The Contributions of the Canadian Oil and Gas Services Sector to the Canadian National Economy

Prepared for Petroleum Services Association of Canada
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Forward

Introduction of the National Energy Program (NEP) in October of 1980 was a major government policy intervention into what prior thereto had been just another Canadian industry – oil and gas. It was a very political policy ("Canadianization", federal/provincial revenue sharing, domestic versus international energy markets) but it also revealed a trend in government policy towards oil and gas that continues to this day: a focus on the economic performance of the companies which explore for and produce oil and gas (E&P) without a full understanding of the economic impact of E&P policy changes on the vast oil and gas service and supply chain (OGS) that supports it.

The lack of knowledge of how the oil and gas business really works among federal policy makers became apparent shortly after the NEP was introduced. The tax changes caused an exodus of exploration dollars and equipment to the United States, including drilling rigs. When this matter was raised by the opposition in the House of Commons the government responded (and I paraphrase), "Are those oil rigs leaving Canada or gas rigs? Because if they are gas rigs, we don't need them. Canada has lots of gas but a shortage of oil".

There is no difference between the type of drilling rig used to drill for oil or natural gas.

The Petroleum Service Association of Canada (PSAC) was created in 1981 with the specific purpose of advocating for OGS and educating the public and policy makers. A particular thrust of PSAC activity has been to ensure all levels of government (municipal, provincial and federal) understand the economic impact on OGS on policies they introduce that can reduce the cash flow of E&P companies. The cash flow of E&P companies is the lifeblood of OGS. The primary areas in which the three levels of government can reduce E&P cash flow through charges, taxes and levies are:

- Municipal: property taxes, fees, licenses, road access
- Provincial: royalties, fees, corporate taxes, administrative processes, regulatory matters
- Federal: income taxes, amortization and depreciation rates, export permits, pipelines

Each and every one of these can reduce E&P cashflow either through affecting profitability or regulating the pace and cost of investment activity. These changes, in turn, affect the amount of capital available for OGS.

There has been continuous activity in representing the interest of OGS among all levels of government by PSAC for many years in many areas, including economic matters.

When the Alberta government introduced the New Royalty Framework (NRF) in 2007 it became apparent to PSAC that once again the negative impact on OGS of reduced E&P cash flow and investment caused by higher provincial royalties had not been considered in the report or in its acceptance by the government of the day. When PSAC presented before the panel in July of 2007 and attempted to forecast the impact royalty changes would have on the service sector the reaction was one of open hostility.

I became PSAC chair for the 2009/2010 year. Each PSAC chair has a mandate for his or her term. As a result of the macro-economic vacuum in which the NRF was created, my mandate was to undertake an economic study to determine the size and scope of the oilfield services industry in Canada. The PSAC

Board of Directors agreed. At that time PSAC contacted the Canadian Energy Research Institute (CERI) because CERI had created similar economic models on behalf of Canadian Association of Petroleum Producers (CAPP) and the Alberta government on the impact of oilsands development. This included determining the impact of oilsands capital spending on the entire supply chain in Alberta, Canada and the United States. These figures have been widely publicized for many years and used as a foundation to justify continued development of oilsands resources.

CERI was contracted by PSAC in 2009 at which time I was made familiar with the Statistics Canada (StatsCan) granular industrial sector GDP model. To be able to most accurately determine the size and reach of the entire upstream oil and gas supply chain in Canada, PSAC had to discuss and agree on the definition of oilfield services. To reach consensus on exactly where E&P activities ended and OGS started, it was agreed that for purposes of this analysis OGS would include all products and services an E&P company did not supply itself. That meant the entire process from exploration conception to the delivery of oil to the pipeline terminal or natural gas to the distribution system would be considered OGS. This included merchant midstream processing and pipelines. It also included business activities that support E&P companies that are not normally considered OGS. This included roads, components, transportation, electronics, instrumentation, buildings and structures, and businesses' services. This was a far broader definition of OGS than that used for any prior research. However, each and every non-E&P business included in the PSAC definition of OGS was affected by changes in E&P production cash flow caused by government policy changes. In agreeing on this foundation for analysis PSAC considered itself a subject matter expert, a position it is confident it still holds today.

Working with then CERI President Peter Howard, I examined the entire list of StatsCan industrial GDP categories and for the first time allocated a percentage of GDP in these categories to OGS because it supported E&P capital investment and operating costs. The final report was released in the fall of 2010. It raised questions among those who had previously dealt with such analysis (provincial governments, federal government) but after explanation it was agreed the methodology was sound. The data has been public for five years and has helped PSAC explain to policy makers the total impact in terms of employment and economic activity of changes they make, or intend to make, to upstream E&P company cash flow and capital investment through adjusting royalties, taxes, or regulatory policies.

In 2012, I went to work for MNP LLP, a national accounting company, as National Leader Oilfield Services. MNP has 4,000 OGS clients across the Western Canadian Sedimentary Basin. At that time MNP had only two classifications for its clients using two NAICS codes: support services for oil and gas, and mining and drilling contractors. Based on the PSAC work, I persuaded MNP of the need to develop a much more granular OGS classification system. Handed a blank sheet of paper I divided the upstream petroleum industry into 12 major segments with 120 sub-segments. Although OGS is larger and more complex, the objective was to develop a system that was providing financial managers with a broader understanding of the size and complexity of OGS. MNP adopted this system in 2013 and coded its clients accordingly.

At the same time I began to do more research into OGS and arrived at two conclusions: OGS CAPEX (the money OGS operators spend on equipment and infrastructure), and E&P operating costs (the funds producers spend and invest to keep their production flowing), are funds available to OGS above and

beyond that of E&P capital expenditures alone. This meant that OGS was actually larger than was determined by PSAC in its 2009 study.

