Q. Reference: 2019 Capital Budget Application, response to Request for Information NP-NLH-006

> The addition of a 230/66 kV, 40/53.3/66.7 MVA power transformer and associated equipment to the Bottom Brook Terminal Station is not in Hydro's "2019-2023 Capital Plan" at this time. Hydro is evaluating the requirement for any system additions as part of its supply adequacy analysis to be included in its submission of the Supply Adequacy report to the Board, scheduled for November 15, 2018.

Was the addition of a 230/66 kV, 40/53.3/66.7 MVA power transformer and associated equipment to the Bottom Brook Terminal Station specifically dealt with in the Reliability and Resource Adequacy Study filed on November 16, 2018? If so, please provide the reference. If not, why not?

A. The addition of a 230/66 kV, 40/53.3/66.7 MVA power transformer and associated equipment to the Bottom Brook Terminal Station was assessed as part of the "Reliability and Resource Adequacy Study" filed on November 16, 2018 ("Study"). The details summarized below were developed as part of supporting analysis that was not explicitly referenced in the Study.

Under normal operation the Newfoundland Power load in the Stephenville area is supplied via the radial 230 kV transmission line TL 209 (Bottom Brook – Stephenville)("TL 209"). During peak load conditions loss of supply over TL 209 is addressed by placing the Stephenville Gas Turbine in operation as a generator. Under light load conditions, with Stephenville T1[1] or TL 209 out of service, the 138/66 kV transformer at Bottom Brook ("Bottom Brook T2") is utilized along with Newfoundland Power's transmission line connecting Bottom Brook to Wheelers ("400L"). It must be noted that the Bottom Brook T2 transformer has a capacity of 15/20/25 MVA. As a result, use of Bottom Brook T2 and 400L provides a transfer capacity of approximately 20 MW into the Stephenville area.

[1] Transformer T1 is a 230/138 kV unit rated at 25/33.3/41.7 MVA.

As peak loads for the Stephenville area exceed 40 MW, the backup source of supply via 400L is not an acceptable solution and system upgrades would therefore be required if the Stephenville Gas Turbine were to be retired. Such upgrades would include the addition of a 230/66 kV, 40/53.3/66.7 MVA transformer[2] T4 at Bottom Brook with connection to 400L, which would provide adequate capacity to supply the Stephenville area for an outage to TL 209.

