

1 Q. Please provide a table indicating the capital budgets for Newfoundland Hydro  
2 terminal station projects for each year from 2019 to 2023. Please provide the  
3 justification used to plan each capital project, with start dates, for that time period.

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6 A. Hydro's five-year capital plan is a living document and is revised on an ongoing basis  
7 as new asset condition information becomes available, asset management  
8 strategies evolve, and demands and priorities change within asset classes. The five-  
9 year capital plan supports Hydro's responsibility to maintain its infrastructure  
10 providing safe, reliable and least-cost electricity for customers.

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12 Please see PUB-Nalcor-154, Attachment 1 for Hydro's terminal station projects for  
13 for the years 2019 to 2023.

**PUB-Nalcor-154, Attachment 1**  
**Rate Mitigation Options and Impacts Reference, Page 1 of 3**

Terminal Station Project Description	Expended to 2018	2019	2020	2021	2022	2023	Total	Justification
Upgrade Circuit Breakers - Various (2016-2020)	33,186.4	6,597.3	11,116.8	-	-	-	50,900.5	Refer to Hydro's 2016 Capital Budget application Volume II Tab 8 Upgrade Circuit Breakers, Pages 9 and 10.
Terminal Station Refurbishment and Modernization (2018-2019)	8,170.6	18,625.1	-	-	-	-	26,795.7	The page and line numbers stated below are from Hydro's 2019 Capital Budget Application Volume 2 Tab 6 ("Terminal Station Refurbishment and Modernization (2019-2020)") Terminal Station Asset Management Overview – Version 3  Replacement of instrument transformers: refer to Page 6 Line 27 to Page 10 Line 2 Replacement of disconnect switches: refer to Page 10 Line 5 to Page 11 Line 12 Replacement of surge arrestors: refer to Page 12 Line 2 to Page 14 Line 2 Refurbishment and modernization of power transformers: refer to Page 17 Line 2 to Page 22 Line 14 Replacement of insulators: refer to Page 14 Line 5 to Page 15 Line 14 Refurbishment and upgrade of station grounding: refer to Page 15 Line 17 to Page 16 Line 11 Replace Battery Bank and Chargers- refer to page 26 Line 6 to 17 Refurbishment of equipment foundations: refer to Page 28 Line 3 to Page 29 Line 6 Installation of fire suppression systems in control buildings: refer to Page 29 Line 9 to Page 30 Line 4 Refurbishment of control buildings: refer to Page 30 Line 7 to Page 30 Line 23 Protection, control, and monitoring replacements and modernization: refer to Page 32 Line 3 to Page 37 Line 17 Refurbishment of the Wabush terminal station: refer to Newfoundland & Labrador Hydro's 2019 Capital Budget Application Volume 2 Tab 6 ("Terminal Station Refurbishment and Modernization (2019-2020)") Page 16 Line 18 to Page 17 Line 17
Replace Transformer T1 - Buchans	249.0	2,086.1	-	-	-	-	2,335.1	Refer to Newfoundland & Labrador Hydro's 2018 Capital Budget Application Volume 2 Tab 19 ("Replace Transformer T1 – Buchans") Page 2 Lines 2-5.
Implement Terminal Station Flood Mitigation - Springdale	186.2	787.8	-	-	-	-	974.0	Refer to Hydro's 2018 Capital Budget Application Volume 2 Tab 27 ("Implement Terminal Station Flood Mitigation - Springdale") Page 2 Lines 6-9 and Page 3 Lines 1-2.
Purchase Mobile DC Power Systems	270.9	695.6	-	-	-	-	966.5	Refer to Hydro's 2018 Capital Budget Application Volume 2 Tab 28 ("Purchase Mobile DC Power Systems") Page 2 Lines 24-26.
