NERA
ECONOMIC CONSULTING

Addendum to AESO Bulk and Regional Tariff Design: Expert Report

17 November 2021

Project Team

Richard Druce, Director
Laura Olive, Associate Director
Michael Dawes, Consultant

NERA Economic Consulting
Marble Arch House
66 Seymour Street
London, UK W1H 5BT
+44 207 659 8500
www.nera.com

Contents

Appendix B. Our Recommended Approach to Functionalize Demand-Driven Costs

287. As we discuss in Section 6.2 above, we recommend that the AESO uses updated TFO data to functionalize costs, because it can utilize a simpler methodology that leads to a more precise outcome compared to using historical data, by avoiding the complexities associated with forecasting and extrapolating costs and asset values.[1]

288. In this addendum, we use updated TFO data to calculate the ratios which we use to functionalize demand-driven costs under our Recommended Rate Design. As under the Current Rate Design, our methodology functionalizes total costs on the basis of the net book value of underlying assets, primarily delineated by voltage.

289. To implement these functionalization calculations, we used asset data received from four TFOs: AltaLink, ATCO Electric, ENMAX, and EPCOR. Each TFO's data provides the net book value of their assets in 2020, O&M costs in 2020, and the proportion of the annual revenue requirement constituted by capital and non-capital costs in 2020.

290. We summarise our simplified methodology below. We also calculate tariffs for the 2019 test year using the updated functionalization calculations in Appendix C below. We set out our calculations in full in Attachments 7A, 7B, and 7C.

B.1. Step 1: We Functionalize AltaLink's and ATCO Electric's Line and Substation Assets

291. In the first step of our recommended approach to functionalizing costs, we functionalize the net book values of AltaLink's and ATCO Electric's line and substation assets. ENMAX and EPCOR functionalize the net book value of their assets (lines and substations), using instructions from the AESO, prior to submission of their data. Therefore, we did not receive an asset-level breakdown for ENMAX and EPCOR, and do not need to follow the steps listed below.

[1] We used historical functionalization calculations based on older TFO data in our Expert Report as a holding assumption while we awaited updated TFO data.

See NERA (24 September 2021), AESO Bulk and Regional Tariff Design: Expert Report.

292. For the reasons explained in our report (see Section 6.2), we recommend functionalizing AltaLink's and ATCO Electric's lines on the basis of their voltage, following the same delineation of bulk and regional assets by voltage as used in the current methodology:

    A. We functionalize transmission lines as bulk if they have a voltage greater than or equal to 240kV.

    B. We functionalize transmission lines as regional if they have a voltage less than 240kV but greater than or equal to 69kV.

    C. We functionalize transmission lines with voltages lower than 69kV as POD.

293. However, we treat radial lines differently to other lines, irrespective of their voltage:[2]

    A. We functionalize radial lines serving load as belonging to the POD system irrespective of their voltage. However, we exclude a portion of the total net book value of these lines because they were partly funded by customer contributions.[3]

    B. We exclude the net book values of radial lines serving generation because they were funded by customer contributions.[4]

294. For some line assets, we do not have available data from the TFO in order to functionalize the asset. In these cases:[5]

    A. We first calculate the proportion of the total net book value of line assets constituted by each of the bulk, regional, and POD line assets using the data we have available.

    B. We then apply these ratios to the net book value of assets for which we do not have available data across the bulk, regional, and POD systems.

---

2 We rely on the AESO's and TFOs' determination of lines as radial, as well as their determination of whether lines serve generators or load. For ATCO, all radial lines were determined to be associated with load. See Attachment 7B, Sheets 'ATCO Lines' Column D, Sheet 'AML Lines' Columns D and E.

3 More specifically, we understand that the AESO's average investment coverage ratio has been set at 60 per cent since 2014. Therefore, we exclude 40 per cent of the total net book value of radial lines serving load from the functionalization calculation as we assume that 40 per cent of the value of assets are funded through customer contributions. See: AUC 22942-D02-2019, 22 September 2019; and AUC Decision 2014-242, 21 August 2014.

4 AUC Decision 25848-D01-2020, Alberta Electric System Operator Stage 2 Review and Variance of Decision 22942-D02-2019 Adjusted Metering Practice and Substation Fraction Methodology, 23 December 2020.

