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Tariffs and the U.S.-Canada Energy Interdependence

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ABSTRACT

In the world's developed countries, access to low-cost energy is a prime mover that enables productivity and economic expansion. This article considers the energy interdependencies of two major North American countries, namely the United States and Canada. Together these countries jointly produce more oil than anywhere else on Earth. They are complementary and interdependent regarding their primary supplies of energy. This article details the resources and trade relationships of these two allies regarding key sources of energy, particularly oil, natural gas, uranium and electricity. The infrastructure of these two counties is designed to support bilateral energy distribution and trading. Mapping the energy relationships between countries is a complex process. Canada exports almost all its oil and natural gas production to the U.S. Regions of the U.S., such as the upper Mid-western States and the Northeast, are highly dependent on Canadian crude oil, natural gas and electricity. The U.S. also exports energy to Canada albeit in lesser volumes. This article delves into the issue of tariffs applied on the importation and exportation of energy resources such as petroleum and electricity. The author concludes that the new tariffs being applied to energy resources by the U.S. on Canadian energy imports are counterproductive and create uncertainties for businesses and industries on both sides of the border.

INTRODUCTION

The U.S. and Canada are each other's largest energy trading partners as measured by the value of energy commodities. They share the world's longest common unfortified border which stretches 8,891 kilo-

meters (5,525 miles) much of it along the 49th parallel. The population of the U.S. is 345.2 million. Canada's population is 41.5 million, slightly more than the U.S. state of California which is 38.9 million. About 90% of the Canadian population lives within 160 km (100 miles) of the U.S. border. Though Canada is slightly larger geographically, both countries have just under 10 million km^2 (3.9 million square miles) of land area. Each of these countries is blessed with vast natural resources that include energy. The U.S. is the world's leading oil producer; Canada is the world's 4th largest. In the U.S., Texas produces over 40% of the total volume of oil; the province of Alberta in Canada produces over 80% of the oil in Canada. Proven Canadian oil reserves are 171.0 billion barrels (bbl), far more than the U.S. total of 44.5 billion barrels which includes its Strategic Petroleum Reserve (SPR) that contains 0.4 billion barrels. Neither country is a member of the Organization of the Petroleum Exporting Countries (OPEC). Petroleum encompasses both crude oil and the refined petroleum products. Petroleum products result after crude oil is refined into fuels like gasoline, jet fuel, or propane.

Canada is a major and dependable energy supplier to the U.S., providing 58% of the volume of hydrocarbons imported by the U.S. in 2023. Hydrocarbons are an organic compound consisting entirely of hydrogen and carbon which serve as the foundation for crude oil, natural gas and coal. In 2021, Canada supplied 61% of U.S. crude oil imports, 98% of natural gas imports, 93% of electricity imports, and 28% of its uranium purchases [1]. These are significant contributions to the energy needs of the U.S. [1].

The oil production of these countries is complementary. Canada's oil exports to the U.S. are primarily heavy oil from oil sands [2]. U.S. production is primarily light oil from the Permian Basin in Texas and New Mexico [2]. Many U.S. refineries, primarily in the Midwest and Gulf Coast regions are configured to process heavy oil. Interestingly, the amount of oil that Canada exports to the U.S. is about equal to total U.S. oil exports. This partnership is crucial for both economies, creating jobs and ensuring energy security. A network of pipelines along with fleets of rail, marine, and freight vehicles, transport crude oil, natural gas, natural gas liquids (NGLs), and refined petroleum products (RPPs) between Canada and the U.S.

MAPPING THE INTERDEPENDENCE

It is physically beneficial and economically efficient for the U.S. and Canada to partner in the distribution and sale of energy. This is particularly true for oil, natural gas and electricity. Though the U.S. is now the world's largest oil producer, this was not always the case. The U.S. in the 1970s through the 2000s was not energy independent and was heavily dependent on costly imported oil. Canada was and remains an important crude oil supplier. As of February 2025, total U.S. crude oil production reached 13.5 million barrels per day (bbl/day). Canada is the world's fourth largest oil producer with 4.8 million bbl/day. New pipeline access and crude-by-rail have allowed more Canadian oil to reach refineries on the U.S. Gulf Coast, increasing from about 140,000 bbl/day in 2010 to about 450,000 bbl/day in 2024 [2]. Because of a vast network of pipelines and refineries, Canadian and U.S. oil production is complementary. Infrastructure is in place and was designed to support this interdependency, especially regarding supplies of crude oil and electricity. Despite increased domestic oil production, the U.S. reliance on oil imports from Canada has never been greater [2].

Mapping Energy Flows

Mapping the energy flows between counties is a complex process because of the different types of energy resources involved. Challenges include benchmarking and obtaining relevant databases without missing data. There have been past attempts to map the energy flows across the countries in North America. Surprisingly, the trade of energy impacts all U.S. states and all Canadian provinces. While the province of Alberta is the center of Canadian oil and gas production, oil is also sourced from Saskatchewan, Newfoundland and Labrador. Most of the oil and natural gas production from Alberta flows to the U.S. Electricity, mostly generated using nuclear energy and hydropower, flows from the provinces of Ontario and Quebec to the New England states and Michigan. In addition to vast amounts of electricity, Ontario exports uranium to the U.S. [1].

Perhaps one of the better past efforts to map the relationship was performed by the Center for Strategic and International Studies in 2018 which focused on the energy trade between the U.S. and Canada. It highlights aspects of the energy interdependence between these allies (see Figure 1).

