment impacts are strongest, with total taxes estimated at $2.94 billion – just above $840 million in Alberta personal income taxes and close to $2.1 billion at the federal level.

Corporate income taxes are estimated at $24 million annually, as corporate profits increase above the base case due to the additional output directly linked to supplying these projects as well as the extra business activity generated from overall increased economic activity (i.e., an economic multiplier effect). The change in corporate income tax revenue falls slightly below the base case scenario in the latter years as a result of higher wage inflation which is driven by falling unemployment rates that potentially lead to higher wage growth as firms compete for available workers. These negative effects can be seen from 2028 to 2030 where the impacts are less than zero as most of the project investment is expended before those years.

After the peak investment years, the higher wages generated by the ramping up of the construction phase raises labour's share of income, and while investment is rapidly falling, so is overall domestic income. This results in a smaller share of income going to businesses and, thereby, lowers corporate profits relative to the base case outlook. Cumulatively across the 2023–2030 construction period, corporate income taxes are estimated at $195 million – $27 million in Alberta corporate taxes and $168 million at the federal level.

Employment impacts are positive over the construction phase, as just over an average of 9,900 jobs are generated annually, peaking just above 23,600 jobs in 2027. Like GDP, the largest employment impacts are in the years where there are multiple projects under construction or when construction investment peaks for large projects. These differences in employment from the base case include the direct construction jobs, but also the indirect employment generated from the increased spending on goods and services to construct these projects, and the induced employment generated as direct and indirect workers spend their wages on goods and services in the province.

The estimated **"direct" construction jobs** are reported in Table 2. These are measured in full-time equivalents; expected to peak in 2027 at around 6,450 jobs. The proposed diversification projects would add 20,250 estimated direct construction jobs across the 2023–2030 construction period, with the largest demands for the following trades, accounting for over 50% of labour requirements:

- carpenters (including scaffolders)
- electricians
- ironworkers
- pipefitters
- trades helpers and labourers

Also in high demand are supervisors and project managers requiring unique skills and experience related to major industrial or petrochemical construction projects.

Table 2: Construction requirements – direct jobs (full-time equivalents)

Distribution by Trade	2023	2024	2025	2026	2027	2028	2029	2030	TOTAL	%
Boilermakers	2	0	3	40	62	49	33	12	**202**	**1%**
Carpenters (incuding scaffolders)	14	154	409	559	723	331	178	76	**2,444**	**12%**
Concrete finishers	5	81	190	164	98	36	10	7	**591**	**3%**
Construction millwrights	4	5	14	142	234	201	133	75	**809**	**4%**
Crane operators	5	51	125	232	295	161	79	31	**978**	**5%**
Electricians	10	13	34	335	718	556	283	78	**2,028**	**10%**
Heavy equipment operators	1	20	43	73	93	40	20	14	**304**	**2%**
Heavy-duty equipment mechanics	0	4	8	19	38	21	7	3	**100**	**0%**
Industrial instrument technicians	5	7	17	153	502	179	92	62	**1,015**	**5%**
Insulators	4	5	14	234	276	181	63	30	**808**	**4%**
Ironworkers & structural metal	8	111	249	417	384	177	53	16	**1,416**	**7%**
Painters	0	1	2	7	35	29	17	11	**102**	**1%**
Sheet metal workers	1	1	3	54	83	47	11	2	**203**	**1%**
Steamfitters, pipefitters	16	17	201	885	1,058	552	278	35	**3,042**	**15%**
Trade helpers & labourers	12	156	453	524	543	217	83	55	**2,044**	**10%**
Truck drivers	1	38	54	35	44	16	8	7	**204**	**1%**
Welders	5	27	122	198	362	230	52	37	**1,031**	**5%**
Construction managers	6	40	137	246	318	170	67	29	**1,012**	**5%**
Supervisors	6	40	137	244	318	168	67	29	**1,008**	**5%**
OTHER (miscellaneous)	4	48	155	207	269	163	42	21	**910**	**4%**
Total	**108**	**819**	**2,372**	**4,767**	**6,452**	**3,525**	**1,575**	**631**	**20,250**	**100%**

Operations phase impacts

The impacts related to the operations of the proposed diversification projects are concentrated in manufacturing, but span across the economy through indirect linkages to other industries such as oil and gas, utilities, etc. The key economic indicators driven by the proposed projects are shown in Table 3.