In early 2015, I was approached by PSAC to update the 2010 study. Using more recent StatsCan data the same process was used except OGS CAPEX and E&P operating costs were included. The result was an expansion in the size of OGS on a GDP basis over the 2010 study. The other conclusion that is not intuitive unless you are a subject area expert is that OGS is larger than the E&P sector. This comes about two ways.

First, the Canadian OGS industry does an increasing amount of business outside of Canada. As a result, the total revenues Canadian OGS operators handle in a given year are greater than the expenditures of Canadian E&P company clients. In 2009, a sample of 36 Canadian-headquartered OGS companies had international revenue of $13 billion. In 2014, a sample of 42 Canadian-headquartered OGS companies had international revenue of $42 billion. This affects Canadian GDP because often the equipment is built in Canada for international service, and the company head office and administrative activities are in Canada.

Second, OGS CAPEX on everything from new drilling and service equipment to merchant processing plants to pipeline and crude-by-rail terminals are financed by OGS companies, not from E&P company expenditures. For example, even in 2015 Precision Drilling will be investing $500 million in new drilling rigs and other CAPEX. Last year it was nearly $1 billion. TransCanada, the pipeline company, has a $2.4 pipeline under construction to carry oil from Fort McMurray to Edmonton. Its order book including Keystone XL and Energy East is billions more. These expenditures cannot be captured by analyzing the spending or financial health of Canadian E&P companies alone.

For upstream oil and gas, policy makers have historically focused on the profitability of E&P companies and adjusted their policies accordingly. They are usually surprised at the ripple effects through the economy. The automobile industry in central Canada, however, is completely different. There is little attention paid to the global corporate profits of Ford, GM, Toyota or Fiat-Chrysler. What is well understood, however, is the negative ripple effects through the Canadian job market and supply chain when an assembly plant closes or the positive impact of a plant opening or expansion. Significant government financial support has been offered for years at all levels in the automotive industry to preserve Canadian direct and supply chain jobs. Economic models exist to justify these investments as government financial support is recovered in property, payroll, corporate and consumption taxes.

The upstream oil and gas industry supply chain reacts exactly the same way. However, policy makers continue to focus on the cash flow and profitability of the E&P companies without fully understanding the impact on the supply chain. However, a healthy oil and gas supply chain also contributes to government revenues at all levels through property taxes, payroll taxes, corporate taxes and corporate and personal consumption taxes. The work CERI has done in this area for the oilsands is well known.

PSAC is hoping that someday governments will change their approach and take a more holistic view of upstream oil and gas. Meanwhile, the StatsCan data employed is extremely valuable in helping PSAC illustrate how more workers and companies support E&P investment than is widely accepted.

David Yager, National Leader Oilfield Services MNP LLP
PSAC Chairman 2009/2010
July 25, 2015

Introduction

Oil and gas exploration and production companies, collectively referred to as "E&P" companies, have long been viewed as the major contributor to the oil and gas extraction sector of the Canadian economy. Sometimes this debate does not include the myriad of companies and tens of thousands of workers that support the efforts of the producers, the Oil and Gas Services (OGS) sector. Over the last two decades E&P companies have outsourced more and more of their regular activities. First, it was exploration and drilling, but now the disaggregation of the sector has extended to many activities originally thought to be part of exploration and production. Examples of products and services employed in direct support of the exploration and production activities include exploration, drilling, completion, production, construction, processing, transportation, logistics, manufacturing, maintenance, and fabrication.

The continuing trend of E&P companies outsourcing elements of the oil and gas extraction process to the OGS sector has led to some analysis indicating that the OGS sector has now become the larger contributor in terms of Gross Domestic Product (GDP), Taxation and employment. However, oil and gas policy is generally focused on oil and gas production, royalties, taxes and profits. When policy makers consider the impact on E&P companies it is unclear whether the impact on oil and gas services are uniquely considered.

By one definition, the OGS sector is made up of diverse companies as detailed in Table 1.

This report documents the difference between the traditional definition of the OGS and the one currently being used by the OGS industry. The OGS Industry definition draws upon several Canadian industries, either partially or in total, which together describe the contributions of the Oil and Gas Services sector. From classical drilling operations, to transportation systems (truck logistics, gathering pipeline construction), to engineering design and construction, to manufacturing field equipment, to specialized chemicals, to research and innovation, to equipment rentals and production metering and reporting, all of these and others participate in the service side of oil and gas developments in Canada. (Refer to Table 1 for a complete list of these industries.)

The purpose of this report is to tabulate the differences between the traditional approach held either by governments and the E&P industry, and the OGS industry view, regarding those Canadian industries that contribute partially or totally to the service side of the oil and gas development process. The latter definition uses percentage allocations to estimate the contribution of the OGS sector to the Canadian economy through economic metrics of GDP, employment, and taxes. This definition goes beyond that used by Statistics Canada for "Support Activities for Oil and Gas Extraction" to include industries that even partially contribute.

The objective is to show the difference in policy impacts between the traditional and industry definitions.

Methodology – OGS Industry Definition

To fully quantify the OGS Industry's understanding of the size of their sector in Canada and the macroeconomic contribution to the Canadian economy, the authors started with the Statistics Canada 2009P Input, modified basic price set of Input-Output Tables at the "W" level of aggregation. At the "W" level of aggregation the Input-Output Table details 235 industries and 462 commodities.

Generally speaking, the Gross Domestic Product or value added is a measure of the unduplicated production of an industry and does not include the intermediate costs of goods and services purchased from other industries. The "Use" matrix displays all the intermediate costs incurred in production by an industry plus the indirect taxes and subsidies, and returns to the factors of production, namely: wages and salaries, supplementary labour income, mixed income and operating surplus. Calculating an industry's GDP at basic prices is the sum of its factor incomes (wages and salaries, supplementary labour income, mixed income and other operating surplus), plus taxes less subsidies on production.