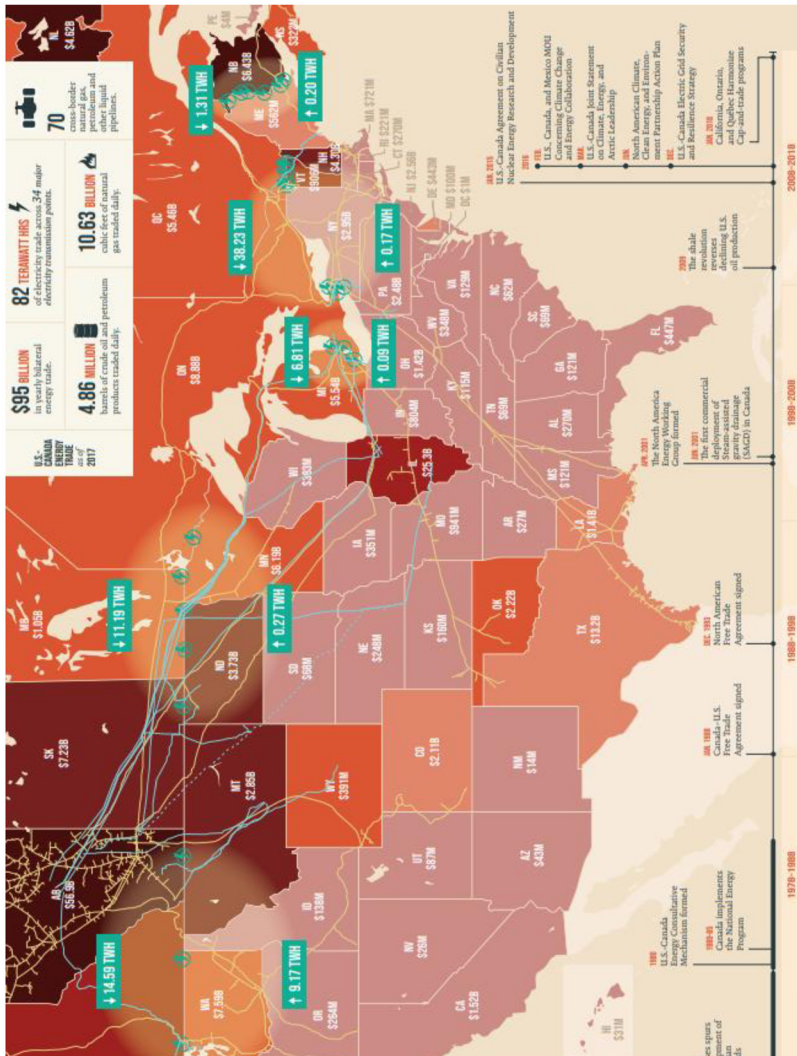

Figure 1. U.S. and Canada energy trade map [1].

ENERGY TRADING

The cross-border trade of energy between the U.S. and Canada is substantial. The extent of the trade activities of key energy products between these major energy producers is an indicator of the interdependence between these countries.

Despite the massive scale of oil and natural gas production in the U.S., the country imports vast volumes of hydrocarbons from Canada. In 2023, Canada provided 58% of the hydrocarbons imported by the U.S. More specifically, Canada provided 60% of the crude oil and close to 100% of the natural gas imported by the U.S. Canada also supplied 21% of the refined petroleum products (RPPs) and 95% of the NGLs imported by the U.S. [3]. Despite being a primarily hydrocarbon-exporting nation, Canada imported 1.1 million barrels (bbl) of oil equivalent (BOE) per day in 2023, 83% of which came from the U.S.

Crude Oil

Crude oil and petroleum products are key examples of the interdependency. In 2023, Canada exported 3.9 million bbl/day of crude oil. Of this, 97% or 3.8 million bbl/day went to the U.S. [3]. The value of U.S. imports of crude oil from Canada was $93 billion in U.S. dollars (or $130 billion Canadian), a decrease of 18% from 2022 because of a lower average price for crude oil [3].

Unlike the trade of crude oil, the exchange of refined petroleum products (RPPs) between the two countries is relatively balanced. RPPs include a wide range of products refined from crude oil, such as motor gasoline, distillate fuel oil (diesel), heating oil, and kerosene jet fuel, among others [3]. In 2023 Canada exported 0.37 million bbl/day of RPPs with 87% going to the U.S.; it imported 0.47 million bbl/day with about 80% sourced from the U.S. [3]. Many U.S. refineries, particularly those located in the Midwest, are designed to process the types of heavy crude oil that are extracted from the Alberta oil sands.

Natural Gas

The natural gas industry is one of the oldest utilities in North America and has provided a key resource for a growing U.S. [4]. Natural

