APPLICATION OF
RES CANADA TRANSMISSION LP

FOR

DESIGNATION AS AN ELECTRICITY TRANSMITTER
TO DEVELOP THE EAST-WEST TIE LINE

ARGUMENT-IN-REPLY

Filed: June 3, 2013

EB-2011-0140

IN THE MATTER OF sections 70 and 78 of the *Ontario Energy Board Act 1998*, S.O. 1998, c. 15 (Schedule B);

AND IN THE MATTER OF a Board-initiated proceeding to designate an electricity transmitter to undertake development work for a new electricity transmission line between Northeast and Northwest Ontario: the East-West Tie Line.

RES CANADA TRANSMISSION LP

ARGUMENT-IN-REPLY

June 3, 2013

DENTONS

Helen T. Newland

helen.newland@dentons.com
D +1 416 863 4471

Dentons Canada LLP
77 King Street West, Suite 400
Toronto-Dominion Centre
Toronto, ON, Canada M5K 0A1

T +1 416 863 4511
F +1 416 863 4592

Salans FMC SNR Denton
dentons.com

June 3, 2013

VIA E-MAIL & COURIER

Ms. Kirsten Walli
Board Secretary
Ontario Energy Board
2300 Yonge Street
27th Floor, Box 2319
Toronto, ON
M4P 1E4

Dear Ms. Walli:

Re: RES Canada Transmission LP;
East-West Tie Line Designation Proceeding;
Argument-in-Reply;
Board File Number EB-2011-0140

I am writing on behalf of RES Canada Transmission LP ("**RES Transmission**") and pursuant to Procedural Order 7 to file RES Transmission's Argument-in-Reply.

We will file hard copies by courier as soon as possible.

Yours truly,
Dentons Canada LLP

(signed) Helen T. Newland

Helen T. Newland
HTN/ko
Encls.
c.c. All Registered Transmitters
All Intervenors
Mr. Jerry Vaninetti
Mr. Darrell Gerrard
Mr. Matthew McVee
Mr. Ryan Flynn
Ms. Jennifer Lea

TABLE OF CONTENTS

I. INTRODUCTION

1. RES Canada Transmission LP ("**RES Transmission**") has filed a plan for the development, construction and operation of the East-West Tie Line ("**EWTL**" or "**Project**") that gives the Ontario Energy Board ("**OEB**" or "**Board**") and, thus, Ontario electricity ratepayers, a choice of two different designs: a 230 kilovolt ("**kV**") double circuit design with conventional lattice towers ("**Reference Design**") and a 230 kV single circuit design with a combination of conventional lattice and steel H-frame towers ("**Preferred Design**").[1] Each design can be constructed along either of the two routes identified by RES Transmission: the Reference Route that parallels the existing East-West Tie corridor and a Preliminary Preferred Route that departs from the existing corridor for 130 kilometres ("**km**") in order to avoid Pukaskwa National Park and First Nation reserve lands. Both the Reference Design and the Preferred Design incorporate dead-end structures along the length of the EWTL, configured to facilitate future interconnections of new generation and loads, at minimal cost and with minimal disruption to the transmission system.

2. Both the Reference Design and the Preferred Design meet or exceed all of the OEB's design and technical requirements for the EWTL. Moreover, both designs meet or exceed the Ontario Power Authority's ("**OPA**") transfer capacity requirements as well as all of the applicable transfer capacity, system performance and system reliability standards prescribed by the Independent Electricity System Operator ("**IESO**"), North American Electricity Reliability Corporation ("**NERC**") and the Northeast Power Coordinating Council, Inc. ("**NPCC**"). In other words, the Reference Design and the Preferred Design are equally reliable.

3. An important feature of the Preferred Design is that all of the 650 MW of new capacity can be installed at once or in increments over time, in order to meet system

[1] These cost estimates assume the EWTL is constructed along RES Transmission's Preliminary Preferred Route.

requirements and customer energy demand as they materialize. Installation of the first increment alone (i.e., the line itself), ensures compliance with all applicable IESO, NERC and NPCC reliability standards. Subsequent increments of capacity can be added over time, in the form of station upgrades.

4. The staging feature of the Preferred Design defers and, thus, reduces the overall cost to ratepayers. Assuming that the full amount of 650 MW of new capacity is installed in five stages over an eight-year period, commencing in 2018, the net present value ("**NPV**") of annual owning and operating savings would be $62.5 million – not an insignificant amount. A decision regarding the level of transfer capacity that should be installed for service in 2018, could be made in conjunction with the OPA after designation and brought forward to the Board at the leave-to-construct ("**LTC**") phase.

5. The total development and construction cost of the line portion of the Reference Design and the Preferred Design is $494 million and $413 million, respectively. The total life cycle project cost ("**Total Life Cycle Cost**") of the Reference Design and the Preferred Design is $531 million and $478 million, respectively. Total Life Cycle Cost includes the cost of developing and constructing the line itself <u>and</u> the NPV of annual operating and maintenance costs ("**O&M**") for the 50 year life of the Project. In the case of the Preferred Design, the estimate of Total Life Cycle Cost also includes the incremental capital cost of station upgrades that are required to accommodate the Preferred Design (estimated at $25 million), as well as the NPV of incremental annual O&M costs related to series compensation equipment, line losses and control actions, that are also required to accommodate the Preferred Design. Even with these additional costs, the Total Life Cycle Cost for the Preferred Design is $53 million less than for the Reference Design.

6. RES Transmission has a very high degree of confidence in all of its cost estimates. This confidence allows it to stand behind its estimates in two different ways. First it is

offering to develop and construct the line portion of the Reference Design or the Preferred Design for a firm cost of $493.7 million and $413.4 million, respectively (each, the "**Bid Amount**"; together, the "**Firm Bid Proposal**"). Second, a specific and innovative Risk Sharing Proposal[2] incents RES Transmission to complete the development and construction of the EWTL on time and on budget, by rewarding it if it completes the Project for less than the Bid Amount and penalizing it for exceeding the Bid Amount. Both the penalty for overages and the reward for underages are expressed in terms of an allowed rate of return on equity ("**ROE**").

7. Under the Risk Sharing Proposal, the reward and the penalty are not symmetrical. For example, in the case of the Preferred Design and assuming an ROE of 8.93 percent and a $20 million overage of the Bid Amount, RES Transmission's return on equity would be reduced by **0.23 percent**.[3] Conversely, however, if RES Transmission "beats" the Bid Amount by $20 million, its ROE would be increased (relative to 8.93%) by just **0.15 percent**. The "bottom line" is that under its Risk Sharing Proposal, RES Transmission assumes a disproportionately larger risk of cost overages, relative to the "risk" that ratepayers would bear (in the form of an ROE reward to RES Transmission), if actual development and construction costs are less than the firm Bid Amount.

8. If it is designated in this proceeding, RES Transmission has undertaken to seek approval of transmission rates derived in accordance with the Bid Amount Proposal and the Risk Sharing Proposal, in its first rate application after the EWTL goes into service. The Board, in that proceeding, would have the sole discretion to accept or reject one or more aspects of RES Transmission's application, including its applied-for annual revenue

[2] The Firm Bid Proposal and the Risk Sharing Proposal, together, comprise RES Transmission's "Development and Construction Cost Proposal", as defined in its Application.

[3] This calculation assumes that the dollar value of the "Exceptions" is zero. The Exceptions comprise four cost categories in respect of which cost overages, above a specified dollar threshold relative to the estimates embedded in the Bid Amount, would be excluded (i.e., carried out) from the application of the "penalty for overages" provision of the Proposal. It is expected that the quantum of excluded cost overages would constitute a very small percentage of the Bid Amount..

requirement derived on the basis, *inter alia*, of the Bid Amount Proposal and the Risk Sharing Proposal.

9. RES Transmission believes its Preferred Design delivers the best value for ratepayers. At $478 million, its Total Life Cycle Cost is $14.7 million less than the next lowest estimate (see Figure 1 and Table 2, below). This does not take into account an additional $62.5 in savings (on an NPV basis) if the installation of the full 650 MW of capacity is installed in stages, over an eight year period. (RES Transmission's Reference Design is in the middle of the Total Life Cycle Cost pack but, unlike other proposals based on a double circuit design, the construction and development cost component is proposed as a firm Bid Amount as opposed to an estimate.)

10. No other applicant is standing behind its cost estimates. Indeed, as discussed at paragraphs 33-38, below, some applicants have presented only broad ranges of cost estimates, while others have presented estimates that are not underpinned by any rigour or detail at all. No other applicant has offered any concrete proposal to back up its cost estimates, incent cost minimization during the development and construction phases of the Project or share risks with ratepayers.

11. The balance of this Argument-in-Reply ("**Reply Argument**") considers (i) issues of public interest and fairness and suggests a way forward for the Board in arriving at a reasoned decision based on sound evidence; and provides (ii) RES Transmission's general response to key issues raised pertaining to its Application. RES Transmission's comprehensive and detailed response to all issues raised by other applicants and by intervenors, are included as Appendices 1-7.

II. THE PUBLIC INTEREST

12. As with every decision it takes, the Board must determine what is in the overall public interest, balancing a wide array of different and, in some cases, competing interests.

These include the interests of consumer groups, concerned about the impact of the EWTL on electricity rates; Ontario communities, whose economies and livelihoods depend upon a reliable supply of electricity; First Nation and Métis communities, who rightfully expect to share in the economic benefits of infrastructure projects that affect their rights, lands and traditional territories; environmental stewards, who speak on behalf of all Ontarians about the impact of development on northern ecosystems; and labour unions, whose members are dependent on the incumbent transmitters for their employment.

13. How should the Board strike the appropriate balance amongst these interests? In their Final Arguments[4], the School Energy Coalition ("**SEC**") and the Consumers Council of Canada ("**CCC**") propose that the Board should assess each application through the lens of the Board's statutory objectives for electricity: to protect consumers with respect to prices and the adequacy, reliability and quality of electricity services and to promote cost-effectiveness and economic efficiency in the transmission of electricity.[5]

14. RES Transmission agrees. Indeed, the Board's stated objectives for this proceeding – driving economic efficiency for the benefit of ratepayers[6] and selecting the applicant that offers the best value for ratepayers,[7] reflect the Board's statutory objectives. In sum, reliability, cost-effectiveness and economic efficiency – all for the benefit of ratepayers – are the touchstones of the Board's public interest electricity mandate in this proceeding.

III. FAIRNESS

15. The interests of the applicants are not part of the Board's decision equation. The Board is not required to balance the interests of applicants against the overall public interest.

---

[4] SEC, Final Argument, at para. 1.2.4; CCC, Final Argument, at p. 3.
[5] OEB Act, s. 1 (1) 1, 2.
[6] EB-2011-0140, Phase I Decision and Order (July 12, 2012) ("**Phase I Decision**"), p. 5.
[7] EB-2011-0140, Decision on Intervention and Cost Award Eligibility (March 30, 2012), p. 8.

The only legitimate expectation of applicants is of a fair process: a level "playing field" (i.e., no inherent advantage for incumbent transmitters), a pre-determined and clearly defined project scope (i.e., "knowing the case that must be met") and a decision based on sound evidence and sound reasoning.

16. The Board took steps, early on, to ensure that the first two indicators of fairness were met. It recognized the importance of a level playing field and acted to constrain the manner in which incumbent transmitters participated in the designation proceeding.[8] The Board also provided registered transmitters with a clearly defined Project scope that stipulated specific Project criteria ("**Project Criteria**"): transfer capacity, reliability standards, target in-service date, Project life, and the like.[9] These Project Criteria mirrored the Project scope criteria proposed by OPA in its June 30, 2011 report to the Board.[10] The Project Criteria were supplemented by the Board's Minimum Technical Requirements (which included the Board's Minimum Design Criteria as an appendix).[11] The Board also issued detailed Filing Requirements that were informed by input of applicants and intervenors.[12] Finally and notwithstanding the expressed preference of the OPA and the IESO for a double circuit design[13,14], the Board also invited applicants to be innovative and propose alternatives that led to a "lower cost solution while meeting the Project requirements."[15] In the result, the Filing Requirements clearly contemplated design variations in the form of number of circuits, choice of towers and conductors, and transformer station equipment.[16] Together, the Project Criteria, Minimum

[8] Phase I Decision, p. 3 and pp. 19-24.
[9] Letter dated December 20, 2011 to All Licensed Electricity Transmitters ("**December 2011 Letter**"), Attachment 1, p. 2.
[10] OPA, Long Term Electricity Outlook for the Northwest and Context for the East-West Tie Expansion ("**OPA Report**") (June 30, 2011), p. 20.
[11] December 20, 2011 Letter, Attachment 2.
[12] Phase 1 Decision, Appendix A.
[13] OPA Report, p. 20.
[14] "An assessment of the westward transfer capability of various options for reinforcing the East-West Tie" (August 18, 2011) (the "**IESO Feasibility Report**") p. 7.
[15] December 2011 Letter, Attachment 1, p. 2; Phase I Decision, p. 11; Filing Requirements, s. 6.5.
[16] Filing Requirements, s. 6.1.

Technical Requirements and Filing Requirements (collectively, the "**Project Requirements**") provide applicants with a clearly defined scope of project.

17. With respect to the third indicator of fairness – a reasoned decision based on sound evidence – the Board will need to decide which evidence it can rely on and which evidence should be disregarded or given little weight. The record of this proceeding is replete with new and untested evidence that has been introduced in responses to interrogatories and in argument; conflicting evidence, not supported by expert reports, some of which has been tested through the interrogatory process, some of which has not; and expressions of opinion and conclusory statements, not supported by any evidence at all, expert or otherwise.

18. Of greatest concern is the Affidavit of Peter Catchpole, of Power Engineers Inc., submitted as an attachment to EWT's Argument-in-Chief (the "**Affidavit**"). RES Transmission requests that the Board strike the Affidavit from the record of this proceeding for the reasons set out in SEC's final argument;[17] specifically, because Power Engineers Inc. is part of the EWT team and is not an independent expert and because the Affidavit was filed as part of EWT's Argument-in-Chief and is, accordingly, inappropriate, late in time and completely untested in this proceeding.

19. Of concern, as well, are the new grounds of opposition to the single circuit design raised by the OPA and the IESO in their Final Arguments. Prior to this proceeding and continuing throughout this proceeding until their Final Argument, both the IESO and the OPA expressed a preference for a double circuit design based on the fact that a single circuit design would require larger control actions (in terms of MW), following the unplanned outage of one line, followed by the unplanned outage of a second line (the so-called "**N-1-1 Contingency**"). The debate in this proceeding then shifted to what the cost of these additional control actions would be.

[17] SEC Final Argument, pp. 10-11.

20. In their Final Arguments, the IESO and the OPA did not address the reliability/cost trade-off, an omission that caused concern amongst some intervenors.[18] Rather, the IESO and the OPA maintained their "going-in" preference for a double circuit design and raised, for the first time, issues related to an alleged lack of "scalability," greater maintenance requirements associated with the series compensation equipment and greater difficulty scheduling planned outages. None of these grounds of opposition were known to applicants or the Board at the time of application, nor are they supported by any evidence or discussed in any detail.

21. The IESO and the OPA have a special role in this proceeding. They are not ordinary interveners and, as custodians of the energy sector in Ontario, their views carry weight. This is precisely the reason why the Board, in its Phase I Decision, stated that the IESO and the OPA should remain neutral in this proceeding, as among applicants. In light of this, the Board should be cautious in considering the IESO and OPA's submissions on the single circuit vs. the double circuit debate.

IV. THE DESIGNATION CRITERIA

22. The stated objective of this proceeding is to select the "most qualified designation applicant" to develop the EWTL and bring an application for leave-to-construct under section 92 of the OEB Act.[19] The most qualified applicant will be determined in accordance with the OEB's designation criteria which fall into two categories: criteria that test the capability of an applicant itself – its organization, experience, technical capability and financial capacity – and criteria that test the feasibility and robustness of an applicant's Project plan – its proposed design, cost, route, schedule and consultation plan and its proposal for the participation of First Nation and Métis in the Project.[20,21]

[18] Northwatch Final Argument, p. 9.
[19] Phase I Decision, p. 3.
[20] *Ibid.*, p. 4.
[21] *Ibid.*, p. 18.

23. While the Board will generally expect the designated transmitter to conform to its filed application, it also expects the plan to evolve and be refined during the development phase of the Project.[22]

24. With respect to design, the Board has explained that this criterion "is intended to be assessed as pass/fail in respect of whether the applicant's design meets the targeted transfer capability while satisfying all applicable reliability standards."[23] The Board also states that under this criterion, an applicant may also demonstrate "the ways in which its design provides advantages to the transmission system, local communities or transmission ratepayers or demonstrates advantageous innovation, or in some way exceeds the minimum requirements, while remaining cost effective."[24] In sum, pass/fail with respect to transfer capability and reliability standards and "extra points" for design-related advantages.

25. On the issue of costs, the Board acknowledges that cost estimates will be firmed up during the development phase. At the designation stage, the Board will assess the economic efficiency of each applicant's plan by having regard to the reasonableness and reliability of its total Project cost and its proposals for reducing costs and risks for ratepayers.[25] These factors will inform the Board's assessment of an applicant's plan. In selecting a designated transmitter, the Board will not be approving an applicant's Project cost or rate proposal. This will be for future panels of the Board, in future OEB proceedings (i.e., leave-to-construct and rate proceedings).

26. With respect to Project schedule, the Board noted that it was not seeking a commitment but, rather, information to assist it in understanding an applicant's strategy for completing the Project. Again, the Board acknowledged that schedules would change as

[22] *Ibid.*, pp. 7, 12 and 18.
[23] Phase I Decision, p. 7.
[24] *Ibid.*
[25] *Ibid.*, pp. 4, 5.

a result of more detailed development work.[26] With respect to route, the Board made it clear that applicants could propose one or more alternative routes. Presumably, the Board will take the advantages and disadvantages of an applicant's route proposals into account in its overall assessment of the application.

V. THE DESIGNATION DECISION

27. By the close of this proceeding, many thousands of pages of evidence and argument will have been submitted by applicants and intervenors, each with their own agenda and objectives. The sheer volume of material, varying assumptions and conflicting evidence on technical issues that, in the normal course, are not adjudicated by the Board, will make its task a difficult one.

28. The Board may decide to approach its decision by first eliminating applicants on the basis of those designation criteria that can be assessed on a pass/fail basis. This would include the pass/fail design criteria identified by the Board itself – meeting targeted transfer capability and all applicable reliability standards[27] – but may also include other decision criteria that could be adequately assessed on a pass/fail basis, such as minimum requirements related to relevant experience, financial capacity and technical capability and compliance with the Board's Project Requirements (see Table 1, below). The question for the Board at this stage will be whether a "fail" on any one or more of the pass/fail criteria puts an applicant out of the running. In RES Transmission's submission, the answer to this question is "yes". There must be some way for the Board to narrow the field.

29. The next step may be for the Board to make a more subjective assessment of the remaining designation applications on the basis of sound evidence and in accordance with the Board's remaining designation criteria. The Board could assign a maximum

[26] *Ibid.*, p. 12.
[27] *Ibid.*, p. 7.

point value to each criteria and, then, rank each applicant in accordance with its total number of points. Points could be awarded for positive aspects of an application and deducted for deficiencies and weaknesses. RES Transmission proposes that the Decision Matrix, depicted in Table 1, below, could form the basis of the Board's assessment in this regard.

TABLE 1: DECISION MATRIX

	Applicant	**Points**	**Pass/Fail**
1.	Relevant Experience		√
2.	Financial Capacity		√
3.	Technical Capability		√
4.	Project Management Proposal	√	
5.	Track Record (budget & schedule)	√	
	Total		
	Plan		
1.	Compliance with OEB's Minimum Standards		√
	- technical standards		
	- IESO feasibility study for alternative designs		
	- reliability & technical capability		
2.	Consultation Plan	√	
	- intervenors and other stakeholders		
	- First Nation and Métis communities		
3.	Environmental and Permitting Plan	√	
4.	Participation Plan	√	
	- equity participation		
	- inclusive (e.g., no discrimination)		
	- flexibility, robustness		
5.	Design	√	
	- suitability and viability		
	- design advantages/disadvantages		
	- innovation		
6.	Costs	√	
	- reliability of cost estimates		
	- completeness of cost estimates		
	- development cost estimate		
	- construction cost estimate		
	- O&M cost estimate		
	- total Project cost estimate		

7. Schedule - realistic & achievable - development phase - construction phase - vulnerability to delay	√	
8. Route - alternate routes - total route length	√	
9. Ratepayer Risk-Sharing	√	
10. Other Factors - innovation - new entrants - sole-sourced contacting to affiliates - local benefits	√	

30. Ranking applications on the basis of points would only be a starting point in the Board's decision-making process. At the end of the day, the Board will exercise its discretion and judgement in arriving at a reasoned decision based on sound evidence. RES Transmission has confidence in the Board in this regard.

