Manitoba Minnesota Transmission Project

Reducing Adverse Impact of Transmission, Line Capacity and Land Use

Submitted by

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Manitoba Wildlands

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Preamble

We all appreciate that electric power transmission is essential to our developing communities. Sixty years ago as rural electification was emerging, electric distribution and high voltage transmission lines were generally welcomed. When a 230 kV transmission line with lattice towers came across our farm, I welcomed them as I could climb to the very top to see where the groups of sheep were. I could direct the sheep dog to get them and bring them to me so with the help of the dog, bring the sheep in to our sheep yard or corral saving a lot of time rounding them up.

Figure 1: The transmission towers on our farm. A second line has been added (from Google Earth)

During the 1970's I spent about seven out of 15 years in Manitoba Hydro's transmission planning department working on the Winnipeg to Twin Cities 500 kV interconnection, now known as M602F. I was very pleased with what we had achieved. The line was commissioned in May 1980. A year or two later I was visiting with friends who lived just west of Warroad, Minnesota near the 500 kV line. I mentioned the line out and to my great surprise, they expressed disgust towards the line. This was a great shock to me, and the first time I had heard such negativism towards transmission lines, and particularly about a line that I was proud of and received two awards for my contribution towards it.

Figure 2: M602F in Minnesota just west of Warroad (Google Earth)

Next I was working Denmark in 2003. Their government then required all overhead transmission lines under 150 kV to go underground with cable and when complete they were to do the same for the 400 kV lines. We helped them with the first 400 kV line to go underground, 109 kM in length. It was so technically challenging and expensive it has not yet been built to my knowledge.

Imagine my surprise when I read that a new double circuit 400 kV overhead transmission line had been constructed in Denmark. “Denmark became the first place in the world where the ubiquitous lattice transmission tower is no longer acceptable for any power line construction…Construction of the line began around the start of 2013 with the project scheduled to be completed by November 2014” [1].

Manitoba Hydro has been exposed to the challenges of today in building high voltage lattice tower transmission lines as evident in the non-acceptance by impacted persons and communities with the Bipole III transmission line now under construction. **The disaster from the non-acceptance of the Bipole III transmission line** needs to be avoided with the MMTP line. Can Manitoba Hydro avoid the failed social acceptance of Bipole III as they proceed forward with MMTP? The answer is; they must. These interventions by knowledge holders and experts must be listened to and accepted and developed further by Manitoba Hydro as they move forward.

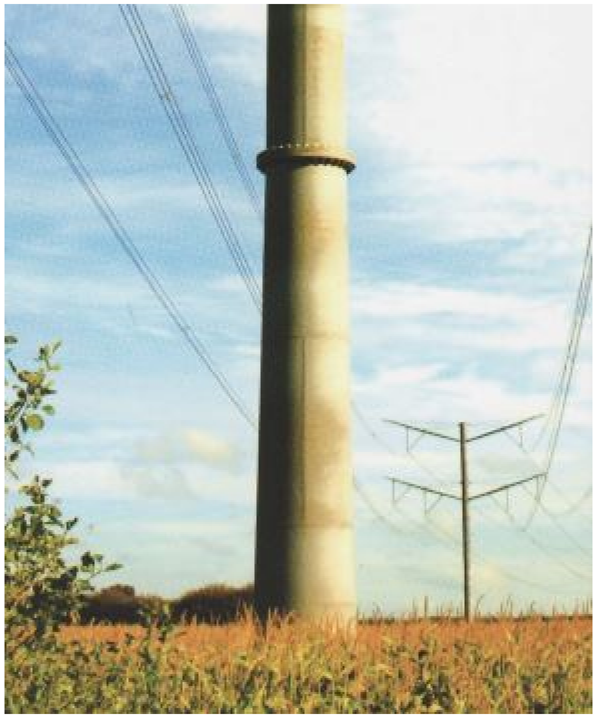


Figure 3: New double circuit tubular 400 kV AC transmission line in Denmark[1] [1]

1. The Design of the Tower Structure and Environmental Sensitivities

a) Features of design and specific components

The lattice tower appearance is basically unchanged in 100 years. Fashion, transportation, economies, communities and communication have developed dramatically over this period. We are in danger that new overhead high voltage lattice tower transmission lines will be treated like oil and bitumen pipelines are today and become all but impossible to permit and license. This will be a tragedy as the future of energy is moving towards new electricity sources and its transmission.

"Leaving behind the steadfast lattice tower is something that will probably never be driven by economics alone: Time has demonstrated that these towers are cost effective and offer outstanding performance and service life.

Indeed, that explains why they have remained in use, basically unchanged for decades". [1]

Appearance is a major factor effecting social acceptance of overhead transmission lines. Also land use, right-of way width, impact on the environment can be achieved with aesthetic, low profile tower design.

In recent years international working groups of the International Council of Large Electric Systems (CIGRE) have been established to examine compact and low profile transmission lines. Of significance is Working Group B2.63 *Compact HVAC Transmission lines* where transmission line design experts from around the world collaborate together on the *design of compact HVAC transmission lines* and where possible the cost of compacting lines [Appendix A]. The Working Group has not completed its study. Manitoba Hydro has provided information to this Working Group. Electranix Corporation has representation on this Compact HVAC Working Group.

What can Manitoba Hydro provide in terms of the design and costs that have been concluded by this Working Group? Does it back up its statement in their statement in Appendix B:

"Based on an internal cost comparison for transmission structures in southern Manitoba installed construction cost (not including line hardware) for a single tubular tower is approximately 70% of the installed cost for a single self supporting lattice tower. However, with the increased number of tubular structures required, the total cost of a tubular line is higher."

This is "an internal cost comparison" that is subjective to what other cost comparisons *for past tranmission lines* have indicated. For example, consider this statement from Bystrup of Denmark in Appendix C:

"*Valmont US is installing drilled steel and concrete monopoles for 345/500kV tubular structures in Florida. They are able to install 4-6 /day. Valmont US* *even tell us that the monopole structures are 30% lower costs than the lattice towers*."

Has Manitoba Hydro obtained cost comparisons for single circuit 500 kV tubular transmission towers from companies such as Bystrup of Denmark (Sinopa Energy Inc. of Toronto) or Valmont Utilities (US)?

Further more from Manitoba Hydro's Statement in Appendix A quoted above was the conclusion of the internal comparison study between lattice and tubular towers based on reduced height for low profile tubular towers or assuming the same basic height for both? If so then this neglects having less material and reduced foundation requirements?

(a) (b)

Figure 4: Single circuit HVAC tubular transmission towers located in the US. (a) 500 kV line in the Arizona desert [4) & (b) by Valmont Utility Structures

In comparing costs of tubular towers to lattice towers, the overall environmental benefits must be considered as well. Benefits of the tubular towers significantly saves footprint, reduces costs for weed control, and modern designs require less maintenance, faster installation, etc. Comprehensive investigations regarding lattice towers compared to monopole structures have been done by Bystrup of Copenhagen with several operators in Europe.

As presented in Appendix C, in Denmark the operator, Energinet.dk saved valuable time installing monopoles for a 2x400kV line / 166km (see Figure 3 above). They installed 2 foundations a day.

It is worth noting that Manitoba Hydro designed and constructed a single circuit 500 kV tubular steel transmission tower nearly 40 years ago for the extension of of M602F to Dorsey station beside Highway 59 near the Floodway.

Bystrup, the low profile and aesthetic transmission tower designer from Copenhagen, Denmark would welcome working with Manitoba Hydro to compare cost comparisons between the MMTP lattice design and a tubular steel design (Appendix C).