Terminal Station Refurbishment and Modernization (2019-2020)	-	10,891.1	19,061.8	-	-	-	29,952.9	The page and line numbers stated below are from Hydro's 2019 Capital Budget Application Volume 2 Tab 6 ("Terminal Station Refurbishment and Modernization (2019-2020)") Terminal Station Asset Management Overview – Version 3  Replacement of instrument transformers: refer to Page 6 Line 27 to Page 10 Line 2 Replacement of disconnect switches: refer to Page 10 Line 5 to Page 11 Line 12 Replacement of surge arrestors: refer to Page 12 Line 2 to Page 14 Line 2 Refurbishment and modernization of power transformers: refer to Page 17 Line 2 to Page 22 Line 14 Replacement of insulators: refer to Page 14 Line 5 to Page 15 Line 14 Refurbishment and upgrade of station grounding: refer to Page 15 Line 17 to Page 16 Line 11 Replace Battery Bank and Chargers- refer to page 26 Line 6 to 17 Refurbishment of equipment foundations: refer to Page 28 Line 3 to Page 29 Line 6 Installation of fire suppression systems in control buildings: refer to Page 29 Line 9 to Page 30 Line 4 Refurbishment of control buildings: refer to Page 30 Line 7 to Page 30 Line 23 Protection, control, and monitoring replacements and modernization: refer to Page 32 Line 3 to Page 37 Line 17 Refurbishment of the Wabush terminal station: refer to Hydro's 2019 Capital Budget Application Volume 2 Tab 6 ("Terminal Station Refurbishment and Modernization (2019-2020)") Page 16 Line 18 to Page 17 Line 17.
Terminal Station In-Service Failures	-	1,000.0	-	-	-	-	1,000.0	Refer to Hydro's 2019 Capital Budget Application Volume 1 Section C ("Projects \$500,000 and Over") Page C44 Lines 2-4.
Upgrade Terminal Station for Mobile Substation - St. Anthony	-	89.3	402.7	-	-	-	492.0	Refer to Hydro's 2019 Capital Budget Application Volume 1 Section D ("2019 Capital Projects \$200,000 and over but less than \$500,000") Page D13 Lines 18-20 and page D14 Lines 1-3.
Terminal Station Refurbishment and Modernization (2020-2021)	-	-	7,555.8	10,823.1	-	-	18,378.9	The page and line numbers stated below are those from Hydro's 2019 Capital Budget Application Volume 2 Tab 6 ("Terminal Station Refurbishment and Modernization (2019-2020)") Terminal Station Asset Management Overview – Version 3  Replacement of instrument transformers: refer to Page 6 Line 27 to Page 10 Line 2 Replacement of disconnect switches: refer to Page 10 Line 5 to Page 11 Line 12 Replacement of surge arrestors: refer to Page 12 Line 2 to Page 14 Line 2 Refurbishment and modernization of power transformers: refer to Page 17 Line 2 to Page 22 Line 14 Replacement of insulators: refer to Page 14 Line 5 to Page 15 Line 14 Refurbishment and upgrade of station grounding: refer to Page 15 Line 17 to Page 16 Line 11 Replace Battery Bank and Chargers- refer to page 26 Line 6 to 17 Refurbishment of equipment foundations: refer to Page 28 Line 3 to Page 29 Line 6 Installation of fire suppression systems in control buildings: refer to Page 29 Line 9 to Page 30 Line 4 Refurbishment of control buildings: refer to Page 30 Line 7 to Page 30 Line 23 Protection, control, and monitoring replacements and modernization: refer to Page 32 Line 3 to Page 37 Line 17 Refurbishment of the Wabush terminal station: This project is required to maintain the reliability of the Wabush Terminal Station and to ensure Hydro is compliant with Environment Canada's Regulations to have all equipment containing greater than 50 ppm PCB removed from service by 2025.
Purchase New Mobile Substation - Bishops Falls	-	-	846.0	3,853.8	-	-	4,699.8	Required to reduce the risk of extended customer outages due to the unavailability of a mobile substation.
Install Fire Barriers Between T10 & T12 and T10 & T11 - Bay d'Espoir	-	-	161.7	1,207.5	-	-	1,369.2	Required to reduce the risk of extended customer outages due to the loss of up to all three of Bay d'Espoir T10, T1, and T12 due to either one of them catching fire.
Upgrade Control Building for Staff Working Spaces - South Brook & Doyles	-	-	453.4	773.5	-	-	1,226.9	Consideration is being given to replacing this project with the refurbishment of the Western Avalon control building due leaks in the roof and deferral of this work to a future year. Refer to Hydro's 2019 Capital Budget application Revision 1 Volume II Tab 6 Refurbish Control Buildings refer to Page 12, lines 10-13.
Terminal Station In-Service Failures (2020)	-	-	1,000.0	-	-	-	1,000.0	Refer to Hydro's 2019 Capital Budget Application Volume 1 Section C ("Projects \$500,000 and Over") Page C44 Lines 2-4.