The operating impacts are presented across a 20-year period from 2025 to 2044, with the results shown in five-year average intervals. The start-up of the individual projects varies across the period, with the first project expected to begin production in 2025 and the final project set to come on stream in 2031. The table shows the cumulative 20-year totals and the average annual impacts for the same key economic indicators reported for construction. GDP is measured in millions of $2023, while tax revenues are measured in millions of nominal dollars (unadjusted for inflation). Impacts are low in the early period as projects come on stream and then rise as all projects are in operation by 2031.

Similar to the construction phase, the cumulative or total employment impacts across the period is not displayed, as the economic model used for this analysis uses data that reflects both full-time and part-time employment versus full-time equivalents. Based on this assumption, employment impacts associated with direct, indirect, and induced impacts are not full-time equivalents, and as such, their inclusion in the analysis would overstate their impacts.

All the key economic indicators report positive average impacts over the operations phase. These impacts fluctuate as the construction of these projects introduce new economic cycles through changes in the cost for the factors of production – labour and capital. As the relative cost for labour increases through the tightening of the labour market during the construction phase, firms are assumed to substitute less expensive capital in place of labour, thereby increasing productivity. The substitution effect eventually reverses as the cost of labour falls relative to the cost of capital. This leads to a cycle that continues throughout the operational life of these projects and beyond. As such, the impact on real GDP growth tends to cycle upward in the first years after the last project is completed in 2030, and then falls, on average, as seen in the subsequent period 2035–2039, before rising again in the final period. While the cycles are generated by each project individually, the overall impacts are dominated by the size and schedules of larger projects. Over the 20-year period, real GDP growth averages around $4.1 billion annually.

Municipal taxes are estimated to increase by $366 million per year over the 20-year period. These taxes are primarily sourced from additional permit and license revenues generated by the higher-level of spin-off activity in residential and non-residential construction. Changes in the residential construction sector are caused by changes in demand for new housing and renovations, which are driven by overall income and population growth in the province. As overall real GDP growth increases into the 2030–2034 period, municipal tax revenue follows suit and maintains a similar level towards the end of the 20-year period. The changes in overall growth also stimulate growth in the business and government sectors resulting in further demand for new permits and licenses from the non-residential sector. The cumulative municipal taxes over the 20-year period are estimated at just above $7.3 billion.

Table 3: Operations phase impacts

OPERATIONS PHASE	2025-2029	2030-2034	2035-2039	2040-2044	Cumulative 2025-2044	5-year period average (2025-2044)	Annual Average
Real GDP at Market Price ($2023 millions)	10,542	24,005	21,973	25,519	82,039	20,510	4,102
% difference	0.45	0.96	0.83	0.90			
Employment (000s)	20,707	20,576	19,997	40,959	NA	25,560	5,112
% difference	0.16	0.15	0.14	0.27			
Municipal Taxes ($millions)	510	2,193	2,208	2,404	7,315	1,829	366
% difference	0.72	2.75	2.41	2.29			
Personal Income Tax ($millions)	1,193	2,244	1,270	2,482	7,189	1,797	359
% difference	0.43	0.73	0.34	0.56			
Provincial Personal Income Tax	418	1,019	766	1,098	3,302	825	165
Federal Personal Income Tax	775	1,225	504	1,384	3,887	972	194
Corporate Income Tax ($millions)	2,123	3,331	4,126	4,032	13,613	3,403	681
% difference	1.35	1.92	1.64	1.29			
Provincial Corporate Income Tax	338	530	657	642	2,167	542	108
Federal Corporate Income Tax	1,785	2,801	3,469	3,390	11,446	2,862	572

Note:

- *"% Difference" refers to the percent difference to the base scenario, excluding the proposed diversification projects.*
- ** Cumulative employment impacts are not reported due to data being for both the full-time and part-time employment concept.*

Personal income taxes are estimated to increase by nearly $359 million annually, driven by the overall positive impact from employment and wages on Alberta's tax base through higher labour income. Personal income tax revenues cycle up as personal income is positively affected over the 20-year period. As wages are inflated through the construction period of 2023–2030, personal income taxes are relatively higher immediately after construction is completed from 2030–2034. However, higher labour costs generated from the construction period leads to lower employment growth by the mid-2030s, dragging down personal income tax revenue. As the positive part of the cycle returns with employment generally increasing over the last 10 years of the period, personal income taxes cycle back upward in line with overall higher employment differences. Total personal income taxes across the 20-year period are estimated at almost $7.2 billion – $3.3 billion to Alberta and $3.9 billion at the federal level.

Corporate income taxes are expected to increase by $681 million annually as corporate profits increase above the base case due to the overall increase in output and inflation. Corporate income tax revenues tend to be lower in the first 5-year period as production from all projects has not yet been fully realized and wage inflation generated by labour market tightening through the construction phase leads to a lower share of domestic income for corporations relative to labour. As all projects are at full production by 2031 and wage inflation settles post construction phase, capital owners see a higher share of domestic income resulting in rising corporate profits and thus corporate income tax revenue. Total corporate taxes across the 20-year period are estimated at $13.6 billion – over $2.1 billion to Alberta and just under $11.5 billion at the federal level.

New direct, indirect, and induced employment across the 20-year period averages just over 5,100 jobs per year. Due to wage inflation introduced during the construction phase of the proposed projects, employment cycles down to a smaller difference of about 1,300 jobs by 2034 compared with the base case forecast. As wages begin to adjust and we see relative labour costs fall again, employment growth improves and averages a difference of close to 6,100 jobs per year in the latter 10-year period.

Once all projects are up and running by 2031, more than 650 new direct full-time operation jobs are created by the proposed diversification projects.

ECONOMIC MULTIPLIERS

The calculation of output and employment multipliers provides a measure of the economic impacts from undertaking a project and its impact on the provincial economy. Economic multipliers consist of type I and type II multipliers where the former includes direct and indirect effects, and the latter also includes the induced effects. The type II multipliers were calculated for each individual project considered in this study and are presented in Table 4 as average multipliers. These measures have been calculated for both the construction phase of the project and the operations phases independently.

In the construction phase, the investment directly expended in the economy generates the direct effect as producers react to meet the increased use. This would occur largely in the construction industry, but also in other industries such as finance and insurance as these types of services are directly purchased. As these producers increase their output, there will also be an increase in use on their suppliers and so on down the supply chain – this is the indirect effect. As a result of the direct and indirect effects, the level of household income throughout the economy will rise with increased employment. A proportion of this increased income will be re-spent on final goods and services – this is the induced effect.

The type II output multipliers presented in Table 4 are expressed as the ratio of direct, indirect, and induced output changes to the change in direct output. The output multiplier in the operations phase only differs from the construction phase in that the direct effect is generated from the higher level of production, rather than investment in the economy, and the direct operations employment that takes place to produce the additional output. Multiplying the change in the direct investment or output by the type II investment (construction phase) or output (operations phase) multiplier will generate an estimate of the direct, indirect, and induced impacts upon output in the Alberta economy.

The type II employment multiplier is the ratio of direct, indirect, and induced employment changes to the direct employment change. As previously noted, the economic model employed in this analysis uses employment measures based on the labour force survey (LFS), and therefore, the employment multiplier includes both part-time and full-time employment. Multiplying the change in direct employment by the type II employment multiplier in either the construction of or the operation of a project in a similar industry as the projects in this study will calculate the change in full-time and part-time employment for the Alberta economy as a whole.