Figure 5: A single Manitoba Hydro tubular steel aesthetically designed 500 kV transmission tower but which is not low profile (Google Earth)

b) Comparisons of conductor height and impact

By lowering the height of the structures, the tranmsmission line becomes less intrusive. By taking the aesthetic tower of Figure 5, keeping the same tower top, but lowering its total height by about 13 m, with the span reduced to keep the same conductor tension and mid-span clearance, a simple comparison of low profile versus the self-supporting steel lattice structure similar to what is designed for the MMTP is presented in Figure 6. This not a recommended low profile aesthetic tower design by any means, but is presented for comparison purposes only. A design similar to Figure 4 is better in appearance. With modern design techniques, materials and construction methods, the costs may come down as Valmont Utility Structures and Bystrup indicate is possible in Appendix C.

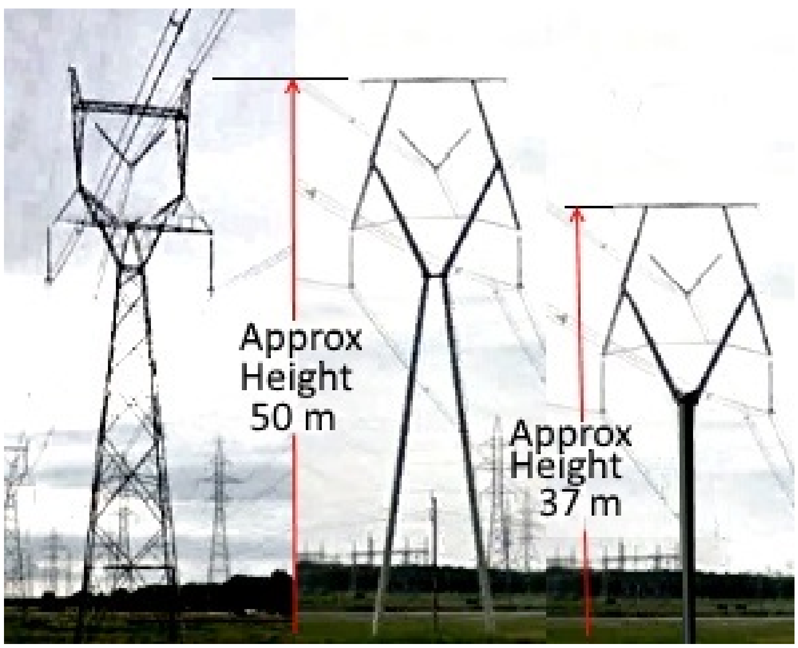


Figure 6. Demonstrating how the tower height can be reduced for less obtrusiveness as well with a better appearance

The impact of the reduced span is shown in Figure 7. Mid span ground clearances remain as Manitoba Hydro describes and standards require.

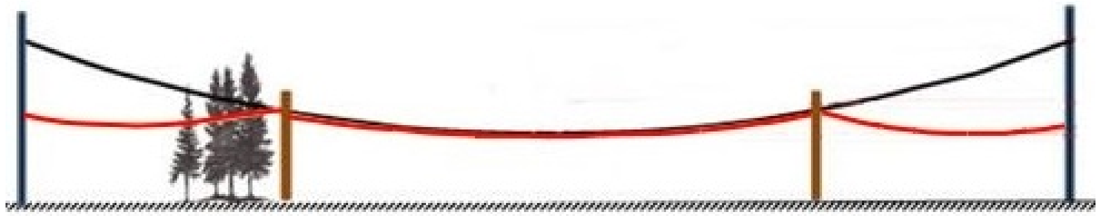


Figure 7: How a low profile reduced span transmission line may appear comparing a 400 m span to a 200 m span. [2]

c) Special considerations of wind load

Question asked of Manitoba Hydro: "Would not a lower tower height be less impacted by a wind hazard?" The response from Manitoba Hydro in Appendix B included:

> 2 …The majority of wind load on a transmission structure is imparted by the wind pressure
> 3 on the conductors. The load is due to the effect of the wind pressure upon a wind span,
> 4 adjusted for conductor height (wind factor) and tower spans (span factor).

Assume the average height of the conductors at the lattice tower structures is approximately 35 m and 22 m for the lower profile tower of Figure 6 and the average mid span height for both is the same at 18 m (5 m greater than lowest conductor mid span clearance of 13 m - page 2-27 of reference [3]). The total average conductor height for the lattice tower structure and span is 23.7 m and 19.3 m for the low profile tower with reduced span.

Wind velocity increases with height above ground and so it can be approximately determined[5] that that the wind velocity at 23.7 m above ground is 3% greater than the wind velocity at 19.3 m above ground for open land surfaces. So indeed the lower profile transmission system design benefits slightly from lower wind forces. This percentage will increase when the transmission line is through forest with a narrower right of way.

So in plain and simple terms, the line with a shorter tower will be exposed to a lower wind force. Therefore a shorter tower is less impacted by wind load. It appears that Manitoba Hydro's assumptions about risks from extreme weather weather effects are based more on the heigher height lattice towers.

2. **Line Capacity and Conductor Optimization**
   a) Issues with Capacity
   A question to Manitoba Hydroa in Appendix B for information on conductor optimization and MMTP final route location. The responses from Manitoba Hydro were clear and well answered. However there is a puzzling fact that the MMTP line has the capacity to carry 1500 MW with the conductor and series compensation in order to operate acceptably with the existing M602F transmission line which also has series compensation (see Figure 8). Yet the firm contracts and opportunity sales for export to the USA can be nowhere near this level. Particularly since the additional generation capacity from Keeyask is only 695 MW. This is over twice the capacity of Keeyask. This large capacity line appears to be a costly extravagance. Figure 8 is a view of the series capacitor station for the existing 500 kV interconnection M602F.

Figure 8: The series capacitor station for the existing M602F transmission line near Warroad, Minnesota (Google Earth)

A series capacitor station similar to that shown in Figure 8 is to be added to the MMTP line in order to reach the 1500 MW rating. Will it be located in Minnesota as it is with M602F or in Manitoba? What is the status of the series capacitor station for the MMTP line?

In Manitoba Hydro's response in Appendix B there is concern expressed about cost and based on their in-house subjective assessment from above. Manitoba Hydro estimates the lower height, shorter span tubular steel structure would increase costs by as much as 40%. They also state:

Installed construction cost (not including line hardware) for a single tubular tower is approximately 70% of the installed cost for a single self supporting lattice tower. However, with the increased number of tubular structures required, the total cost of a tubular line is higher.

Comparing costs of tubular towers to lattice towers the overall environmental benefits must be considered as well is put forward in Appendix C. The are developing considerations for tubular steel aesthetic low profile transmission line structures which Manitoba Hydro must take into account[4] including the following:

i. Why is the MMTP line rated at a voltage of 500 kV resulting in a transmission line that needs series capacitors and appears overrated to about 1500 MW capacity as a consequence?

ii. A response might be that in the future Conawapa generating station of 1380 MW may be constructed and so it is sized to accommodate exporting its power to the US in addition to Keeyask. But why would Manitoba Hydro build a high priced speculative venture for MMTP when it is a participant in the recently initiated "Regional Electricity Cooperation and Strategic Infrastructure Initiative" (RECSI) funded by Natural Resources Canada? RECSI is a very intensive study for the western Canadian provinces which includes examining the benefits and costs of new interties between Saskatchewan and Manitoba and in particular to reduce CO_2 emissions in Saskatchewan. The RECSI study is based on the premise that if results are environmentaly and cost effective, the additional transmission from Manitoba to Saskatchewan will be financed by the Canada Infrastructure Bank. It is important to note that the proposal for the RECSI study was recently sent out 1 December 2016, to be administered by the Alberta Electric System Operator (Appendix D), and well after the PUB NFAT of June 2014.

The RECSI study and increasing the interprovincial interconnections in western Canada were the main topics in a panel session chaired by Manitoba Hydro's president and CEO Mr. Kelvin Shepherd at the Western Canada Regional Event "*Multiple Pathways to Clean Energy: Canada's Western Provinces*" in Regina May 9, 2017. The topic of Mr. Shepherd's session was "Regional Electricity Grid" (See Appendix E).

