2013

Washington Connecting to Canada: Flow of Goods

David L. (David Lindsay) Davidson
Western Washington University

Ian Faulds

BORDER POLICY RESEARCH INSTITUTE
WESTERN WASHINGTON UNIVERSITY

BORDER POLICY BRIEF | WINTER 2013

Washington Connecting to Canada: Flows of Goods

Volume 8, No. 1 Winter 2013

by David Davidson & Ian Faulds*

Web Address: www.wwu.edu/bpri

WA Foreign Trade[1]

($ billions, 2012)

↓ Top 5 Export Partners		
China	$14.20	18.8%
Japan	$9.01	11.9%
Canada	$8.26	10.9%
U.A.E.	$5.06	6.7%
S. Korea	$3.39	4.5%
All others	*$35.62*	*47.2%*
Exports	**$75.53**	**100%**
Aircraft & parts	$37.04	49.0%
Crops, fruits	$12.46	16.5%
Refinery products	$3.64	4.8%
Wood products	$1.02	1.3%
Ultrasonic scanners	$0.66	0.9%
All others	*$20.70*	*27.4%*
↑ Top 5 Export Goods		

↓ Top 5 Import Partners		
Canada	$13.85	29.1%
China	$8.47	17.8%
Japan	$6.15	12.9%
S. Korea	$2.19	4.6%
Taiwan	$1.95	4.1%
All others	*$15.04*	*31.6%*
Imports	**$47.64**	**100%**
Crude oil	$8.63	18.1%
Aircraft parts	$6.92	14.5%
Natural gas	$2.29	4.8%
Autos	$2.48	5.2%
Video game parts	$1.93	4.0%
All others	*$25.40*	*53.3%*
↑ Top 5 Import Goods		

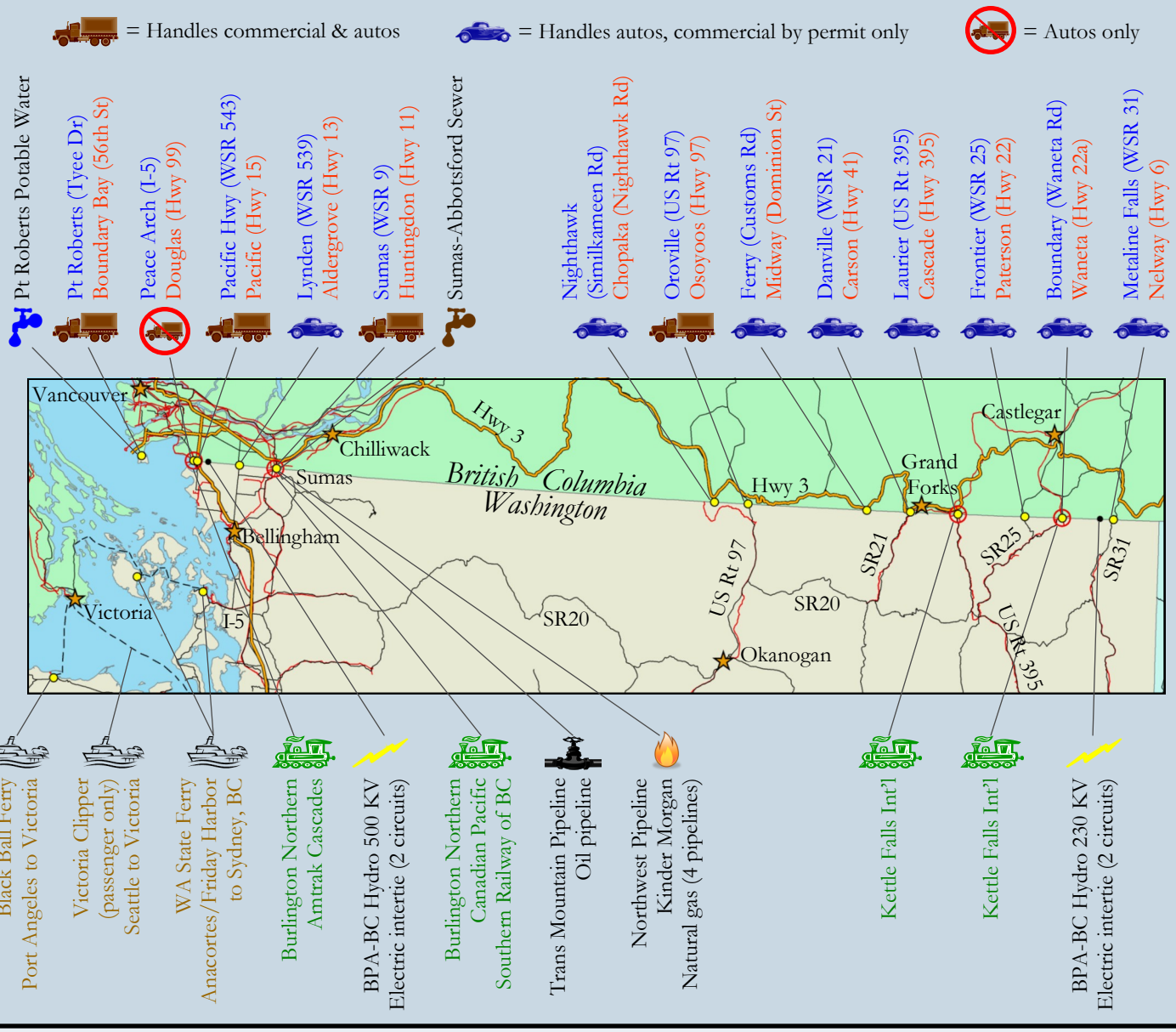
Introduction. There is a dense web of connections between the state of Washington and its northern neighbor, Canada. This article catalogs the transportation modes that connect the two and then explores the way in which goods flow between Washington and Canada across and through those connections. As seen in the sidebar figure, Canada is the 3rd-ranked destination of Washington's exports and the largest source (by far) of imports. The conveyance of goods between these trade partners is of vital interest to both, so the methods of conveyance deserve some attention. A future issue of the *Border Policy Brief* will examine other kinds of connections, such as business ownership and flows of people.