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**Rate Mitigation Options and Impacts Reference, Page 2 of 3**

Replace Telecontrol Building and Upgrade Equipment - Daniels Harbour	-	-	57.0	764.0	-	-	821.0	This building was originally meant to house metering and telecontrol equipment only and has since grown to house the station controls and protection, making working conditions congested. The walls contain asbestos sheeting and the rotten floor had to be reinforced with plywood as a temporary fix to make it safe in the walking area. Further review is required to investigate an alternative of moving Daniels Harbour Terminal Station (DHRTS) equipment to Peters Barren Terminal Station (PBNTS) to eliminate DHRTS due to the poor condition of the control building and also the close proximity of the station to a potential landslide.
Replace Corroded Junction Boxes - Various	-	-	200.0	200.0	200.0	200.0	800.0	This project is justified based upon corrosion of junction boxes in Terminal Stations. Currently under consideration as most junction boxes being replaced with other equipment replacements.
Install Fire Barriers between T1, T2 and T3 and the Substation - Massey Drive	-	-	100.0	400.0	300.0	-	800.0	Based upon a recommendation from FM Global. Required to reduce the risk of extended customer outages due to the loss of up to all three of Massey Drive T1, T2, and T3 due to either one of them catching fire. Further review with risk and insurance is required to look at requirements and possibly reduction in scope.
Install Firewall Between Transformer and Gas Turbine - Stephenville	-	-	146.6	648.7	-	-	795.3	Based upon a recommendation from FM Global. Required to reduce the risk of customer outages due to damage of Stephenville G1 if it caught fire due to Stephenville T1 catching fire. Further review with risk and insurance is required to look at requirements and possibly reduction in scope.
Replace Capacitor Bank C1 - Oxen Pond	-	-	363.6	369.8	-	-	733.4	Asset is past its forecasted service life of 35 years (it's 41 years old). Plan to defer if condition data warrants this.
Upgrade Station Lighting - Various	-	-	200.0	200.0	200.0	-	600.0	This project is required to maintain safe and effective working conditions in Terminal Stations due to deteriorated condition in existing lighting systems. This is a forecasted budget to do one station per year starting with Holyrood in 2020.
Install Drainage to Stop Surface Flooding - Various	-	-	67.8	457.2	-	-	525.0	This was a project to address drainage in Western Avalon Terminal Station due to surface flooding. Further evaluation is required in 2019 to further assess if this project is still required due to recent work completed relating to addition of GIS to accommodate the new TL 267 transmission line.
Install Telephone System - Bottom Waters	-	-	500.0	-	-	-	500.0	This project was justified on the need to have telephone communications installed to this site. This was completed under another project.
Construct Fire Separation Wall between Transformers - Happy Valley	-	-	300.0	-	-	-	300.0	Based upon a recommendation from FM Global. Required to reduce the risk of extended customer outages due to the loss of up to all three of Happy Valley transformers T1, T2, and T4 due to either one catching fire. Further review with risk and insurance is required to look at requirements and possibly reduction in scope or deferral.
Upgrade Access Road with New Topping - Buchans	-	-	243.4	-	-	-	243.4	This project was put in plan to have the access road to Buchans Terminal Station upgraded due to deterioration over many years. Further evaluation is required in 2019 to assess priority and timing of project.
Upgrade AC/DC Station Service - Various (2020-2021)	-	-	75.0	75.0	-	-	150.0	As terminal station equipment is replaced, added, or upgraded, the AC and DC station service loads may increase. When the station service loads exceed the design load of the system, upgrades such as cable, circuit breaker panel, splitter, and transfer switch replacements or additions are required.
Upgrade Reclosing for Circuit Breakers - Various (2020)	-	-	100.0	-	-	-	100.0	This project will now be included in the Terminal Station Refurbishment Project.
Upgrade Circuit Breakers - Various	-	-	-	10,450.0	10,100.0	9,910.0	30,460.0	This is a project to continue with circuit breaker replacements after the 2016-2020 program. The justification is the same as what was presented in Hydro's 2016 Capital Budget application Volume II Tab 8 Upgrade Circuit Breakers, Pages 9 and 10.