Since Manitoba Hydro's financial situation is of great concern to Manitobans, why build MMTP to about 1500 MW with the significant cost this entails when it may be replace by a 230 kV interconnection to Minnesota Power along with the existing 230 kV (R50M) interconnection to Minnesota Power may well be adequate to accommodate the firm contracts with them? A 230 KV MMTP line would have a narrower ROW than a lattice tower 500 kV MMTP line and <u>therefore less destruction to the forest</u>.

iii. It was stated by Mr.Kelvin Shepherd that the Keeyask generating station is not required for Manitoba's domestic load until 2033 (Appendix F). This means that Keeyask will be surplus for many years. Will a 230 kV MMTP line and the existing 230 kV (R50M) line to Minnesota Power have the combined rating to accommodate all existing and expected firm contracts with Minnesota Power? Furthermore can the surplus energy above Manitoba's requirements and firm export sales plus the spot market be accommodated on all existing interconnections to the US including the existing 500 kV M602F interconnection? As these questions are asked, the RECSI study (Appendix D) and the movement towards a western Canada regional grid (Appendix E) must be considered seriously since they reflect significant changes since the PUB NFAT of June 2014

iv. Added reliability to Manitoba Hydro may be cited as a reason to require a 1500 MW MMTP interconnection. But it is well known that Bipole III was stated and deterministically justified to supply the needed reliability to Manitoba without MMTP. What new evidence would there be that the reliability from Bipole III is not adequate?

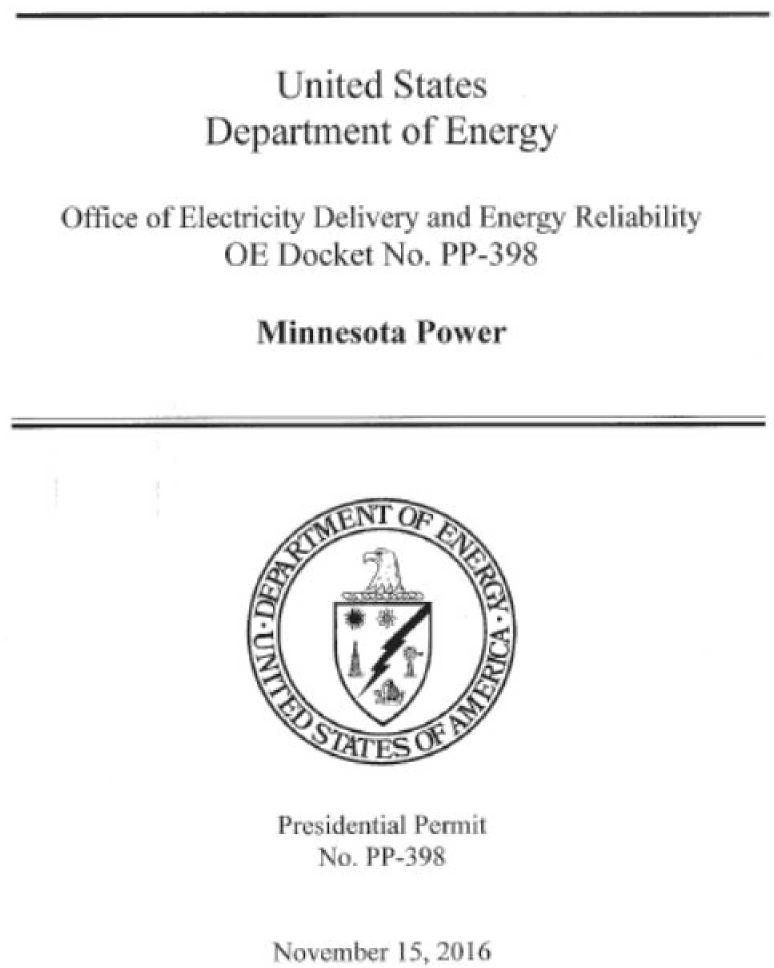
v. An impending drought may be a justification for the 1500 MW rating of MMTP. As has been done in past years in droughts, Manitoba Hydro would purchase energy from the US overnight and during the day if needed to pond water for release during the daytime peak. Would surplus Keeyask and overnight energy purchases from the US during severe drought conditions be accomodated with just a 230 kV MMTP interconnection? Is there signiicant evidence to the contrary?

Figure 9: The existing 230 kV interconnection to Minnesota Power R50M

vi. Although Manitoba Hydro will not disclose existing or proposed contractual agreements with Minnesota Power, the basic fact is according to President and CEO Kelvin Shepherd in Appendix F that Keeyask generating station is not required for Manitoba use until about 2033. This was not the case when MMTP was recommended in 2014 by the PUB NFAT.

This surplus of electricity in Manitoba Hydro is due to lower than expected domestic load growth as well as the intent of the new “Efficiency Manitoba” Act to reduce Manitoba load 1.5% each year which will result in no need for new generation for well into the future. This must leave Manitoba Hydro’s existing or proposed agreements with Minnesota Power whatever they may be, in a non-ideal situation.

From Question # DPWO-IR-010 we learn that Presidential Permit # 398, issued November 15, 2016 indicates a not to exceed level for Manitoba Hydro to purchase 750MW of winter capacity from Minnesota Power while not to exceed the delivery of 883 MW of summer capacity to Minnesota Power.



United States
Department of Energy

Office of Electricity Delivery and Energy Reliability
OE Docket No. PP-398

Minnesota Power

Presidential Permit
No. PP-398

November 15, 2016

Figure 11: Presidential Permit for the Great Northern Transmission Line (MMTP)

The fact that winter energy can be provided from Minnesota Power up to the 750 MW to be delivered to Manitoba, there is no obvious need for Manitoba to contract to purchase to this level when Bipole III and Keeyask are able to supply all the winter supply Manitoba needs. This was the justification for Bipole III for reliability and for the construction of Keeyask.

According to Presidential Permit # 398, Manitoba Hydro can supply up to 883 MW of power for summer export energy to Minnesota Power. Much depends on what actual contract level for summer power and energy south is agreed upon. No doubt Manitoba Hydro will have the generating capacity for north to south exports. Based on the expected summer power contracted south to Minnesota Power, will there be enough capacity on MMTP at 230 kV along with the existing interconnection to Minnesota Power to deliver this amount without resorting to a 500 kV, 1500 MW interconnection?

The Presidential Permit # 398 is not cast in stone. There is possibility to change the requirements of the Presidential Permit # 386 with the approval of the US Department of Energy.

vii. The Canadian Electrical Association Transmission International (CEATI) have recently released a request for proposal entitled “Innovative New Structures (Visually Pleasing) for Better Public Acceptance”, CEATI PROJECT No. T163700-33115. Manitoba Hydro is a member of CEATI as well as other Canadian and international utilities. This indicates the growing interest in this very important subject and so must be considered for MMTP.

b) Factors Effecting Configuration

The request made of Manitoba Hydro in Appendix B was confirmation that a low profile, more acceptable appearing transmission structure and transmission line can be designed to the same standards as D604I (MMTP) is designed to. The response from Manitoba Hydro was that such a structure could not be designed to the same standards as D604I is designed to assuming compact tower head geometry. The stated main reason is:

"..the current D604I tower head design is as compact as possible while still providing safe clearance for live line work which is a D604I design requirement. The inability to perform live line work would result in more scheduled line outages and reduced availability".

The low profile line designer Bystrup of Denmark state in Appendix C that for National Grid (UK transmission provider) they have finalized a compact tower design including reduced corona using optimized fitting designs etc. So it is possible to reduce the overall design and corona. Since Bystrup hasn't fully detailed the design for Manitoba Hydro they don't know the final design, but it seems obvious to them that the design can be optimized according to the D604I. Bystrup also state that for RTE (the French electric system operator) they have optimized their compact T-Pylon live-line maintenance without extending the size of the pylon.