VI. RESPONSE ON KEY ISSUES

31. In this section, RES Transmission responds to key arguments raised by its competitors, by the IESO and the OPA and by other intervenors in respect of the following issues:

(i) costs;

(ii) the Firm Bid Proposal and the Risk Sharing Proposal;

(iii) design;

(iv) technical capability; and

(v) First Nation and Métis participation.

32. Comprehensive and detailed responses to each of these issues are provided in the Appendices 1-7, attached hereto.

A. COSTS

1. Cost Comparisons

33. In its Final Argument, SEC asked all applicants, but especially those who had offered single circuit design options, to include life cycle cost projections in their Reply Argument so that the development, construction and annual O&M cost of each plan could be assessed.[28] Total Life Cycle Cost is the sum of the cost of development and construction and the present value of annual O&M costs, over the life of the Project. In response, RES Transmission has prepared Figure 1 and Table 2, below. Figure 1 and Table 2 present the Total Life Cycle Costs of RES Transmission's Preferred Design and its Reference Design, alongside the Total Life Cycle Cost of the plans of other applicants.

34. The cost estimates presented in Figure 1 and Table 2 were calculated on the basis of information provided by each applicant in its application, response to interrogatory OEB All-26 and Argument-in-Chief, and, for the single circuit design alternatives, RES Transmission's estimates of the capital cost of station upgrades not required under the Reference Design and the NPV of the incremental annual O&M cost related to control actions, line losses and series compensation equipment, relative to the Reference Design. The derivations of the O&M cost items are explained in paragraphs 39-43 (control actions), 44-45 (line losses) and 49-53 (series compensation), below; the basis of RES Transmission's estimate of station upgrades is explained in response to interrogatory OEB All-31.

[28] SEC, Final Argument, paras. 4.3.2, 4.3.3 and 7.4.3.

FIGURE 1: COMPARISON OF TOTAL LIFE CYCLE COSTS

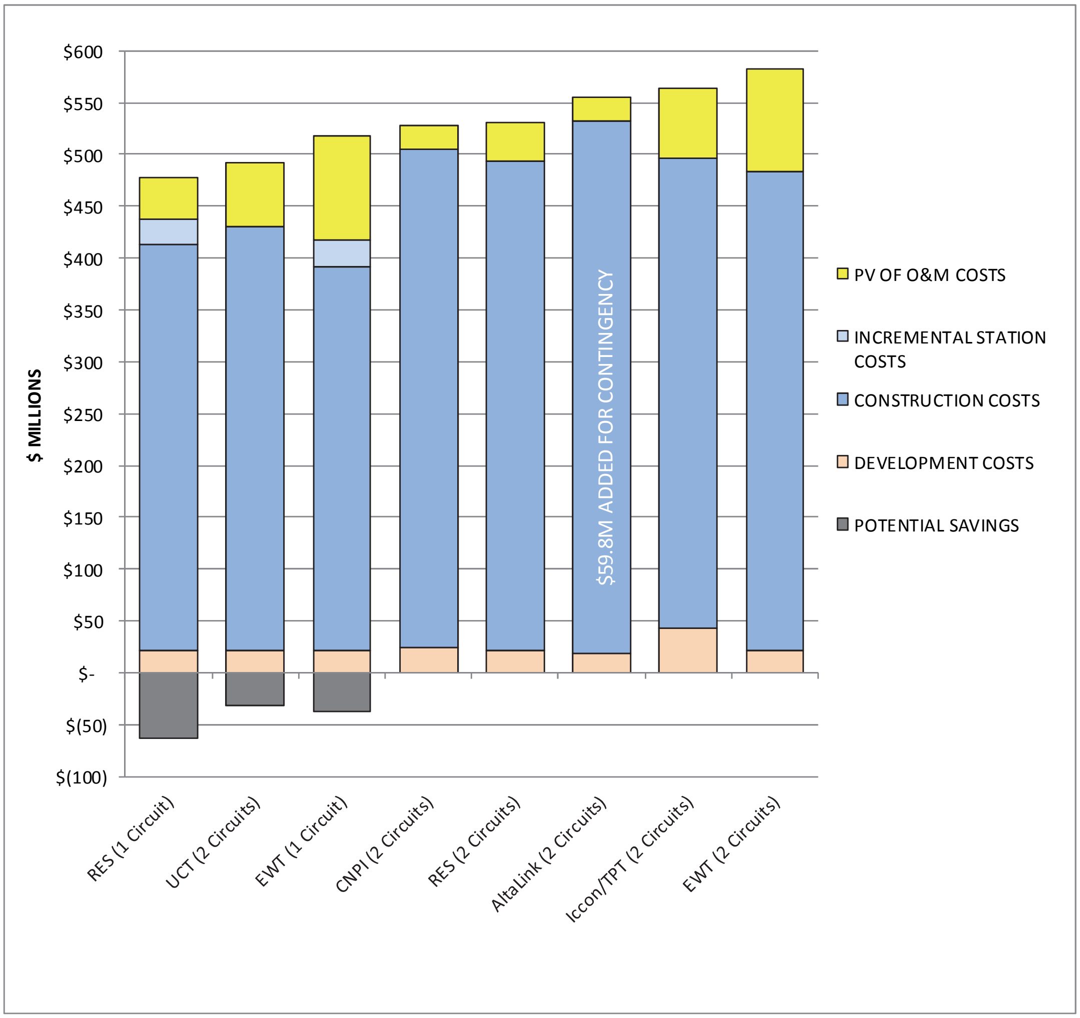


TABLE 2: COMPARISON OF TOTAL LIFE CYCLE COSTS ($2012)

			a	b	c	d	e	f	g	h	i
		APPLICANT (CIRCUITS)	**RES (1 Circuit)**	**UCT (2 Circuits)**	**EWT (1 Circuit)**	**CNPI (2 Circuits)**	**RES (2 Circuits)**	**AltaLink (2 Circuits)**	**Iccon/TPT (2 Circuits)**	**EWT (2 Circuits)**	**COMMENTS**
1	**LIFE-CYCLE COSTS ($MM)**	DEVELOPMENT COSTS	$21.37	$22.18	$22.12	$23.97	$21.53	$18.18	$43.74	$22.12	
2		CONSTRUCTION COSTS	$391.90	$408.65	$370.00	$480.82	$472.20	$513.88	$452.56	$462.00	
3		INCREMENTAL STATION COSTS	$25.00		$25.00						RES Estimates
4		**SUB-TOTAL**	**$438.27**	**$430.83**	**$417.12**	**$504.79**	**$493.73**	**$532.06**	**$496.30**	**$484.12**	
5		PV OF O&M COSTS	$39.27	$61.37	$100.27	$23.24	$37.26	$23.46	$66.93	$98.26	@7% for 50 Yrs
6		**TOTAL**	**$477.54**	**$492.20**	**$517.39**	**$528.03**	**$530.99**	**$555.52**	**$563.23**	**$582.38**	
7		POTENTIAL SAVINGS	($62.50)	($31.14)	($38.00)						
8		**POTENTIAL NET COSTS**	**$415.04**	**$461.06**	**$479.39**	**$528.03**	**$530.99**	**$555.52**	**$563.23**	**$582.38**	
9	**O&M COSTS ($MM/YR)**	LINE O&M (Stand-Alone)	$2.20	$4.45	$6.62	$1.68	$2.70	$1.70	$4.85	$7.12	
10		SERIES COMP O&M	$0.50		$0.50						RES Estimates
11		INCREMENTAL LOSSES	$0.13		$0.13						RES Estimates
12		INCREMENTAL CONTROL ACTIONS	$0.02		$0.02						RES Estimates
13		**TOTAL O&M COSTS**	**$2.85**	**$4.45**	**$7.27**	**$1.68**	**$2.70**	**$1.70**	**$4.85**	**$7.12**	

Notes:

- Amounts for allowance for funds used during construction ("**AFUDC**") and/or interest during construction ("**IDC**") are excluded as most applicants did not and were not required by the OEB to estimate those costs.
- The present value of annual O&M costs for each plan, were calculated using a discount rate of 7 percent over the 50-year life of the Project, which is consistent with the approach used by EWT and AltaLink.
- The potential cost savings associated with RES Transmission's single circuit design (the present value of annual savings related to adding transfer capability in increments over 8 years), UCT's unconventional double circuit guyed tower design and EWT's single circuit guyed CRS design, are shown on line 7.
- "Stand-alone" annual line O&M costs for EWT's single circuit options (line 9, column c) are assumed to be $0.5 million/year less than the O&M cost of the double circuit design (the same line O&M cost reduction as between RES Transmission's single and double circuit designs). Stand-alone line O&M costs do not include the incremental O&M costs related to series compensation, line losses and control actions. These costs are included at lines 10, 11 and 12, respectively.
- AltaLink's development cost estimate of $18.18 million (line 1, column f) does not include post-application/pre-designation costs and land acquisition costs; these costs could add another $3 million to AltaLink's estimate.
- In the absence of a contingency estimate provided by AltaLink, RES Transmission added contingency amount of $59.78 million to AltaLink's $454.1 million construction cost estimate (for a total of $513.88 million) (line 2, column f), based on the average contingency percentage for all other applicants (13.2%).
- Iccon/TPT's development cost estimate of $43.74 million (line 1, column g) includes $13.0 million of costs that would actually be incurred in the construction phase of the Project.
- EWT's single circuit construction cost estimate of $370 million (line 2, column c) is for its conventional lattice tower option; its construction cost estimate for its guyed CRS option would be $38 million less (as shown in line 7).
- The annual O&M cost associated with series compensation equipment for single circuit designs, relative to double circuit designs, is estimated at $500,000 (line 10, columns a and c).
- The annual O&M cost of incremental line losses for single circuit designs, relative to double circuit designs, is estimated at $130,276 (line 11, columns a and c).
- The annual O&M cost of incremental control actions for single circuit designs, relative to double circuit designs, is estimated at $15,200 (line 12, columns a and c).

35. As can be seen from Figure 1 and Table 2, the Total Life Cycle Cost of RES Transmission's Preferred Design is $53 million less than the Total Life Cycle cost of its Reference Design. If the additional $62.5 million in savings (on an NPV basis) from staging the installation of the full 650 MW of capacity over an eight-year period is taken into account, the Preferred Design is $116 million less than the Reference Design, on a Total Life Cycle Cost basis. Moreover, the Total Life Cycle Cost of the Preferred Design is $14.7 million less than the next lowest estimate – UCT's unconventional double circuit guyed tower design. RES Transmission's double circuit option is in the "middle of the pack" but, unlike other proposals based on a double circuit design, it is proposed as a firm bid.

36. The OPA, in its June 30, 2011 Report on the Long-term Electricity Outlook for the Northwest, assumed that "a single circuit 230 kV line would likely have a similar cost to a double circuit 230 kV line."[29] Table 2, above, disproves this assumption.

37. All applicants provided cost comparisons in their Argument-in-Chief but these were not prepared on a comparable basis. Some applicants added costs to the estimate of their competitors, others removed costs. Almost all applicants, other than CNPI, excluded AFUDC/IDC costs from their comparisons. This led CNPI to provide estimates of AFUDC/IDC for four of the applicants. CNPI also added $95.9 million for contingency to AltaLink's costs, as AltaLink (alone of all applicants) did not provide a contingency cost estimate. UCT and Iccon/TPT excluded contingency, escalation and certain other costs from their cost comparisons. CNPI and AltaLink compared the present value of annual O&M costs for each applicant, but used different methodologies to do so. UCT included EWT's estimate of the present value of the annual incremental cost of control actions required by single circuit designs, an estimate that was, in effect, subsequently invalidated by the IESO in its Final Argument.[30] EWT's comparison of O&M costs

[29] Ontario Power Authority, "Long Term Electricity Outlook for the Northwest and Context for the East-West Tie Expansion" (June 30, 2011), s. 7.1, lines 6-7.

[30] In its Final Argument, the IESO estimated that the single circuit design would require an additional 175 MW of control actions following a single circuit contingency, relative to a double-circuit design. EWT's estimate of $104

included an estimate of its own O&M costs that were $3 million/year less than the estimate it had stipulated in its application. In other words, EWT's response to interrogatory OEB-29 changes its O&M cost estimate from the estimate provided in its application.[31]

38. To the extent that the Board relies on any cost comparison, it must take the foregoing into account. It is also important to remember that RES Transmission's development and construction costs, for both the single circuit design and the double circuit, are firm costs, underpinned by its Firm Bid and Risk Sharing Proposals; all other amounts shown on Figure 1 and Table 2 are cost estimates.

2. Annual O&M Costs

(a) Control Actions

39. EWT estimates that, for single circuit designs, the annual cost of control actions for the N-1-1 contingency is approximately $7 million (for a description of the N-1-1 contingency please see paragraphs 69-75, below).[32] RES Transmission believes that this cost is a gross overestimate for three reasons.

40. First, EWT assumes that 300 MW of control actions are required, not the 175 MW estimated by the IESO.[33] Second, EWT significantly overestimates the number of hours that such control actions will be required in a given year. EWT mistakenly assumes that control actions will be required for both planned (e.g. scheduled maintenance) and unplanned outages (e.g. storms, forest fires, icing, sabotage, etc.). However, as described below at paragraphs 69-75, no control actions are required for planned

---

million is based on 300 MW of required control actions, not 175 MW. There are other problems with EWT's estimate. These are discussed at paras. 69-75.

[31] EWT Application, Part B, Exhibit 8, p. 30; EWT Argument-in-Chief, Figure 5, p. 35.

[32] Response of EWT to interrogatory EWT-5. EWT's estimate of control action costs for the N-1-1 contingency were adopted in the Argument-in-Chief of AltaLink at paras. 54-57 and in the Argument-in-Chief of UCT at paras. 4, 37 and 38.

[33] Response of EWT to interrogatory EWT-5 and IESO, Final Argument, at p. 2.

outages. Once the planned outages are removed from EWT's estimate, potentially only 76 hours (not 405 hours) of control actions may be required each year.[34]

41. Third, EWT improperly assumes a cost of $58/MW for each hour that the control actions are required. EWT mistakenly includes the entire market cost of generating electricity to calculate the cost of the control action. A more accurate estimate of the control action cost is the additional cost to have each MW of control actions available as reserves, not the total cost of electricity generated, since the electricity must be generated in any event. Based on an average of the IESO's daily operating reserve price for the past year, the cost to maintain generation in reserve is approximately $2/MW per hour.[35]

42. If the three errors in EWT's analysis are corrected, the resultant cost of control actions is not significant, relative to the total cost of the Project, or to the cost savings associated with a single circuit design. In sum, using the IESO's estimate of 175 MW of control actions, the control action cost is expected to be $26,600 per year (175 MW X 76 hours X $2/MW per hour) or a NPV of $367,100, not the $7 million (300 MW X 405 hours X $58/MW per hour) per year and $104 million NPV estimated by EWT.

43. Further, for the reasons described in paragraph 75, below, RES Transmission believes that the IESO's 175 MW estimate of control actions is high and that, based on the OPA's forecasted flows on the EWTL, only 100 MW of control actions would be required. Based on this lower estimate, the cost of required control actions would be reduced to $15,200 per year (100 MW X 76 hours X $2/MW per hour) or a NPV of $209,770.[36]

[34] See Appendix 1, at pp. A-3 to A-4.
[35] See Appendix 1, at pp. A-4 to A.6.
[36] See Appendix 1, at pp. A-4 to A-6.

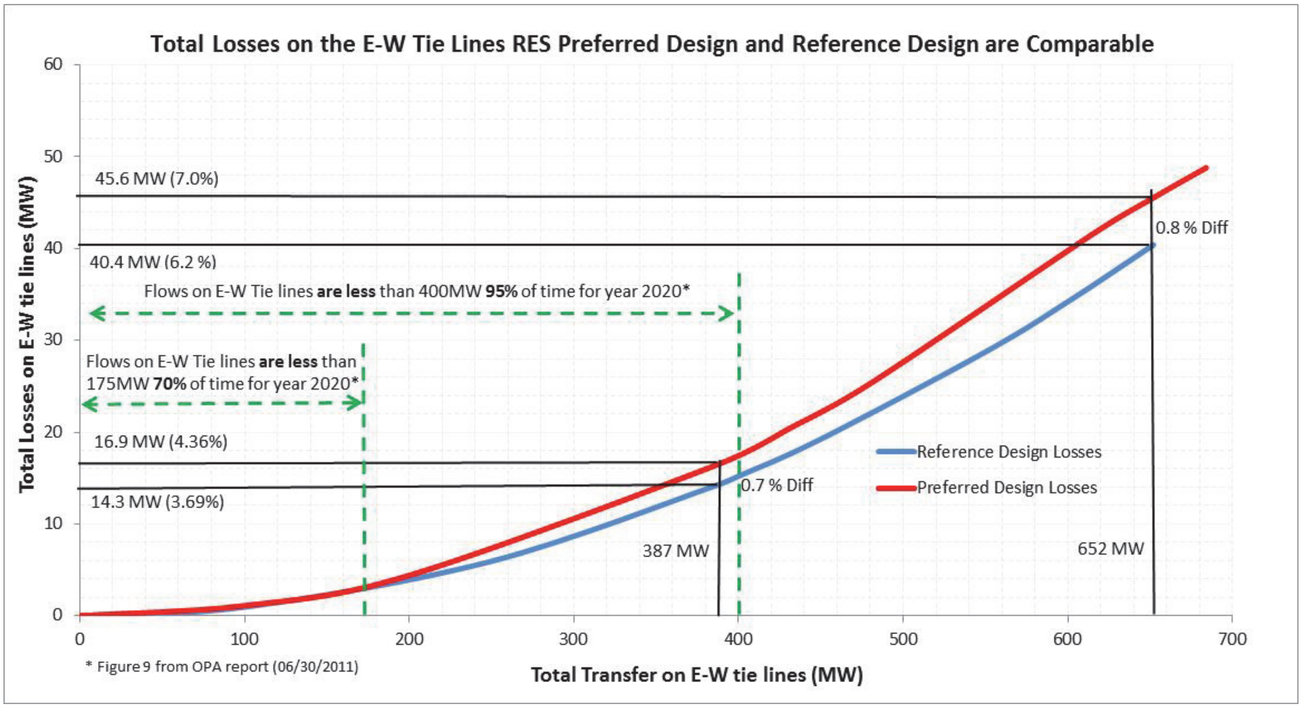
(b) Line Losses

44. Several applicants and the SEC argue that line losses will be greater for a single circuit design than for a double circuit design.[37] UCT asserts that the incremental line losses could easily approach $40 million for a single circuit line but provides no basis to support this estimate.[38]

45. The 2012 IESO Feasibility Study for RES Transmission's Preferred Design ("**Preferred Design Feasibility Study**") concluded that line losses for the single circuit Preferred Design will be slightly greater than for a double circuit design.[39] For all transmission lines, line losses decline dramatically (as the square of line power flow) when transmission capacity is not fully utilized. Figure 2, below, combines the line losses estimated by the IESO for both the Preferred Design and the Reference Design, with the OPA's estimate of transmission capacity utilization of the EWTL in 2020.[40] RES Transmission's calculations estimate the incremental cost of line losses for the Preferred Design at less than $2 million NPV, which is more than offset by the $53 million in savings from adopting the Preferred Design. Please see Appendix 2 for detailed calculations of this estimate.

[37] UCT, Argument-in-Chief, at paras. 27 and 39; Iccon/TPT, Argument-in-Chief, of at para. 60; AltaLink, Argument-in-Chief, at para. 56 and SEC, Final Argument, at section 4.3.2.
[38] UCT, Argument-in-Chief, at para. 39.
[39] See Exhibit H-2-3 of RES Transmission's Application and RES Transmission, Argument-in-Chief, at pp. 41-42.
[40] OPA Report at p. 14.

