

1 Q. Please provide all analyses and reports used to determine if transmission costs were "peak-
2 related". Please provide a list of all transmission expenditures reviewed for inclusion in the
3 transmission capacity component of the marginal cost calculation and indicate the
4 expenditures that were selected for inclusion.

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7 A. Christensen Associates Energy Consulting determined if transmission costs were peak-
8 related through an assessment of planned future capital projects. Newfoundland and
9 Labrador Hydro provided a list of projects and/or upgrades contained in its transmission
10 expansion plan for the years 2018–2022 then determined for each individual component if
11 it would contribute to providing peak capacity on the system over forward years. For
12 Newfoundland and Labrador Hydro, historical transmission investment expenditures,
13 measured as real stock, does not provide guidance with respect to transmission capacity
14 costs forward-looking.

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16 Please refer to PUB-NLH-009, Attachment 1 and Attachment 2 for a full list of the peak
17 load-related planned transmission capital expenditures.

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19 Projects chosen as "peak-related" are required in order to satisfy forecasted peak system
20 demand. These projects include upgrades to transformer capacity or functionality,
21 increased current carrying capacity of transmission lines or power cables, or the addition of
22 new transmission or terminal station infrastructure.

Project	2018	2019	2020	2021	2022	Transmission Capacity Selection	
Purchase Mobile dc Power Systems Year 1	0	966,200	0	0	0	0	0
Replace BUC T1 w Spare Year 1	0	2,335,100	0	0	0	0	0
Implement Terminal Station Flood Mitigation Year 1	0	973,800	0	0	0	0	0
Install Recloser Remote Control Year 1	0	338,700	0	0	0	0	0
VAR Upgrade Circuit Breakers Year 3	15,408,800	0	0	0	0	0	0
VAR Upgrade Circuit Breakers Year 4	0	6,597,500	0	0	0	0	0
VAR Upgrade Circuit Breakers Year 5	0	0	11,117,000	0	0	0	0
Replace Battery Banks and Chargers for Various locations 2018-2019 Year 1	0	937,900	0	0	0	0	0
Replace Protective Relays Year 1	0	7,535,500	0	0	0	0	0
Upgrade Fault Recorders Year 1	0	1,026,900	0	0	0	0	0
Upgrade Data Alarm Management Year 1	0	611,400	0	0	0	0	0
Install Breaker Failure Protection Year 1	0	855,500	0	0	0	0	0
Upgrade Equipment Foundations Year 1	367,100	0	0	0	0	0	0
Replace Instrument Transformers Year 1	0	1,181,100	0	0	0	0	0
Replace Disconnects Year 1	0	1,966,880	0	0	0	0	0
Replace Surge Arrestors Year 1	289,440	0	0	0	0	0	0
Replace Surge Arrestors Year 1	-72,360	0	0	0	0	0	0
Install Fire Protection Year 1	0	765,100	0	0	0	0	0
Replace Insulators Year 1	0	961,800	0	0	0	0	0
Perform Grounding Upgrades Year 1	0	293,800	0	0	0	0	0
Upgrade Power Transformers Year 1	1,729,700	0	0	0	0	0	x
Upgrade Power Transformers Year 2	0	2,479,440	0	0	0	0	x
Upgrade Terminal Station for Mobile Substation STA Year 1	0	0	492,000	0	0	0	x
Upgrade Fault Recorders Year 1	0	623,500	0	0	0	0	x
Upgrade Data Alarm Management Year 1	0	0	509,440	0	0	0	0
Install Breaker Failure Protection Year 1	0	0	436,950	0	0	0	0
Upgrade Equipment Foundations Year 1	0	306,300	0	0	0	0	0
Replace Instrument Transformers Year 1	0	0	1,100,100	0	0	0	0
Replace Disconnects Year 1	0	0	2,350,600	0	0	0	0
Replace Surge Arrestors Year 1	0	130,960	0	0	0	0	0
Install Fire Protection Year 1	0	0	883,400	0	0	0	0
Upgrade Transformer Paralleling Year 1	0	0	301,800	0	0	0	x
Replace Insulators Year 1	0	0	988,700	0	0	0	0
Perform Grounding Upgrades Year 1	0	0	1,845,500	0	0	0	0
Upgrade Power Transformers Year 1	0	4,386,200	0	0	0	0	x