From Appendix A, the international CIGRE Working Group B2.63 *Compact HVAC Transmission lines* has in its main tasks: e) *Live line mainenance clearances*. This is indeed an essential requirement and both this Working Group and Bystrup are dealing with it.

Advantage should be taken to explore this developing technology.

3. Design of Towers and Effect on Agricultural zones

a) Environmental Impact on Agricultural Zones

In a continued response in Appendix B, Manitoba Hydro states that:

"From a purely structural perspective, you could design a low profile transmission structure that would meet the D604I structural requirements, but more structures would be required, increasing the property, bio-security and agricultural impacts as well as the overall cost. "

Bystrup's comment In Appendix C to this was:

"*In some cases probably yes! But if public acceptance, reduced height, reduced corona noise, less footprint, easy installation (less than 10 parts pr.*

Pylon), reduced maintenance etc are interesting to get the project approved, accepted and executed, then the monopole structures are a feasible alternative."

The width of ROW should be considered as a critical factor, both for environment when passing through wild lands and for agriculture. Lower profile transmission towers allow for a narrower ROW.

Recognizing in Appendix B that Manitoba Hydro had stated: "*The existence of right-of-way (ROW) is seen as more significant than the width of the ROW*". They also state: "*Width of ROW is not as significant as finding ROW*". Certainly we agree that finding a ROW is a key activity, but these statements raise the question as to what is the value placed on the width of the ROW?

In reviewing Table 5-3 MMTP Alternative Corridor Evaluation Model and Table 5-5 MMTP Alternative Route Evaluation Model from chapter 5 of the EIS, there is no specific value placed on width of ROW. Instead under "Proximity to Buildings" or residences in the tables specify a fixed value of 100 m. This implies that the area of the ROW is considered in the EPRI-GTC methodology to have no value. It is recognized that in Appendix 5A under Table 5A-1 Macro Corridor model that relative values are placed on land features, but not on the area taken up by the ROW.

Built	
Proximity to Buildings	10.0%
> 800 m	1
400 - 800 m	2.7
100 - 400 m	6.5
ROW - 100 m	9
Building Density	15.0%

Figure 12: ROW fixed as 100 m in the EPRI-GTC methodology (EIS Table 5-3)

The lack of value placed on land area due to the width of the ROW is contrary to the values that the EPRI-GTC methodology attempts to address. It is mentioned in the EIS chapter 5 under section 5.3 "Preliminary Planning for MMTP" that:

"..various departments with the Transmission Business Unit at Manitoba Hydro begin the process of planning the transmission routing process. This planning includes many aspects. One key item includes;

- Preliminary line design – consideration of tower design <u>and ROW size determination</u>"

In chapter 2 of the EIS, section 2.9.7 Right-of-Way Width, the factors that determine ROW width are described. In summary these are:

1. Effects of the wind on the conductors (conductor swing out)
2. To avoid damage to adjacent property in the event of a structure failure
3. Reduce electric and magnetic field (EMF) effects
4. Compliance with standards and guidelines
5. Access requirements requirements for construction and maintenance

Further to item 2 above on requiring ROW width be sufficient to avoid damage to adjacent property if a structure falls over. This does not seem to be a concern in Winnipeg. Consider the transmission line down the centre of Pembina Highway from (a) near "Confusion Corner" to Grant Ave., and along (b) Grant Ave. from Pembina Highway to Stafford substation as in Figure 13:

(a) (b)

Figure 13: Transmission structures on Pembina Hwy (a) and Grant Ave (b) that might cause property damage with structure failure (Googe Earth)

A lower profile transmission line with shorter spans will:

1. Reduce conductor swing out (see Figure 14)
2. With lower tower structure height the distance to impact adjacent property is reduced and shorter spans may provide some conductor support for a single tower failure to fall fall length towards the edge of the ROW
3. Since EMF effects are greatest at mid span and with the low profile transmission line with same mid span ground clearance (Figure 7), the EMF effects will be slightly higher at the edge of a narrower ROW. If the EMF effects are not the determining factor for ROW width then ROW can then be reduced from 80 m with the low profile transmission line design
4. Compliance with standards and guidelines should be possible as per comments above in pages 16 to 18
5. Is access requirement the determining factor needing an 80 m ROW? If not, the ROW can be reduced.

Further to item 3 above on EMF effects, it is known that audible noise at the edge of the ROW can be a determining factor in the transmission line design. Manitoba Hydro was asked in Appendix G if audible noise was the deciding factor in width of right-of-way, Manitoba Hydro responded that the predicted audible noise for MMTP would:

"remain below guidelines for residential and commercial areas."

From this it can be concluded that a low profile transmission line design with a ROW less than 80 may still be well within standards so far as audible noise is concerned.

Conductor swing-out is shown in Figure 14. Swing out is less with a shorter span, resulting in the possibility for a reduced ROW width. By way of example, for the designed MMTP line of chapter 2 in the EIS with a 400 m span but not knowing the exact parameters used by the transmission line designers of Manitoba, the swing-out is approximately 32 m based on assumed values. A shorter 250 m span would have an approximate swing-out of 15 m, a difference of 17 m. Taking into account both sides of the of the transmission line, this provides opportunity to reduce the ROW by 34 m. Thus the ROW width could be reduced in the extreme to 80-34 = 46 m. With tubular steel tower structures located where ROW is 100 m, the possible ROW reduction is much more dramatic.

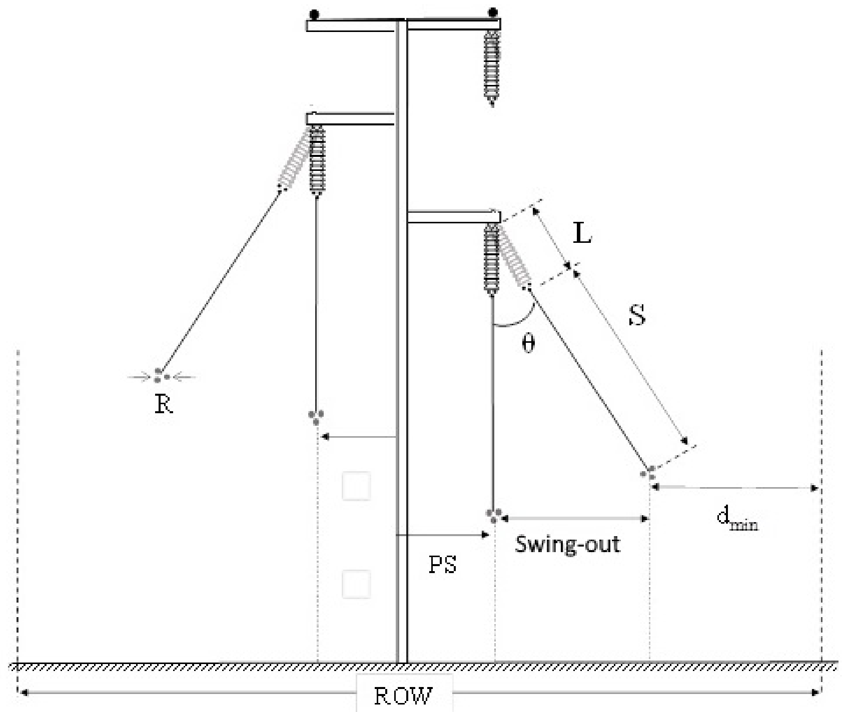


Figure 14: Demonstrating how transmission line swing-out from wind contributes to width of ROW

In forested areas shorter spans and reduced conductor swing-out require fewer trees to be cut and more carbon dioxide sequestered from the atmosphere. It also saves maintenance costs related to regular clearing under the lines. In such areas, the cost of footings increases less rapidly with height, particularly if the average conductor height is at tree level or lower. In agricultural areas, smaller corridors reduce the economic losses due to future value of land, land income, harvest losses and the time and cost of cleaning out weeds. These are benefits of the resulting narrower ROW.