Table 4: Average output and employment type II multipliers

	Development Phase	
Multiplier	**Construction**	**Operations**
Investment/Output	0.850	1.787
Employment	2.462	7.832

Output and employment multipliers are impacted by the import leakages to destinations outside the province in both the construction and operations phases; however, the leakages tend to be relatively larger in the construction phase, as some projects require specialized machinery and equipment during construction or for productive capital stock that may not be available from suppliers within the province. Import leakages exist for all eight projects considered in this analysis and range from 10% of the machinery and equipment sourced from outside the province to 100%. The value of imports is a very important factor in generating the multipliers for the projects considered in this study, as projects with a low import share of construction or production inputs will produce a large multiplier, and vice versa.

The impact caused by import leakage from outside the province causes the average investment multiplier to be less than one in the construction phase. The output multiplier increases in the operations phase as fewer inputs to production are sourced from outside the province and make use of more provincially sourced supply chains.

The employment multiplier is significant in the construction and operations phases but increases in the operations phase for similar reasons as the output multiplier; supply chain linkages are sourced from within Alberta. As the projects considered in this analysis are value added in nature, which implies that they will use locally sourced outputs as production inputs, the multipliers are relatively large.

SUMMARY

The diversification projects currently under consideration in the oil and gas and manufacturing sector translate into significant contributions to the Alberta economy during both the construction and operations phases. When considering the indirect and induced spin-off effects, the impacts span well beyond the direct construction, oil and gas, and manufacturing industries. Across the study period, these projects use the existing feedstock and skilled workforce to expand Alberta's oil and gas, and chemical manufacturing industries by creating new investment and construction and operating employment opportunities.

The average annual economic impacts generated by these projects are summarized in Table 5, including GDP, employment, municipal taxes, and provincial and federal personal and corporate income taxes.

Table 5: Average annual economic impacts

	Construction	Operations
Real GDP at market price ($2023 millions)	2,317	4,102
Employment (full and part-time)	9,908	5,112
Municipal taxes ($millions)	47	366
Personal income tax ($millions)	368	359
Provincial personal income tax	105	165
Federal personal income tax	263	194
Corporate income tax ($millions)	24	681
Provincial corporate income tax	3	108
Federal corporate income tax	21	572

APPENDIX A

BuildForce Canada's construction labour market information system

BuildForce Canada is a national industry-led organization committed to working with the construction industry to provide information and resources to assist with the management of workforce requirements.

BuildForce has developed a comprehensive labour market information (LMI) system that is designed to track data on economic conditions, construction investment activity, employment, and supply-side analysis for construction and maintenance-related occupations and trades by sector and province. This is a robust macroeconomic modelling system that produces annual provincial and national forecast scenarios for 34 trades and occupations in both non-residential and residential construction and maintenance over a 10-year forecast horizon. The LMI system is the most advanced and detailed construction industry model available in Canada.

BuildForce regularly consults with industry, including labour groups, contractors, and owners, to validate the scenario assumptions, and seeks input from governments on related analysis and construction project lists. This approach offers efficient access to project information and detailed first-hand assessments of labour supply and demand for individual construction trades and occupations.

Each year the BuildForce LMI system is reviewed, and improvements are introduced in response to industry suggestions and other opportunities. Projected construction activity sets out specific labour requirements for trades and occupations. In the BuildForce LMI system, employment in each trade and occupation is linked to investment in specific residential and non-residential building types. Each link is defined by a measure of labour required for each million dollars of construction. This model structure distributes the changing mix of construction activity to the trades based on their specialization.

The LMI system tracks employment, labour force, unemployment, retirements, new entrants, and mobility for selected trades and occupations (the BuildForce trades cover approximately 75% of total construction industry employment). Estimates are based on the 2021 Census of Canada, input from the industry, and analysis of building patterns and labour requirements. These estimates are sometimes limited by difficulties allocating workers to occupations, the small size of the workforce, and the associated risks in statistical measurement. In some cases, information for the smaller trades and occupations is suppressed because of limited statistical reliability.

Construction and Maintenance Looking Forward reports are available by province at www.constructionforecasts.ca.

