



Sizing the Potential Green Bond Market in Canada

Summary

The 2016 Canadian edition of the [Bonds and Climate Change Report](#) indicated that Canadian issuers currently account for \$32.9bn outstanding of climate-aligned bonds, of which \$2.9bn represents labelled green bonds (the other \$30bn are unlabeled climate-aligned bonds).

In 2016 there were \$1bn of labeled green bonds from Canadian issuers. Globally, 2016 saw record issuance of labeled green bonds: USD 81bn, up 92% on 2015 figures.

This report uses a bottom up analysis to arrive at a high-level estimate of the potential for annual green bond issuances by Canadian entities of \$56.3 billion in fiscal 2017/18.

This report also assesses the current ReNew Canada list of the top 100 infrastructure projects in Canada, and found that fully 56 of them – with a total value of \$107 billion – would be green-bond eligible.

These findings show that green bonds have the potential to become a much bigger part of Canadian capital markets with potential greenium benefits for issuers (lower cost of financing for green purposes), while creating a Canadian cluster of green finance expertise for arranging global green bond issues (a market estimated to exceed \$1 trillion annually by 2020, according to Climate Bonds Initiative).

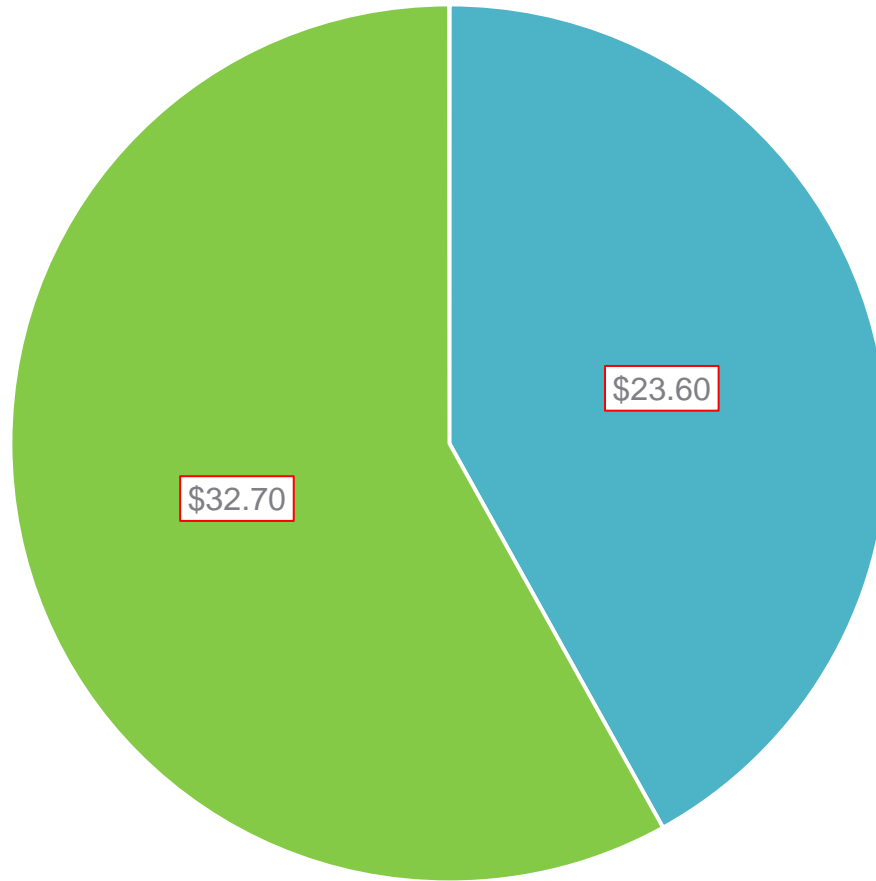
Methodology

A bottom up assessment of the green bond market in Canada

1. Defining the universe of bond issuers to consider.
 - The universe comprises 21 of the top 30 largest bond issuers in Canada who are well suited to offer green bonds. Bond issuer data provided by RBC Capital Markets
2. Identify the issuer's CAPEX or other use of proceeds that are:
 - Explicitly Green (directly supports the green economy and is consistent with the Climate Bonds Standard)
 - Potentially Green (has the potential to directly support the green economy but is not necessarily green, for example, a hospital or affordable housing unit has the potential to be built in an energy efficient manner according to green standards)
3. Compile the combined "Explicit" and "Potential" Green Bond issuance across the universe

Top 21 Issuers

Explicitly Green vs Potentially Green use of proceeds in \$bn for 2017



**\$56.3bn green use of
proceeds total for 2017**

■ Explicitly Green ■ Potentially Green

Federal Government

\$3.4bn– Explicitly Green use of proceeds
\$3.1bn– Potentially Green use of proceeds

Federal Government

Expected Net New Borrowing vs Green Bond Capacity \$bn



Methodology

Net new **BORROWING** \$39bn CAD*

Estimate based on allocation of budget 2016 to 2017 infrastructure investments plus allocation of 2017's budget to long term infrastructure.

Potential green uses of proceeds Include:

Explicitly Green \$3.4bn 53%

Public Transit \$1.9bn

Green Infrastructure \$1.5bn

Potentially Green \$3.1bn 47%

Social Infrastructure \$1.69bn

Strategic Investments in Post-Secondary Institutions \$1bn

Rural Broadband \$0.08bn

Trade and Transportation Provision \$0.4bn

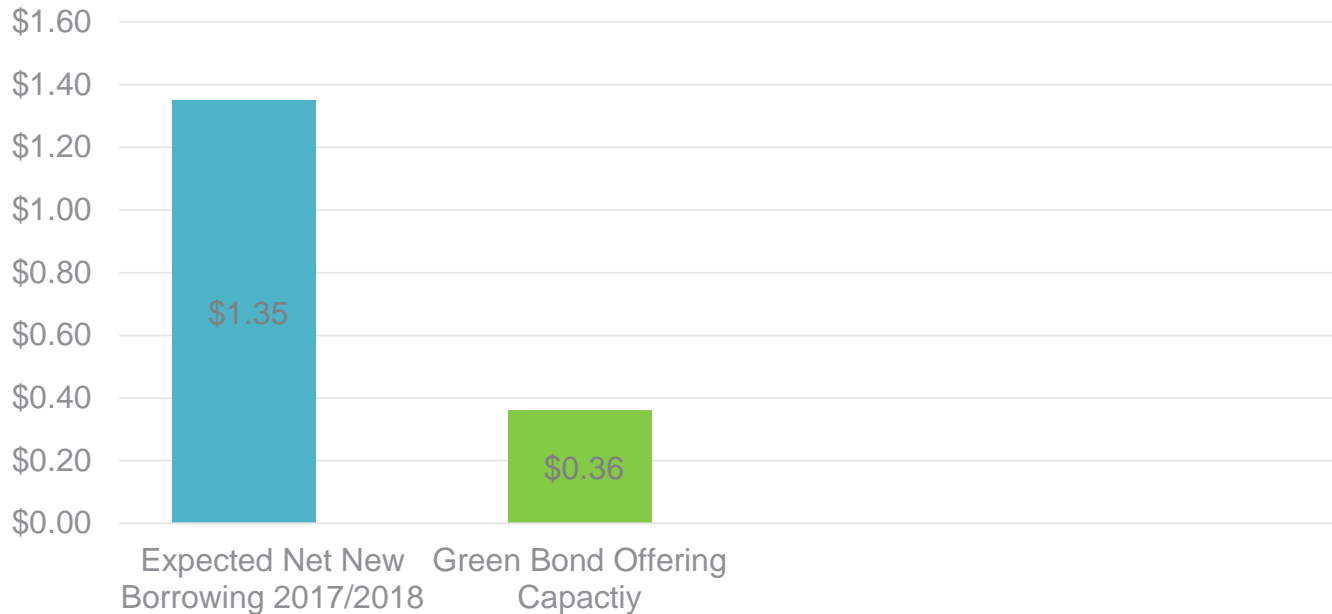
Crown Corporations

\$0.36– Explicitly Green use of proceeds

\$0– Potentially Green use of proceeds

Crown Corporations- Canadian Housing Trust

Expected Net New Borrowing vs Green Bond Capacity \$bn



Methodology

The Canadian housing trust issues bonds and uses the proceeds to purchase mortgage backed securities. Potential Green Bond Offerings estimates derived by dividing the number of Energuide rated homes with 80% and above (120,000) by the number of private households in Canada (13 million) multiplied by the Canadian Housing Trust's annual expected total borrowing (\$40bn).

