Q. Tab 2.2: 2016 Additions Due to Load Growth
Attachment C – Doyles 25 kV Substation

Please explain how the age and remaining useful life of the spare 6.7 MVA transformer being removed from LET Substation was taken into consideration in the evaluation of alternatives for the DOY Substation.

A. The age and remaining useful life of the spare 6.7 MVA transformer being removed from Lethbridge Substation is taken into account to the extent to which the transformer is considered acceptable for reuse when it is taken out of service. If the transformer is not acceptable for reuse it is retired. To aid in making such a decision, a review of the most recent transformer condition assessment results, potential transformer deployment locations and the transformer's probable remaining useful life is completed.

The most recent transformer condition assessment performed on the 6.7 MVA transformer planned to be relocated from Lethbridge Substation to Doyles Substation indicated that this transformer is in good working condition.

A review of Newfoundland Power's substations indicated that the former Lethbridge transformer could be used in 7 other Company substations in the event of a transformer failure.[1] This particular transformer is currently 40 years old. Newfoundland Power estimates that the average remaining service life of a 40 year old substation transformer is approximately 20 years.[2] Given the transformer's condition, its potential use as a spare, and its average remaining life, the transformer is considered acceptable for reuse.

No explicit economic evaluation of remaining life of the spare 6.7 MVA was completed. Given the condition and age of the former Lethbridge transformer, the Company considers the remaining life of the transformer adequate for its use to provide additional capacity at the Doyles Substation.

To provide explicit analysis of the potential impact of differing lives for the reuse of the former Lethbridge transformer, the Company has completed an economic analysis determining how soon the spare 6.7 MVA unit would need to fail in order for use of the spare transformer to be not least cost.

The additional cost of installing a new transformer in 2016 is $413,000. The present value of this additional cost needs to be less that the present value of the replacement cost of $605,000 when the spare 6.7 MVA transformer needs to be replaced at the end of its

[1] This is due to the spare transformer's specific capacity, winding configuration, primary/secondary voltage ratings, and voltage regulation ability.

[2] The average remaining service life was determined based on 50 – R1.5 Iowa survivor curve. The *Depreciation Study* filed with the Company's 2013 /2014 General Rate Application determined the 50 – R1.5 Iowa curve provided a best fit for the historic lives of Newfoundland Power's Substation Equipment which includes Substation Transformers.

life.[3] Table 1 shows a comparison of the present value for the additional cost of installing a new transformer versus the timing of the replacement of the spare transformer at end of life.

Table 1
Alternative 1 Sensitivity Analysis

PV additional cost new transformer **$477,000**

PV Replacement of spare at end of life

Remaining Life	Replacement Year	Net Present Value
4	2020	$590,000
9	2025	$475,000
14	2030	$383,000
19	2035	$309,000

Table 1 shows that the spare transformer needs to have a remaining life of 9 years or more in order for the use of the spare transformer to be lower cost than purchasing a new unit.

Given the transformer is considered acceptable for reuse and the expected remaining life of the transformer is approximately 20 years it is least cost to reuse the spare transformer to increase the substation transformer capacity at Doyles Substation.

[3] This cost estimate assumes the spare 6.7 MVA transformer will be replaced on a planned basis as opposed to an emergency basis. The current transformer monitoring program identifies the requirement to replace transformers before they actually fail in service, allowing for their replacement to be appropriately planned.