Project	2018					2019					2020					2021					2022					Transmission Capacity Selection			
Upgrade Power Transformers Year 2	0	0	0	0	0	0	0	0	0	0	4,738,700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x			
Cable Upgrades Year 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500,000	0	0	0	0	0	0	0	0	0	x			
Replace Protective Relays (Proper) Year 1	0	0	0	0	0	0	0	0	0	0	4,579,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Breaker Reclosing Year 1	0	0	0	0	0	0	0	0	0	0	367,600	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Refurbish Control Buildings Year 1	0	0	0	0	0	650,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Terminal Station In-Service Failures Year 1	0	0	0	0	0	1,000,400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Perform Wood Pole Line Management Program Year 1	0	0	0	0	0	2,220,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Perform Wood Pole Line Management Program Year 2	0	0	0	0	0	0	0	0	0	0	3,439,080	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Perform Wood Pole Line Management Program Year 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,043,170	0	0	0	0	0	0	0	0	0				
Perform Wood Pole Line Management Program Year 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,696,220	0	0	0	0				
Perform Wood Pole Line Management Program Year 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Install Recloser Remote Control Year 1	0	0	0	0	0	0	0	0	0	0	386,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Energy Efficiency Improvements Various Year 1	-276,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Energy Efficiency Improvements Various Year 2	0	0	0	0	0	-168,900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Increase Fuel and Water Treatment System Capacity Year 1	0	0	0	0	0	-8,829,900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Increase Fuel and Water Treatment System Capacity Year 2	0	0	0	0	0	-3,012,700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Upgrade Aluminum Support Structures Year 1	287,600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Replacement due to In-Service Failure Year 1	1,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Wood Pole Line Management (2018) Year 1	3,532,900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Wood Pole Line Management (2018) Year 2	0	0	0	0	0	2,449,890	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Wood Pole Line Management (2018) Year 3	0	0	0	0	0	0	0	0	0	0	1,940,940	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Wood Pole Line Management (2018) Year 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,878,830	0	0	0	0	0	0	0	0	0				
Wood Pole Line Management (2018) Year 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,944,800	0	0	0	0				
MAK - Replace Genset Unit 2059 (635 up 910 kW) & Building Expansion Year 1	-604,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
MAK - Replace Genset Unit 2059 (635 up 910 kW) & Building Expansion Year 2	0	0	0	0	0	-4,703,400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Install Energy Efficient Lighting in Diesel Plants Year 1	-104,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Install Energy Efficient Lighting in Diesel Plants Year 2	0	0	0	0	0	-119,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Install Energy Efficient Lighting in Diesel Plants Year 3	0	0	0	0	0	0	0	0	0	0	-122,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Upgrade Terminal Station Equipment Foundations (based on 2019) Year 1	0	0	0	0	0	0	0	0	0	0	321,390	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Replace Instrument Transformers Year 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	720,000	0	0	0	0	0	0	0	0	0				
Replace Protective Relays Various Year 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,260,000	0	0	0	0	0	0	0	0	0				
Replace Disconnect Switches Various Year 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,125,000	0	0	0	0	0	0	0	0	0				
Replace Surge Arresters Various (based on 2019) Year 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	189,000	0	0	0	0	0	0	0	0	0				
Install Fire protection in 230 kV Terminal Stations Year 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	650,000	0	0	0	0				
Install Fault Recorder System for 2020 IRV Year 1	0	0	0	0	0	0	0	0	0	0	597,300	0	0	0	0	0	0	0	0	0	0	0	0	0	0				

