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Executive Summary

The XXXX, the Interconnection Customer (IC), proposes to develop the Bullmoose Wind Energy Project in the Peace River Region to deliver electric energy to BC Hydro (BCH) through the BCH 2008 Clean Power Call (CPC).

The Bullmoose Wind Energy Project is one of five new wind farms to be developed in the Peace River region. These five generating sites, with a maximum total generation of approximately 443 MW, are to be connected to the 230 kV system between GMS and TLR, in a period of three years between the winter of 2012 and the winter of 2015.

This report identifies the required system modifications for interconnecting the proposed Bullmoose Wind Energy Project. The report also considers a regional transmission reinforcement project, referred to as DCAT, that is planned to provide supply capability from the 230 kV system to the 138 kV system in this region, with a planned in-service date of late 2013. The maximum power injection to the system from the Bullmoose project is 59.9 MW at the Point of Interconnection (POI), which is on 2L322 approximately 3 km from the BLM substation and about 25 km from TLR substation. The proposed Commercial Operation Date (COD) is November 1, 2015.

To interconnect Bullmoose Wind and its facilities to the BCH Transmission System at the POI on line 2L322, this System Impact Study (SIS) report has identified the following issues and requirements for Stage 3 of project development in this area based on the proposed in service date of Bullmoose Wind. Please refer to Table 2 in the body of the report for detailed information regarding stages.

Stage 3

1. No unacceptable transmission equipment overload or unacceptable voltage condition in the Transmission System has been observed due to the proposed power injection from Bullmoose Wind under system normal conditions.
2. To interconnect the Bullmoose Wind Energy Project to the system, two 230kV disconnects are required to be installed at the POI.
3. A generation run-back RAS based on local detection is required to resolve overload on 2L308, GMS T13, or GMS T14 caused by system contingencies. Upon detecting the overload, the scheme will run back Bullmoose Wind generation to a pre-set level in a few minutes.
4. Power quality anti-islanding protection is required to prevent an undesirable islanding operating condition. Due to the possibility of islanding conditions in which the power quality protection may be inadequate, there will also be a requirement for a transfer tripping scheme when opening 2L313 (SNK to the Meikle Creek new POI substation) or 2LXXX (the Meikle Creek new POI substation to TLR) to protect Bullmoose from islanded operation and unacceptable over-voltage conditions.
5. The 230 kV intertie breaker owned by Bullmoose Wind Energy Project may need the capability of Point-on-Wave Control to avoid unacceptable voltage sag caused by inrush.
current during energization of the customer’s 230 kV transformer. The IC will be responsible for undertaking the studies required to determine the necessity of an inrush mitigation scheme.

6. A fast generation shedding scheme is required to mitigate the impact caused by the loss of 2L308 or 2L309 in order to achieve acceptable dynamic voltage performance and avoid overloads.

Based upon the above requirements, the cost estimate and the estimated schedule are as follows:

- The non-binding good faith cost estimate for interconnection Network Upgrades required to interconnect the proposed project to the BCH transmission system is $2.9 M.
- The estimated time to construct the Network Upgrades required to interconnect the project in Stage 3 to the BCH Transmission System is up to 12 months after the Standard Generation Interconnection Agreement is signed.

Upgrades that are common to the other IPP projects in this area are not included in this report.

Further EMTP studies using adequate models for Wind Turbines and dynamic equipment are required to identify/verify any potential issues such as transient voltages and islanding concerns.
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1.0 Introduction

The XXXX, the Interconnection Customer (IC), proposes to develop the Bullmoose Wind Energy Project in the south Peace River region to deliver electric energy to BC Hydro (BCH) through the BCH 2008 Clean Power Call (CPC).

The project reviewed in this system impact study report is as described in Table 1 below.

**Table 1: Summary Project Information of Bullmoose Wind Energy Project**

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Bullmoose Wind Energy Project</th>
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<tr>
<td>Interconnection Customer</td>
<td>XXXX</td>
</tr>
<tr>
<td>Point of Interconnection</td>
<td>On 2L322 approximately 25 km from TLR</td>
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<tr>
<td>IC Proposed COD</td>
<td>November 1, 2015</td>
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<tr>
<td>Type of Interconnection Service</td>
<td>NRIS ☑ ERIS ☐</td>
</tr>
<tr>
<td>Maximum Power Injection (MW) at the POI</td>
<td>59.9 (Summer) 59.9T (Winter)</td>
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<tr>
<td>Number of Generator Units</td>
<td>20</td>
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<tr>
<td>Plant Fuel</td>
<td>Wind</td>
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</table>

The Bullmoose Wind Energy Project consists of twenty 3.0 MW wind turbines. Two 34.5 kV overhead feeders will connect the 20 wind turbine generators to a 230/34.5 kV 85 MVA collecting substation, which will connect to BCH line 2L322 [Tumbler Ridge Sub (TLR) to existing Bullmoose Mine Sub (BLM)] via a line tap.