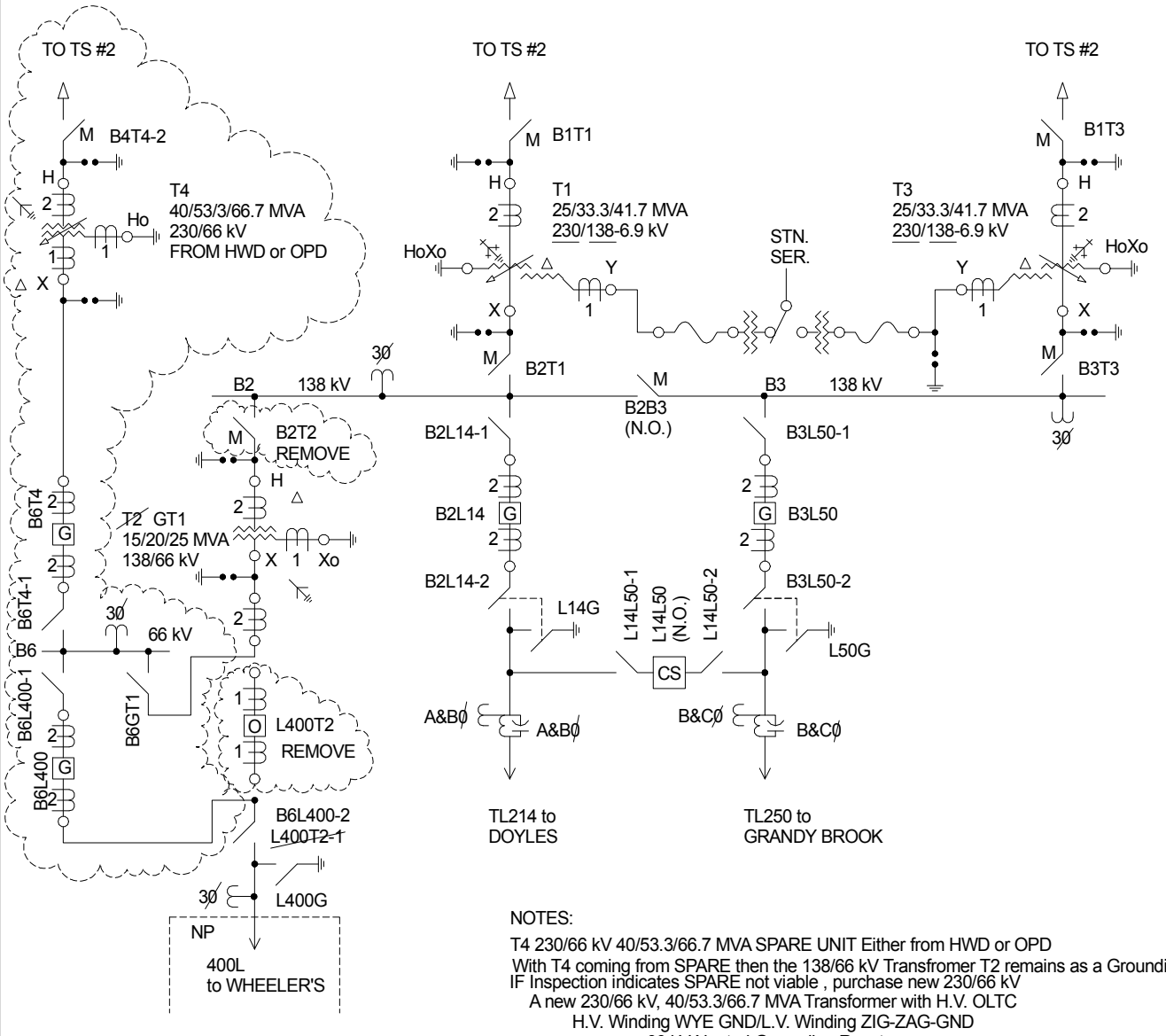
With respect to voltage control on the west coast, the operation of the Stephenville Gas Turbine as a synchronous condenser is no longer required since the addition of the Maritime Link. The Maritime Link employs voltage source converter technology and allows for voltage control of the Bottom Brook 230 kV bus.[3] In the event that both Maritime Link poles are out of service, the reactive capability of nearby hydraulic units may be used to ensure that system voltages do not violate operational limits. In the event that nearby units are out of service during extreme light loading conditions, 230 kV transmission lines such as TL 233 can be removed from service to reduce charging and mitigate overvoltage conditions.

The attached single-line diagrams (NP-NLH-001, Attachment 1 and NP-NLH-001, Attachment 2) were developed to illustrate the system modifications at Bottom Brook Terminal Station 1 and Terminal Station 2. The diagrams include the transformer addition as well as system modifications to meet grounding requirements.

[2] Newfoundland and Labrador Hydro has a spare 230/66 kV, 40/53.3/66.7 MVA power transformer as a result of the transformer capacity addition in the Hardwoods – Oxen Pond 66 kV loop.

[3] The reactive power capability for the Maritime Link is defined as ±125 MVAR at maximum active power and ±150 MVAR at zero active power.

Note 1 - Check with P&C on actual wave trap phase arrangement



NOTES:

T4 230/66 kV 40/53.3/66.7 MVA SPARE UNIT Either from HWD or OPD
With T4 coming from SPARE then the 138/66 kV Transfromer T2 remains as a Grounding Transformer
IF Inspection indicates SPARE not viable , purchase new 230/66 kV
A new 230/66 kV, 40/53.3/66.7 MVA Transformer with H.V. OLTC
H.V. Winding WYE GND/L.V. Winding ZIG-ZAG-GND
66 kV Neutral Grounding Reactor
T2 can be removed from Service

66 kV Conductor: 795 kcmil, 26/7, ACSR "DRAKE" or 2 inch IPS AL minimum
66 kV Disconnect Switches: 72.5 kV, 1200 A (min), 350 kV BIL
66 kV Circuit Breakers: 72.5 kV, 2000 A, 31.5 kA, 350 kV BIL

230 kV Conductor: 795 kcmil, 26/7, ACSR, "DRAKE" or 2 inch IPS Al (min)
230 kV Motor Operated Disconnect Switch: 253 kV, 1200 A, 1050 kV BIL