5 We perform this apportionment separately for each TFO i.e., using TFO A's unavailable data and its functionalized line values; and using TFO B's unavailable data and its functionalized line values.

295. We recommend functionalizing ATCO Electric's and AltaLink's substations on the basis of their secondary voltage, following the same delineation of bulk and regional assets by secondary voltages as used in the Current Rate Design:

    A. We functionalize substations as bulk if they have a secondary voltage greater than or equal to 240kV.

    B. We functionalize substations as regional if they have a secondary voltage less than 240kV but greater than or equal to 69kV.

    C. We functionalize substations with secondary voltages lower than 69kV as belonging to the POD system.

296. We also consider how load and/or generation customer contributions offset substation costs. We adopt the AESO's and TFO's apportionment of the net book value of substations between DTS (i.e. load) and Supply Transmission Service ("**STS**") (i.e. generation) based on the contracted capacity at the substation:[6]

    A. The net book value of the substation is functionalized to POD if the contracted capacity at the substation is 100 per cent DTS, irrespective of the secondary voltage of the substation. However, similar to our treatment of radial lines, we exclude a portion of the net book value of these substations because they were partly funded by customer contributions.[7]

    B. The net book value of the substation is excluded from the functionalization of substation costs if the contracted capacity is 100 per cent STS, irrespective of the secondary voltage of the substation, because they were funded through customer contributions.

    C. If the substation has both DTS and STS contracts, we apportion the net book value of the substation between DTS and STS based on the proportion of the contracted capacity, and then treat the portion of costs that are DTS and STS as described above.

6 See Attachment 7B, Sheets 'ATCO Subs' Columns D through F, Sheets 'AML Subs' Columns D through F.

7 Similar to radial lines, we exclude 40 per cent of the total net book value of these substations as the AESO's average investment coverage ratio is approximately 60 per cent.

297. For some substation assets, we do not have available data from ATCO Electric in order to functionalize the asset. In these cases, and similarly to above:[8]

   A. We first calculate the proportion of the total net book value of substation assets constituted by each of the bulk, regional, and POD substation assets (for which we have available data).

   B. We then use these proportions to apportion the net book value of substations for which we do not have available data across the bulk, regional, and POD systems.

298. We summarise our functionalization of assets to bulk, regional, and POD in Table 13.

Table 13: Summary of Functionalization of Capital Costs

	Bulk	Regional	POD
Lines	▪ Voltage >= 240kV	▪ Voltage <240kV and >=69kV	▪ Voltage <69kV ▪ The share of the net book value of radial lines not funded by customer contributions, irrespective of voltage
Substations	▪ Secondary voltage >= 240kV	▪ Secondary voltage <240kV and >=69kV	▪ Secondary voltage <69kV ▪ The share of the net book value of substations not funded by customer contributions, irrespective of voltage

Excludes radial lines associated with generation and substations apportioned to STS as funded through customer contributions. Source: Attachment 7B.

B.2. Step 2: We Calculate Capital Cost Functionalization Ratios

299. Having functionalized line and substation assets for AltaLink and ATCO Electric, we sum the net book value of assets across all four TFOs (including the already functionalized assets by EPCOR and ENMAX) to calculate the total net book value of assets in each of the bulk, regional, and POD systems.

300. We calculate the proportions of the total net book value of assets constituted by the net book value of assets functionalized to each of the bulk, regional, and POD systems. These proportions are our functionalization ratios for capital costs.

[8] We perform this apportionment separately for each TFO i.e. using TFO A's unavailable data and its functionalized substation values; and using TFO B's unavailable data and its functionalized substation values.

B.3. Step 3: We Calculate Non-Capital Cost Functionalization Ratios

301. We then examine O&M costs across the four TFOs. The AESO functionalizes TFOs' O&M costs into bulk, regional, and POD systems based on a mechanical update of the allocators that it adopts under the Current Rate Design.[9]

302. The total functionalized O&M costs for each TFO do not equal the TFO's total non-capital costs. Therefore, we perform a residual adjustment for each TFO and prorate the remaining non-capital costs across bulk, regional, and POD systems using the proportion of functionalized O&M costs in each of those systems.[10]

303. We then aggregate results across the four TFOs. We calculate total non-capital costs in each of the bulk, regional, and POD systems by summing the functionalized non-capital costs across the four TFOs. We then calculate the proportions of total non-capital costs constituted by total non-capital costs functionalized to each of the bulk, regional, and POD systems. These proportions are our functionalization ratios for non-capital costs.