Potential green uses of proceeds Include:

Explicitly Green \$0.36bn 100%

Mortgage backed security comprising energy efficient homes.

Provinces

\$11.9bn– Explicitly Green use of proceeds

\$22.63bn– Potentially Green use of proceeds

Provinces - Ontario

Expected Net New Borrowing vs Green Bond Capacity \$bn



Methodology

Potential Green Bond Offerings estimates derived from provincial budgetary documents. Provincial capital expenditures are considered if they are not related to building road infrastructure and have an “Explicitly Green”, or “Potentially Green” purpose.

Potential green uses of proceeds Include:

Explicitly Green \$6.07bn 47%

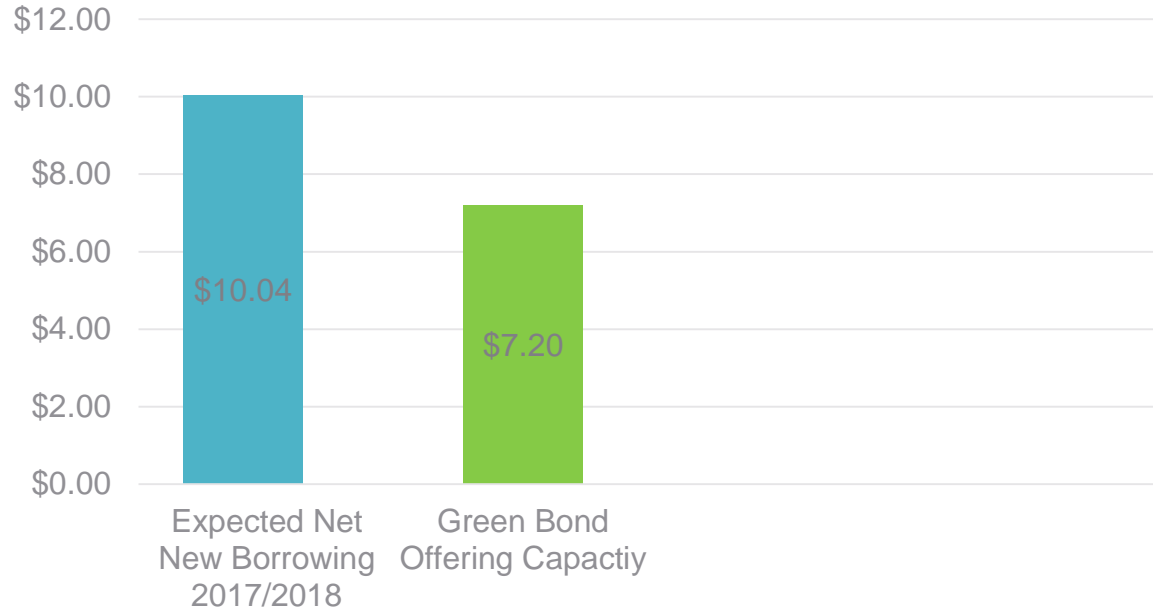
Transportation – Transit e.g. TTC LRT project \$5.3bn
Other Transportation Property and Planning \$0.77bn

Potentially Green \$6.65bn 53%

Education Infrastructure e.g. energy efficiency retrofits, building new schools \$2bn
Postsecondary - Colleges and Other retrofits \$0.63bn
Postsecondary – Universities \$0.19bn
Social Housing Infrastructure e.g. building or repairing community housing \$0.31bn
Health – Hospitals repairs, retrofits \$2.88bn
Health - Other Health Education \$0.38bn
Justice Infrastructure e.g. courthouse repairs \$0.26bn

Provinces - Quebec

Expected Net New Borrowing vs Green Bond Capacity \$bn



Methodology

Potential Green Bond Offerings estimates derived from provincial budgetary documents. Provincial capital expenditures are considered if they are not related to building road infrastructure and have an “Explicitly Green”, or “Potentially Green” purpose.

Potential green uses of proceeds Include:

Explicitly Green \$1.32bn 18%

Public Transit \$0.96bn

Marine, Air, Rail and Other Transportation e.g. ferries, wharves, stations, railways \$0.36bn

Potentially Green \$5.95bn 82%

Health and Social Services building Infrastructure \$1.62bn

Education Infrastructure e.g. buildings, retrofits \$1.47bn

Higher Education and Research Infrastructure e.g. buildings, retrofits \$0.68bn

Culture Infrastructure e.g. buildings, retrofits \$0.19bn

Municipal, Sports, Community and Recreational Infrastructure \$0.97bn

Social and Community Housing \$0.28bn

Government Buildings e.g. repairs \$0.35bn

Information Resources e.g. information technology \$0.40bn

Provinces - Manitoba

Expected Net New Borrowing vs Green Bond Capacity \$bn



Methodology

Potential Green Bond Offerings estimates derived from provincial budgetary documents. Provincial capital expenditures are considered if they are not related to building road infrastructure and have an “Explicitly Green”, or “Potentially Green” purpose.

Potential green uses of proceeds Include:*

Explicitly Green \$0.69bn 18.28%

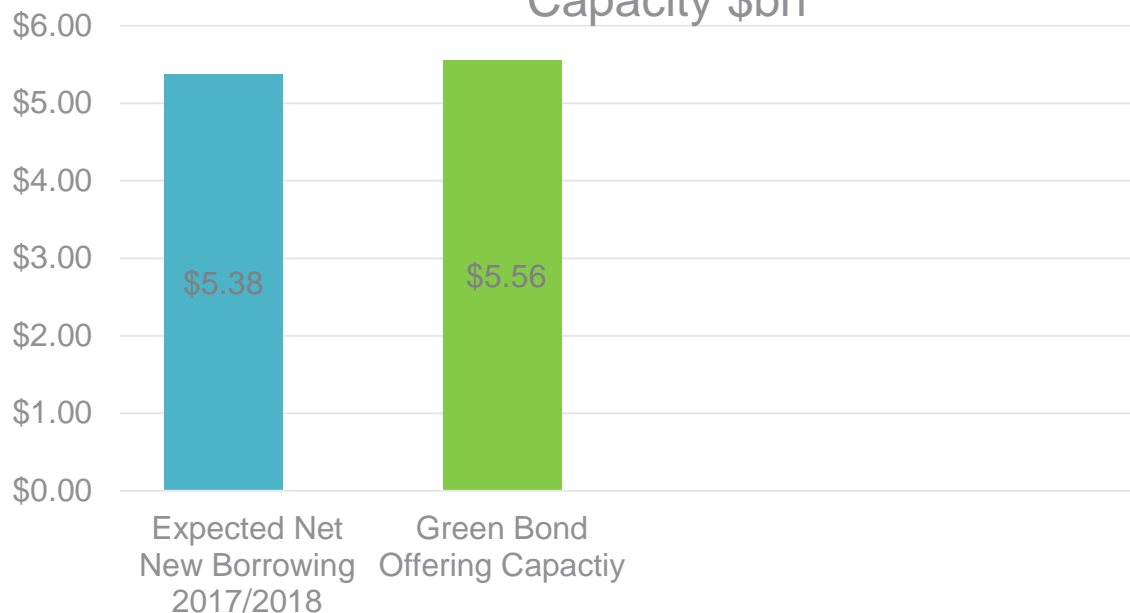
Potentially Green \$3.10bn 81.72%

Source: <https://www.gov.mb.ca/finance/budget16/papers/speech16.pdf>

*Manitoba reports capital expenditure using CPA standards. Recognizing amortization in this way allocates the cost of capital assets to the periods of service provided and amortization is recorded as an expense in the statement of operations. We used Quebec as a comparable province to estimate the split between Explicitly Green and Potentially Green projects as Quebec has similar debt capacity as well as a state owned hydro company

Provinces – British Columbia

Expected Net New Borrowing vs Green Bond Capacity \$bn



Methodology

Potential Green Bond Offerings estimates derived from provincial budgetary documents. Provincial capital expenditures are considered if they are not related to building road infrastructure and have an “Explicitly Green”, or “Potentially Green” purpose.