Figure 2



3. Tower, Conductor and Interconnection Costs

(a) Tower and Foundation Costs

46. EWT argues that RES Transmission has underestimated both the number of H-frame towers required for its Preferred Design, and the associated foundation costs.[41] While EWT is correct that H-frame towers have shorter spans and that, accordingly, more towers will be required, the cost of the additional structures required has been incorporated in RES Transmission's cost estimates. The cost of the additional H-frame towers is more than offset by the cost reduction resulting from the use of smaller towers with less steel and less installation-related labour.

47. As for the cost of the H-frame tower foundations, RES Transmission has not, as EWT claims, simply halved the cost of foundation construction to reflect the fact that H-frame towers require only two foundations (as opposed to four foundations for lattice

[41] EWT, Argument-in-Chief, at pp. 45-47 and 49.

structures). The forces expected on each tower, as well as the prevailing terrain and geological conditions, will be taken into account when determining the final design of tower foundations. However, even after taking into account the greater number towers required, the H-frame tower will require fewer (and smaller) foundations in total, relative to the Reference Design.

(b) Conductor Costs

48. EWT argues that the ACSS Trapezoidal Conductors proposed by RES Transmission are more expensive than standard ACSR conductors.[42] Although the unit cost of the ACSS Trapezoidal Conductors is greater than the unit cost of ACSR conductors, RES Transmission's Preferred Design requires only a single set of three conductors, as opposed to the two sets of conductors (six in total) required for a double circuit design. Once the number of conductors is taken into account, the purchase and installation cost differential between the two conductors disappears.[43]

(c) Interconnection Costs

49. In its Final Argument, the IESO states that it will be more complex and expensive to connect a single circuit line to the existing transformer stations than a double circuit line because Hydro One cannot use standard station arrangements of circuit breakers and disconnect switches for a single circuit design and would also have to modify the series compensation equipment.[44]

50. RES Transmission does not agree that it is more complex to connect one circuit to the transformer stations than two circuits. Single circuit transformer station interconnections are simpler and cheaper than double circuit connections because only one set of three conductors is required to interconnect with each transformer station (as opposed to the two sets of three, or a total of six conductors required by a double

[42] EWT, Argument-in-Chief, at p. 55.
[43] Southwire's Overhead Conductor Manual, 2nd Edition, 2007 Tables: 1-29 (ACSR) and 1-36 (ACSS TW).
[44] IESO, Final Argument, at p. 3.

circuit design). This, in turn, significantly reduces the number of circuit breakers and disconnect switches required.[45]

51. RES Transmission believes that standard transformer station arrangements for circuit breakers and disconnect switches can be used conjunction with the single circuit design alternative, with no additional modifications to the series compensation equipment. Since the Wawa transformer station (the easternmost interconnection for the EWTL) already interconnects with a double circuit line and a single circuit line to the east, it should be a simple matter to arrange the circuit breakers and disconnect switches to interconnect with a single circuit EWTL to the west. Further, the arrangement at Wawa transformer station could be applied at both Marathon and Lakehead transformer stations. No new transformer station arrangements would be required.

52. As to the cost of modifying the series compensation equipment, this amount has already been incorporated into RES Transmission's estimate of station costs for the Preferred Design.[46] Since the series compensation equipment would be specifically installed to operate on a single circuit line, incorporation of this equipment would not come with any additional cost.

53. The IESO has not provided any information to support its assertion that a double circuit line is simpler and cheaper to interconnect; nor has it provided any estimate of these incremental costs. The IESO's conclusions also appear to be contrary to common sense since it should be simpler and cheaper to interconnect with one line than two. Without information from the IESO to support its statements, it is impossible for the Board to determine whether or not the IESO's comments are justified.

[45] See RES Transmission's Application at Exhibits G-3-1, G-3-2 and G-3-3 for a comparison of the station configurations for both the Preferred Design and the Reference Design.
[46] RES Transmission Argument-in-Chief, at paras. 125-127 and the response of RES Transmission' to interrogatory OEB All-31.

4. Recovery of Impact-Benefit Agreement Costs

54. In its Final Argument, the SEC expressed concerns regarding the recovery of the cost of First Nation and Métis participation from ratepayers.[47] Like most other applicants, RES Transmission included the cost of negotiating participation agreements with First Nation and Métis communities in its development budget,[48] Also, like most applicants, RES Transmission has not determined whether the cost of implementing participation agreements should be recovered from ratepayers and, if so, whether as an operating or capital cost. This is an issue that will be determined in a future rate proceeding, having regard to the relevant policies of the Board that may be in place at that time.

B. <u>RISK SHARING PROPOSAL</u>

55. Applicants and intervenors raised two principal issues in respect of RES Transmission's Firm Bid and Risk Sharing Proposals. EWT and SEC argued that if the Board were to designate RES Transmission in this proceeding, it would also be approving RES Transmission's Firm Bid and Risk Sharing Proposals, and that this would constitute a rate-setting exercise under section 78 of the OEB Act[49]. EWT, SEC and others also criticized the Proposals as being skewed and one-sided in favour of RES Transmission, at the expense of ratepayers.[50]

56. The assertion that by designating RES Transmission, the Board would also be approving the Firm Bid and Risk Sharing Proposals, for rate-making purposes or otherwise, is incorrect. By designating RES Transmission, the only rate-related decision the Board would be making would be the approval of RES Transmission's development cost estimate for future recovery in rates. As the Board stated in its Phase I Decision:

[47] SEC, Final Argument, at section 5.4.
[48] Response of RES Transmission to interrogatory OEB-26.
[49] EWT, Argument-in-Chief, at pp. 62-63. SEC, Final Argument, p. 27, at para. 7.3.11.
[50] AltaLink, Argument-in-Chief, at para. 83; EWT Argument-in-Chief, at p. 3; CNPI, Argument-in-Chief, at p. 40; SEC, Final Argument, at p. 27, para. 7.3.10; PWU, Final Argument, at para. 94.

> [T]he selection of a transmitter for designation will indicate that the Board has found the development costs to be reasonable as part of an overall development plan. This selection will also establish that the development costs are approved for recovery.[51]

57. If it is designated in this proceeding, RES Transmission has undertaken to seek approval of transmission rates derived in accordance with the Bid Amount Proposal and the Risk Sharing Proposal, in its first rate application after the EWTL goes into service. The Board, in that proceeding, would have the sole discretion to accept or reject one or more aspects of RES Transmission's application, including its applied-for annual revenue requirement derived on the basis, *inter alia*, of the Bid Amount Proposal and the Risk Sharing Proposal.

58. Those criticizing the Risk Sharing Proposal as one-sided and skewed in favour of RES Transmission, do so mainly on the basis of their objection to the carving out, from the application of the "penalty for overages" provision of the proposal, cost overages in four cost categories (the "**Exceptions**"). The equity portion (i.e., 40%) of any cost overage in any of these four categories (relative to the Bid Amount), would earn an equity return at the rate determined by the Board annually, and would not be subject to the penalty that would otherwise be applicable to cost overages. Conversely, any cost underages in these four categories would not attract an incentive rate of return on equity.

59. Criticisms that the Risk Sharing Proposal is one-sided ignore several important features of that proposal. First, under the Risk Sharing Proposal, <u>only overages and underages in excess of the defined cost threshold for each category, would be exempt from the penalty/reward provision of the proposal</u>. These thresholds are as follows: land acquisition: $15.5 million; First Nation and Métis participation costs: $1.0 million; environmental and permitting costs: $2.5 million; and line costs in respect of a total line length that exceeds 410 km: $1 million for each additional kilometre.

[51] Phase 1 Decision, p. 17.

60. Second, the excluded cost overages are expected to be a very small percentage of the Bid Amount, on a total dollar basis.

61. Third, all costs for which recovery is sought in a future rate proceeding would be subject to the usual prudence review, notwithstanding the Firm Bid and Risk Sharing Proposals. RES Transmission would be at risk for any cost disallowances.

62. Lastly, and importantly, under the Risk Sharing Proposal, the resultant increase in return in respect of cost underages and decrease for cost overages are not symmetrical but, rather, skewed in favour of ratepayers. Accordingly, RES Transmission assumes a disproportionately larger share of the risk of cost overages (relative to the Bid Amount). For example, in the case of the Preferred Design and assuming an ROE of 8.93 percent and a $20 million overage of the Bid Amount (excluding Exceptions[52]), the Applicant's ROE would be reduced by **0.23 percent**. Conversely, however, if the Applicant "beats" the Bid Amount by $20 million, its ROE would be increased (relative to 8.93%) by just **0.15 percent**.

63. This asymmetry is clearly demonstrated by Figures 3 and 4, below, which compare returns on equity resulting from the application of the Risk Sharing Proposal under various cost overage and underage scenarios, on the one hand, with returns on equity derived on the basis of the Board's usual return methodology, on the other hand. Figures 3 and 4 also demonstrate the effect of the Risk Sharing Proposal on annual revenue requirements ("**ARR**"). Assuming a $20 million cost overage the ARR, under the Risk Sharing Proposal, would be $0.4 million less than the ARR calculated in accordance with traditional rate-base methodology. Conversely, a $20 million cost underage would increase the ARR by only $0.2 million, relative to the ARR under the traditional methodology.

[52] The Exceptions are described above in paragraph 58-60.

Figure 3: Traditional v. Incentive Methodologies (Preferred Design)

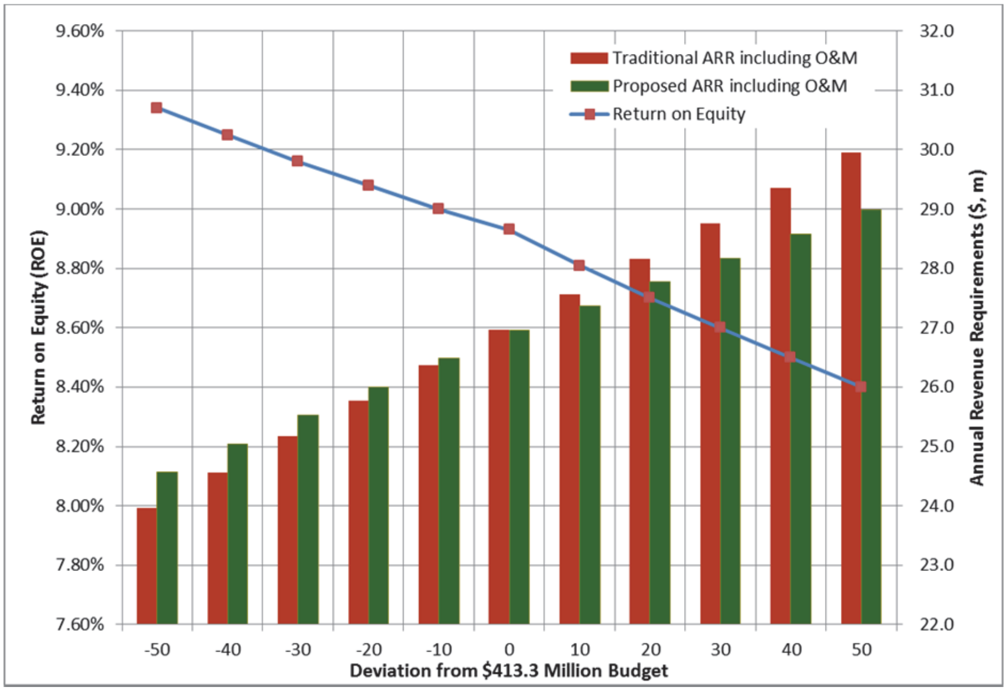
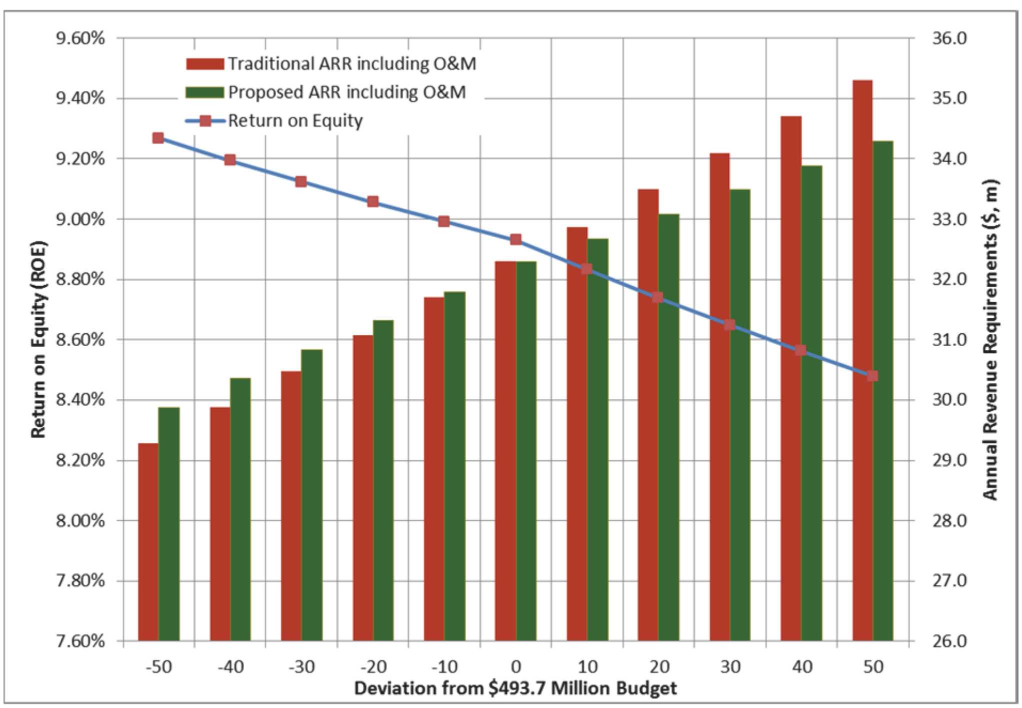


Figure 4: Traditional v. Incentive Methodologies (Reference Design)



64. Some parties criticized the Risk Sharing Proposal for departing from traditional, rate-base rate-of-return regulation. Incentive rate methodologies are, by definition, a departure from traditional approaches. They are intended to modify the behaviour of the utility for the benefit of ratepayers, by incenting the utility to minimize overall costs and assume a greater degree of risk. This is precisely what RES Transmission's Risk Sharing Proposal does and precisely what the Board invited applicants to consider in terms of driving value for ratepayers.

65. It is important to remember that by designating RES Transmission as a transmitter to develop the EWTL, the Board would not be approving the Risk Sharing Proposal, expressly or by implication. It would simply be choosing an applicant who has committed to bring a specific incentive rate methodology to the Board, for examination and approval in a future rate proceeding.

C. DESIGN

1. Reliability

66. Although the Preferred Design Feasibility Study confirmed that the Preferred Design meets or exceeds all IESO, NERC and NPCC requirements,[53] the IESO and some applicants assert that a single circuit design is not as reliable as a double circuit design.[54] The IESO states in its Final Argument that not all designs that satisfy the IESO's reliability criteria are equally reliable, since:[55]

(i) it is easier to schedule maintenance outages for double circuit designs;

(ii) larger control actions would be required for single circuit designs under the N-1-1 contingency (described at paragraphs 69-75, below); and

[53] See Exhibit H-2-3 of RES Transmission's Application.
[54] Upper Canada Transmission Inc. ("**UCT**"), Argument-in-Chief, at para. 35; Iccon Transmission, Inc. and TransCanada Power Transmission (Ontario) L.P. (together, "**Iccon/TPT**"), Argument-in-Chief, at para. 59; AltaLink Ontario Limited Partnership ("**AltaLink**"), Argument-in-Chief, at paras. 52-54 and 57; Canadian Niagara Power Inc. ("**CNPI**"), Argument-in-Chief, at pp. 36-37; and IESO, Final Argument, at pp. 2-3.
[55] IESO, Final Argument, at pp. 2-3.

(iii) single circuit designs have the potential for series compensation outages.

67. Regarding item (i) above, the IESO has not provided any information to support this assertion nor was this potential double circuit benefit contained in the IESO Feasibility Report. Without supporting data, it is impossible to quantify reliability and to determine whether the IESO's assertion is valid.

68. The N-1-1 contingency and series compensation outages are discussed in detail, below, along with an additional reliability benefit of the Preliminary Preferred Route.

(a) N-1-1 Contingency

69. Central to the N-1-1 contingency, is the distinction between planned and unplanned outages. Planned outages occur when the IESO intentionally plans in advance to take a single transmission line out of service for a limited amount of time for routine maintenance or for any other reason. This event is usually planned during periods of low or reduced energy demand and EWTL flows. Unplanned outages occur when unforeseen events force a transmission line out of service (e.g. for storms, forest fires, icing, sabotage, etc.) and may involve single or multiple transmission lines and may occur under all energy demand periods (high or low).

70. Despite its prominence in this proceeding, it is important to recognize that the N-1-1 contingency occurs very infrequently and that N-1-1 planned outages do not require control actions. This is because the system operator will have taken steps, in advance of the outage, to ensure the system is in a condition to operate reliably after removing one transmission line from service.

71. The limited benefit of a double circuit line (over a single circuit line) in an N-1-1 contingency will usually only occur during the unplanned outage of a single transmission line followed by another unplanned transmission line outage. In this unplanned event, following the outage of the first transmission line (N-1), the system operator will have

time to adjust system generation and flow, only if necessary due to system conditions, to prepare system for the outage of a second transmission line (N-1-1). Control actions are only necessary and called on when two transmission lines are out of service for unplanned outages and only during times when system energy demands are above certain levels.

72. For unplanned outages, IESO, NERC and NPCC reliability standards do not recognize any increased measure of reliability of a double circuit line (N-2) over a single circuit line (N-1) since both of these conditions (N-2 and N-1) must be planned for by the IESO as separate events that may occur for any system energy demand levels. Transmission system performance for line outages under NERC Transmission Planning Standards, TPL-3 (N-1-1) and TPL-3 (N-2), are similar as both of these conditions result in two transmission lines out of service.[56] Also both standards require the system operator to make changes in generation or loads to prevent overloads of the system remaining in service, after line outages, and to re-establish the system in a reliable and stable operating state. The only real difference between the two events above is the system operator has more time to prepare the system for the unplanned N-1-1 event. For unplanned outages, NERC and NPCC reliability standards require that multiple lines sharing a common element (such as two circuits of a double circuit line that share common towers) must be assumed to fail simultaneously (N-2) for system planning and operational reasons and a single circuit line does not have this (N-2) requirement.

73. The reliability benefit of a double circuit design over a single circuit design for the N-1-1 contingency is that approximately 175 MW less of control actions must be available in the very rare event, when one transmission line is out of service and while the full transfer capacity of the EWTL is in use.[57] Accordingly, in this very limited system operating condition, the IESO's opinion is that all single circuit designs require that 175

[56] NERC, Reliability Standards for the Bulk Electric Systems of North America, updated May 14, 2013. Available online at: http://www.nerc.com/pa/Stand/Reliability%20Standards%20Complete%20Set/RSCompleteSet.pdf.
[57] IESO, Final Argument, at p. 2.

MW of control actions be available to the system operator. In a letter to RES Transmission dated March 25, 2013, the IESO stated that it already has adequate control options available for this system condition.[58] No incremental control actions and no increase in control actions beyond those already available to the IESO, will be necessary under a single circuit design.

74. Contrary to the assertions of several applicants, control action events are very rare, and are of varying magnitudes set by system demand conditions. Additionally, in the event they do occur, the cost is not significant relative to the cost savings from adopting a single circuit design. As described in paragraphs 39-43, above, the IESO's estimated 175 MW of control actions are only needed for the estimated 76 hours of unplanned outages on the EWTL expected each year.[59] All told, the control action costs for the single circuit design, if control actions were to occur, is expected to be $26,600 per year or a NPV of $367,100, compared to the estimated $53 million in costs savings from the Preferred Design.