In order to determine the contribution of the OGS sector, it was first necessary to identify the industries that contribute either partially or fully to the efforts of supporting the E&P sector. Based on the Petroleum Services Association of Canada (PSAC) definition, it was estimated that 82 industries either partially or totally generate goods and services that are employed in the effort of finding and developing oil and gas resources. In addition, it was also estimated that 225 commodities were used in carrying out various services employed by the OGS sector. Some industries generate goods and services used by other industries and final products not used by the OGS sector. In these cases, the OGS related GDP for that given industry was reduced based on the ratio of input costs incurred in production by an industry of OGS related commodities divided by the input costs incurred in production by an industry in total. This factor was then applied to the GDP value for the industry and reflects that portion which can be attributed to an OGS industry. Additionally, some industries produce products that are used both by the OGS sector and other non-OGS sectors. In these situations a simple estimation of the percentage of goods and services that each industry generates that is taken up by the OGS sector was applied.

The Input-Output Tables do not explicitly identify the level of employment associated with each industry. However, by utilizing the "Wages and Salaries" coupled with the "Supplementary Labour Income" and "Mixed Income" values and then dividing by the average wage (from Canada Revenue Agency) for a given industry, an estimate of the employment per industry is determined.

Income taxes and corporate taxes are calculated based on Canada Revenue Agency's average wage (and the various tax brackets) and the published corporate tax rates. In a similar fashion as the employment data, a calibration factor (based on Canada Revenue Agency published numbers) is determined and applied to each contributing industry.

Table 1 details the individual contributions, by industry, to the OGS total estimated impact of $74.6 billion dollars. This represents a 5.1 percent impact on the Canadian GDP for the year 2009. Figure 1 breaks down this contribution into what the authors defined as direct industries, manufacturing and construction industries and other industries.

The OGS "Direct Industries", which include all aspects of drilling, completion, gathering, processing, and construction, account for 56 percent of the total GDP contribution of the OGS sector. The "Manufacturing and Construction Industries" (Indirect Manufacturing and Other Manufacturing), which include all the industries that manufacture commodities used by the OGS sector, account for 15.5 percent of the total GDP contribution of the OGS sector. "Other Industries" account for the remaining 29 percent which is made up of elements like truck transportation, communication engineering, warehousing, machine shops, repair shops etc. While the "Direct Industries" are specifically related to the locations where oil and gas

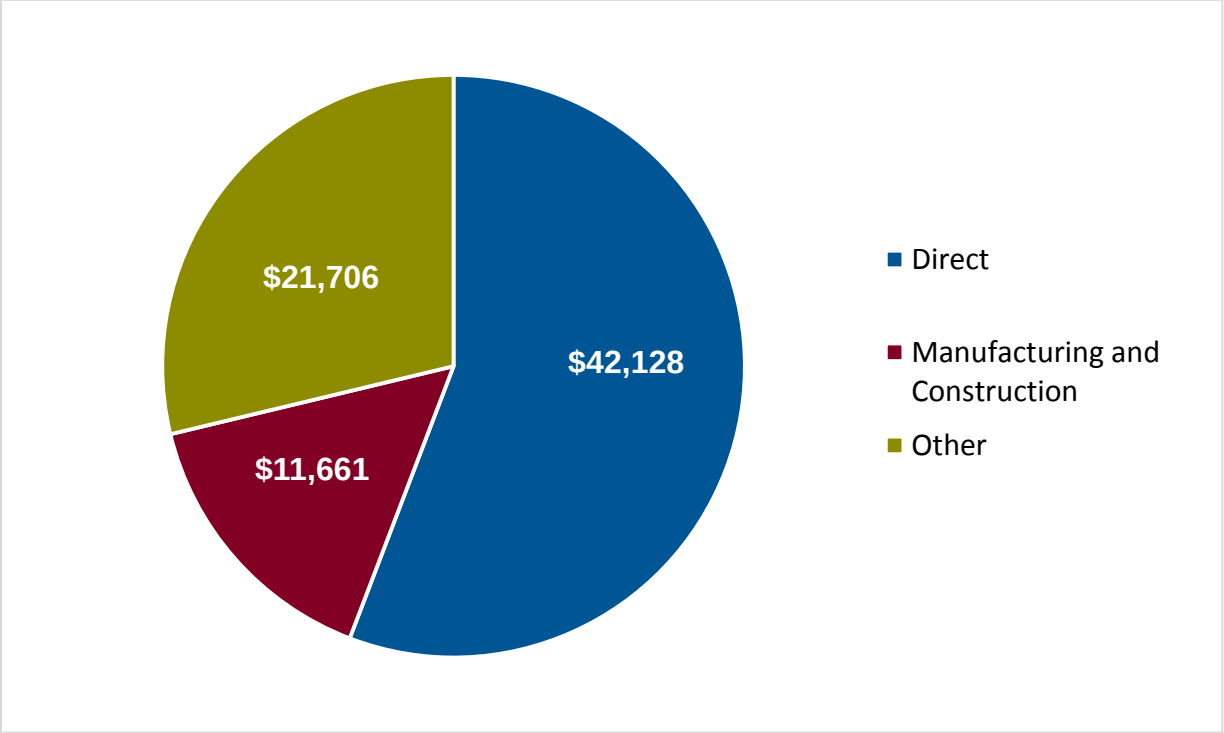
field activities take place, which Western Canada accounts for the majority, the other OGS industries, which include manufacturing, transportation and services are located throughout the country.