Terminal Station Refurbishment and Modernization (2021-2022)	-	-	-	4,540.0	7,059.8	-	11,599.8	The page and line numbers stated below are from Hydro's 2019 Capital Budget Application Volume 2 Tab 6 ("Terminal Station Refurbishment and Modernization (2019-2020)") Terminal Station Asset Management Overview – Version 3  Replacement of instrument transformers: refer to Page 6 Line 27 to Page 10 Line 2 Replacement of disconnect switches: refer to Page 10 Line 5 to Page 11 Line 12 Replacement of surge arrestors: refer to Page 12 Line 2 to Page 14 Line 2 Refurbishment and modernization of power transformers: refer to Page 17 Line 2 to Page 22 Line 14 Replacement of insulators: refer to Page 14 Line 5 to Page 15 Line 14 Refurbishment and upgrade of station grounding: refer to Page 15 Line 17 to Page 16 Line 11 Replace Battery Bank and Chargers- refer to page 26 Line 6 to 17 Refurbishment of equipment foundations: refer to Page 28 Line 3 to Page 29 Line 6 Installation of fire suppression systems in control buildings: refer to Page 29 Line 9 to Page 30 Line 4 Refurbishment of control buildings: refer to Page 30 Line 7 to Page 30 Line 23 Protection, control, and monitoring replacements and modernization: refer to Page 32 Line 3 to Page 37 Line 17 Refurbishment of the Wabush terminal station: This project is required to maintain the reliability of the Wabush Terminal Station and to ensure Hydro is compliant with Environment Canada's Regulations to have all equipment containing greater than 50 ppm PCB removed from service by 2025.
Terminal Station In-Service Failures (2021)	-	-	-	1,000.0	-	-	1,000.0	Refer to Hydro's 2019 Capital Budget Application Volume 1 Section C ("Projects \$500,000 and Over") Page C44 Lines 2-4.
Upgrade Drainage to Stop Frost Heaving - Various	-	-	-	200.0	400.0	400.0	1,000.0	This project is required to address drainage in Buchans, Hardwood and Stoney Brook Terminal Stations due to frost heave. Further evaluation required in 2019 to assess need and timing of projects.
Upgrade Station Access Road - Various	-	-	-	400.0	200.0	200.0	800.0	This project is based upon the need to upgrade access roads at Western Avalon, Sunnyside, Deer Lake, Massey Drive, Doyles, Howley and Bottom Brook. Bottom Brook is no longer required due to new road installed by Emera. Further evaluation required in 2019 to assess need and timing of projects.
Upgrade Reclosing for Circuit Breakers - Various (2021)	-	-	-	300.0	-	-	300.0	This project will now be included in the Terminal Station Refurbishment Project.
Upgrade AC/DC Station Service - Various (2021-2022)	-	-	-	75.0	75.0	-	150.0	As terminal station equipment is replaced, added, or upgraded, the AC and DC station service loads may increase. When the station service loads exceed the design load of the system, upgrades such as cable, circuit breaker panel, splitter, and transfer switch replacements or additions are required.
Replace Transformers - Various	-	-	-	-	12,200.0	18,200.0	30,400.0	This is a project for Wabush Terminal Station T3 and T4 and Oxen Pond GT1. Oxen Pond was replaced in 2018 with SVTS. Wabush T3 & T4 are anticipated to have a measured inferred solid insulation degree-of-polymerization (from furan analysis) of less than 400 by 2021. An inferred degree-of-polymerization of less than 400 is one of Hydro's network power transformer replacement criteria.

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Terminal Station Refurbishment and Modernization (2022-2023)	-	-	-	-	6,608.6	8,236.5	14,845.1	<p>The page and line numbers stated below are from Hydro's 2019 Capital Budget Application Volume 2 Tab 6 ("Terminal Station Refurbishment and Modernization (2019-2020)") Terminal Station Asset Management Overview – Version 3</p> <p>Replacement of instrument transformers: refer to Page 6 Line 27 to Page 10 Line 2            Replacement of disconnect switches: refer to Page 10 Line 5 to Page 11 Line 12            Replacement of surge arrestors: refer to Page 12 Line 2 to Page 14 Line 2            Refurbishment and modernization of power transformers: refer to Page 17 Line 2 to Page 22 Line 14            Replacement of insulators: refer to Page 14 Line 5 to Page 15 Line 14            Refurbishment and upgrade of station grounding: refer to Page 15 Line 17 to Page 16 Line 11            Replace Battery Bank and Chargers- refer to page 26 Line 6 to 17            Refurbishment of equipment foundations: refer to Page 28 Line 3 to Page 29 Line 6            Installation of fire suppression systems in control buildings: refer to Page 29 Line 9 to Page 30 Line 4            Refurbishment of control buildings: refer to Page 30 Line 7 to Page 30 Line 23            Protection, control, and monitoring replacements and modernization: refer to Page 32 Line 3 to Page 37 Line 17            Refurbishment of the Wabush terminal station: This project is required to maintain the reliability of the Wabush Terminal Station and to ensure Hydro is compliant with Environment Canada's Regulations to have all equipment containing greater than 50 ppm PCB removed from service by 2025.</p>
Modify 230kV Bus Height - Western Avalon	-	-	-	-	2,500.0	-	2,500.0	Increase clearance of Bus for connection to TL237 from disconnects L01L37-2 and B1L37-2 at WAVTS due to low bus height. Further review of options is required.