75. Further, RES Transmission believes that the IESO has overestimated the magnitude of control actions that may be required. Based on the OPA Reports' East-West Tie Duration Curve,[60] RES Transmission believes no more than 100 MW of control actions will be necessary for the 76 hours of unplanned outages and that an estimate of 175 MW is highly conservative. Accordingly, RES Transmission believes the control action cost would be reduced to $15,200 per year or a NPV of $209,770.[61] In any event, whether its 100 MW of control actions or 175 MW, the annual costs are minimal.

[58] Response of RES Transmission to interrogatory RES-8, Appendix 4.
[59] See Appendix 1, at pp. A-3 to A-6.
[60] OPA Report, at p. 14.
[61] See costs section above at paras. 39-43 and Appendix 1, at pp. A-3 to A-6.

(b) Additional Outages and Maintenance

76. In its Final Argument, the IESO states that one benefit of a double circuit design is that it would not be subject to series compensation outages because series compensation equipment is not required under a double circuit design.[62] While, planned and unplanned outages of series compensation devices may occur, the frequencies of these events are very rare with today's technology and they occur significantly less than line outage events. Additionally, during the outages of series compensation devices the available line capacity may be reduced, however, the line remains in service and can operate reliably. Planned outages of series compensation devices for maintenance or other reasons would likely be scheduled during low system demand periods or during planned outages of the transmission line directly connected to the devices. RES Transmission notes that for its Preferred Design in the event of a series compensation device outage the EWTL transfer capacity of approximately 500 MW is still maintained.[63]

77. Moreover, the IESO's Final Argument fails to mention that the additional material and equipment used by a double circuit line (namely, three extra 400 km conductors, nine extra transformer station interconnections and additional circuit breakers) would also be subject to additional outages. The IESO has not provided any information on the system operational impacts, frequency or duration of these types of outages.

(c) Implications of Route on Reliability

78. As Northwatch observed in its Final Argument, the route deviations proposed by RES Transmission in its Preliminary Preferred Route may provide a system reliability benefit.[64] By deviating from the existing EWTL transmission corridor for 130 km (to avoid First Nation reserve lands and Pukaskwa National Park), the Preliminary Preferred Route will place the new line about 15-20 km away from the existing line (i.e., the

[62] IESO, Final Argument, at p. 3.
[63] See Exhibit B-1-1 of RES Transmission's Application at Figure B-1, p. 10
[64] Northwatch, Final Argument, at p. 6.

Reference Route), for approximately one-third of the total route length. This provides an added reliability benefit to the ETWL in the event of NERC TPL 3 (loss of two lines) and TPL 4 (loss of all lines in a corridor).[65]

2. Scalability

79. In their Final Arguments, both the IESO and OPA state that a double circuit design is more easily expanded to a total future east-west transfer capacity of 800 to 850 MW (from 650 MW for the current Project), than a single circuit design.[66] The IESO states that while a double circuit design would only require additional shunt compensation equipment to reach the 800 to 850 MW transfer capability, a single circuit design would require 50 percent series compensation as well.[67] The IESO also asserts that the cost of the additional series compensation equipment would erode any initial savings of a single circuit design.[68] The Board should disregard the scalability submissions of the IESO and the OPA for four reasons.

80. First, it is unfair for the IESO and OPA to impose additional Project Requirements in their Final Argument and at the end of long, competitive process to select a designated transmitter. While scalability may be a legitimate design criteria, none of the foundational documents comprising the Project Requirements in this proceeding, made any mention of a transfer capability of 800 to 850 MW for the EWTL. Changing the Project Requirements near the end of a competitive process, is unacceptable.

81. Second, the OPA Report does not support the conclusion that 800 to 850 MW of transfer capability are necessary now or in the future.[69] To the contrary, the OPA Report indicates that peak electricity demand in northwestern Ontario, though uncertain, has

---

[65] *Supra*, NERC at note 56.
[66] IESO, Final Argument, at p. 3. OPA, Final Argument, at p. 3.
[67] IESO, Final Argument, at p. 3.
[68] IESO, Final Argument, at p. 3.
[69] Ontario Power Authority, "Long Term Electricity Outlook for the Northwest and Context for the East-West Tie Expansion" (June 30, 2011), p. 14.

declined by 35 percent from 2005 to 2010 and is not expected to reach 2010 levels again until approximately 2030 under the highest demand scenario. [70]

82. Given that the OPA's own data show that the peak load in northwestern Ontario is highly uncertain, has declined dramatically in recent years and is not expected to recover until 2030 at the earliest (and possibly much later), RES Transmission disagrees with the OPA's assertion that there is "greater value in the potential for future expandability [of the EWTL] rather than in the potential for staging", as in RES Transmission's Preferred Design.[71] There also appears to be significant disagreement between the NOACC-NOMA intervenors and the OPA regarding the level of expected future electricity demand in northwestern Ontario.[72] In light of the uncertainty over future electricity demand, RES Transmission submits that, rather than overbuilding the EWTL to meet demand that may not materialize, ratepayers would be better served by matching transmission infrastructure investment with forecasted demand, as *per* the Preferred Design's staged approach.

83. Third, the IESO has not produced any feasibility studies that identify the facilities that would be required by a double or single circuit design with a transfer capability of 800 to 850 MW. While both single and double circuit designs can theoretically be scaled up, it is unclear what station equipment will be required to ensure that the 800 to 850 MW transfer capability is met and that IESO, NERC and NPCC reliability criteria are respected. Until such time as the IESO completes a feasibility study for both single and double circuit designs, with 800 to 850 MW of transfer capability (as was done for the current 650 MW Project), it is premature for the IESO to speculate what station equipment may be required or to conclude that the initial cost savings of a single circuit design would be eroded by the installation of the as yet unknown equipment. Further, since the IESO and the OPA have not given any indication as to when the full 800 to 850 MW transfer

[70] *Ibid.* at p. 4.
[71] OPA, Final Argument, at p. 3, lines 12-14.
[72] NOACC-NOMA, Final Argument, at pp. 10-12.

capability will be required, it is impossible to calculate whether ratepayers would be best served by paying for a more expensive double circuit line now, or upgrading a single circuit line in the future.

84. Fourth, the useful transfer capability of the EWTL depends on not only the transfer capability of the new line to be constructed, but also on the transmission systems to which it will interconnect. There are transmission system constraints to the east and west of the EWTL that would prevent the transfer 800 to 850 MW between southern and northwestern Ontario.[73] Since, Ontario's Long Term Energy Plan does not identify any plans for upgrading these transmission systems,[74] expanding the EWTL to 800 to 850 MW would not provide for any additional transfer capability between southern and northwestern Ontario, relative to the 650 MW proposed for the current Project.

3. Towers and Foundations

85. In its Argument-in-Chief, EWT (via Power Engineers) asserts that the steel H-frame towers and associated foundations proposed in RES Transmission's Preferred Design have inherent limitations that render them unsuitable for the EWTL.[75] Specifically, EWT argues that steel H-frame towers are an unproven design, subject to greater cascade failure risk, and have foundations that are not suitable for the terrain of the EWTL.

86. Contrary to EWT's assertions, steel H-frame towers are an industry standard design widely used in North America and Ontario, including in terrain similar to the terrain that will be traversed by the EWTL. The MidAmerican Group, alone, operates several thousand kilometres of H-frame tower-supported transmission lines. The steel H-frame towers and foundations that EWT criticizes have, in fact, been widely deployed in northern Ontario by EWT "affiliates," Hydro One and Great Lakes Power and by Nova

---

[73] RES Transmission, Argument-in-Chief, at paras. 95-99.
[74] Ontario Ministry of Energy, "Ontario's Long Term Energy Plan" (2010) pages 41-47. Available online at: http://www.energy.gov.on.ca/en/ltep/ontarios-long-term-energy-plan/.
[75] EWT, Argument-in-Chief, at pp. 44 to 50.

Scotia Power and New Brunswick Power in their respective jurisdictions.[76] One such example is shown in Figure 5 for Hydro One's 230 kV line near Timmins, Ontario.

87. Appendix 3, Claim 1 includes photographs of H-frame towers that are currently in service in northern Ontario as part of the transmission systems of Hydro One and Great Lakes Power:

(a) Hydro One's recent 115 kV transmission line refurbishment in the Algoma district of Ontario, the same district as the eastern portion of the EWTL;[77]

(b) two Hydro One 230 kV transmission lines near Timmins (see Figure 5, below);[78] and

(c) two Great Lakes Power 230 kV transmission lines near Sault. Ste. Marie.[79]

Figure 5: Existing Hydro One H-frame 230 kV Transmission Line Near Timmins, Ontario

[76] See Appendix 3, Claim 1, at p. A-17.
[77] See Appendix 3, Claim 1, at p. A-13.
[78] See Appendix 3, Claim 1, at pp. A-12 and A-15.
[79] See Appendix 3, Claim 1, at pp. A-14 and A-16.

88. EWT's "affiliates" use of similar towers in similar northern Ontario terrain soundly refutes EWT's argument that steel H-frame towers are an unproven design, with unacceptable cascade failure risks and unworkable foundations.

89. Finally, with respect to the specific steel H-frame tower and foundation designs proposed in the Preferred Design, RES Transmission sought advice from PowerTel Utilities Contractors Limited, a local transmission construction firm, regarding both tower and foundation constructability. PowerTel's assessment informed RES Transmission's construction plan, cost estimate and schedule proposals.

(a) Cascade Failure

90. EWT argues that the steel H-frame towers proposed in RES Transmission's Preferred Design are subject to greater cascade failure risk than traditional steel lattice towers.[80] While wooden H-frame towers have limited strength to protect against cascade failure risks, tubular steel H-frame structures can be designed to withstand significant longitudinal loads and the resulting bending moments. The proposed tubular steel H-frame structures will be designed in strength and geometry to meet or exceed all loading criteria specified in the OEB's Minimum Technical Requirements for the EWTL, as well as applicable Canadian Standards Association requirements.[81]

91. Moreover, all transmission towers, whether steel H-frame, lattice, or otherwise, are subject to cascading tower failure during extreme weather events. The double circuit lattice towers proposed by many applicants (including in RES Transmission's Reference Design) are not immune to such risks, as demonstrated by the cascade failure of approximately five towers on Hydro One's existing EWTL in 2009 near Terrace Bay.[82]

92. RES Transmission's Preferred Design, utilizes a combination of H-frame towers and steel lattice structures in order to optimize the line for local conditions and reduce costs. The

[80] EWT, Argument-in-Chief, at p. 45.
[81] See CSA C22.3 No. 60286, section 6.6.3.1 "torsional load" and section 6.6.3.2 "longitudinal loads".
[82] Outage data provided by Hydro One.

final configuration is likely to be a transmission line comprised largely of H-frame structures, with some interspersed lattice towers. All towers, be they H-frame or steel lattice, will exceed the OEB's Minimum Technical Requirements. Additional protection against cascade failure will be provided by the installation of full dead-end and strain dead-end lattice towers throughout the line. Only RES Transmission's Preferred Design incorporates the use of pre-configured dead-end towers to facilitate interconnections along the EWTL of future generation and load projects with minimal disruption[83] - a concern of several intervenors.[84]

(b) Foundation Construction

93. EWT argues that RES Transmission's proposed H-frame tower foundation design is unsuitable for the terrain of the EWTL.[85] EWT incorrectly assumes that the foundation design used by MidAmerican Transmission for the Sigurd-Red Butte transmission line in Utah would be used for the EWTL.

94. RES Transmission has not finalized a foundation design for its H-frame towers. Instead, it has compiled a list of potential designs that are likely to be effective in the geological conditions of the EWTL. All of the foundation options identified in RES Transmission's Application are established foundation types that have similarly been proposed by all applicants in this proceeding.[86] RES Transmission will choose a foundation type based on comprehensive geotechnical exploration and testing during the development phase. The final design will reflect the forces expected on each tower.

95. Based on RES Transmission's field work, a review of foundation and tower constructability review by PowerTel Utilities Contractors and on Hydro One and Great Lakes Power's use of H-frame tower – supported transmission lines in northern Ontario,

[83] See Exhibit B-1-1 of RES Transmission's Application at p. 8-9.
[84] NOACC-NOMA, Final Argument, at p. 12; Algoma Coalition, Final Argument, at pp. 3 and 8; Northwatch; Final Argument, at p. 4.
[85] EWT, Argument-in-Chief, at pp. 48 and 49.
[86] See Exhibit G-7-1 of RES Transmission's Application at pages 3 and 4.

RES Transmission is confident that appropriate tower foundations can be constructed in the terrain of the EWTL.

4. Conductors

96. EWT criticizes the RES Transmission's choice of 1557 ACSS trapezoidal conductors ("**ACSS Trapezoidal Conductors**") for its Preferred Design arguing that it is inferior to the standard ASCR conductors proposed by many applicants (including RES Transmission, in respect of its Reference Design). EWT asserts that ACSS Trapezoidal Conductors have poor conductor sag, vibration and blowout characteristics and are more difficult to install. RES Transmission disagrees for the reasons set out below and, in greater detail, in Appendix 3.

97. EWT's critique of the ACSS Trapezoidal Conductors mixes apples and oranges. Moreover it is not founded on the technical parameters specified in RES Transmission's Application (e.g. EWT assumes a tower span length of 355 m, instead of 335 m, as specified in RES Transmission's Application). Once these errors are corrected and RES Transmission's design parameters pertaining to sag and tension are applied, the single circuit ACSS Trapezoidal Conductors outperform or are equal to standard ASCR conductors in this respect.

98. ACSS conductors have been used successfully throughout North America and are quickly replacing ACSR conductors as the industry standard.[87] A 2012 life cycle analysis performed for Connecticut Light and Power concluded that "ACSS [conductors have] been adopted as CL&P's new standard replacing ACSR [conductors] based on benefits of less sag, operation at higher temperatures and additional current carry capacity."[88]

99. Conductor manufacturers also see the value of ACSS conductors over ACSR conductors. Southwire, a manufacturer of both types of conductors, states that the ACSS Trapezoidal

[87] ACSS are utilized by affiliates of RES Transmission throughout North America.
[88] Connecticut Siting Council Life-cycle Cost Report 2012.

Conductor proposed in RES Transmission's Preferred Design "sags less than comparable ACSR [conductors] under electric loading" and is "especially useful for new line applications where structures can be economized because of reduced conductor sag."[89] Southwire also states that the ACSS Trapezoidal Conductors, in particular, have superior self-damping abilities.[90] General Cable, another conductor manufacturer, has reached a similar conclusion:

> With thousands of miles installed throughout North America, ACSS is a proven, trustworthy overhead conductor technology and remains the most accepted solution for high temperature performance… ACSS sags less under emergency electrical loadings than ACSR, it is self-damping, and its final sags are not affected by long-term creep of the aluminum.[91]

(a) Conductor Sag

100. Notwithstanding the views of utilities and conductor manufacturers, EWT argues that RES Transmission's proposed ACSS Trapezoidal Conductors have inferior sag properties at high temperatures relative to ACSR conductors.[92] Conductor sag is an important consideration since the greater the sag, the higher the towers that must be constructed in order to ensure that minimum ground clearances are respected. Conductors usually have maximum sag at their maximum operating temperature (100° C as specified by the Board in its Minimum Technical Requirements)[93] or when covered with heavy ice.

101. Rather than assessing the sag of RES Transmission's ACSS Trapezoidal Conductors at an operating temperature of 100° C (as specified in the Minimum Technical Requirements

---

[89] Southwire May 2012 ACSS Conductor Specification Brochure.
[90] Southwire's Overhead Conductor Manual, 2nd Edition, 2007, Section 1.6.4 "High Temperature Conductors," page 1.40.
[91] General Cable March 13 Overhead Conductor Specification Brochure. Available online at: http://www.generalcable.com/NR/rdonlyres/2915DDB6-3A90-4964-ACDE-812E31235E2/0/20120281ACSS_TW.pdf.
[92] EWT, Argument-in-Chief, at pp. 52 and 53.
[93] Ontario Energy Board, December 20, 2011 Letter, Attachment 2.

and in RES Transmission's Application), EWT assesses conductor sag at 250º C.[94] At the correct operating temperature of 100º C, the ground clearance infringements cited by EWT in its Argument-in-Chief disappear and, in fact, the ACSS Trapezoidal Conductors sag approximately 0.7 m less than standard ASCR conductors.[95]

(b) Conductor Vibration

102. EWT argues that ACSS Trapezoidal Conductors do not have superior self-damping vibration properties as stated in RES Transmission's Application.[96] EWT's argument is not consistent with the conclusions of Southwire and General Cable, both of whom cite superior self-damping, due to the use of pre-annealed aluminum strands, as a key advantage of ACSS conductors, relative to ACSR conductors.[97]

103. Moreover, contrary to EWT's assertion, RES Transmission is not relying, solely, on the superior self-damping properties of the ACSS Trapezoidal Conductors to reduce vibration. RES Transmission's Preferred Design incorporates vibration dampers for all conductors and shield wires. The type, size, number and spacing of these dampers will be determined during the development phase.

(c) Conductor Fatigue

104. EWT argues that the ACSS Trapezoidal Conductors proposed by RES Transmission will have a shorter life-span and will be more prone to failure since they will operate closer to their rated tensile strength than will standard ACSR conductors.[98] EWT's conductor tension calculations are in error because they assume a tower span length (i.e., the

[94] EWT, Argument-in-Chief, at pp. 53 and 54.
[95] See Appendix 3, Claim 9, at pp. A-30-A-31.
[96] Argument in Chief of EWT at pages 54 and the Application of RES Transmission at Exhibit G-1-1 at page 3.
[97] See Southwire's Overhead Conductor Manual, 2nd Edition, pages 7 and 18, 2007 and General Cable's March 13 Overhead Conductor Specification Brochure.
[98] EWT, Argument-in-Chief, at pp. 54 and 55.

space between each set of towers) of 355 m, rather than the 335 m value specified in RES Transmission's Preferred Design.[99]

105. Conductor tensile strength (the force a conductor can withstand when pulled in both directions before it breaks or deforms), is an important characteristic since operating close to the rated maximum strength will cause the material in the conductor to become stressed and fatigued over time. This can potentially lead to the conductor wearing out prematurely or create other safety problems, such as cascade failure. Assuming the correct span length, the operating tension in the Preferred Design's ACSS Trapezoidal Conductors is less than that of the ACSR conductors, both in terms of total force applied and as a percentage of each conductor's rated tensile strength.[100]

(d) Conductor Blowout

106. EWT asserts that the ACSS Trapezoidal Conductors proposed by RES Transmission have greater conductor blowout (the side-to-side swing of the conductor due to high winds) and will, accordingly, require a larger right-of-way (in the order of 0.4 m).[101] Again, EWT errs by basing its calculations on a tower span length of 355 m, rather than on the 335 m value specified in RES Transmission's Preferred Design.[102] Once the correct span length is applied, the conductor blowout differential between the ACSS Trapezoidal Conductors and the ASCR conductors disappears. In the result, no additional right-of-way is required.

(e) Conductor Installation

107. EWT argues that ACSS Trapezoidal Conductors are more difficult and expensive to install because they are heavier (2,600 kg/km vs. 2,300 kg/km for the ACSR conductors) and

---

[99] See Exhibit H-1-1 of RES Transmission's Application at page 4.
[100] See Appendix 3, Claim 12, at pp. A-34 to A-35.
[101] EWT, Argument-in-Chief, at pp. 55 and 56.
[102] See Exhibit H-1-1 of RES Transmission's Application at page 4.

require more care during installation.[103] EWT fails to mention, however, that double the length of ACSR conductors must be installed for a double circuit design. This means that for each kilometre of transmission line, 4,600 kg of ACSR conductors must be installed (vs. 2,600 kg of ACSS Trapezoidal Conductors). Over the 400 km length of the EWTL, the extra care that must be taken to install the ACSS Trapezoidal Conductors is immaterial, compared with the 800 tonnes (800,000 kg) of additional ACSS conductors that must be transported to the site and installed for a double circuit design.