B.4. Step 4: We Use a Weighted Average Approach to Obtain Final Functionalization Ratios

304. In our Recommended Rate Design, we use final functionalization ratios that combine the capital and non-capital ratios that we calculate above to functionalize demand-driven costs.[11] To determine the final functionalization ratios, we first calculate our cost (combined capital and non-capital) functionalization ratios:

    A. We sum capital and non-capital costs in the annual revenue requirement across all TFOs.

---

9 For details of all allocators, see Attachment 7C.

For AltaLink, we utilise the data it provides in Attachment 7C, Sheet: "AltaLink", Cells R24:25 to functionalize brushing costs using the O&M allocators, but then adjust the total of functionalized brushing costs such that it is consistent with those reported in Attachment 7C, Sheet: "AltaLink", Cell D59 whilst maintaining the same proportion of brushing costs functionalized to bulk, regional, and POD. This is because AltaLink provides two sets of brushing cost data.

10 For AltaLink and ATCO Electric, we use total non-capital costs reported on Attachment 7C, Sheet: "AltaLink", Cells D39; and Sheet "ATCO Electric", Cells D39; because these reconcile to the costs reported in TFO's General Tariff Applications. In the case of AltaLink and ATCO Electric, the bottom-up data detailing line-item O&M and G&A costs (for instance see Attachment 7C, Sheet: "AltaLink", Cells D78) do not sum to the same total non-capital costs.

11 The calculations in this section are detailed in Attachment 7B, Sheet "Functionalization Calculation".

B. We calculate the proportion of capital costs to total costs (capital and non-capital costs). We also calculate the proportion of non-capital costs to total costs (capital and non-capital costs).

C. We calculate a weighted average of the capital and non-capital functionalization ratios, weighting by the proportion of capital and non-capital costs to total costs respectively as calculated in Step B above. The final proportions are our cost functionalization ratios:

$$Cost\ Functionalization\ Ratio = \left(\frac{Capital\ Costs}{Total\ Costs} \times Capital\ Functionalization\ Ratio\right) + \left(\frac{Non\text{-}Capital\ Costs}{Total\ Costs} \times Non\text{-}Capital\ Functionalization\ Ratio\right)$$

305. Finally, we adjust our cost functionalization ratios to account for additions from the Competitive Process i.e., to avoid double counting the revenue requirement of Alberta PowerLine:

A. We apportion the AESO's revenue requirement less the additions associated with the Competitive Process across bulk, regional, and POD systems using our final functionalization ratios developed in Paragraph 304.C above.[12]

B. We functionalize the revenue requirement of Alberta PowerLine to bulk because it relates to bulk assets.[13]

C. We calculate the final functionalization ratios by examining the proportion of total revenue requirement constituted by the revenue requirement functionalized to the bulk, regional, and POD systems respectively.