The Point of Interconnection (POI) is on 2L322 approximately 3 km from the BLM substation and about 25 km from TLR substation. The proposed Commercial Operation Date (COD) is November 1, 2015.

1.1 Development Stages

Including the Bullmoose Wind Energy Project, there are five new wind farms planned for the South Peace region, with a maximum total generation of about 443 MW. These five generating sites are to be connected to the 230 kV system between GMS and TLR, in a period between the winter of 2012 and the winter of 2015. The report also considers a regional transmission reinforcement project, referred to as DCAT, which is planned to provide supply capability from the 230 kV system to the 138 kV system in this region, with a planned in-service date of late 2013. The development of the five wind farm interconnections and the DCAT project in that area can be divided into three stages from the winter of 2012 to the winter of 2015, based on the proposed in-service dates.

The three stage developments are summarized in Table 2 below and the associated area transmission one-line diagrams are shown in Fig. 1 to Fig. 3.


**Table 2: Three Stages for Peace Region Wind Farm Projects**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Transmission System</th>
<th>Wind Projects in-service</th>
<th>Total MW Injection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>Existing system</td>
<td>Wildmare, Tumbler Ridge, Quality Wind</td>
<td>266</td>
</tr>
<tr>
<td>(2012 winter)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 2</td>
<td>DCAT in-service</td>
<td>Wildmare, Tumbler Ridge, Quality Wind, Meikle</td>
<td>383</td>
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<tr>
<td>(2013 winter)</td>
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<tr>
<td>Stage 3</td>
<td>DCAT in-service</td>
<td>Wildmare, Tumbler Ridge, Quality Wind, Meikle, Bullmoose</td>
<td>443</td>
</tr>
<tr>
<td>(2015 winter)</td>
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</table>

*Fig. 1 – Stage 1 Peace Region Transmission One-line Diagram (2012 winter) (Wildmare, Tumbler Ridge, and Quality Wind Farm Projects Interconnected, No DCAT)*
Fig. 2 – Stage 2 Peace Region Transmission One-line Diagram (2013 winter)
(Wildmare, Tumbler Ridge, Quality Wind and Meikle Wind Farm Projects connected, with DCAT)

Fig. 3 – Stage 3 Peace Region Transmission One-line Diagram (2015 winter)
(Wildmare, Tumbler Ridge, Quality Wind, Meikle and Bullmoose Wind Farm Projects connected, with DCAT)
2.0 Purpose of Study

The purpose of this SIS is to assess the impact of the interconnection of the proposed project on the BCH Transmission System. This study will identify constraints and Network Upgrades required for the reliable operation of the Transmission System.

3.0 Terms of Reference

This study investigates and addresses the voltage and overloading issues of the transmission networks in the vicinity of the Bullmoose generating station as a result of the proposed interconnection. Topics studied include equipment thermal loading and rating requirements, system transient stability and voltage stability, transient over-voltages, protection coordination, operation flexibility, telecom requirements and high level remedial action scheme requirements. BCH planning methodology and criteria are used in the studies.

The SIS does not investigate the operating restrictions and other factors for the possible second contingency outages. Subsequent internal network studies will determine the requirements for reinforcements or operating restrictions/instructions for those kinds of events. Impact to the bulk transmission system is not included in the SIS and will be covered in a separate study.

The work necessary to implement the network improvements identified in this SIS report will be described in greater detail in the Interconnection Facilities Study report for this project.

4.0 Assumptions

The power flow conditions studied are base cases that include generation, transmission facilities, and load forecast representing the queue position applicable to this project. Applicable seasonal conditions and the appropriate study years for the study horizon are also incorporated.

4.1 Data and Modeling of the IPPs

The study is based on the model and data information provided by the proponent in the Generator Interconnection Data Form for this project. Reasonable assumptions are made to complete the study and the report, whenever such information is unavailable.