Modes of Connection. Figure 1 catalogs 31 goods-transport linkages between Washington and Canada, encompassing five modes (road, rail, ship, pipeline, power line). The figure shows only those linkages which might be considered "public"—i.e., which are actual common-carrier facilities (such as gas pipelines) or which are routinely available for public use. The linkages include:

- 13 roads, which terminate at port-of-entry (POE) facilities where the passage of goods and people is regulated.
- 4 railroads, all of which cross the border adjacent to POEs. A fifth railroad was recently abandoned (Danville, WA/Grand Forks, BC).
- 3 ferry routes, all of which terminate at POEs.
- 4 transmission lines that intertie the electric grids of BC Hydro and the Bonneville Power Administration.
- 4 natural gas pipelines that cross the border near Sumas, WA, linking to a pipeline network that extends throughout several north-west states. The pipelines are bidirectional, but the direction of flow is predominantly southward.
- 1 oil pipeline that crosses the border near Sumas, carrying crude oil south to refineries in Washington.
- 1 sewer line (unique on the northern border) linking the collection system in Sumas to a treatment plant in Abbotsford, BC.
- 1 water line that provides potable water to Point Roberts, WA.

Freight Corridors. While 20 road, rail, and ferry routes cross the border, flows of goods are concentrated at a relatively small number of the crossings. The upper portion of Figure 2 examines truck