D. TECHNICAL CAPABILITY

108. CNPI, EWT and PWU argue that RES Transmission relies too heavily upon the use of external consultants and does not have the necessary technical, management and permitting skills to complete a project of the magnitude of the EWTL.[104] RES Transmission disagrees. RES Transmission enjoys the benefit of the combined internal expertise of experience of the MidAmerican Group and the RES Group. This experience translates into over 30,000 km of high voltage transmission lines and associated facilities, constructed in a wide array of terrain, and topographies, under challenging climate conditions and subject to many different regulatory regimes.[105]

109. RES Transmission disagrees that its use of experienced, Ontario-based external consultants implies a lack of internal expertise necessary to execute the Project. All applicants in this proceeding are relying on external consultants to some degree because, reliance on specialized contracted expertise is often the best way to obtain high quality services at competitive prices. In RES Transmission's experience, reliance on a combination of internal technical staff and external service providers, as appropriate, provides the best value to ratepayers. This approach is borne out by RES Transmission's

[103] EWT, Argument-in-Chief, at p. 56.
[104] CNPI, Argument-in-Chief, at p. 38; EWT, the Argument-in-Chief, at pp. 56-58 and PWU, Final Argument, at pp. 18 and 21.
[105] See Exhibits E-3-1, E-3-2 and E-9-1 of RES Transmission's Application and Appendix 3, Claims 16 and 17, at pp. A-37 to A-38.

demonstrated track record of successfully completing large, high-voltage transmission projects on or under budget.[106]

E. FIRST NATION AND MÉTIS PARTICIPATION

110. CNPI and the PWU criticize RES Transmission for offering a lower level of First Nation and Métis equity participation than some of the other applicants (20 percent vs. up to 49 percent) and for not providing direct financing to facilitate such investments.[107]

111. As the SEC states in its Final Argument, there is no guarantee that higher potential shares of equity participation will obtained,[108] nor is there any guarantee that a higher equity stake will lead to larger benefits. The value of any equity stake to First Nation and Métis communities will depend on the negotiated terms and conditions between the parties and, most importantly, the rate of interest charged to facilitate such investments. While some applicants have indicated a willingness to provide direct financing, they have not indicated the interest rate at which they will do so. High borrowing costs could significantly reduce the value of any equity participation to First Nation and Métis communities.

[106] Response of RES Transmission to interrogatory OEB-All – 32.
[107] CNPI, Argument-in-Chief, at p. 17 and PWU, Final Argument, at pp. 12-13 and 34.
[108] Final Argument of the SEC at paras. 5.2.5 and 5.2.6.

ALL OF WHICH IS RESPECTFULLY SUBMITTED THIS 3rd DAY OF JUNE 2013.

(signed) Helen T. Newland

Helen T. Newland

(signed) Nalin Sahni

Nalin Sahni

Counsel to RES Canada Transmission LP

APPENDICES

Clarifying Statement: These appendices consist largely of technical rebuttals to claims made by competing applicants and should not be construed as a complete listing of claims and RES Transmission's disagreement with claims made by those applicants.

Appendix 1 – Control Actions Analysis

The IESO studied the relative merits of a new single-circuit line versus a new double-circuit line and has identified that "[f]or the One-plus-One contingency condition, the installation of a new double-circuit line to reinforce the East-West Tie would therefore represent the superior option." EWT LP, in its response to EWT-IR #5 estimated a cost of **$7.0m** annually to provide control actions for a single-circuit line in the event of an N-1-1 contingency.

EWT utilized inaccurate assumptions in their response to the aforementioned IR #5 in three areas: the need for control actions, the frequency and types of line outages that require control actions, and the cost of control actions. In RES Transmission's view, EWT's cost estimate is extremely unrealistic as it overestimates the number of hours of outages in which control actions would be required, and it overestimates the cost of re-dispatching generation to accommodate such outages. More details regarding the cost of control actions have been presented in RES Transmission's AIC at paragraph 132. Due to the many reasons stated therein, it should be noted that the IESO has also not quantified the costs of control actions, as in RES Transmission's view they are insignificant to the overall cost of the Project.

1. **Need for control action:**

There is NO need for new or additional control actions for a single-circuit line beyond those that are already available. RES transmission has worked with the IESO to determine the availability of control actions to accommodate its single-circuit Preferred Design. In response, the IESO has indicated that "[f]or the single-circuit option, the IESO has evaluated increasing generation, increasing imports and managing load in the North West in the event of a second single-element contingency after experiencing an initial single-element contingency. ***The IESO is confident enough control actions are available to satisfy the load security criteria*** found in section 7.1 of its ORTAC criteria even without firm long-term arrangements with the neighboring jurisdictions." (emphasis added)

2. **Hours of Outage:**

EWT LP has improperly assumed a need for control actions for "planned outages" along with "unplanned outages," and has estimated 405 hours per year when control actions will be required for a new single-circuit line due to an outage.

There is no need for control actions during planned outages. Utilizing the outage rates and durations described in EWT's response to EWT-IR#5 (page 66 of 74), the correct annual outage duration is 76 hours, rather than the 405 hours estimated by EWT, as described as follows:

Performance of the existing East-West tie path (from public HONI data)

Average number of sustained unplanned outages of any circuit per year:	1.8
Average duration of sustained unplanned outage (hours per outage):	7.6
Assumed outage rate of new circuits compared to old circuits:	75%

The total number of outages on the existing East-West Tie Line would be 1.8 x 4 (2 segments per each of the 2 circuits), or 7.2 per year. The total number of outages on the new single-circuit line would be 1.8 x 2 x 75%, or 2.7. Therefore, the overall number of outages on the reinforced East-West Tie Line would be 7.2 + 2.7, or 9.9 per year.

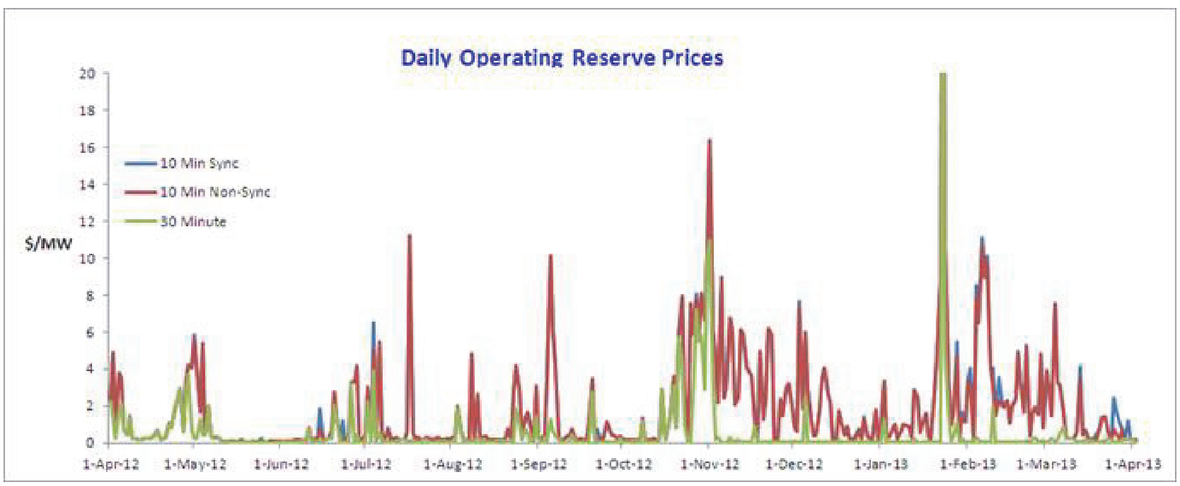
Based on an average duration of sustained unplanned outage of 7.6 hours, the total number of hours per year when any circuit is expected to be on an unplanned outage would be 9.9 x 7.6, or approximately **76 hours**.

3. **Cost of control action:**

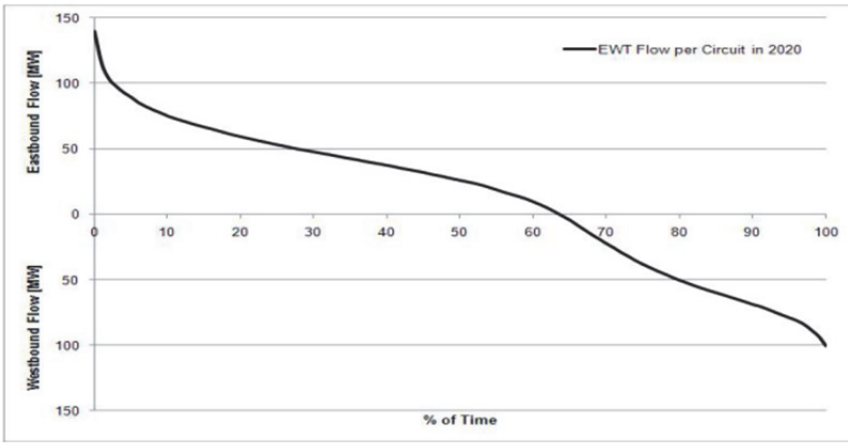
EWT LP has used the incorrect energy price in calculating the cost of control actions. In its response to EWT-IR#5, it uses the average market energy price of $58/MWh to compute the cost of control actions, rather than the price of operating reserves, which would be utilized by the IESO in the event of an N-1-1 contingency.

The IESO, in their recent submission to the Board, indicated the following: "While both double and single-circuit designs can meet the required transfer capability with all elements in service, the double-circuit design has material advantages when considering the actions that will be invoked following contingencies. The IESO estimates that the single-circuit design would require an additional 175 MW of control actions following a single-circuit contingency, compared with the double-circuit design. These additional control actions carry an increased operating cost as typically they are provided by scheduling additional ***operating reserves*** on an hourly basis." (emphasis added)

The following is a plot of the daily operating reserve prices for the past year, with the average price being approximately **$1.9/MWh**, rather than the $58/MWh as estimated by EWT.



Further, in its response to EWT-IR#5, EWT assumed the need to replace 300MW of generation for ALL the hours where any one line on the East-West Tie Line is out of service. Based on the OPA's East-West Tie Duration Curve shown below, it is unlikely that a N-1-1 contingency will occur during a period of high flows, and therefore it is unlikely that 300 MW of replacement generation by way of control actions will be required. A more appropriate estimate, based on the OPA's duration curve, would be 100MW.



Therefore, assuming that control actions of 100 MW are needed for unplanned outages of 76 hours per year, the total cost of control actions would be in the order of:

(Hours of unplanned outage/year) x (Amount of Control action) x (Cost of Operating Reserve)

= 76 x 100 x 1.9

= $15,200.00 per year.

Appendix 2 – Line Losses Analysis

Transmission losses are the power losses in an electrical system and are caused by the electrical resistance of the conductor lines or power lines. Transmission losses are proportional to the square of the amount of the current flowing on the conductors and of the resistance it encounters.

The value of electrical resistance for RES transmission's preferred design and the reference design for the E-W tie lines is calculated based on the losses and the amount of power transfers modeled in the study reports provided by the IESO. Based on these values of resistance, transmission losses are calculated at various transfer levels.

A comparison of the transmission line losses, measured in MW for the reference design and preferred design is calculated and plotted together for comparison as indicated in Figure 1 below. The line losses for both the design options are identical when E-W tie flows are below approximately 200MW. Based on the ETW Line flow duration curve (Figure 9 from the report by OPA[109]) provided by OPA, it is estimated that the E-W tie flows will stay below this value nearly 70% of the time. It is also estimated that ETW line flows stay below 400MW for 95% of time and the difference in losses between the Preferred Design and the Reference Design is about 0.7% as indicated in Figure 1 below.

[109] Long Term Electricity Outlook for the Northwest and Context for the East-West Tie Expansion dated June 30, 2011

FIGURE 1

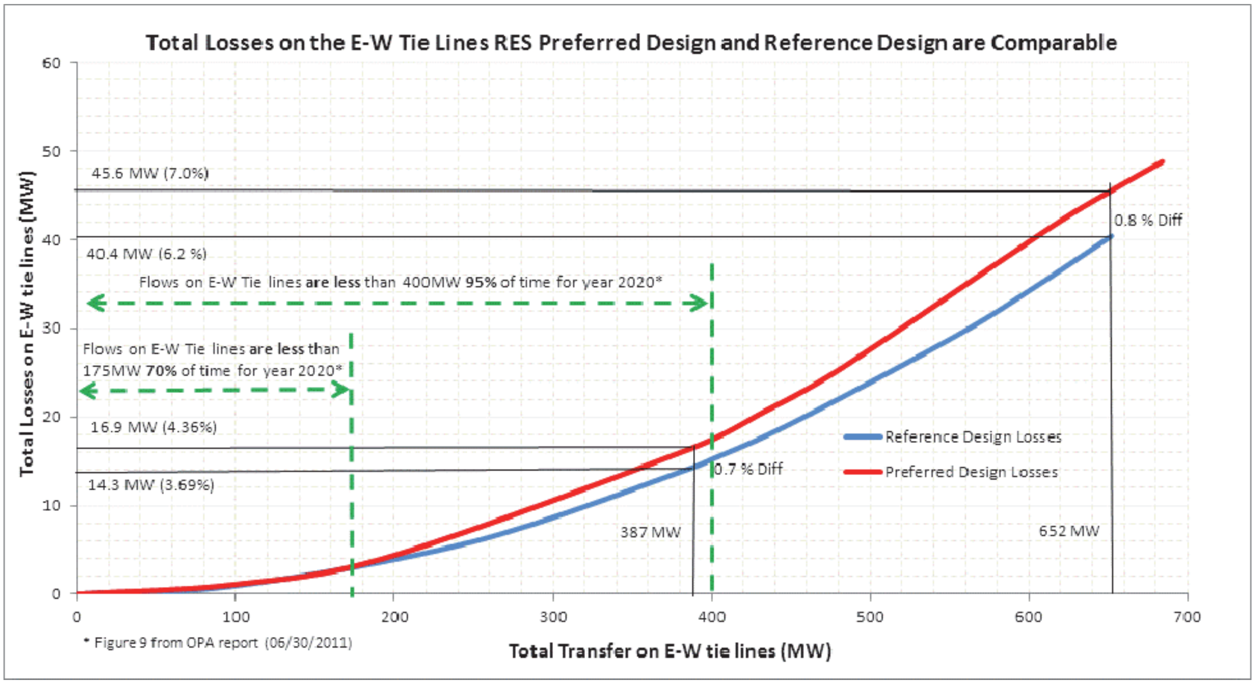


Figure 1: Line losses comparison between RES Preferred and Reference Design.

Typical values of the E-W tie line usage are derived from the (Figure 9 from the report by OPA[110]) duration curve provided by OPA and are used to compute the losses in MWh based on the calculated losses (MW) described in Figure 1. The following Table 1 provides a comparative analysis of the losses for both the proposed designs.

For the purpose of estimating the cost associated with the losses, an average of Hourly Ontario Electricity price (HOEP)[111] is used. The average price for the past 12 months is approximately $26/MWh as indicated in the Figure 2 below. RES Transmission's analysis indicates that the difference in annual line loss costs between the RES Preferred Design and the Reference Design has a net present value of approximately $1.8 million over 50 years.

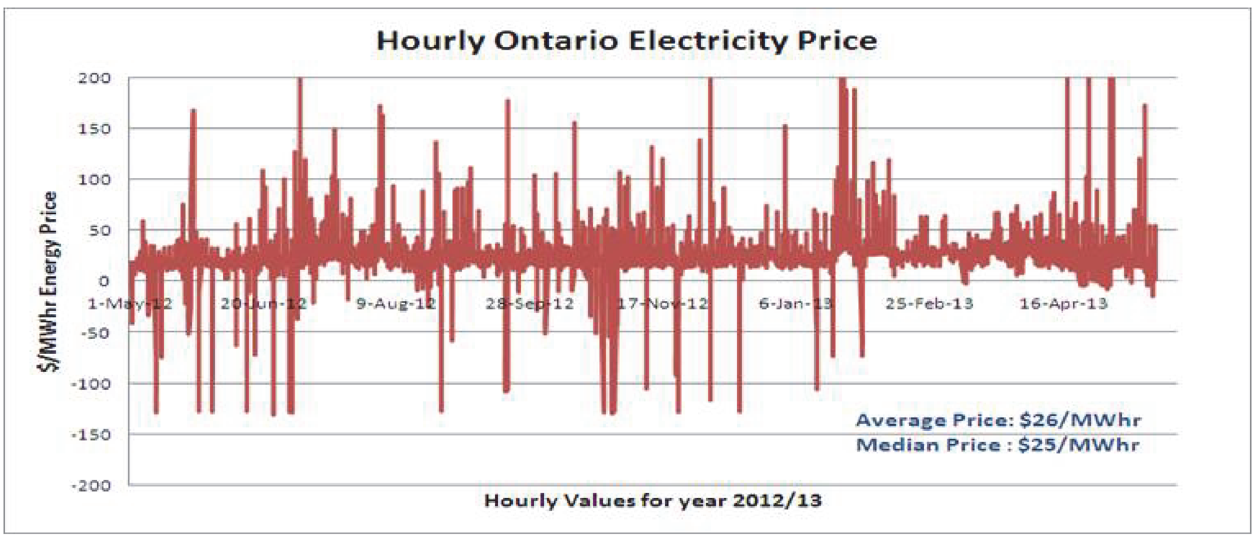
[110] Long Term Electricity Outlook for the Northwest and Context for the East-West Tie Expansion dated June 30, 2011

[111] http://www.ieso.ca/imoweb/marketdata/marketData.asp

TABLE 1-Difference in losses between RES Preferred and Reference Design

Reference Design (MW)	Losses (MW)	Preferred Design (MW)	Losses (MW)	Losses Differential	Usage	MWh/yr	Losses MWh/Yr	**Value @ $26/MWh**
650	40.40	650	45.26	4.86	0.5%	28,470	213	$ 5,533
550	28.75	550	33.23	4.48	1.0%	48,180	393	$ 10,210
450	19.24	450	22.25	3.00	1.5%	59,130	394	$ 10,252
400	15.21	400	17.58	2.37	2.0%	70,080	415	$ 10,801
300	8.55	300	9.89	1.33	10.0%	262,800	1,168	$ 30,377
250	5.94	250	6.87	0.93	15.0%	328,500	1,217	$ 31,643
175	2.91	175	3.36	0.45	25.0%	383,250	994	$ 25,842
100	0.95	100	1.10	0.15	30.0%	262,800	389	$ 10,126
50	0.24	50	0.27	0.03	15.0%	65,700	39	$ 1,025
0	-	0	-	-	0.0%	-	-	$ -
TOTALS					100%	1,480,440	5,011	**$ 130,276**
NPV @ 7% over 50 years								**$ 1,797,908**

Figure 2: Hourly Ontario Electricity price from May-2012 to May-2013



Appendix 3 – EWT Rebuttals

Claim 1: Selection of Steel H-Frame Structures is Inappropriate and Unsubstantiated

Reference: EWT AIG, 2013-04-18, Page 44 of 122, Lines 19-24

EWT Claim: *In its application RES conclusively endorses a technical design using tubular steel H-frame structure as its preferred option. However, in doing so, RES has not provided the results of any technical or economic studies to endorse its choice of structure, and has not disclosed to the Board the inherent limitations of tubular steel H-frame structures that will expose the Project to additional risks.*

RES Response 1:

Choice of Structure:

RES Transmission has completed an industry proven PLS-CADD model, locating every structure along the route using available GIS data. In this process RES Transmission has identified all variable terrain impacts, waterways, geological obstructions and crossing concerns. With the preliminary design models, the resulting design loads and requirements were incorporated into other design software packages for pole, tower, and foundation design considerations. The design was then reviewed with a local Canadian construction firm (PowerTel) for tower and foundation constructability and then used for development of construction plans and schedules. During the review, an on-site inventory of available access roads was performed for assessment and cataloging of the access road map and road development plan.

Inherent limitations:

EWT LP misrepresents that H frame towers have some inherent limitations or defects that make them unsuitable for this Project. This is an unsupported argument of convenience for EWT LP. In fact, all transmission tower types have some inherent limitations depending on their design, as well as the performance requirements expected. EWT LP's assertion is that these towers cannot be adequately designed for Ontario conditions, which is incorrect and not true. Any statements that RES Transmission has not disclosed information regarding its design to the Board are not true and inappropriate.

EWT LP's statements of additional risk are again convenient, general and without merit. Their statements imply that additional risks exist regardless of the Project design or technical diligence, and they also imply that additional risks are imminent regardless of design. These assertions are untrue.

Cost:

EWT LP's claim that RES Transmission has not considered cost in its selection of H frame transmission towers is inaccurate and not true. RES Transmission has extensive experience in the design, construction, operation and maintenance of transmission lines, and by virtue of this experience, understands that cost of towers is only one component of cost considerations necessary in the design of a project. RES Transmission's bid price and total binding project cost are documented in its proposal filed with the OEB.