Project	Transmission Capacity Selection				
	2018	2019	2020	2021	2022
Upgrade Data Alarm Management Year 1	0	0	0	270,000	0
Install Breaker Failure Protection Various Year 1	0	0	0	274,900	0
Upgrade Terminal Station for Mobile Substation (copy of 2017-2018) Year 1	0	0	0	1,512,800	0
Replace Insulators Various Year 1	0	0	0	405,000	0
Perform Grounding Upgrades Various Year 1	0	0	0	1,000,000	0
Upgrade Power Transformers Various Year 1	0	0	0	3,780,000	0
Refurbish Terminal Station Control Buildings Year 1	0	0	676,800	0	0
Install Drainage to Stop Surface Flooding VAR (based on 2017-2018) Year 1	0	0	0	524,900	0
Replace Corroded Junction Boxes Year 1	0	0	200,100	0	0
Replace Corroded Junction Boxes Year 2	0	0	0	200,000	0
Upgrade Station Lighting Year 1	0	0	200,000	0	0
Upgrade Station Lighting Year 2	0	0	0	200,000	0
Install Fire Barrier between T10 & T11 and T10 & T12 Year 1	0	0	0	1,369,200	0
Install Fire Barriers Year 1	0	0	100,100	0	0
Install Fire Barriers Year 2	0	0	0	400,000	0
Install Fire Barriers Year 3	0	0	0	0	300,000
Fire Separation Wall between Transformers Year 1	0	0	300,000	0	0
SOK, DLS Upgrade Control Building for Staff Working Spaces Year 1	0	0	0	1,226,800	0
DHR Control Building Replacement Year 1	0	0	0	821,100	0
Upgrade ac_dc Station Service Year 1	0	0	75,000	0	0
Upgrade ac_dc Station Service Year 2	0	0	0	75,000	0
Upgrade Reclosing for Circuit Breakers Various Year 1	0	0	100,000	0	0
Purchase Mobile Substation Year 1	0	0	0	4,699,700	0
Replacement Due To In-Service Failure (copy of 2019) Year 1	0	0	1,000,000	0	0
Perform Wood Pole Line Management Program Year 1	0	0	0	0	0
Conduct Lidar Surveys Year 1	0	0	250,800	0	0
Recloser Remote Control 2020 (copy of 2019) Year 1	0	0	0	550,000	0
Upgrade Terminal Station Equipment Foundations (based on 2019) Year 1	0	0	0	450,090	0
Replace Instrument Transformers (based on 2019) Year 1	0	0	0	0	540,000
Replace Protective Relays Various (based on 2019) Year 1	0	0	0	0	990,090
Replace Disconnect Switches Various (based on 2019) Year 1	0	0	0	0	900,000
Replace Surge Arresters Various Year 1	0	0	0	180,000	0
Install Fire protection in 230 kV Terminal Stations (based on WAV & HWD) Year 1	0	0	0	0	650,000
Upgrade Fault Recorder System Year 1	0	0	0	450,100	0
Upgrade Data Alarm Management (based on 2019-2020) Year 1	0	0	0	0	350,000

Project	2018	2019	2020	2021	2022	Transmission Capacity Selection	
Install Breaker Failure Protection Various (based on 2018–2019) Year 1	0	0	0	0	0	315,000	
Upgrade Terminal Station for Mobile Substation (copy of BCV) Year 1	0	0	0	0	0	1,554,500	
Perform Grounding Upgrades Various (based on 2019–2020) Year 1	0	0	0	450,000	0	0	
Perform Grounding Upgrades - Various (based on 2019–2020) Year 2	0	0	0	0	0	450,000	
Upgrade Power Transformers - Various (based on 2019–2020) Year 1	0	0	0	0	0	2,500,000	x
Upgrade Cables (based on 2019–2020) Year 1	0	0	0	200,000	0	0	x
Upgrade Cables (based on 2019–2020) Year 2	0	0	0	0	0	450,000	x
Refurbish Terminal Station Control Buildings Year 1	0	0	0	625,860	0	0	
Upgrade Circuit Breakers Year 1	0	0	0	9,405,000	0	0	
Upgrade ac_dc Station Service Year 1	0	0	0	67,500	0	0	
Upgrade ac_dc Station Service Year 2	0	0	0	0	0	67,500	
Upgrade Reclosing for Circuit Breakers Various (copy of 2019) Year 1	0	0	0	270,090	0	0	
Replacement Due To In-Service Failure (copy of 2019) Year 1	0	0	0	1,000,000	0	0	
Perform Wood Pole Line Management Program Year 1	0	0	0	0	0	0	
Conduct Lidar Surveys Year 1	0	0	0	256,400	0	0	
Recloser Remote Control (copy of 2019) Year 1	0	0	0	0	0	563,300	
Replace Battery Banks and Chargers Various Locations Year 1	0	0	0	437,130	0	0	
Replace HD Off-Road Track Unit 7954 Year 1	-200,000	0	0	0	0	0	
Install Protective Guards in Turbine Pits Year 1	-248,200	0	0	0	0	0	
Install Protective Guards in Turbine Pits Year 2	0	-292,800	0	0	0	0	
Replace Air Conditioners Year 1	74,500	0	0	0	0	0	
Replace Protective Relays Various Sites	1,816,800	0	0	0	0	0	
Install Breaker Failure Protection Various Sites	623,000	0	0	0	0	0	
Replace Electromechanical Timers Various Sites	198,000	0	0	0	0	0	
Replace Instrument Transformers Various Sites	1,345,200	0	0	0	0	0	
Replace Disconnects Various Sites	3,369,600	0	0	0	0	0	
Install Fire Protection Various Sites	926,800	0	0	0	0	0	
Replace Insulators Various Sites	971,800	0	0	0	0	0	
Perform Grounding Upgrades Various Sites	1,719,500	0	0	0	0	0	
Upgrade Power Transformers Various Sites	7,089,400	0	0	0	0	0	x
Cable Upgrades Various Sites	470,400	0	0	0	0	0	x
TL 267 BDE to WAV	86,932	0	0	0	0	0	
TL 267 BDE to WAV	86,300	0	0	0	0	0	
TL 267 BDE to WAV	181,121	0	0	0	0	0	
TL 267 BDE to WAV	15,816	0	0	0	0	0	