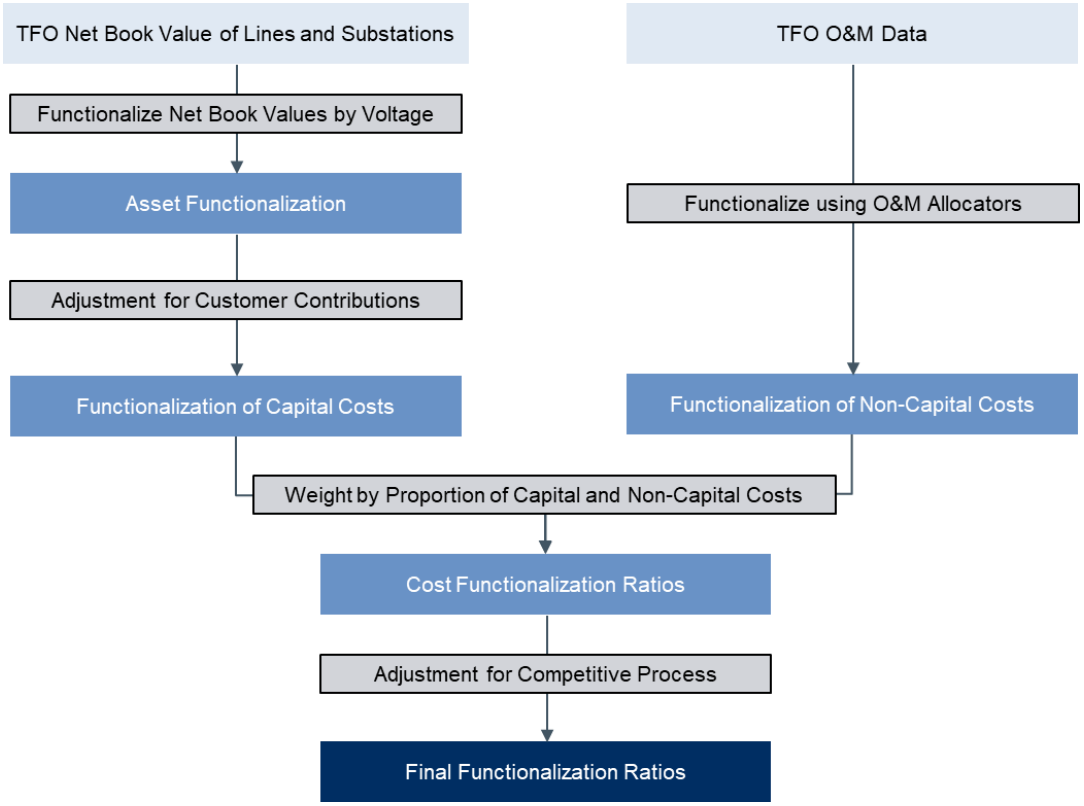
306. We summarise the method of functionalizing costs in Figure 15 below.

[12] We use a revenue requirement of $2,199m in our calculations. Source: Exhibit 26541_X0038, Appendix K, "3-1 2020 Costs".

[13] We use costs relating to the Competitive Process of $106.74m in our calculations. Source: Exhibit 26541_X0038, Appendix K, "3-1 2020 Costs".

Source: AESO, Fort McMurray West 500kV Transmission Project, Link: https://www.aeso.ca/grid/competitive-process/fort-mcmurray-west-500-kv-transmission-project/.

Figure 15: Summary of Functionalization Method



Source: NERA Illustration.

307. We use our final functionalization ratios to functionalize demand-driven costs. However, in our Recommended Rate Design we functionalize demand-driven Bulk and Regional costs between bulk and regional systems only (and not POD). Therefore:

    A. We calculate the proportion of costs to be functionalized to bulk by taking the ratio of the bulk final functionalization factor to the total of the bulk and regional final functionalization factors.

    B. We calculate the proportion of costs to be functionalized to regional by taking the ratio of the regional final functionalization factor to the total of the bulk and regional final functionalization factors.

308. We use the functionalization factors calculated using the updated TFO data to recalculate our Recommended Rate Design for the 2019 test year in Appendix C and Attachment 7A. For clarity, whilst we use the functionalization factors calculated using 2020 TFO data, all remaining elements of the calculation (e.g. revenue requirement, billing determinants, and classification/allocation of costs) are calculated using 2019 data.

Appendix C. Calculation of Tariffs Using Our Recommended Rate Design

309. In this Appendix, we set out our calculation of the Bulk and Regional Tariff for 2019 using our Recommended Rate Design. These rates differ from those presented in Appendix A because we use the updated TFO data to functionalize demand-driven costs. We set out our calculations in Attachment 7A.

310. For the purposes of this calculation, we assume a Bulk and Regional Tariff revenue requirement in 2019 as shown in Table 14 below.

Table 14: Costs to be Recovered Through Bulk and Regional Tariff in 2019

	Units	2019
Bulk and Regional Costs	$m	1,572.32

In order to ensure comparability with the rates set under the Current Rate Design in 2019, we calculate the charges under our Recommended Rate Design using the same non-POD cost revenue requirement and forecast billing determinants that the AESO used to calculate rates in 2019. Source: Attachment 7A.

311. In the first step of our Recommended Rate Design, we classify costs between those associated with demand and those associated with accommodating flows of in-merit energy. We report this classification using our Recommended Rate Design in Table 15 below.

Table 15: Classification of Costs Between Demand and Accommodating Flows of In-Merit Energy

Classification of Costs	Units	2019
Demand	%	59.45%
Accommodating Flows of In-Merit Energy	%	40.55%
Classification of Revenue Requirement		
Demand	$m	934.81
Accommodating Flows of In-Merit Energy	$m	637.51
Total	$m	**1,572.32**

Note: Total may not match due to rounding. Source: Attachment 7A and 3B.