4.2 Modeling of BC Hydro’s System

The 2012, 2013, 2015, and 2016 heavy winter, heavy summer and light summer load flow base cases were selected for this study. The loads are modeled as constant MVA loads in power flow analysis. In dynamics simulations, the combined residential, commercial and industrial load models are represented.
4.2.1 The 138 kV and 230 kV Transmission System in the Peace Region

The Peace Region is undergoing significant economic development as a result of increased oil and gas activities. DCAT project (1st stage) is proposed to meet the increasing load and will be in-service by November 2013 based on preliminary studies. Some details of the project are as follows:

1. A new station called Sundance Switching Station (SLS) will be built at or near the intersection of 2L312 and 1L358, the substation will be looped into the line 2L312 and 1L358.
2. A new 230 kV line from SLS is terminated at Bear Mountain Terminal (2L359).
3. The current Bear Mountain Terminal station will be upgraded to a 138/230kV substation.
4. A new 138 kV line (1L350) will be built to connect BMT to DAW.
5. There will be a 230/138 kV transformer rated at 150 MVA at both SLS and BMT substations.

The DCAT related transmission system including the new SLS Substation, 230 kV SLS-BMT line, 138 kV BMT-DAW line, and looping through 1L358 and 2L312 is shown in Fig. 4.
5.0 System Studies

Power flow, short circuit and transient stability studies were carried out to evaluate the impact of the proposed interconnection. Studies were also performed to determine the protection, control and communication requirements, and to evaluate possible over-voltage issues.

5.1 Steady State Pre-Outage Power Flows

Pre-outage power flows are prepared to assess the impact of the proposed interconnection using 9 basic system load conditions for all three stages starting from the 2012 winter through to 2016 summer. The steady-state power flow studies have indicated:

- No unacceptable voltage conditions observed with the proposed interconnection.
- No facilities overloaded with the proposed interconnection

5.2 Power Flow Based First Contingency Study

Power flow based single contingency (N-1) studies have been conducted to check if the post-disturbance performance including bus voltage deviation and facility loading meets the planning criteria under different system loading conditions including heavy winter, heavy summer and light summer. Based on the system planning study criteria, generation run-back or shedding schemes are acceptable solutions to mitigate any potential overload and stability problem for N-1 contingency. Since Bullmoose Wind is planned to be connected in stage 3, only the Stage 3 study results are shown as follows:

Stage 3 (2015 winter)

1. A local detection generation run-back RAS is required to resolve overload on 2L308, GMS T13, or GMS T14 caused by system contingencies. Upon detecting the overload, the scheme will run back Bullmoose Wind generation to a pre-set level in a few minutes.

2. Voltage performance is acceptable.

3. A fast generation shedding RAS at Bullmoose wind farm is required to mitigate the impact caused by the loss of 2L308 or 2L309 in order to achieve acceptable transient and post-transient voltage performance. (Please refer to Section 5.3 Transient Stability Study regarding details of transient stability problems.) Without the generation rejection, the Peace Regional transmission system would collapse. Some additional generation shedding may be required to solve the potential overload in the Peace River 138 kV system.

Table 3 below lists the details of the study results.
Table 3: Study Results for Stage 3  
(With 443 MW Injection from Wildmare, Quality Wind, Tumbler Ridge, Meikle, Bullmoose)

<table>
<thead>
<tr>
<th>System Load Condition</th>
<th>System Configuration</th>
<th>Wildmare T1</th>
<th>Quality T7</th>
<th>Meikle T26</th>
<th>Bullmoose e T2</th>
<th>MW</th>
<th>Mvar</th>
<th>MW</th>
<th>Mvar</th>
<th>MW</th>
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<td></td>
<td>75</td>
<td>46</td>
<td>137</td>
<td>113</td>
<td>56</td>
<td>-404</td>
<td>73</td>
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<td>34</td>
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<td>Loss of 2L308</td>
<td></td>
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<td>46</td>
<td>137</td>
<td>113</td>
<td>56</td>
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<td>Loss of 2L309</td>
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<td>137</td>
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<td>Loss of 2L312</td>
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<td>316</td>
<td>-316</td>
<td>11</td>
<td>96</td>
<td>-19</td>
<td>178</td>
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<td></td>
<td>75</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>-102</td>
<td>-11</td>
<td>39</td>
<td>9</td>
<td>113</td>
<td>21</td>
<td>N/A</td>
<td>55</td>
<td>-12</td>
<td>-27</td>
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Notes:
- Summer Rating of 1L362 (BMT-DAW): 135 MVA
- Summer Line Rating of 13kV SLS-CWD line: 135 MVA
- MW load on of GMS T13 or T14 is half of MW load on 2L308; Summer Rating of GMS T13 or T14: 300 MVA
5.3 Transient Stability Study