Summary Highlights
Oil and Gas Services (OGS) Sector Value to Canada

	2006	2009	2013e
GDP Contribution	$ 65 billion	$75 billion	$91 billion*
Taxes Paid (federal and provincial)	$ 9 billion	$17.3 billion	**
Employment	800,000	685,000	**

** Estimated based on comparable percentage of total Canadian GDP*
*** Not yet available*

Figure 1: Oil and Gas Services (OGS) Sector GDP Contributions (millions of Canadian dollars)



Source data: StatsCan

Table 1: Oil and Gas Services and Energy Related Service Industries GDP Contributions (Million $ CAD)

Industry Code	2009 StatsCan Data Industry Identification (W-Level)	GDP (Market Price)
DIRECT OIL AND GAS E&P		
BS211113	Conventional oil and gas extraction	11,100
BS211114	Non-conventional oil extraction	4,976
BS21311A	Support activities for oil and gas extraction	6,556
BS23C200	Oil and gas engineering construction	8,806
BS221200	Natural gas distribution	809
BS324110	Petroleum refineries	1,602
BS21311B	Support activities for mining	108
BS3241A0	Petroleum and coal products manufacturing (except petroleum refineries)	54
BS325100	Basic chemical manufacturing	219
BS486A00	Crude oil and other pipeline transportation	2,365
BS486200	Pipeline transportation of natural gas	3,831
BS541600	Management, scientific and technical consulting services	885
BS541700	Scientific research and development services	207
BS541900	Other professional, scientific and technical services	215
BS561400	Business support services	397
SUPPORT MANUFACTURING AND CONSTRUCTION		
BS212320	Sand, gravel, clay, and ceramic and refractory minerals mining and quarrying	110
BS221100	Electric power generation, transmission and distribution	1,366
BS221300	Water, sewage and other systems	1
BS23B000	Non-residential building construction	908
BS23C100	Transportation engineering construction	2,221
BS23C300	Electric power engineering construction	725
BS23C400	Communication engineering construction	21
BS23C500	Other engineering construction	317

Industry Code	2009 StatsCan Data Industry Identification (W-Level)	GDP (Market Price)
SUPPORT MANUFACTURING AND CONSTRUCTION (continued)		
BS23D000	Repair construction	935
BS321900	Other wood product manufacturing	0
BS326100	Plastic product manufacturing	87
BS326200	Rubber product manufacturing	96
BS327300	Cement and concrete product manufacturing	612
BS325200	Resin, synthetic rubber, and artificial and synthetic fibres and filaments manufacturing	50
BS325500	Paint, coating and adhesive manufacturing	42
BS325600	Soap, cleaning compound and toilet preparation manufacturing	3
BS325900	Other chemical product manufacturing	125
BS331100	Iron and steel mills and ferro-alloy manufacturing	0
BS331200	Steel product manufacturing from purchased steel	98
BS332100	Forging and stamping	0
BS332300	Architectural and structural metals manufacturing	0
BS332400	Boiler, tank and shipping container manufacturing	436
BS332600	Spring and wire product manufacturing	4
BS332700	Machine shops, turned product, and screw, nut and bolt manufacturing	479
BS332800	Coating, engraving, heat treating and allied activities	399
BS333100	Agricultural, construction and mining machinery manufacturing	182
BS333200	Industrial machinery manufacturing	171
BS333300	Commercial and service industry machinery manufacturing	278
BS333400	Ventilation, heating, air-conditioning and commercial refrigeration equipment manufacturing	54
BS333500	Metalworking machinery manufacturing	127
BS333600	Engine, turbine and power transmission equipment manufacturing	118
BS333900	Other general-purpose machinery manufacturing	543
BS334100	Computer and peripheral equipment manufacturing	29

Industry Code	2009 StatsCan Data Industry Identification (W-Level)	GDP (Market Price)
SUPPORT MANUFACTURING AND CONSTRUCTION (continued)		
BS334200	Communications equipment manufacturing	142
BS334A00	Other electronic product manufacturing	58
BS335100	Electric lighting equipment manufacturing	41
BS335300	Electrical equipment manufacturing	325
BS335900	Other electrical equipment and component manufacturing	82
BS336120	Heavy-duty truck manufacturing	38
BS336200	Motor vehicle body and trailer manufacturing	31
BS336500	Railroad rolling stock manufacturing	38
BS336600	Ship and boat building	3
BS336900	Other transportation equipment manufacturing	93
BS417000	Machinery, equipment and supplies wholesaler-distributors	271
OTHER		
BS481000	Air transportation	249
BS482000	Rail transportation	273
BS484000	Truck transportation	4,043
BS488000	Support activities for transportation	387
BS493000	Warehousing and storage	95
BS517000	Telecommunications	1,511
BS518000	Data processing, hosting, and related services	94
BS52A000	Financial investment services, funds and other financial vehicles	665
BS531100	Lessors of real estate	4,793
BS531A00	Offices of real estate agents and brokers and activities related to real estate	544
BS5311A0	Owner-occupied dwellings	5,688
BS532100	Automotive equipment rental and leasing	161
BS532A00	Rental and leasing services (except automotive equipment)	295
BS541500	Computer systems design and related services	900