312. Next, we functionalize demand-driven costs into bulk system demand-driven costs, and regional system demand-driven costs using functionalization ratios, see Table 16 below.

Table 16: Functionalization of Demand-Driven Costs Between Bulk and Regional Systems

Functionalization Ratios for Demand-Driven Costs	Units	2019
Bulk System	%	66.63%
Regional System	%	33.37%
Functionalization of Demand-Driven Costs		
Bulk	$m	622.84
Regional	$m	311.97
Total	$m	**934.81**

Note: Total may not match due to rounding. Source: Attachment 7A.

313. Finally, we allocate bulk system demand-driven costs between those associated with coincident peak demand and those associated with non-coincident peak demand using allocation factors calculated using our Recommended Rate Design (see Table 17 below).

Table 17: Allocation of Bulk System Demand-Driven Costs Between Coincident Peak and Non-Coincident Peak

Allocation Factors for Bulk Demand-Driven Costs	Units	2019
Coincident Peak	%	92.82%
Non-Coincident Peak	%	7.18%
Allocation of Bulk Demand-Driven Costs		
Coincident Peak	$m	578.10
Non-Coincident Peak	$m	44.74
Total	$m	**622.84**

Note: Total may not match due to rounding. Source: Attachment 7A and 3B.

314. Having classified, functionalized, and allocated costs, we calculate charges by dividing the costs to be recovered by the forecast billing determinants upon which we recommend the AESO recovers those costs. We recommend recovering bulk system demand-driven costs from a charge levied on a five-year trailing average of 12CP, the remaining demand-driven costs from a charge levied on billing capacity, and the costs associated with accommodating flows of in-merit energy from a flat energy charge. Our calculation of charges is set out in Table 18 below.

Table 18: Recovery of Costs from Billing Determinants and Calculation of Bulk and Regional Charges

Costs Recovered from Billing Determinants	**Units**	**2019**
12 CP	$m	578.10
Billing Capacity	$m	356.71
Energy	$m	637.51
Total	$m	**1,572.32**
Forecast Billing Determinants		
12 CP	MW-months	100,532
Billing Capacity	MW-months	161,545
Energy	GWh	62,524
Charges Under Our Recommended Rate Design		
12 CP Charge*	$ per MW-month	**5,750**
Billing Capacity Charge	$ per MW-month	**2,208**
Energy Charge	$ per MWh	**10.20**

** Note: 12CP charge levied on a five-year trailing average of 12CP but calculated using the same 12CP billing determinant as used under the Current Rate Design. Total may not match due to rounding. In order to ensure comparability with the rates set under the Current Rate Design in 2019, we calculate the charges under our Recommended Rate Design using the same non-POD cost revenue requirement and forecast billing determinants that the AESO used to calculate rates in 2019. Source: Attachment 7A.*

Qualifications, assumptions and limiting conditions

NERA Economic Consulting ("**NERA**") was instructed by Norton Rose Fulbright LLP to produce this report providing our expert opinion on NERA's Recommended Rate Design for the Alberta Electric System Operator's ("**AESO**") Bulk and Regional Tariff. The primary audience for this report includes the Alberta Utilities Commission, and the AESO. NERA shall not have any liability to any third party in respect of this report or any actions taken or decisions made as a consequence of the results, advice or recommendations set forth herein.

This report does not represent investment advice or provide an opinion regarding the fairness of any transaction to any and all parties. This report does not represent legal advice, which can only be provided by legal counsel and for which you should seek advice of counsel. The opinions expressed herein are valid only for the purpose stated herein and as of the date hereof. Information furnished by others, upon which all or portions of this report are based, is believed to be reliable but has not been verified. No warranty is given as to the accuracy of such information. Public information and industry and statistical data are from sources NERA deems to be reliable; however, NERA makes no representation as to the accuracy or completeness of such information and has accepted the information without further verification. No responsibility is taken for changes in market conditions or laws or regulations and no obligation is assumed to revise this report to reflect changes, events or conditions, which occur subsequent to the date hereof.

NERA
ECONOMIC CONSULTING

NERA Economic Consulting
Marble Arch House
66 Seymour Street
London, UK W1H 5BT
+44 207 659 8500
www.nera.com