Transient stability studies have been performed using the base cases for 2016 heavy summer, 2016 light summer, 2015 heavy winter, 2014 light summer, 2013 light summer and 2012 heavy winter in order to cover the three stages of wind generation developments under light and heavy load conditions. The model of the generating project was based on the IC’s data submission plus additional assumptions where the IC’s data was incomplete or inappropriate. The models and data values of the key components used in the study are shown in Appendix A.

The 3 phase faults are applied to the following facilities:

2L308, 2L309, 2L312, 2L313, 2L322, 2L323, GMS T14, SLS-BMT, and TLR T1.

In some study cases, only the contingencies deemed severe have been applied.

WTG models for all five projects are provided to BC Hydro by the manufacturers as user-defined models in the form of object code and are virtually a “Black Box”. Their parameters remain as provided without any adjustment.

General Observations

No generator instability phenomena have been observed for synchronous units based on the studied scenarios and contingencies.

Study results demonstrate that the light loading conditions are more restrictive than the heavy loading conditions for the regional transmission system in the Peace Region.

Transient voltage excursions have been observed when excess generation becomes significant in the Peace Region after the loss of 2L308. With sufficient generation rejection, this problem is resolved.

Voltage spikes as high as 1.3 pu at 230 kV buses are observed immediately following the clearance of a fault before generation rejection takes place. This phenomenon should be further investigated with an EMTP type of analysis at the later design stages.

Voltage spikes as high as 1.42 pu at WTG terminal buses are observed immediately following the clearance of a fault before generation rejection takes place. Some wind generators may be tripped by overvoltage protection. This phenomenon should be further investigated with an EMTP type of analysis at a later stage.

Summary of system stability study results for stage 3 under light load condition is shown in Table 4 below.
Stage Specific Observations

Stage 3

Faults on 2L308 or 2L309 will require generation rejection in order to overcome the unacceptable transient voltage excursions. Fast tripping of generators should be made available to all new projects.

Power quality protection is required for the wind farm to prevent undesirable islanding operation by tripping the generating plants. Due to the possibility of operating conditions that this type of protection may not cover, direct transfer tripping of all IPPs downstream of the faulted circuits is required to prevent excessive overvoltages and possible damage to equipment when opening 2L313.
Table 4: Transient Stability Study Results
(Pre-outage condition: 2016 LS with 443 MW Injection from Wildmare, Quality Wind, Tumbler Ridge, Meikle, and Bullmoose)

<table>
<thead>
<tr>
<th>Case</th>
<th>Outage</th>
<th>3Φ Fault Location</th>
<th>Fault Clearing Time (Cycles)</th>
<th>Maximum Transient Voltage (p.u.)</th>
<th>IPP Low Voltage Ride Through Performance</th>
<th>Minimum Transient Voltage (p.u.)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Close End</td>
<td>Far End</td>
<td>SNK 230kV Bus</td>
<td>TLR 230kV Bus</td>
<td>SLS 230kV Bus</td>
</tr>
<tr>
<td>1</td>
<td>2L308 (GMS – DKT)</td>
<td>Close to GMS</td>
<td>GMS 5</td>
<td>DKT 7</td>
<td>1.27</td>
<td>1.3</td>
<td>1.27</td>
</tr>
<tr>
<td>2</td>
<td>2L308 (GMS – DKT)</td>
<td>Close to DKT</td>
<td>DKT 5</td>
<td>GMS 7</td>
<td>1.27</td>
<td>1.3</td>
<td>1.27</td>
</tr>
<tr>
<td>3</td>
<td>2L309 (DKT – SNK)</td>
<td>Close to DKT</td>
<td>DKT 5</td>
<td>SNK 7</td>
<td>1.27</td>
<td>1.3</td>
<td>1.27</td>
</tr>
<tr>
<td>4</td>
<td>2L309 (DKT – SNK)</td>
<td>Close to SNK</td>
<td>SNK 5</td>
<td>DKT 7</td>
<td>1.27</td>
<td>1.3</td>
<td>1.27</td>
</tr>
<tr>
<td>5</td>
<td>2L312 (SNK – SLS)</td>
<td>Close to SNK</td>
<td>SNK 5</td>
<td>SLS 7</td>
<td>1.27</td>
<td>1.3</td>
<td>1.27</td>
</tr>
<tr>
<td>6</td>
<td>2L312 (SNK – SLS)</td>
<td>Close to SLS</td>
<td>SLS 5</td>
<td>SNK 7</td>
<td>1.27</td>
<td>1.3</td>
<td>1.27</td>
</tr>
<tr>
<td>7</td>
<td>2L313 (SNK– TLR)</td>
<td>Close to SNK</td>
<td>SNK 5</td>
<td></td>
<td>1.27</td>
<td>1.3</td>
<td>1.27</td>
</tr>
<tr>
<td>8</td>
<td>2L313 (SNK– TLR)</td>
<td>Close to TLR</td>
<td>SNK 25</td>
<td>N/A</td>
<td>1.27</td>
<td>1.3</td>
<td>1.27</td>
</tr>
<tr>
<td>9</td>
<td>TLR 25kV Fault</td>
<td>Close to TLR</td>
<td>TLR 35</td>
<td>N/A</td>
<td>1.17</td>
<td>1.2</td>
<td>1.17</td>
</tr>
</tbody>
</table>