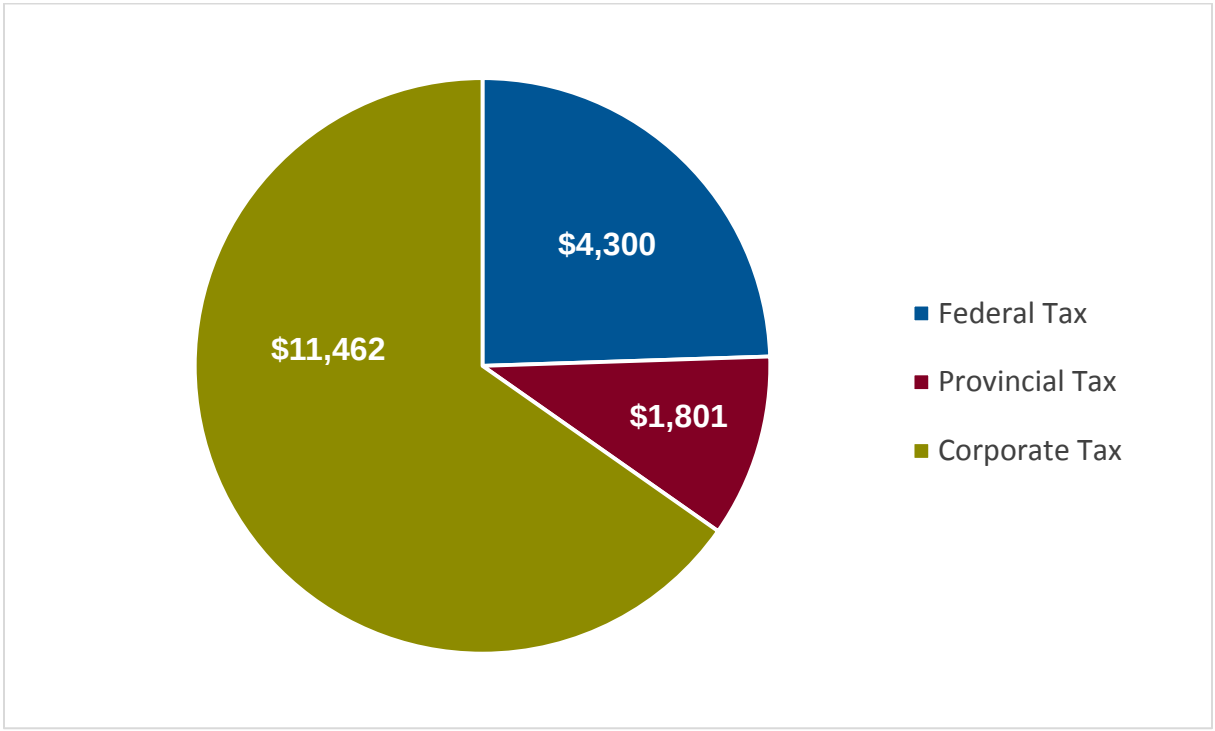
Industry Code	2009 StatsCan Data Industry Identification (W-Level)	GDP (Market Price)
OTHER (continued)		
BS561500	Travel arrangement and reservation services	107
BS561600	Investigation and security services	345
BS562000	Waste management and remediation services	380
BS722000	Food services and drinking places	928
BS811100	Automotive repair and maintenance	217
BS811A00	Repair and maintenance (except automotive)	30

Source: StatsCan

Oil and Gas Services Contribution to Taxation

Table 2 details the individual industry tax contributions, in the form of federal/provincial income tax and corporate tax, which in total is estimated at $17.6 billion dollars. This represents a 4.1 percent impact on Canadian government taxes for the year 2009. Figure 2 shows the OGS sector total taxes by the three tax categories.

Figure 2: Oil and Gas Services (OGS) Sector Tax Contributions (millions of Canadian dollars)



Source data: StatsCan

Table 2: Oil and Gas Services and Energy Related Service Industries Federal, Provincial and Corporate Tax Contributions (Million $ CAD)

Industry Code	2009 StatsCan Data Industry Identification (W-Level)	Federal Tax	Provincial Tax	Corporate Tax
DIRECT OIL AND GAS E&P				
BS211113	Conventional oil and gas extraction	532	223	3,084
BS211114	Non-conventional oil extraction	141	59	1,448
BS21311A	Support activities for oil and gas extraction	770	323	-102
BS23C200	Oil and gas engineering construction	354	148	528
BS221200	Natural gas distribution	106	44	154
BS324110	Petroleum refineries	5	2	451
BS21311B	Support activities for mining	7	3	16
BS3241A0	Petroleum and coal products manufacturing (except petroleum refineries)	1	0	11
BS325100	Basic chemical manufacturing	3	1	43
BS486A00	Crude oil and other pipeline transportation	74	31	660
BS486200	Pipeline transportation of natural gas	389	163	1,061
BS541600	Management, scientific and technical consulting services	105	44	39
BS541700	Scientific research and development services	52	22	16
BS541900	Other professional, scientific and technical services	20	8	12
BS561400	Business support services	74	31	26
SUPPORT MANUFACTURING & CONSTRUCTION				
BS212320	Sand, gravel, clay, and ceramic and refractory minerals mining and quarrying	9	4	21
BS221100	Electric power generation, transmission and distribution	128	54	279
BS221300	Water, sewage and other systems	0	0	0
BS23B000	Non-residential building construction	55	23	52
BS23C100	Transportation engineering construction	128	54	137
BS23C300	Electric power engineering construction	50	21	139

Industry Code	2009 StatsCan Data Industry Identification (W-Level)	Federal Tax	Provincial Tax	Corporate Tax
SUPPORT MANUFACTURING & CONSTRUCTION (continued)				
BS23C400	Communication engineering construction	1	0	1
BS23C500	Other engineering construction	21	9	28
BS23D000	Repair construction	89	37	45
BS321900	Other wood product manufacturing	0	0	0
BS326100	Plastic product manufacturing	4	2	8
BS326200	Rubber product manufacturing	5	2	0
BS327300	Cement and concrete product manufacturing	23	10	85
BS325200	Resin, synthetic rubber, and artificial and synthetic fibres and filaments manufacturing	1	0	8
BS325500	Paint, coating and adhesive manufacturing	1	1	5
BS325600	Soap, cleaning compound and toilet preparation manufacturing	0	0	0
BS325900	Other chemical product manufacturing	4	2	21
BS331100	Iron and steel mills and ferro-alloy manufacturing	0	0	0
BS331200	Steel product manufacturing from purchased steel	2	1	-14
BS332100	Forging and stamping	0	0	0
BS332300	Architectural and structural metals manufacturing	0	0	0
BS332400	Boiler, tank and shipping container manufacturing	24	10	26
BS332600	Spring and wire product manufacturing	0	0	0
BS332700	Machine shops, turned product, and screw, nut and bolt manufacturing	36	15	25
BS332800	Coating, engraving, heat treating and allied activities	32	13	23
BS333100	Agricultural, construction and mining machinery manufacturing	8	3	10
BS333200	Industrial machinery manufacturing	13	5	1
BS333300	Commercial and service industry machinery manufacturing	15	6	39