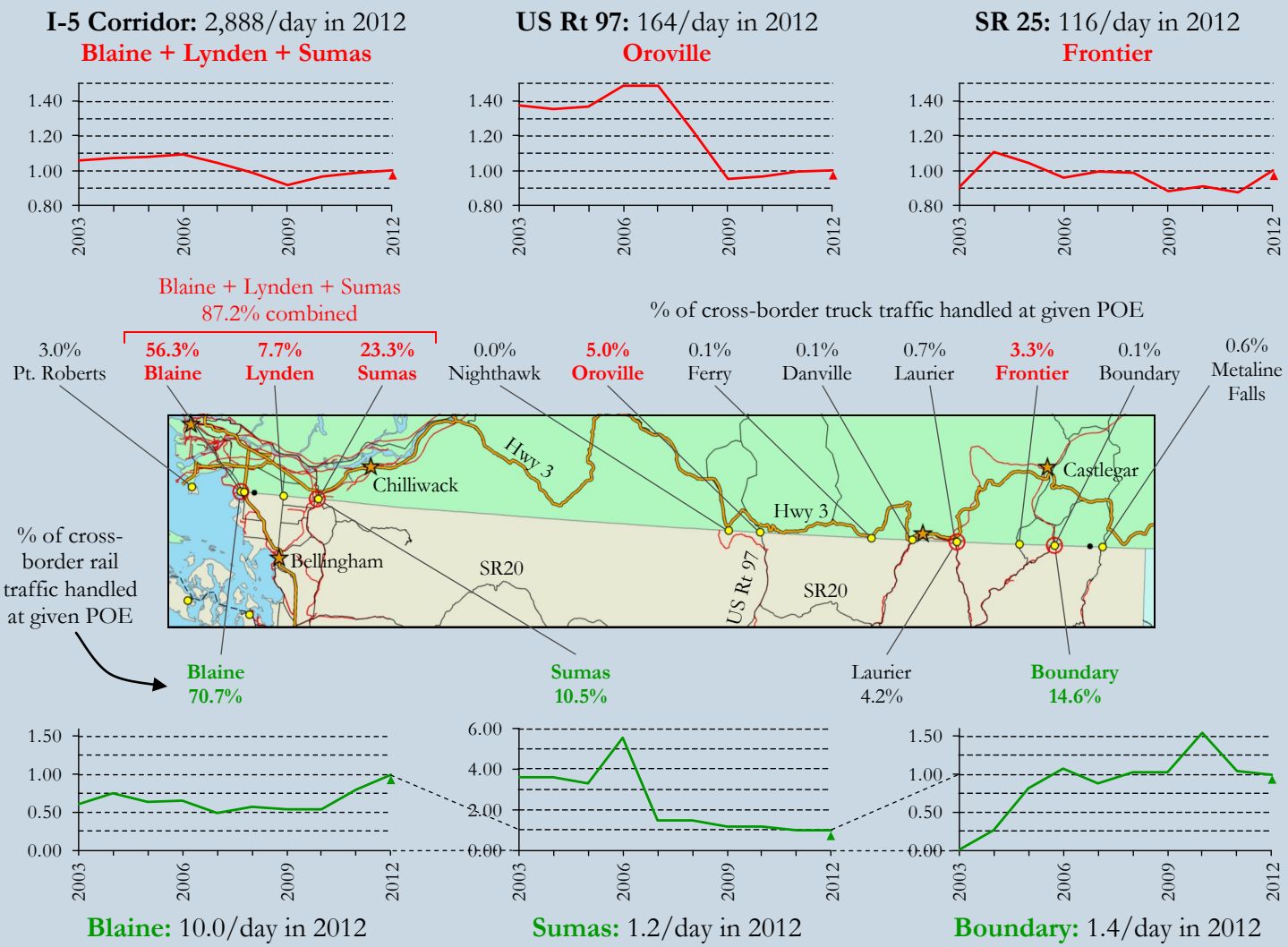
Figure 1. Modes of Connection



flows through POEs. In 2012, the 2-way annual average daily traffic volume (AADT) of trucks across the Washington – BC border was 3,312. The figure reveals that 87.2 percent of the traffic made use of the Cascade Gateway, which is the group of four POEs (Blaine-Peace Arch, Blaine-Pacific Highway, Lynden, Sumas) that serve the I-5 corridor. Two POEs east of the Cascade Crest (Oroville, Frontier) handled most of the remainder. Similarly, the bottom portion of the figure shows that 81.2 percent of the freight rail traffic is accommodated within the Cascade Gateway, at Sumas and Blaine. This "I-5 centric" pattern is to be expected, given the distribution of urbanization within the coastal Northwest. The Lower Mainland of BC is home to almost 3 million people and the site of major seaports. In Oregon and Washington as well, urbanization is overwhelmingly present west of the Cascades. I-5 is the artery linking these centers of economic activity.