In summary, EWT LP's accusations that characterize a typical and universally accepted single circuit H-frame tower as "*inappropriate*," " *unsubstantiated*," and "*unproven*" are untrue and/or misleading. Further claims that an industry standard H-frame design is not suitable for the Project or for Ontario in general, are not borne out. They are in extensive use in North America including in Ontario, as evidenced by the photographs below of existing, in-service H-frame structures being utilized in Ontario and elsewhere in Canada, including by two of EWT LP's three main partners, HONI and GLPT. RES Transmission's proposal has been thoroughly considered, and the efficient and simple configuration of an H-frame tower will lend itself to a successful and cost effective solution that creates a safe and operationally reliable transmission system.

Sample photographs of Ontario and Canadian Transmission Line Projects Utilizing H-Frame Structures:

Existing Hydro One transmission line near Timmins, ON; 230kV x 177 structures using tubular steel poles and arms:

New Hydro One 115kV Transmission line Refurbishment Project Circuit, Algoma/North Shore Circuit T1B; from Hydro One Final Environmental Study Report :

Brookfield Power/Great Lakes Power, 230kV Transmission Line for Prince Wind Power Interconnect Project:

230kV Transmission Lines into Ansonville Substation, wood poles with various arms configurations:

Great Lakes Power Transmission, 230kV Transmission Lines near Sault Ste Marie using wood and steel in both conventional H and wishbone configuration:

Nova Scotia Power, 230kV Transmission Line using wood pole H-frame in wishbone configuration:

New Brunswick Power, 115kV Transmission Line near Moncton using tubular steel poles and cross arms:

Claim 2: H-Frame Structures have Greater Cascade Failure Risk

Reference: EWT AIG, 2013-04-18, Page 44-45, Lines 25 to 12

EWT Claim: *ASCE Manual 74, "Guidelines for Electrical Transmission Line Structural Loading" states: "H-frames and narrow-based, rectangular, latticed structures (which) have little inherent ability to withstand the longitudinal loads of a cascading line." Unlike either conventional guyed structures or four-legged trussed steel lattice structures, H-frames inherently lack longitudinal mechanical strength, i.e. the structures are robust against transverse wind loads but are weak against longitudinal loads, for example unbalanced loads caused by ice shedding or a conductor breakage.*

RES Response 2:

RES Transmission is fully aware of the ASCE guidelines referenced by EWT LP, and took these guidelines into consideration when developing its design proposals; however, in the case of the EWTL, design is dictated by standards established in Canada and specified by the OEB. EWT LP uses terms of "robust" and "weak" which are entirely relative and have no bearing unless compared to some standard.

RES Transmission has designed a reliable transmission line system which meets or exceeds all requirements specified by the OEB. While H-frame structures using wood poles cannot achieve significant longitudinal strength, tubular steel H-frame structures can be designed to withstand significant longitudinal loads and resulting bending moments. The proposed tubular steel tangent structures have been designed in strength and geometry to meet or exceed all loading criteria specified in the OEB's *Minimum Technical Requires for Reference Option of the E-W Tie Line*. Further, loading conditions for tangent H structures, including a broken conductor phase or shield wire and unbalanced wire loads due to ice unloading, were included to ensure that the longitudinal tower loadings required of CSA C22.3 section 6.6.3.1 and 6.6.3.2 were fully met. RES Transmission, based on its extensive experience and project route onsite diligence, has also included full dead-end and strain dead-end lattice towers as supplemental limiting devices to provide additional security against cascading failures. Foundations have similarly been designed to accommodate all loads potentially imposed on the structures and wires.

In their arguments EWT LP also did not point out the fact that double-circuit lattice towers, similar to those installed on the existing EWTL, are not immune to failures and cascading, as evidenced by an occurrence on the existing line in 2009 wherein five towers were compromised during extreme weather events.

Claim 3: Foundation Costs are Improperly Estimated

> Reference: EWT AIG, 2013-04-18, Page 45-47, Lines 13-8
>
> EWT Claim: *RES claims that the foundation cost for the tubular steel pole H-frames are lower than for the four-legged latticed tower based on the count of two foundations compared to four foundations for the latticed tower. It notes: "where the Preferred Design uses single-circuit H-frame structures, there would be further cost savings from constructing two rather than four foundations for each tower…"*

RES Response 3:

EWT LP's claim that RES Transmission simply reduced the number of required tower foundations for its Preferred Design by a factor of two over those required for the Reference Design, and then accordingly reduced its estimate, is inaccurate. RES Transmission's Preferred Design considers potential soil and rock conditions as well as structure loading translated to foundation "ground-line" loading. A base number comparison of legs and foundations is too simplistic, as foundation requirements for the double-circuit lattice structures included in the Reference Design are quite different than those for the single-circuit H-frame structures included in the Preferred design, in that they are not of the same size nor perhaps even the same type. The specific individual structure loading must be considered in the foundation design for each tower. The difference in loading between a double circuit configuration and

RES Transmission's proposed single circuit also must be considered. The two foundations associated with single circuit H-Frame tangents vs. four foundations associated with double circuit lattice structures will ultimately utilize less material and have a smaller level of disturbance associated with excavation at the tower site, as the overall structure will have a smaller footprint and only be required to support the loads from a single circuit.

Claim 4: Construction Techniques for H-Frame Structures are Unproven

Reference: EWT AIG, 2013-04-18, Page 47-48, Lines 8-14

EWT Claim: *RES has not proven that it understands the construction techniques to construct its recommended tubular steel H-frame design in the Project area. RES provided the MidAmerican Group's Sigurd Red Butte Project in Utah as a reference. EWT LP has reviewed the draft Environmental Impact Statement97 for this Project prepared by the US Department of Interior Bureau of Land Management ("BLM"). On page 2-38, BLM describes the proposed installation methodology:*

BLM also notes that Rocky Mountain Power is proposing typical 1 foundations 4-5 ft diameter and 20 to 30 ft deep for a tower 80–140 ft tall, i.e. similar in height to the proposed Project towers. The hole would typically be bored by a truck-mounted auger. It is EWT LP's understanding that the terrain for MidAmerican's Sigurd Red Butte Project is dry desert, mostly barren of trees, very light snow in winter with warmer winter temperatures and often quite flat with occasional dramatic rocky areas. The soil is often deep and the rock is not hard granite. In comparison, in northern Ontario the ground is wetter and softer with more streams, harder rock, deeper snow, colder temperatures and longer winters. The steep rocky hills, granite bed rock and boggy wooded areas likely to be found in the Project area will limit vehicular access and make this installation technique very challenging. RES does not make the fundamental connection between (a) the nature of the H-frame structures and foundations needed to serve them; and (b) the geological characteristics of the land on which the structures will be placed. RES *highlights in its application the geological characteristics but does not factor those facts into its choice of structures and its costs.*

RES Response 4:

EWT did not provide any evidence or facts, only their opinions, that RES Transmission "has not made the fundamental connection" between line design, access and construction nor have they provided any evidence that RES Transmission has not included geological characteristics and constructability factors in its Preferred Design. RES Transmission conducted extensive onsite field diligence, inventoried existing access road information and identified potentially new access routes that would be needed to construct its Preferred Design. This evidence is provided in the Application at exhibit **EB-2011-0140, Exhibit H, Tab 1, Schedule 1 (H-1-1); Exhibit H, Tab 6, Schedules 1, 2, 3, and 4 (H-6-1, H-6-2, H-6-3, H-6-4)**.

RES Transmission further demonstrates that H-Frame structure configurations are well established and used throughout the transmission industry across all of North America. The included referenced project (Sigurd-Red Butte) was a representative example of a successful 345kV project utilizing H-Frame structures. This Project is one of many projects consisting of several thousands of miles of H-Frame structure configurations in MidAmerican Transmission's operating system. The foundations depicted for the Sigurd-Red Butte 345kV application are tailored to its specific design loads, geology and terrain and are not intended to be directly or universally applicable to the Ontario Project specific design criteria. RES Transmission has demonstrated that the proposed foundation designs are refined for the expected EWTL terrain and subsurface conditions. The suggestion that RES Transmission will unilaterally use the same Sigurd-Red Butte design for the EWTL is incorrect. As this analysis is not contained within Mr. Catchpole's affidavit, RES can only conclude that this is a non technical comparison.

For the site-specific location of the Project, RES Transmission's construction and management personnel have visited and inspected the proposed alignment numerous times and are well familiar and experienced with transmission line construction in this type of terrain and conditions. The access and construction techniques have been well vetted, which was vetting including a review by a local Canadian construction firm (PowerTel) for tower and foundation constructability plans and schedule development.

Claim 5: H-Frame Foundation Designs are Unproven in Similar Terrain and Conditions

Reference: EWT AIC, 2013-04-18, Page 48-49, Lines 15-5

EWT Claim: *RES has not provided a proven foundation design for 75% of the new line. At Exhibit H, Tab 5, Schedule 1 of RES's application, RES sets out its subsurface foundation design assumptions. In particular, it notes that 60% of the structure's location would have bedrock at ground surface or within one meter of the surface, and that a further 15% of structure locations will have bedrock within 3 m of the surface. RES notes that "Drilled shaft concrete piers will be utilized whenever possible. Alternate foundations will be designed where appropriate." It seems unlikely it will be cost effective for RES to auger a 20 – 30 ft. hole to use a drilled shaft concrete foundation where bedrock is at or within 3 m of the surface. Instead RES will need to design a new, alternative foundation. RES stated that "For H-Frames in rock, a grouted anchor system 1 with a concrete cap that incorporates anchor-bolts is being developed."*

RES has proposed a tubular steel H-frame design but acknowledges that a suitable foundation has not yet been developed or tested in service for the ground conditions expected at approximately 75% of the structure locations on the Project.

RES Response 5:

This statement is neither accurate nor representative of the foundation design evidence provided in RES Transmission's Application. RES Transmission has evaluated potential foundation types for all subsurface conditions. EWT LP reiterated a portion of the RES Transmission proposal which verifies RES Transmission's proper and more complete understanding of the terrain and soil types than any other proponent. RES Transmission fully recognizes the varied soil conditions to be encountered during construction and has designed foundations accordingly.

As noted in the proposal in exhibit **2011-0140, Exhibit G, Tab 7, Schedule 1 (G-7-1)** "A project of this nature can expect to face numerous challenges in constructing foundations for the structures. The Applicant's plan accounts for these in several ways, not the least of which is by choosing foundations from an array of foundation types, including: concrete pier, pad and pedestal, rock anchor, helical pier, grillage, and direct embeds. Through comprehensive geotechnical exploration and testing, soil will be characterized and a model for applying the discovered soil and rock design-strength parameters will be formulated. Based on the soil conditions and load demand, the Applicant will choose the optimal type and design for the foundations. The Applicant's access plan and construction personnel will identify any constraints on available materials, delivery, and equipment requirements and, if any are constrained, will select a foundation permitting limited excavation and concrete. Design assumptions made during excavation will be verified by a qualified Geotechnical Engineer, authorized to alter the design as appropriate for any unanticipated conditions."

All of these are proven, established foundation types and mentioned as potential options by essentially all Applicants. As noted in the proposal, RES Transmission has evaluated, acknowledges, and is prepared to address the numerous potential challenges in constructing foundations for the structures. Each applicant potentially faces these construction challenges, as well.

Claim 6: Costs and Environmental Implications Have Not Been Properly Evaluated

> Reference: EWT AIC, 2013-04-18, Page 49, Lines 8-14
>
> EWT Claim: *In response to Board Interrogatory #15, RES stated that any risks associated with the H-frame structures identified in its risk analysis were incorporated into its developmental cost proposal. RES's design span for the tubular pole option is relatively*

small compared to conventional lattice and guyed structures – 335 m vs. 410 m. This in turn means that 22% more structures will be required when a steel H-frame is used. The greater number of structures will tend to increase costs. The additional construction sites and associated construction access tracks are likely to result in greater environmental damage during construction.

RES Response 6:

Environmental impacts, as well as costs associated with access to structure locations, were assessed, analyzed and included in RES Transmission's Application. The additional number of structures associated with the 335 m span vs. the 410 m span was acknowledged in the RES Transmission's Application (Exhibit H-1-1); furthermore, extensive field inspection and evaluation efforts were conducted with respect to access to structure locations, including the identification and inventorying of approximately 300 water crossings. Structure access roads were inventoried and classified as to the extent of improvement needed. Alternative methods for construction to minimize disturbance were developed and presented in the proposal. These include wooden matting use, potential barge use, helicopter assisted construction and winter construction techniques.

It should be noted that the associated comment contained in the EWT LP Affidavit of Peter Catchpole (Item #19), that "…RES offers the shortest design span for the Project" is inconsistent with the fact that the baseline EWT LP proposal consists of a double-circuit line with an average span of 270 m, as presented in the EWT cost estimate. The alternate EWT (long span) reference design consists of an average 439 m span; however, this would not meet the original OEB galloping criteria and would also require a wider right of way due to blowout considerations. As discussed in Response 3, the RES Transmission single circuit H-frame system will require only two foundations as compared to the four foundations required for the double circuit lattice tower system, thereby lessening the environmental impact at each tower site.

Claim 7: RES Transmission's Preferred Design is Unproven

Reference: EWT AIC, 2013-04-18, Page 49-50, Lines 15-20

EWT Claim: *RES has not filed evidence sufficient to demonstrate that RES's recommended design has been used in similar terrain and condition as the Project.*

In the absence of any evidence from RES to the contrary, one must therefore conclude that RES's endorsement of a tubular steel H-frame for the 400km East-West Tie is based solely on its affiliate's experience with two lines neither of which are longer than 17 miles / 25 km. Furthermore, on the basis of the above-noted search, it appears that RES's affiliate has minimal experience of transmission development and construction with which to compare the tubular Hframe design.

RES Response 7:

MAT has several thousand miles of H-frame transmission lines within its operating system. EWT LP's suggestions that RES Transmission lacks experience with H-frame systems based on spurious analysis drawn from two sample projects are far reaching and wrong.

Claim 8: Selection of ACSS Conductor is Inappropriate and Unsubstantiated

Reference: EWT AIC, 2013-04-18, Page 51-52, Lines 1-6

EWT Claim: *In its application RES conclusively endorses a technical design using ACSS/TW conductor ("ACSS") with a tubular steel H-frame structure as its preferred option. RES did not provide the results of a conductor optimization study typically completed before endorsing the choice of conductor and did not disclose the inherent limitations of the ACSS conductor that will expose the Project to structural risks.*

Many of RES's claims for the superior performance of its recommended conductor are either unsubstantiated or incorrect. RES's conductor choice is theoretically capable of *operating at a higher continuous temperature and thus providing greater ampacity. However, RES did not explain the unique design changes that would be required to allow this additional ampacity to be realized without infringing safety clearances, nor did it explain the value of this unsolicited extra ampacity to ratepayers. RES did not identify the risks and disadvantages associated with using ACSS conductor including its higher costs, reduced safety margins, higher sags, higher purchase cost and increased installation costs. RES's claims as to the conductor's excellent self-damping vibration properties are incorrect.*

In summary, RES's selected Potomac ACSS/TW conductor offers higher risks at higher costs than the widely discussed Grackle ACSR choice. RES has not provided any evidence of having completed the line optimization studies necessary to select the most cost effective and technically effective conductor.

RES Response 8:

Inherent limitations of Conductor:

Table 8.a was created to show the Board how Potomac ACSS/TW can benefit this Project through less sag, reduced structure height and reduced structure loading, while still meeting the electrical requirements provided.

Safety Clearances:

Southwire has stated ACSS is, "*especially useful for new line applications where structures can be economized because of reduced conductor sag.*" (Southwire May 2012 ACSS Conductor Specification Brochure)

Clearances are specifically addressed in controlling weather cases, as provided by The Board in Table 8.a. Table 8.a lists the design data for the double circuit reference design

(Grackle ACSR) and RES's preferred single circuit H-frame design (Potomac ACSS/TW) resulting in the clearances not only improving, but in a reduction of structure heights.

Higher Costs:

Although the unit cost for ACSS is higher than ACSR, RES Transmission's solution requires only a single ACSS conductor as compared to EWT LP's two ASCR conductor bundles. As a general rule, total cost for purchase and installation of single ACSS conductor is equivalent to a double bundle ACSR conductor of similar total ampacity. However the mechanical loads imparted to the tower and foundations are much reduced for the single ACSS conductor since one conductor carries less conductor weight and is subject to less ice and wind loads when compared to two conductors. Less loading results in lighter towers, smaller foundations and less **total** cost, which is reflected in RES Transmission's proposal. Additionally, other utilities such as Connecticut Light and Power have adopted ACSS for cost benefits, as noted below.

Connecticut Light and Power

Per the 2012 life cycle analysis performed by Connecticut Light and Power by KEMA (globally recognized EHV testing and consulting expert), "ACSS HTLS has been adopted as CL&P's new standard replacing ACSR based on benefits of less sag, operation at higher temperatures and additional current carry capacity" (Connecticut Siting Council Life-cycle Cost Report 2012). ACSS is quickly becoming an industry wide standard and the CL&P case was provided as an example to many.

Un-solicited extra capacity to ratepayers:

The RES Transmission solution does not require OEB to increase capacity to match the conductor's limits. The extra capacity is a benefit under emergency situations, and not a burden to the rate payers.

Self-Damping Vibration Properties:

ACSS conductor has excellent self-damping properties, as compared to ACSR, due to the pre-annealed aluminum strands. This additional benefit, however, does not mean, nor was it stated by RES Transmission, that dampers would not be used. Vibration dampers for both the conductors and shield wires are included in the RES Transmission proposal. Type, size, number and spacing will be determined in final line design, and will be incorporated in construction. The advantages of ACSS conductor are well documented and supported by leading manufactures such as Southwire and General Cable.

Southwire

Southwire, a manufacturer of conductor, states in their Overhead Conductor Manual the following:

> ACSS *"sags less than comparable ACSR under electric loading" and is "especially useful for new line applications where structures can be economized because of reduced conductor sag" (Southwire May 2012 ACSS Conductor Specification Brochure)*
>
> *The key advantages of ACSS include:*
>
> - *Higher operating temperatures, up to 250^{o} C, with no loss in strength*
> - *Lower thermal elongation*
> - *Better self-damping ability*
> - *No creep elongation over time" (Overhead Conductor Manual, 2nd Edition, page 7.18 , 2007)*

General Cable

General Cable reports "*With thousands of miles installed throughout North America, ACSS is a proven, trustworthy overhead conductor technology and remains the most accepted solution for high temperature performance*" (General Cable March 13 Overhead Conductor Specification brochure). In conjunction to these benefits, General Cable further acknowledges other advantages over ACSR, "*ACSS sags less under emergency electrical loadings than ACSR, it is self-damping, and its final sags are not affected by long-term creep of the aluminum*" (General Cable March 13 Overhead Conductor Specification brochure).

Technically effective conductor:

Table 8.a lists the design data for the double circuit reference design (Grackle ACSR) and RES's preferred single circuit H-frame design (Potomac ACSS/TW).

Table 8.a RES Transmission Reference versus Preferred Design Comparison

	Compared Factors: Green = Better	
	Referenced Design	**Preferred Design**
Structure Type	Double Circuit Lattice Tower	Tubular Steel H-Frame
Tower Spacing	410 m	335 m
Conductor	1192.5 kcmil 54/19 ACSR Grackle	1557.4 kcmil 45/7 ACSS/TW HS285 Potomac/TW
Line Design Load at 93°C	1120 Amperes	1545 Amperes
Line Design at 127°C	1440 Amperes	1891 Amperes
Conductor Rated Tensile Strength	186,380 N	145,902 N
C22.3 No. 1-06 Heavy Loading Tension (% RTS)	69,929 N (37.5 % RTS)	50,579 N (34.7% RTS)

-30°C; Bare; Initial **Tension** **(% RTS)**	43,198 N (23.3% RTS)	32,174 N (22.1% RTS)
15°C; Bare; Initial **Tension** **(% RTS)**	37,268.7 N (20.0% RTS)	29,177 N (20.0% RTS)
Sag at Maximum Operating Temperature (100°C; Bare; Final)	15.70 m	15.08 m
Sag at Static Ice Load **(0°C; 25 mm; Final)**	16.08 m	15.35 m
Vertical Phase Spacing (m)	7.3 m per phase	0 m (horizontal single circuit configuration
Structure Height (m)	40m-70m	25m-54m

Claim 9: Sag of ACSS Conductor is Misrepresented

Reference: EWT AIC, 2013-04-18, Pages 52-53, Lines 8-15 & Affidavit Items

EWT Claim: *RES claims that the reduced line sag of its recommended conductor, especially during situations of emergency electrical load, is superior to that of the Grackle conductor identified by the IESO and a number of the other applicants. This claim is not correct.*

To illustrate, as set out in the affidavit of Peter Catchpole attached as an Appendix hereto, Power Engineers compared the Potomac ACSS/TW conductor to Grackle ACSR conductor as assumed by the IESO. The two conductor choices were held to a common span – that being RES's suggested span of 355 m – and to a common cold temperature

Catenary Constant value of 1,900 m. The results of Power Engineers' analysis are set out below.