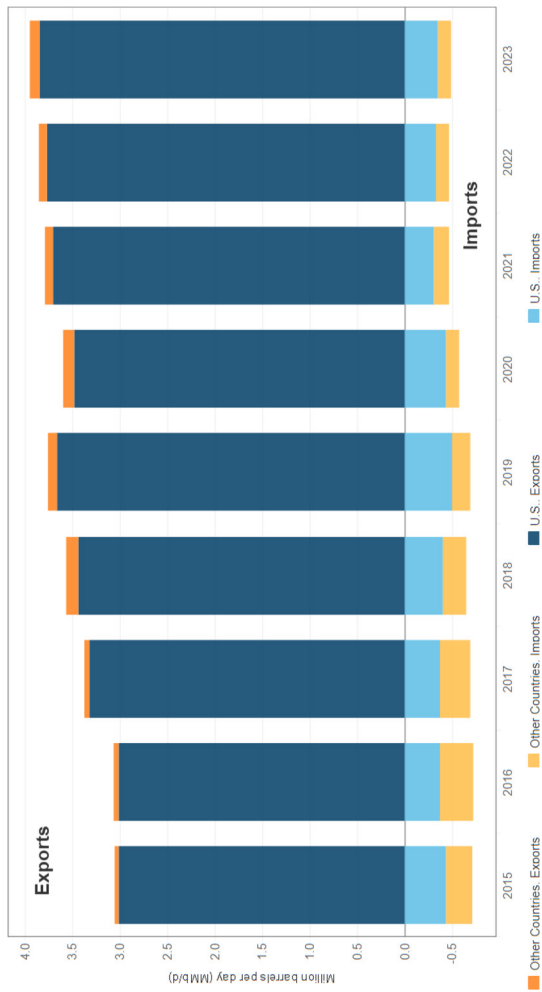

Figure 2. Annual crude oil exports from Canada to the U.S. and imports from the U.S. to Canada in million barrels/day, 2015-2023 [3].

gas processing requires multiple steps that begin at the wellhead and end at the burner tips [4]. Each production stage increases its value. Today natural gas is primarily used for heat and to produce electricity.

The U.S. is the world's leading producer of natural gas. In 2023, three regions—Appalachia, Permian, and Haynesville—accounted for 59% of the total natural gas production in the U.S. [5]. Associated natural gas accounted for about 37% of U.S. natural gas production and most of this production came from the Permian region. As of year-end 2022, U.S. total natural gas proved reserves—estimated as wet gas—totaled about 691 trillion cubic feet (Tft^3) [6].

Canada is the world's 5th largest producer of natural gas. Canadian natural gas production in 2023 averaged 17.9 billion cubic feet (Bft^3) per day [7]. Total Canadian natural gas proved reserves totaled about 77 Tft^3.

The volume of natural gas imports and exports between the U.S. and Canada have remained relatively stable since 2015. The U.S. imports about four times as much natural gas from Canada as it exports to Canada (see Figure 3). Canada exports 7.8 Bft^3/day of natural gas, all of which goes to the U.S. Canada imported 2.0 Bft^3/day of natural gas; almost all was imported from the U.S.

Liquefied natural gas (LNG) is a form of natural gas that has been cooled to about −162°C (260°F) to enable shipping and storage. Once liquefied, the volume of natural gas is about 610 times smaller than its volume in a gaseous state. The U.S. became the world's largest exporter of LNG beginning in 2023 overtaking Qatar. In 2024, the U.S. exported approximately 123 Bft^3 (12 Bm^3) /day of LNG. Though Canada is not yet a major exporter of LNG, the country has seven export projects in various stages of development.

Natural Gas Liquids

Natural gas liquids (NGLs) are recovered from natural gas or condensate as liquids when they are under slightly higher pressures and lower temperatures [3]. These liquids include ethane, propane, butanes, plus pentane among others. Canada exported 245.0 thousand bbl/day of NGLs, with 66% or 159.0 Mb/day going to the U.S. Canada imported 91.8 thousand bbl/day of NGLs—almost 100% from the U.S. [3].

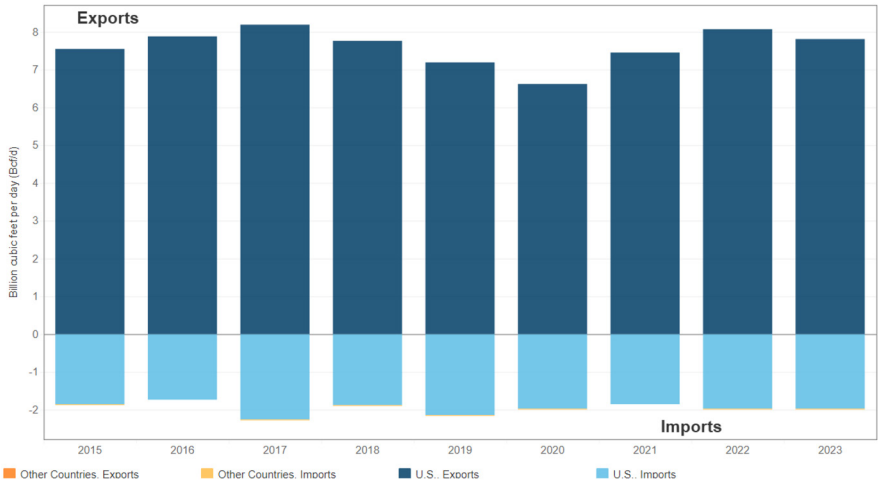

Figure 3. Annual natural gas exports from Canada to the U.S. and imports from the U.S. to Canada in billion ft^3/day, 2015-2023 [3].

Figure 4 presents yearly stacked bar charts, one each for butane, propane, and ethane, from the Canadian import/export perspective. Each chart displays imports and exports in thousand barrels per day (Mb/day) from 2015 to 2023, categorized by source and destination (U.S. versus other countries) [8]. Exports are displayed as positive values, with dark blue representing exports to the U.S. and dark orange for exports to other countries. Imports are shown as negative values, with light blue representing imports from the U.S. and negligible quantities of imports from other countries shown in light orange [8].