Figure 2 also includes graphs showing ten years of traffic history for the busiest POEs, in relation to the 2012 AADT at each (i.e., the 2012 AADT is equated to 1.00, and prior years' values are calculated in proportion to 1.00). All three graphs of truck data reveal the effects of the economic slowdown that began in 2007, with Oroville having been particularly hard hit. While rail traffic at Sumas has declined steeply since 2003 (note that graph's different vertical scale), traffic at Blaine

Figure 2. Truck & Freight Rail: Traffic Volumes & Trends at POEs[2]



and Boundary has generally risen; at Blaine, rail traffic has almost doubled since 2010.

Washington's freight corridors are not for the exclusive use of Washingtonians—flows of goods between Canada and other states are a major fraction of the traffic.[3] In 2012, only 39 percent (by dollar value) of the truck-borne goods entering the US via Washington POEs were destined to points within Washington. Similarly, only 31 percent of the truck-borne goods exported to Canada via Washington POEs came from points within Washington. Of course, Washingtonians are free to make use of POEs elsewhere along the border: in 2012, 42 percent of Washington's truck-borne import stream and 31 percent of its export stream were handled at non-Washington POEs. The same dynamic prevails in the rail mode, where, for example, 45 percent of Washington's rail-borne import stream was cleared at POEs in states to the east.

Commodities & Trade Partners. The front-page figure provided the global context of Canada's importance as a trade partner of Washington. We now look more closely at the nature of trade between Washington and Canada—which provinces are the major partners; which commodities comprise the flow in each direction. That earlier figure hints at some of what is revealed in the detailed data: aircraft manufacturing and oil refining are major drivers of foreign trade.

Figures 3 and 4 focus upon the provinces that engage in the most trade with Washington, as measured by dollar volume. For each province, the top six commodities are shown, along with information about the freight mode used to move each kind of good.

Immediately obvious is that a small number of partners are responsible for the vast majority of trade, particularly so with respect to Washington's exports: BC and Ontario together are the destination for over 90 percent of exports. Alberta, the #3 export destination, is the largest import partner, but BC and Ontario again are key, and the three combined are the origin of 92 percent of imports.

Economists use "gravity" models to explain the volume of trade occurring between a pair of places, with proximity and sizes of GDPs being the factors most responsible for the size of the trade relationship between a pair. The trade patterns revealed in the figures are consistent with the "gravity" paradigm, given that Canada's GDP heavyweights are Ontario and Quebec, and given the proximity of Washington to BC and Alberta.

Another striking fact is that energy is by far the largest single component of trade. Crude oil and natural gas from Alberta and BC (HST code 27) account for 56 percent of all imports, and the

Figure 3. WA Exports to Canada in 2012: Top 4 Provinces, Top 6 Goods Per Province, & Dominant Modes of Transport[3]

($ billions, 2-digit HST codes)

$6.49 #1. British Columbia: 78.6% of exports

$ 1.65	27. Mineral fuels & distillates	65%	33%
$ 0.55	84. Computer-related machinery & parts	98%	
$ 0.47	87. Vehicles (other than railway)	97%	
$ 0.28	85. Electrical machinery, equipment & parts	97%	
$ 0.28	44. Wood & articles of wood	97%	
$ 0.24	72. Iron & steel	77%	23%
$ 3.01	*90 other categories combined*		

$1.06 #2. Ontario: 12.9% of exports

$ 0.19	08. Edible fruit & nuts	99%	
$ 0.16	85. Electrical machinery, equipment & parts	83%	14%
$ 0.15	84. Computer-related machinery & parts	88%	12%
$ 0.08	90. Measuring & testing instruments	56%	44%
$ 0.05	20. Preparations of fruits, nuts, vegetables	96%	4%
$ 0.04	88. Aircraft, spacecraft & parts	63%	36%
$ 0.40	*85 other categories combined*		

$0.33 #3. Alberta: 4.0% of exports

$ 0.17	88. Aircraft, spacecraft & parts	99%	
$ 0.05	84. Computer-related machinery & parts	83%	15%
$ 0.02	87. Vehicles (other than railway)	100%	
$ 0.01	85. Electrical machinery, equipment & parts	51%	49%
$ 0.01	90. Measuring & testing instruments	66%	33%
$ 0.01	72. Iron & steel	98%	
$ 0.07	*69 other categories combined*		