Install Remote Control Sectionalizer TL251(2)(3) - Hampden	-	-	-	-	437.5	1,691.4	2,128.9	To improve SAIDI of customers by providing remote sectionalizing by the Energy Control Centre. Further evaluation is required to look at priority and timing of this project.
Terminal Station In-Service Failures (2022)	-	-	-	-	1,000.0	-	1,000.0	Refer to Hydro's 2019 Capital Budget Application Volume 1 Section C ("Projects \$500,000 and Over") Page C44 Lines 2-4.
Upgrade Reclosing for Circuit Breakers - Various (2022)	-	-	-	-	200.0	-	200.0	This project will now be included in the Terminal Station Refurbishment Project.
Upgrade Station Lighting - Various (2022)	-	-	-	-	200.0	-	200.0	This project is required to maintain safe and effective working conditions in Terminal Stations due to deteriorated condition in existing lighting systems. This is a forecasted budget to do one station per year starting with Holyrood in 2020.
Upgrade AC/DC Station Service - Various (2022-2023)	-	-	-	-	75.0	75.0	150.0	As terminal station equipment is replaced, added, or upgraded, the AC and DC station service loads may increase. When the station service loads exceed the design load of the system, upgrades such as cable, circuit breaker panel, splitter, and transfer switch replacements or additions are required.
Terminal Station Refurbishment and Modernization (2023-2024)	-	-	-	-	-	4,588.9	4,588.9	<p>The page and line numbers stated below are from Hydro's 2019 Capital Budget Application Volume 2 Tab 6 ("Terminal Station Refurbishment and Modernization (2019-2020)") Terminal Station Asset Management Overview – Version 3</p> <p>Replacement of instrument transformers: refer to Page 6 Line 27 to Page 10 Line 2            Replacement of disconnect switches: refer to Page 10 Line 5 to Page 11 Line 12            Replacement of surge arrestors: refer to Page 12 Line 2 to Page 14 Line 2            Refurbishment and modernization of power transformers: refer to Page 17 Line 2 to Page 22 Line 14            Replacement of insulators: refer to Page 14 Line 5 to Page 15 Line 14            Refurbishment and upgrade of station grounding: refer to Page 15 Line 17 to Page 16 Line 11            Replace Battery Bank and Chargers- refer to page 26 Line 6 to 17            Refurbishment of equipment foundations: refer to Page 28 Line 3 to Page 29 Line 6            Installation of fire suppression systems in control buildings: refer to Page 29 Line 9 to Page 30 Line 4            Refurbishment of control buildings: refer to Page 30 Line 7 to Page 30 Line 23            Protection, control, and monitoring replacements and modernization: refer to Page 32 Line 3 to Page 37 Line 17            Refurbishment of the Wabush terminal station: This project is required to maintain the reliability of the Wabush Terminal Station and to ensure Hydro is compliant with Environment Canada's Regulations to have all equipment containing greater than 50 ppm PCB removed from service by 2025.</p>
Terminal Station In-Service Failures (2023)	-	-	-	-	-	1,000.0	1,000.0	Refer to Hydro's 2019 Capital Budget Application Volume 1 Section C ("Projects \$500,000 and Over") Page C44 Lines 2-4.
Upgrade Reclosing for Circuit Breakers - Various (2023)	-	-	-	-	-	200.0	200.0	This project will now be included in the Terminal Station Refurbishment Project.
Upgrade Station Lighting - Various (2023)	-	-	-	-	-	200.0	200.0	This project is required to maintain safe and effective working conditions in Terminal Stations due to deteriorated condition in existing lighting systems. This is a forecasted budget to do one station per year starting with Holyrood in 2020.
Upgrade AC/DC Station Service - Various (2023-2024)	-	-	-	-	-	-	75.0	As terminal station equipment is replaced, added, or upgraded, the AC and DC station service loads may increase. When the station service loads exceed the design load of the system, upgrades such as cable, circuit breaker panel, splitter, and transfer switch replacements or additions are required.
<b>Total Terminal Stations</b>	<b>42,063.1</b>	<b>40,772.3</b>	<b>42,951.6</b>	<b>36,737.6</b>	<b>41,755.9</b>	<b>44,976.8</b>	<b>249,257.3</b>	