Potential green uses of proceeds Include:

Explicitly Green \$2.83bn 51%

BC Transit \$161m

Columbia River Power Projects \$12m

Transportation Investment Corporation \$46m

BC Hydro \$2,613m

Potentially Green \$2.725bn 49%

Schools (k-12) Buildings \$687m

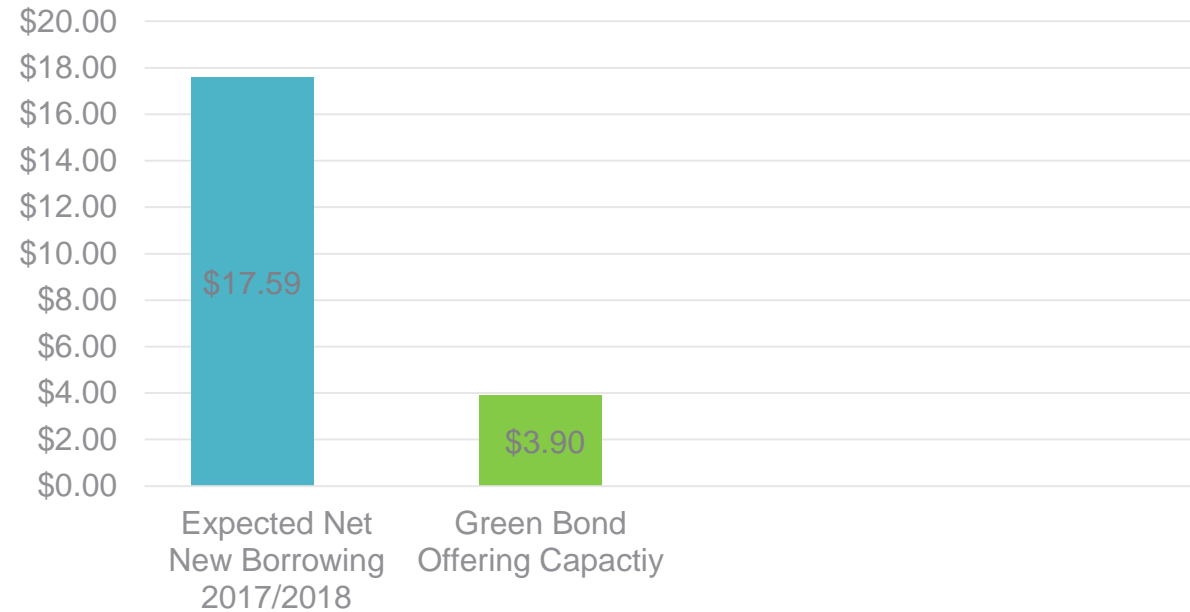
Post Secondary Institutions e.g. building repairs and retrofits \$987m

BC Housing Management Commission and Provincial Rental Housing \$134m

Health Infrastructure e.g. buildings \$917m

Provinces - Alberta

Expected Net New Borrowing vs Green Bond Capacity \$bn



Methodology

Potential Green Bond Offerings estimates derived from provincial budgetary documents. Provincial capital expenditures are considered if they are not related to building road infrastructure and have an “Explicitly Green”, or “Potentially Green” purpose.

Potential green uses of proceeds Include:

Explicitly Green \$981m 25%

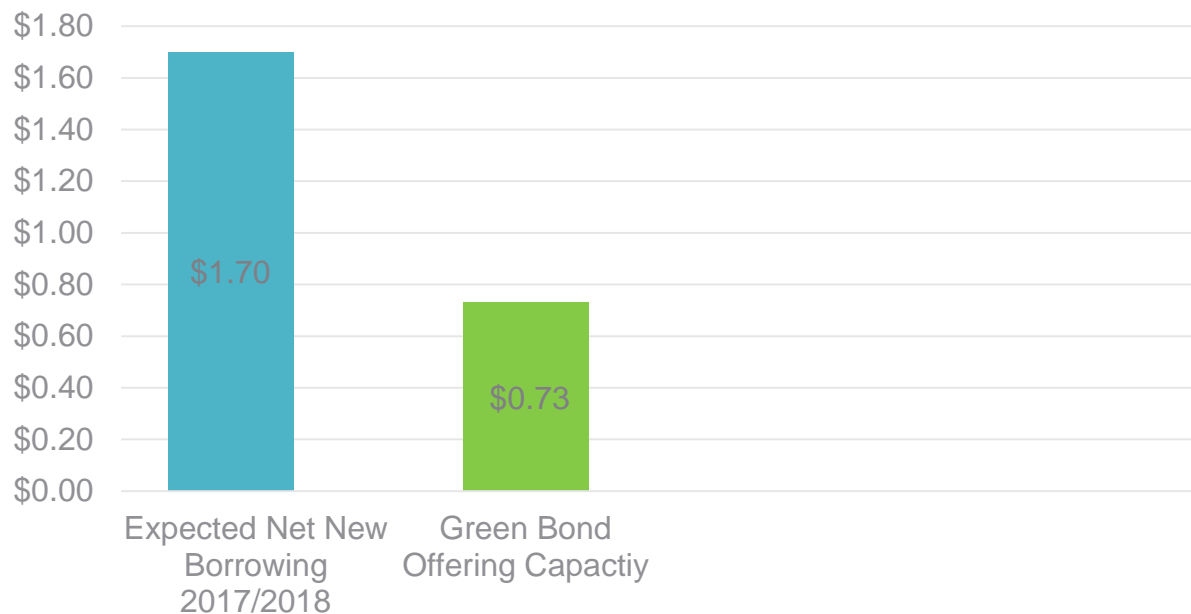
Climate Change, Environmental Protection & Sustainability e.g. Municipal Water and Wastewater Program \$931m
Farming, Natural Resources & Industry e.g. Alberta Tree Improvement and Seed Centre (ATISC) \$50m

Potentially Green \$2,920m 75%

Adult Education and Skills e.g. campus upgrades, retrofits \$292m
Capital Maintenance and Renewal \$1000m
Family, Social Supports & Housing e.g. New Housing Supply – Community and Specialized Housing \$248m
Government Facilities, Equipment and Other \$277m
Health Facilities and Equipment \$688m
Municipal Infrastructure Support \$238m
Public Safety and Emergency Services e.g. Courthouse renewal \$90m
Sports, Arts, Recreation & Culture e.g. Calgary Zoo expansion \$87m

Provinces - Saskatchewan

Expected Net New Borrowing vs Green Bond Capacity \$bn



Methodology

Potential Green Bond Offerings estimates derived from provincial budgetary documents. Provincial capital expenditures are considered if they are not related to building road infrastructure and have an “Explicitly Green”, or “Potentially Green” purpose.