Industry Code	2009 StatsCan Data Industry Identification (W-Level)	Federal Tax	Provincial Tax	Corporate Tax
SUPPORT MANUFACTURING & CONSTRUCTION (continued)				
BS333400	Ventilation, heating, air-conditioning and commercial refrigeration equipment manufacturing	4	1	5
BS333500	Metalworking machinery manufacturing	10	4	0
BS333600	Engine, turbine and power transmission equipment manufacturing	6	2	12
BS333900	Other general-purpose machinery manufacturing	27	11	36
BS334100	Computer and peripheral equipment manufacturing	1	0	3
BS334200	Communications equipment manufacturing	8	3	18
BS334A00	Other electronic product manufacturing	5	2	4
BS335100	Electric lighting equipment manufacturing	2	1	5
BS335300	Electrical equipment manufacturing	15	6	30
BS335900	Other electrical equipment and component manufacturing	3	1	7
BS336120	Heavy-duty truck manufacturing	1	0	3
BS336200	Motor vehicle body and trailer manufacturing	2	1	2
BS336500	Railroad rolling stock manufacturing	2	1	8
BS336600	Ship and boat building	0	0	0
BS336900	Other transportation equipment manufacturing	4	2	17
BS417000	Machinery, equipment and supplies wholesaler-distributors	58	24	27
OTHER				
BS481000	Air transportation	9	4	17
BS482000	Rail transportation	27	11	45
BS484000	Truck transportation	190	80	235
BS488000	Support activities for transportation	22	9	52
BS493000	Warehousing and storage	16	7	5
BS517000	Telecommunications	84	35	337

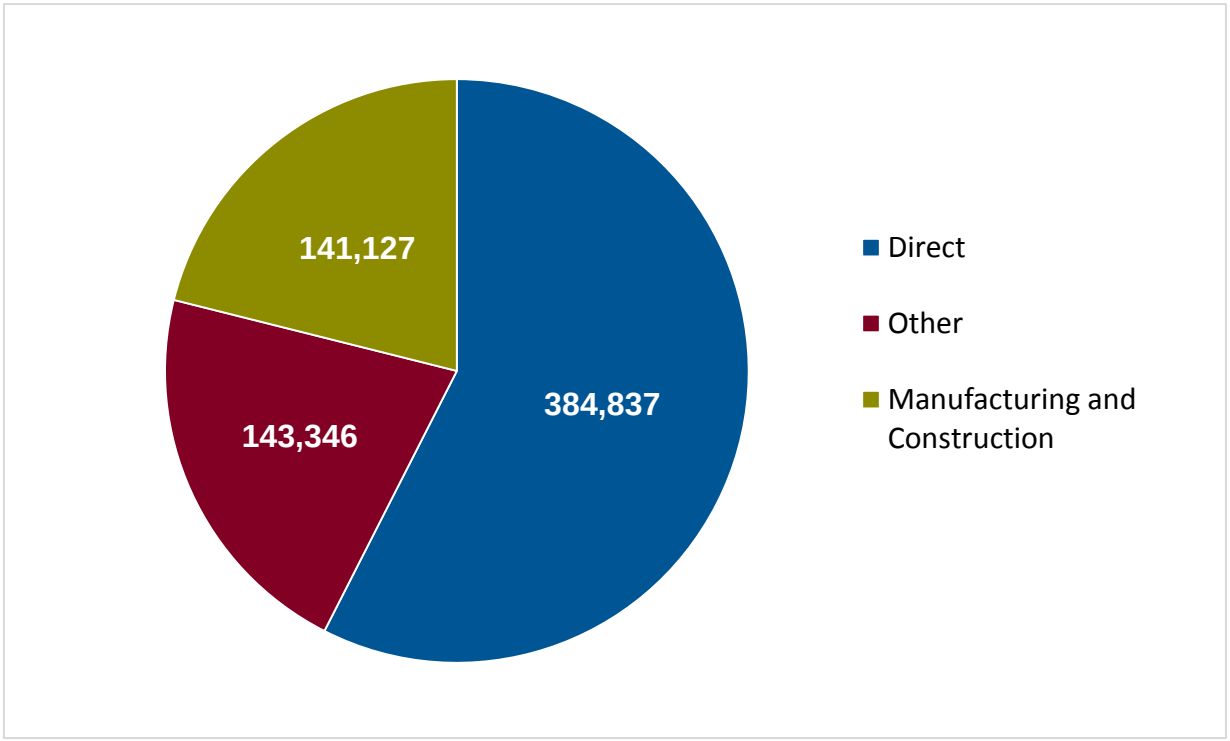
Industry Code	2009 StatsCan Data Industry Identification (W-Level)	Federal Tax	Provincial Tax	Corporate Tax
OTHER (continued)				
BS518000	Data processing, hosting, and related services	10	4	11
BS52A000	Financial investment services, funds and other financial vehicles	34	14	16
BS531100	Lessors of real estate	86	36	871
BS531A00	Offices of real estate agents and brokers and activities related to real estate	20	8	66
BS5311A0	Owner-occupied dwellings	0	0	926
BS532100	Automotive equipment rental and leasing	8	3	38
BS532A00	Rental and leasing services (except automotive equipment)	26	11	53
BS541500	Computer systems design and related services	95	40	87
BS561500	Travel arrangement and reservation services	14	6	4
BS561600	Investigation and security services	86	36	14
BS562000	Waste management and remediation services	42	18	66
BS722000	Food services and drinking places	73	31	38
BS811100	Automotive repair and maintenance	26	11	17
BS811A00	Repair and maintenance (except automotive)	3	1	2

Source: StatsCan

Oil and Gas Services Contribution to Employment

Figure 3 and Table 3 detail the individual contributions, by industry, to the OGS total estimated employment of 685,623 jobs. This represents a 4.1 percent impact on the Canadian work force for the year 2009. The OGS "Direct Industries" account for 56 percent of the total employment contribution of the OGS sector. The "Manufacturing Industries" accounts for 20 percent of the total employment contribution of the OGS sector. "Other Industries" account for the remaining 24 percent.