RES Response 9:

The analysis performed by Power Engineers is incorrect; their calculations were based on a span length of 355m rather than 335m as proposed by RES Transmission. The oversight of using an incorrect span exaggerates any differences in conductor sag and corresponding tensions. RES Transmission's design as shown in Table 8.a will meet all the OEB's design tension limits specified in OEB's Minimum Technical Requirements for the Reference Option of the E-W Tie Line.

When the actual structure configuration of the reference double circuit Grackle ACSR and preferred single circuit H-frame designs are incorporated, the assertions by Power Engineers regarding structure height, line sags and safety clearances are incorrect. The proposed RES preferred H-frame single circuit Potomac ACSS/TW design has:

- Lower Structure Heights: The H-frame single circuit preferred design has lower structure heights due to less sag using the Potomac ACSS/TW conductor and a single circuit horizontal configuration versus the reference double circuit vertical configuration using Grackle ACSR conductor.

- Less Line Sag: The H-frame preferred design using ACSS/TW has lower sag than the reference double circuit design using Grackle ACSR.

- Electrical Safety Clearances Incorporated: Per the OEB's criteria, RES's proposed design incorporated the static ice (0.25mm ice) condition in the structure height estimation for both the Grackle ACSR reference design and Potomac ACSS/TW preferred design to meet electrical safety clearances.

- When taken in context, it is clear that EWT and Power Engineers' evaluation ignores the obvious benefits associated with RES and MAT's innovative single circuit H-frame solution as compared to the double circuit lattice tower solution.

Claim 10: Costs of Operating ACSS Conductor at Higher Temperatures are Ignored

Reference: EWT AIC, 2013-04-18, Page 53-54, Lines 17-11

EWT Claim: *RES claims that Potomac ACSS can operate at higher temperatures, and that this makes it superior. This claim is true in part because ACSS is designed for continuous operation at temperatures up to 250°C which allows for a higher ampacity.*

However, RES has not discussed the effect that operating the line at 250°C will have on conductor sag. As can be seen from the table above, the sag at 250°C will be 17.2 m compared to the maximum design sag of 15.1 m. Unless RES either employs 2.1 m taller towers, which will be more expensive, or increases the conductor tension, which is not necessarily desirable for the reasons discussed below, RES will not be able to run the line at these higher temperatures without infringing ground safety clearances.

Both Grackle and Potomac ACSS conductors are capable of delivering the required MVA capacity within the limits expressed in the Board's technical requirements. While the ACSS conductor can run much hotter and deliver more ampacity, this capability comes at the added cost of greater sag and the need to provide for the higher capacity with the station equipment. The incremental capacity does not come free of charge, nor was it solicited.

RES Response 10:

As submitted, the RES Transmission preferred single circuit H-frame design using Potomac ACSS/TW conductor will have a maximum operating temperature of 127^{o} C rather than the

250^{o} C as stated by EWT LP. This temperature rating results in more electrical load capacity than the reference double circuit design as shown in Table 8.a.

The referenced statement referring to 200°C is found in RES Transmission's Application Exhibit H-4-1 on page 1 of 1 lines 6 and 7: "The 1557 ACSS conductor is designed for continuous operation at 200°C – more than sufficient to operate the EWTL at 650 MW." This merely states that an ACSS conductor can operate continuously at 200°C. It does not state that the design submitted by RES is designed or must be designed to 200°C.

The statements made by Power Engineers regarding structure height are inaccurate and do not reflect the fact that for Grackle ACSR conductor to be used a double circuit configuration must be employed. As shown in Table 8.a, the reference double circuit configuration is taller than RES's proposed single circuit H-frame configuration since the double circuit configuration has a vertical configuration for two circuits versus the H-frame's single horizontal configuration.

Claim 11: Self-Damping Properties of ACSS Conductor are Overstated

Reference: EWT AIC, 2013-04-18, Page 54, Lines 12-20

EWT Claim: *RES claims that its recommended Potomac ACSS conductor has superior self-damping vibration properties. This claim is not backed up by Power Engineers' independent calculations. Power Engineers' analysis shows that two dampers per span are recommended for the ACSS installation and one damper per span for the ACSR conductor choice. This recommendation conflicts with the proponent's statement of excellent self-damping properties. The basis for the disagreement can be expressed as this: while a conductor may be less prone to vibration due to its self-damping capabilities, this does not imply that once vibrating, it also has equal or better survivability against fatigue damage.*

RES Response 11:

RES has always planned and accounted for dampers with the Potomac ACSS/TW conductor and that information is reflected in the bid.

The Power Engineers analysis is flawed by the span and design tensions utilized with their calculations. When applying the RES design tensions and span in Table 8.a, RES's analysis determined that one damper is require per span for both the reference double circuit Grackle ACSR and proposed single circuit H-frame Potomac ACSS/TW designs. RES's analysis was performed using the Vibrec software, which is developed by the dampening hardware supplier AFL. It should be noted that EWT's single circuit proposal requires two Drake ASCR conductors in a bundled configuration for each phase to meet the electrical requirements.

Claim 12: ACSS Conductor Tensions are Proportionately Higher than ACSR

Reference: EWT AIC, 2013-04-18, Page 54-55, Lines 22-9

EWT Claim: *RES did not file any evidence in its application identifying or proposing mitigation against the risks of reduced fatigue life, increased cascade failure or reduced safety margins resulting from the use of Potomac ACSS conductor operating closer to its rated tensile strength.*

The tension of Potomac ACSS for given operating conditions is greater than that of Grackle. However, the sags are greater. These larger sags could be reduced by increasing the design tension as discussed above but doing so further increases the vibration activity and raises the %RTS "usage" of the ACSS conductors – values that are already quite high. Increased design tensions could also affect the fatigue life of the conductor. Note that the rated tensile strength of Potomac ACSS (12,353-14,842 kg) 112 is considerably less than that of Grackle (18,959 kg) 113 – this may be an issue given the harsh conditions in the Project area. EWT LP also notes from the tables that the initial *design tension at -30°C for Potomac ACSS, 39% of RTS, is greater than the 25% value specified in the Board's Minimum Design Criteria.*

RES Response 12:

As shown in Table 8.a, the design tensions of the Potomac ACSS/TW conductor for the preferred single circuit H-frame design are less than the tensions for the Grackle ACSR conductor for the reference double circuit design. This is in terms of tension load and conductor usage as a percent of rated tensile strength (% RTS).

With the RES Transmission design information correctly represented, one can observe that there is not additional risk of fatigue, increased cascade failure or reduced safety margin for the Potomac ACSS/TW conductor.

Claim 13: ACSS Conductor is More Expensive than ACSR

Reference: EWT AIC, 2013-04-18, Page 55, Lines 10-14

EWT Claim: *Potomac ACSS is estimated to cost approximately 36% more than Grackle ACSR. This estimate is based on equal unit costs for aluminum and steel core materials except for an adder for annealing and shaping the ACSS strands and providing a high heat resistance ACSS core. RES did not file any evidence justifying this incremental cost.*

RES Response 13:

RES acknowledges that the Potomac ACSS/TW conductor is more expensive than the equivalent ACSR conductor on a per-unit conductor basis, but when comparing a complete design using a single circuit Potomac ACSS/TW conductor to a double circuit Grackle ACSR conductor design, RES Transmission finds there are considerable cost savings due to the superior electrical characteristics. The unit cost described by EWT LP does not account for the need of a second Grackle ACSR circuit to meet the OEB's electrical ampacity load requirements. The unit cost comparison described by EWT LP intentionally omits the need for bundling or for a second circuit. Using a correct comparison between EWT LP's solution (double circuit) and RES's preferred solution (single circuit), results indicate the Potomac ACSS/TW conductor will have superior project cost benefits for the complete structural system including:

- Reduced structure height and weight: The single circuit H-Frame design has a horizontal configuration which allows for shorter structures to be used compared to the double circuit reference design that has a vertical configuration.
- Reduction in structure loading: Due to less conductors (6 for the double circuit reference compared to 3 for the single circuit H-frame preferred), there is less wind loading which will reduce structure weight and foundation reactions.
- Fewer Insulators required: The single circuit H-frame will have significantly less hardware than the double circuit reference design due to less wires (6 for the double circuit reference compared to 3 for the single circuit H-frame preferred).

Claim 14: ACSS Conductor Requires a Wider Right-of-Way than ACSR

Reference: EWT AIC, 2013-04-18, Page 55-56, Lines 15-2

EWT Claim: *Potomac ACSS has a greater conductor blowout (4.3 m) compared to Grackle ACSR (3.9 m). The use of Potomac ACSS will therefore require a marginally wider right of way to maintain safety clearances unless the conductor tension is increased.*

RES did not file any evidence justifying either the increased costs or identifying the permitting risks associated with a wider right of way because of greater conductor blowout.

RES Response 14:

In RES Transmission's Responses to Interrogatories to All Applicants dated March 28, 2013, the required right of way width for the preferred H-frame design is 48 meters, which is less than the reference double circuit design of 50 meters. The values calculated by Power Engineers did not incorporate the correct span lengths for the two designs nor the configuration differences between the reference double-circuit and preferred single-circuit H-frame designs.

Claim 15: ACSS Conductor is More Difficult and Expensive to Install than ACSR

Reference: EWT AIC, 2013-04-18, Page 56, Lines 3-10

EWT Claim: *The installation cost for ACSS conductor will be greater than for the ACSR choice. RES did not identify these additional costs in its evidence. Potomac ACSS (2,600 kg/km) is heavier than Grackle ACSR (2,300 kg/km). Heavier conductors cost more to install than lighter conductors mostly because the lengths on the reels are shorter forcing more installation set-up locations.*

ACSS conductors also require more careful handling on site to avoid damage to the very soft annealed outer aluminum strands.

RES Response 15:

While the Potomac ACSS/TW conductor is larger when compared to the Grackle ACSR conductor, and requires more care during installation, the EWT analysis did not incorporate the fact that to use the Grackle ACSR conductor a second circuit must be used. This means that twice the conductor length must be installed for the double circuit Grackle ACSR reference versus the RES Transmission's preferred single circuit H-frame design. This equates to Potomac ACSS/TW having a total conductor weight of almost half that of the Grackle ACSR (2,600 kg/km versus 4,600 kg/km).

Claim 16: RES Transmission's Internal Engineering Resources are Limited

Reference: EWT AIC, 2013-04-18, Page 56-57, Lines 15-3

EWT Claim(s): *RES has provided no evidence that it has engaged external engineers for this Project. The 1 conclusion one must draw is that RES does not have the engineering capacity to undertake the Project, and will not do so until MidAmerican Group engages external engineers. This is a significant risk were RES to be designated.*

RES Response 16:

MAT does leverage the resources of external engineers to develop the preliminary design for the RFP package; however, the final design is performed by the EPC contractor. Powers Engineers is currently assigned to Gateway West and Gateway South; however, MAT has used David Evans & Associates/Stanley Engineers, Black & Veatch and Pike Engineering in the same role for the Populus-Terminal, Mona-Oquirrh and Sigurd-Red Butte projects, respectively. It is incorrect to assume that this Project cannot be delivered without an external consultant, in as much as MAT's engineering completed a full preliminary design to support the RES Transmission proposal.

Claim 17: RES Transmission Lacks Adequate Permitting Experience

Reference: EWT AIC, 2013-04-18, Page 57-58, Lines 4-18

EWT Claim(s): *It is apparent from the public record that although MidAmerican did host project meetings with landowners along the study corridor, the majority of the consultation was led by BLM, not MidAmerican. This is in contrast to the Ontario process, where the designated transmitter will be responsible for coordinating and executing all consultation, permitting and routing.*

RES Response 17:

EWT LP's claim that MidAmerican Transmission is not leading consultation for the Energy Gateway Program with regard to the National Environmental Policy Act (NEPA) is wrong. EWT LP has carefully parsed headlines and taken phrases of out context to suggest that the Bureau of Land Management will lead the NEPA permitting effort and develop the permit applicable on behalf of any proponent who desires to build a transmission line on public lands. This is either a disingenuous characterization of MidAmerican's permitting experience or demonstrates EWT LP's lack of knowledge and understanding of the process administered in the United States.

MidAmerican works very closely with the agencies in achieving the technical and engineering requirements of the project while taking into consideration one of its core principles: Environmental respect and stewardship. All detailed work needed to support requirements of the permit are performed by the Owners Engineer and the Environmental Consultant, and are so performed at the direction of the MAT project team. A partial list of such activities includes:

- Development of preferred and alternate transmission routes
- Review and approval of revised alternatives
- Development of purpose and need
- Development of transmission routes and alternatives
- Approval of regional study areas
- Provision and review of data
- Participation in scoping meetings
- Development of permit applications for all rights of entry for data gathering
- Environmental analysis of all routes including physical ground truthing
- Data proving for preliminary Plan of Development
- Provision of aerial photography
- Review of inventory

- Participation in public information meetings and responding to all comments
- Provision of engineering, construction, operation and maintenance data
- Provision of additional engineering data in issue areas
- Development and review of mitigation measures and plans
- Development of engineering selection criteria
- Review and provision of input on selected alternatives
- Performance of preliminary engineering to supplement Draft EIOS
- Provision of preliminary engineering design and cost data
- Provision of general engineering costs and construction input
- Attendance at all hearings and response to all comments

For BLM sponsored meetings, MidAmerican staff attended and actively participated in all meetings by addressing questions and/or concerns raised by the public, providing presentation materials and coordinating the use of facilities. MidAmerican was also involved in the compilation of feedback received at the meetings and incorporating those concerns into the Project.

Additionally MidAmerican has held hundreds of "transmitter" led meetings with agencies and stakeholders at their own discretion following the same approach as the Bureau led meetings.

Finally, MidAmerican has demonstrated a very successful track record using its current methodology and approach for permitting, design and construction. Within a five year period MidAmerican has permitted and constructed three EHV transmission lines totaling 408km, and will receive its fourth permit for 282km within months.

Appendix 4 – UCT Rebuttals

Claim 1: Double-Circuit Provides Superior Voltage Stability and Transfer Capacity to Single-Circuit

Reference: UCT-Nextbridge AIC, 2013-04-18, Page 11, item 29

UCT Claim: *RES' technical assessment of the single circuit option proposes that voltage stability at low load times is more favourable under a single circuit option. However, it is at high load times when the system is at a point where contingencies may propagate through the system and cause significant outages. It is at these times that issues such as voltage stability and transfer capacity become critically important issues. It is at these critical times (i.e. times of high load and high system stress) that a double circuit option provides more and better system response during a contingency.*

RES Response 1:

It appears that UCT acknowledges that the single circuit design performs better under light load system conditions. RES Transmission has explained in great detail the electrical benefits from achieving higher capacity and better voltage control in its response to RES-specific interrogatory #10.

RES Transmission also provided a detailed explanation of the improved system performance section in its AIC (page 30). While the Preferred Design has equivalent, and in some scenarios superior performance attributes to the IESO's Reference Case when the line is heavily loaded, the Preferred Design provides superior voltage control and management of reactive power during normal transfer levels. This is important since the OPA's flow duration chart, shown in its June 30, 2011 Long-Term Electricity Outlook for the Northwest Report, indicates that the EWTL would not be at its rated capacity (i.e., the EWTL will be at normal transfer levels) for approximately 95 percent of the time, in any one year.

Claim 2: Double-Circuit Offers Superior Scalability to Single-Circuit

Reference: UCT-Nextbridge AIC, 2013-04-18, item 30

UCT Claim: *In respect of higher total transfer capability, RES's technical assessment of the single-circuit option is correct in that the design can achieve stated OEB, OPA and IESO transfer criteria. However, the equipment proposed by RES is often used to add additional capacity to an existing system no longer meeting requirements, rather than as an original design where alternatives are available. If the additional equipment of the type proposed in the RES application were applied to a double-circuit solution for the East-West Tie, there would be increases in transfer capacity above and beyond the capacity afforded by a double-circuit option without such equipment. This would be the means of achieving the "up to about 800 MW" thermal rating for future expansion that the OPA has identified as a benefit of a double-circuit solution for the East-West Tie (as noted in paragraph 29, above). A double circuit option with equivalent voltage control or compensation equipment would yield better transfer capability than a single circuit option.*

RES Response 2:

UCT acknowledges that the single circuit design option is correct in that the design can achieve stated OEB, OPA and IESO transfer criteria.

The additional equipment proposed by RES Transmission in its single circuit design is generally considered an industry standard in projects that require power transfer over long transmission lines. This would be the most cost effective way to get the desired transfer capacity.

IESO nor any other applicants have conducted studies to determine that an 800 MW transfer is achievable with the double circuit option. The results produced in the IESO feasibility report indicate that the additional transfer capability beyond 650 MW will introduce significant problems during outage conditions on the underlying transmission system. Further, the system

East of Wawa and West of Lakehead is incapable to handle a transfer level of 800MW. The cost of the proposed double circuit would further increase due to the addition of these reactive devices necessary to increase the transfer.