More attention should have been paid to width of ROW, instead of only considering the one lattice tower design with its 80 m and 100 m ROWs.

Consider how advantageous it would be to all and the environment if MMTP could be a lower cost and low profile line rated at 230 kV with narrower ROW instead of the MMTP 500 kV line as brought forward in page 13 above.

b) Effect of Lack of Public Consultation on Large Environmental Footprint

In the EIS chapter 2 page 20 under the heading "Towers" the following statement is made: "*While steel lattice towers require larger ROWs than tubular towers, there are several advantages. Steel lattice towers allow for longer span lengths, thereby reducing the number of obstacles that land owners may need to avoid when operating agricultural equipment*." When questioned about this in MWL-IR-036 as to how many landowners were consulted about this, Manitoba Hydro's response was: None.

In IR#2 MWL-IR-087 we stated that there is a 100 square metre footprint of an MMTP tower on crop land, an area prone to weeds once every 400 metre span length, whereas a tubular steel low profile tower would have a much smaller footprint of about 5 square metres every 250 metres with minimal weeds to deal with.

Since landowners were not consulted on the transmission line design, the assertion that the large 400 metre span with its 100 square metre footprint is less an obstacle than the 250 m span with tubular steel low profile tower and a much less 5 square metre footprint is not a convincing justification.

Weeds will prevail within the 100 square metre footprint on farmland and that appears to receive minimum attention as per Manitoba Hydro's reponse in Appendix H where they state:

"Regarding weed control, Manitoba Hydro acknowledges that there may be concerns regarding weed control around towers; structure impact compensation provided to landowners for lands classed as agricultural considers weed control underneath and in close proximity to the tower footprint."

It is unfortunate that that the transmission towers and line design included in chapter 2 of the EIS were the only configurations presented to impacted landowners in the public engagement and consultation process. When asked about this in Appendix I, Manitoba's response was:

"There were no constraints. However, there were no alternative tower configurations acceptable to Manitoba Hydro that would have been presented in any event. Further, tower design was not raised as a concern in the public engagement process."

We can only assume that landowners are not aware of any alternative configurations that may be available and so did not question what Manitoba Hydro presented to them in the EIS chapter 2. Is it the landowner's responsibility to be up-to-date on the latest and developing technologies of high voltage electric power transmission or is it Manitoba Hydro's?

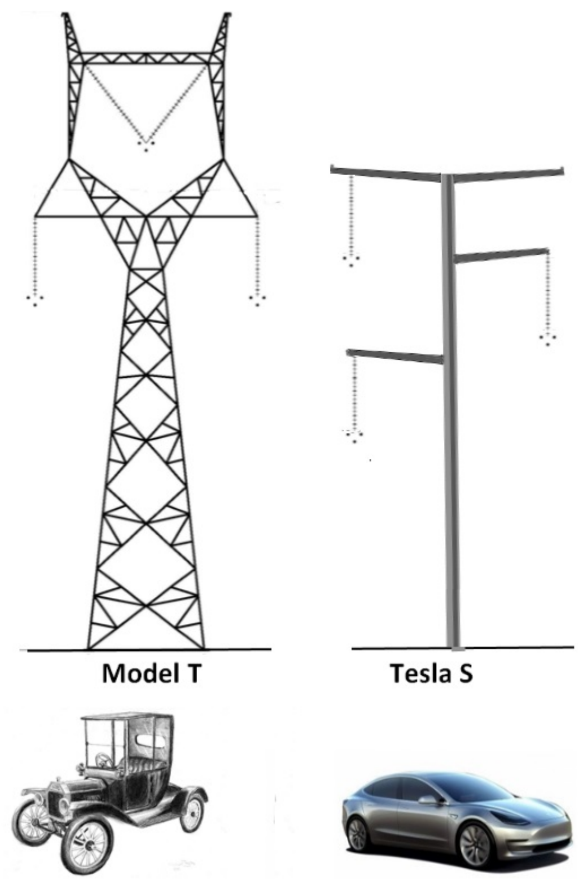


Figure 15: Lattice tower and low profile structure comparison

4. **Ability to Reduce Tower Height and Aesthetic Tower Design**

   a) Decision-making and Public Consultation

In was suggested that the significant concerns of individuals most impacted by the MTP line were diluted by the multitude of inputs that are fed into the EPRI-GTC methodology. Manitoba Hydro vigorously defended the EPRI-GTC methodology in its response (Appendix J).

There still remains the inherent contradiction with presenting only one basic tall tower, fixed wide ROW, lattice transmission design to the public engagement and consultation process based on Manitoba Hydro's definitive and subjective design without providing less obtrusive, less land consuming, more socially acceptable options. Even if one additional option to the lattice tower structures was presented to the public, communities and landowners from chapter 2 of the EIS and presented at community consultations, this may have had an interesting impact.

5. **Reducing Impact of MMTP on Interested and Affected Parties**

   a) Decision-making and Public Consultation

   There were many consultations on routing through the public engagement and First Nations and Metis engagement. That is indeed a tremendous effort and Manitoba Hydro is to be commended for it. As Manitoba Hydro stated in their response to Question MWL-IR-140: "*Width of ROW is not as significant as finding ROW*" there should have been more emphasis on more socially and environmentally acceptable low profile tubular and aesthetic transmission at these consultations. This reduces ROW width, perhaps enabling greater possibility to enable roadside ROW such as is typical with rural 66 kV feeders throughout the province (Figure 16).

Figure 16: Typical rural roadside 66kV feeder

A low profile tubular MMTP transmission line with a reduced width of ROW could also be routed roadside similarly to that shown in Figure 16.

b) Failure to Present Options to Communities Regarding Design

It has been mentioned above that communities were presented only one 500 kV transmission line design during the public consultations.

In Question # MWL-IR-040 the example of a 400 kV AC tower developed in Sweden and constructed in Norway was brought forward. In response Manitoba Hydro raised a number of points:

- The examples provided are for 400-kV applications and that currently there are no proven designs for 500-kV projects.

This is no longer valid since in page 5 above it reports that Valmont US is installing drilled steel and concrete monopoles for 345/500kV tubular structures in Florida.

- The Danish example is a double circuit rather than a single circuit line

This is true, however single circuit 500 kV aesthetic monopole tubular transmission towers to be used for low profile transmission is possible by Valmont US and the configuration of Figure 4 above is a reality.

The Manitoba Hydro response also raised the valid point of live line maintenance. However, modern aesthetic tubular monopole designs are capable of live line maintenance as presented in pages 16 to 18 above. Low profile does not necessarily mean compact as represented in Figure 15 above where the phase spacings from conductor to structure on the lower profile aesthetic and tubular tower can be the same as for the higher lattice tower structure. Nevertheless, as mentioned in pages 16 to 18 above, even high voltage transmission aesthetic and tubular tower line designs can be compacted allowing live-line maintenance.

Manitoba Hydro had a reputation for pioneering new transmission technologies. These included:

1. Constructing the Nelson River HVDC transmission system
2. Implementing the largest mercury arc converter valves ever built for Bipole 1
3. Using water cooling for the thyrstor valves for Bipole II
4. The first application of metal oxide surge arresters at 500 kV on the M602F transmission line

Has Manitoba Hydro lost this pioneering spirit which served it so well in the past?

6. Recommendation to the CEC for Changes to the Construction of MMTP

With Keeyask being delayed 21 months and based on the June 2014 PUB NFAT recommendation to build MMTP for exporting Keeyask power, there is incentive to delay MMTP as well. The financial situation of Manitoba Hydro would benefit from delaying whatever expense it can. Therefore we recommend delaying MMTP, particularly since three years have passed since the PUB NFAT recommendation to build MMTP and much has changed since then.