Electricity

The U.S. and Canada share one of the world's most integrated electricity grids. Resources are pooled to improve reliability and economic dispatch. There are 86 international power lines that move electricity through various provinces and states [3]. Electricity is more costly south of the border. U.S. consumers in 2024 paid an average retail price of $0.184/kWh for electricity. Consumers in Canada paid an average of only $0.126/kWh. This is the result of the greater use of hydropower in Canada.

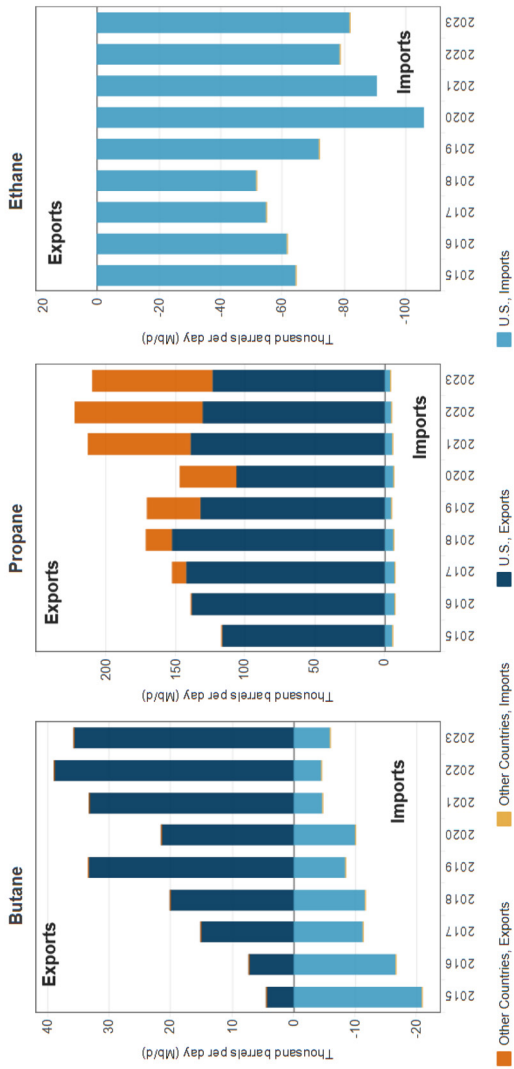

Figure 4. Annual NGLs exports from Canada to the U.S. and imports from the U.S. to Canada in 1,000 barrels/day, 2015-2023 [3].

Canada is the world's 2nd largest producer of hydroelectricity after China. Just over 60% of Canada's electricity is generated by hydropower. The country's ability to provide renewable electricity is highly valued in New England and elsewhere in the U.S. as it provides baseload generation and enables some regions to reduce their greenhouse emissions. The U.S. needs Canadian electricity. Despite energy efficiency efforts which stabilized usage from 2006-2019, the U.S. demand for electricity has since steadily increased (see Figure 5). Electricity consumption was 4,304,309 gigawatt-hours in 2024, up 3.1% from 2023. This growth in the demand for electricity is due to the added electrical needs of regional data centers, air conditioning, and electric vehicles.

Together electricity imports and exports have a crucial role in ensuring the reliability of the electricity systems in several Canadian provinces and U.S. states [3]. Because of interconnected transmission infrastructure all of Canada's electricity trade is with the U.S. Despite increases in electricity use, exports of electricity to the U.S. from Canada declined from 2016 through 2023 (see Figure 6). In 2023, Canada exported 49.4 terawatt-hours (TWh) of electricity; alternatively, the U.S. exported 16.7 TWh of electricity to Canada [3].

IMPACT OF TARIFFS ON ENERGY SUPPLES

In early March 2025 the U.S. announced tariffs on goods including energy from Canada and Mexico, some of which were delayed to be implemented later in the year. The term "energy" or "energy resources" as applied to the tariffs is defined as crude oil, natural gas, lease condensates, natural gas liquids, refined petroleum products, uranium, coal, biofuels, geothermal heat, the kinetic movement of flowing water, and critical minerals [9]. The tariffs chiefly targeted oil, natural gas, uranium and electricity imports to the U.S. from Canada. Why were the tariffs being threatened and implemented? Mr. Donald Trump, the U.S. President, said that a primary reason for his new tariffs against the country's three largest trading partners (Canada, Mexico, and China) was the "national emergency" brought on by fentanyl flowing across the country's borders [10]. However, nearly all the fentanyl entering the U.S. was

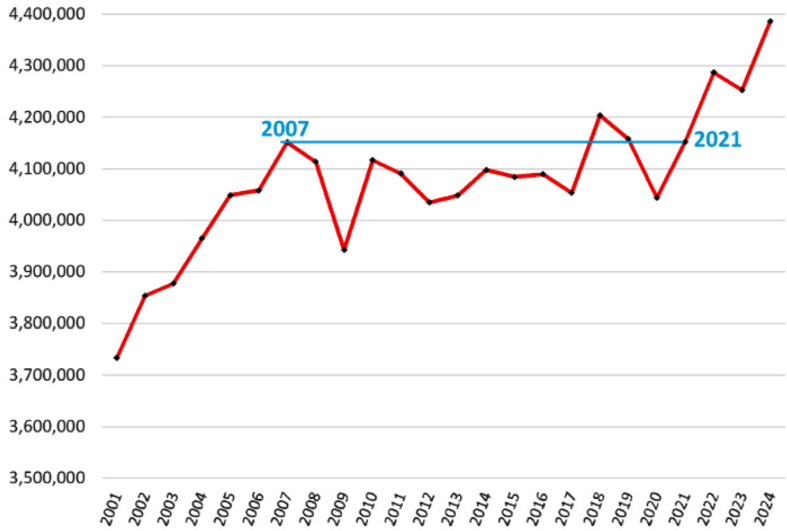

Figure 5. U.S. electricity generation, 2001-2024 in GW hours/year (sources: EIA, wolfstreet.com).