$0.18 #4 Quebec: 2.2% of exports

$ 0.02	85. Electrical machinery, equipment & parts	61%	39%
$ 0.02	90. Measuring & testing instruments	81%	17%
$ 0.02	48. Paper & paperboard	98%	
$ 0.02	88. Aircraft, spacecraft & parts	75%	25%
$ 0.02	84. Computer-related machinery & parts	52%	45%
$ 0.02	27. Mineral fuels & distillates	99%	
$ 0.06	*74 other categories combined*		

$0.19 Other provinces combined: 2.3% of exports

$8.25 Total WA exports to Canada

Figure 4. WA Imports from Canada in 2012: Top 4 Provinces, Top 6 Goods Per Province, & Dominant Modes of Transport[3]

($ billions, 2-digit HST codes)

$7.53 #1. Alberta: 54.3% of imports

$ 6.64	27. Mineral fuels & distillates	89%		5%		5%
$ 0.32	01. Live animals			100%		
$ 0.11	28. Inorganic chemicals			99%		
$ 0.07	31. Fertilizers			92%		8%
$ 0.05	47. Pulp of wood & paperboard			68%		32%
$ 0.05	44. Wood & articles of wood			81%		19%
$ 0.29	*58 other categories combined*					

$3.59 #2. British Columbia: 25.9% of imports

$ 1.10	27. Mineral fuels & distillates	67%		22%		2%
$ 0.52	44. Wood & articles of wood	76%		15%		9%
$ 0.24	72. Iron & steel	48%		27%		25%
$ 0.14	84. Computer-related machinery & parts			96%		4%
$ 0.11	88. Aircraft, spacecraft & parts			99%		
$ 0.10	03. Fish & crustaceans			98%		2%
$ 1.38	*84 other categories combined*					

$1.63 #3. Ontario: 11.7% of imports

$ 0.52	88. Aircraft, spacecraft & parts			95%		3%
$ 0.38	98. Special classification provisions			85%		11%
$ 0.11	85. Electrical machinery, equipment & parts			60%		40%
$ 0.08	87. Vehicles (other than railway)			99%		
$ 0.08	90. Measuring & testing instruments			60%		39%
$ 0.08	84. Computer-related machinery & parts			94%		6%
$ 0.37	*81 other categories combined*					

$0.42 #4 Manitoba: 3.0% of imports

$ 0.34	88. Aircraft, spacecraft & parts			99%		
$ 0.01	84. Computer-related machinery & parts			94%		6%
$ 0.01	15. Animal or vegetable fats & oils			94%		6%
$ 0.01	87. Vehicles (other than railway)			100%		
$ 0.01	48. Paper & paperboard			100%		
$ 0.01	94. Furniture, lamps & prefab. buildings			100%		
$ 0.04	*51 other categories combined*					

$0.68 Other provinces combined: 5.0% of imports

$13.85 Total WA imports from Canada

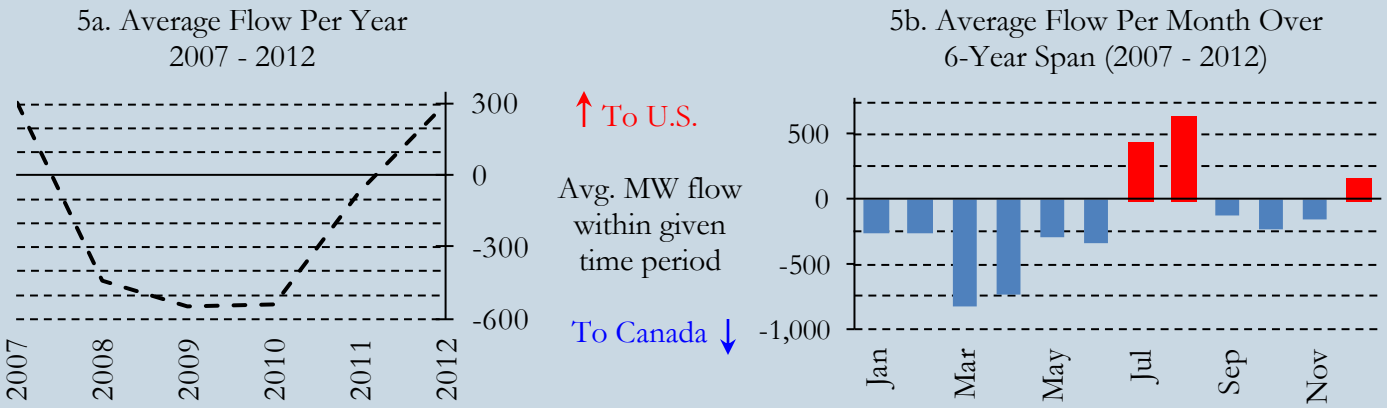
refined products exported to BC (also HST code 27) account for 20 percent of total Washington exports. If energy products were removed from the picture, Washington would have a trade surplus with Canada, rather than the sizeable deficit revealed in the figures.