Therefore it is firmly recommended that advantage be taken to delay MMTP. This provides time to explore cost effective lower profile aesthetic tubular transmission and lower voltage transmission for MMTP with its lower adverse environmental and social impact. This also opens up opportunity to provide impacted persons and communities a look at another option besides the one detailed in Chapter 2 of the EIS. Bystrup of Copenhagen has indicated a desire to work with Manitoba Hydro to provide the latest techology in low profile tubular aesthetic steel towers and their foundations (Appendix C).

The delay also provides opportunity to develop the interconnection agreement with Minnesota Power to provide the best deal possible to Manitoba Hydro considering the changes that have come and are coming to Manitoba Hydro. This should be possible since no agreement should have been finalized until provincial government and National Energy Board permits are obtained.

It is recommended consideration be given to redesigning MMTP with cost effective tubular steel low profile aesthetic tubular transmission towers as per Manitoba sustainable development and principles and guidelines (The Sustainable Development Act)

Conclusions and Recommendations

The following conclusions and recommendations are made:

1. Delay construction of MMTP so that it is completed near to when Keeyask becomes operational

2. Since;
   i. the Manitoba domestic load conditions have not materialized to the extent that was presented at the PUB for the NFAT into Manitoba Hydro's preferred development plan,
   ii. and since Keeyask is stated to not be needed for Manitoba's load way beyond what was presented to the NFAT and,
   iii. whereas Efficiency Manitoba is almost certain to work towards reducing the load growth 1.5% each year and,
   iv. whereas the "Regional Electricity Cooperation and Strategic Infrastructure Initiative" (RECSI) study is due to be completed at the end of 2017 and may open up Canada Infrastructure Bank financing for increased transmission to Saskatchewan then,

   take the time available to delay MMTP to minimize the costs to Manitoba Hydro and determine the most economical way forward, adjusting and negotiating the interconnection connection agreement accordingly

3. In the process of delay of MMTP, make an active effort to work with international transmission line design experts to design a more aesthetic and cost effective transmission line to improve social acceptance of the MMTP interconnection including a detailed review of its rating and costs

4. Where there is the most adverse impact of the MMTP line as presently proposed has on communities, landowners and the environment, use the delay time to take advantage a low profile transmission line offers and reconsider its route and ROW.

These recommendations are made with full awareness and recognition of the tremendous effort that Manitoba Hydro staff have put into the MMTP interconnection. The information and recommendations brought forward by Manitoba Wildlands in this presentation are intended to be suppportive and helpful to Manitoba Hydro and the MMTP project and for future major transmission projects of Manitoba Hydro that will be essential for the growing dependency in our society on clean electric energy.

References

[1] "Aesthetic Tower Design Helps Danish Grid Operators Obtain Approvals for Important New 400kV Line", Independent T&D Information Resources (INMR), Issue 106, Quarter 4, 2014. Pages 32 to 50 https://issuu.com/inmr/docs/inmr_issue_106_q4_2014_complete_low

[2] M. Salimi, "A New Approach for Compaction of HVDC Transmission Lines and the Assessment of the Electrical Aspects", PhD thesis, University of Manitoba, 2017, Figure 3-9, Page 3-8

[3] Manitoba Hydro – Minnesota Transmission Project Environmental Impact Statement, Chapter 2, Submitted to the CEC Sept 2015

[4] Marvin L. Zimmerman, "Growing Role of Aesthetics in Line Design" based on INMR Editorial, October 18, 2013, http://www.inmr.com/growing-role-aesthetics-line-design/ See also: http://www.inmr.com/y-tubular-towers-500-kv-line-arizona-desert/

Appendices

Appendix A

Terms of Reference for Working Group B2.63 *Compact AC Transmission Lines*

The International Council of Large Electric Systems (CIGRE)

CIGRE Study Committee N° B2

PROPOSAL FOR CREATION OF A NEW WORKING GROUP

WG* N° B2.63	**Name of Convenor:** Rob Stephen (South Africa) E-mail address: StepheRG@eskom.co.za
Technical Issues # 7, 9	**Strategic Directions # 1, 2, 3**
The WG does not apply to Distribution Networks	
Title of the Group: Compact AC Transmission Lines	

Scope, deliverables and proposed time schedule of the Group

Background:
Given the difficulty in obtaining new servitudes (i.e. right-of-way) and the need to reduce the visual impact of overhead lines, utilities must consider designing and building new compact AC transmission lines to reduce their height and width, to increase line reactance/surge impedance, and to facilitate increasing the operating voltage of existing lines with minimal physical modifications.

The largest opportunity for compaction exists at line voltages from 100 to 400 kV where traditional line phase spacing may be more generous. AC lines at this voltage level are often subject to large post-contingency loadings from the loss of higher voltage lines and generating stations and often must be maintained without taking them out of service. Therefore, compact designs must accommodate live line working and possess high power flow capacity.

Scope:

The objective of the proposed WG is to identify the balance between reduction in phase-phase spacing and structure height with the need to perform routine maintenance without taking these lines out of service. The scope will include finding ways to maximize their emergency power flow capacity to handle occasional but severe post-contingency loads. In certain line routes, it may be required to add a section of cable in areas where the overhead line cannot be placed. The scope includes consideration of compact overhead-underground transition structures used where underground cable sections may be necessary.

Where possible the cost of compacting lines as well as the cost of profiling to reduce blowout will be evaluated.

The main tasks of the WG will include the study of the following line design parameters:

a) Corona
b) Bundle design (expanded, asymmetrical)
c) Audible noise and Radio Interference
d) Overvoltage (switching and lightning surges)
e) Live line maintenance clearances
f) Conductor mechanical parameters

The compaction techniques that will be covered include:

a) Tower spotting

b) Reduction of blowout to limit servitude width
c) Bundle conductor choices including HTLS conductors
d) Insulator selection and arrangements
e) Tower types (cross rope, Racket type, pole. lattice)
f) Live-line maintenance techniques
g)

Specific Actions are:

1. Prepare a Technical Brochure or Electra scientific paper
2. Prepare a tutorial, including possibly a demo

Target date – 2018

Deliverables : Report to be published in Electra or as a Technical Brochure

Time Schedule: Start: May 2015 **Final Report:** 2018

Comments from Chairmen of SCs concerned:

Approval by Technical Committee:
Date: 23/04/2015 M. Waldron

Appendix B

Information Request to Manitoba Hydro Question # MWL-IR-089 and Response

SUBJECT AREA: **Tower, Configuration**

REFERENCE: **MWL-IR-038**

QUESTION:

Please provide evidence that a monopolar structure/tubular steel is not an alternate structure type for this transmission line, taking into account reduced right-of-way width and less land use is possible, lower tower height when the span is reduced by say 50%, foundations can be pile driven in suitable soil so faster construction time, and opportunity to share existing rights-of-way, all present value over the life of the transmission line.

RESPONSE:

Based on an internal cost comparison for transmission structures in southern Manitoba, installed construction cost (not including line hardware) for a single tubular tower is approximately 70% of the installed cost for a single self supporting lattice tower. However, with the increased number of tubular structures required, the total cost of a tubular line is higher. Assuming 500m spans for lattice and 250m spans for tubular structures, a line constructed with tubular towers would increase the cost of the line by as much as 40%. This is based on 240 kV structure costs in southern Manitoba.

The assumption of reduced ROW width is not accurate as explained in MWL_IR-090, thus any reduction in land use is minimal and the opportunities for shared rights-of-way beyond the use of existing transmission corridors for almost half of the projects length are not realized.

Not included in the cost comparison, but would also need to be considered, would be the challenges associated designing economical foundations for large overturning moments on tubular structures. With the high overturning moments and large loads developed by the anchor bolts, tubular structures would require multiple driven precast piles with a large cap up to 3m in depth. The faster construction time suggested would not include the additional time required to tie the multiple driven piles together. This would require substantially more time.