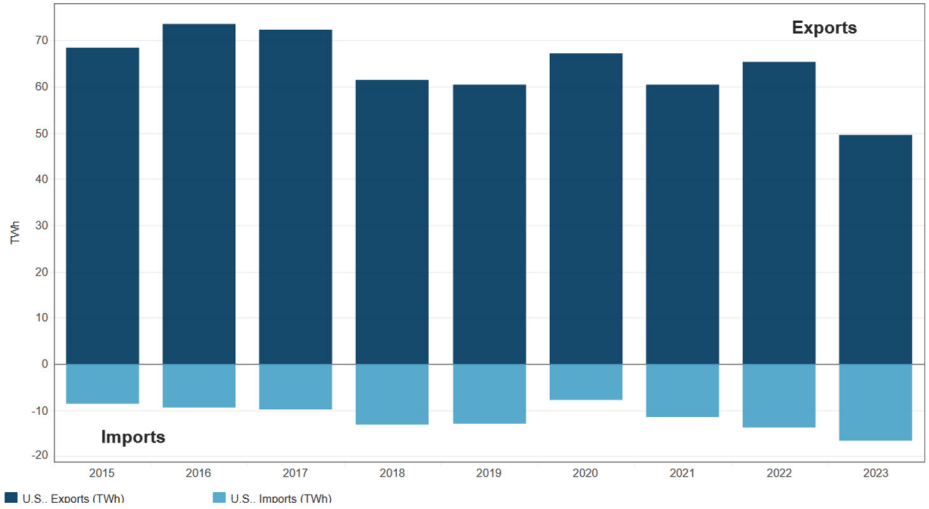

Figure 6. Annual electricity exports from Canada to the U.S. and imports from the U.S. to Canada in TWh, 2015-2023 [3].

via its southern border with Mexico; overdose deaths had declined in the previous two years [10]. He also pointed to concerns regarding illegal immigration most of which is not via Canada.

Justin Trudeau, then Canada's Prime Minister, responded that "While less than 1% of the fentanyl intercepted at the U.S. border comes from Canada, we have worked relentlessly to address this scourge that affects Canadians and Americans alike. We implemented a $1.3 billion border plan with new choppers, boots on the ground, more coordination, and increased resources to stop the flow of fentanyl" [11]. Referring to the imposition of tariffs, he stated that "Canada will not let this unjustified decision go unanswered" [11].

Regardless of Canada's efforts, the U.S. placed a 10% import tariff on Canadian oil. "Virtually all economists think that the impact of the tariffs will be very bad for America and for the world… they will almost surely be inflationary" said Nobel Prize winner Joseph Stiglitz, an economics professor at Columbia University [12]. The damage of the tariffs will be compounded by the retaliatory actions that Canada and Mexico vowed to take [13]. "It is going to be an absolute disaster for both countries. We are your largest trading partner," said Doug Ford, the premier of Ontario, Canada's most populous province. "I do not want to respond, but we will respond like they have never seen before. You [referring to the U.S.] need our uranium. If he [referring to U.S. president] wants to destroy our economy and our families, I will shut down the electricity going to the U.S." [14]. He also said that, "we keep the lights on for 1.5 million homes and manufacturing in New York, Michigan and Minnesota." [14]. Ford later said he will not be afraid to retaliate by matching tariffs, noting Canada's importance regarding U.S. usage of its energy and electricity [15]. The threat is that counter tariffs by Canada would likely impact electricity sales to the U.S.

Crude Oil

The Canadian oil drilling sector has endured a prolonged downturn dating back to the oil price collapse of 2014. After peaking at 626 rigs in February 2014 and despite a gradual improvement afterwards, by March 2025 there were only 188 active rigs in operation [16]. After reaching a peak of 1,609 active oil rigs in October 2014, the U.S. had

593 operating rigs in December 2024. In 2024, total employment in the drilling sector stood at approximately half of what it was a decade earlier, underscoring the fragile nature of the post-COVID recovery [16]. Yet Canada remains the dominate supplier of imported oil to the U.S. In 2024, Canada supplied 62% of U.S. oil imports, with Mexico, Saudi Arabia, and Venezuela together providing just 14% [2].

In Canada, there are two common benchmarks for oil. The variables that typically drive price differences between the benchmark crudes are quality, marketability, and logistics. Western Canadian Select (WCS) is a blend of diluted bitumen and conventional heavy oil priced in Hardisty, Alberta. Canadian light sweet (CLS) crude oil, once known as Edmonton Par, is a basket of light sweet crudes priced in Edmonton, Alberta [14]. Most Canadian crude sells at a lower price than U.S. crude. In Canada, light and heavy benchmarks largely trade at a discount to West Texas Intermediate (WTI). Both Central Alberta oil prices and WTI prices have been generally declining in price since April 2024.

About two-thirds of Canada's exports are shipped to the Midwest via Enbridge's Mainline [14]. The Midwestern U.S. states are Canada's ideal customer. The region is closer, and lacks major producers and nearby import terminals. Refineries in the Midwest invested billions to retool their facilities to process the heavy, sour, and acidic crudes from the oil sands [14]. Canada's largest crude pipeline operator, Enbridge, constructed most of its infrastructure to serve the region. Unfortunately, having a single large buyer of Canadian crude oil reduces Alberta's ability to compete for higher prices [14].