Note:
1. For 2L308 contingency, the voltage performance may be unacceptable without tripping any wind generators. About 250 MW wind power would be required to be quickly tripped within about 12 cycles to mitigate the voltage oscillation shown in Fig 7 below.
2. For 2L309 contingency, the voltage performance may be unacceptable without tripping any wind generators. About 150 MW wind power would be required to be quickly tripped within about 12 cycles to mitigate the voltage oscillation.
5.4 Islanding

Islanded operation is normally not an acceptable practice in BCH. Power quality protection will be required at the generating units to detect abnormal system conditions such as under/over voltage and under/over frequency and subsequently trip the units. The settings of these protective relays must conform to the existing BCH practice for generating plants so that the generator will not trip during normal ranges of voltages and frequencies. Based on the preliminary analytical study for islanding situations, a direct transfer tripping scheme is required to resolve overvoltage concerns.

5.5 Fault Analysis

The short circuit analysis for the CPC System Impact Studies is based upon the latest BCH system short circuit model, which includes project equipment and impedances provided by the successful CPC Interconnection Customers. The model includes higher queued projects and planned system reinforcements but excludes the Northwest Transmission Line (NTL) and other lower queued projects. At this stage, the report does not provide Thevenin impedances at the Point of Interconnection (POI) due to uncertainties associated with the system reinforcement options identified for the CPC projects and the statuses of higher queued projects. However, these Thevenin impedances, including the ultimate fault levels at POI, will be made available to Interconnection Customers upon request.

BC Hydro will work with the IC to provide accurate data, as required, during the project design phase.

5.6 Analytical Studies

Transformer Energization:

Random closing of 230kV intertie to pick up the Bullmoose wind farm could produce voltage sag up to 17%, which is much larger than 6% allowed by the IPP interconnection requirements. The transformer inrush current can be effectively limited by using a 230kV energizing breaker with three independent poles and point-on-wave closing. The IC will be responsible for undertaking the appropriate studies required to determine the necessity of an inrush mitigation scheme.

5.7 Protection and Control & Telecommunications

5.7.1 Protection and Control
- Review protections and revise settings as necessary for the BCH stations/lines in Peace region (GMS/DKT/SNK/TLR, etc.) due to increased fault levels. Model power system testing will be required.
- Replace existing TLR 2L322 protections and provide primary and standby communication independent protection for 2L322. BCH will also provide settings for the protection facilities in Bullmoose station for 2L322 protection.
- Review IC’s entrance protections, line protections and documents etc.
- Check fault level increase and inform customers/existing IPPs for their setting review as necessary.

Note: A BCH initiative is underway to install single pole reclosing capability on 230 kV circuits in this region. This would require a partial review of these recommendations.

5.8.2 Telecommunications

With Bullmoose Wind in service in stage 3, more generation shedding, transfer tripping and/or communication assisted line protection are required. In addition to the requirements for the four IPPs in stage 1 and stage 2, the following new telecommunications are required for primary protection (standby protection similar):

- Provide WECC class 2 communication from GMS to Bullmoose wind farm to send five signals for Gen Shed and transfer trip
- Provide a minimum 9600 bps channel for the Bullmoose Wind Project to connect to the WSN DCP site via the closest station with appropriate telecom facilities (station to be determined by Telecom).
- Provide the following Primary and Standby Class 2 transfer trips:
  1. 2L313 (renamed as 2LXXX in stage 2) open from SNK to Bullmoose IPP
  2. 2L313 open from TLR to Bullmoose IPP
  3. 2L322 open from TLR to Bullmoose IPP
- A Power Line Carrier (PLC) link will be installed between Bullmoose and TLR.