Stokes Economics

Stokes Economics is Canada's leading detailed occupational labour market information provider, macroeconomic model builder, and forecast data centre. Stokes maintains national, provincial, and regional economic models that are used to develop economic outlooks and customized impact studies ranging from economic and fiscal projections to occupational human resource planning. The models are updated semi-annually and calibrated to the latest economic and demographic data available. Stokes also closely tracks major construction projects for a more accurate estimate of investment and economic growth.

Macroeconomic model – Alberta

The projections are prepared using the Stokes Economics multi-sector macroeconomic model of the Alberta economy. The model is calibrated to Alberta's economic, demographic, and fiscal data obtained from Statistics Canada. The economic data employs a 2012 base or reference year. The system incorporates input-output coefficients derived from Statistics Canada's input-output tables to determine both inter-industry and intra-industry demand (i.e., total demand by each sector from all other sectors and from an industry's own sector).

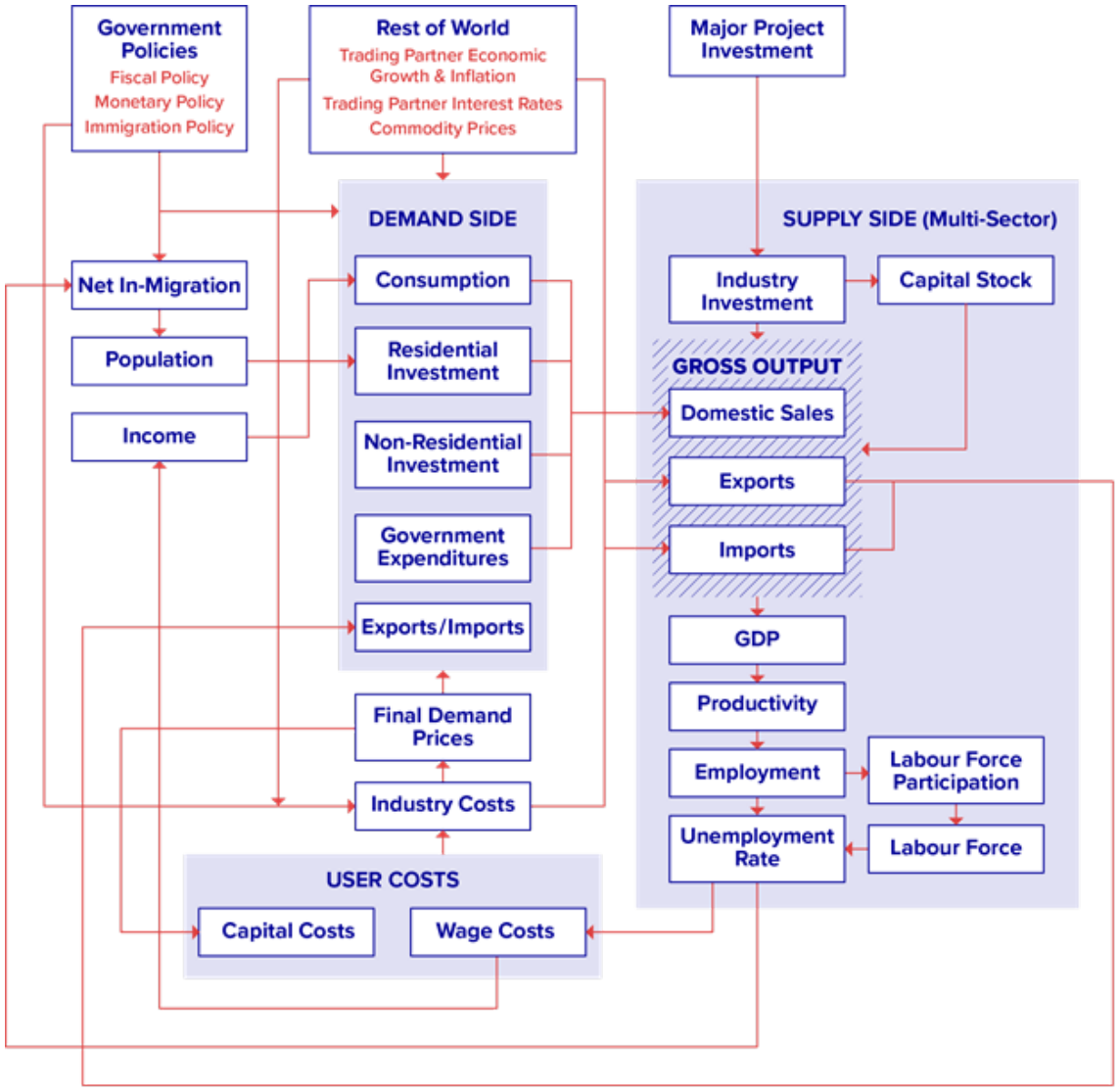
While the model involves the simultaneous decisions of various factors, its basic workings can be seen in Figure 1.