Figures 3 and 4 reveal Canada's role as a supplier of natural resources, with many of the goods coming from Alberta and BC being resource-related. The manufacturing-centric nature of Ontario's economy is also apparent, as both its imports and exports are weighted heavily toward manufactured goods.

Finally, the figures reveal the way in which choice of mode interacts with both distance of travel and type of good. The goods traded with distant locations such as Ontario and Quebec are often shipped by air, because many are of the sort with a high ratio of value to volume (e.g., instruments, aircraft parts, computers). On the other hand, modes better suited to conveyance of bulk commodities (vessel, rail) figure heavily in the trade with Alberta and BC.

Some interesting shipping patterns exist with respect to energy. While pipelines are the dominant mode for conveyance of natural gas and oil to Washington, there is significant use of vessels and of rail. The refineries in Washington are located on shorelines

Figure 5. Cross-Border Flow of Electricity in MegaWatts (MW)[4]



because most were designed to refine Alaskan crude arriving by tanker. With shipments of Alaskan crude declining over time, the refineries have begun to source oil from other places, including the Bakken formation in North Dakota. Some oil now reaches the refineries via barges that are filled at rail-to-barge reload facilities in locations as distant as Oregon. The oil reaches those facilities in unit trains traveling adjacent to water bodies such as the Puget Sound, after traversing the neighboring states of Idaho and Montana. This shipping route is similar to the controversial route proposed for export of Wyoming coal to Asia, except that once the energy product is loaded onto a vessel, the vessel's destination is Washington rather than Asia. As seen in Figure 3, barges are also then used to convey refined products from Washington to BC.

Trade in Electricity. Four electric transmission lines connect Washington and BC. Net electric flow between the two jurisdictions varies from year to year, as seen in Figure 5a. The Columbia River Treaty obligates the US to continuously deliver power to Canada (505 average annual MW as of 2013), but that power can be re-marketed to customers in the US. In years of greater demand within the US (e.g., 2007 and 2012, bracketing the recession) power flows south. Figure 5b reveals the seasonality of flows, with peak southbound flows typically occurring in the hot summer months and the coldest winter months, when heating and air conditioning demands spike.

Conclusion. Trade with Canada is key to the vibrancy of Washington's economy, and many transportation modes are used to convey goods between the two partners. Continuity of goods-movement is a necessity, so the various modal infrastructures (pipelines, rail trackage, POEs, etc.) are critical to Washingtonians, as are the policies, plans, and preparations undertaken to ensure the resilience of such infrastructure. Most other lower-48 states also trade extensively with Canada, and given the manner in which trade is funneled to major corridors (such as I-5), the border infrastructure serving those corridors must be viewed as a high priority not only by the states and provinces that are home to the facilities, but also by the two national governments.

Endnotes

1. U.S. Census international trade data retrieved at: http://www.census.gov/foreign-trade/statistics/state/data/index.html. Some commodities aggregated for display in figure (e.g., exports under 6-digit codes HS 271019, 271012, 271312 displayed as "Refinery products").
2. U.S. Bureau of Transportation Statistics "Border Crossing/Entry Data" retrieved at: http://transborder.bts.gov/programs/international/transborder/TBDR_BC/TBDR_BCQ.html.
3. U.S. Bureau of Transportation Statistics "North American Transborder Freight Data" retrieved at: http://transborder.bts.gov/programs/international/transborder/TBDR_QA.html.
4. Author calculations using BC Hydro historical data for the US interties retrieved at: http://transmission.bchydro.com/transmission_system/actual_flow_data/historical_data.htm.

* David Davidson is Associate Director of the BPRI; Ian Faulds is a BPRI undergraduate research assistant.