5.8 Black Start Capability

BCH does not require the proposed project to have black start (self-start) capability.

However, if the IC desires their facilities to be energized from the BCH system, the IC is required to apply for an Electricity Supply Agreement. Upon receipt of this application, a plant pick-up study would be required to assess the impact of energizing the IC’s facilities.

A high level plant pick-up screening was performed as part of the SIS and any issues are identified in Section 5.6
5.9 **Transmission Line Upgrade Requirements**

The following upgrades are required due to the interconnection of the Bullmoose Wind project:

- Installation of a wood pole 230 kV tap structure into circuit 2L322 (Tumbler to Bullmoose)
- Installation of two non-standard 230 kV non-load break switch structures
- Installation of overhead conductor as required (0.5km)

5.10 **Additional BC Hydro Station Upgrades/Additions**

To accommodate the Bullmoose Wind project’s interconnection to the Transmission System, the IC’s line will be tapped on 2L322. In effect, this new IPP is the main customer on 2L322 with BLM (existing customer) substation as a tap. The two 230 kV disconnects shown in Fig.5 are required to be installed at POI.

![Fig.5 Configuration at POI of Bullmoose Wind Energy Project](image)

5.11 **Other Issues**

Further EMTP studies using adequate models for Wind Turbines and dynamic equipment are required to identify/verify any potential issues such as transient voltages and islanding concerns.
5.12 Cost Estimate and Schedule

The non-binding good faith cost estimate for interconnection Network Upgrades required to interconnect the proposed project to the BCH Transmission System is $2.9 M. The Facilities Study Report will provide more accurate information of the cost estimates.

The estimated time to construct the Network Upgrades required to interconnect the project to the BCH Transmission System is up to 12 months after the Standard Generation Interconnection Agreement is signed.

BCH system upgrades triggered by CPC projects are being determined and the IC may be required to post security to cover one or more upgrade. Further information will be provided over the next few months.

6.0 Conclusion & Discussion

To interconnect the Bullmoose Wind Energy Project and its facilities to the BCH Transmission System at the proposed POI on 2L322, this System Impact Study has identified the following issues and requirements:

Stage 3 (2015 winter)

1. No unacceptable transmission equipment overload or unacceptable voltage condition in the Transmission System has been observed due to the proposed interconnection to and power injection from Bullmoose Wind IPP under system normal condition.
2. To interconnect the Bullmoose Wind IPP into system, two 230kV disconnects are required to be installed at POI.
3. A generation run-back RAS based on local detection is required to mitigate overload on 2L308, GMS T13, or GMS T14 caused by system contingencies. Upon detecting the overload, the scheme will run back Bullmoose Wind IPP generation down to a pre-set level in a few minutes.
4. Power quality anti-islanding protection is required to prevent an undesirable islanding operating condition. Due to the possibility of islanding conditions in which the power quality protection may be inadequate, there will also be a requirement for a transfer tripping scheme when opening 2L313 (SNK to the Meikle Creek new POI substation) or 2LXXX (the Meikle Creek new POI substation to TLR) to protect Bullmoose from islanded operation and unacceptable over-voltage conditions.
5. The 230 kV intertie breaker owned by Bullmoose Wind may need the capability of Point-on-Wave Control to avoid unacceptable voltage sag caused by inrush current during energization of the customer’s 230 kV transformer. The IC will be responsible for
undertaking the studies required to determine the necessity of an inrush mitigation scheme.

6. A fast generation shedding scheme is required to mitigate the impact caused by the loss of 2L308 or 2L309 in order to achieve acceptable dynamic voltage performance and avoid overloads.

Upgrades that are common to the other IPP projects in this area are not included in this report.

Appendix A   IPP Model and Data

The contents of this section have been removed due to the proprietary nature of the information
Appendix B  Disturbance stability swings of the BCH-Bullmoose interconnected systems

The contents of this section have been removed due to the proprietary nature of the information
The contents of this section have been removed due to the proprietary nature of the information