Potential green uses of proceeds Include:

Potentially Green \$0.73bn 100%

Municipal Infrastructure e.g. Regina Stadium \$279.3m

Education Capital e.g. School infrastructure and preventative maintenance and renewal \$119.1m

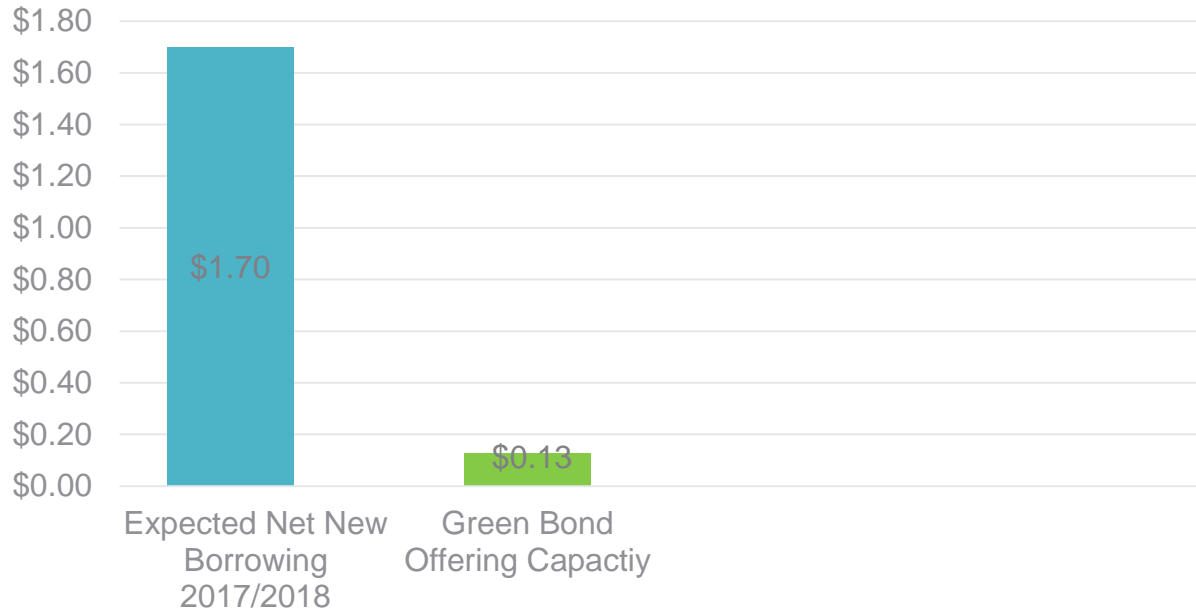
Advanced Education e.g. maintenance capital \$21.5m

Health Care e.g. maintenance and facility regeneration, Hospitals \$231.2m

Government Services e.g. IT capital, courts and correctional capital, government buildings, parks capital \$79.9m

Provinces – New Brunswick

Expected Net New Borrowing vs Green Bond Capacity \$bn



Methodology

Potential Green Bond Offerings estimates derived from provincial budgetary documents. Provincial capital expenditures are considered if they are not related to building road infrastructure and have an “Explicitly Green”, or “Potentially Green” purpose.

Potential green uses of proceeds Include:

Explicitly Green \$1.8m 2%

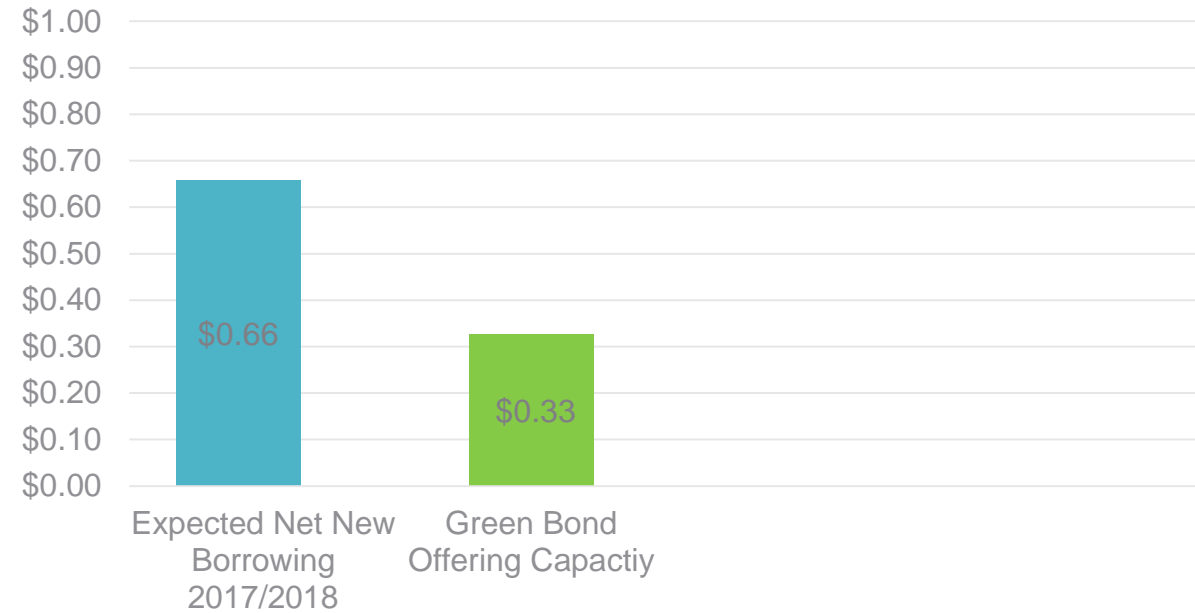
Agriculture, Aquaculture and Fisheries \$0.6m
Environment and Local Government \$1.22m

Potentially Green \$120.48m 98%

Energy and Resource Development \$2.9 m
Education and Early Childhood Development e.g. schools \$2.1m
Health e.g. hospitals \$20m
Post-Secondary Education, Training and Labour \$2m
Regional Development Corporation \$92m
Tourism, Heritage and Culture \$9.1m

Provinces – Nova Scotia

Expected Net New Borrowing vs Green Bond Capacity \$bn



Methodology

Potential Green Bond Offerings estimates derived from provincial budgetary documents. Provincial capital expenditures are considered if they are not related to building road infrastructure and have an “Explicitly Green”, or “Potentially Green” purpose.

Potential green uses of proceeds Include:

Potentially Green \$330m 100%

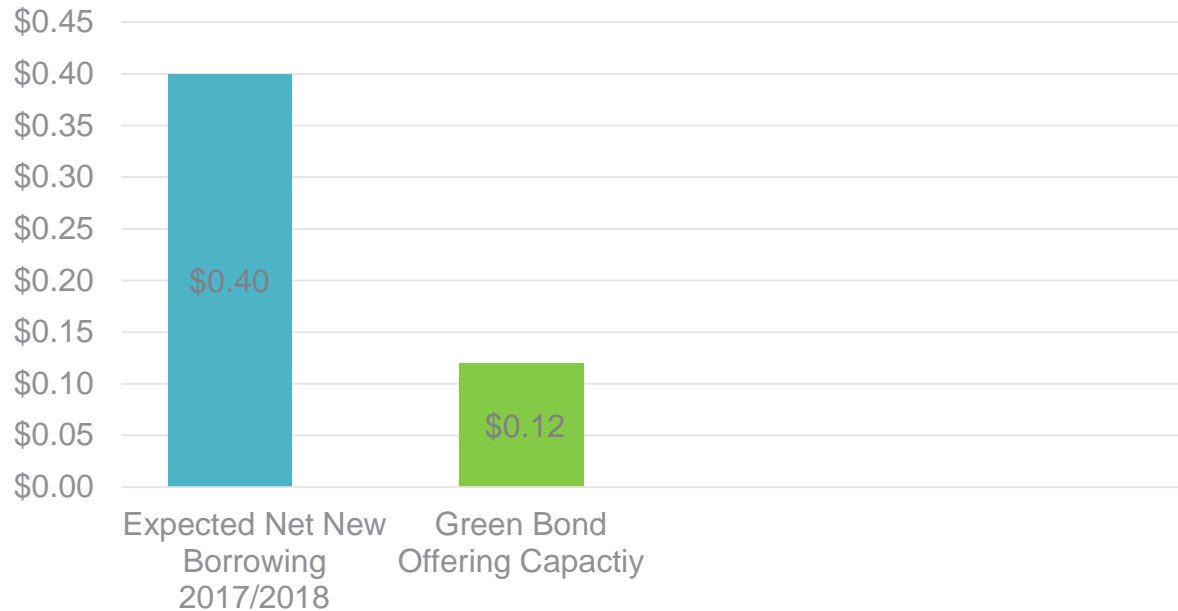
Buildings and Land \$137.4 m

Buildings - Halifax Convention Centre \$169.2m

Vehicles and Equipment \$19.8m

Provinces – Newfoundland & Labrador

Expected Net New Borrowing vs Green Bond Capacity \$bn



Methodology

Potential Green Bond Offerings estimates derived from provincial budgetary documents. Provincial capital expenditures are considered if they are not related to building road infrastructure and have an “Explicitly Green”, or “Potentially Green” purpose

Potential green uses of proceeds Include:

Explicitly Green \$11.8m 10%

Transportation and Works e.g. Ferry Terminals & refits \$11.8m

Potentially Green \$108m 90%

Advanced Education, Skills & Labour \$27.8m

Fisheries & Land Resources \$1.7m

Tourism, Culture, Industry, & Innovation \$0.88m

Health & Community Services e.g. Building improvements, Health Care infrastructure \$77m

Justice & Public Safety e.g. Court Facilities, Correctional Facilities \$0.91m

Telecommunications

\$0—Explicitly Green use of proceeds

\$6.78bn—Potentially Green use of proceeds

Telecommunications - Bell

Expected Net New Borrowing vs Green Bond Capacity \$bn



Methodology

Potential Green Bond Offerings estimates derived from company's 10-K where explicitly stated.

Potential green uses of proceeds Include:

Potentially Green \$3.88bn 100%

“Capital investments supported the continued rollout of broadband fibre, including the build-out of Gigabit Fibe in the city of Toronto and other urban locations, the ongoing deployment of our 4G LTE and LTE-A mobile networks, and expansion of wireless and internet network capacity to support subscriber growth and accelerating data consumption.”

Telecommunications - TELUS

Expected Net New Borrowing vs Green Bond Capacity \$bn



Methodology

Potential Green Bond Offerings estimates derived from company's 10-K where explicitly stated.

Potential green uses of proceeds Include:

Potentially Green \$2.9bn 100%

"Continuing investment in broadband infrastructure to support customer growth, technology evolution and reliability"

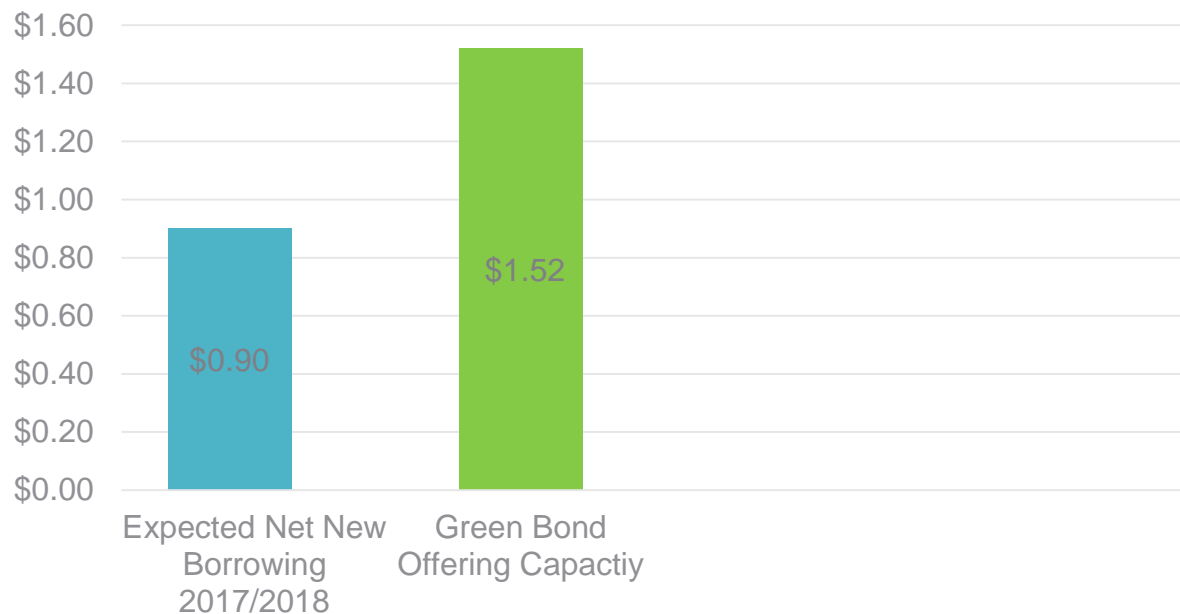
Utilities

\$5.42B –Explicitly Green use of proceeds

\$0–Potentially Green Capex use of proceeds

Utilities – Hydro One Inc.

Expected Net New Borrowing vs Green Bond Capacity \$bn



Methodology

Potential Green Bond Offerings estimates derived from company's disclosed financial reporting

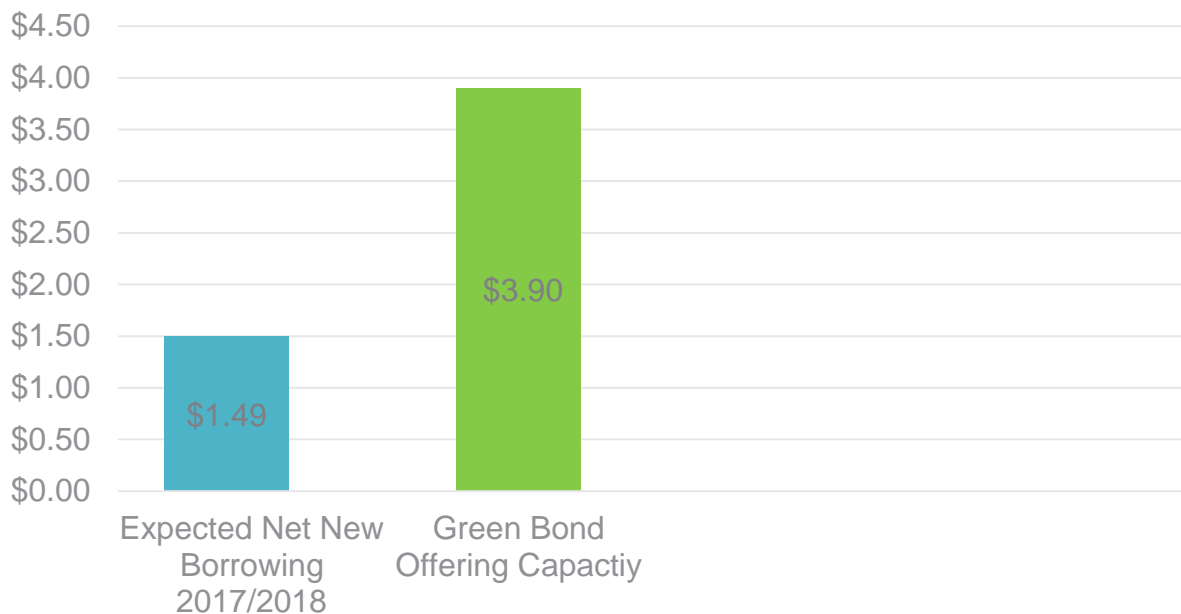
Potential green uses of proceeds Include:

Explicitly Green \$1.52bn 100%

Capital Expended on Transmission(\$1.09bn) to link renewables to the grid and Distribution (\$648bn) of energy

Utilities – Quebec-Hydro

Expected Net New Borrowing vs Green Bond Capacity \$bn



Methodology

Potential Green Bond Offerings estimates derived from company's disclosed financial reporting

Potential green uses of proceeds Include:

Explicitly Green \$3.9bn 100%

Continued support of power generation and distribution that is 99% renewable.