In addition to tariffs announced on goods, there was a 10% tariff on Canadian energy imports. The impacts of tariffs are far-reaching. For example, on 9 April 2025 the price of Canadian Central Alberta crude oil was $51.43 (U.S.) per barrel. An import duty of 10% on Canadian oil increases the price to $56.57 per barrel which is slightly less than the WTI price of $57.35 per barrel. This means that tariffed Canadian crude despite having a less challenging and costly supply chain to regions of the U.S. has little price advantage. When the export pipelines are at capacity, the incremental barrels of oil must be shipped by rail which has a higher transportation cost and increases pricing discounts [14].

Canadian suppliers could ship their oil to other countries and sell at international prices, or lower their prices to continue selling to the U.S. which would reduce their margins. As most of this Canadian crude flows to the upper mid-western U.S. states, consumers there will ultimately pay the increased costs; the added funds raised by the tariff will flow to the U.S. Treasury. If Canada is unable to sell its oil to the U.S., it could within the boundaries of its vast lands construct pipelines to coastal ports to ship oil to other countries. This would be costly. Reinventing the proposed Keystone XL pipeline to the Gulf Coast offers an opportunity for beneficial marketability because it opens a large market for heavy crude which has a notable shortage of stable suppliers [14]. However, the oil would flow through U.S. territory [14]. With the added tariffs on Canadian crudes the economics of the project are less favorable. If reconsidered, this alternative would once again face strong opposition from landowners and environmentalists in the U.S. In the meantime, Canadian oil has nowhere else to go.

Tariffs will eventually impact industry supply chains. For example, one major concern is the availability and price of sand, a resource included in Canada's proposed list of counter-tariffs. Sand is a key component in hydraulic fracturing (fracking) processes [16]. It acts as a proppant, holding open the fractures created in rock layers during the fracking process. Frac sand must meet stringent specifications in terms of grain shape, size, and durability, to be used for hydraulic fracturing. A price increase for this essential resource would raise operating costs for oil and natural gas companies, further straining the industry [16]. The price for frac sand varies from $25/ton to $200/ton depending on the type of sand, its availability, and delivery costs.

Natural Gas

The 10% energy tariff would likely apply to the importation of natural gas into the U.S. from Canada. If so, how it would be applied in the pricing formula for natural gas is undefined and difficult to sort out. It is uncertain whether the import tariff basis for natural gas will be applied to the posted index price, the contract's index price at or near the U.S.-Canadian border, or the price at a trading hub [17]. Because of the nature of the tariff, a legal argument can be proposed that the added

tariff costs are defined by contract as government-imposed taxes [17]. There are two options: 1) the buyer pays taxes at and after the delivery point; or 2) the seller pays taxes before and at the delivery point [17]. To further confound the issue, there remains the question of whether the tariffs would apply to the costs of delivering the product to the Canadian border. While the contractual responsibility for payment is uncertain, the costs must be paid to guarantee carriage.

In North America prices for natural gas tend to vary seasonally as demand increases in the winter. However, market-specific demand shocks are the main source of natural gas prices fluctuations. The price of natural gas in the U.S. more than doubled from April 2024 to March 2025 to $3.98/therm (see Figure 7). It fell by 25 April 2025 to $2.91/therm. While this increase may seem substantial, the price is much less than was posted in August 2022 when the market price for natural gas spiked at $9.40/therm. While the price elasticity of natural gas demand is relatively high, natural gas supply prices are relatively inelastic.

For tariffs on natural gas imports into the U.S., the pricing formula could be based on the posted market index price. For example, if the pricing formula were based on market pricing, a 10% tariff on natural gas priced at $2.91 (U.S.) per therm would be about $0.29 which would increase the price to $3.20/therm. However, AECO-C (a virtual trading point) Canadian natural gas is priced as low as $1.48/therm [18]. If the

Figure 7. U.S. Natural gas prices in from 2020 to March 2025 (USD/therm) [19].

tariff is levied at this point and price, it would increase the cost by only $0.14/therm, yielding a total price of $1.62/therm.

Natural gas prices have become increasingly volatile due in part to the exports of LNG. An increase in price would increase the tariff applied. Ultimately, the tariff would vary, add to price volatility, and be paid by U.S. consumers.

Uranium

Canada, the world's second-largest producer and exporter of uranium, has reserves about 10 times larger than those held by the U.S. The U.S. has an estimated 59,400 tons of uranium, accounting for 1% of the global supply—Canada possesses 588,500 tons [20]. Canada boasts the world's largest deposits of high-grade uranium with concentrations reaching up to 20% uranium—100 times higher than the global average [20]. A 25% tariff on Canadian mineral imports that include uranium could cost U.S. off-takers an additional $11.75 billion—a figure that would likely increase as uranium prices recover [20].

The U.S. relies on foreign sources for 70% of its enriched uranium. Though Canada supplies 27% of U.S. uranium, it has not threatened to disrupt supplies. In the unlikely event that were to happen, it would be difficult for the U.S. to quickly develop high-grade domestic supplies. The alternative would be to obtain more uranium from Kazakhstan or Russia.

The application of tariffs clearly counters the intent of Executive Order 14156, the declaration of a national energy emergency, signed on 29 January 2025. It explicitly prioritized uranium and other energy resources and directed that adding uranium to its critical minerals list be considered [9].