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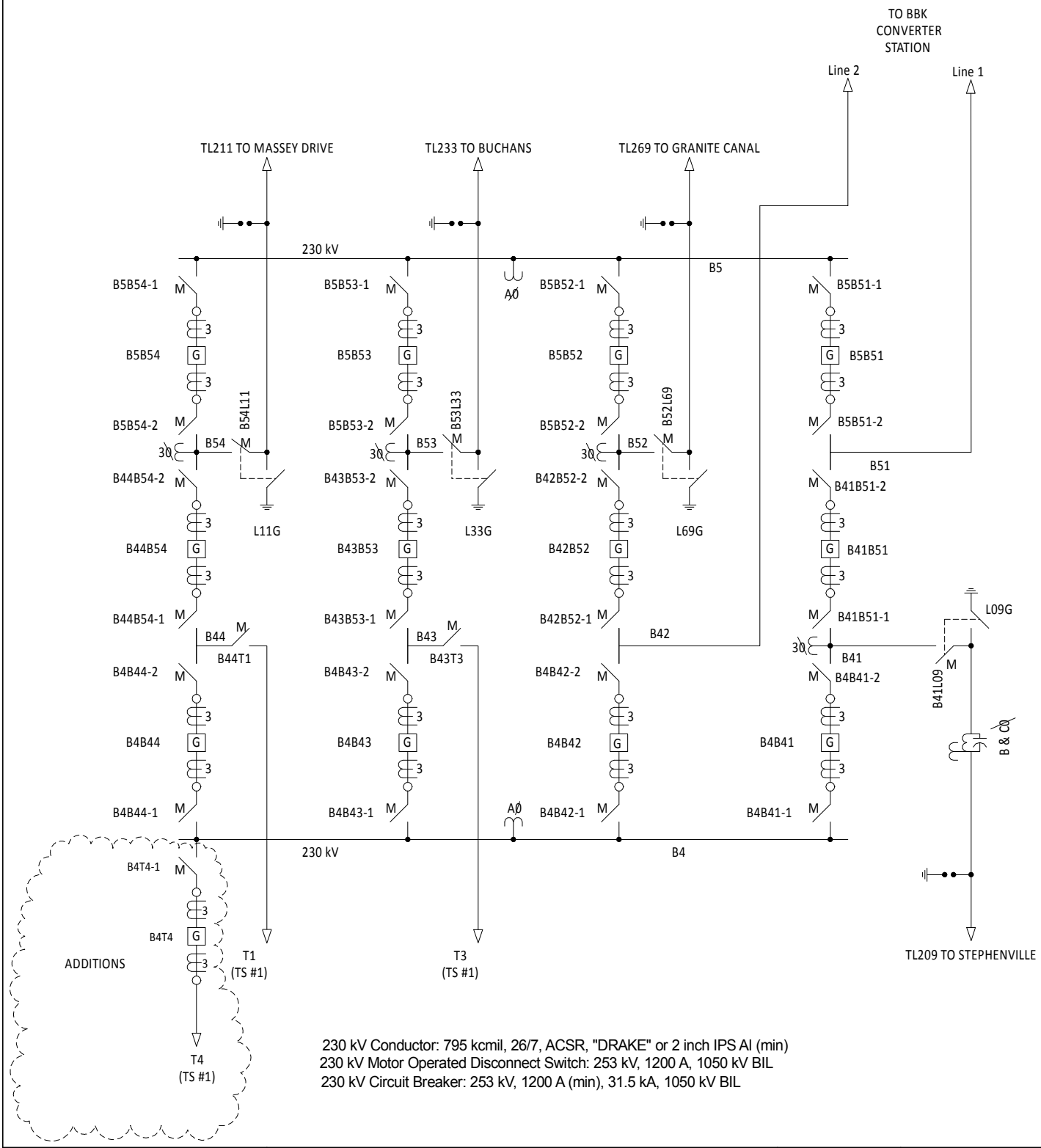
BOTTOM BROOK TERMINAL STATION #1 (BBKTS1)
230/66 kV TRANSFORMER T4 ADDITION

SYS PLAN:	SHEET 1 OF 1
SYS OP:	DATE: MARCH 2, 2018
ELEC:	DRAWN BY: PWT
P&C:	REVISION: A
FILE: BBKTS1 - SOD - Rev A T4 added.SKF	



230 kV Conductor: 795 kcmil, 26/7, ACSR, "DRAKE" or 2 inch IPS Al (min)
230 kV Motor Operated Disconnect Switch: 253 kV, 1200 A, 1050 kV BIL
230 kV Circuit Breaker: 253 kV, 1200 A (min), 31.5 kA, 1050 kV BIL

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BOTTOM BROOK TERMINAL STATION #2 (BBKTS2) 230/66 kV TRANSFORMER ADDITION

SYS PLAN:	SHEET 1 OF 1
SYS OP:	DATE: MARCH 2, 2018
ELEC:	DRAWN BY: PWT
P&C:	REVISION: B
FILE: BBKTS2 - SOD - Rev B T4 added.SKF	