Investors

\$0.98bn –Explicitly Green use of proceeds
\$0.19bn–Potentially Green use of proceeds

Investors - PSP

Expected Net New Borrowing vs Green Bond Capacity \$bn



Methodology

Potential Green Bond Offerings Estimates derived by forecasting PSP's 2017 direct investment into infrastructure and natural resources asset classes using the 5 year compound annual growth rate . We assume a capital allocation to be consistent with pervious year's targets.

Potential green uses of proceeds Include:

Explicitly Green \$0.98bn 83%

Water Utilities \$0.1bn

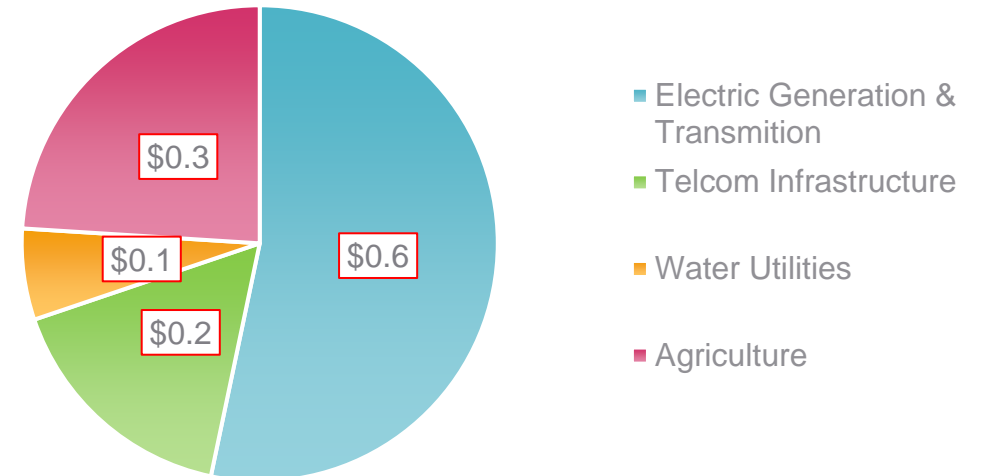
Renewable Electrical Generation and Transmission \$0.61bn

Agriculture \$0.27bn

Potentially Green \$0.19bn 17%

Telcom Infrastrucure \$0.19bn

Green Use of Proceeds Breakdown \$bn



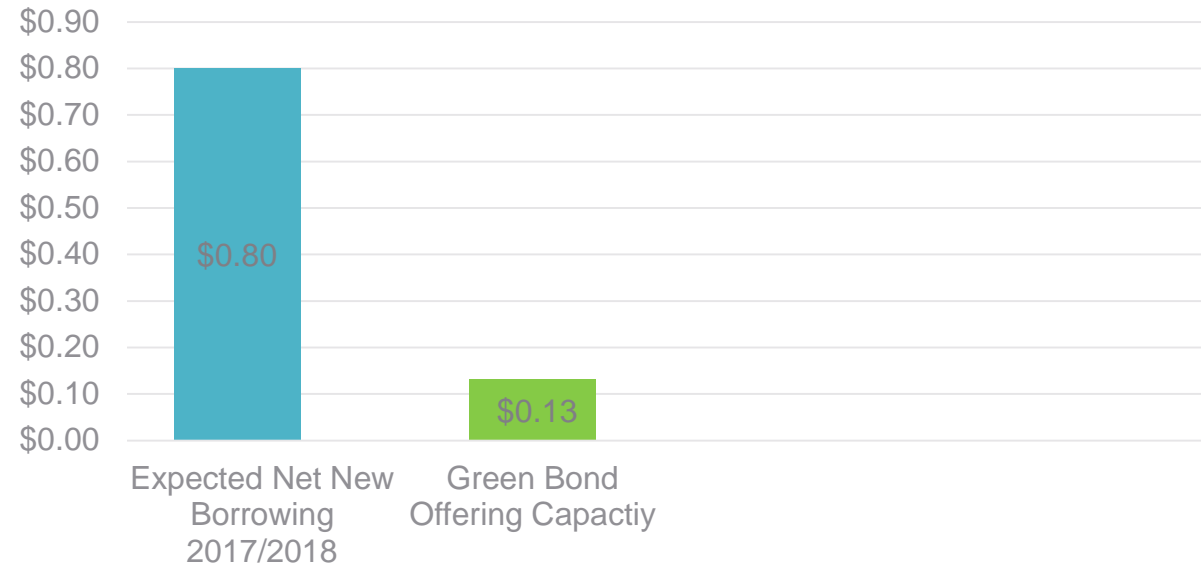
Cars

\$0.13bn—Explicitly Green use of proceeds

\$0—Potentially Green use of proceeds

Cars – Toyota Credit Canada Inc.

Expected Net New Borrowing vs Green Bond Capacity \$bn



Methodology

Potential Green Bond Offerings Estimates derived by multiplying Prius Family vehicle sales (8095) by percentage of Canadian's expressing interest to purchase a car through financing (63%) multiplied by the average cost of a Prius Family vehicle (\$26,051). (Prius Family includes Prius V, Prius C, Prius Plugin)

Potential green uses of proceeds Include:

Explicitly Green \$0.13bn 100%

Extending credit to potential Prius owners to finance the purchase of Hybrid Vehicles

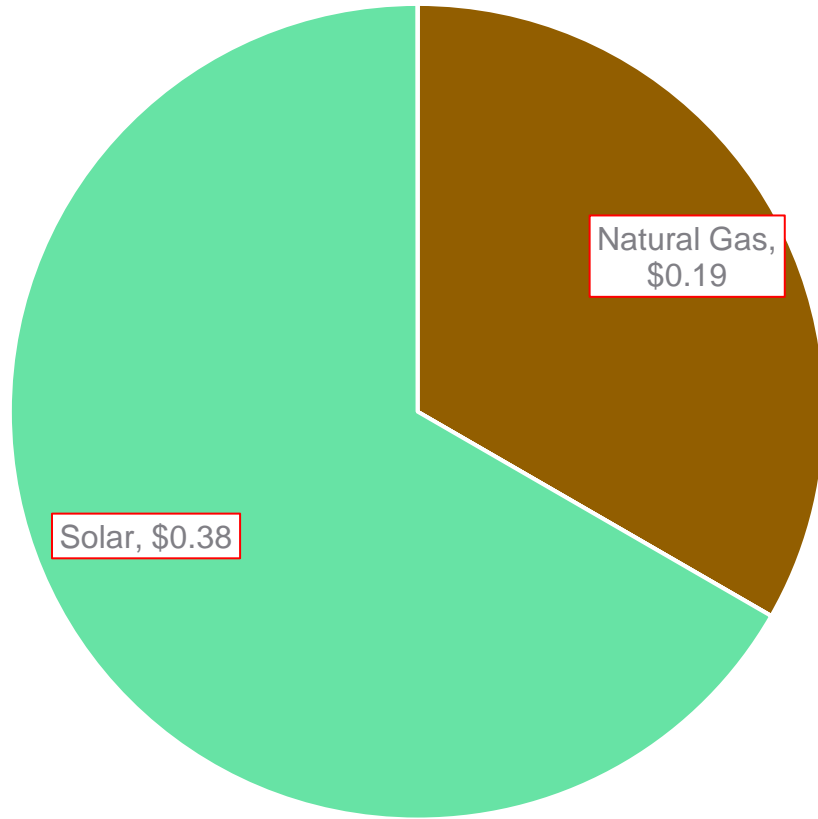
Banks

\$1.41bn –Explicitly Green Power Finance

\$0–Potentially Green Power Finance

Banks – Royal Bank of Canada

Power Finance By Energy Type \$bn



- Biofuels
- Fuel Cells
- Natural Gas
- Solar
- Biomass & Waste
- Geothermal
- Oil
- Wind
- Coal
- Large Hydro
- Other
- Digital Energy
- Marine
- Small hydro