Short term

Influences from the rest of the world and economic policies are the main outside forces driving the economy. The rest of world refers to Alberta's primary trading partners such as the United States, the European Union, China, Japan, and the rest of Canada, to name a few. These trading partners' real GDP growth, inflation, and interest rates, in the case of international trading partners, drive Alberta's economic growth through their influence on trade, domestic inflation, and the cost and availability of credit. The resulting effects shape the views of local decision makers, including their decision to invest in the province.

Fiscal and monetary policies, both in Canada and in its trading partner countries, are a further determinant of domestic inflation, interest rates, and exchange rates for trade purposes. Other economic policies such as trade agreements are also taken into account, as these policies would have further effects on specific industries and their short- and longer-term growth. Assumptions regarding international trading partner growth are taken from consensus forecasts such as the World Bank and used as inputs to Stokes' modelling system.

Figure 1: Macroeconomic model



Once real output for each industry is determined, employment for all industries is set through the productivity of labour. Employment, combined with wages, other income, and consumer prices, then determines private consumption. Employment, when compared with labour force, then drives net in-migration, which in turn sets population growth. In the current version of the model, international migration is determined in a national linking model, where international migrants are determined based on national labour force requirements.

Population growth, combined with personal income, then determines private consumption. Population also impacts government consumption, as a change in population leads to a change in the demand for government services and investment.

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Long term

In the long term, growth in both fixed investment expenditures and productivity are the key determinants of changes in overall economic activity in the model. The rate of productivity growth is determined by changes in technology and modifications to the way in which business is conducted. Productivity is an exogenous variable, set outside the model.

Real fixed investment expenditures are a key driving factor behind economic growth in the model, as shown on the supply side of Figure 1. These expenditures are determined for each industry and then summed to obtain total investment expenditures. Such expenditures determine the rate of change in the capital stock, which determines the amount of output growth.

Investment in industries that are primarily export-oriented is set based on views regarding growth in the rest of the world and economic policies affecting the cost of investment and profitability. In industries that serve the latter sectors and the population of the country, investment is determined by the expected amount of capital that will be needed to achieve a target level of output. The latter target is determined by growth in demand for the particular industry's product, which depends on the growth in the other industries in the domestic economy and domestic demand, along with capital costs.

Resource Diversification Council

The Resource Diversification Council (RDC) is a non-profit association compromised of industry, post-secondary, and labour leaders that share a mutual interest in advancing Alberta's resource value added sector. The Council provides leadership, advocacy, and trusted information to ensure that Alberta is the number one jurisdiction to invest in.

The RDC is dedicated to realizing the full potential of Alberta's abundant natural resources by expanding and diversifying Alberta's resource manufacturing industries. The RDC is focused on advancing decarbonization policies for the sector and ensuring adequate workforce development.

RDC members include:

- Construction Labour Relations Alberta
- Dow Canada
- Inter Pipeline
- Keyera
- NAIT
- NOVA Chemicals
- Nutrien
- Pembina Pipeline

RDC members represent a broad cross-section of Alberta's value-added industries. They include petrochemical and refining companies that primarily produce value added products, midstream members that have interests in both producing feedstock supply as well as value added products, labour members who are involved in the construction and operation of facilities, and post-secondaries who develop the workforce.

For further information, please visit www.diversification.org.