Claim 3: Single-Circuit is Not as Reliable and Performs Poorer than Double-Circuit

Reference: AIC pg13, paragraph 35

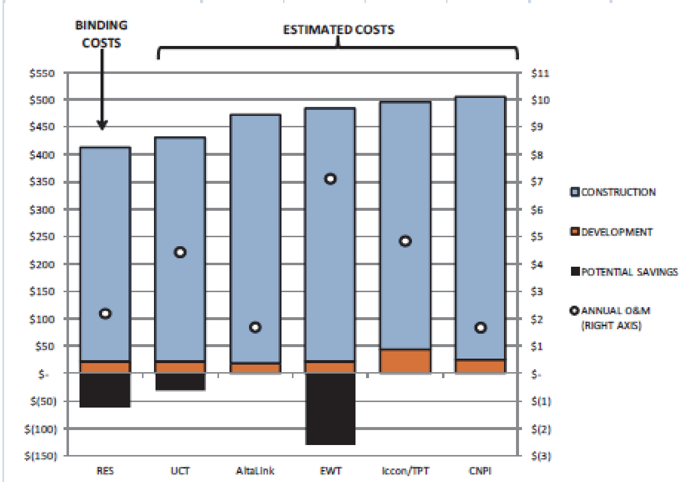
UCT Claim: *NextBridge submits that RES has not discharged the onus of demonstrating that a single-circuit alternative is equivalent, in terms of performance, reliability, cost etc., to the Reference Option, and the RES proposal should thus be rejected.*

RES Response 3:

RES Transmission has demonstrated on multiple accounts the benefits its single-circuit Preferred Option will offer, such as rate payer savings, construction time and cost savings, lower O&M costs, and system operability over the Reference Option. Such statements have been made in RES Transmission's response to Interrogatory #21 from the Board to All Applicants, as well as in RES Transmission's Argument in Chief as follows:

- page 51, Figure E-1, reproduced herein:

Figure E-1: Line Costs ($MM – 2012)



	RES	UCT	AltaLink	EWT	Iccon/TPT	CNPI
CIRCUITS	1	2	2	2	2	2
BASIS OF COSTS	BINDING	ESTIMATED	ESTIMATED	ESTIMATED	ESTIMATED	ESTIMATED
DEVELOPMENT	$21.5	$22.2	$18.1 [1]	$22.1	$43.7 [3]	$24.0
CONSTRUCTION	$391.9	$408.6	$454.1 [2]	$462.0	$452.6	$480.8
TOTAL LINE COSTS	$413.4	$430.8	$472.3	$484.1	$496.3	$504.8
COST DIFFERENTIAL	BASE	$17.4	$58.8	$70.7	$82.9	$91.4
POTENTIAL SAVINGS [4]	($62.5)	($31.1)		($130.0)		
POTENTIAL NET COST	$350.9	$399.7	$472.3	$354.1	$496.3	$504.8
ANNUAL O&M (STAND ALONE)	$2.2	$4.4	$1.7	$7.1	$4.9	$1.7

[1] Post-application/pre-designation costs and land costs were not included in AltaLink's development estimate
[2] Contingency costs were not included in AltaLink's construction estimate
[3] $30.7M incurred during development phase and $13.0M incurred during construction phase
[4] RES - Staged substation upgrades (revenue requirement); UCT - unconventional guyed structures (capital); EWT - guyed CRS structures & single-circuit (capital)

NOTE: All cost data from applicants' responses to OEB Interrogatory #26 and their original applications (cost sections)

- Table 1, reproduced herein:

	Compared Factors: Green = Better	
	Referenced Design	**Preferred Design**
Structure Type	Double Circuit Lattice Tower	Tubular Steel H-Frame
Tower Spacing	410 m	335 m
Conductor	1192.5 kcmil 54/19 ACSR Grackle	1557.4 kcmil 45/7 ACSS/TW HS285 Potomac/TW

Line Design Load at 93°C	1120 Amperes	1545 Amperes
Line Design at 127°C	1440 Amperes	1891 Amperes
Conductor Rated Tensile Strength	186,380 N	145,902 N
C22.3 No. 1-06 Heavy Loading Tension (% RTS)	69,929 N (37.5 % RTS)	50,579 N (34.7% RTS)
-30°C; Bare; Initial Tension (% RTS)	43,198 N (23.3% RTS)	32,174 N (22.1% RTS)
15°C; Bare; Initial Tension (% RTS)	37,268.7 N (20.0% RTS)	29,177 N (20.0% RTS)
Sag at Maximum Operating Temperature (100°C; Bare; Final)	15.70 m	15.08 m
Sag at Static Ice Load (0°C; 0.25 mm; Final)	16.08 m	15.35 m
Vertical Phase Spacing (m)	7.3 m per phase	0 m (horizontal single circuit configuration
Structure Height (m)	40m-70m	25m-54m

- page 87, paragraph 190
- page 103, paragraph 195

Claim 4: RES Transmission Has Not Committed to a Finalized Design

Reference: AIC pg 16, 53.b

UCT Claim: *UCT states in its AIC, referencing RES Transmission's response to Board Interrogatory #22, that "RES's lack of a finalized tower design" contributes to "a lack of commitment to a preferred option" that "indicates a lack of rigour in analysis of the appropriate solution for the line."*

RES Response 4:

Board Interrogatory #22, and the corresponding response from RES Transmission, is in regards to the electrical resistance of RES Transmission's proposed design options. It has no bearing on RES Transmission's choice of tower design, nor does it indicate "a lack of commitment to a preferred option." In fact, RES Transmission has, multiple times throughout its Application, response to Interrogatories, and Argument-in-Chief, described the benefits of its Preferred Design, notably the advantages of utilizing tubular steel single-circuit H-frame structures in combination with traditional lattice single-circuit structures as appropriate.

Claim 5: Acknowledgment of the Benefits of Guyed Structures

Reference: AIC pg 35 line 126

UCT Claim: *The specification by NextBridge of Guyed tower structures contributes materially to its impressive proposed schedule. It is noteworthy that both EWT LP and RES acknowledge the advantage of Guyed tower structures in expediting transmission line construction.*

RES Response 5:

Board Interrogatory #21, and the corresponding response from RES Transmission, is in regards to the benefits of its single-circuit Preferred Design. It does not include any commentary on guyed structures, nor does it "acknowledge the advantage of Guyed tower structures in expediting transmission line construction," as referenced by UCT. In fact, RES Transmission has described numerous times in this proceeding how guyed structures are not suitable for the East-West Tie Line, most recently in its Argument in Chief as follows:

1. pg 86 of 114, paragraph 190, section xi
2. pg 98 of 114, paragraph 195, section iii
3. pg 40 of 114, paragraph 90
4. pg 49 of 114, paragraph 110
5. pg 101 of 114, paragraph 195, section iv

Appendix 5 – AltaLink Rebuttals

Claim 1: Single-Circuit has been Rejected by IESO and OPA

Reference: AltaLink AIC, 2013-04-18, Page 16-17 of 40, items 52 and 53

AltaLink Claim:

52. In doing so, these transmitters are proposing an option which was considered and rejected by the OPA because of reduced operability during planned and forced outages. The OPA explains at page 20 of its Long Term Electricity Outlook for the Northwest and Context for the East-West Tie Expansion that:

> *"The OPA has assumed that the proposed expanded E-W Tie would be a new double-circuit 230 kV overhead transmission line. This is based on the knowledge that a 500 kV line or a high-voltage direct-current line would be more costly than a 230 kV line, while providing a similar benefit. A single-circuit 230 kV line would likely have a similar cost to a double-circuit 230 kV line, but would have reduced operability during planned and forced outages. Therefore, the OPA believes that the double-circuit 230 kV line is preferred […]"*

53. the IESO considered and rejected the single circuit option in its Feasibility Study IESO_REP_0748, noting at page 7 that "[f]or the One-plus-One contingency condition, the installation of a new double-circuit line to reinforce the East-West Tie would therefore represent the superior option.".

RES Response 1:

The IESO, in their feasibility study for the Reference Option, conducted analyses to determine various configurations that would provide the required 650 MW transfer capability across the East-West Tie Line. One of these alternatives is a single-circuit design with either bundled

1192.5 or 795 kcmil conductors (Page 3 “Summary of Reinforcement options” of IESO_REP_0748).

The IESO also evaluated the relative merits of installing a new double-circuit line versus a new single-circuit line, and first stated that all design options meet all applicable NERC, NPCC and IESO reliability standards. Then, having satisfied all reliability criteria, and due to the need for incremental control actions for a single-circuit option beyond those required for a double-circuit option, that “[f]or the One-plus-One contingency condition, the installation of a new double-circuit line to reinforce the East-West Tie would therefore represent the superior option.”

It appears from the description of the AIC produced by AltaLink that they have not understood the various design options and study report produced by the IESO and have claimed that IESO has rejected the single circuit option. In other words, the IESO did not “reject” a single-circuit option, but rather stated that in its analysis of a single-circuit alternative to the Reference Option, all other factors being equal, it would prefer a double-circuit solution. However, RES Transmission has submitted, and continues to submit, that all other factors are not equal; the substantial, demonstrated cost savings realized from a single-circuit design vis-à-vis a double-circuit one more than offset the marginal reliability benefits of a double-circuit design, as described amply throughout this proceeding.

Claim 2: Single-Circuit does Not Meet Reliability Standards

> Reference: AltaLink AIC, 2013-04-18, Page 17 of 40, item 54
>
> AltaLink Claim: *One problem with the single circuit option is that it cannot meet the total eastbound and westbound transfer capabilities of 650 MW, while respecting all NERC, NPCC and IESO reliability standards including the N-1-1 contingency without the IESO taking additional control actions such as dispatching additional generating resources totalling at least 300 MW.*

RES Response 2:

RES Transmission has worked with the IESO and has produced a detailed study report indicating that its single-circuit Preferred Design meets or exceeds all applicable reliability criteria, including N-1-1 contingencies. In its response to RES-IR#8, RES Transmission produced a letter from the IESO indicating that "the IESO is confident enough control actions are available to satisfy the load security criteria found in section 7.1 of its ORTAC even without firm long-term arrangements with neighboring jurisdictions."

Claim 3: Single-Circuit Proposals Should Be Rejected

Reference: AltaLink AIC, 2013-04-18, Page 18 of 40, item 57

AltaLink Claim: *In conclusion, AltaLink Ontario submits that the Board should reject the two proposed single circuit options based upon the recommendations and judgment of both the OPA and IESO (as noted above), the inherently higher level of security and reliability afforded by the double-circuit option and based upon the fact that the proposed single circuit options are simply not comparable to the reference option because of the necessity of costly, but as of yet unquantified, control actions.*

RES Response 3:

RES Transmission has indicated in its responses to interrogatories and in its AIC that it has worked with the IESO and has produced a detailed study report indicating that its single-circuit Preferred Design meets all applicable reliability criteria, including the N-1-1 contingencies.

RES Transmission has proposed its single-circuit Preferred Design along with the Reference Design for the Project. RES Transmission acknowledges that under the extremely rare and specific N-1-1 type outage, the IESO needs to use its available control actions to mitigate the outage for the single-circuit option and does not need to mitigate the outage for the double-circuit line. As mentioned above, RES Transmission has submitted correspondence from the

IESO confirming this fact. The IESO study for RES Transmission's Preferred Design along with the single-circuit alternatives initially evaluated by the IESO for the Reference Option indicate numerous benefits with a single-circuit design from achieving higher transfer capacity, flexible project development by staging, reduced O&M, system normal and post contingency system performance, especially better system voltage performance under light load conditions.

OPA in the project scope section has stated the following "A single-circuit 230 kV line would likely have a similar cost to a double-circuit 230 kV line, but would have reduced operability during planned and forced outages. Therefore, the OPA believes that the double-circuit 230 kV line is preferred, *but other options could be proposed to the extent that they meet the other project scope criteria*"

RES Transmission's Preferred Design is approximately $53 million less costly than its Reference Design. With respect to reliability, the IESO has verified that RES Transmission's Preferred Design meets all applicable requirements pertaining to transfer capacity, system performance and system reliability. To be clear, the single circuit Preferred Design is as reliable as the double circuit configuration.

AltaLink has misjudged the descriptions provided by the OPA and the IESO on the single circuit alternative and is misguiding the board and has recommended to reject the single circuit alternative proposed by RES Transmission.

Moreover, the N-1-1 contingency that underpins the argument about the benefits of a double circuit design, relative to a single circuit design, is a discrete, rare event that may not ever occur over the expected life of the EWTL. The incremental cost of dealing with this rare contingency, by requiring the construction of a double circuit line, is simply not warranted. RES Transmission has disputed the EWT annual cost estimate of $7.0 million for the control actions. In RES Transmission's view, this cost estimate is extremely unrealistic as it overestimates the number of hours of outages in which control actions would be required and it overestimates the cost of re-dispatching generation to accommodate outages. More details regarding the cost of control actions has been presented as a part of RES AIC item number 132. Due to the many reasons stated, IESO has also not quantified the costs of control actions, as they are insignificant to the overall cost of the Project.

Claim 4: Cost of Control Actions

Reference: AltaLink AIC, 2013-04-18, Page 17 of 40, item 55

AltaLink Claim: *While ELP and RES suggest in their applications that a single circuit line would be less costly than the double circuit reference option, neither of these transmitters have included in their estimates for the single circuit option the costs to Ontario ratepayers of procuring the required control actions noted in IESO_REP_0748 (ELP Response to Interrogatory #5, RES Response to Interrogatory #8).*

RES Response 4:

RES Transmission's Preferred Design is approximately $53 million less costly than its Reference Design. RES Transmission agrees with EWT and AltaLink that under the extremely rare and specific N-1-1 type outage, the IESO needs to use its available control action to mitigate the outage for the single circuit option and does not need to mitigate the outage for the double circuit line. To this end, RES Transmission worked with the IESO and received a letter stating that no new control actions are necessary to mitigate the above mentioned outage.

RES Transmission has disputed the EWT annual cost estimate of $7.0 million for the control actions. In RES Transmission's view, this cost estimate is extremely unrealistic as it overestimates the number of hours of outages in which control actions would be required and it overestimates the cost of re-dispatching generation to accommodate outages. More details regarding the cost of control actions have been presented in RES Transmission's Argument in Chief at paragraph 132. Due to the many reasons stated, IESO has also not quantified the costs of control actions, as they are insignificant to the overall cost of the Project.

Claim 5: EWT LP's Estimated Cost of Control Actions is Low

Reference: AltaLink AIC, 2013-04-18, Page 17 of 40, item 56

AltaLink Claim: *Since the IESO has not assessed the annual costs of such control actions (Appendix 4 to the RES Interrogatory Responses), the only information the Board has available is an estimate proposed by ELP of the costs of providing the necessary control actions in response to ELP Interrogatory #5. ELP estimates the annual cost of the control actions to equal an additional $7 million per year, representing a $104 million net present value (using ELP's stated assumptions). AltaLink Ontario views this estimate as low as it assumes there will be 25% fewer outages per year than on the existing line and it does not account for the additional costs associated with holding the necessary capacity on standby throughout the year awaiting an N-1-1 contingency. AltaLink Ontario has indicated in its interrogatory responses that the costs to contract approximately 300MW of control actions may be in the tens of millions of dollar per year, and must be factored into the lifecycle cost of all single circuit alternatives (ATL IRRs, General IR #21). In addition, the ELP and RES estimates also fail to take into account the present value of the incremental cost of the higher system losses under the single circuit option.*

RES Response 5:

RES Transmission has disputed the EWT annual cost estimate of $7.0 million for the annual control actions in its AIC submittals to the board. EWT and AltaLink have a lack of understanding about the cost of control actions and in RES Transmission's view, this cost estimate is extremely unrealistic as it overestimates the number of hours of outages in which control actions would be required and it overestimates the cost of re-dispatching generation to accommodate outages. More details regarding the cost of control actions has been presented as a part of RES AIC item number 132 and Appendix 1 of this filing. Due to the many reasons stated, IESO has also not quantified the costs of control actions.

Claim 6: Staged Single-Circuit Proposal does Not Meet Filing Requirements

Reference: AltaLink AIC, 2013-04-18, Page 37 of 40, item 115

AltaLink Claim: *AltaLink Ontario submits that the Board should reject RES' proposal to stage the construction of the East-West Tie Line over an 8 year period commencing in 2018 (RES Application, Exhibit G, Tab 1, Schedule 1, Page 2). This approach is incompatible with the Filing Requirements which at Section 7.3 requires applicants to propose a single in service date for the line (which under this staged approach, would appear not to occur until sometime in 2026). It is premature to make a decision on whether a staged approach would be preferable at this designation hearing. Rather, if a staged approach to constructing the East-West Tie Line provides for optimal value to ratepayers based on the OPA's updated assessment of need, the Board should expect that any transmitter that is designated as a result of this proceeding would come forth with such a proposal as part of its leave to construct application.*

RES Response 6:

It appears that AltaLink has not understood RES Transmission's proposal with respect to the staging approach identified for its Preferred Design. In its Application, RES Transmission stated the following: "Under the Preferred Design, the full transfer capacity (684 MW) could be installed at once or, alternatively, in stages, as system requirements materialize. (Exhibit G, Tab 1, Schedule 1, Page 7 lines 1 and 2). In this regard, RES Transmission has indeed proposed a 2018 in-service date for its full and complete Preferred Design, including all station equipment required to meet the Board's 650 MW target transfer capacity.

However, RES Transmission also notes that it believes that it is far more likely that the need for this transfer capacity will develop over time and it makes economic sense to construct only those facilities that will be required in the foreseeable future and defer the construction – and cost – of additional capacity to future periods. This is something that would be investigated thoroughly, in cooperation with the IESO and OPA, throughout the development stage of the EWTL, and would be presented to the Board along with a finalized design recommendation in a Leave to Construct hearing.

RES Transmission estimated its upfront, overall cost of construction for the transmission line portion of the Project is $53 million less for its Preferred Design than for the Reference Design; it allows for increments of transfer capacity to be installed in five discrete stages, in the form of station upgrades, in order to meet system requirements as they materialize, thereby deferring and, thus, reducing costs to ratepayers; assuming that the five stages are installed over an eight year period, commencing in 2018, the total savings in owning and operation costs would be approximately $62.5 million.

Appendix 6 – Iccon/TPT Rebuttals

Claim 1: Single-Circuit is Deficient

Reference: Iccon/TPT AIC, 2013-04-18, Page 23, Item 59.

ICCON/TPT Claim: *RES has prematurely indicated a preference for the single circuit design for the East-West Tie. It is not disputed that, from a reliability perspective, a double circuit line is the superior option to the single circuit line, as the Independent Electricity System Operator (IESO) concluded in its Feasibility Study:*

> *For the One_plus_One contingency condition, the installation of a new double_circuit line to reinforce the East_West Tie would therefore represent the superior option.*

RES Response 1:

RES Transmission has not prematurely indicated a preference for the single circuit design, as RES Transmission worked with the IESO and has determined that its single circuit Preferred Design meets all reliability criteria and in-fact has numerous benefits from achieving higher capacity, added flexibility of staging the Project, system normal and post contingency system performance; especially better system voltage performance under light load conditions. ICCON/TPT makes no reference to cost to ratepayers for each design and they do not provide any evidence to support the claim regarding superior option.

RES Transmission acknowledges that under the extremely rare and specific N-1-1 type outage, the IESO needs to use its existing available control action to mitigate the outage for the single circuit option and does not need to mitigate the outage for the double circuit line. To this end, RES Transmission worked with the IESO and received a letter stating that no new control actions are necessary to mitigate the above mentioned outage.

Claim 2: Single-Circuit Cost Savings are Unfounded

Reference: Icon/TPT AIC, 2013-04-18, Page 23, Item 60.

ICCON/TPT Claim: *Further, the alleged cost savings of RES's single circuit option have not been established. RES has not filed a detailed full lifecycle analysis that compares the costs of the single and double circuit options considering all of the incremental costs of a single circuit design. Those costs include additional reactive equipment in the substations (which RES has estimated at $25 million), additional line losses for a single circuit, costs associated with control actions to address n-1-1 conditions (estimated by EWT LP at $104 million on a net present value basis), and reduced transfer capacity until the necessary station upgrades are made. A full analysis of these factors during the development phase is required to substantiate the claimed cost savings of the single circuit option and to determine if they outweigh the shortcomings of the single circuit option.*

RES Response 2:

RES Transmission's Preferred Design is approximately $53 million less costly than its Reference Design. Details regarding the cost benefits and additional cost savings due to the staging process adapted to better utilize the single circuit design has been detailed in the initial proposal and also as a part of all interrogatories and AIC.

RES Transmission has disputed the EWT annual cost estimate of $7.0 million for the control actions in its AIC. In RES Transmission's view, this cost estimate is extremely unrealistic as it overestimates the number of hours of outages in which control actions would be required and it overestimates the cost of re-dispatching generation to accommodate outages. More details regarding the cost of control actions has been presented as a part of RES AIC item number 132. Due to the many reasons stated, IESO has also not quantified the costs of control actions, as they are insignificant to the overall cost of the Project.

Appendix 7 – CNPI Rebuttals

Claim 1: Single-Circuit Proposals Should be Rejected

Reference: CNPI AIC, 2013-04-18, Page 36 of 42, lines 25-28 and Page 37 of 42, lines 1-4

CNPI Claim: *Further, CNPI submits that single circuit alternatives (ELP, RES) that are not supported by evidence of equivalent or superior reliability should be disregarded. Neither ELP nor RES provided supporting evidence of equivalent or superior reliability. In fact, ELP has indicated that the single circuit alternative is less reliable than the double circuit alternative. If the OEB had wanted applicants to propose alternatives that sacrifice reliability for cost or other system performance variables, it would have suggested this in its Filing Requirements. The single circuit option is not equivalent or superior, it is cheaper. As such, CNPI submits that all single circuit options should be disregarded.*

RES Response 1:

As discussed above, RES Transmission has provided various benefits of its single circuit design as a part of the proposal and also a part of the interrogatories and AIC. IESO study for RES Transmission's Preferred Design, along with the single circuit alternatives initially evaluated by the IESO for the Reference Option indicate numerous benefits with a single circuit design from achieving higher transfer capacity, flexible project development by staging, reduced O &M, system normal and post contingency system performance, especially better system voltage performance under light load conditions.

RES Transmission's Preferred Design is approximately $53 million less costly than its Reference Design. With respect to reliability, the IESO has verified that RES Transmission's Preferred Design meets all applicable requirements pertaining to transfer capacity, system performance and system reliability.