Electricity

The impact of tariffs on electricity imported to the U.S. are regional. After the U.S. tariffs on Canadian oil imports were announced, Canada immediately hit back by imposing 25% tariffs on $155 billion worth of U.S. exports to Canada [21]. The province of Ontario quickly threatened a 25% surcharge to be applied to electricity sales to the U.S. states of Michigan, New York, and Minnesota [22,23]. The electricity sur-

charge would immediately effect consumers in these states because they rely on imports of electricity from Canada to supply their businesses and homes [23]. Regional wholesale electricity markets would be disrupted. Adding about $277,000 per day to the cost of imported electricity, the 1.5 million consumers in the affected U.S. states would see their average costs for the electricity increase by about $830 per year [24]. Within a few days Canada backed off this threat and retaliated by increasing tariffs on other goods.

If a more broadly applied 10% energy tariff were placed on wholesale electricity, the impact would affect additional U.S. states. For example, electricity exported to the U.S. from Canada is also consumed in California, Nevada, and parts of Arizona.

CONCLUSION

The availability of low-cost energy is a prime mover that enables productivity and economic expansion. The gross domestic product (GDP) of the U.S. in 2024 was $29.168 trillion, by far the world's largest. Canada's GDP was $2.215 trillion, ranked 14th worldwide, slightly larger than many of the world's other fossil-fuel exporters including the Russian Federation [25]. The U.S. and Canada are increasingly interdependent in terms of their importation and exportation of energy resources. It is physically beneficial, strategically important, and economically efficient for the U.S. and Canada to partner in the distribution of energy resources, particularly for the sale of oil, natural gas, uranium, and electricity. Their energy infrastructures are interconnected and optimized to support energy trading between the two allies. Though Canada's exports of hydropower to the U.S. are only a fraction of U.S. electricity generation, the shared grid between the two countries is critical to maintaining system reliability [22]. Canada generates large amounts of renewable hydroelectricity which does not create air pollution nor emit greenhouse gases.

The U.S. is dependent on Canadian uranium and its comparatively less costly hydroelectricity. In the U.S., electricity users have reduced their costs by investing in more efficient equipment such as new lighting,

appliances, electronic equipment, heating and air-conditioning systems, and controls [26]. This drive for greater efficiency has until recently kept the demand for electricity stable despite the growing economy and population [26]. Due to the market penetration of electric vehicles and the demand from new data centers, electricity consumption is now increasing [26].

The international energy markets tend to focus on oil and petroleum derivatives. According to the EIA, in the next 25 years the U.S. will need to import about the same amount of oil as it does today—7.0 million bbl/day in 2050 compared to 6.98 million bbl/day in 2023 [2]. With no anticipated increase in demand and the U.S. and Canada involved in trade disputes… who will control the oil markets? OPEC has indicated it will increase oil production, flooding world markets with excess production which would increase downward pressures on petroleum prices. Alternatively, world oil prices could increase, especially if a major event were to occur in the Middle East. In any case, the U.S. will likely miss its newfound leverage to control pricing. Given most any scenario, the new tariffs on energy resources by the U.S. are counter-productive.

The Consequences of Tariffs

Given the size of its economy, the U.S. is certainly in a stronger position to sustain the negative consequences of an impending trade war that may result from the institution of import duties. Canada appears to be more vulnerable because about 19.5% of Canada's GDP is due to exports to the U.S. [27]. However, certain U.S. regions and states are highly dependent on their exports to Canada. North Dakota derives about 10% of its GDP from exports to Canada alone [27]. Many U.S. states have worked for decades to foster close trading partnerships with Canada; these relationships are threatened and could be permanently damaged. Tariffs are an escalation of the trade tensions between the two countries [22].

Attempts to solve the problems brought on by fentanyl flowing into the U.S. and illegal immigration by creating tariffs on energy flowing from Canada into the U.S. are mistargeted. Little illegal drug trafficking has been proven to cross into the U.S. from Canada and most of the immigration issues happen elsewhere. If tariffs are the solution, then

why are there no commitments to direct the funds raised toward resolving them? These tariffs create distractions that stymie more effective solutions. In context they seem burdensome, unjustified, and untimely. Consumers are the ones who will incur the burden of the added taxes on energy. Their situation will not be improved by redistribution of benefits, and productivity will be threatened.

The conflicting rationales for tariffs are not only troublesome but also create uncertainties and chaos for North American consumers and businesses. These tit-for-tat, on-again/off-again, threats of tariffs are counterproductive. U.S. consumers will pay more than the Canadians due to the sheer volume of energy the country imports. The application of tariffs significantly increases the price of energy—particularly oil, natural gas, and uranium—paid by U.S. consumers and industries. It directly opposes stated policies, found in Executive Order 14156, that intends to reduce the "high energy costs that devastate American consumers by driving up the cost of transportation, heating, utilities, farming, and manufacturing, while weakening our national security" [9]. The U.S. president's past pledges to reduce both taxes and the cost of energy are undercut by actions to institute tariffs on energy supplies.

If the tariffs on certain goods are fully imposed, the U.S. would be violating the United States-Mexico-Canada Agreement (USMCA) a multilateral compact that replaced the North American Free Trade Agreement. It was brokered during President Trump's first term in office and went into effect in July of 2020. The stated policy goal of the USMCA was to support competitiveness and help lower the reliance on energy imports from outside the region [28]. It provided for the free flow of energy across borders in North America, through the continued zero-tariff treatment of U.S. energy exports to Mexico and Canada [29]. The treaty facilitated the movement of oil and natural gas by pipeline, revised rules of origin certification for oil and gas movement, and streamlined the regulatory process of U.S. LNG exports [29]. Many of the manufactured goods, equipment, electronics, spare parts, and chemical products covered by the treaty are value chain inputs to key U.S. energy industries. The application of U.S. tariffs jeopardizes the intent of the USMCA and may directly violate the terms of the treaty [29]. With the initial announcements and threats of spiraling tariffs, oil

prices fell sharply, U.S. stock market volatility increased, and the dollar weakened as investors looked for safer places for their assets [21].