Project	Transmission Capacity Selection				
	2018	2019	2020	2021	2022
TL 267 BDE to WAV	127,162	0	0	0	0
TL 267 BDE to WAV	146,119	0	0	0	0
TL 267 BDE to WAV	313,300	0	0	0	0
TL 267 BDE to WAV	1,550,702	0	0	0	0
TL 267 BDE to WAV	277,187	0	0	0	0
TL 267 BDE to WAV	212,677	0	0	0	0
TL 267 BDE to WAV	2,489	0	0	0	0
TL 267 BDE to WAV	336,814	0	0	0	0
TL 267 BDE to WAV	1,494	0	0	0	0
TL 267 BDE to WAV	29,986	0	0	0	0
TL 267 BDE to WAV	9,358,250	0	0	0	0
TL 267 BDE to WAV	306,818	0	0	0	0
TL 267 BDE to WAV	306,818	0	0	0	0
TL 267 BDE to WAV	85,084	0	0	0	0
TL 267 BDE to WAV	85,084	0	0	0	0
TL 267 BDE to WAV	21,676	0	0	0	0
TL 267 BDE to WAV	25,697	0	0	0	0
TL 267 BDE to WAV	239,006	0	0	0	0
TL 267 BDE to WAV	1,328,068	0	0	0	0
TL 267 BDE to WAV	88,081	0	0	0	0
TL 267 BDE to WAV	3,701,044	0	0	0	0
TL 267 BDE to WAV	9,746	0	0	0	0
TL 267 BDE to WAV	108,627	0	0	0	0

	2018	2019	2020	2021	2022
Total	9,289,500	7,489,140	5,532,500	4,480,000	2,950,000
Selection	x				
Row Labels	2018	2019	2020	2021	2022
Cable Upgrades - Various Sites	470,400	0	0	0	0
Cable Upgrades Yr 1	0	0	0	500,000	0
Upgrade Cables (based on 2019-20) Yr 1	0	0	0	200,000	0
Upgrade Cables (based on 2019-20) Yr 2	0	0	0	0	450,000
Upgrade Fault Recorders Yr 1	0	623,500	0	0	0
Upgrade Power Transformers - Various Yr 1	0	0	0	3,780,000	0
Upgrade Power Transformers - Various (based on 2019-20) Yr 1	0	0	0	0	2,500,000
Upgrade Power Transformers - Various Sites	7,089,400	0	0	0	0
Upgrade Power Transformers Yr 1	1,729,700	4,386,200	0	0	0
Upgrade Power Transformers Yr 2	0	2,479,440	4,738,700	0	0
Upgrade Terminal Station for Mobile Substation - STA Yr 1	0	0	492,000	0	0
Upgrade Transformer Paralleling Yr 1	0	0	301,800	0	0
Grand Total	9,289,500	7,489,140	5,532,500	4,480,000	2,950,000