BiPole III tangent towers supported by a single monolithic cast in place pile took, on average, 1 day to complete. The angle towers on BiPole III, multiple piles tied together with a cap, took on average 5 days (1 day for piles, 3 days to form and 1 day to pour). An additional concern with driven piles would be the bio-security issues created by the large amount of equipment required on site (drill rig, crane, driving equipment, skid steer, flat deck trucks, concrete trucks).

Lattice towers have the advantage of resolving their foundation loads into pure tension and compression, which can be resisted by a multitude of foundation types. Precast mat footings, cast in place piles, micropiles and helical piles have all been successfully used to support lattice towers. Helical piles have been successfully used to mitigate bio-security concerns by minimizing the amount of traffic at a tower sites. Tubular towers have not traditionally been supported by helical piles (or driven piles), due, in part, to the complexity and cost associated with the attachment of the tower to the foundation.

Appendix C

Comments to Dennis Woodford on Manitoba Hydro Statements from Henrik Skouboe, Director Global Project of Bystrup of Denmark (See underlined in red)

SUBJECT AREA: Tower, Configuration
REFERENCE: MWL-IR-038
QUESTION:

Please provide evidence that a monopolar structure/tubular steel is not an alternate structure type for this transmission line, taking into account reduced right-of-way width and less land use is possible, lower tower height when the span is reduced by say 50%, foundations can be pile driven in suitable soil so faster construction time, and opportunity to share existing rights-of-way, all present value over the life of the transmission line.

RESPONSE:

Based on an internal cost comparison for transmission structures in southern Manitoba, installed construction cost (not including line hardware) for a single tubular tower is approximately 70% of the installed cost for a single self-supporting lattice tower. However, with the increased number of tubular structures required, the total cost of a tubular line is higher. Assuming 500m spans for lattice and 250m spans for tubular structures, a line constructed with tubular towers would increase the cost of the line by as much as 40%. This is based on 240 kV 6 structure costs in southern Manitoba.
When you compare the cost of tubular towers to lattice towers you need to consider the overall environmental benefits as well. The tubular towers have a long list of benefits such a minimal footprint that saves compensation, less maintenance, faster installation etc. It will be interesting to discuss your experiences and compare this to the installed solutions in Denmark.

For several operators in Europe we have done comprehensive investigations regarding lattice towers compared to monopole structures and would like compare this to Manitoba Hydro's "internal cost comparison".

The assumption of reduced ROW width is not accurate as explained in MWL_IR-090, thus any reduction in land use is minimal and the opportunities for shared rights-of-way beyond the use of existing transmission corridors for almost half of the projects length are not realized.
Not included in the cost comparison, but would also need to be considered, would be the challenges associated designing economical foundations for large overturning moments on tubular structures. With the high overturning moments and large loads developed by the anchor bolts, tubular structures would require multiple driven precast piles with a large cap up to 3m in depth. The faster construction time suggested would not include the additional time required to tie the multiple driven piles together. This would require substantially more time.

In Denmark the operator, Energinet.dk saved valuable time installing monopoles as the foundation for a 2x400kV line / 166km. They installed 2 foundations a day.

National Grid in the UK is also going to install monopole foundations for the future T-pylon line at Hinckley where it is efficient.BiPole III tangent towers supported by a single monolithic cast in place pile took, on average, 1 day to complete. The angle towers on BiPole III, multiple piles tied together with a cap, took on average 5 days (1 day for piles, 3 days to form and 1 day to pour). An additional concern with driven piles would be the bio-security issues created by the large amount of equipment required on site (drill rig, crane, driving equipment, skid steer, flat deck trucks, concrete trucks).

Lattice towers have the advantage of resolving their foundation loads into pure tension and compression, which can be resisted by a multitude of foundation types. Precast mat footings, cast in place piles, micropiles and helical piles have all been successfully used to support lattice towers. Helical piles have been successfully used to mitigate bio-security concerns by minimizing the amount of traffic at a tower sites. Tubular towers have not traditionally been supported by helical piles (or driven piles), due, in part, to the complexity and cost associated with the attachment of the tower to the foundation.

Valmont US is installing drilled steel and concrete monopoles for 345/500kV tubular structures in Florida etc. They are able to install 4-6 /day. Valmont US even tell us that the monopole structures are 30% lower costs than the lattice towers.

We have comprehensive knowledge regarding the detail and attachment between the foundation and monopole, and would very much like to discuss this together with you if you believe it is relevant for other projects.

Monopole structures have been installed for the last 20 years in the US and Europe, and a lot of optimization has already been done.

Appendix D

Proposal for the RECSI Study is now underway, with GE Energy Connections as the successful contractor with Electranix Corporation as a sub-contractor. Advisors to the project include Manitoba Hydro and representatives from the other three western provinces

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ALBERTA
ELECTRIC
SYSTEM
OPERATOR

INDEPENDENT SYSTEM OPERATOR, operating as Alberta Electric System Operator (the "AESO")

REQUEST FOR PROPOSALS

FOR

Consulting Services for the Regional Electricity Cooperation and Strategic Infrastructure Initiative (RECSI)

Solicitation Number: AESO_CC2016-RECSI
MERX Reference Number: PR389716
RECSI Services - Request for Proposals Date Issued: December 01, 2016
Proposal Submission Deadline: January 18, 2017

Make all inquiries and send all questions to:
Jacques Duchesne Renewables Advisor
Email: Jacques.Duchesne@aeso.ca

Appendix E

Multiple Pathways to Clean Energy: Canada's Western Provinces, REGINA, May 8-9, 2017 at the Hotel Saskatchewan by the Energy Council of Canada.

The objectives are:

The resource-based economies of Canada's four western provinces contribute in a major way to their economic growth, employment, and support for social and health programs. Development of the region's diverse mix of fossil, hydro, uranium and renewable resources, together with aggressive conservation and energy efficiency programs, characterize the region's energy sector.

Clean energy has become a central policy goal as a pathway to both achieve provincial emissions reduction targets and to diversify provincial economies and to foster growth in green businesses, investment, and new types of jobs. Each jurisdiction has set aggressive goals to accelerate the transformation to clean energy and has developed programs and initiatives mirroring their policy preferences

Portion of the program May 9th, 2017 chaired by Manitoba Hydro President and CEO, Kelvin Shepherd:

1:30 – 3:00 PM **Regional Electricity Grid**

Western Canada has abundant fossil, uranium, hydro and renewable resources across the four provinces. To date, electricity generation, transmission, and distribution have been largely provincial matters, coupled with north-south electricity trade with neighbouring U.S. jurisdictions. Dialogue is underway on the idea of expanding regional electricity trade amongst the western provinces. A regional electricity transmission system would provide increased generation from hydropower, sharing of generation from renewables across the region, matching peak loads in one jurisdiction with supply from a neighbouring jurisdiction, and an increase in supply diversity.

Session Chair: Kelvin Shepherd, President and CEO, Manitoba Hydro

- **David Boyd**, Vice President, Government and Regulatory Affairs, MISO
- **Keith Cronkhite**, Senior Vice President, Business Development and Strategic Planning, NB Power
- **Jerry Mossing**, Vice President, Transmission, AESO
- **Niall O'Dea**, Director General, Electricity Resources Branch, NRCan
- **Douglas Opseth**, Director, Supply Planning and Integration, SaskPower

Appendix F

HYDROGRAM

March 9, 2017 | Volume 46, Number 48

Control budget for Keeyask Generating Station revised

The Keeyask Hydropower Limited Partnership (KHLP) and Manitoba Hydro announced this week a new control budget of $8.7 billion and revised in-service date of August 2021 for the Keeyask Generating Station, currently under construction on the Nelson River in northern Manitoba.

This represents an increase from the previously approved control budget of $6.5 billion and a delay of 21 months from the previous in-service date of November 2019.