Methodology

Power Finance Estimates from Bloomberg Power Financing Data. We assume banks will have a similar capacity for power financing in 2017

Potential green uses of proceeds Include:

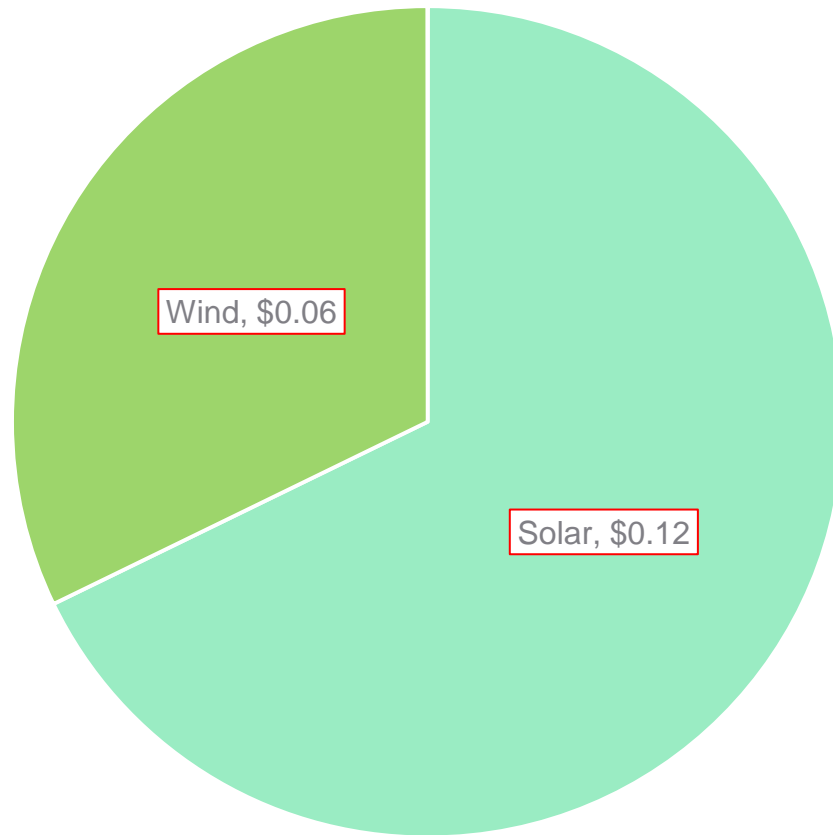
Explicitly Green \$0.38 bn 100%

Renewable Power Financing 2016

Solar - \$0.38bn

Banks – Canadian International Bank of Commerce

Power Finance By Energy Type \$bn



Methodology

Power Finance Estimates from Bloomberg Power Financing Data. We assume banks will have a similar capacity for power financing in 2017

Potential green uses of proceeds Include:

Explicitly Green \$0.18bn 100%

Renewable Power Financing 2016

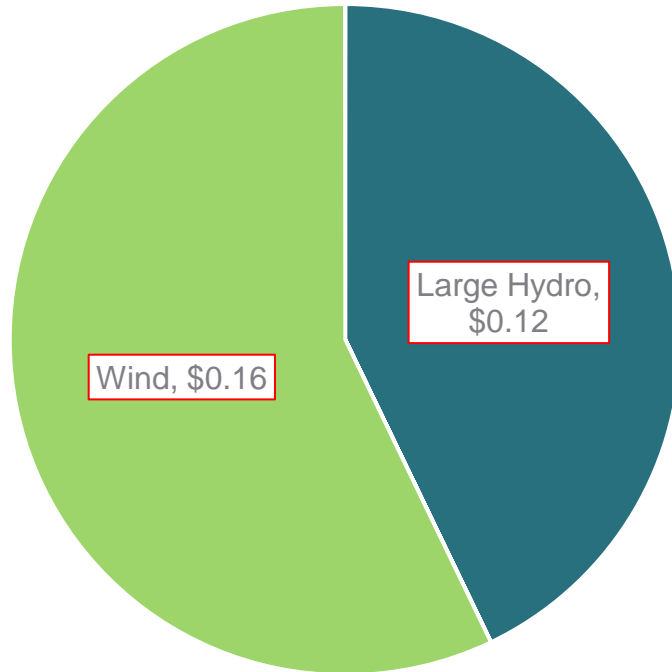
Wind- \$0.06bn

Solar – \$0.12bn

- Biofuels
- Biomass & Waste
- Coal
- Digital Energy
- Fuel Cells
- Geothermal
- Large Hydro
- Marine
- Natural Gas
- Oil
- Other
- Small hydro
- Solar
- Wind

Banks – Bank of Nova Scotia

Power Finance By Energy Type \$bn



- Biofuels
- Digital Energy
- Large Hydro
- Oil
- Solar
- Biomass & Waste
- Fuel Cells
- Marine
- Other
- Wind
- Coal
- Geothermal
- Natural Gas
- Small hydro

Methodology

Power Finance Estimates from Bloomberg Power Financing Data. We assume banks will have a similar capacity for power financing in 2017

Potential green uses of proceeds Include:

Explicitly Green \$0.28 100%

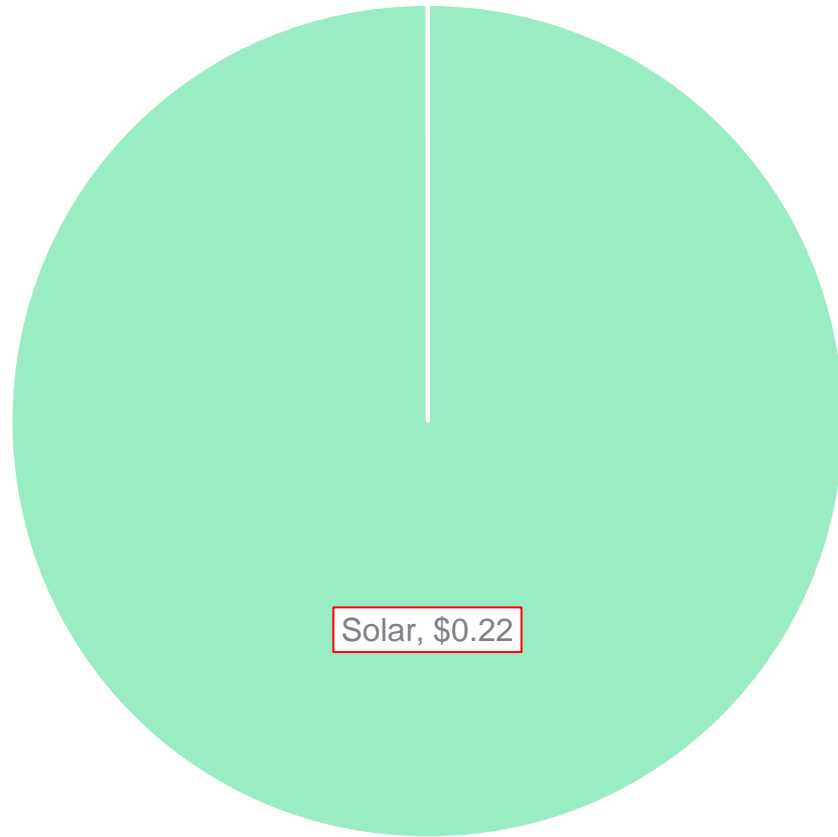
Renewable Power Financing 2016

Large Hydro- \$0.12bn

Wind – \$0.16bn

Banks – National Bank of Canada

Power Finance By Energy Type \$bn



Methodology

Power Finance Estimates from Bloomberg Power Financing Data. We assume banks will have a similar capacity for power financing in 2017

Potential green uses of proceeds Include:

Explicitly Green \$0.22bn 100%

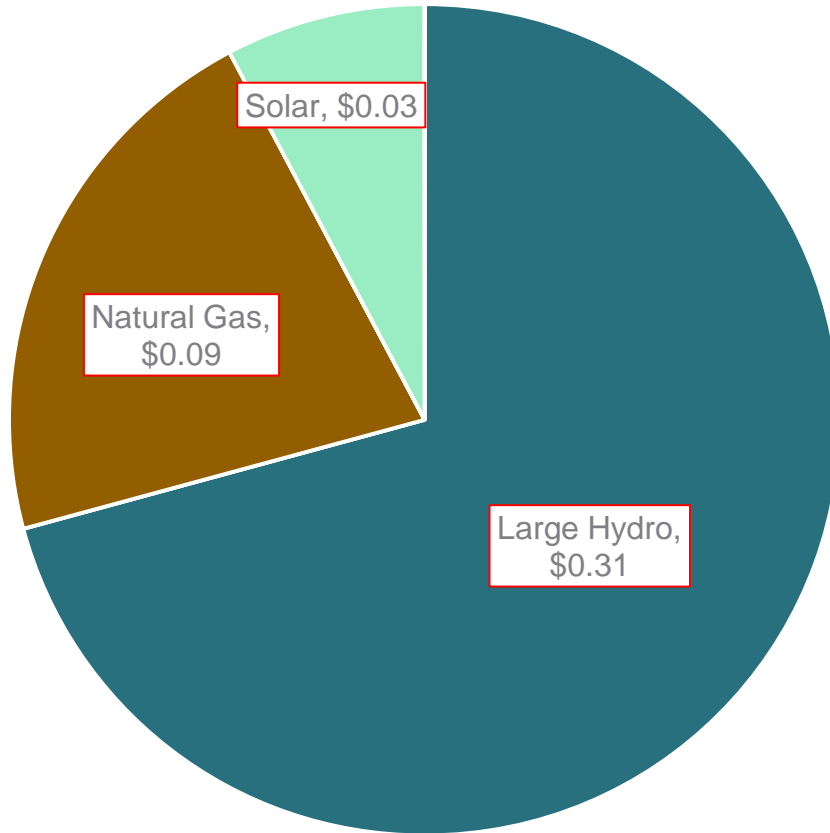
Renewable Power Financing 2016

Solar - \$0.22bn

- Biofuels
- Biomass & Waste
- Coal
- Digital Energy
- Fuel Cells
- Geothermal
- Large Hydro
- Marine
- Natural Gas
- Oil
- Other
- Small hydro
- Solar
- Wind

Banks – Bank of Montreal

Power Finance By Source \$bn



Methodology

Power Finance Estimates from Bloomberg Power Financing Data. We assume banks will have a similar capacity for power financing in 2017

Potential green uses of proceeds Include:

Explicitly Green \$0.35bn 100%

Renewable Power Financing 2016

Solar - \$0.04bn

Large Hydro – \$0.31bn

- Biofuels
- Biomass & Waste
- Coal
- Digital Energy
- Fuel Cells
- Geothermal
- Large Hydro
- Marine
- Natural Gas
- Oil
- Other
- Small hydro
- Solar
- Wind

Appendix – Top Canadian Green Bond Eligible Projects

Project	Value
Muskat Falls Project	\$ 9,100,000,000.00
Eglinton Crosstown LRT	\$ 9,100,000,000.00
Site C Clean Energy Project	\$ 8,775,000,000.00
Romaine Complex	\$ 6,500,000,000.00
Keeyask Hydroelectric Project	\$ 6,496,000,000.00
Réseau électrique métropolitain	\$ 5,900,000,000.00
Bipole III Transmission Line	\$ 4,900,000,000.00
Turcot Interchange	\$ 3,670,000,000.00
Scarborough Subway Extension	\$ 3,560,000,000.00
Ottawa LRT – Stage 2	\$ 3,315,000,000.00
Spadina Subway Extension	\$ 3,180,000,000.00
Montreal Metro Car Replacement	\$ 2,191,000,000.00
Confederation Line	\$ 2,130,000,000.00
Edmonton Valley Line – Stage 1	\$ 1,800,000,000.00
Renovations to Beauharnois Generating Station	\$ 1,600,000,000.00
Maritime Link Project	\$ 1,577,000,000.00
York Viva Bus Rapid Transit (vivaNext)	\$ 1,500,000,000.00
Barrie Corridor GO RER	\$ 1,440,000,000.00
Huronario LRT	\$ 1,400,000,000.00
Chamouchouane–Bout-de-l'Île Transmission Line	\$ 1,400,000,000.00
Wataiykaneyap Transmission Project	\$ 1,350,000,000.00
Romaine Complex Transmission Line	\$ 1,300,000,000.00
Port Hope Area Initiative	\$ 1,280,000,000.00
Alberta Carbon Trunk Line	\$ 1,200,000,000.00
Finch West LRT	\$ 1,200,000,000.00
New TTC Light-Rail Vehicles	\$ 1,187,000,000.00
Johan Hart Generating Station Replacement Project	\$ 1,093,000,000.00
Henvey Inlet Wind Project	\$ 1,000,000,000.00
Hamilton LRT	\$ 1,000,000,000.00
Sheppard East LRT	\$ 1,000,000,000.00
Giant Mine Remediation Project	\$ 903,500,000.00
Canadian Forces Base Trenton Expansion	\$ 860,000,000.00
East Rail Maintenance Facility	\$ 859,200,000.00
Region of Waterloo ION LRT – Stage 1	\$ 818,000,000.00
Union Station Revitalization Project	\$ 800,700,000.00
North End Sewage Treatment Plant Biological Nutrient Removal Upgrade	\$ 794,600,000.00
Ruskin Dam and Powerhouse Upgrade	\$ 748,000,000.00
Union Station Infrastructure Renewal Program	\$ 700,000,000.00
Lions Gate Secondary Wastewater Treatment Plant	\$ 700,000,000.00
Marmora Pumped Storage Project	\$ 700,000,000.00
Juan de Fuca Power Cable	\$ 665,000,000.00
Gordon M. Shrum Generating Station Refurbishment	\$ 600,000,000.00
East-West Transmission Tie	\$ 600,000,000.00
Bonnybrook Wastewater Treatment Plant D Expansion	\$ 600,000,000.00
Annacis Island Wastewater Treatment Plant Expansion	\$ 600,000,000.00
Réno-Systèmes Program Phase IV	\$ 582,500,000.00
Wilson Facility Enhancement and Yard Expansion	\$ 506,400,000.00
Tazi Twé Hydroelectric Project	\$ 500,000,000.00
Nicolas-Riou Wind Project	\$ 500,000,000.00
Regina Railyard Renewal Project	\$ 500,000,000.00
Upper Lillooet Hydro Project	\$ 491,600,000.00
Southwest Rapid Transitway (Stage 2) and Pembina Highway Underpass Project	\$ 467,300,000.00
Meikle Wind Energy Project	\$ 456,000,000.00
Hankan Water Project	\$ 450,000,000.00
Côte-Vertu Station Underground Garage	\$ 350,200,000.00
South End Water Pollution Control Centre	\$ 335,600,000.00



of Top 100 Infrastructure Projects in Canada that would qualify for green bond financing: 56 with a total value of \$107bn



Sizing the Potential Green Bond Market in Canada

Research

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