Figure 3: Oil and Gas Services (OGS) Sector Employment Contributions



Source data: StatsCan

Table 3: Oil and Gas Services and Energy Related Service Industries Employment Contributions

Industry Code	2009 StatsCan Data Industry Identification (W-Level)	Employment Jobs
DIRECT OIL AND GAS E&P		
BS211113	Conventional oil and gas extraction	91,417
BS211114	Non-conventional oil extraction	24,197
BS21311A	Support activities for oil and gas extraction	67,986
BS23C200	Oil and gas engineering construction	58,414
BS221200	Natural gas distribution	18,204
BS324110	Petroleum refineries	795
BS21311B	Support activities for mining	1,140
BS3241A0	Petroleum and coal products manufacturing (except petroleum refineries)	197
BS325100	Basic chemical manufacturing	452
BS486A00	Crude oil and other pipeline transportation	12,654
BS486200	Pipeline transportation of natural gas	66,740
BS541600	Management, scientific and technical consulting services	18,046
BS541700	Scientific research and development services	8,874
BS541900	Other professional, scientific and technical services	2,995
BS561400	Business support services	12,724
SUPPORT MANUFACTURING & CONSTRUCTION		
BS212320	Sand, gravel, clay, and ceramic and refractory minerals mining and quarrying	768
BS221100	Electric power generation, transmission and distribution	22,037
BS221300	Water, sewage and other systems	10
BS23B000	Non-residential building construction	9,099
BS23C100	Transportation engineering construction	21,143
BS23C300	Electric power engineering construction	8,617
BS23C400	Communication engineering construction	105
BS23C500	Other engineering construction	3,534

Industry Code	2009 StatsCan Data Industry Identification (W-Level)	Employment Jobs
SUPPORT MANUFACTURING & CONSTRUCTION (continued)		
BS23D000	Repair construction	14,730
BS321900	Other wood product manufacturing	0
BS326100	Plastic product manufacturing	736
BS326200	Rubber product manufacturing	799
BS327300	Cement and concrete product manufacturing	4,801
BS325200	Resin, synthetic rubber, and artificial and synthetic fibres and filaments manufacturing	138
BS325500	Paint, coating and adhesive manufacturing	256
BS325600	Soap, cleaning compound and toilet preparation manufacturing	18
BS325900	Other chemical product manufacturing	636
BS331100	Iron and steel mills and ferro-alloy manufacturing	0
BS331200	Steel product manufacturing from purchased steel	433
BS332100	Forging and stamping	0
BS332300	Architectural and structural metals manufacturing	0
BS332400	Boiler, tank and shipping container manufacturing	4,866
BS332600	Spring and wire product manufacturing	43
BS332700	Machine shops, turned product, and screw, nut and bolt manufacturing	7,465
BS332800	Coating, engraving, heat treating and allied activities	6,554
BS333100	Agricultural, construction and mining machinery manufacturing	1,678
BS333200	Industrial machinery manufacturing	2,661
BS333300	Commercial and service industry machinery manufacturing	3,041
BS333400	Ventilation, heating, air-conditioning and commercial refrigeration equipment manufacturing	606
BS333500	Metalworking machinery manufacturing	1,782
BS333600	Engine, turbine and power transmission equipment manufacturing	1,195
BS333900	Other general-purpose machinery manufacturing	5,604
BS334100	Computer and peripheral equipment manufacturing	152

Industry Code	2009 StatsCan Data Industry Identification (W-Level)	Employment Jobs
SUPPORT MANUFACTURING & CONSTRUCTION (continued)		
BS334200	Communications equipment manufacturing	1,426
BS334A00	Other electronic product manufacturing	797
BS335100	Electric lighting equipment manufacturing	399
BS335300	Electrical equipment manufacturing	3,092
BS335900	Other electrical equipment and component manufacturing	600
BS336120	Heavy-duty truck manufacturing	170
BS336200	Motor vehicle body and trailer manufacturing	263
BS336500	Railroad rolling stock manufacturing	260
BS336600	Ship and boat building	35
BS336900	Other transportation equipment manufacturing	679
BS417000	Machinery, equipment and supplies wholesaler-distributors	9,900
OTHER		
BS481000	Air transportation	1,505
BS482000	Rail transportation	4,555
BS484000	Truck transportation	41,012
BS488000	Support activities for transportation	4,687
BS493000	Warehousing and storage	3,428
BS517000	Telecommunications	14,491
BS518000	Data processing, hosting, and related services	1,760
BS52A000	Financial investment services, funds and other financial vehicles	5,781
BS531100	Lessors of real estate	14,734
BS531A00	Offices of real estate agents and brokers and activities related to real estate	3,410
BS5311A0	Owner-occupied dwellings	0
BS532100	Automotive equipment rental and leasing	1,429
BS532A00	Rental and leasing services (except automotive equipment)	4,515

Industry Code	2009 StatsCan Data Industry Identification (W-Level)	Employment Jobs
OTHER (continued)		
BS541500	Computer systems design and related services	16,313
BS561500	Travel arrangement and reservation services	2,457
BS561600	Investigation and security services	14,829
BS562000	Waste management and remediation services	7,197
BS722000	Food services and drinking places	12,579
BS811100	Automotive repair and maintenance	4,394
BS811A00	Repair and maintenance (except automotive)	583

Source: StatsCan

Methodology – Traditional Definition

Statistics Canada defines the E&P companies using the North American Industry Classification System (NAICS) under the section "21111: Oil and gas extraction". This industry comprises establishments primarily engaged in operating oil and gas field properties. Such activities may include exploration for crude petroleum and natural gas; drilling, completing and equipping wells; operating separators, emulsion breakers, desilting equipment and field gathering lines for crude petroleum; and all other activities in the preparation of oil and gas up to the point of shipment from the producing property. Sub categories further define this sector as:

- conventional oil and gas extraction (211113)
  - crude oil, conventional extraction
  - fractionating natural gas liquids
  - liquefied petroleum gases (LPG) from natural gas production
  - natural butane, ethane, isobutene, and propane production
  - natural gas cleaning and preparation plants.
  - natural gas liquids recovering and mining
  - Oil and gas exploration
- non-conventional oil extraction (211114)
  - bitumen production, extraction by mining
  - heavy oil in place, solution gas drive recovering
  - petroleum from shale or sand, production
  - shale oil mining
  - tar sand mining for oil extraction

(Note: PSAC has elected to include 25% of the GDP contribution of 211113 and 211114 in its OGS GDP determination because in the years since the foregoing classifications were created E&P companies have increasingly outsourced these activities to OGS. Many of the activities in the foregoing classifications are similar to those below in 21311,"Support activities for mining and oil and gas instruction". The differentiator appears to be "on a contract or fee basis". Increasingly essential activities such as "operating separators, emulsion breakers, desilting equipment and field gathering lines for crude petroleum; and all other activities in the preparation of oil and gas up to the point of shipment from the producing property" are performed by third parties on a contract or fee basis. A clear example would be field processing of raw oil or gas which used to be performed in E&P company-owned facilities but is now increasingly outsourced to independent midstream facility operators which have, to a great, degree, purchased these assets from E&P companies and now provide processing on a fee-for-service basis. The same goes for pipelines, gathering systems etc. PSAC assumes that when GDP figures are allocated in three classifications there is no overlap or double counting of such activities as the definitions of the activities are, in many cases, starkly similar).

Statistics Canada further defines service activities using the NAICS structure under the section "21311: Support activities for mining, and oil and gas extraction". This subsector comprises establishments primarily engaged in providing support services, on a contract or fee basis, for the mining and quarrying of minerals and the extraction of oil and gas. As it relates specifically to oil and gas developments this subsector is further defined as:

- oil and gas contract drilling
- acidizing wells, on a contract basis
- cementing oil and gas well casings, on a contract basis
- cleaning out oil and gas wells, on a contract basis
- contract battery operators, oil field
- cutting casings, tubes and rods, oil field
- drilling water intake wells, on a contract basis
- excavating slush pits and cellars, on a contract basis
- shot-hole drilling service, oil and gas field, on a contract basis
- well foundation building, at oil and gas wells, on a contract basis
- well pumping, oil and gas, on a contract basis

Note to file: we should include here the GDP, tax and employment numbers for the services sector based on the traditional definition.

Conclusion

The purpose of this report was to delve deeper into the structural change of oil and gas extraction and oil sands development with a view to highlighting all the industries that contribute in some form to a different view of the Oil and Gas Services sector. This analysis documents that there are fifteen (15) industries that "directly support oil and gas developments", forty four (44) industries that support

"manufacturing and construction elements" of oil and gas developments and twenty four (24) industries that are considered "other" support industries. In total, after applying percentage ratios based on the level of involvement, the Oil and Gas Services sector:

	Traditional Definition Canadian GDP contribution (2009 $ billion)	**Industry Definition** Canadian GDP contribution (2009 $ billion)
Conventional oil and gas extraction	$44,401	$33,301
Non-conventional oil extraction	$19,905	$14,929
Support activities – mining	$2,167	$75,495
Support activities – oil and gas	$29,024	

For the purpose of clarity, the analysis presented in this report is an innovative view of the oil and gas service sector. This is based on the Petroleum Services Association of Canada (PSAC) using the Oil and Gas Services as defined by Table 1 and does not mirror the traditional definition (refer to Methodology – Traditional Definition above) used by Governments of other industry associations. The difference between these results supports the observation that consideration of collateral impacts should be included when new policy is debated.

About the Authors

Peter Howard, President Emeritus
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Peter Howard joined the Canadian Energy Research Institute (CERI) in November 2004. He was appointed President and CEO in 2010 and held that position until his retirement in November 2014. His current title with CERI is President Emeritus.

Mr. Howard has over 40 years of experience specializing in engineering and technical applications in the oil and gas industry. Prior to joining CERI, Peter held several positions, including senior associate with J.R. Lacey International, president of Arundel Information Systems, partner with LOGIS Data Systems Ltd., and vice president with Computer Research Associates Ltd. Mr. Howard is a co-author of the Gas Energy Management Model, the LOGIS data retrieval system and has acted in a consulting role for numerous companies with regard to computer modeling, data mining and computer application development.

Mr. Howard holds a Bachelor of Science degree in Mechanical Engineering from the University of Alberta in Edmonton and is a registered Professional Engineer in the Province of Alberta.

David Yager, National Leader, Oilfield Services
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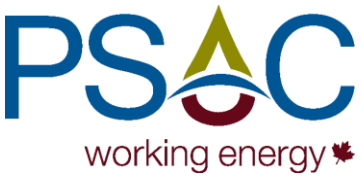
David Yager is the National Leader, Oilfield Services for MNP in Calgary. With over 40 years of hands-on industry experience from field operations to senior executive, David's role is to provide knowledge and expertise on the large and diverse oilfield services sector to MNP and clients. He joined MNP in October of 2012.

Starting in 1970, David began a diverse oilfield services career that included being a founder, officer and director of three TSX listed companies. In that time his companies acquired over 35 private companies, merged with or acquired four public companies, and commercialized several new technologies and business models. He has 25 years of public companies board experience. His most recent executive position was Chairman and CEO of HSE Integrated Ltd. which traded on the TSX until it was taken private in 2012. He is also a recognized expert on energy policy and upstream oil industry operations and trends and has written and spoken extensively on this subject since 1979.

Mr. Yager was on the PSAC Board of Directors from 2006 to 2011 serving as Chairman in 2009/2010. His project as Chair was working with PSAC and Canadian Energy Research Institute to create a groundbreaking study on the size of the oilfield services industry in Canada and other markets.



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