Simultaneous rounds of increased and retaliatory tariffs with its other two leading trade partners, China and Mexico, will likely stall U.S. economic growth. The counteroffensive responses by these countries plus Canada will inevitably create inflation, disrupt employment, stress supply chains, reduce economic growth, and eventually lower corporate earnings. The U.S. could enter an extended period of stagflation, one with sluggish growth, and higher than anticipated inflation and unemployment. Inflation in the U.S. could increase by an added 0.6% and economic growth could slow by 0.7% to 1.1% lower over 9-12 months as an add-on result of the tariffs [30]. Small business owners who operate on low margins and rely on low-cost energy will be threatened by the increased risks and some will shutter their companies. The uncertainties and added risks will impact investments in energy. If the U.S. proves to be an unreliable partner for Canadian oil, the country will likely consider other markets. Though capital-intensive, these options might include constructing new pipelines into the Northwest Territories, Manitoba, Hudson Bay, or Eastern Canada, and selling its oil to other countries. Canada could also retaliate by halting or preventing the purchase of other U.S. goods including durables and military hardware.

Will Tariffs on Energy Achieve the Intended Policy Goals?

Using tariffs as an economic tool to protect national economies usually backfires and often fails to achieve the stated policy goals. This is particularly true in the case of U.S. tariffs on energy as there is no proven correlation between the increase in taxes and the resolution of the targeted objectives. An example of an undesirable national security consequence of tariffs on Canadian uranium is that they will make imports from Russia and elsewhere more competitive.

Some advocates argue that the cost of tariffs can be offset by the increased production of some industries. For example, it is argued that the 25% tariff on imported metals could create an incentive to expand U.S. aluminum production. The U.S. uses about 5 million metric tons annually. Because only 678,000 metric tons are domestically produced, large amounts of aluminum are imported from Canada [31]. Produc-

ing aluminum is energy-intensive. Canada has comparatively low-cost electricity and has been a reliable supplier of aluminum [31]. Creating a metric ton of this versatile material takes nearly 15,000 kWh of electricity—enough to power a typical U.S. household for 16 months [31]. Increasing U.S. production is not probable for the near-term as it takes years to construct smelters and markets may shrink in real terms. If the U.S. were to onshore all 2.7 million metric tons of Canadian aluminum it imported in 2024, the increased energy requirement would be over 40 million MWh of electricity—nearly four and a half times the annual electricity production of the Hoover Dam [31]. A more cost-effective solution for the U.S. is to enhance and mandate aluminum recycling programs.

Manufacturing a National Energy Emergency

It is difficult to sort out the real reasons a U.S. national energy emergency (per Executive Order 14156) was declared by the U.S. President or how tariffs on energy will meet its goal of strengthening "relations with allies and partners, and support international peace and security" [9]. This newly fabricated energy crisis is defined more by its lack of evidence than its essence. There are no major natural gas shortages, no oil shortages or price shocks, no long lines at the pumps, no rationing of petroleum fuels, and no widespread electrical outages nor extended brownouts. While the increased need for electricity to supply new data centers and electric vehicles will be challenging, U.S. electric generating capacity is adequate [32].

The U.S. is the world's largest energy producer, maintains a surplus in total primary energy production, and is the dominate exporter of natural gas [32]. It is ironic that the fossil-fuel industry has argued strongly against carbon taxes but has readily accepted the application of tariffs on their products. After all, a tax is a tax. Based mostly on their lobbying efforts and media-driven claims, the substance of Executive Order 14156 withers when faced with actual data [32]. The tariffs will not resolve a national emergency if none exists and that is perhaps the intention. At any time, the U.S. administration can declare a victory and reset the policy structure.

The tariffs as proposed appear random, unjustified, untimely and

entropic. The use of the added taxes being collected is unclear and untargeted. Most importantly, they are misdirected and will alienate a long-standing and key U.S. ally and trading partner. The U.S. administration's policies that effect or implement tariffs on energy imports from Canada are a form of inverse protectionism that is aggressive and counter-productive.

The economic interdependence between the U.S. and Canada means that tariffs will create ripple effects in energy markets. The imposition of new tariff structures on energy supplies will lead to higher consumer costs, investment uncertainties, and unintended consequences. Some businesses will fail under the weight of the tariffs.

Perhaps the most effective way to resolve these interrelated problems is to eliminate the tariffs that are increasing the cost of energy. The trade and supply chains associated with delivering sustainable energy supplies are challenging enough without incurring the added costs of tariffs and surcharges. When energy prices increase, demand will ultimately decline and consumers will reduce consumption or find substitutes. Another way is to direct the funds collected to supporting clean energy generation and improving energy infrastructure.

One result of the tariffs will be to improve the comparative economic competitiveness of certain domestic energy resources and technologies. This may ultimately and inadvertently align with the recent Presidential Action intended to "unleash America's affordable and reliable energy and natural resources" [33]. However, because the tariffs increase the cost of imported fossil fuels, domestic renewable energy resources and technologies will become more economically competitive.

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