The Keeyask Generating Station is owned by the KHLP, a partnership between Manitoba Hydro and four First Nations: Tataskweyak Cree Nation, Fox Lake Cree Nation, York Factory First Nation and War Lake First Nation. Manitoba Hydro has been contracted by the KHLP to build and operate the 695-megawatt station on its behalf.

"The new control budget and revised in-service date developed by Manitoba Hydro has been presented to the KHLP board," said Lorne Midford (Vice-President, Generation and Wholesale), chair of the KHLP Board. "Manitoba Hydro continues to work with its Keeyask partners to evaluate the impact of the cost and schedule changes to each partner's interests in the project."

Midford said this examination includes assessing the potential impact on project benefits, including employment and business opportunities for each partner community.

The potential for the increased cost estimate was first identified in the Manitoba Hydro-Electric Board's (MHEB) review of capital projects completed in the fall of 2016. That analysis, conducted by the Boston Consulting Group (BCG) for the MHEB, identified costs for Keeyask were expected to rise from the 2014 control budget of $6.5 billion up to a possible $7.8 billion, along with a potential delay in completion of up to 31 months.

It's still too early to determine the impact of the revised control budget on the Corporation's rates. Manitoba Hydro is still finalizing its long-term financial forecast as part of the utility's next General Rate Application to the Public Utilities Board.

The revised control budget reflects a more detailed review conducted by Manitoba Hydro. The review considered the current state of project's progress and costs incurred to date, including the results of the first full year of structural concrete work in 2016.

The new control budget includes an additional $900 million in contingency funds, interest and escalation not included in the BCG analysis. The utility believes these allowances are prudent steps to help address potential cost and schedule risks still present in the project.

"Keeyask is a large and very complex project and the updated control budget is a realistic estimate based on what we know today," said Kelvin Shepherd (President & CEO). "However, there is always a chance of additional risks materializing that could impact the schedule and costs."

Shepherd said the MHEB reviewed the updated plan developed by Manitoba Hydro. The MHEB considered other factors, such as revised estimates for Manitoba load growth, updated export pricing and a risk analysis of the cost estimates. The MHEB concluded that despite the cost escalation, completing the project makes the best sense for Manitoba Hydro, its customers and the province.

"Completing Keeyask will allow us to fulfill export contracts worth approximately $4.5 billion," Shepherd said. "This will help offset some of the costs of the project. Despite the increased cost to complete construction, stopping now is not an economically viable option as the significant costs of cancellation—together with lost revenues—more than offset any potential savings."

"It's important to remember Manitoba is growing," Shepherd said. "Updated electric growth forecasts indicate our province is going to need a new source of generation to meet domestic load by approximately 2033. Keeyask will provide a reliable, renewable source of energy to meet that demand then and well into the future."

(continued on page 2)

Appendix G

Information Request to Manitoba Hydro Question # MWL-IR-042 and Response

Manitoba Hydro

Manitoba-Minnesota Transmission Project
Source CEC
Question # MWL-IR-042

SUBJECT AREA: **Noise & EMF, None**

REFERENCE: **Section 2.9.7 Right-of-Way Width page 38**

QUESTION:

"ROW widths are also designed to avoid damage to adjacent property in the event of a structure failure and to reduce electric and magnetic field (EMF) effects, such as radio interference and audible noise, which decrease with increasing distance from the lines."

i. Is audible noise the deciding factor in width of right-of-way?

ii. What is the calculated audible noise at the edge of an 60 m ROW, 80 m ROW and at the edge of a 100 m ROW? (See also section 2.13.4 where it is stated that mathematical modelling of audible noise is determined in field and corona effects calculations)

RESPONSE:

Audible noise is one of many factors considered when determining width of the right-of-way (ROW). Please see Chapter 2– Section 2.9.7, for a list of factors in determining ROW width. These factors are based on related design parameters in CSA standards, NERC/MRO/MH reliability criteria and internal Manitoba Hydro Transmission Line Design Guidelines.

Chapter 18 Section 18.5.4.1.2 provides an assessment of audible noise levels for the ROW. As noted in this section, the predicted fair-weather audible noise from Project transmission lines at the edge of the ROW represents an inaudible increase in noise (less than 1 dB) from 22 dBA for existing configurations to 23 dBA (Table 18-9) (Exponent 2015b). Therefore, noise from the transmission line would have a negligible effect on ambient noise levels, and total sound levels would remain below guidelines for residential and commercial areas. Modeling details can also be found in the Electric Field, Magnetic Field, Audible Noise, and Radio Noise Calculations Technical Data Report.

Appendix H

Information Request to Manitoba Hydro Question # MWL-IR-036 and Response

Manitoba-Minnesota Transmission Project
Source CEC Round 2
Question # MWL-IR-087

SUBJECT AREA: Tower, Landowners Affected

REFERENCE: MWL-IR-036

QUESTION:

A self-supporting steel lattice tower with a 100 square metres of footprint area on crop land provides opportunity for weeds to grow. Is this an item of concern?

If landowners were not asked for their opinion on the impact to them of the larger 100 square metre footprint every 400 metres compared to the much smaller footprint every 200 to 250 metres of a low profile tubular steel tower, then what evidence can you supply to support your claim that fewer (but much larger) obstacles would be preferable?

RESPONSE:

The EIS and response to MWL-IR-036 did not indicate that larger tower footprints with fewer towers was preferred over smaller footprint towers with more towers (i.e., tubular steel towers). As noted in the EIS Chapter 2 page 20, Manitoba Hydro was simply stating a fact that, "....steel lattice towers allow for longer span lengths, thereby reducing the number of obstacles that land owners may need to avoid when operating agricultural equipment". Regarding weed control, Manitoba Hydro acknowledges that there may be concerns regarding weed control around towers; structure impact compensation provided to landowners for lands classed as agricultural considers weed control underneath and in close proximity to the tower footprint.

Appendix I

Information Request to Manitoba Hydro Question # MWL-IR-037 and Response

Manitoba Hydro

Manitoba-Minnesota Transmission Project
Source CEC Round 2
Question # MWL-IR-088

SUBJECT AREA: **Tower, Configuration**

REFERENCE: **MWL-IR-037**

QUESTION:

What constraints prevented alternative tower configurations from being presented to impacted landowners in the public engagement and consultation process?

RESPONSE:

There were no constraints. However, there were no alternative tower configurations acceptable to Manitoba Hydro that would have been presented in any event. Further, tower design was not raised as a concern in the public engagement process.

Appendix J

Information Request to Manitoba Hydro Question # MWL-IR-043 and Response

Manitoba Hydro

Manitoba-Minnesota Transmission Project
Source CEC
Question # MWL-IR-043

SUBJECT AREA: Routing, Process

REFERENCE: EIS Chapter 5, Page 17, Table 6 - 3

QUESTION:

Table 6-3 MMTP Alternative Corridor Evaluation Model, Page 17 of Chapter 5 includes many factors that have been studiously developed for the EPRI-GTC analysis. An apparent weakness of this method is the lack of allowance for extra and significant input such as unique issues from individuals. In other words individual and significant issues are diluted with the multitude of inputs to result in being ineffectual. Please justify why impacted communities and municipalities should not have the final say in where the MMTP line should be routed through their area and be given a selection of aesthetic structure designs with minimum ROW width rather than just the unattractive and ancient structures of figures 2-4 and 2-5 of chapter 2 pages 2-29 and 2-30 in the EIS.

RESPONSE:

There appears to be two questions and an assertion above:

1) An assertion that the alternate corridor model (depicted in Table 5-3 on page 5-17) has a weakness in that it does not make allowances for "extra and significant input such as unique issues from individuals"
2) A question asking Manitoba Hydro to justify why impacted communities and municipalities should not have the final say in where the MMTP line should be routed through their area, and
3) A question asking why communities and municipalities are not given a selection of aesthetic structure designs with minimum ROW widths.

The following respond to the above, in the order listed above: