

JOHN HART GENERATING STATION REPLACEMENT PROJECT

Schedule 5

Design and Construction Protocols

SCHEDULE 5

DESIGN AND CONSTRUCTION PROTOCOLS

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SCHEDULE 5

DESIGN AND CONSTRUCTION PROTOCOLS

1. SUBMITTALS

1.1 Submittal Procedure

The parties will comply with Schedule 2 *[Review Procedure, Consent Procedure and Other Submittals]*.

1.2 Submittal Summary

Project Co shall prepare and submit all documents and deliverables as and when required pursuant to this Schedule 5 *[Design and Construction Protocols]*, including the following:

| | Deliverable Name | Due Date | Section Reference | Review, Consent or Information |
|-----|---|---|-------------------|--------------------------------|
| 1. | Project look ahead summary | Not less than 5 Business Days prior to each meeting of Construction Period Joint Committee | 2(e) | Information Only |
| 2. | Construction Period Joint Committee Meeting Minutes | Within 5 Business Days after making recommendation or holding meeting | 2(g) | Review |
| 3. | <i>Not Used</i> | | | |
| 4. | <i>Not Used</i> | | | |
| 5. | <i>Not Used</i> | | | |
| 6. | <i>Not Used</i> | | | |
| 7. | Threat and Risk Assessment | Within 90 days after the Effective Date | 4.1 | Review |
| 8. | Reliability assessments | At least 90 days before the dates specified in the Submittal Schedule for submission of the applicable Final Design | 4.2.1 | Review |
| 9. | Interim Dam Safety Risk Management Plan | At least 30 days prior to performance of specified Project Work | 4.3.1 | Consent |
| 10. | Amendments to Interim Dam Safety Risk Management Plan | Time-to-time, as required | 4.3.3 | Consent |

| | Deliverable Name | Due Date | Section Reference | Review, Consent or Information |
|-----|--|--|--------------------------|---------------------------------------|
| 11. | Interim Dam Safety Risk Management Plan monitoring information | On or before the last day of each month | 4.3.4 | Information Only |
| 12. | Results of Monitoring | Quarterly basis | 4.3.4 | Review |
| 13. | Data and information as may be requested in connection with inspections | Semi-annual basis | 4.3.4 | Review |
| 14. | Safe Design Plan | Within 90 days after the Effective Date | 4.4.2 | Consent |
| 15. | Initial Hazard Log | Within 120 days after the Effective Date | 4.4.4C.(b) | Review |
| 16. | Updated Hazard Log | At least 10 days prior to each Interim Design review meeting and concurrently with the submission of each Final Design | 4.4.4C.(c) | Review |
| 17. | Updated Hazard Log, assessment of effectiveness of each Control Measure and details of any modified or additional Control Measures | Within 10 days after each anniversary of the Service Commencement Date | 4.4.4E.(b) | Review |
| 18. | Safe Design Report | Not later than 30 days prior to the Target Service Commencement Date | 4.4.5 | Review |
| 19. | SDI Certificates | Prior to application for Certificate of Service Commencement and Certificate of Bypass System Completion | 4.5 | Review |
| 20. | Design Management Plan | Within 60 days following the Effective Date | 5.5.1 | Consent |
| 21. | Submittal Schedule | Within 60 days following the Effective Date (included in Design Management Plan) | 5.5.1(s) | Consent |
| 22. | Submittal Schedule updates | On or before the last day of each month up to and including the Total Completion Date | 5.5.3 | Information Only |
| 23. | Basis of Design Report | Within 90 days after the Effective Date | 5.6 | Review |

| | Deliverable Name | Due Date | Section Reference | Review, Consent or Information |
|-----|--|--|--------------------------|---------------------------------------|
| 24. | Design Basis Memoranda | With each Final Design and Construction activity package | 5.7 | Review |
| 25. | Technical Appraisal Form | With each Final Design and Construction activity package | 5.8.1(a) | Review |
| 26. | Variations to Basis of Design Report, DBM or TAF | Time-to-time, as required | 5.9 | Review |
| 27. | Design Certificate | With each Final Design package | 5.10.1 | Review |
| 28. | Facility Model | On or before the date shown in the Submittal Schedule for applicable Interim Designs and Final Designs Prior to application for Certificate of Service Commencement and Certificate of Total Completion | 5.13(a) | Review |
| 29. | Turbine Model | On or before the applicable date specified in the Works Schedule | 5.13(b) | Review |
| 30. | Control Panel Wiring Mock-Up | Not less than 60 days prior to manufacture of any control, protection or alarm panel | 5.13(c) | Review |
| 31. | Intake Hydraulic Model | On or before the date shown in the Submittal Schedule for the applicable Interim Design review | 5.13(d) | Review |
| 32. | Tailrace(s) and First Island Hydraulic Model | On or before the date shown in the Submittal Schedule for the applicable Interim Design review | 5.13(e) | Review |
| 33. | TIV Hydraulic Model | On or before the date shown in the Submittal Schedule for the applicable Final Design package | 5.13(f) | Review |

| | Deliverable Name | Due Date | Section Reference | Review, Consent or Information |
|-----|--|--|--------------------------|---------------------------------------|
| 34. | INOG Hydraulic Model | On or before the date shown in the Submittal Schedule for the applicable Final Design package | 5.13(g) | Review |
| 35. | Interim Designs | Time-to-time, as shown in the Submittal Schedule | 5.14 | N/A |
| 36. | Interim Design Meeting Minutes | Within 5 Business Days after applicable meeting | 5.15(b) | Review |
| 37. | Proposed Checking Team | Concurrent with the submission of the initial Design Management Plan | 5.16.1 | Consent |
| 38. | Report sealed by the Checking Team members and Design Certificate | As part of the applicable Design Package | 5.16.3 | Review |
| 39. | Final Design Submission Report | At least 30 days prior to the date specified in the Submittal Schedule for submission of the applicable Final Design | 5.17.1 | Review |
| 40. | Final Designs | Time-to-time, as shown in the Submittal Schedule | 5.17.2 | Review |
| 41. | Final Design for Temporary Works | Time-to-time, as required | 5.22(a) | Review |
| 42. | Documents, Permits and environmental work plans required in connection with applications for Leaves to Commence Construction | Time-to-time, as required | 6.2(d) | Review |
| 43. | Applications for Leaves to Commence Construction | To BC Hydro's Representative, concurrently with submission to Independent Engineer | 6.2(d) | Information Only |
| 44. | Formal application for Leave to Commence Construction | Following acceptance by the Independent Engineer | 6.2(e) | Information Only |
| 45. | Applications for Leaves to Commence Operation | To BC Hydro's Representative, concurrently with submission to Independent Engineer | 6.3(d) | Information Only |
| 46. | Formal application for Leave to Commence Operation | Following acceptance by the Independent Engineer | 6.3(e) | Information Only |

| | Deliverable Name | Due Date | Section Reference | Review, Consent or Information |
|-----|--|--|-----------------------------|---------------------------------------|
| 47. | Site safety plan | Before commencing the Construction | 7.5(b) | Review |
| 48. | Notice of unusual or abnormal conditions | Immediately upon observation | 7.5(c) | Review |
| 49. | Asset Register | Prior to Service Commencement | 8.2 / 11.4.2A.(o) | Review |
| 50. | Commissioning Joint Committee minutes | Within 3 days of recommendation, identification of action item or holding of meeting | 9.4.1(f) | Review |
| 51. | Commissioning Plan | Not less than 6 months prior to the Target Commercial Operation Date for the first Generating Unit | 9.4.2 | Consent |
| 52. | Draft LOO 3-G-JHN-01 | Together with Commissioning Plan | 9.4.2(p) | Consent |
| 53. | Draft Joint Operating Order | Together with Commissioning Plan | 9.4.2(q) | Consent |
| 54. | Commissioning Schedule | At least 15 Business Days prior to the commencement of each portion of the Commissioning Work | 9.4.4 | Consent (5 days) |
| 55. | Detailed schedule of all proposed SCADA testing with the Remote Control Centre | At least one month in advance of any proposed SCADA testing | 9.4.4 | Consent (15 days) |
| 56. | Requested changes to a Commissioning Schedule | Promptly, as required | 9.4.5 | N/A |
| 57. | Copies of inspection and test procedures, test results, technical documentation and other data and photographs | Upon request | 9.5.1(l) | Review |
| 58. | GOO 4G-44 Variance Applications | Time-to-time, as required | Section 9.5.2 / Appendix 5K | Review |
| 59. | Cutover of Water Conveyances – Commissioning Certificate – Part I | Prior to connecting the Water Conveyances to an Existing Surge Tower | 9.6.1(b) | Information Only |

| | Deliverable Name | Due Date | Section Reference | Review, Consent or Information |
|-----|--|---|--------------------------|---------------------------------------|
| 60. | Cutover of Water Conveyances – Commissioning Certificate – Part II | Within 24 hours after completion of cutover of the Water Conveyances (or portion thereof) | 9.6.1 | Information Only |
| 61. | Water-up of Water Conveyances – Commissioning Certificate – Part I | Prior to commencing watering up of the Water Conveyance | 9.6.2A.(a) | Information Only |
| 62. | Accepted IDSRMP for first filling | Prior to commencing watering up of the Water Conveyance | 9.6.2A.(d) | Consent |
| 63. | LOO 3-G-JHN-01 | Prior to commencing watering up of the Water Conveyance | 9.6.2A.(e) | Review |
| 64. | LOO 3-G-JHN-06 | Prior to commencing watering up of the Water Conveyance | 9.6.2A.(f) | Review |
| 65. | John Hart Joint Operating Order | Prior to commencing watering up of the Water Conveyance | 9.6.2A.(g) | Review |
| 66. | Water Up Water Conveyances Commissioning Certificate – Part II | Within 24 hours after watering-up of Water Conveyances | 9.6.2C.(a) | Information Only |
| 67. | First Filling Test Report | Within 60 days after the first filling of the Water Conveyances | 9.6.2C.(b) | Information Only |
| 68. | Wet Testing of Large Discharge Valves – Commissioning Certificate – Part I | Prior to commencing wet testing of Bypass System and each large discharge valve | 9.6.3A.(a) | Information Only |
| 69. | LOO 3-G-JHN-04 | Prior to commencing wet testing of Bypass System and each large discharge valve | 9.6.3A.(d) | Review |
| 70. | LOO 3-G-JHN-06 | Prior to commencing wet testing of Bypass System and each large discharge valve | 9.6.3A.(e) | Review |
| 71. | LOO 3-G-JHN-08 | Prior to commencing wet testing of Bypass System and each large discharge valve | 9.6.3A.(f) | Review |

| | Deliverable Name | Due Date | Section Reference | Review, Consent or Information |
|-----|--|---|--------------------------|---------------------------------------|
| 72. | Updated version of each previously submitted Operating Order | Prior to commencing wet testing of Bypass System and each large discharge valve | 9.6.3A.(g) | Review |
| 73. | Wet Testing Commissioning Certificate – Part II | Within 24 hours of completion of wet testing of applicable large discharge valves | 9.6.3C.(a) | Information Only |
| 74. | A test and inspection report for large discharge valves | Concurrently with the submission of the Commissioning Test Report | 9.6.3C.(b) | Review |
| 75. | Offline Wet Testing of each Generating Unit – Commissioning Certificate – Part I | Prior to commencing offline wet testing of a Generating Unit | 9.6.4A.(a) | Information Only |
| 76. | LOO 3-G-JHN-04 | Prior to commencing offline wet testing of a Generating Unit | 9.6.4A.(f) | Review |
| 77. | LOO 3-G-JHN-08 | Prior to commencing offline wet testing of a Generating Unit | 9.6.4A.(g) | Review |
| 78. | Updated version of each previously submitted Operating Order | Prior to commencing offline wet testing of a Generating Unit | 9.6.4A.(h) | Review |
| 79. | Offline Wet Testing of each Generating Unit Commissioning Certificate – Part II | Within 24 hours of completion of offline wet testing of the applicable Generating Unit | 9.6.4C.(a) | Information Only |
| 80. | A test and inspection report of wet testing of applicable Generating Unit | Concurrently with Commissioning Test Report | 9.6.4C.(b) | Review |
| 81. | Interconnection to the BC Hydro Transmission System Commissioning Certificate – Part I | Prior to making an initial connection to, or initial synchronization to, the BC Hydro Transmission System | 9.6.5(a) | Information Only |
| 82. | Specified documentation related to each piece of interconnected equipment | Prior to making an initial connection to or initial synchronization to the BC Hydro Transmission System | 9.6.5(b) | Consent (5 days) |

| | Deliverable Name | Due Date | Section Reference | Review, Consent or Information |
|-----|---|---|--------------------------|---------------------------------------|
| 83. | Interconnection to the BC Hydro Transmission System Commissioning Certificate – Part II | Within 24 hours after making initial connection, or initial synchronization of any station service transformer, Unit Transformer or Generator | 9.6.5 | Information Only |
| 84. | Generating Unit Online Local Testing – Commissioning Certificate – Part I | Prior to proceeding with synchronization and online testing of a Generating Unit | 9.6.6A.(a) | Information Only |
| 85. | Generating Unit Online Local Testing – Commissioning Certificate – Part II and updated test data and information | Within 24 hours after completion of online local testing of the applicable Generating Unit | 9.6.6C.(a) | Information Only |
| 86. | Generating Unit Online Remote Testing – Commissioning Certificate – Part I | Prior to proceeding with synchronization and online testing of a Generating Unit | 9.6.7A.(b) | Information Only |
| 87. | Updated versions of each previously submitted Operating Order | Prior to proceeding with synchronization and online testing of a Generating Unit | 9.6.7A.(d) | Review |
| 88. | Generating Unit Online Remote Testing – Commissioning Certificate – Part II and updated test data and information | Within 24 hours of completion of online remote testing of the applicable Generating Unit | 9.6.7C. | Information Only |
| 89. | Marketable Power Test – Commissioning Certificate – Part I | Prior to proceeding with the marketable power test of a Generating Unit, or the Facility | 9.6.8A.(b) | Information Only |
| 90. | Updated versions of each previously submitted Operating Order | Prior to proceeding with the marketable power test of a Generating Unit, or the Facility | 9.6.8A.(c) | Review |
| 91. | Marketable Power Test – Commissioning Certificate – Part II | Within 24 hours after completion of the applicable marketable power tests | 9.6.8C.(a) | Information Only |
| 92. | Written marketable power test report and supporting documentation | Within 24 hours after completion of the applicable marketable power tests | 9.6.8C.(b) | Information Only |

| | Deliverable Name | Due Date | Section Reference | Review, Consent or Information |
|------|--|--|--------------------------|---------------------------------------|
| 93. | WECC Test Data and Model Validation Report | At least 30 days prior to making an application for the Certificate of Total Completion. | 9.8 | Review |
| 94. | Commissioning Test Report | Within 90 days after the Service Commencement Date | 9.9 | Review |
| 95. | Updated Commissioning Test Report | Within 60 days after the Bypass System Completion Date (if the Bypass System Completion Date occurs after the Service Commencement Date) | 9.9 | Review |
| 96. | Updated Commissioning Test Report | Within 60 days after completion of the Performance Verification Tests | 9.9 | Review |
| 97. | Training Materials | Time-to-time, as required | 9.10 | Review |
| 98. | Written notice of training or education session | At least 15 Business Days prior to any training or education session | 9.10 | N/A |
| 99. | Construction Certificates | Prior to: (i) Commercial Operation of each Generating Unit; (ii) Bypass System Completion; (iii) Service Commencement; and (iv) Total Completion | 10.1 | Review |
| 100. | Survey of final surfaces of excavations | 45 days prior to application for Certificate of Service Commencement | 10.2.2 | Review |
| 101. | As-built records of rock support | 45 days prior to application for Certificate of Service Commencement | 10.2.2 | Review |
| 102. | As-built records of geotechnical instrumentation | 90 days prior to application for Certificate of Total Completion | 10.2.2 | Review |

| | Deliverable Name | Due Date | Section Reference | Review, Consent or Information |
|------|---|--|--------------------------|---------------------------------------|
| 103. | Site plan detailing the total Construction footprint | At least 45 days prior to application for Certificate of Service Commencement and Certificate of Total Completion | 10.2.3 | Review |
| 104. | Control point survey drawings | Within 6 months after Service Commencement Date | 10.2.4 | Review |
| 105. | Preliminary drafts of GOO 4G-44 (Excerpts), OMS Manual (Excerpts), Generation Emergency Plan (Excerpts) and Emergency Planning Guide (Excerpts) | Not later than 120 days prior to submission of an application for a Leave to Commence Operations | 10.3.1(a), (b) | Review |
| 106. | Preliminary drafts of Installation Manuals, O&M Manuals, Facility Manual and Geotechnical Instrumentation Manual | Not later than 180 days prior to Target Service Commencement Date | 10.3.1(c) – (f) | Review |
| 107. | GOO 4G-44 (Excerpts), OMS Manual (Excerpts), Generation Emergency Plan (Excerpts) and Emergency Planning Guide (Excerpts) | Not later than 75 days prior to submission of an application for a Leave to Commence Operations | 10.3.2 (a), (b) | Review |
| 108. | Installation Manuals, O&M Manuals, Facility Manual and Geotechnical Instrumentation Manual | Not later than 45 days prior to application for Certificate of Service Commencement | 10.3.2 (c) – (f) | Review |
| 109. | Preliminary draft of the Final Design and Construction Report | At least 3 months prior to the Target Service Commencement Date | 10.4 | Review |
| 110. | Final Design and Construction Report | No later than 1 month prior to the Target Total Completion Date | 10.4 | Review |
| 111. | Advance notice regarding Commercial Operation of a Generating Unit | At least 15 Business Days but no more than 30 Business Days prior to the applicable Target Commercial Operation Date | 11.1.1 | Review |
| 112. | Documents required for Commercial Operation of a Generating Unit | Prior to application for Commercial Operation of each Generating Unit | 11.1.2 | Review |
| 113. | Application for Commercial Operation | Concurrently with application to Independent Certifier | 11.1.3 | N/A |

| | Deliverable Name | Due Date | Section Reference | Review, Consent or Information |
|------|---|---|--------------------------|---------------------------------------|
| 114. | Notice of Outages and Operating Constraints | At least 5 days in advance of Outage or Operating Constraint | 11.2.1 | N/A |
| 115. | Advance notice of Bypass System Completion | At least 15 Business Days but no more than 30 Business Days prior to the Target Bypass System Completion Date | 11.3.1 | Review |
| 116. | Documents required for Bypass System Completion | Prior to application for Bypass System Completion | 11.3.2 | Review |
| 117. | Application for Bypass System Completion | Concurrently with application to Independent Certifier | 11.3.3 | N/A |
| 118. | Advance notice of Service Commencement | At least 15 Business Days but no more than 30 Business Days prior to the Target Service Commencement Date | 11.4.1 | Review |
| 119. | Documents required for Service Commencement | Prior to application for Service Commencement | 11.4.2 | Review |
| 120. | Application for Service Commencement | Concurrently with application to Independent Certifier | 11.4.3 | N/A |
| 121. | Advance notice of Total Completion | At least 15 Business Days but no more than 30 Business Days prior to the Target Total Completion Date | 11.5.1 | Review |
| 122. | Documents required for Total Completion | Prior to application for Total Completion | 11.5.2 | Review |
| 123. | Application for Total Completion | Concurrently with application to Independent Certifier | 11.5.3 | N/A |

1.3 BC Hydro Not Responsible for Design or Construction

BC Hydro's rights of review, consent, acceptance, approval or confirmation of compliance with respect to any aspect of the Design or the Construction, including pursuant to Schedule 2 *[Review Procedure, Consent Procedure and Other Submittals]* will be for BC Hydro's benefit only, and no review, consent, acceptance, approval or confirmation of compliance by BC Hydro's Representative or any other representative of BC Hydro will in any way relieve Project Co of its obligation or responsibility for all

aspects of the Design and Construction of the Facility except as may be expressly set out in this Agreement.

2. CONSTRUCTION PERIOD JOINT COMMITTEE

- (a) Not less than 20 Business Days after the Effective Date, BC Hydro and Project Co will establish, and will maintain until the Total Completion Date, a joint liaison committee (the “**Construction Period Joint Committee**”) consisting of BC Hydro’s Representative and Project Co’s Representative and such other members as the parties may agree from time to time.
- (b) The purpose of the Construction Period Joint Committee is to provide a formal forum for the parties to consult and cooperate in all matters relating to the Project during the period between the Effective Date and the Total Completion Date and any member appointed to the Construction Period Joint Committee will not have any duties or obligations arising out of such appointment independent of such member’s duties or obligations to the party making such appointment.
- (c) The Construction Period Joint Committee:
 - (i) will only have authority as expressly delegated to it by BC Hydro and Project Co, and both parties will give reasonable consideration to delegating appropriate authority to permit efficient decision making with respect to the Project;
 - (ii) may strike, establish terms of reference for, delegate authority and appoint members having the necessary experience and qualifications to, such sub-committees as the Construction Period Joint Committee may determine are necessary from time to time and all such sub-committees will report to the Construction Period Joint Committee;
 - (iii) will establish protocols and procedures for undertaking the tasks and responsibilities delegated to it, including a co-operative and consultative process to review all documentation submitted to it in relation to the Design and Construction, including each of the Interim Designs;
 - (iv) may make recommendations to the parties on all matters relating to the Project, which the parties may accept or reject in their complete discretion; and
 - (v) will have no authority to agree to any amendments or to give any waivers of this Agreement.
- (d) Subject to the provisions of this Agreement, the members of the Construction Period Joint Committee may adopt such procedures and practices for the conduct of the activities of the Construction Period Joint Committee as they consider appropriate from time to time and:

- (i) may invite to any meeting of the Construction Period Joint Committee such other (non-voting) persons as a member may decide; and
 - (ii) receive and review a report from any person agreed by the members of the Construction Period Joint Committee.
- (e) The Construction Period Joint Committee will meet at least once each month at a location provided by Project Co at or near the Site (unless otherwise agreed by its members) and from time to time as necessary. If any member of the Construction Period Joint Committee requests an additional meeting, the parties will act reasonably in accommodating this request. Not less than 5 Business Days prior to each meeting of the Construction Period Joint Committee, Project Co shall deliver a Project look ahead summary to BC Hydro's Representative, for information only. The Project look ahead summary shall describe all planned Project activities over the next 30, 60 and 90 days and shall include details of all associated activities required to be completed by BC Hydro (if any).
- (f) Meetings of the Construction Period Joint Committee will be convened on not less than 10 Business Days' notice (which will also identify the agenda items to be discussed at the meeting) provided that in an emergency a meeting may be called at any time on such notice as may be reasonable in the circumstances. The Construction Period Joint Committee will be chaired by a representative of BC Hydro unless BC Hydro requires that a representative of Project Co chair the Construction Period Joint Committee.
- (g) Project Co shall keep minutes of all recommendations and meetings of the Construction Period Joint Committee and circulate such minutes to BC Hydro within five Business Days of the making of the recommendation or the holding of the meeting.

3. PROJECT CO'S RESPONSIBILITIES

3.1 Design-Build Responsibility

Notwithstanding any other provision of this Agreement, Project Co shall:

- (a) have complete responsibility for the Design and Construction of the Facility;
- (b) provide written notice to BC Hydro's Representative of any conflict or inconsistency between or among the Project Requirements, as soon as practicable after becoming aware of such conflict or inconsistency between or among the Project Requirements;
- (c) perform and complete the Design, the Construction and all other activities, including completion, Commissioning and testing of the Facility and its components, the Decommissioning Work and the restoration and re-vegetation of the Site:

- (i) in accordance with all terms of this Agreement, including the terms of this Schedule, Schedule 6 *[Design and Construction Specifications]*, Schedule 8 *[Environmental Obligations]* and the DBSS;
- (ii) so as to provide a new hydroelectric generating facility that, at Service Commencement:
 - (A) is complete and operational and fit for the uses of the Facility, as described in the Design and Construction Specifications;
 - (B) will permit BC Hydro to carry out the BC Hydro Activities and fulfil the Legal Obligations;
 - (C) will permit Project Co to provide the Services in accordance with the requirements of this Agreement;
 - (D) will permit BC Hydro to perform its obligations, including those described in Schedule 7 *[Services]*, in accordance with the requirements of this Agreement
 - (E) complies with the specifications, criteria, terms, conditions and mitigation measures described in the EA, provided that where more stringent specifications, criteria, terms, conditions or mitigation measures are specified in this Agreement, the provisions of this Agreement shall take precedence over those in the EA; and
 - (F) is fully integrated with other existing or planned buildings, facilities, structures and systems at the Site, as described in the Project Requirements;
- (iii) so as to provide a flow bypass system that, on the Bypass System Completion Date:
 - (A) is complete and operational and fit for the uses of the Facility, as described in the Design and Construction Specifications;
 - (B) complies with the specifications, criteria, terms, conditions and mitigation measures described in the EA, provided that where more stringent specifications, criteria, terms, conditions or mitigation measures are specified in this Agreement, the provisions of this Agreement shall take precedence over those in the EA;
 - (C) will permit BC Hydro to fulfil the Legal Obligations, including the requirements established as a result of a decision under the Canadian *Environmental Assessment Act* (Canada) and authorizations under the *Fisheries Act* (Canada); and

- (D) is fully integrated with the Facility, so as to automatically provide a compensating flow to match real-time changes in Powerhouse Flow, up to the maximum capacity of the Bypass System;
- (iv) so that at Total Completion:
 - (A) the components of the Existing Facility specified in Section 1.4 *[Decommissioning Work]* of Schedule 6 *[Design and Construction Specifications]* have been decommissioned and demolished to the extent described in the Project Requirements;
 - (B) the Site has been restored and re-vegetated as described in the Project Requirements, including Schedule 8 *[Environmental Obligations]* and Schedule 23 *[Public Safety and Public Use]*;
 - (C) all remaining Construction is complete and operational and fit for the uses of the Facility, as described in the Design and Construction Specifications; and
 - (D) the Site is clear of all Temporary Works related to the Design and Construction, including construction site offices; and
- (v) so as to reflect and capture the intent and benefits of the Proposal Extracts;
- (d) maintain the complete, unfolded hard copy, full-sized, original set of all signed and sealed (red ink stamped) Design Drawings, and all shop or fabrication drawings required to be signed and sealed (red ink stamped), together with all revisions thereto, on 24 lb. bond, until submission to BC Hydro at Service Commencement and Total Completion, as applicable. The drawings set shall be logically organized and structured and shall be made available to BC Hydro's Representative and the Independent Certifier upon request;
- (e) maintain a complete, hard copy, full-sized, set of all the latest revision and all Site mark-ups of all signed and sealed Design Drawings and shop or fabrication drawings required to be signed and sealed, on Site until the End of Term. The drawings set shall be logically organized and structured and shall be made available to BC Hydro's Representative and the Independent Certifier upon request;
- (f) comply with all applicable BC Hydro Policies; and
- (g) not interfere with BC Hydro's ability to comply, or otherwise prevent BC Hydro from complying, with the Legal Obligations.

Each of the obligations in Sections 3.1(c)(i), 3.1(c)(ii), 3.1(c)(iii), 3.1(c)(iv) and 3.1(c)(v) *[Design-Build Responsibility]* of this Schedule are independent obligations, and the fact that Project Co has satisfied one obligation will be no defence to an allegation that it has failed to satisfy another.

3.2 Standard of Performance for Design and Construction

Project Co shall, at all times during the period between the Effective Date and the Total Completion Date and in all respects, perform the Design and Construction in accordance with Good Utility Practice and to the standards required by Schedule 6 [*Design and Construction Specifications*].

3.3 Defects in Design or Construction

Project Co shall, without cost to BC Hydro, and without limiting Project Co's obligations to perform the Services as set out in this Agreement, including Schedule 7 [*Services*], correct any Defect that becomes apparent at any time during the Term, subject to the terms of this Agreement, including any Planned Maintenance and the Handback Requirements.

3.4 Compliance with Laws

Project Co shall undertake and perform the Design and Construction in accordance with all applicable Laws, and so that all elements of the Design and the Construction, including all workmanship, construction equipment and materials, and the supply and installation of equipment, meet or exceed the requirements of all applicable Laws. If there is any conflict or ambiguity between the provisions of applicable Laws, or between a provision of applicable Laws and the Project Requirements, or between provisions of the Project Requirements, then the provision of higher quality or higher standard will govern.

3.5 Permits for the Design and Construction

Project Co and BC Hydro each acknowledge and agree that risk and responsibility for all Permits required for the Design and Construction shall be as specified in Section 4.19 [*Regulatory Approvals and Permits*] of this Agreement.

4. RISK MANAGEMENT

4.1 Threat and Risk Assessment

Project Co shall, within 90 days after the Effective Date, prepare and deliver to BC Hydro in accordance with the Review Procedure a comprehensive threat and risk assessment report for the Facility ("**Threat and Risk Assessment**"). The Threat and Risk Assessment shall: (i) be prepared and sealed by a Professional Engineer; (ii) be based on the preliminary threat and risk assessment included in the Proposal Extracts; (iii) identify specific risks and vulnerabilities to people and property, including BC Hydro and the surrounding community, associated with the Facility; and (iv) shall describe how the design of the Facility will mitigate these risks and vulnerabilities. In developing the design of the Facility, Project Co shall implement the risk mitigation strategies described in the Threat and Risk Assessment to which there is no objection by BC Hydro's Representative in accordance with the Review Procedure.

4.2 Reliability Assessment

4.2.1 Preparation

On or before the applicable dates specified in the Submittal Schedule, Project Co shall prepare separate reliability assessments and mitigation plans in accordance with IEC 60812 and IEC 61078 with respect to:

- (a) all Facility systems upstream of, and including, the Turbine Inlet Valves and the Bypass System, including:
 - (i) Power Intake Operating Gates, focusing on their ability to close against maximum flows in accordance with Section 5.3-6.1 [*Power Intake Operating Gate (INOG)*] of Schedule 6 [*Design and Construction Specifications*] and to prevent spurious operation;
 - (ii) Environmental Flow Release System, focusing on its ability to accurately pass the required flows and to prevent spurious operation;
 - (iii) Low Level Outlet, focusing on its ability to operate on demand after prolonged periods of inactivity and to prevent spurious operation;
 - (iv) Power Tunnel dewatering system, focusing on its ability to effectively dewater the Power Tunnel and keep it dewatered as required for safe access;
 - (v) Turbine Inlet Valves, focusing on their ability to close against maximum flows in accordance with Section 5.2-3.2 [*Emergency Closing*] of Schedule 6 [*Design and Construction Specifications*];
 - (vi) Hydraulic Transient Management System, focusing on its ability to manage water hammer to the applicable design constraints and to prevent spurious operation; and
 - (vii) Bypass System, focusing on its ability to operate on demand after prolonged periods of inactivity, to accurately provide compensating flows upon the occurrence of a Bypass Event and to prevent spurious operation;
- (b) all public safety systems, including sirens, warning lights, booms and barriers, focusing on their ability to perform accurately and reliably;
- (c) all civil structures of the Facility (IEC 60812 only) located upstream of, and including, the Turbine Inlet Valves and the Bypass System, focusing on their ability to prevent the uncontrolled release of water following an MDE over the applicable Design Service Life; and
- (d) the Generation Systems, focusing on the availability of the Generation Systems for the production of power on demand.

Each mitigation plan and each reliability assessment, together with pareto charts and a report demonstrating: (i) the assumptions and data used in preparation of the reliability assessment; (ii) a list of all single points of failure and spurious operation; and (iii) the steps to be taken by Project Co to overcome any deficiencies and mitigate any risks identified in the applicable reliability assessment and pareto charts, shall be prepared and sealed by a Professional Engineer and shall be submitted to BC Hydro's Representative at least ninety (90) days prior to the date specified in the Submittal Schedule for submission of the applicable Final Design.

4.2.2 Implementation

Project Co shall incorporate the reliability assessment mitigation plans, to which BC Hydro has no objection pursuant to the Review Procedure, in accordance with the Design Management Plan and shall implement the identified mitigation measures into the design and maintenance of the Generation Systems and the applicable Facility equipment, components, systems and sub-systems.

4.3 Interim Dam Safety Risk Management Plans

4.3.1 Preparation and Submission

At least thirty (30) days prior to performance of any Project Work, at or near a Dam, which has the potential to directly or indirectly impact the safety of the Dams, Project Co shall prepare and submit an interim dam safety risk management plan (an "***Interim Dam Safety Risk Management Plan***" or "***IDSRMP***") to BC Hydro's Representative in accordance with the Consent Procedure. Each IDSRMP shall be submitted together with sufficient Design Data, Design Drawings and other information and documentation as BC Hydro's Representative requires in order to fully consider the applicable IDSRMP, and shall:

- (a) be prepared and sealed by a Professional Engineer with experience in dam design and construction;
- (b) comply with the requirements of all applicable Laws and Good Utility Practice;
- (c) specify the time period during which the applicable Project Work is scheduled to be performed;
- (d) provide a description of the relevant Project Work (including details of each activity, task or component thereof, having the potential to directly or indirectly impact the safety of the Dams), with sufficient detail to permit BC Hydro's Representative to fully understand the proposed activities, tasks and components thereof;
- (e) describe all potential hazards and risks to the Dams that are directly or indirectly related to each activity, task or component thereof, which Project Co proposes to undertake at or near the Dam, with sufficient detail to permit BC Hydro's Representative to fully understand each potential hazard and risk and its relationship to the proposed activities, tasks or components thereof;

- (f) provide a detailed description of the construction means and methods to be employed by Project Co in connection with each proposed activity, task or component thereof;
- (g) specify the work procedures and other mitigation measures to be implemented by Project Co to reduce or control the potential hazards and risks posed by each proposed activity, task or component thereof;
- (h) specify the additional surveillance steps to be implemented by Project Co as part of the Project Work (including any increased monitoring of existing instrumentation, increased visual inspections or installation of new instrumentation), required to monitor the development or progression of the identified hazards and risks;
- (i) describe Project Co's response procedures in the event that any of the identified hazards or risks should occur;
- (j) specify the distribution list for the IDSRMP, which distribution list shall include as a minimum, Project Co's Representative and the project manager and field engineer responsible for performance of the applicable Project Work; and
- (k) be acknowledged by the Designer as having been integrated with the applicable portions of the design of the Facility.

For the purpose of this Section 4.3 [*Interim Dam Safety Risk Management Plans*] activities which have the potential to directly or indirectly impact the safety of the Dams include, geotechnical drilling or blasting at, near or under the Dams, changing the surface configuration of the Dams, including by excavation or trenching, altering the structural integrity of the Dams, weakening or damaging components of the Dams, altering or damaging the seepage regime or drainage systems within the Dams, disabling or removing the Spillway Gates from service, removing the Existing Penstock protection system from service, removing or altering any dam safety systems or monitoring equipment, reducing the discharge capacity of the Existing Facility, impacting the stability of the Reservoir slopes or operation of the Facility.

For clarity, an IDSRMP, accepted by BC Hydro's Representative in accordance with the Consent Procedure, shall be in place before: (i) performing any Project Work, at or near a Dam, which has the potential to directly or indirectly impact the safety of the Dams; or (ii) conducting field investigations in support of Design Work, where such investigations may adversely impact the non-overflow Dam monoliths or Spillway structures.

4.3.2 Compliance with IDSRMP

Project Co shall implement, and ensure that all Project Co Persons engaged in the applicable Project Work are familiar and comply with, the applicable IDSRMP which has been accepted by BC Hydro's Representative in accordance with the Consent Procedure, and any subsequent amendments or updates to such IDSRMP which have been accepted by BC Hydro's Representative in accordance with the Consent Procedure.

4.3.3 Review and Amendment of IDSRMP

Project Co shall review and amend each IDSRMP from time to time as necessary to ensure that the IDSRMP at all times: (i) reflects the nature of the Project Work being performed, including any changes in the nature of the proposed activities, tasks or components thereof, the proposed timing or methodology, the availability or applicability of the proposed mitigation or surveillance measures, or the hazards and risks posed by the performance of such Project Work; and (ii) complies with the requirements set out in Section 4.3.1 [*Preparation and Submission*] of this Schedule.

All IDSRMP updates and amendments shall be subject to the Consent Procedure, and Project Co shall not implement any IDSRMP update or amendment that has not been accepted by BC Hydro in accordance with the Consent Procedure.

4.3.4 Monitoring and Reporting

Project Co shall monitor and record information and data obtained pursuant to an IDSRMP. The results of such monitoring shall be submitted to BC Hydro for information only on or before the last day of each month.

On a quarterly basis, Project Co shall present the results of such monitoring at a meeting of the Construction Period Joint Committee. Relevant dam safety experts of Project Co and BC Hydro shall participate in the meetings.

On a semi-annual basis, a joint inspection involving dam safety experts from Project Co and BC Hydro shall be conducted and Project Co shall provide such data and other information as may be requested by BC Hydro in connection with such inspections.

4.4 Safe Design Policy Requirements

4.4.1 Acknowledgement

Project Co acknowledges that as part of its commitment to making the workplace safer, BC Hydro has implemented practices with respect to the identification and treatment of Hazards through design (the “**Safe Design Policy**”).

The Safe Design Policy requires consideration, identification, analysis, documentation and treatment of Hazards associated with the full life cycle of the facility to be constructed (including each component thereof and any Temporary Works, equipment, facilities and systems), at all stages of the design development process. For the purpose of this Section 4.4 [*Safe Design Policy Requirements*], the life cycle of a facility begins with project conception and includes all phases of the design cycle, construction, manufacturing, testing, installation, commissioning, operation, maintenance, decommissioning and final disposal.

4.4.2 Safe Design Plan

Within 90 days after the Effective Date, Project Co shall prepare and submit a safe design plan (the “**Safe Design Plan**”) to BC Hydro’s Representative in accordance with the Consent Procedure. The Safe Design Plan shall:

- (a) be prepared by, or under the direction of, the Designer;
- (b) comply with the requirements of all applicable Laws and Good Utility Practice;
- (c) implement the “*Guidance on the Principles of Safe Design for Work*” published by Australian Safety and Compensation Council;
- (d) describe Project Co’s methodology for:
 - (i) systematic consideration, identification, analysis and documentation of Hazards associated with each phase of the Facility’s life cycle;
 - (ii) incorporating the systematic consideration, identification, analysis and documentation of Hazards into the design development process;
 - (iii) integration of safe design and human factors principles into the design of the Facility;
 - (iv) solicitation of meaningful input and feedback from designated BC Hydro Persons at appropriate stages of the design development process; and
 - (v) integration of input and feedback received from designated BC Hydro Persons into the design of the Facility;
- (e) describe the techniques and tools to be employed by Project Co for Hazard identification and analysis;
- (f) be fully integrated with the Design Management Plan and the Submittal Schedule, including Project Co’s design review and audit schedule; and
- (g) include Project Co’s proposed template form of hazard log and final safe design report.

4.4.3 Compliance with Safe Design Plan

Project Co shall implement, and ensure that all Project Co Persons engaged in the applicable Project Work are familiar and comply with, the Safe Design Plan which has been accepted by BC Hydro’s Representative in accordance with the Consent Procedure, and any subsequent amendments or updates to the Safe Design Plan to which there is no objection by BC Hydro’s Representative in accordance with the Review Procedure.

4.4.4 Safe Design Procedures

In accordance with the Safe Design Plan and Good Utility Practice, Project Co shall, on a continuing basis throughout the design development process:

A. Hazard Identification

- (a) consider, in a structured, thorough and systematic manner, all Hazards and potential Hazards associated with, or arising from, the design of the Facility or from the performance of the Project Work;

B. Analysis and Evaluation

- (a) analyze and evaluate the Risk, likelihood of occurrence and range of potential consequences associated with each identified Hazard and potential Hazard using a combination of qualitative, quantitative and reactive techniques and tools;
- (b) apply consistent and conservative analytical techniques and tools to the analysis and evaluation of identified Hazards and potential Hazards;
- (c) during each Interim Design review meeting, and as required by the Construction Period Joint Committee, consult with designated BC Hydro Persons regarding the identification, analysis and evaluation of Hazards and potential Hazards, the application of safe design and human factors principles to the design of the Facility, available Control Measures and Treatment options;
- (d) ensure that knowledgeable Project Co Persons are present at, and participate in, all Hazard review meetings;
- (e) consider and incorporate safe design input and feedback received from the designated BC Hydro Persons into the ongoing development of the design of the Facility;

C. Documentation

- (a) document each identified Hazard and potential Hazard in a written hazard log, in a form acceptable to BC Hydro's Representative acting reasonably (the "**Hazard Log**");
- (b) within 120 days after the Effective Date, Project Co shall prepare and submit an initial Hazard Log, derived from the preliminary hazard log submitted in the Proposal Extracts, to BC Hydro's Representative in accordance with the Review Procedure;
- (c) at least 10 days prior to each Interim Design review meeting, and concurrently with submission of each Final Design, Project Co shall resubmit the Hazard Log, updated to reflect the then current status of the design of the Facility;
- (d) the Hazard Log shall include the following information:

- (i) a description of the nature and type of each identified Hazard and potential Hazard;
- (ii) details of the location or locations of each Hazard or potential Hazard, including details of the room, area or space in which the Hazard or potential Hazard may arise and all equipment, design features and systems which may cause or contribute to the Hazard or potential Hazard;
- (iii) details of the applicable hazard sequence(s), including details of the applicable events, causes, and range of potential consequences associated with each identified Hazard and potential Hazard;
- (iv) details of all existing Control Measures to Treat each Hazard or potential Hazard;
- (v) an assessment of the Risk, likelihood of occurrence and range of potential consequences associated with each identified Hazard and potential Hazard, including details of any associated health, safety or environmental impacts;
- (vi) details of all Control Measures available to eliminate each Hazard or potential Hazard, or to reduce the Risk associated with the Hazard or potential Hazard to a level which is as low as reasonably possible. For each available Control Measure, provide details of:
 - (A) each Residual Hazard and Residual Risk, if any, after implementation of the Control Measure;
 - (B) any new Hazards or potential Hazards resulting from the implementation of the Control Measure;
 - (C) an overview of the use history of the Control Measure in similar applications; and
 - (D) Project Co's assessment of whether implementation of such Control Measure: (I) is required to be implemented pursuant to the Project Requirements or Good Utility Practice; or (II) would provide additional protection or risk mitigation beyond that required pursuant to subparagraph (I);
- (vii) for each Control Measure described in Section 4.4.4C.(d)(vi)(D)(II) *[Documentation]* of this Schedule, details of:
 - (A) the cost (calculated in accordance with Section 1.11(a)(2) *[Valuation of and Payment for Changes]* of Schedule 14 *[Changes]*) and schedule impact, if any, associated with its implementation; and

- (B) the date(s), if any, by which a decision by BC Hydro must be made, with respect to its implementation;

D. Treatment

- (a) Treat each Hazard and potential Hazard by:
 - (i) implementing those Control Measures required pursuant to the Project Requirements and Good Utility Practice; and
 - (ii) any additional Control Measures which have been confirmed in a Development Change Record Confirmation, Change Certificate or Change Directive;

E. Monitor

- (a) at all times during the performance of the Project Work, Project Co shall continue to consider, identify, analyze, evaluate, document and Treat Hazards and potential Hazards associated with, or arising from, the design of the Facility or from the performance of the Project Work;
- (b) within 10 days after each anniversary of the Service Commencement Date, Project Co shall prepare and submit the following to BC Hydro's Representative in accordance with the Review Procedure:
 - (i) an updated Hazard Log including details of any new Hazards or potential Hazards encountered or identified including, for each such Hazard or potential Hazard, all information required pursuant to Section 4.4.4C.(d) [Documentation] of this Schedule; and
 - (ii) an assessment of the effectiveness of each implemented Control Measure; and
 - (iii) details of any modified or additional Control Measures then available to further Treat each Hazard or potential Hazard.

4.4.5 Safe Design Report

Not later than 30 days prior to the Target Service Commencement Date, Project Co shall prepare and submit a detailed report with respect to the integration of safe design and human factors principles into the design of the Facility and the implementation of the Safe Design Plan to BC Hydro's Representative in accordance with the Review Procedure (the "**Safe Design Report**"). The Safe Design Report shall include:

- (a) the Hazard Log, updated to include all Final Design Submittals;
- (b) details of all Control Measures described in Section 4.4.4C.(d)(vi) [Documentation] of this Schedule, which:

- (i) were implemented in accordance with Section 4.4.4D.(a) *[Treatment]* of this Schedule; and
- (ii) which were not implemented in accordance with Section 4.4.4D.(a) *[Treatment]* of this Schedule, but which remain capable of implementation.

4.5 Confined Spaces

All “Confined Spaces”, as defined in Part 9 of the *Occupational Health and Safety Regulation* (British Columbia), shall comply with the applicable requirements of Schedule 6 *[Design and Construction Specifications]*, the Safety Minimum Requirements, the Safety Regulations, BC Hydro’s OSH standards and all applicable WorkSafe BC requirements. Without limiting the preceding sentence, prior to making an application for a:

- (a) Certificate of Service Commencement, Project Co shall prepare and submit valid SDI Certificates, in the forms attached as Appendix 5B *[Confined Space and SDI Certificates]*, sealed by a Professional Engineer for each confined space and device that is protected by a single isolation device, excluding any confined spaces in the Bypass System that are located downstream of the Bypass System isolation valves; and
- (b) Certificate of Bypass System Completion, Project Co shall prepare and submit valid SDI Certificates, in the forms attached as Appendix 5B *[Confined Space and SDI Certificates]*, sealed by a Professional Engineer for each confined space and device in the Bypass System that is protected by a single isolation device.

5. DESIGN, CERTIFICATION, AND SUBMISSION PROCEDURES

5.1 General Design Considerations

In addition to the other requirements of this Agreement, Project Co shall undertake and perform the Design Work so that the design of the Facility:

- (a) is undertaken by a Design Team exercising such degree of care, skill and diligence as would reasonably be expected from consultants qualified to perform services similar in scope, nature and complexity to the Design Work, as of the Effective Date, and Project Co shall appoint a Design Team that:
 - (i) is so qualified;
 - (ii) includes (as required by applicable Law or Good Utility Practice) licensed or registered Professional Engineers and architects;
 - (iii) has sufficient expertise and experience to expeditiously and efficiently perform all of the Design Work in a proper and professional manner to the standard set out in this Agreement; and

- (iv) includes registered structural engineers, licensed to practice in the Province of British Columbia;
- (b) includes specific consideration of safety, constructability, maintainability and life cycle cost issues at all stages of design development process, as appropriate; and
- (c) includes consideration of safe, efficient and cost-effective operation and maintenance of the Facility.

5.2 Design and Certification Procedure

- (a) Throughout the Term, Project Co shall implement and enforce the design development, certification, submission and implementation procedures set out in: (i) this Schedule 5 [*Design and Construction Protocols*] (the “**Design and Certification Procedure**”); and (ii) the Design Management Plan, and any subsequent amendments or updates thereto, which have been accepted by BC Hydro’s Representative in accordance with the Consent Procedure.
- (b) The Design and Certification Procedure shall apply to all Design Data prepared or adopted in connection with the Construction and any other construction activities taking place during the Term, including any further design development or changes to a design once a Technical Appraisal Form has been subjected to the Review Procedure.
- (c) Project Co shall ensure that all certification procedures referred to in the Design Management Plan and the Design and Certification Procedure are complied with by the appropriate persons referred to therein, including the members of the Design Team, the Designer and any independent team or engineer within the Designer, as the case may be (together, the “**Appropriate Persons**”), and that all Appropriate Persons are at all relevant times duly authorized and qualified to carry out such procedures and to sign the relevant certificates. Any failure by any Appropriate Person to fulfill the obligations required of them under the Design Management Plan and the Design and Certification Procedure shall be a breach of Project Co’s obligations under this Agreement.

5.3 Design and Certification Procedure in Emergency

In the case of an emergency, Project Co may proceed with such measures as are immediately necessary for the protection of persons and/or property prior to complying with the applicable provisions of the Design and Certification Procedure, provided that Project Co shall comply with the provisions of the Design and Certification Procedure otherwise applicable to those measures as soon as reasonably possible under the circumstances.

5.4 No Limitation

A requirement for certification or for any check or review pursuant to, and for purposes of, this Schedule is in addition to, and does not in any way limit, qualify, replace or relieve Project Co from, the obligation to comply with any other certification, check or review requirement provided elsewhere in this Agreement or

in any of the Project Requirements, or pursuant to any applicable Laws, professional standards or practices.

5.5 Design Management Plan

5.5.1 Submission of Design Management Plan

Within 60 days following the Effective Date, Project Co shall submit a Design Management Plan to BC Hydro's Representative in accordance with the Consent Procedure. The Design Management Plan shall include:

- (a) an organization chart for all Design activities;
- (b) the procedures to be used for designing and checking, including interdisciplinary review and interface review with other design elements, environmental obligations, the Basis of Design Report, the Design Basis Memoranda, each of the designs and the form of review to be undertaken by the Service Provider, the Quality Manager and the Environmental Director;
- (c) the identification of the proposed Checking Team(s);
- (d) the identification of the proposed reliability engineer(s) who will prepare the reliability assessments and mitigation plans required pursuant to Section 4.2 [*Reliability Assessment*] of this Schedule. Each proposed reliability engineer shall have a minimum of 10 years experience with the formal reliability techniques required pursuant to IEC 60812 and IEC61078;
- (e) details of the integration of the following into the design development process:
 - (i) mitigation of risks and vulnerabilities identified in the Threat and Risk Assessment;
 - (ii) elimination of deficiencies and mitigation of risks identified through the reliability assessments;
 - (iii) planned inclusion and involvement of the reliability engineer(s) throughout all stages of the design development process;
 - (iv) requirements for development of, and compliance with, Interim Dam Safety Risk Management Plans;
 - (v) the Safe Design Plan;
 - (vi) the applicable Project Requirements, including the requirements of Schedule 8 [*Environmental Obligations*]; and

- (vii) planned inclusion and involvement of the Quality Manager and the Environmental Director throughout all stages of the design development process;
- (f) principles to be used to guide performance of each of reliability assessment;
- (g) the content, format and timing of each reliability assessment;
- (h) principles to be used to prepare the Basis of Design Report and Design Basis Memoranda, including:
 - (i) the content and format of the Basis of Design Report; and
 - (ii) the content and format of the Design Basis Memoranda;
- (i) details of the timing, development, review and verification of models and mock-ups;
- (j) the contents and format of each Interim Design and Final Design submission;
- (k) a detailed design review and audit schedule, indicating the dates that Project Co plans to:
 - (i) conduct internal audits of the design verification process;
 - (ii) submit each Interim Design and Final Design;
 - (iii) undertake review meetings in accordance with Section 5.15 [*Review Meetings and Minutes*] of this Schedule; and
 - (iv) verify implementation of design of the Facility during Construction, including during Commissioning and throughout performance of the Decommissioning Work;
- (l) a drawing tree indicating the organization and hierarchy of all Design Drawings;
- (m) the proposed hydrojacking test schedule and detailed testing procedures, including the proposed method of interpreting the hydrojacking test results;
- (n) details of the plans for implementing, and verifying the implementation of, the design throughout the Construction.
- (o) the procedures to be used to ensure compliance with the APEGBC Quality Management Guidelines;
- (p) details of the plan and procedures for the identification of all Project Intellectual Property, including Third Party Technology, and for the execution of agreements (including confirmatory agreements) regarding the Project Intellectual Property and related IP Rights required under this Agreement or otherwise requested by BC Hydro, including

transfers or assignments to BC Hydro of Project Co's rights and licenses to use Project Intellectual Property and related IP Rights;

- (q) details of the plan for implementing, and verifying the implementation of, the design through performance of inspections, tests, pre-commissioning and commissioning activities and for collecting sufficient quantitative data with respect to the Facility and each piece of equipment, component, system and sub-system, to establish a baseline for comparing performance, determining deterioration over the applicable Design Service Life and assessing the sufficiency and performance of the Asset Management Plan;
- (r) appropriate metrics to measure the progress of the Design activities for each discipline; and
- (s) a detailed design submittal schedule (the "**Submittal Schedule**") which shall:
 - (i) provide for a progressive and orderly flow of Design Data, reliability assessments and other Submittals from Project Co to BC Hydro as appropriate to allow sufficient time for consideration of each Submittal by BC Hydro's Representative, taking into account the volume and complexity of the Submittals and the resources necessary to be available to BC Hydro to consider such Submittals;
 - (ii) allow adequate time prior to performance of the applicable Design and Construction that is the subject of the applicable Submittal, for review of the Submittal, including all Design Data and reliability assessments, by BC Hydro's Representative and for Project Co to make changes to the Submittals as may be required to account for any comments received from BC Hydro's Representative;
 - (iii) show the scheduled submission date for each Submittal; and
 - (iv) include a drawing register showing all proposed Design Drawings.

Any subsequent amendments or updates to the Design Management Plan shall be submitted to BC Hydro's Representative in accordance with the Consent Procedure.

5.5.2 Compliance with Design Management Plan

Project Co shall implement and comply with the Design Management Plan, and any amendments or updates, which have been accepted by BC Hydro's Representative in accordance with the Consent Procedure, in connection with all Design Data prepared or adopted in connection with the design of the Facility, the Construction and any other construction activities.

5.5.3 Submittal Schedule Updates

On or before the last day of each month, up to and including, the Total Completion Date, Project Co shall submit an updated Submittal Schedule to BC Hydro's Representative for information only. Each updated version of the Submittal Schedule shall:

- (a) Comply with the requirements of Sections 5.5.1(s)(i), 5.5.1(s)(ii), 5.5.1(s)(iii) and 5.5.1(s)(iv) [*Submission of Design Management Plan*] of this Schedule;
- (b) show the current status of all design Submittals, including scheduled submission date, actual submission date, status of BC Hydro response, revision number of the Submittal (for use on resubmittals), and resubmittal schedule dates, where applicable; and
- (c) include a drawing register showing all known submitted and proposed Design Drawings including, drawing number, title, certifying engineer, revision number, issued date, and status.

Project Co shall bear the risk of delays and additional costs caused as a result of the late submission of any Design or Construction activity package to BC Hydro's Representative and by Design or Construction activity packages which are rejected or required to be corrected and resubmitted in accordance with the terms of this Schedule.

5.6 Basis of Design Report

Within 90 days after the Effective Date, Project Co shall submit to BC Hydro in accordance with the Review Procedure a basis of design report (the "***Basis of Design Report***"), which shall include:

- (a) a narrative describing Project Co's plan to ensure compliance with the Project Requirements, including a description of the design computations, design inputs and their sources, proposed design methods, reliability assessment methods, techniques and software as well as a list of all references to be used for design of all major components of the Facility;
- (b) an outline of each Design Basis Memoranda to be prepared pursuant to Section 5.7 [*Design Basis Memoranda*] of this Schedule;
- (c) a summary of the tests, studies, and investigations planned to be carried out in connection with the Design and Construction;
- (d) general arrangement and principal outline drawings (plans, profiles and sections) showing the Facility layout as well as principal drawings and schematic-line diagrams for all mechanical and electrical systems;
- (e) a description of Project Co's plan to ensure each of the Performance Guarantees is achieved;
- (f) a description and block diagram of the protection and control logic for the Generating Units, the Turbine Inlet Valves, the Power Intake Operating Gate, the Hydraulic Transient Management System and the Bypass System;

- (g) interim reliability assessments for the Power Intake Operating Gate, Power Tunnel dewatering system, Turbine Inlet Valves, Hydraulic Transient Management System, Bypass System, Generation Systems and for the Facility as a whole; and
- (h) a title page identifying the certifying Professional Engineer and the “Checker” (as defined by APEGBC) for the Basis of Design Report.

5.7 Design Basis Memoranda

Project Co shall prepare and submit to BC Hydro, together with each Final Design and Construction activity package, a detailed and comprehensive memorandum describing the design basis for the part of the Facility covered by the applicable Final Design (each, a “**Design Basis Memorandum**” or “**DBM**”). Each DBM shall include:

- (a) a title page certifying that the applicable Final Design has been reviewed by a principal of the Designer for integration with the overall design of the Facility and compliance with the Basis of Design Report. The title page shall also identify the certifying Professional Engineer and the “*Checker*” (as defined by APEGBC) for the design basis;
- (b) a description of the scope of the Final Design package, including a description of the design objectives and a list of all Design Data forming part of, or required for interpretation of, the Final Design package;
- (c) all applicable design inputs, including their sources, assumptions (if any), requirements (e.g. statutory, environmental, regulatory, functional or performance requirements), references materials and related Design Data;
- (d) design criteria and parameters;
- (e) live loads, dead loads and all combinations thereof considered in the applicable design, including hydraulic, flood, thermal, wind and seismic loads;
- (f) material properties including strength, allowable stresses, capacity reduction factors and other relevant parameters;
- (g) proposed procedures for demonstrating compliance with the Project Requirements including: (i) method of analysis; (ii) techniques; (iii) design/analysis software; and (iv) special formulae;
- (h) calculation checking procedures, including details of the level and type of calculation checking performed;
- (i) protective coatings, as applicable;

- (j) Commissioning requirements and criteria, including details of the quantitative data to be collected with respect to the Facility and each piece of equipment, component, system and sub-system, and the applicable acceptance criteria;
- (k) other criteria for foreseeable events and/or circumstances considered in the relevant design;
- (l) load flow, short circuit, transient stability and transient voltage calculations;
- (m) computations and analyses required to substantiate the validity of the proposed design, including preliminary stability, hydraulic, and other general preliminary computations;
- (n) Construction planning considerations, including:
 - (i) Site-use plans during the applicable stages of the Construction, including locations of active and completed Construction, roads (permanent and temporary), offices, parking, laydown areas, Temporary Works and stockpiles;
 - (ii) a description of methods and principal equipment to be used for each major Construction activity;
 - (iii) plans for protection of the ongoing operation and maintenance of the Existing Facility; and
 - (iv) plans for disposal of spoil material;
- (o) plans for procuring the applicable major equipment, components, systems and sub-systems and long-lead items;
- (p) reference drawings, including arrangement drawings, block diagrams, flow diagrams and other drawings; and
- (q) details of all applicable codes and standards.

5.8 Technical Appraisal Forms (TAF)

5.8.1 TAF Submission Requirements

- (a) Each Final Design and Construction activity package submitted by Project Co in accordance with this Section 5 [*Design, Certification, and Submission Procedures*] shall be accompanied by a completed TAF.
- (b) In any case where submitted Design Data involves multiple technical disciplines, Project Co shall submit to BC Hydro's Representative in accordance with the Review Procedure a separate TAF in respect of the data and functions covered by each different technical

discipline. The technical disciplines shall be split into electrical, protection and control, mechanical, civil-structural, civil-hyrotechnical and civil-geotechnical, at a minimum.

- (c) In any case where the Project Work involves the complete or partial demolition of an existing structure, Project Co shall submit to BC Hydro's Representative in accordance with the Review Procedure a TAF in respect of such complete or partial demolition.

5.8.2 TAF Form and Content

Each TAF submitted by Project Co pursuant to Section 5.8 [*Technical Appraisal Forms*] of this Schedule shall be in the format shown in Appendix 5C [*Sample Contents for a TAF*] to this Schedule and shall:

- (a) for Final Design submissions, include the relevant design criteria, environmental and ground considerations, and interface requirements, together with a listing of the design documentation included in the design package accompanying the Design Certificate;
- (b) for Construction activity submissions, provide the relevant Construction Certificate for such Construction activity; and
- (c) be signed by:
 - (i) Project Co's Representative; and
 - (ii) the Designer and the Design-BUILDER, or their respective principal(s), as necessary.

5.9 Variation to a Basis of Design Report, Design Basis Memorandum or Technical Appraisal Form

Any variation to the Basis of Design Report, a DBM or a TAF, which has been subject to the Review Procedure, shall be submitted in accordance with the Review Procedure as an addendum to the Basis of Design Report or the applicable DBM or TAF.

5.10 Design Certification

5.10.1 Design Certificates

Project Co shall issue a Design Certificate together with each Final Design package. All Design Certificates shall be:

- (a) on the applicable design certificate form attached hereto as Appendix 5D [*Design Certificate Forms*]; and
- (b) be signed and sealed by the responsible engineer, who shall be a Professional Engineer and a principal of the Designer (provided that for custom-manufactured equipment designed outside British Columbia, the applicable Design Certificate shall be signed and

sealed by the applicable designer and countersigned and sealed by a Professional Engineer and a principal of the Designer), and by Project Co's Representative (or, in the case only of Design Certificates for environmental works (including mitigation, compensation and other works undertaken to comply with Schedule 8 [*Environmental Obligations*]) incorporated in the Project Work, the Environmental Director).

All parties that sign Design Certificates shall clearly print their name and position held in their organization.

5.10.2 Submission of Design Certificates

All Design Certificates together with the supporting documentation shall be submitted to BC Hydro's Representative in accordance with the Review Procedure with original signatures, seals and registration numbers and in such form as to allow BC Hydro's Representative to perform its function in respect of such Design Certificate without delay.

5.11 Format of Design Submissions

- (a) Project Co shall provide one hard copy, one PDF and one AutoCAD copy of each Interim Design, Final Design and As Built Drawing submission.
- (b) All Design Data shall be organized in design folders with indexes and sectional dividers.
- (c) Design Data and Design Drawings shall comply with the "*BC Hydro Generation Engineering AutoCAD Drafting Standards and Conventions*", included in the Disclosed Data, as modified by Appendix 5E [*Project Specific Drawing Standards*]. All drawing conventions and standards, including AutoCAD standards, title block, drawing numbers and stationing convention shall be acceptable to BC Hydro's Representative acting reasonably, and shall be confirmed with BC Hydro's Representative prior to commencement of Design Drawing production.
- (d) The first version of each Design Drawing included in a Final Design submission shall be marked "Revision 0", each subsequent version of such Design Drawing, including As Built Drawings, shall be submitted to BC Hydro's Representative and shall be marked with the next sequential revision number.

5.12 Preparation of Design Data

All Design Data shall be prepared under the supervision of the Designer. Prior to the submission of any Design Data to BC Hydro's Representative, the Designer and the relevant Checking Team, where applicable, shall satisfy themselves that the Design Data meets all Project Requirements and otherwise complies with the requirements of this Agreement.

5.13 Models and Mock-Ups

Project Co shall, at its cost, provide "models" and "mock-ups" as follows:

- (a) **Facility Model** – on or before the date shown in the Submittal Schedule for the applicable Interim Design reviews, Project Co shall prepare and submit a 3D BIM model prepared in accordance with Appendix 5E *[Project Specific Drawing Standards]*, showing the relevant parts of the Facility in sufficient detail so that BC Hydro can observe the interaction and integration of the various parts of the Facility and the effects of the design of the Facility on the performance of operation, maintenance, inspection and repair activities. The applicable BIM models will be updated and resubmitted along with each Final Design package. A fully integrated BIM model of the complete Facility shall be submitted on an as-built basis prior to submission of the application for: (i) the Certificate of Service Commencement; and (ii) the Certificate of Total Completion.
- (b) **Turbine Model** – Project Co shall prepare the Turbine Model in accordance with the requirements of Section 4.1 *[Turbine Hydraulic Design and Model Tests]* of Schedule 6 *[Design and Construction Specifications]*;
- (c) **Control Panel Wiring Mock-Up** – not less than 60 days prior to manufacture of any control, protection or alarm panel, Project Co shall provide a complete set of the applicable wiring diagrams, a panel layout diagram and a fully constructed mock-up of the unit control panel for a Generating Unit, or another panel of similar complexity acceptable to BC Hydro's Representative, acting reasonably. The wiring diagrams, panel layout diagram and the mock-up shall include all wiring and panel components so that BC Hydro can observe the implementation of the applicable Project Requirements;
- (d) **Intake Hydraulic Model** – on or before the date shown in the Submittal Schedule for the applicable Interim Design reviews, Project Co shall prepare and submit a 3D computational fluid dynamics (CFD) computer model or a fully constructed physical model in accordance with the requirements of Section 3.4 *[Hydraulic Design and Transient Management System]* of Schedule 6 *[Design and Construction Specifications]*;
- (e) **Tailrace(s) and First Island Hydraulic Model** – on or before the date shown in the Submittal Schedule for the applicable Interim Design reviews, Project Co shall prepare and submit a 3D computational fluid dynamics (CFD) computer model or a fully constructed physical scale model including all discharges from the Facility that enter into the lower Campbell River with sufficient detail so that BC Hydro can observe the ability of the Powerhouse, Bypass System and HTMS discharge outlets, Tailrace(s), and any downstream energy dissipation structures to satisfy the applicable Project Requirements, including: (i) the effects of the energy dissipation in the device Tailrace(s) and in the natural downstream channel; (ii) the effects of the device discharges on environmental and public safety in the river; and (iii) the flow split around First Island, all in accordance with the requirements of Section 3.4 *[Hydraulic Design and Transient Management System]*, Section 4.2 *[Turbine]*, and Section 5.1 *[Non-Power Flow Systems]* of Schedule 6 *[Design and Construction Specifications]*;
- (f) **TIV Hydraulic Model** – on or before the date shown in the Submittal Schedule for the applicable Final Design packages, Project Co shall prepare and submit a 3D computer

model of the Turbine Inlet Valves with sufficient detail so that BC Hydro can observe the ability of the TIV to close under full design flow in accordance with Section 5.2-3.2 *[Emergency Closing]* of Schedule 6 *[Design and Construction Specifications]*; and

- (g) **INOG Hydraulic Model** – on or before the date shown in the Submittal Schedule for the applicable Final Design packages, Project Co shall prepare and submit a fully constructed physical model of the Power Intake Operating Gate with sufficient detail so that BC Hydro can observe the ability of the INOG to close under full design flow in accordance with Section 5.3-6.1 *[Power Intake Operating Gate]* of Schedule 6 *[Design and Construction Specifications]*.

5.14 Interim Design Reviews

- (a) At a minimum, Project Co shall submit to BC Hydro's Representative Interim Designs, including supporting information, for: (i) each major piece of equipment, component, system and sub-system of the Facility, including the Powerhouse, Power Intake, Power Tunnel (including the proposed layout of hydrojacking test holes), Water Conveyances, Bypass System and Hydraulic Transient Management System; (ii) any work requiring an IDSRMP, including any modifications to the Dams or Spillway; (iii) all modifications to the Substation; (iv) all major Temporary Works, including cofferdams and similar water retaining structures; (v) the Existing Intake plugs; and (vi) each major component of the Decommissioning Work, including rehabilitation, revegetation and landscaping of the Site.
- (b) Interim Design submissions shall be informal and shall not be reviewed according to the provisions of Schedule 2 *[Review Procedure, Consent Procedure and Other Submittals]*. Rather, such informal Interim Design submissions shall be used to inform BC Hydro's Representative of the development of the design and to provide an opportunity for a dialogue on compliance with the Project Requirements before the applicable design is complete.
- (c) The content of such Interim Design submissions shall be appropriate to the subject and discipline. The information provided shall be adequate to show that the design is proceeding in compliance with the Project Requirements and is taking into consideration the relevant Construction activities, the BC Hydro Activities, including the continuing operation of the Existing Facility, the Services and the applicable Legal Obligations.
- (d) In accordance with this Design and Certification Procedure, Project Co and BC Hydro's Representative shall agree on the design information to be submitted for review in each Interim Design submission, the schedule of such Interim Design submissions, and the scope of each review.

5.15 Review Meetings and Minutes

- (a) Project Co shall organize Interim Design and other review meetings with BC Hydro's Representative for the purpose of the applicable Interim Designs and other Design Data in accordance with the Design Management Plan. The meetings shall be convened in the greater Vancouver, BC, area unless otherwise agreed.
- (b) Project Co shall prepare minutes of such review meetings, including recording BC Hydro's comments, and promptly address the comments to the satisfaction of BC Hydro's Representative. Copies of the minutes shall be provided to BC Hydro's Representative within 5 Business Days following the review meeting.
- (c) For greater certainty, the minutes of such review meetings, including any BC Hydro comments included and addressed therein, shall not be considered for the purposes of this Agreement as either Changes or Innovation Proposals.

5.16 Independent Checking

[REDACTED]

[REDACTED]
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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

5.17 Final Designs

5.17.1 Final Design Submission Report

At least 30 days prior to the date specified in the Submittal Schedule for submission of the applicable Final Design, Project Co shall prepare and submit to BC Hydro's Representative a draft TAF for the applicable Final Design submission (each, a "***Final Design Submission Report***").

5.17.2 Final Design Review

Final Designs from all design disciplines shall be submitted to BC Hydro's Representative in accordance with the Review Procedure and each Final Design submission shall, at a minimum:

- (a) comply with the applicable Final Design Submission Report to which BC Hydro's Representative has no objection in accordance with the Review Procedure;
- (b) include the applicable DBM in accordance with Section 5.7 [*Design Basis Memoranda*] of this Schedule, all required TAFs in accordance with Section 5.8 [*Technical Appraisal Forms (TAF)*] of this Schedule, Design Certificates in accordance with Section 5.10 [*Design Certification*] and 5.16.3 [*Elements Requiring an Independent Check*] of this Schedule, and such other information as required to demonstrate the integration of the applicable Final Design with the overall design of the Facility, including details of all relevant interdependencies with other Final Design packages;
- (c) include all pertinent Design Data, including Design Drawings, design calculations and backup information, including copies of all approvals and design reports sufficient to demonstrate conformance with the Project Requirements, including the applicable information specified in Appendix 5H [*Specific Design Submittals*];
- (d) include all reports applicable to the relevant Final Design or otherwise required to demonstrate compliance with the applicable Project Requirements, including geotechnical reports, performance reports and hydraulic reports;
- (e) include all models and studies applicable to the relevant Final Design, or otherwise required to demonstrate compliance with the applicable Project Requirements;
- (f) include all Design Data required pursuant to Appendix 5G [*Interconnection Submittal Requirements*], to the fullest extent practicable;
- (g) include all plans and procedures applicable to implementation of the relevant Final Design, including environmental mitigation/compensation plans;
- (h) demonstrate, through comprehensive geotechnical and structural analyses and designs, that the performance requirements and tolerances of the Facility, and each component thereof, will be met over the applicable Design Service Life;
- (i) include details of maintenance considerations incorporated into the applicable Final Design;
- (j) include descriptions of aesthetic treatments, where applicable;
- (k) address any comments of BC Hydro's Representative from, and issues identified during, the Interim Design reviews and any other comments and issues resulting from internal design reviews, quality control procedures and Checking Team reviews;
- (l) include a complete register of all Project Intellectual Property, including Third Party Technology, incorporated, embedded or otherwise included in or with, or required for the use of, the applicable Final Design, and copies of all agreements (including confirmatory agreements) regarding the Project Intellectual Property and related IP Rights required

under this Agreement or otherwise requested by BC Hydro, including transfers or assignments to BC Hydro of Project Co's rights and licenses to use Project Intellectual Property and related IP Rights;

- (m) contain all pertinent correspondence, arranged by subject matter in chronological order; and
- (n) include a neat, bound and indexed set of design calculations initialled by the responsible engineer, who shall be a duly experienced Professional Engineer of an appropriate discipline.

5.18 Objection to Final Design

If BC Hydro's Representative objects to a Final Design package, including any of the Design Data, in accordance with the Review Procedure, BC Hydro's Representative shall so notify Project Co and Project Co shall, unless Project Co disputes the objection by BC Hydro's Representative to such Final Design in accordance with the Dispute Resolution Procedure, either:

- (a) cause to be made such alterations and additions as may be necessary such that the Final Design accords with the Project Requirements and all other requirements of this Agreement, all in accordance with the Review Procedure; or
- (b) subject to the other provisions of this Agreement, submit an Innovation Proposal.

5.19 Adherence to Final Design

Final Designs, including all Design Data, which have been the subject of a Design Certificate that has been submitted to BC Hydro's Representative in accordance with the Design Management Plan and the Design and Certification Procedure shall not be departed from otherwise than in accordance with Schedule 14 *[Changes]* of this Agreement.

5.20 No Construction

Project Co shall not commence or permit the commencement of the applicable portion of the Construction (including any Temporary Works) or any other construction activities unless and until Project Co has:

- (a) satisfied the applicable conditions precedent, as set out in this Agreement, including Schedule 8 *[Environmental Obligations]* and Schedule 24 *[First Nations]*; and
- (b) submitted all Final Designs, including all Design Data and relevant certificates, required in respect of the relevant part of the Design and Construction or other construction activities, to which BC Hydro has no objection in accordance with the Review Procedure; and
- (c) fulfilled any other applicable requirements in respect of the relevant part of the Design and Construction or other construction activities.

5.21 Designer Review during Construction

During Construction, Project Co shall ensure that the Designer, in accordance with the procedures set out in the Design Management Plan and the relevant Quality Documentation and other Project Requirements, examines the same and satisfies itself that such Project Work and every part thereof has been designed, fabricated, constructed, completed, commissioned, tested and maintained in all respects so as to accord with:

- (a) Design Data in respect of which Design Certificates have been issued and to which there has been no objection in accordance with the Review Procedure; and
- (b) all applicable Project Requirements,

and otherwise to comply in all respects with the requirements of this Agreement.

5.22 Temporary Works

- (a) As a minimum, design submissions for Temporary Works shall include those items intended for public use, which potentially affect public safety or which potentially affect the safety, stability or reliability of the Dams or the Existing Facility. Final Designs for these Temporary Works shall be submitted to BC Hydro's Representative in accordance with the Review Procedure.
- (b) Without limiting Section 5.16 [*Independent Checking*] of this Schedule, Design Data relating to any Temporary Works that is prepared by or on behalf of the Design-Builder requires an independent check by the Designer.
- (c) In performing a check referred to in Section 5.22(b) [*Temporary Works*] of this Schedule, the Designer shall satisfy itself that:
 - (i) the Design Data meets the Project Requirements and otherwise complies with the requirements of this Agreement;
 - (ii) the Temporary Works (as a whole and the constituent parts) are satisfactory for the safe and proper discharge of Project Co's relevant obligations; and
 - (iii) the Design Data reflects the requirements of the relevant Governmental Authorities.

6. LEAVES TO COMMENCE

6.1 General

- (a) Water Licences, pursuant to the *Water Act* (British Columbia), have been issued for the Existing Facility and will be amended so as to permit the construction and operation of the Facility (collectively, the "**Water Licence**").

- (b) The terms of the Water Licence require that a number of formal Leaves to Commence Construction and formal Leave(s) to Commence Operation be obtained from the Comptroller of Water Rights;
- (c) Applications for Leaves to Commence will be submitted by Project Co in accordance with: (i) the requirements of the Water Licence; (ii) the procedures and restrictions specified in this Schedule 5 [*Design and Construction Protocols*], including this Section 6 [*Leaves to Commence*]; and (iii) the requirements of, and directions provided by, the Independent Engineer and the Comptroller of Water Rights.
- (d) BC Hydro has retained the Independent Engineer. The role and responsibilities of the Independent Engineer are described in the Water Licence.
- (d2) BC Hydro has retained the Independent Environmental Monitor. The role and responsibilities of the Independent Environmental Monitor are described in the Water Licence.
- (e) Project Co shall cooperate with BC Hydro, the Independent Engineer, the Independent Environmental Monitor and the Comptroller of Water Rights and shall provide all information, including Design Data, Design Drawings, design criteria, calculations, descriptions, environmental work plans, monitoring reports, schedules and other information, as required or requested by BC Hydro, the Independent Engineer, the Independent Environmental Monitor or the Comptroller of Water Rights for them to perform their obligations under the Water Licence.
- (f) Personnel from Governmental Authorities may visit the Site from time to time to review the progress of the Project Work. Project Co shall meet with such Persons to discuss the progress of the Project Work and any issues arising from such Site visits, provided that Project Co shall ensure that no Project Co Persons meet, or have discussions, with such representatives of the Governmental Authorities except in the presence of designated BC Hydro Persons.
- (g) Performance of the Project Work at Site may be monitored by the Independent Engineer and the Independent Environmental Monitor.
- (h) Nothing in this Schedule 5 [*Design and Construction Protocols*] shall relieve Project Co of its obligation to: (i) prepare applications for and to obtain those Permits that are specified in this Agreement to be obtained by Project Co, or that may be required to be obtained by Project Co in accordance with applicable Laws, prior to commencing the part of the Project Work covered by such Permits; (ii) comply with Section 3.5 [*Permits for the Design and Construction*] of this Schedule; or (iii) to comply with the terms and conditions of any Permits required for the Project.

6.2 Leaves to Commence Construction

- (a) The scope and staging of the Leaves to Commence Construction will be determined by the Comptroller of Water Rights. Without limiting the preceding sentence, it is expected that, as a minimum, separate Leaves to Commence Construction will be required for each of the following:
 - (i) commencement of Construction of the Power Intake cofferdam;
 - (ii) commencement of Construction of the penetration of the Main Dam for the Power Intake;
 - (iii) prior to flooding of the area between the Power Intake Maintenance Gate and the Power Intake cofferdam and subsequent to removal of the Power Intake Cofferdam; and
 - (iv) prior to water-up of the Water Conveyances from the Power Intake Maintenance Gate to the Turbine Inlet Valve (tunnel first filling).
- (b) The Leaves to Commence Construction may be subdivided into smaller components or authorizations if required by the Comptroller of Water Rights, or with the prior written consent of the Comptroller of Water Rights, if requested by Project Co.
- (c) No Construction shall proceed on any component of the Facility for which a Leave to Commence Construction is required until after the applicable Leave to Commence Construction has been issued by the Comptroller of Water Rights, or applicable authorization has been received from the Independent Engineer.
- (d) Project Co shall not submit an application for a Leave to Commence Construction until such time as:
 - (i) BC Hydro has no objection to the applicable Design Data, or any other documents required in connection with the applicable Leave to Commence Construction application, pursuant to the Review Procedure;
 - (ii) all Permits required to be obtained by Project Co for the Project Work covered by the applicable Leave to Commence Construction have been obtained by Project Co and copies of those Permits have been submitted to BC Hydro;
 - (iii) BC Hydro has no objection to the environmental work plans relating to the Project Work covered by the applicable Leave to Commence Construction pursuant to the Review Procedure; and
 - (iv) all requirements of the EA, the Project Environmental Commitments and the Permits, relating to the commencement of Construction of the Project Work covered by the applicable Leave to Commence Construction, have been met.

Project Co shall concurrently submit each Leave to Commence Construction application to BC Hydro and to the Independent Engineer.

- (e) Once an application for a Leave to Commence Construction has been accepted by the Independent Engineer, BC Hydro shall then submit a formal application to the Comptroller of Water Rights on behalf of Project Co for the applicable Leave to Commence Construction. BC Hydro, acting reasonably, will provide such assistance with respect to the process for obtaining Leaves to Commence Construction as requested by the Independent Engineer or the Comptroller of Water Rights.
- (f) The Independent Engineer, Independent Environmental Monitor or the Comptroller of Water Rights may require additional information or meetings with Project Co as part of his review. All drawings, calculations, design criteria, design descriptions and other Submittals required by the Independent Engineer or Comptroller of Water Rights, shall be signed and sealed by the Designer. Project Co shall fully cooperate with the Independent Engineer and the Comptroller of Water Rights in all aspects of the review and application process for the Leaves to Commence Construction, including attending meetings with personnel from the office of the Comptroller of Water Rights and other Governmental Authorities. Project Co shall ensure that suitably qualified staff from the Designer attend all such meetings, such that Project Co and Designer are able to properly explain the documentation and support the application for a Leave to Commence Construction. At the discretion of the Comptroller of Water Rights, such meetings may be in Victoria, Vancouver, or on Site. Project Co shall provide BC Hydro with advance written notice of, and an opportunity to attend, all meetings related to a Leave to Commence Construction.
- (g) Project Co shall provide everything required by the Independent Engineer, Independent Environmental Monitor and the Comptroller of Water Rights to secure Leaves to Commence Construction. Without limiting the preceding sentence, information required as part of an application for a Leave to Commence Construction include, as applicable to the relevant Project Work:
 - (i) design criteria for the overall Project, with particular reference to the Dam Safety Guidelines of the Canadian Dam Association, Schedule 6 [*Design and Construction Specifications*] and the *British Columbia Dam Safety Regulation*;
 - (ii) Design Basis Memoranda covering all components of the Project Work affecting the safety or integrity of the Reservoir and Dams, including the Existing Intake;
 - (iii) design calculations and drawings for the stability of water retaining structures, including the Power Intake cofferdam. The Power Intake, and the Dams;
 - (iv) Interim Dam Safety Risk Management Plans addressing any risks that might arise from the alteration of the Dams;
 - (v) plan views and typical sections showing proposed Construction methods;

- (vi) results of modelling demonstrating the integrity of the Dams with the Power Intake cofferdam;
 - (vii) calculations demonstrating stability analysis of the Power Intake and modified Main Dam;
 - (viii) calculations demonstrating the continuing functionality of the drainage gallery;
 - (ix) Construction plan for flooding of the Water Conveyances and first filling of the Power Tunnel;
 - (x) documents demonstrating compliance with all applicable social and environmental commitments;
 - (xi) criteria for the design of the Power Intake, Water Conveyances, Hydraulic Transient Management System, Bypass System, Powerhouse and all flow discharge devices;
 - (xii) plans showing the general arrangement of the Power Intake, Water Conveyances, Hydraulic Transient Management System, Bypass System, Powerhouse and all flow discharge devices;
 - (xiii) schedules for the construction of the Power Intake, Water Conveyances, Hydraulic Transient Management System, Bypass System, Powerhouse and all flow discharge devices; and
 - (xiv) an environmental management plan for the management and mitigation of construction impacts.
- (h) Project Co shall comply with all conditions provided in the Leaves to Commence Construction.
- (i) Project Co shall allow sufficient time in the Works Schedule to obtain each required Leave to Commence Construction. Subject to Section 4.19 *[Regulatory Approvals and Permits]* of this Agreement, Project Co assumes all risk and costs arising in relation to the Leaves to Commence Construction, including delays to the Works Schedule arising from delays in obtaining the Leaves to Commence Construction or inability to obtain Leaves to Commence Construction, conditions of obtaining Leaves to Commence Construction, or amendments to Leaves to Commence Construction, as may be required.
- (j) The Comptroller of Water Rights may not be satisfied with an application for a Leave to Commence Construction, notwithstanding the review of Project Co's Submittals by BC Hydro and the Independent Engineer and notwithstanding the review of the applicable Final Design by BC Hydro. Project Co shall provide any and all additional documents, data and other information requested by the Comptroller of Water Rights.

- (k) Project Co shall submit to BC Hydro for the Comptroller of Water Rights, within one year after receipt of the Leave to Commence Operation, the As Built Drawings for the Power Intake, Water Conveyances, Hydraulic Transient Management System, Bypass System, Powerhouse and all flow discharge devices.

6.3 Leave to Commence Operation

- (a) The scope and staging of the Leave(s) to Commence Operation will be determined by the Comptroller of Water Rights. Without limiting the preceding sentence, it is expected that a Leave to Commence Operation will be required before water is passed through any Generating Unit.
- (b) Not Used.
- (c) Project Co shall submit the documents listed in the Water Licence with each application for a Leave to Commence Operation.
- (d) Project Co shall concurrently submit each Leave to Commence Operation application to BC Hydro and to the Independent Engineer.
- (e) Once an application for a Leave to Commence Operation has been accepted by the Independent Engineer, BC Hydro shall then submit a formal application to the Comptroller of Water Rights on behalf of Project Co for the applicable Leave to Commence Operation. BC Hydro, acting reasonably, will provide such assistance with respect to the process for obtaining the Leave to Commence Operation as requested by the Independent Engineer or the Comptroller of Water Rights.
- (f) Project Co shall fully cooperate with the Independent Engineer, the Independent Environmental Monitor and the Comptroller of Water Rights and promptly, when requested by the Independent Engineer, the Independent Environmental Monitor or the Comptroller of Water Rights, provide all documents, data and other information as may be required by either of them and in such form and format as may be requested by the Independent Engineer or the Comptroller of Water Rights.
- (g) Project Co shall comply with all conditions provided in the Leave(s) to Commence Operation.
- (h) Project Co shall allow sufficient time in the Works Schedule to obtain the required Leave(s) to Commence Operation. Subject to Section 4.19 [*Regulatory Approvals and Permits*] of this Agreement, Project Co assumes all risk and costs arising in relation to the Leave(s) to Commence Operation, including delays to the Works Schedule arising from delays in obtaining the Leave(s) to Commence Operation or inability to obtain the Leave(s) to Commence Operation, conditions of obtaining the Leave(s) to Commence Operation, or amendments to the Leave(s) to Commence Operation.

- (i) The Comptroller of Water Rights may not be satisfied with an application for a Leave to Commence Operation, notwithstanding the review of Project Co's Submittals by BC Hydro and the Independent Engineer and notwithstanding the review of the applicable Final Design by BC Hydro. Project Co shall provide any and all additional documents, data and other information requested by the Comptroller of Water Rights.

7. CONSTRUCTION

7.1 Skilled Workers

Project Co shall employ or cause the Design-Builder to employ a sufficient number of sufficiently qualified and skilled workers to perform the Construction in compliance with this Agreement.

7.2 Control of the Construction

Project Co shall have total control of the Construction and shall effectively direct and supervise the Construction so that it is undertaken in compliance with the terms of this Agreement. Project Co shall be responsible for all construction means, methods, techniques, sequences and procedures with respect to the Construction and for coordinating the various elements of the Construction, and nothing in this Agreement (including this Schedule) will be interpreted as giving any responsibility for the above to BC Hydro, BC Hydro's Representative or any other representative or agent of BC Hydro, or to the Independent Certifier, the Independent Engineer or the Comptroller of Water Rights.

7.3 Existing Utilities

Project Co shall confirm the location of, and protect:

- (a) all existing off-Site utilities and services that may be affected by the Construction; and
- (b) all existing on-Site utilities and services that may be affected by the Construction.

Project Co shall relocate any existing on-Site utilities and services that conflict with the Construction, except for the relocation of the existing two 138kV circuits, 1L103 and 1L104, which shall be relocated by BC Hydro in accordance with Section 1.2-4.3 [*Transmission Tower Relocation*] of Schedule 6 [*Design and Construction Specifications*], if required. Without limiting the foregoing provisions of this Section, all existing utilities and services to:

- (a) the Existing Units and the applicable Existing Facility systems must remain in operation until the final Planned Outage date for the applicable Existing Unit;
- (b) the Existing Site Office Building must remain in operation until Project Co commences demolition of the Existing Site Office Building, if applicable, or until after the Existing Site Office Building is connected to replacement utilities and services as part of the Project Work; and

- (c) other BC Hydro facilities and other buildings and structures located on and off the Site must remain in operation at all times,

with interruption only with the prior consent of BC Hydro's Representative, acting reasonably.

7.4 Site Investigation

Subject to, and without limiting, Section 4.12 [*Disclosed Data and Investigations*] of this Agreement, by entering into this Agreement, Project Co shall be deemed to have inspected the Site in relation to the performance of its obligations under this Agreement and to have satisfied itself and accepted all risks and related responsibilities relating to the Site (except as expressly provided to the contrary in this Agreement) including:

- (a) the adequacy of the rights of access to and through the Site for the Construction;
- (b) access and parking;
- (c) temporary storage of building materials and equipment;
- (d) existing utilities on the Site;
- (e) existence of Hazardous Substances on the Site; and
- (f) geotechnical conditions.

7.5 Emergency Measures

Project Co shall:

- (a) provide a 24-hour hotline (and post the phone number in a prominent location on the Site) for:
 - (i) BC Hydro staff to notify Project Co of any Construction related emergencies; and
 - (ii) neighbours and passers-by to contact Project Co;and Project Co shall respond to any phone calls made on the hotline within 1 hour, or such other time as may be specified in the John Hart Joint Operating Order, or any other applicable Operating Order;
- (b) before commencing the Construction, prepare and implement in co-operation with BC Hydro a site safety plan for the Project, which plan will describe emergency access routes to and from the Existing Facility during an emergency; and
- (c) immediately notify BC Hydro's Representative upon observation of:

- (i) any unusual, abnormal or suspected abnormal, conditions that have the potential to adversely affect the safety of the Dams or any Reservoir retaining structures; or
- (ii) any unusual conditions that may necessitate a declaration of a “*Dam Safety Incident*”, “*Alert*” or “*Breach*”, as defined in the CDA Dam Safety Guidelines.

Project Co shall cause one or more of Project Co's Representative, the Design-Build Director or the Services Director to participate in all emergency planning table-top exercises organized by BC Hydro throughout the Term. Emergency planning table-top exercises are designed to review, update and demonstrate understanding of BC Hydro's “*Generation Emergency Plan*” and “*Emergency Planning Guides*” and are expected to occur at least once every two years throughout the Term.

7.6 BC Hydro's Access to Site

Without limiting, and in addition to, the Site access rights described elsewhere in this Agreement, BC Hydro's Representative and its delegates will, subject to complying with all relevant safety procedures, including any relevant health and safety plans for the carrying out of the Construction and Project Co's and/or the Design-Builder's site rules, have access to:

- (a) attend the Construction Site and view the Construction throughout the Construction Period;
- (b) attend and observe all aspects of the Commissioning Work and the Performance Verification Tests;
- (c) attend the Existing Facilities Site and view the Construction throughout the period between the Service Commencement Date and the Total Completion Date; and
- (d) during normal working hours, visit any site or workshop where materials, plant or equipment are being manufactured, prepared or stored for use in the Construction, for the purposes of general inspection and of attending any test or investigation being carried out in respect of the Construction.

BC Hydro's Representative and its delegates will have the right to attend all monthly progress meetings and site meetings, including meetings between Project Co and the Design-Builder or its Sub-Contractors and Project Co shall provide reasonable advance notice of the time and location of all such meetings to BC Hydro's Representative.

Project Co shall cooperate with BC Hydro to arrange for tours of the Site at reasonable times during Construction for interested personnel, in a way that does not interfere with the progress of the Construction.

Except as set out above or as otherwise provided for in this Agreement, BC Hydro will not grant any person access to: (i) the Construction Site during the Construction Period; or (ii) the Existing Facilities Site

during the period between the Service Commencement Date and the Total Completion Date, without the consent of Project Co, such consent not to be unreasonably withheld or delayed.

7.7 Inspection

Prior to the Total Completion Date, Project Co shall, upon request by BC Hydro's Representative including detailed reasons for the request, open up for inspection by BC Hydro's Representative any part of the Project Work which BC Hydro's Representative, acting reasonably, believes is defective and:

- (a) if the parties agree or if it is determined in accordance with the Dispute Resolution Procedure that there are no Defects in the relevant part of such Project Work, and Project Co complied with the requirements of Section 7.6 *[BC Hydro's Access to Site]* of this Schedule and Section 14 *[Permitted Access]* of Schedule 29 *[Independent Certifier]*, then the exercise of such rights will be treated as a Compensation Event and be subject to Section 8.3 *[Project Co's Entitlements Upon Occurrence of a Compensation Event]* of this Agreement;
- (b) if the parties agree or if it is determined in accordance with the Dispute Resolution Procedure that any relevant part of the Project Work is defective, then:
 - (i) Project Co shall rectify and make good such Defect(s);
 - (ii) any consequence of such rectification or making good Defect(s) will be carried out by Project Co at no cost to BC Hydro; and
 - (iii) Project Co shall not be entitled to any extension of time to the Works Schedule in relation to such rectification and making good of such Project Work; and
- (c) if the parties are unable to reach agreement in accordance with Sections 7.7(a) or 7.7(b) *[Inspection]* above, then the matter will, at the request of either party, be referred to the Dispute Resolution Procedure. If, in order to maintain compliance with the Works Schedule, it is necessary to proceed in respect of the matter in Dispute, the parties will proceed in accordance with the position of BC Hydro, provided that Project Co proceeding in accordance with BC Hydro's position will be a Compensation Event if the relevant matter in Dispute is determined in favour of Project Co.

7.8 Signage

Project Co may erect signage at the Site during Construction to identify Project Co, the Design-Builder and Project Contractors provided such signs are acceptable to BC Hydro's Representative, acting reasonably.

7.9 BC Hydro Project Meetings

At BC Hydro's request, Project Co's Representative shall attend meetings to update BC Hydro on the progress of Construction and to discuss any issues that have arisen. These meetings will be no more than weekly unless agreed otherwise by parties.

8. ASSET TAGGING AND REGISTER

8.1 Asset Tagging

Project Co shall, in consultation with BC Hydro, supply and affix BC Hydro approved asset identification tags to:

- (a) each piece of equipment installed in the Facility, including any equipment used in the Facility but not normally secured in place by bolting, embedment, or similar means;
- (b) all security and communications systems equipment;
- (c) all tools and maintenance equipment;
- (d) all spare parts; and
- (e) all other items that are required for the operation or maintenance of the Facility.

Each asset identification tag will include a unique numerical identifier.

8.2 Asset Register

Project Co shall create, maintain, update and share with BC Hydro, an asset register of all items required to be tagged with an asset identification tag pursuant to Section 8.1 *[Asset Tagging]* of this Schedule (the "**Asset Register**"). The Asset Register shall be consistent with the format and organization of the "Detailed Capital Cost Breakdown Form" included in the Disclosed Data, shall be incorporated into the Maintenance Plan and Schedule and, for each item included in the Asset Register, Project Co shall, as applicable, record, or provide a remotely accessible link to, the following information:

- (a) make, model and device type;
- (b) equipment item number;
- (c) asset tag number;
- (d) serial number;
- (e) purchase order or equipment purchase contract identifier;
- (f) equipment supplier and contact information for the equipment supplier;

- (g) installed location;
- (h) date installed;
- (i) anticipated replacement date or timeframe;
- (j) warranty start date and expiry date;
- (k) required utility or other connections;
- (l) complete quantitative and baseline performance data, including applicable Commissioning data; and
- (m) any other information that may be agreed upon by BC Hydro and Project Co.

9. COMMISSIONING

9.1 Lead Test Engineer

Project Co shall, on or before the date specified in Schedule 3 *[Roles and Representatives]*, retain a qualified commissioning engineer who: (i) is neither a Project Co Person nor an Affiliate of a Project Co Person; (ii) is a Professional Engineer with a minimum of 10 years of experience in hydroplant commissioning; and (iii) is acceptable to BC Hydro's Representative, acting reasonably (the "**Lead Test Engineer**"). The Lead Test Engineer shall be responsible for planning, implementation, management and oversight of all Commissioning Work and for preparation of all commissioning documentation, records, equipment data sheets, equipment characteristics, systems data, and reports.

9.2 General

Project Co shall conduct and complete all pre-commissioning and Commissioning Work, including all tests and inspections, required by this Agreement and Good Utility Practice. Project Co shall prepare and submit to BC Hydro's Representative and the Independent Certifier all required Commissioning Certificates and copies of the applicable documentation, records, equipment data sheets, equipment characteristics, systems data, and reports required to: (i) establish a baseline for comparing performance, determining deterioration over the applicable Design Service Life and assessing the sufficiency and performance of the Asset Management Plan; and (ii) demonstrate to the Independent Certifier, BC Hydro's Representative and all applicable Governmental Authorities, that:

- (a) all applicable equipment, components, systems and sub-systems, and the fully integrated Facility, including the integrated operation of the Generating Units, Powerhouse and Non-Power Flow Systems:
 - (i) comply with the Project Requirements and are safe to energize and operate in accordance with all applicable Laws and the requirements of all Legal Obligations;

- (ii) comply with the applicable requirements of Tariff Supplement 79 (TS-79) and the Terms and Conditions for Modifications (TCM) document included in the Disclosed Data. Without limiting the preceding sentence, Project Co shall collect and submit all information required by Appendix 5G [*Interconnection Submittal Requirements*];
 - (iii) comply with the requirements of NERC; and
 - (iv) will permit BC Hydro to comply with its reporting obligations under the Mandatory Reliability Standards for the Electricity Bulk Power System in British Columbia, NERC Operating Policies, WECC Minimum Operating Reliability Criteria (MORC), and all other applicable WECC guides and policies;
- (b) all commissioning test equipment has been properly calibrated and that such calibration is documented and traceable to the applicable national standards; and
- (c) as applicable:
 - (i) the applicable Generating Unit is ready for, and has met all of the conditions precedent for, Commercial Operation;
 - (ii) the Facility is ready for, and has met all of the conditions precedent for, Service Commencement;
 - (iii) the Bypass System is ready for, and has met all of the conditions precedent for, Bypass System Completion; and
 - (iv) the Facility is ready for, and has met all of the conditions precedent for, Total Completion.

For the purpose of this Schedule 5 [*Design and Construction Protocols*] successful completion of a Commissioning step or test shall mean that the step or test has demonstrated compliance of the Facility, or portion thereof, with the applicable Project Requirements.

9.3 Minimum Scope of Commissioning

The Commissioning Work shall be comprehensive, as outlined in IEEE 1248 (IEEE Guide for the Commissioning of Electrical Systems in Hydroelectric Power Plants) and ANSI/NETA ATS-2009 (Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems), and shall include, as a minimum, all testing and inspections required to:

- (a) satisfy the requirements set out in Section 9.2 [*General*] of this Schedule;
- (b) satisfy the requirements of Operating Order 1T-35 (Commissioning Procedures for Generators, Station and Transmission Projects) and BC Hydro Engineering Standard ES 44-B0006 [*Project Test Summary For Level 1-4 Equipment*];

- (c) confirm the functionality and proper integration of the Facility, including the Powerhouse, Generating Unit controls, Generating Unit electrical protection, Generating Unit mechanical protection, excitation systems, governor systems, Bypass System, Power Intake Operating Gate, Low Level Outlet, Environmental Flow Release System, supervisory controls, metering and annunciation, Backup Diesel Generator, and other building systems, including all associated equipment, components, systems and sub-systems, all in accordance with the Project Requirements;
- (d) confirm range limits of all inputs, outputs and displays, including emergency and abnormal or unusual conditions, together with both communicated variables and hardwired inputs and outputs (e.g., 4-20 mA);
- (e) provide quantitative data with respect to the Facility and each piece of equipment, component, system and sub-system for use as a baseline in comparing performance, determining deterioration over the applicable Design Service Life and assessing the sufficiency and performance of the Asset Management Plan. The data collected and recorded shall be consistent in content and level of detail to that specified in IEEE 1248 (IEEE Guide for the Commissioning of Electrical Systems in Hydroelectric Power Plants) and ANSI/NETA ATS-2009 (Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems); and
- (f) confirm that all protection and control systems fail to safe in accordance with the applicable Project Requirements and that the applicable backup systems operate as planned.

Project Co shall develop and implement an inspection and test recording system which shall permit ready retrieval of quantitative records of all inspection results and test readings. Project Co shall provide inspection and test readings to BC Hydro's Representative upon request.

9.4 Commissioning Coordination and Planning

9.4.1 Commissioning Joint Committee

- (a) Not less than fifteen (15) months prior to the Target Commercial Operation Date for the first Generating Unit, BC Hydro and Project Co will establish, and maintain until the later of: (i) the Service Commencement Date; or (ii) the Bypass System Completion Date, a joint liaison committee (the "**Commissioning Joint Committee**") consisting of the Lead Test Engineer, Project Co's Representative, the BC Hydro Vancouver Island Generation Planner, BC Hydro's Representative, and such other members as the parties may agree from time to time.
- (b) The purpose of the Commissioning Joint Committee is to provide a formal forum for the parties to consult and cooperate in all matters relating to Commissioning, including discussion, clarification, planning and coordination of the roles, responsibilities and activities of each of the parties.

- (c) The Commissioning Joint Committee:
- (i) will only have authority as expressly delegated to it by BC Hydro and Project Co, and both parties will give reasonable consideration to delegating appropriate authority to permit efficient decision making with respect to the Commissioning of the Project;
 - (ii) may strike, establish terms of reference for, delegate authority and appoint members having the necessary experience and qualifications to, such sub-committees as the Commissioning Joint Committee may determine are necessary from time to time and all such sub-committees will report to the Commissioning Joint Committee;
 - (iii) will establish protocols and procedures for undertaking the tasks and responsibilities delegated to it, including a co-operative and consultative process to review all documentation submitted to it in relation to the Commissioning Work;
 - (iv) may make recommendations to the parties on all matters relating to the Commissioning of the Project, which the parties may accept or reject in their complete discretion; and
 - (v) will have no authority to agree to any amendments or to give any waivers of this Agreement.
- (d) Subject to the provisions of this Agreement, the members of the Commissioning Joint Committee may adopt such procedures and practices for the conduct of the activities of the Commissioning Joint Committee as they consider appropriate from time to time and:
- (i) may invite to any meeting of the Commissioning Joint Committee such other (non-voting) persons as a member may decide; and
 - (ii) receive and review a report from any person agreed by the members of the Commissioning Joint Committee.
- (e) The Commissioning Joint Committee will meet at least once each: (i) month for the first 9 months after formation; and (ii) week thereafter, at a location provided by Project Co at or near the Site (unless otherwise agreed by the Commissioning Joint Committee's members) and from time to time as necessary. If any member of the Commissioning Joint Committee requests an additional meeting, the parties will act reasonably in accommodating this request. Meetings of the Commissioning Joint Committee will be convened on not less than 1 Business Days' notice (which will also identify the agenda items to be discussed at the meeting and include the, then current, Commissioning Schedule) provided that in an emergency a meeting may be called at any time on such notice as may be reasonable in the circumstances. The Commissioning Joint Committee

will be chaired by the Lead Test Engineer unless BC Hydro requires that a representative of BC Hydro chair the Commissioning Joint Committee.

- (f) Project Co shall keep minutes of all recommendations, action items and meetings of the Commissioning Joint Committee and circulate such minutes to BC Hydro within 3 days of the making of the recommendation, identification of the action item or the holding of the meeting. Meeting minutes shall clearly identify all agreed upon recommendations and action items, including identification of the responsible party and agreed schedule to address each recommendation and action item.

9.4.2 Commissioning Plan

Not less than six (6) months prior to the Target Commercial Operation Date for the first Generating Unit, Project Co shall prepare and submit to BC Hydro's Representative, in accordance with the Consent Procedure, and to the Independent Certifier a detailed plan (the "**Commissioning Plan**") setting out the testing, inspection and commissioning activities, requirements and applicable acceptance criteria, training and other activities, Project Co intends to carry out to fully commission the Facility and satisfy the requirements of this Section 9 [Commissioning]. The Commissioning Plan shall incorporate the commissioning and testing requirements and acceptance criteria described in each of the Design Basis Memoranda and shall:

- (a) be prepared by, or under the direction of, the Lead Test Engineer;
- (b) comply with the requirements of all applicable Laws and Good Utility Practice;
- (c) include a detailed description of the proposed implementation of IEEE 1248 (IEEE Guide for the Commissioning of Electrical Systems in Hydroelectric Power Plants) and ANSI/NETA ATS-2009 (Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems), and Project Co's plan to ensure: (i) satisfaction of the requirements of the Terms and Conditions for Modifications document, Operating Order 1T-35 (Commissioning Procedures for Generators, Station and Transmission Projects) and BC Hydro Engineering Standard ES 44-B0006; and (ii) that the Commissioning Test Report requirements will be satisfied;
- (d) include a detailed inspection and test plan for all SCADA testing;
- (e) include a description of the specific equipment, components, systems and sub-systems to be inspected, tested and commissioned and the associated Commissioning requirements;
- (f) include a description of all supporting documentation, including as appropriate: (i) design calculations and assumptions; and (ii) manufacturer's specifications;
- (g) include a description and schedule of all training and education that Project Co intends to provide to BC Hydro's staff to enable BC Hydro to properly operate and maintain the Facility;

- (h) include the name of the Lead Test Engineer and the names of all other persons to be involved in the Commissioning Work, together with details of the organization and responsibilities of each member of Project Co's commissioning team;
- (i) include a description of Project Co's system for managing documentation and records of tests, inspections, quality assurance and training;
- (j) include a high level schedule for performance of the Commissioning Work, which shall be consistent with the then current Project Schedule and Works Schedule, showing:
 - (i) details and timing of all expected outages of the in-service Existing Units and the schedule window for the offline wet testing and online testing for each Generating Unit;
 - (ii) expected quantity and timing of power output and anticipated turbine discharge (the detail for each activity shall include procedures and mitigation plans for ensuring compliance with the requirements of GOO 4G-44 (John Hart Project) and minimizing risk to the Existing Powerhouse and the Existing Units);
 - (iii) the timing of all Commissioning Work, including all testing, inspection, and training activities; and
 - (iv) for each condition precedent for: (i) Commercial Operation; (ii) Service Commencement; or (iii) Bypass System Completion, as applicable, the date upon which Project Co anticipates completing the condition;
- (k) include a description of the methodology and sequencing for transferring the water passage and electrical interconnection from the Existing Units to the Generating Units, including mitigation activities for the environment, ensuring the continuous operation of the Substation, and the continuous operation of Existing Units which are to remain in-service. The sequencing plan shall include drawings or sketches showing each stage of the transfer sequence;
- (l) include performance of all of the Commissioning tests described in Section 9.7 *[BC Hydro Required Testing]* of this Schedule;
- (m) include detailed procedures for conducting all of the Commissioning tests, including reference documents, manufacturer's recommendations, test standards, and narrative descriptions explaining how each test parameter will be measured or calculated, and descriptions of how test results will be reported;
- (n) include detailed environmental risk mitigation plans for all Commissioning activities that identify:

- (i) procedures to mitigate the potential for environmental or public safety impacts from Commissioning activities, including base flow or flow balancing procedures; and
- (ii) mitigation plans and monitoring plans for initial water-up of the Power Tunnel to ensure that high NTU/turbidity levels are not released into the Campbell River;
- (o) include a detailed plan for real time communications between Project Co, BC Hydro, the Facility and the Existing Facility with respect to the performance of the Commissioning Work;
- (p) include a draft LOO 3-G-JHN-01 (John Hart Generating Station) prepared in accordance with the requirements of *Appendix 5L [Operating Order Requirements]* and based on LOO 3-G-JHT-01 (John Hart Generating Station) included in the Disclosed Data;
- (q) include a draft Joint Operating Order, for the operation of the Facility and the Existing Facility throughout Commissioning and the Bridging Period, prepared in accordance with the requirements of *Appendix 5L [Operating Order Requirements]* and based on the draft Joint Operating Order included in the Disclosed Data;
- (r) demonstrate the means by which the introduction of environmental hazards and public safety hazards during Commissioning will be minimized;
- (s) minimize the risk of a flow disruption event, or other flow hazard, should a piece of equipment, component, system or sub-system fail to perform as expected or if a test must be aborted for any reason;
- (t) minimize the risk of unauthorized NTU/turbidity levels being released into the Campbell River; and
- (u) include a summary of all tests required for each piece of Project Co supplied equipment shown on the John Hart Substation Operating One-line drawing.

9.4.3 Compliance with Commissioning Plan

Project Co shall implement, and ensure that all Project Co Persons engaged in the Commissioning Work comply with, the Commissioning Plan which has been accepted by BC Hydro's Representative in accordance with the Consent Procedure, and any subsequent amendments or updates to the Commissioning Plan which have been accepted by BC Hydro's Representative in accordance with the Consent Procedure.

9.4.4 Commissioning Schedule

At least 15 Business Days prior to the commencement of a portion of the Commissioning Work, Project Co shall prepare and submit a detailed schedule for the applicable Commissioning Work to BC Hydro's Representative pursuant to the Consent Procedure (provided that the time for BC Hydro's consideration

under Schedule 2 [*Review Procedure, Consent Procedure and Other Submittals*], shall be five (5) days). The detailed schedule shall:

- (a) update the high level schedule included in the Commissioning Plan;
- (b) include details of the applicable Commissioning Work to be performed, including:
 - (i) details and timing of all expected outages, including power system isolation requests, equipment energization requests, and microwave system outage/fibre-optic outage requests, and outages of the in-service Existing Units and the schedule window for the offline wet testing and online testing for each Generating Unit;
 - (ii) expected MW and flow by hour, for each Generating Unit or the Bypass System, as applicable;
 - (iii) expected quantity and timing of power output and anticipated turbine discharge (the detail for each activity shall include procedures and mitigation plans for ensuring compliance with the requirements of GOO 4G-44 (John Hart Project) and minimizing risk to the Existing Powerhouse and the Existing Units);
 - (iv) the timing of all applicable Commissioning Work, including all testing, inspection, and training activities; and
 - (v) details of any required changes to the SCADA system, such as changes to alarm points, control point, indication points or analog points;
- (c) be consistent with the then current Project Schedule and Works Schedule;
- (d) be safe, reasonable, practicable and in accordance with Good Utility Practice;
- (e) comply in all respects with the requirements of GOO 4G-44 (John Hart Project), all applicable Laws, any applicable environmental constraints and all applicable Legal Obligations; and
- (f) provide a level of detail consistent with that shown in the sample commissioning schedule titled: "*Revelstoke Unit 5 – Commissioning Schedule*", included in the Disclosed Data,

(each, a "**Commissioning Schedule**").

Without limiting the preceding paragraphs of this Section 9.4.4 [*Commissioning Schedule*], at least one month in advance of any proposed SCADA testing involving the Remote Control Centre, Project Co shall prepare and submit a detailed schedule of all proposed SCADA testing with the Remote Control Centre to BC Hydro's Representative pursuant to the Consent Procedure (provided that the time for BC Hydro's consideration under Schedule 2 [*Review Procedure, Consent Procedure and Other Submittals*], shall be fifteen (15) days).

9.4.5 Scheduling of Commissioning Work

Project Co shall be responsible for the coordination and scheduling of all Commissioning Work and shall perform all Commissioning Work in accordance with the applicable Commissioning Schedule which has been accepted by BC Hydro's Representative in accordance with the Consent Procedure, subject to the following protocols:

- (a) Project Co shall promptly submit all requested changes to an accepted Commissioning Schedule directly to BC Hydro's Representative. Where Project Co requests a change to the Commissioning Schedule BC Hydro shall make reasonable commercial efforts to accommodate the requested change, provided that Project Co shall not implement any requested modifications to an accepted Commissioning Schedule without the prior consent of BC Hydro's Representative, not to be unreasonably withheld or delayed;
- (b) Project Co shall coordinate and agree flow coordination through the Existing Powerhouse, for flow balancing and real-time activities, directly with the person responsible for operation of the Existing Powerhouse, as designated by BC Hydro's Representative; and
- (c) where BC Hydro requires a modification to an accepted Commissioning Schedule, BC Hydro's Representative shall promptly notify Project Co's Representative of the required modification and: (i) the applicable Commissioning Schedule shall be deemed to be amended in accordance with BC Hydro's notice; and (ii) where the modification is the result of a circumstance which would not otherwise constitute a Force Majeure Event, a Relief Event or an Excusing Event, it shall be deemed a Compensation Event under Section 8.3 [*Project Co's Entitlements Upon Occurrence of a Compensation Event*] of this Agreement.

9.5 Commissioning Constraints

9.5.1 General

Project Co shall ensure that:

- (a) all Commissioning activities are performed so as to prevent unscheduled disruption to the continued operation of any in-service Generating Units or any Existing Units still remaining in-service;
- (b) the Campbell River System water flows are maintained in compliance with the seasonal project discharges and in compliance with the project flow ramping rates as specified in GOO 4G-44 (John Hart Project);
- (c) its activities do not cause any interruption to the water supply to the City of Campbell River Water Treatment Plant;

- (d) no Project Co Persons operate, or attempt to operate, any equipment under the Operating Authority or Operating Responsibility of BC Hydro;
- (e) all testing equipment used for taking or recording Commissioning data is properly calibrated;
- (f) all test results are signed and dated by the tester and the Lead Test Engineer;
- (g) where a Defect is discovered, all affected equipment, components, systems and sub-systems are re-tested until they meet the applicable Project Requirements;
- (h) where a Nonconformity, or potential Nonconformity, is discovered during Commissioning, the applicable Nonconformity, or potential Nonconformity, is investigated and the source or cause of the Nonconformity, or potential Nonconformity, is determined and rectified prior to proceeding with further Commissioning of the affected equipment, components, systems or sub-systems;
- (i) testing of Facility systems and sub-systems, including HVAC, fire protection, emergency systems, security, lighting, elevators, cranes and communications includes both system testing and end-to-end testing. System testing shall involve device and operational testing of the individual systems and their components and end-to-end testing shall involve the operation of individual devices or systems, and confirmation that all auxiliary devices, systems and outputs operate in accordance with the applicable Project Requirements;
- (j) subject to complying with all relevant safety procedures, including any relevant health and safety plans for the carrying out of the Construction and Project Co's and/or the Design-Builder's site rules, BC Hydro's Representative, designated BC Hydro Persons and the Independent Certifier have full access to all parts of the Project Work at all times during the Commissioning;
- (k) the Independent Certifier, BC Hydro's Representative and designated BC Hydro Persons receive advance notice of, and have full access to attend, all testing, inspection and Commissioning of all parts of the Project Work, including individual pieces of equipment, components, systems and sub-systems;
- (l) copies of all inspection and test procedures, test results, technical documentation and other data and photographs recorded or observed by Project Co are submitted to the Independent Certifier and to BC Hydro's Representative upon request; and
- (m) to the greatest extent practicable, all test data is recorded electronically. Where electronic recording of test data is impracticable, such test data shall be recorded manually and tabulated in a neat, consistent and methodical manner, and Project Co shall manually enter such data into a digital platform.

9.5.2 Environmental Commissioning Requirements

Project Co shall ensure that the number of flow changes in any given seasonal flow range is minimized so as to reduce the potential for cumulative effects to the species and life stages present at that time.

Subject to compliance with the applicable ramp rates, Project Co may utilize the procedures below to mitigate the potential for downstream environmental impacts, provided that use of any of the following procedures shall not relieve Project Co of the obligation to fully comply with GOO 4G-44 (John Hart Project) and to otherwise comply with the requirements of this Schedule 5 [*Design and Construction Protocols*]:

- (a) utilize the then in-service Generating Units and Existing Units to inversely mirror the flow changes resulting from the Commissioning activities such that net flow changes to the downstream channel are minimized;
- (b) utilize the then in-service Generating Units and Existing Units to provide a protective base flow to minimize the potential for fish stranding. To the extent this procedure is incorporated in the accepted Commissioning Plan, BC Hydro will provide the base flow through the in-service Generating Units/Existing Units to the extent practical and within the applicable operating constraints, without additional charge to Project Co;
- (c) utilize the Spillway to provide a protective base flow to minimize the potential for fish stranding. To the extent this procedure is incorporated in the accepted Commissioning Plan, BC Hydro will provide the Spillway flow without additional charge to Project Co; and
- (d) utilize the Bypass System to minimize the potential for fish stranding.

Where Project Co believes that it is necessary or desirable to seek a temporary variance to the requirements of GOO 4G-44, Project Co shall comply with the GOO variance request procedure described in Appendix 5K [*GOO 4G-44 Variance Request Procedure*].

9.6 Commissioning Execution

9.6.1 Cutover of Water Conveyances

Prior to connecting the Water Conveyances to an Existing Surge Tower, Project Co shall:

- (a) obtain from BC Hydro a protection guarantee for the Existing Penstock(s), or the applicable portions thereof;
- (b) prepare and submit to BC Hydro's Representative, for information only, and to the Independent Certifier, a Commissioning Certificate – Part I, in the form attached hereto as Appendix 5M [*Form of Commissioning Certificate*], signed by the Designer, the Design-Builder and Project Co's Representative, confirming that all pre-commissioning tests, inspections and other conditions precedent to cutover of the Water Conveyances,

or the applicable portion thereof, have been completed and that the Water Conveyances, or the applicable portion thereof, are ready to, and can safely, be cutover; and

- (c) decommission and demolish at least 20 meters of the applicable Existing Penstock(s) immediately upstream of the applicable Existing Surge Tower.

Within 24 hours after completion of cutover of the Water Conveyances, or the applicable portion thereof, Project Co shall prepare and submit to BC Hydro's Representative, for information only, and to the Independent Certifier, a Commissioning Certificate – Part II, in the form attached hereto as Appendix 5M *[Form of Commissioning Certificate]*, signed by the Lead Test Engineer, confirming that the cutover of the Water Conveyances, or the applicable portion thereof, has been successfully completed.

9.6.2 Water-up Water Conveyances

A. Conditions Precedent

Prior to commencing watering-up of the Water Conveyances, Project Co shall:

- (a) prepare and submit to BC Hydro's Representative, for information only, and to the Independent Certifier, a Commissioning Certificate – Part I, in the form attached hereto as Appendix 5M *[Form of Commissioning Certificate]*, signed by the Designer, the Design-Builder and Project Co's Representative, confirming that all pre-commissioning tests, inspections and other conditions precedent to watering-up of the Water Conveyances have been completed and that the Water Conveyances are ready to, and can safely, be watered-up;
- (b) obtain such Leaves to Commence as are required by the Comptroller of Water Rights;
- (c) have completed all dry commissioning of the Power Intake, the TIVs and any other valves to be wetted;
- (d) have an accepted IDSRMP, including details of Project Co's plan for first filling of the Water Conveyances and methods of dewatering the Water Conveyances in a reasonable amount of time;
- (e) have submitted LOO 3-G-JHN-01 (John Hart Generating Station), prepared in accordance with the requirements of *Appendix 5L [Operating Order Requirements]* and based on LOO 3-G-JHT-01 (John Hart Generating Station) included in the Disclosed Data, to which BC Hydro has no objection in accordance with the Review Procedure;
- (f) have submitted LOO 3-G-JHN-06 (Dam and Discharge Facilities), in accordance with the requirements of *Appendix 5L [Operating Order Requirements]* and based on LOO 3-G-JHT-06 (John Hart Generating Station (JHT) Dam and Discharge Facilities) included in the Disclosed Data, to which BC Hydro has no objection in accordance with the Review Procedure;

- (g) have submitted a Joint Operating Order, for the operation of the Facility and the Existing Facility throughout Commissioning and the Bridging Period, to which BC Hydro has no objection in accordance with the Review Procedure (the “**John Hart Joint Operating Order**”). The John Hart Joint Operating Order shall be prepared in accordance with the requirements of *Appendix 5L [Operating Order Requirements]* and shall be based on the draft Joint Operating Order included in the accepted Commissioning Plan; and
- (h) complete the BC Hydro required testing described in Section 9.7.3(c) *[Emergency Closure Tests]* of this Schedule.

B. *Key instrumentation and monitoring*

Project Co shall complete the following testing as part of the water-up of the Water Conveyances, as a minimum:

- (a) recording of all data as required by the IDSRMP, including Project Co's first filling plan; and
- (b) monitoring of the slopes in the Elk Falls Canyon area of the park.

C. *Submittals*

- (a) Within 24 hours after completion of watering-up of the Water Conveyances, Project Co shall prepare and submit to BC Hydro's Representative, for information only, and to the Independent Certifier, a Commissioning Certificate – Part II in the form attached hereto as Appendix 5M *[Form of Commissioning Certificate]*, signed by the Lead Test Engineer, confirming that the watering-up of the Water Conveyances has been successfully completed.
- (b) Within 60 days after the first filling of the Water Conveyances, Project Co shall prepare and submit to BC Hydro's Representative, for information only, and to the Independent Certifier, a first filling test report describing the test findings and attaching all relevant data and observations collected.

9.6.3 Wet Testing of Large Discharge Valves

A. *Conditions Precedent*

Prior to commencing wet testing of the Bypass System and each large discharge valve, including the HTMS, EFRS and LLO, Project Co shall:

- (a) prepare and submit to BC Hydro's Representative, for information only, and to the Independent Certifier, a Commissioning Certificate – Part I, in the form attached hereto as Appendix 5M *[Form of Commissioning Certificate]*, signed by the Designer, the Design-Builder and Project Co's Representative, confirming that all pre-commissioning tests, inspections and other conditions precedent to wet testing of the applicable large

discharge valves have been completed and that the applicable large discharge valves are ready to, and can safely, be subjected to wet testing;

- (b) have successfully completed dry commissioning of the applicable large discharge valves;
- (c) have obtained such Leaves to Commence as required by the Comptroller of Water Rights;
- (d) have submitted LOO 3-G-JHN-04 (John Hart Environmental Spill Contingency), prepared in accordance with the requirements of *Appendix 5L [Operating Order Requirements]* and based on LOO 3-G-JHT-04 (John Hart Generating Station (JHT) John Hart Environmental Spill Contingency) included in the Disclosed Data, to which BC Hydro has no objection in accordance with the Review Procedure; and
- (e) have submitted LOO 3-G-JHN-06 (Dam and Discharge Facilities), prepared in accordance with the requirements of *Appendix 5L [Operating Order Requirements]* and based on LOO 3-G-JHT-06 (John Hart Generating Station (JHT) Dam and Discharge Facilities) included in the Disclosed Data, to which BC Hydro has no objection in accordance with the Review Procedure;
- (f) have submitted LOO 3-G-JHN-08 (John Hart Public Safety Management Plans), prepared in accordance with the requirements of *Appendix 5L [Operating Order Requirements]* and based on LOO 3-G-JHT-08 (John Hart Generating Station (JHT) John Hart Public Safety Management Plans) included in the Disclosed Data, to which BC Hydro has no objection in accordance with the Review Procedure; and
- (g) have submitted an updated version of each previously submitted Operating Order, as required to reflect any changes to the Facility, to which BC Hydro has no objection in accordance with the Review Procedure.

B. Key Tests

Project Co shall complete the following testing as part of the wet testing of each large discharge valve, as a minimum:

- (a) full flow open and closure test on each valve individually;
- (b) demonstration of the unwatering of the upstream and downstream side of each valve;
- (c) inspection of each valve for any damage, cavitation and wear resulting from the full flow test; and
- (d) the BC Hydro required testing described in Sections 9.7.3(d), 9.7.3(e) *[Emergency Closure Tests]* and 9.7.6 *[Environmental Requirements Confirmation Testing]* of this Schedule.

C. Submittals

- (a) Within 24 hours after completion of wet testing of the applicable large discharge valves, Project Co shall prepare and submit to BC Hydro's Representative, for information only, and to the Independent Certifier, a Commissioning Certificate – Part II, in the form attached hereto as Appendix 5M [*Form of Commissioning Certificate*], signed by the Lead Test Engineer, confirming that wet testing of the applicable large discharge valves has been successfully completed.
- (b) Project Co shall prepare a test and inspection report, describing the test findings and attaching all relevant data and observations collected. The applicable test and inspection report shall be submitted to BC Hydro concurrently with the Commissioning Test Report.

9.6.4 Generating Unit Offline Wet Testing

A. Conditions Precedent

Prior to commencing offline wet testing of a Generating Unit (initial discharge of water through a Generating Unit or watering-up of any part of the Generation System), Project Co shall:

- (a) prepare and submit to BC Hydro's Representative, for information only, and to the Independent Certifier, a Commissioning Certificate – Part I, in the form attached hereto as Appendix 5M [*Form of Commissioning Certificate*], signed by the Designer, the Design-Builder and Project Co's Representative, confirming that all pre-commissioning tests, inspections and other conditions precedent to offline wet testing of the applicable Generating Unit have been completed and that the applicable Generating Unit is ready to, and can safely be, subjected to offline wet testing;
- (b) have successfully completed dry commissioning of the applicable Generating Unit;
- (c) have obtained such Leaves to Commence as required by the Comptroller of Water Rights;
- (d) demonstrate that all public safety systems, including sirens, warning lights, booms and barriers are in place and performing their intended public safety functions;
- (e) communicate the applicable flow requirements and timing to, and obtain the agreement of, BC Hydro's Representative;
- (f) have submitted an updated version of LOO 3-G-JHN-04 (John Hart Environmental Spill Contingency), prepared in accordance with the requirements of *Appendix 5L [Operating Order Requirements]* and based on LOO 3-G-JHT-04 (John Hart Generating Station (JHT) John Hart Environmental Spill Contingency) included in the Disclosed Data, to which BC Hydro has no objection in accordance with the Review Procedure; and

- (g) have submitted an updated version of LOO 3-G-JHN-08 (John Hart Public Safety Management Plans), prepared in accordance with the requirements of *Appendix 5L [Operating Order Requirements]* and based on LOO 3-G-JHT-08 (John Hart Generating Station (JHT) John Hart Public Safety Management Plans) included in the Disclosed Data, to which BC Hydro has no objection in accordance with the Review Procedure; and
- (h) have submitted an updated version of each previously submitted Operating Order, as required to reflect any changes to the Facility, to which BC Hydro has no objection in accordance with the Review Procedure.

B. Key Tests

Project Co shall complete the following testing as part of the Generating Unit offline wet testing as a minimum:

- (a) functional testing of each Turbine Inlet Valve, including control and protection functionality, opening, closing and emergency closing;
- (b) Generating Unit speed run in incremental speeds from 0 RPM to at least the TIV closure trip level and held at each increment, up to a point immediately below the TIV closure trip level, for a period of at least 5 minutes;
- (c) brake testing, including normal braking, emergency braking, and repeatedly bringing the rotating parts to rest with the field excitation removed and the wicket gates closed;
- (d) fill, drain and isolation functionality between the TIV and the Draft Tube gates; and
- (e) wicket gate functional testing and leakage test.

C. Submittals

- (a) Within 24 hours after completion of offline wet testing of the applicable Generating Unit, Project Co shall prepare and submit to BC Hydro's Representative, for information only, and to the Independent Certifier, a Commissioning Certificate – Part II, in the form attached hereto as Appendix 5M *[Form of Commissioning Certificate]*, signed by the Lead Test Engineer, confirming that offline wet testing of the applicable Generating Unit has been successfully completed.
- (b) Project Co shall prepare and submit a test and inspection report, describing the test findings and attaching all relevant data and observations collected. The applicable test and inspection report shall be submitted to BC Hydro concurrently with the Commissioning Test Report.

9.6.5 Interconnection to the BC Hydro Transmission System

Prior to making an initial connection to, or initial synchronization to, the BC Hydro Transmission System (including first energization or synchronization of any station service transformer, Unit Transformer or Generator), Project Co shall:

- (a) prepare and submit to BC Hydro's Representative, for information only, and to the Independent Certifier, a Commissioning Certificate – Part I, in the form attached hereto as Appendix 5M [*Form of Commissioning Certificate*], signed by the Designer, the Design-Builder and Project Co's Representative, confirming that all pre-commissioning tests, inspections and other conditions precedent to interconnection to the BC Hydro Transmission System have been completed and that the applicable station service transformer, Unit Transformer or Generator is ready to, and can safely, interconnected to the BC Hydro Transmission System;
- (b) submit the following information for each piece of interconnected equipment to BC Hydro's Representative pursuant to the Consent Procedure (provided that the time for BC Hydro's consideration under Schedule 2 [*Review Procedure, Consent Procedure and Other Submittals*] shall be five (5) days):
 - (i) a Commissioning Notice to Energize (CNE), in the form attached as Appendix 5N [*Commissioning Notice to Energize Form*] certifying that the applicable equipment has been designed, installed and tested in accordance with the requirements of this Agreement and Good Utility Practice and are ready for initial energization and online testing without jeopardizing the safety of persons or the safety and integrity of the BC Hydro Transmission System;
 - (ii) confirmation that the applicable Generating Unit deluge system has been commissioned and is fully functional;
 - (iii) a detailed listing of the name and unique identifier of all equipment to be energized, including the equipment details;
 - (iv) a summary of the Commissioning Work, tests and inspections completed on the equipment to be energized;
 - (v) LOO 3-G-JHN-02A (John Hart Alarm Systems), prepared in accordance with the requirements of *Appendix 5L [Operating Order Requirements]* and based on LOO 3-G-JHT-02A (John Hart Generating Station (JHT) John Hart Alarm Systems) included in the Disclosed Data;
 - (vi) LOO 3-G-JHN-02B (John Hart Protection Information), prepared in accordance with the requirements of *Appendix 5L [Operating Order Requirements]* and based on LOO 3-G-JHT-02B (John Hart Generating Station (JHT) John Hart Protection Information) included in the Disclosed Data;

- (vii) LOO 3-G-JHN-03 (John Hart Fire Protection System), prepared in accordance with the requirements of *Appendix 5L [Operating Order Requirements]* and based on LOO 3-G-JHT-03 (John Hart Generating Station (JHT) John Hart Fire Protection System) included in the Disclosed Data;
- (viii) LOO 3-G-JHN-10 (John Hart Emergency Planning & Procedures), prepared in accordance with the requirements of *Appendix 5L [Operating Order Requirements]* and based on LOO 3-G-JHT-10 (John Hart Generating Station (JHT) John Hart Emergency Planning & Procedures) included in the Disclosed Data;
- (ix) an updated version of each previously submitted Operating Order, including the John Hart Joint Operating Order, as required to reflect any changes to the Facility;
- (x) revised operating one-line drawings (or mark-ups), including re-establishing the applicable PSSP boundary;
- (xi) details of the initial energization sequence, including any Operating Restrictions;
- (xii) details of any SCADA changes;
- (xiii) details of any Defects, Operating Restrictions and incomplete Design or Construction, related to the equipment to be energized;
- (xiv) for each Unit Transformer and station service transformer, the following:
 - (A) applicable factory acceptance test results;
 - (B) a transformer oil and erection report; and
 - (C) transformer data information, included in *Appendix 5G [Interconnection Submittal Requirements]*;
- (xv) for a Generating Unit, the following:
 - (A) Generating Unit data information, included in *Appendix 5G [Interconnection Submittal Requirements]*;
 - (B) documentation sufficient to demonstrate that the voltage fluctuation and flicker comply with the requirements of the Terms and Conditions for Modifications document;
 - (C) documentation sufficient to confirm correct phase rotation;

- (D) documentation sufficient to confirm protective relay settings for line protection, entrance protection and electricity quality protection, are in accordance with those provided by BC Hydro's Representative following request from Project Co at least 3 months prior to requirement for the information;
- (E) documentation sufficient to confirm that the Generator relay setting, including excitation system controls and limits, and generator protective relays, are in accordance with the applicable Project Requirements; and
- (F) documentation sufficient to demonstrate compliance with the "Revenue Meter Certification Requirements" included in the Disclosed Data; and
- (xvi) all other documentation required pursuant to the relevant parts of Operating Order 1T-35 (Commissioning Procedures for Generators, Station and Transmission Projects); and
- (c) receive an accepted copy of the applicable Commissioning Notice to Energize and each of the other Submittals described in Section 9.6.5(b) [*Interconnection to the BC Hydro Transmission System*] of this Schedule, from BC Hydro's Representative in accordance with the Consent Procedure.

Within 24 hours after making the initial connection, or initial synchronization, of any station service transformer, Unit Transformer or Generator to the BC Hydro Transmission System, Project Co shall prepare and submit to BC Hydro's Representative, for information only, and to the Independent Certifier, a Commissioning Certificate – Part II, in the form attached hereto as Appendix 5M [*Form of Commissioning Certificate*], signed by the Lead Test Engineer, confirming that the initial connection, or initial synchronization, has been successfully completed.

9.6.6 Generating Unit Online Local Testing

A. Conditions Precedent

Prior to proceeding with synchronization and on-line testing of a Generating Unit, Project Co shall:

- (a) prepare and submit to BC Hydro's Representative, for information only, and to the Independent Certifier, a Commissioning Certificate – Part I, in the form attached hereto as Appendix 5M [*Form of Commissioning Certificate*], signed by the Designer, the Design-Builder and Project Co's Representative, confirming that all pre-commissioning tests, inspections and other conditions precedent to online testing of the applicable Generating Unit have been completed and that the applicable Generating Unit is ready to, and can safely, be subjected to online local testing; and
- (b) obtain CNEs, accepted pursuant to the Consent Procedure, for all equipment to be subjected to energized online testing.

B. Key Tests

Project Co shall complete the following testing, as a minimum:

- (a) functional testing sufficient to prove the proper operation of synchronization controls, governor systems, excitation systems, voltage regulators, power system stabilizer systems and other control schemes;
- (b) load rejection tests on each Generating Unit, in steps of at least four points covering the full range of rated load. Instrumentation monitoring the following shall be monitored and recorded during each test: (i) vibration; (ii) governor on-line gain performance; (iii) pressure rise; (iv) speed rise; (v) voltage rise; (vi) level of the surge or drop of the water level at any free surface in the Water Conveyances (including any Surge Tanks, shafts and intake shafts); (vii) pressure rise at or near the spiral case inlets and Surge Tank(s) (if used); and (viii) the pressure rise and/or fall at the location in the Water Conveyances that is upstream of the Power Tunnel shaft and where the hydraulic grade line is closest to the crown of the Water Conveyances.
- (c) all online testing described in IEEE 1248 (IEEE Guide for the Commissioning of Electrical Systems in Hydroelectric Power Plants) and ANSI/NETA ATS-2009 (Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems);
- (d) all testing required to complete the test data and information requirements of the Interconnection Data Submittal Requirements outlined in Appendix 5G [*Interconnection Submittal Requirements*];
- (e) testing of all analogue values and status indications, including confirmation of correct indication by the Remote Control Centre. Each supervisory alarm shall be initiated in the applicable Facility control system and confirmed by the Remote Control Centre;
- (f) the BC Hydro required testing described in Sections 9.7.3 [*Emergency Closure Tests*] and 9.7.7(a) [*Reliability Requirements Confirmation Testing*] of this Schedule; and
- (g) testing sufficient to demonstrate and document the stable operation of the applicable Generating Unit over the entire range of Powerhouse Flows.

C. Submittals

Within 24 hours after completion of online local testing of the applicable Generating Unit, Project Co shall prepare and submit:

- (a) to BC Hydro's Representative, for information only, and to the Independent Certifier, a Commissioning Certificate – Part II, in the form attached hereto as Appendix 5M [*Form of Commissioning Certificate*], signed by the Lead Test Engineer, confirming that online local testing of the applicable Generating Unit, has been successfully completed.

- (b) to BC Hydro's Representative, for information only, and to the Independent Certifier, updated test data and information required pursuant to Appendix 5G [*Interconnection Submittal Requirements*] to the greatest extent practicable.

9.6.7 Generating Unit Online Remote Testing

A. Conditions Precedent

Prior to proceeding with synchronization and online testing of a Generating Unit, Project Co shall:

- (a) have successfully completed all Generating Unit online local testing in accordance with Section 9.6.6 [*Generating Unit Online Local Testing*] of this Schedule; and
- (b) prepare and submit to BC Hydro's Representative, for information only, and to the Independent Certifier, a Commissioning Certificate – Part I, in the form attached hereto as Appendix 5M [*Form of Commissioning Certificate*], signed by the Designer, the Design-Builder and Project Co's Representative, confirming that all pre-commissioning tests, inspections and other conditions precedent to online remote testing of the applicable Generating Unit have been completed and that the applicable Generating Unit is ready to, and can safely, be subjected to online remote testing;
- (c) obtain CNEs, accepted pursuant to the Consent Procedure, for all equipment to be subjected to energized online testing; and
- (d) have submitted an updated version of each previously submitted Operating Order, as required to reflect any changes to the Facility, to which BC Hydro has no objection in accordance with the Review Procedure.

B. Key Tests

Project Co shall complete the following testing, as a minimum:

- (a) SCADA and telecommunications system testing, including:
 - (i) integration testing of alarms, telemetry, supervisory control and protection for all equipment, up to the JHN Remote Terminal Unit (RTU) interface;
 - (ii) individual verification testing of all remotely monitored indications, alarms and controls, between the Facility and the Remote Control Centre. For verification of remote operation, each control command shall be initiated at the Remote Control Centre and correct operation confirmed; and
 - (iii) testing of all analogue values and status indications, including confirmation of correct indication by the Remote Control Centre. Each supervisory alarm shall be initiated in the applicable Facility control system and confirmed by the Remote Control Centre.

C. Submittals

Within 24 hours after completion of online remote testing of the applicable Generating Unit, Project Co shall prepare and submit:

- (a) to BC Hydro's Representative, for information only, and to the Independent Certifier, a Commissioning Certificate – Part II, in the form attached hereto as Appendix 5M [*Form of Commissioning Certificate*], signed by the Lead Test Engineer, confirming that online remote testing of the applicable Generating Unit, has been successfully completed.
- (b) to BC Hydro's Representative, for information only, and to the Independent Certifier, updated test data and information required pursuant to Appendix 5G [*Interconnection Submittal Requirements*] to the greatest extent practicable.

9.6.8 Marketable Power Test

A. Conditions Precedent

Prior to proceeding with the marketable power test for a Generating Unit, or of the Facility, as applicable, Project Co shall:

- (a) have successfully completed all Generating Unit online local and remote testing in accordance with Section 9.6.6 [*Generating Unit Online Local Testing*] and 9.6.7 [*Generating Unit Online Remote Testing*] of this Schedule;
- (b) prepare and submit to BC Hydro's Representative, for information only, and to the Independent Certifier, a Commissioning Certificate – Part I, in the form attached hereto as Appendix 5M [*Form of Commissioning Certificate*], signed by the Designer, the Design-Builder and Project Co's Representative, confirming that all pre-commissioning tests, inspections and other conditions precedent to the marketable power test for the applicable Generating Unit, or for the Facility, as applicable, have been completed and that the applicable Generating Unit, or the Facility, as applicable, is ready to, and can safely, be subjected to the marketable power test; and
- (c) have submitted an updated version of each previously submitted Operating Order, as required to reflect any changes to the Facility, to which BC Hydro has no objection in accordance with the Review Procedure.

B. Key Tests

Project Co shall demonstrate that the applicable Generating Unit, or the Facility, as applicable, is generating, or Available to generate, power without the occurrence of a Derate, Outage or Immediate Call-Out for:

- (a) a period of 120 consecutive hours for each Generating Unit, as applicable for Commercial Operation; and

- (b) a period of 120 consecutive hours for the Facility (with all three Generating Units operating, or Available), for Service Commencement,

so as to demonstrate that the Generating Unit, or the Facility, as applicable:

- (c) can safely and reliably produce marketable power;
- (d) can operate over the full range of discharges within the Normal Operating Conditions, without a Derate, Outage or Immediate Call-Out, and within the Project Requirements applicable to the equipment; and
- (e) can continuously provide power to the BC Hydro Transmission System in accordance with all applicable regulatory requirements and the Legal Obligations.

C. Submittals

Within 24 hours after completion of the applicable marketable power tests, Project Co shall prepare and submit:

- (a) to BC Hydro's Representative, for information only, and to the Independent Certifier, a Commissioning Certificate – Part II, in the form attached hereto as Appendix 5M [*Form of Commissioning Certificate*], signed by the Lead Test Engineer, confirming that the marketable power test of the applicable Generating Unit, or of the Facility, as applicable, has been successfully completed; and
- (b) to BC Hydro's Representative, for information only, and to the Independent Certifier, a written marketable power test report confirming the results of the applicable marketable power test, together with sufficient documentation to demonstrate that the Generating Unit, or the Facility, as applicable, has successfully completed the marketable power test requirements.

9.7 BC Hydro Required Testing

Without limiting the requirements of Section 9.6 [*Commissioning Execution*] of this Schedule, as part of the Commissioning Work, and prior to making an application for a Certificate of Service Commencement, Project Co shall successfully complete all inspections and testing specified in Schedule 6 [*Design and Construction Specifications*] along with the following tests:

9.7.1 Generator Sudden Short-Circuit Tests

- (a) Sudden short-circuit tests shall be performed on one Generator only and measurements shall be made at a minimum of five voltage steps for extrapolation purposes. Sudden short-circuit tests shall be performed up to 100% rated voltage.
- (b) Project Co shall ensure that all currents produced or experienced during the sudden short-circuit tests are measured accurately.

- (c) Prior to performance of the sudden short-circuit tests, Project Co shall perform a stator winding single-phase HDV step test in accordance with BC Hydro Maintenance Standard 01.20.TEST.02.
- (d) After the completion of the sudden short-circuit tests, Project Co shall perform a stator winding single-phase HDV step test in accordance with BC Hydro Maintenance Standard 01.20.TEST.02.
- (e) Project Co shall compare the results of the two-stator winding single-phase HDV step tests and perform an inspection of the windings and Generator to confirm compliance with the Project Requirements, including inspections of:
 - (i) the Generator to determine that all coils and other materials are tight in the slot and have not slipped;
 - (ii) the Generator to determine that wedges, packing, blocking, and lashings are tight; and
 - (iii) the stator frame and winding components for abnormalities including:
 - (A) loose stator laminations, loose core clamping studs, loose fingers, hotspots or paint discolouration;
 - (B) presence of dust or powder which may be related in any way to deterioration of the stator winding, core, circuit ring buses or main and neutral leads; or
 - (C) unusual movement, cracking or distortion.
- (f) Project Co shall prepare and submit a test and inspection report, describing the test findings and attaching all relevant data and observations collected. The applicable test and inspection report shall be submitted to BC Hydro's Representative concurrently with the Commissioning Test Report.

9.7.2 Transient Testing/Full Plant Load Rejection Test

- (a) Full plant load rejection test, shedding full generation of all three Generating Units by simultaneously opening all three Generating Unit circuit breakers, shall be conducted. If the Bypass System is available prior to Service Commencement, this test shall include the operation of the Bypass System, including testing of each Bypass System valve up to its maximum capacity, and transfer of flow back to the Generating Units in accordance with allowable ramp rates. If the Bypass System is not available prior to Service Commencement, this test, including the operation of the Bypass System up to the Maximum Normal Bypass Flow and transfer of flow back to the Generating Units in accordance with allowable ramp rates shall be repeated as a condition precedent to Bypass System Completion. If the Powerhouse Flows, as specified in GOO 4G-44, do

not permit operation of the Bypass System to the Maximum Normal Bypass Flow at the time of testing, the test shall be repeated as soon as practicable thereafter, and any identified deficiencies shall be added to the list of Bypass System Deficiencies or Service Commencement Deficiencies, as applicable.

- (b) Transient instrumentation installed in the Power Tunnel shall be monitored during the full plant load rejection test. The instrumentation at a minimum shall record:
 - (i) the level of the surge or drop of the water level at any free surface in the Water Conveyances (including any Surge Tanks, shafts and intake shafts)
 - (ii) the pressure rise at or near the spiral case inlets and Surge Tank(s) (if used); and
 - (iii) the pressure rise and/or fall at the location in the Water Conveyances that is upstream of the Power Tunnel shaft and where the hydraulic grade line is closest to the crown of the Water Conveyances.

9.7.3 Emergency Closure Tests

- (a) Activation of each TIV emergency closure from all contacts shall be demonstrated.
- (b) Closure of each TIV against Rated Flow shall be demonstrated, this test will involve bypassing some of the normal Generating Unit protection until the negative sequence power relay removes the Generating Unit from operation.
- (c) Activation of the Power Intake Operating Gate emergency closure and proper transfer-trip to the Generating Unit TIVs shall be demonstrated. Full emergency closure of the Power Intake Operating Gate will be demonstrated by cracking the INOG and completing an emergency closure from the fill position height at full differential head.
- (d) Closure of the valves isolating the LLO and EFRS under the applicable maximum flow conditions shall be demonstrated.
- (e) Closure of the valves isolating the Bypass System under the maximum flow conditions shall be demonstrated.

9.7.4 Functional Test of the Security Systems

- (a) Testing of the Facility's security systems, including all cameras and alarms, through to the JHN Remote Terminal Unit (RTU) interface, shall be performed to demonstrate that the Facility's security systems are fit for the uses of the Facility's security systems, as described in the Design and Construction Specifications, and fulfill the applicable Project Requirements.

9.7.5 Total Building System Integration Testing

- (a) Integrated testing of all Facility systems and sub-systems, including fire protection, HVAC, emergency egress lighting, alarms and devices, domestic water systems, elevators, Backup Diesel Generator, and security systems, shall be performed to demonstrate that the Facility and each such auxiliary system is fit for the uses of the Facility, as described in the Design and Construction Specifications, and fulfills the applicable Project Requirements.

9.7.6 Environmental Requirements Confirmation Testing

- (a) Not Used.
- (b) Testing sufficient to demonstrate that operation of the Bypass System does not result in increased total gas pressure (TGP) levels in excess of those specified in Section 5.1-3.2(O) *[Bypass System]*.of Schedule 6 *[Design and Construction Specifications]*.
- (c) Testing sufficient to demonstrate that operation of the Generating Units, Bypass System, Environmental Flow Release System and Low Level Outlet, do not result in unauthorized negative impacts to the surrounding environment, including fish habitat, riparian areas and total gas pressure levels.
- (d) Testing sufficient to demonstrate that the full range of Environmental Flow Releases (4-10 m³/s) can be released with the Generating Units each at maximum discharge and performing in accordance with the applicable Project Requirements.

9.7.7 Reliability Requirements Confirmation Testing

- (a) Testing sufficient to demonstrate that the Generating Units are each capable of starting and accepting full load within 10 minutes, after being offline for 24 hours.
- (b) Testing sufficient to demonstrate that the Generating Units can each be started from the Backup Diesel Generator, as the sole source of station service power supply.
- (c) Load tests of protective relays immediately after initial energization including ratio, polarity and phasing checks of CT's and VT's.
- (d) Testing sufficient to demonstrate the functionality of the DC Station Service System and the Essential Station Service System, including operation of the automatic transfer scheme, and the Backup Diesel Generator.

9.7.8 Runaway Speed Testing

- (a) The ability of one Generating Unit to withstand the effects of maximum runaway speed without damage shall be tested.

- (b) Testing shall be performed at the Generating Unit's maximum runaway speed, sustained for 5 minutes.

9.7.9 Minimum Performance Testing

- (a) Testing sufficient to demonstrate and document the stable operation of all three Generating Units, concurrently with the marketable power test, as described in Section 9.6.8 [*Marketable Power Test*] of this Schedule, with all Facility systems including auxiliary systems online and operating normally, including the control thereof, while: (i) passing the Maximum Normal Powerhouse Flow (124m³/s) with 10 m³/s Environmental Flow Release; and (ii) producing at least 128MW on average over a continuous 24 hour period, with a measurement accuracy of +/- 0.5 MW, as measured at the high voltage disconnects by the Facility's metering and control devices, with the Reservoir at least at elevation 139.3m.

9.7.10 Not Used.

9.8 WECC Testing

Project Co shall conduct all required online and offline testing of one Generating Unit to collect Generating Unit data necessary to create and validate models of all applicable Generating Unit components, including the Generator, governor system, excitation system, and power system stabilizers in accordance with WECC's policy "*Generating Unit Model Validation Policy*" (<http://www.wecc.biz/>). The applicable WECC Generating Unit Data Requirements are set out in Appendix 5G [*Interconnection Submittal Requirements*].

Project Co shall submit a "***WECC Test Data and Model Validation Report***" for one Generating Unit to BC Hydro, pursuant to the Review Procedure, at least 30 days prior to making an application for the Certificate of Total Completion. The WECC Test Data and Model Validation Report shall be consistent in content and level of detail with the sample report titled "*Testing of Synchronous Unit Reactive Limits and Dynamic Testing Model Validation for Stave Falls Generating Station – BC Hydro Generation Technical Services Report GEN10*", dated August 2004, included in the Disclosed Data.

9.9 Commissioning Test Report

Within 90 days after the Service Commencement Date, Project Co shall cause the Lead Test Engineer to prepare and submit a commissioning test report to BC Hydro's Representative in accordance with the Review Procedure (the "***Commissioning Test Report***"). The Commissioning Test Report shall be: (i) formally reviewed by the Designer for conformance of the Facility to the Project Requirements and the design; (ii) signed and sealed, by the Designer and the Lead Test Engineer; and (iii) fully integrated with the Facility Model, and shall include:

- (a) a description of all Commissioning Work performed by Project Co, together with detailed records of all results, data and observations obtained during the Commissioning of the Facility;

- (b) results of all equipment tests and inspections as described in IEEE 1248 (IEEE Guide for the Commissioning of Electrical Systems in Hydroelectric Power Plants) and ANSI/NETA ATS-2009 (Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems);
- (c) results of all BC Hydro Required Testing, as described in Section 9.7 [*BC Hydro Required Testing*] of this Schedule;
- (d) information for each tested piece of equipment, component, system and sub-system, including:
 - (i) description of the tested equipment, component, system or sub-system;
 - (ii) purpose of the test, including pass fail criteria;
 - (iii) test procedure utilized and applicable industry standards;
 - (iv) time and date of the test and name of tester;
 - (v) measuring instruments used, including make, model and accuracy; sketches indicating location of test measurements; calibration data for each instrument; and calculation of measurement uncertainty;
 - (vi) sample calculations demonstrating how test results were obtained from measured data;
 - (vii) photographs and other test documentation; and
 - (viii) results of the test, including pass or fail;
- (e) all signed off quality control inspection sheets with final calibrations, set points, measurements and inspection results; and
- (f) a baseline report covering each tested piece of equipment, component, system and sub-system, including all quantitative data required to establish a baseline for comparing performance, determining deterioration over the applicable Design Service Life and assessing the sufficiency and performance of the Asset Management Plan.

Where the Bypass System Completion Date occurs after the Service Commencement Date, within 60 days after the Bypass System Completion Date, Project Co shall cause the Lead Test Engineer to prepare and submit an updated Commissioning Test Report, including results of all Commissioning of the Bypass System and any additional Commissioning Work, to BC Hydro's Representative in accordance with the Review Procedure.

Within 60 days after completion of the testing required by Section 11.5.2(p) [*Conditions Precedent for Total Completion*] of this Schedule, Project Co shall cause the Lead Test Engineer to prepare and submit

an updated Commissioning Test Report, including details of such testing and any additional Commissioning Work, to BC Hydro's Representative in accordance with the Review Procedure.

Within 60 days after completion of the Performance Verification Tests, Project Co shall cause the Lead Test Engineer to prepare and submit an updated Commissioning Test Report, including details of the Performance Verification Tests (including charts and graphs of Performance Verification Test results) and any additional Commissioning Work, to BC Hydro's Representative in accordance with the Review Procedure.

All updates to the Commissioning Test Report shall also be (i) formally reviewed by the Designer for conformance of the Facility to the Project Requirements and the design; (ii) signed and sealed, by the Designer and the Lead Test Engineer; and (iii) fully integrated with the Facility Model.

9.10 Training

Project Co shall be knowledgeable on the proper operation and maintenance of the Facility, including the use and maintenance of all equipment, components, systems and sub-systems installed in the Facility, and shall, during Commissioning and in any event prior to transfer of Operating Authority for the applicable system, sub-system or portion of the Facility to BC Hydro, provide training and education for BC Hydro staff sufficient to enable persons with appropriate qualifications and experience to operate and maintain the Facility.

Project Co shall prepare and supply all materials required for training of BC Hydro staff, which materials shall:

- (a) be Project-specific, prepared for the specific equipment, components, systems and sub-systems provided as part of the Facility;
- (b) address relevant Site-specific conditions, including environmental conditions under which the Facility will operate;
- (c) be fully integrated with the Facility Model and the applicable Manuals;
- (d) be written entirely in English, using accepted North American nomenclature and terminology; and
- (e) be electronically searchable, logically organized, clear, legible, grammatically correct and capable of being photocopied or printed for reproduction by BC Hydro.

At least 15 Business Days prior to the occurrence of any proposed training or education session involving BC Hydro staff, Project Co shall provide written notice to BC Hydro's Representative describing the purpose, scope, timing, location and duration of the proposed training or education session. Provided that Project Co has provided the required notice, BC Hydro will identify the relevant BC Hydro staff and make such staff available at reasonable times before the Service Commencement Date, or transfer of Operating Authority for the applicable system or portion of the Facility, as applicable.

10. RECORD DOCUMENTATION; FINAL REPORTING

10.1 Construction Certificates

Project Co shall, in accordance with the procedures set out in the Design Management Plan and the relevant Quality Documentation or other Project Requirements, submit Construction Certificates to the Independent Certifier and to BC Hydro's Representative in accordance with the Review Procedure.

The Construction Certificates shall contain, or refer to and be submitted with, a package of information used to verify and confirm that the part of the Project Work covered by the Construction Certificate has been completed in accordance with the requirements of this Agreement and shall include the applicable as-built documentation. The Construction Certificates shall be in the format shown in Appendix 5O [*Form of Construction Certificate*].

The applicable Construction Certificates shall be submitted to BC Hydro's Representative and the Independent Certifier prior to the application for: (i) Commercial Operation of each Generating Unit; (ii) Bypass System Completion; (iii) Service Commencement; and (iv) Total Completion.

Project Co's Representative, the Designer and the Design-Builder shall each sign all Construction Certificates.

10.2 As Built Documentation

10.2.1 General

All as-built documents including As Built Drawings shall be certified and signed by a duly authorized and qualified representative of the Designer, confirming and certifying that the as-built documents truly and accurately represent the as-built conditions, that any changes from the applicable Final Design submission have been reviewed by the Designer, and do not adversely affect the integrity, safety or quality of the Existing Facility or the Facility, or result in any contravention of any requirement of this Agreement.

All as-built drawings shall:

- (a) be clearly marked as an as-built drawing by use of a stamp or a label in the notes;
- (b) indicate that the drawing was originally signed and sealed by the person responsible for the design, naming that person in the declaration;
- (c) maintain the original drawing number; and
- (d) show as built locations, sizes and details of the Project Work as executed,

(collectively, the "**As Built Drawings**").

10.2.2 Geotechnical As Builts

Project Co shall survey the final surfaces of all excavations using LIDAR to achieve a survey point density equal to or less than 0.2 m in each direction. Project Co shall use the LIDAR survey to prepare a digital terrain model (DTM) of the as-built excavations in AutoCAD and, at least 45 days prior to making application for the Certificate of Service Commencement, shall submit to BC Hydro the DTM as the as-built record of the excavations.

At least 45 days prior to making application for the Certificate of Service Commencement, Project Co shall submit as-built records of all rock support, including the locations and lengths of rock bolts and drains, and the areas and thicknesses of shotcrete, and the location, extent and type of steel mesh or other reinforcement. As-built records of rock support can be in the form of drawings or annotated photographs provided that sufficient reference lines and datum are shown on the photographs to accurately locate the rock support.

At least 90 days prior to making application for the Certificate of Total Completion, Project Co shall submit as-built records of all geotechnical instrumentation installed as an aid to Construction and as a part of the completed Facility. These records shall include calibration data, all readings and interpretation of those readings.

10.2.3 Site Plan As Builts

At least 45 days prior to making an application for: (i) the Certificate of Service Commencement; and (ii) the Certificate of Total Completion, Project Co shall prepare and submit to BC Hydro's Representative an as-built Site plan detailing the total Construction footprint, including all Construction laydown areas used in the performance of the Project Work, and an as-built Site plan showing the location of all permanent works comprising the Facility.

10.2.4 Control Point Survey

Within 6 months after the Service Commencement Date, Project Co shall cause a professional land surveyor, registered in the Province of British Columbia, to: (i) conduct a survey of the Site; (ii) prepare updated control point survey drawings, based on the "*Control Point Survey Drawing 502-S11-00010*" included in the Disclosed Data; and (iii) install a sufficient quantity (not less than the number of existing survey markers removed by Project Co during the performance of the Construction) of permanently affixed (brass pin) survey markers on the Lands so as to properly delineate the Facility in accordance with Good Utility Practice. Project Co shall promptly submit the updated control point survey drawings to BC Hydro's Representative.

10.3 Manuals

10.3.1 Preliminary Drafts

Not later than 120 days prior to submission of an application for a Leave to Commence Operation, Project Co shall submit copies of the following preliminary drafts to BC Hydro's Representative in accordance with the Review Procedure:

- (a) GOO 4G-44 (Excerpts), prepared in accordance with *Appendix 5L [Operating Order Requirements]* and based on GOO 4G-44 (John Hart Project) included in the Disclosed Data; and
- (b) the OMS Manual (Excerpts), the Generation Emergency Plan (Excerpts), and the Emergency Planning Guide (Excerpts), each prepared in accordance with Appendix 5P *[Manuals]*.

Not later than 180 days prior to the Target Service Commencement Date, Project Co shall demonstrate the electronic interface, including the integration of the Manuals and the Facility Model, and deliver preliminary drafts of the following manuals, prepared in accordance with Appendix 5P *[Manuals]*, to BC Hydro's Representative:

- (c) all Installation Manuals;
- (d) all O&M Manuals;
- (e) the Facility Manual; and
- (f) the Geotechnical Instrumentation Manual.

10.3.2 Final Excerpts

Not later than 75 days prior to submission of an application for a Leave to Commence Operation, Project Co shall submit the following excerpts to BC Hydro's Representative in accordance with the Review Procedure:

- (a) GOO 4G-44 (Excerpts), prepared in accordance with *Appendix 5L [Operating Order Requirements]*; and
- (b) the OMS Manual (Excerpts), the Generation Emergency Plan (Excerpts) and the Emergency Planning Guide (Excerpts), each prepared in accordance with Appendix 5P *[Manuals]*.

Not later than 45 days prior to the date on which Project Co first makes an application for a Certificate of Service Commencement, Project Co shall submit the following manuals, prepared in accordance with Appendix 5P *[Manuals]*, to BC Hydro's Representative in accordance with the Review Procedure:

- (c) all Installation Manuals;
- (d) all O&M Manuals;
- (e) the Facility Manual; and
- (f) the Geotechnical Instrumentation Manual.

10.3.3 Final Manuals

BC Hydro will prepare and provide Project Co with an updated copy of GOO 4G-44 (John Hart Project), within 60 days after submission by Project Co in accordance with Section 10.3.2 [*Final Excerpts*] of this Schedule of the GOO 4G-44 (Excerpts), OMS Manual (Excerpts) and Generation Emergency Plan (Excerpts) and Emergency Planning Guide (Excerpts) to which BC Hydro has no objection in accordance with the Review Procedure.

10.4 Final Design and Construction Report

Project Co shall prepare and submit to BC Hydro pursuant to the Review Procedure a final report on the Project (the "***Final Design and Construction Report***"). A preliminary draft of the Final Design and Construction Report, excluding only the chapter on Commissioning, shall be delivered to BC Hydro's Representative at least 3 months prior to the Target Service Commencement Date. The Final Design and Construction Report shall be submitted to BC Hydro's Representative pursuant to the Review Procedure no later than 1 month prior to the Target Total Completion Date. The Final Design and Construction Report shall describe the Design and Construction and shall include separate chapters for Design, Construction, Commissioning, Safety, and Environmental, as follows:

- (a) the Design chapter of the Final Design and Construction Report shall include a detailed description of the design philosophy employed for the Facility, a summary of the design changes that occurred during the performance of the Project Work, and a summary of the geotechnical and rock mechanic issues that were addressed during Construction (including a summary of the rock support requirements). The following shall be incorporated by reference into the Final Design and Construction Report: (i) each Design Basis Memorandum; and (ii) each as-built general arrangement drawing, block diagram, schematic, and one-line diagram. The Final Design and Construction Report shall include detailed descriptions (including photographs and drawings) of all rock support installed;
- (b) the Construction chapter of the Final Design and Construction Report shall include, for each major component of the Facility:
 - (i) a description of the equipment and methods used (illustrated by photographs);
 - (ii) documentation of any damage caused during Construction and remedial work performed to correct such damage;
 - (iii) the final Works Schedule (as-achieved); and
 - (iv) such other documentation as may be reasonably required to summarize the Construction of the Facility;
- (c) the Commissioning chapter of the Final Design and Construction Report shall be the Commissioning Test Report;

- (d) the Safety chapter shall include the following:
 - (i) safety statistics for the performance of the Construction performed on Site; and
 - (ii) a summary of WorkSafeBC inspections and any orders written by WorkSafeBC during the performance of the Construction on Site; and
- (e) The Environmental chapter shall include:
 - (i) a list and copy of all Permits obtained by Project Co for the Project Work;
 - (ii) a description of all material elements of the Design and material steps taken during Construction to minimize the environmental impact of the Facility and the Project Work, including a description of how each Project Environmental Commitment was addressed;
 - (iii) a description of all design, mitigation and other measures implemented to ensure that environmental impacts from the Project, the Facility and the Construction are kept within the limits described in the EA,
 - (iv) a summary of all environmental incidents reported to Environmental Authorities during Construction and measures taken to correct any environmental impacts associated with those incidents;
 - (v) a summary of all investigations by Environmental Authorities during Construction and any directions, charges, tickets, orders or other legal proceedings issued or commenced by any Environmental Authority or other Person with respect to Construction activities, a description of the steps taken with respect to those matters and a description of the final resolution of the matter if a final resolution has been achieved at the time of delivery of the Final Design and Construction Report;
 - (vi) a list and location drawing of all spills of Hazardous Substances that occurred during Construction, together with a copy of the spill reports, a description of the steps taken to remove the Hazardous Substance and remediate any resulting Contamination and the results of all sampling to confirm completion of such removal and remediation;
 - (vii) all records associated with the final disposition of any Contamination and Hazardous Substances removed or remediated during the performance of the Construction including the location, dates of disposal and volume of material sent to each disposal or recycling location; and
 - (viii) As Built Drawings showing:

- (A) topographic contours of all areas restored to the date of delivery of the Final Design and Construction Report, indicating the date seeded or planted, seed mix and plant types used and rate of application;
- (B) the location and details of any fisheries compensation habitat constructed to the date of delivery of the Final Design and Construction Report; and
- (C) the location and details of any red-legged frog compensation habitat constructed to the date of delivery of the Final Design and Construction Report.

The following shall also be attached as appendices to the Final Design and Construction Report:

- (f) quality control summary documentation (such as histograms) of concrete strengths, shotcrete strengths and all other Site inspection and testing specified in the applicable quality control plans; and
- (g) results of testing of high capacity rock anchors for permanent support.

11. COMPLETION

11.1 Requirements for Commercial Operation of a Generating Unit

11.1.1 Advance Notice of Application for Commercial Operation

Project Co acknowledges that the Independent Certifier will need sufficient time to complete any inspections, consult with BC Hydro, and prepare the lists of deficiencies, and accordingly Project Co shall:

- (a) at least 15 Business Days but no more than 30 Business Days prior to the applicable Target Commercial Operation Date, deliver to the Independent Certifier, with a concurrent copy to BC Hydro's Representative, a notice setting out:
 - (i) a description of all outstanding Design and Construction to be completed by Project Co prior to Commercial Operation of the applicable Generating Unit; and
 - (ii) a list of all Defects and incomplete Design or Construction that Project Co is aware of at the time of the notice; and
- (b) assist the Independent Certifier to make any advance inspections requested by the Independent Certifier.

If Project Co has at any time reason to believe that the expected date for Commercial Operation of the applicable Generating Unit shall be delayed or achieved earlier by more than 5 Business Days, it shall issue a fresh notice informing the Independent Certifier and BC Hydro's Representative of the new date expected for Commercial Operation of the Generating Unit.

11.1.2 Conditions Precedent to Commercial Operation of a Generating Unit

Commercial Operation of each Generating Unit shall only be achieved if, at the time of certification, the applicable Generating Unit is Available and the following conditions precedent have been satisfied:

A. Conditions Precedent to Commercial Operation of Each Generating Unit

- (a) Substantial Completion of the Powerhouse Building has occurred;
- (b) Substantial Completion of the Power Intake Structure has occurred;
- (c) a Commissioning Notice to Operate, including a declaration of any Defects and incomplete Design or Construction, in the form attached as Appendix 5Q *[Commissioning Notice to Operate Form]*, has been received by BC Hydro and is signed by the Lead Test Engineer, Project Co's Representative, the Designer and the Independent Certifier;
- (d) Project Co has submitted an updated version of LOO 3-G-JHN-01 (John Hart Generating Station), prepared in accordance with the requirements of Appendix 5L *[Operating Order Requirements]*, to which BC Hydro has no objection in accordance with the Review Procedure; and
- (e) Project Co has submitted an updated version, to which BC Hydro has no objection in accordance with the Review Procedure, of each previously submitted Operating Order, as required to reflect any changes to the Facility.

B. Procedures for Issuance of a Commissioning Notice to Operate for Each Generating Unit

In order to obtain a completed Commissioning Notice to Operate for a Generating Unit, Project Co shall:

- (a) successfully complete all Commissioning Work, including the BC Hydro required testing pursuant to Sections 9.7.3, 9.7.6(c), 9.7.7(a) and 9.7.7(c) *[BC Hydro Required Testing]* of this Schedule and reliability testing (excluding WECC testing as described in Section 9.8 *[WECC Testing]* of this Schedule), with respect to the Generating Unit and all associated equipment, components, systems and sub-systems, without any protection or alarm systems "jumpered out" or otherwise bypassed;
- (b) successfully complete a full load rejection test on the applicable Generating Unit;
- (c) have had all required Commissioning Notices to Energize accepted by BC Hydro in accordance with the Consent Procedure;
- (d) obtain all Leaves to Commence required by the Comptroller of Water Rights;
- (e) update all CNE documentation to include all information and knowledge gained during performance of the applicable Commissioning Work;

- (f) successfully complete the Marketable Power Test on the applicable Generating Unit in accordance with Section 9.6.8 [*Marketable Power Test*] of this Schedule;
- (g) successfully complete all testing of the SCADA, including demonstration of full remote operation and monitoring of the applicable Generating Unit from the Remote Control Centre;
- (h) successfully complete Commissioning of the Generation System protection systems (as they relate to the applicable Generating Unit), including the fire protection systems, Generating Unit deluge systems, oil water separators, dewatering system and HVAC system, including demonstration of their full functionality without outstanding Defects;
- (i) transfer Operating Responsibility for the applicable Generating Unit to BC Hydro in accordance with the procedures set out in the then current John Hart Joint Operating Order;
- (j) obtain all applicable Permits and regulatory approvals required for Commercial Operation of the Generating Unit, except those specified in Section 4.19 [*Regulatory Approvals and Permits*] of this Agreement, as being the responsibility of BC Hydro; and
- (k) prepare and submit a draft form of Commissioning Notice to Operate to the Independent Certifier for review and to BC Hydro's Representative for information only. The draft form of Commissioning Notice to Operate shall identify all Defects and incomplete Design or Construction, associated with the applicable Generating Unit and all associated equipment, components, systems and sub-systems and include a declaration by each of the Lead Test Engineer, Project Co's Representative and the Designer certifying that the Generating Unit and all associated equipment, components, systems and sub-systems are safe to operate despite the identified Defects and any incomplete Design and Construction activities.

Once signed by the Independent Certifier in accordance with Section 11.1.6(a) [*Certification of Commercial Operation*] of this Schedule, the draft Commissioning Notice to Operate prepared by Project Co shall constitute the "Commissioning Notice to Operate" for the applicable Generating Unit.

11.1.3 Application for Commercial Operation

If Project Co believes it has achieved the requirements for Commercial Operation of a Generating Unit and complied with Section 11.1.1 [*Advance Notice of Application for Commercial Operation*] of this Schedule, then Project Co may apply to the Independent Certifier (with a concurrent copy to BC Hydro's Representative) for Commercial Operation of the applicable Generating Unit.

11.1.4 Inspection for Commercial Operation

No later than 5 Business Days after Project Co delivers:

- (a) an application for Commercial Operation of the applicable Generating Unit pursuant to Section 11.1.3 [*Application for Commercial Operation*] of this Schedule;
- (b) the draft Commissioning Notice to Operate for the applicable Generating Unit;
- (c) the Construction Certificates in respect of Commercial Operation of the applicable Generating Unit; and
- (d) all other relevant certificates and supporting documentation in accordance with the Project Requirements,

to BC Hydro's Representative and the Independent Certifier, the parties will require the Independent Certifier to, in cooperation with Project Co's Representative and BC Hydro's Representative:

- (e) review and verify the accuracy of the draft form of Commissioning Notice to Operate and the listed Defects and incomplete Design or Construction;
- (f) review all applicable inspection, testing and Commissioning data, records and other information; and
- (g) perform an inspection of the Facility, the applicable Generating Unit and all associated equipment, components, systems and sub-systems, to determine whether Commercial Operation of the applicable Generating Unit has been achieved.

11.1.5 Deficiency List

Prior to and as a condition of issuance of the Certificate of Commercial Operation for each Generating Unit, Project Co shall, in cooperation with BC Hydro's Representative and the Independent Certifier, prepare a complete list of Defects and incomplete Design or Construction that are apparent upon review of all applicable inspection, testing and Commissioning data, records and other information and inspection of the Facility, the applicable Generating Unit and all associated equipment, components, systems and sub-systems (the "**Commercial Operation Deficiencies**") and deliver to BC Hydro's Representative and the Independent Certifier the list of Commercial Operation Deficiencies.

Subject to the right of Project Co to refer matters to the Dispute Resolution Procedure as set out below, the list of Commercial Operation Deficiencies shall include all items required by BC Hydro to be included on such list.

BC Hydro or Project Co may refer matters relating to the accuracy or completeness of the list of Commercial Operation Deficiencies to the Dispute Resolution Procedure.

11.1.6 Certification of Commercial Operation

BC Hydro's Representative and Project Co shall cause the Independent Certifier, within 5 Business Days of the commencement of the inspection under Section 11.1.4 [*Inspection for Commercial Operation*] of this Schedule, to either:

- (a) issue the Commissioning Notice to Operate and the Certificate of Commercial Operation for the applicable Generating Unit, stating the applicable Commercial Operation Date, to BC Hydro and Project Co and sign the draft form of Commissioning Notice to Operate confirming that: (i) the Generating Unit and all associated equipment, components, systems and sub-systems are safe to operate despite the identified Defects and any incomplete Design and Construction activities; and (ii) the Generating Unit and all associated equipment, components, systems and sub-systems meet the applicable Project Requirements, subject to correction of the applicable Commercial Operation Deficiencies; or
- (b) notify Project Co and BC Hydro's Representative of its decision not to sign the draft Commissioning Notice to Operate and issue the Certificate of Commercial Operation for the applicable Generating Unit and state the reasons in detail for such decision, including what further work may be required to achieve Commercial Operation of the applicable Generating Unit.

11.1.7 Refusal to Certify Commercial Operation

The Independent Certifier shall refuse to sign the draft Commissioning Notice to Operate and issue the Certificate of Commercial Operation for the applicable Generating Unit only if: (i) the Generating Unit and all associated equipment, components, systems and sub-systems do not meet the conditions precedent specified in Section 11.1.2 [*Conditions Precedent to Commercial Operation of a Generating Unit*] of this Schedule; or (ii) the Generating Unit or any associated equipment, components, systems and sub-systems are not safe to operate.

11.1.8 Completion of Further Work for Commercial Operation

In the event of service of a notice by the Independent Certifier under Section 11.1.6(b) [*Certification of Commercial Operation*] of this Schedule, Project Co shall issue to the Independent Certifier a notice not less than 5 Business Days but no more than 10 Business Days prior to the date upon which Project Co expects to complete such further work or other measures necessary or appropriate to remedy or remove the cause of the Independent Certifier's refusal to issue the Commissioning Notice to Operate and the Certificate of Commercial Operation for the applicable Generating Unit. Upon Project Co notifying the Independent Certifier and BC Hydro's Representative that such further work or measures necessary or appropriate have been completed, BC Hydro's Representative and Project Co shall cause the Independent Certifier to commence, within 5 Business Days of receipt of such notice, an inspection of such further work or measures and the provisions of Section 11.1.2 [*Conditions Precedent to Commercial Operation of a Generating Unit*] of this Schedule through to this Section, inclusive, shall thereafter apply to such notice *mutatis mutandis*.

11.1.9 Correction of Commercial Operation Deficiencies

Upon issuance of the Certificate of Commercial Operation, Project Co shall proceed expeditiously to correct each Commercial Operation Deficiency by the date that is 60 days after the Commercial Operation Date for the applicable Generating Unit, or such later date as may be reasonably required to

provide sufficient time to correct the Commercial Operation Deficiency and that is agreed by BC Hydro, acting reasonably (each Commercial Operation Deficiency having its own “**Commercial Operation Deficiency Deadline**”).

11.2 Bridging Period

11.2.1 General

During the Bridging Period, Project Co shall be responsible for all aspects of the Facility, including inspection, maintenance, operation, and response to alarms and Forced Outages, with the exception of load dispatch and alarm monitoring of the Generating Units then in Commercial Operation.

The scope of administration, operations and maintenance responsibilities during the Bridging Period will be as further described in the John Hart Joint Operating Order.

Until the Service Commencement Date, Project Co shall retain Operating Authority for all equipment up to and including the high side disconnects on the Unit Transformers.

BC Hydro shall retain Operating Authority and Operating Responsibility for safety protection guarantee administration for all of the Substation up to, but not including, the high side disconnects on the applicable unit transformers, at all times throughout the Term.

After transfer of Operating Responsibility for each Generating Unit in accordance with the applicable BC Hydro Safety Practice Regulations, Project Co shall be required to notify the Remote Control Centre and obtain Operating Responsibility for the applicable Generating Unit from BC Hydro, prior to isolating, operating, maintaining or changing anything associated with the applicable Generating Unit. BC Hydro, acting reasonably, shall transfer Operating Responsibility back to Project Co upon request, subject to compliance with all applicable Laws and the Legal Obligations.

The party requiring an Outage or an Operating Constraint shall communicate the requirement to the other party's Representative. Where Project Co requires an Outage or an Operating Constraint, Project Co shall communicate the requirement to BC Hydro's Representative at least 5 days in advance using the Outages and Constraint Notification Form attached as Appendix 5R [*Outages and Constraints Notification Form*], with concurrent copies provided in accordance with the routing instructions shown thereon.

11.2.2 Dispatch of Facility by BC Hydro

Each Generating Unit in Commercial Operation shall be deemed to be available for unrestricted operation as provided in the latest version of LOO 3-G-JHN-01 (John Hart Generating Station) to which BC Hydro has no objection in accordance with the Review Procedure, unless BC Hydro has been formally notified of an Operating Constraint by Project Co using an Outages and Constraint Notification Form.

11.2.3 Response to Alarms and Outages

Project Co shall ensure that one of its authorized personnel, as identified in the then current version of LOO 3-G-JHN-01 (John Hart Generating Station), to which BC Hydro has no objection in accordance with

the Review Procedure, is designated and available 24x7 for contact by Remote Control Centre in the event of an alarm or outage.

The parties shall respond to alarms and outages in accordance with the then current versions of LOO 3-G-JHN-02A (JHN Alarm Systems) and LOO 3-G-JHN-02B (JHN Protection Information) to which BC Hydro has no objection in accordance with the Review Procedure. Without limiting the preceding sentence, Project Co shall implement and maintain, throughout the Bridging Period, a NFRS system in accordance with the requirements of Appendix 7C [*Notification of Failure or Request for Service*].

11.2.4 Operating Constraints and Outages During Bridging Period

All real time communication regarding operating issues will be conducted directly between the Remote Control Center and the Person designed as Project Co's "*Authorized Person*" in the latest version of LOO 3-G-JHN-01 (John Hart Generating Station) to which BC Hydro has no objection in accordance with the Review Procedure.

11.3 Requirements for Bypass System Completion

11.3.1 Advance Notice of Application for Bypass System Completion

Project Co acknowledges that the Independent Certifier will need sufficient time to complete any inspections, consult with BC Hydro, and prepare the lists of deficiencies, and accordingly Project Co shall:

- (a) at least 15 Business Days but no more than 30 Business Days prior to the Target Bypass System Completion Date, deliver to the Independent Certifier, with a concurrent copy to BC Hydro's Representative, a notice setting out:
 - (i) a description of all outstanding Design and Construction to be completed by Project Co prior to the Bypass System Completion Date; and
 - (ii) a list of all Defects and incomplete Design or Construction that Project Co is aware of at the time of the notice; and
- (b) assist the Independent Certifier to make any advance inspections requested by the Independent Certifier.

If Project Co has at any time reason to believe that the expected date for Bypass System Completion shall be delayed or achieved earlier by more than 5 Business Days, it shall issue a fresh notice informing the Independent Certifier and BC Hydro's Representative of the new date expected for Bypass System Completion.

11.3.2 Conditions Precedent to Bypass System Completion

Bypass System Completion shall only be achieved if, at the time of certification, the Bypass System is Available, and the following conditions precedent have been satisfied:

A. Conditions Precedent to Bypass System Completion

- (b) Substantial Completion of the Bypass System Facility and all applicable equipment, components, systems and sub-systems comprising the Bypass System has occurred;
- (c) Commissioning of the Bypass System and all applicable equipment, components, systems and sub-systems has been successfully completed;
- (d) a Commissioning Notice to Operate, including a declaration of any Defects and incomplete Design or Construction, in the form attached as Appendix 5Q [*Commissioning Notice to Operate Form*], has been received by BC Hydro and is signed by the Lead Test Engineer, Project Co's Representative, the Designer and the Independent Certifier;
- (e) Project Co has submitted an updated version of LOO 3-G-JHN-06B (JHN Bypass System), prepared in accordance with the requirements of Appendix 5L [*Operating Order Requirements*], to which BC Hydro has no objection in accordance with the Review Procedure;
- (f) Project Co has submitted an updated version, to which BC Hydro has no objection in accordance with the Review Procedure, of each previously submitted Operating Order, as required to reflect any changes to the Facility;
- (g) BC Hydro has no objection to any applicable SDI Certificates, prepared in accordance with Section 4.5 [*Confined Spaces*] of this Schedule, and submitted in accordance with the Review Procedure;
- (h) all conditions precedent for Service Commencement, as specified in Section 11.4.2 [*Conditions Precedent to Service Commencement*] of this Schedule, as they relate to the Facility, including integration of the Bypass System, remain satisfied (if the Bypass System Completion Date occurs after the Service Commencement Date); and
- (i) Commercial Operation of at least one Generating Unit has occurred.

B. Procedures for Issuance of a Commissioning Notice to Operate for Bypass System Completion

In order to obtain a completed Commissioning Notice to Operate for the Bypass System, Project Co shall:

- (a) successfully complete all Commissioning Work, including the BC Hydro required testing pursuant to Sections 9.7.3(e) and 9.7.6(b) [*BC Hydro Required Testing*] of this Schedule, with respect to the Bypass System and all applicable equipment, components, systems and sub-systems;
- (b) obtain all Leaves to Commence required by the Comptroller of Water Rights;
- (c) successfully complete all testing of the SCADA, including demonstration of full remote monitoring of the Bypass System from the Remote Control Centre;

- (d) transfer Operating Responsibility (and Operating Authority if after Service Commencement) for the Bypass System to BC Hydro in accordance with the procedures set out in the then current John Hart Joint Operating Order;
- (e) obtain all applicable Permits and regulatory approvals required for operation of the Bypass System, except those specified in Section 4.19 [*Regulatory Approvals and Permits*] of this Agreement, as being the responsibility of BC Hydro;
- (f) prepare and submit a draft form of Commissioning Notice to Operate to the Independent Certifier for review and to BC Hydro's Representative for information only. The draft form of Commissioning Notice to Operate shall identify all Defects and incomplete Design or Construction, associated with the Bypass System and all associated equipment, components, systems and sub-systems and include a declaration by each of the Lead Test Engineer, Project Co's Representative and the Designer certifying that the Bypass System and all associated equipment, components, systems and sub-systems are safe to operate despite the identified Defects and any incomplete Design and Construction activities;
- (g) if the Bypass Completion Date occurs after the Service Commencement Date, submit the complete, unfolded hard copy, full-sized, original set (excluding only those related to the Decommissioning Work and those which have already been submitted with Project Co's application for Service Commencement) of all signed and sealed (red ink stamped) Design Drawings, including the civil As Built Drawings and:
 - (i) the As Built Drawings for: (A) all Generation Systems; and (B) all protection and control systems for Generation Systems; or
 - (ii) if the As Built Drawings referred to in Section 11.3.2B.(g)(i) [*Conditions Precedent to Bypass System Completion*] of this Schedule are not yet available, a marked up, signed and sealed (red ink stamped), unfolded hard copy, full-sized original set of the issued for construction drawings,

and all shop or fabrication drawings required to be signed and sealed (red ink stamped), together with all revisions thereto, to BC Hydro on 24 lb. bond and in a logically organized and structured format; and
- (h) submit the complete, unfolded, hard copy, full-sized, original set (excluding only those related to the Decommissioning Work and those which have already been submitted with Project Co's application for Service Commencement) of all signed and sealed (red ink stamped) As Built operating one-line diagrams, isolation schematics and any other drawings required for the safe isolation of equipment.

Once signed by the Independent Certifier in accordance with Section 11.3.6(a) [*Certification of Bypass System Completion*] of this Schedule, the draft Commissioning Notice to Operate prepared by Project Co shall constitute the "Commissioning Notice to Operate" for the Bypass System.

11.3.3 Application for Bypass System Completion

If Project Co believes it has achieved the requirements for Bypass System Completion and complied with Section 11.3.1 *[Advance Notice of Application for Bypass System Completion]* of this Schedule, then Project Co may apply to the Independent Certifier (with a concurrent copy to BC Hydro's Representative) for Bypass System Completion.

11.3.4 Inspection for Bypass System Completion

No later than 5 Business Days after Project Co delivers:

- (a) an application for Bypass System Completion pursuant to Section 11.3.3 *[Application for Bypass System Completion]* of this Schedule;
- (b) the draft Commissioning Notice to Operate for the Bypass System;
- (c) the Construction Certificates in respect of the Bypass System; and
- (d) all other relevant certificates and supporting documentation in accordance with the Project Requirements,

to BC Hydro's Representative and the Independent Certifier, the parties will require the Independent Certifier to, in cooperation with Project Co's Representative and BC Hydro's Representative:

- (e) review and verify of the accuracy of the draft form of Commissioning Notice to Operate and the listed Defects and incomplete Design or Construction;
- (f) review all applicable inspection, testing and Commissioning data, records and other information; and
- (g) perform an inspection of the Facility, the Bypass System and all applicable equipment, components, systems and sub-systems, to determine whether Bypass System Completion has been achieved.

11.3.5 Deficiency List

Prior to and as a condition of issuance of the Certificate of Bypass System Completion, Project Co shall, in cooperation with BC Hydro's Representative and the Independent Certifier, prepare a complete list of Defects and incomplete Design or Construction that are apparent upon review of all applicable inspection, testing and Commissioning data, records and other information and inspection of the Facility, the Bypass System and all associated equipment, components, systems and sub-systems (the "**Bypass System Deficiencies**") and deliver to BC Hydro's Representative and the Independent Certifier the list of Bypass System Deficiencies. Where the As Built Drawings referred to in Section 11.3.2B.(g)(i) *[Conditions Precedent to Bypass System Completion]* of this Schedule are not submitted with Project Co's application for Bypass System Completion, the As Built Drawings will be included on the list of Bypass System Deficiencies.

Subject to the right of Project Co to refer matters to the Dispute Resolution Procedure as set out below, the list of Bypass System Deficiencies shall include all items required by BC Hydro to be included on such list.

BC Hydro or Project Co may refer matters relating to the accuracy or completeness of the list of Bypass System Deficiencies to the Dispute Resolution Procedure.

11.3.6 Certification of Bypass System Completion

BC Hydro's Representative and Project Co shall cause the Independent Certifier, within 5 Business Days of the commencement of the inspection under Section 11.3.4 [*Inspection for Bypass System Completion*] of this Schedule, to either:

- (a) issue the Certificate of Bypass System Completion, stating the Bypass System Completion Date, to BC Hydro and Project Co and sign the draft form of Commissioning Notice to Operate confirming that: (i) the Bypass System and all associated equipment, components, systems and sub-systems are safe to operate despite any identified Defects and any incomplete Design and Construction activities; and (ii) the Bypass System and all associated equipment, components, systems and sub-systems meet the applicable Project Requirements, subject to correction of the Bypass System Completion Deficiencies; or
- (b) notify Project Co and BC Hydro's Representative of its decision not to sign the draft Commissioning Notice to Operate and issue the Certificate of Bypass System Completion and state the reasons in detail for such decision, including what further work may be required to achieve Bypass System Completion.

11.3.7 Refusal to Certify Bypass System Completion

The Independent Certifier shall refuse to sign the draft Commissioning Notice to Operate and issue the Certificate of Bypass System Completion only if: (i) the Bypass System and all associated equipment, components, systems and sub-systems do not meet the conditions precedent specified in Section 11.3.2 [*Conditions Precedent to Bypass System Completion*] of this Schedule; (ii) the Bypass System or any associated equipment, components, systems and sub-systems (and the Facility, if after the Service Commencement Date) are not safe to operate; or (iii) any other conditions or requirements under this Agreement to the achievement of Bypass System Completion have not been satisfied or complied with.

11.3.8 Completion of Further Work for Bypass System Completion

In the event of service of a notice by the Independent Certifier under Section 11.3.6(b) [*Certification of Bypass System Completion*] of this Schedule, Project Co shall issue to the Independent Certifier a notice not less than 5 Business Days but no more than 10 Business Days prior to the date upon which Project Co expects to complete such further work or other measures necessary or appropriate to remedy or remove the cause of the Independent Certifier's refusal to issue the Commissioning Notice to Operate and the Certificate of Bypass System Completion. Upon Project Co notifying the Independent Certifier and BC Hydro's Representative that such further work or measures necessary or appropriate have been

completed, BC Hydro's Representative and Project Co shall cause the Independent Certifier to commence, within 5 Business Days of receipt of such notice, an inspection of such further work or measures and the provisions of Section 11.3.2 [*Conditions Precedent to Bypass System Completion*] of this Schedule through to this Section, inclusive, shall thereafter apply to such notice *mutatis mutandis*.

11.3.9 Correction of Bypass System Deficiencies

Upon issuance of the Certificate of Bypass System Completion, Project Co shall proceed expeditiously to correct each Bypass System Completion Deficiency by the date that is 60 days after the Bypass System Completion Date, or such later date as may be reasonably required to provide sufficient time to correct the Bypass System Completion Deficiency and that is agreed by BC Hydro, acting reasonably (each Bypass System Completion Deficiency having its own "***Bypass System Completion Deficiency Deadline***").

11.4 Service Commencement

11.4.1 Advance Notice of Application for Service Commencement

Project Co acknowledges that the Independent Certifier will need sufficient time to complete any inspections, consult with BC Hydro, and prepare the lists of deficiencies, and accordingly Project Co shall:

- (a) at least 15 Business Days but no more than 30 Business Days prior to the Target Service Commencement Date, deliver to the Independent Certifier, with a concurrent copy to BC Hydro's Representative, a notice setting out:
 - (i) a description of all outstanding Design and Construction to be completed by Project Co prior to the Service Commencement Date; and
 - (ii) a list of all Defects and incomplete Design or Construction that Project Co is aware of at the time of the notice; and
- (b) assist the Independent Certifier to make any advance inspections requested by the Independent Certifier.

If Project Co has at any time reason to believe that the expected date for Service Commencement shall be delayed or achieved earlier by more than 5 Business Days, it shall issue a fresh notice informing the Independent Certifier and BC Hydro's Representative of the new date expected for Service Commencement.

11.4.2 Conditions Precedent to Service Commencement

Service Commencement shall only be achieved if, at the time of certification, all three Generating Units and if the Bypass System Completion Date has occurred prior to Service Commencement, the Bypass System, are Available, and the following conditions precedent have been satisfied:

A. Conditions Precedent to Service Commencement

- (a) complete installation of all Bypass System components located within the Powerhouse Building has occurred;
- (b) all conditions precedent for Bypass System Completion, as specified in Section 11.3.2 [*Conditions Precedent to Bypass System Completion*] of this Schedule, remain satisfied (if the Service Commencement Date occurs after the Bypass System Completion Date). If the Bypass System Completion Date occurs after the Service Commencement Date, all references in this Section 11.4.2 to the Facility, shall exclude the Bypass System;
- (c) Commercial Operation of all three Generating Units has occurred;
- (d) Substantial Completion of the Facility has occurred, excepting only:
 - (i) the Decommissioning Work;
 - (ii) final restoration, remediation and landscaping work;
 - (iii) final paving of Permanent Access Roads and parking lots and final grading of gravel roads; and
 - (iv) any Design or Construction work specifically indicated under Schedule 5 [*Design and Construction Protocols*] or Schedule 6 [*Design and Construction Specifications*] as occurring after the Service Commencement Date;
- (e) a Commissioning Notice to Operate for the Facility, including a declaration of any Defects and incomplete Design or Construction, in the form attached as Appendix 5Q [*Commissioning Notice to Operate Form*], has been received by BC Hydro and is signed by the Lead Test Engineer, Project Co's Representative, the Designer and the Independent Certifier;
- (f) Project Co has submitted LOO 3-G-JHN-05 (JHN Work Protection Practices), prepared in accordance with the requirements of *Appendix 5L [Operating Order Requirements]* and based on LOO 3-G-JHT-05 (John Hart Generating Station (JHT) Work Protection Practices) included in the Disclosed Data, to which BC Hydro has no objection in accordance with the Review Procedure;
- (g) Project Co has submitted LOO 3-G-JHN-07A (Air Auxiliary Systems), prepared in accordance with the requirements of *Appendix 5L [Operating Order Requirements]* and based on LOO 3-G-JHT-07A (John Hart Generating Station (JHT) Air Auxiliary Systems) included in the Disclosed Data, to which BC Hydro has no objection in accordance with the Review Procedure;
- (h) Project Co has submitted an updated version of LOO 3-G-JHN-07B (Drinking Water System Emergency Response Plan), prepared in accordance with the requirements of

Appendix 5L [Operating Order Requirements] and based on LOO 3-G-JHT-07B (John Hart Generating Station (JHT) Drinking Water System Emergency Response Plan) included in the Disclosed Data, to which BC Hydro has no objection in accordance with the Review Procedure;

- (i) Project Co has submitted an updated version of LOO 3-G-JHN-09 (John Hart Station Security), prepared in accordance with the requirements of *Appendix 5L [Operating Order Requirements]* and based on LOO 3-G-JHT-09 (John Hart Generating Station (JHT) John Hart Station Security) included in the Disclosed Data, to which BC Hydro has no objection in accordance with the Review Procedure;
- (j) Project Co has submitted an updated version, to which BC Hydro has no objection in accordance with the Review Procedure, of each previously submitted Operating Order, as required to reflect any changes to the Facility;
- (k) BC Hydro has no objection, pursuant to the Review Procedure, to any other Operating Orders required to be prepared by Project Co pursuant to this Agreement;
- (l) BC Hydro has no objection to the Manuals and Manual excerpts, prepared in accordance with Section 10.3.2 *[Final Excerpts]* of this Schedule, and submitted in accordance with the Review Procedure;
- (m) BC Hydro has no objection to any applicable SDI Certificates, prepared in accordance with Section 4.5 *[Confined Spaces]* of this Schedule, and submitted in accordance with the Review Procedure;
- (n) all spare parts, specialized tools, and maintenance equipment as specified in Appendix 5S *[Spare Parts, Special Tools and Maintenance Equipment]*, have been received and are properly stored and maintained in a secure area on the Site, in accordance with the Project Requirements and any applicable manufacturers' instructions;
- (o) asset tagging in accordance with Section 8.1 *[Asset Tagging]* of this Schedule and establishment of the Asset Register in accordance with Section 8.2 *[Asset Register]* of this Schedule have been successfully completed;
- (p) BC Hydro has no objection to the following plans and reports, prepared in accordance with the requirements of Schedule 7 *[Services]*, and submitted in accordance with the Review Procedure:
 - (i) Asset Management Plan (including the Maintenance Plan and Schedule);
 - (ii) Immediate Callout and Forced Outage Response Plan; and
 - (iii) Facility Condition Assessment Plan;

- (q) BC Hydro has accepted the Operational Environmental Management Plan, prepared in accordance with the requirements of Schedule 8 *[Environmental Obligations]*, and submitted in accordance with the Consent Procedure;
- (r) BC Hydro has no objection to, or has accepted, all other documentation specified in this Agreement to be submitted pursuant to the Review Procedure or the Consent Procedure, as applicable, on or before Service Commencement.

B. *Procedures for Issuance of a Commissioning Notice to Operate for the Facility*

In order to obtain a completed Commissioning Notice to Operate for the Facility, Project Co shall:

- (a) successfully complete all Commissioning Work, including the BC Hydro required testing pursuant to Section 9.7 *[BC Hydro Required Testing]* of this Schedule, and reliability testing (excluding WECC testing as described in Section 9.8 *[WECC Testing]* of this Schedule), with respect to the Facility and all associated equipment, components, systems and sub-systems;
- (b) have had all required Commissioning Notices to Energize accepted by BC Hydro in accordance with the Consent Procedure;
- (c) obtain all Leaves to Commence required by the Comptroller of Water Rights;
- (d) successfully complete all testing of the SCADA, including demonstration of full remote operation of the Facility from the Remote Control Centre;
- (e) demonstrate that all Facility security systems (cyber and physical) are fully functional so as to enable BC Hydro to ensure a safe and secure working environment;
- (f) demonstrate that all alarms and public safety management systems are installed, commissioned and fully functional;
- (g) demonstrate that all Facility life safety systems and other safety requirements specified in this Agreement and all Work Safe BC requirements for the Facility, including the operation and maintenance thereof, have been met, without any Defects or deficiencies;
- (h) submit the complete, unfolded hard copy, full-sized, original set (excluding only those related to the Bypass System, if Bypass System Completion has not occurred on or before the Service Commencement Date, and Decommissioning Work) of all signed and sealed (red ink stamped) Design Drawings, including the civil As Built Drawings and:
 - (i) the As Built Drawings for: (A) all Generation Systems; and (B) all protection and control systems for Generation Systems; or

- (ii) if the As Built Drawings referred to in Section 11.4.2B.(h)(i) of this Schedule are not yet available, a marked up, signed and sealed (red ink stamped), unfolded hard copy, full-sized original set of the issued for construction drawings,

and all shop or fabrication drawings required to be signed and sealed (red ink stamped), together with all revisions thereto, to BC Hydro on 24 lb. bond and in a logically organized and structured format;

- (i) have completed all training required pursuant Schedule 6 [*Design and Construction Specifications*], and Section 9.10 [*Training*] of this Schedule;
- (j) transfer Operating Responsibility and Operating Authority for the Facility to BC Hydro in accordance with the procedures set out in the then current John Hart Joint Operating Order;
- (k) submit the complete, unfolded, hard copy, full-sized, original set (excluding only those related to the Bypass System, if Bypass System Completion has not occurred on or before the Service Commencement Date, and the Decommissioning Work) of all signed and sealed (red ink stamped) As Built operating one-line diagrams, isolation schematics and any other drawings required for the safe isolation of equipment; and
- (l) obtain all applicable Permits and regulatory approvals required for operation of the Facility, except those specified in Section 4.19 [*Regulatory Approvals and Permits*] of this Agreement, as being the responsibility of BC Hydro; and
- (m) prepare and submit a draft form of Commissioning Notice to Operate to the Independent Certifier for review and to BC Hydro's Representative for information only. The draft form of Commissioning Notice to Operate shall identify all Defects and incomplete Design or Construction, associated with the Facility and all associated equipment, components, systems and sub-systems and include a declaration by each of the Lead Test Engineer, Project Co's Representative and the Designer certifying that the Facility and all associated equipment, components, systems and sub-systems are safe to operate despite the identified Defects and any incomplete Design and Construction activities.

Once signed by the Independent Certifier in accordance with Section 11.4.6(a) [*Certification of Service Commencement*] of this Schedule, the draft Commissioning Notice to Operate prepared by Project Co shall constitute the "Commissioning Notice to Operate" for the Facility.

11.4.3 Application for Service Commencement

If Project Co believes it has achieved the requirements for Service Commencement and complied with Section 11.4.1 [*Advance Notice of Application for Service Commencement*] of this Schedule, then Project Co may apply to the Independent Certifier (with a concurrent copy to BC Hydro's Representative) for Service Commencement.

11.4.4 Inspection for Service Commencement

No later than 5 Business Days after Project Co delivers:

- (a) an application for Service Commencement pursuant to Section 11.4.3 [*Application for Service Commencement*] of this Schedule;
- (b) the draft Commissioning Notice to Operate for the Facility;
- (c) the Construction Certificates in respect of the Facility; and
- (d) all other relevant certificates and supporting documentation in accordance with the Project Requirements,

to BC Hydro's Representative and the Independent Certifier, the parties will require the Independent Certifier to, in cooperation with Project Co's Representative and BC Hydro's Representative:

- (e) review and verify of the accuracy of the draft form of Commissioning Notice to Operate and the listed Defects and incomplete Design or Construction;
- (f) review all applicable inspection, testing and Commissioning data, records and other information; and
- (g) perform an inspection of the Facility to determine whether Service Commencement has been achieved.

11.4.5 Deficiency List

Prior to and as a condition of issuance of the Certificate of Service Commencement, Project Co shall, in cooperation with BC Hydro's Representative and the Independent Certifier, prepare a complete list of Defects and incomplete Design or Construction that are apparent upon review of all applicable inspection, testing and Commissioning data, records and other information and inspection of the Facility (the "**Service Commencement Deficiencies**") and deliver to BC Hydro's Representative and the Independent Certifier the list of Service Commencement Deficiencies. Where the As Built Drawings referred to in Section 11.4.2B.(h)(i) of this Schedule are not submitted with Project Co's application for Bypass System Completion, the As Built Drawings will be included on the list of Bypass System Deficiencies.

Subject to the right of Project Co to refer matters to the Dispute Resolution Procedure as set out below, the list of Service Commencement Deficiencies shall include all items required by BC Hydro to be included on such list.

BC Hydro or Project Co may refer matters relating to the accuracy or completeness of the list of Service Commencement Deficiencies to the Dispute Resolution Procedure.

11.4.6 Certification of Service Commencement

BC Hydro's Representative and Project Co shall cause the Independent Certifier, within 5 Business Days of the commencement of the inspection under Section 11.4.4 [*Inspection for Service Commencement*] of this Schedule, to either:

- (a) issue the Certificate of Service Commencement for the Facility, stating the Service Commencement Date, to BC Hydro and Project Co and sign the draft form of Commissioning Notice to Operate confirming that: (i) the Facility is safe to operate despite any identified Defects and any incomplete Design and Construction activities; and (ii) the Facility meets the applicable Project Requirements, subject to correction of the Service Commencement Deficiencies; or
- (b) notify Project Co and BC Hydro's Representative of its decision not to sign the draft Commissioning Notice to Operate and issue the Certificate of Service Commencement and state the reasons in detail for such decision, including what further work may be required to achieve Service Commencement.

11.4.7 Refusal to Certify Service Commencement

The Independent Certifier shall refuse to issue the Certificate of Service Commencement only if: (i) the Facility does not meet the conditions precedent specified in Section 11.4.2 [*Conditions Precedent to Service Commencement*] of this Schedule; (ii) the Facility is not safe to operate; or (iii) any other conditions or requirements under this Agreement to the achievement of Service Commencement have not been satisfied or complied with.

11.4.8 Completion of Further Work for Service Commencement

In the event of service of a notice by the Independent Certifier under Section 11.4.6(b) [*Certification of Service Commencement*] of this Schedule, Project Co shall issue to the Independent Certifier a notice not less than 5 Business Days but no more than 10 Business Days prior to the date upon which Project Co expects to complete such further work or other measures necessary or appropriate to remedy or remove the cause of the Independent Certifier's refusal to issue the Commissioning Notice to Operate the Facility and the Certificate of Service Commencement. Upon Project Co notifying the Independent Certifier and BC Hydro's Representative that such further work or measures necessary or appropriate have been completed, BC Hydro's Representative and Project Co shall cause the Independent Certifier to commence, within 5 Business Days of receipt of such notice, an inspection of such further work or measures and the provisions of Section 11.4.2 [*Conditions Precedent to Service Commencement*] of this Schedule through to this Section, inclusive, shall thereafter apply to such notice *mutatis mutandis*.

11.4.9 Correction of Service Commencement Deficiencies

Upon issuance of the Certificate of Service Commencement, Project Co shall proceed expeditiously to correct each Service Commencement Deficiency by the date that is 60 days after the Service Commencement Date, or such later date as may be reasonably required to provide sufficient time to

correct the Service Commencement Deficiency and that is agreed by BC Hydro, acting reasonably (each Service Commencement Deficiency having its own "***Service Commencement Deficiency Deadline***").

11.5 Requirements for Total Completion

11.5.1 Advance Notice of Application for Total Completion

Project Co acknowledges that the Independent Certifier will need sufficient time to complete any inspections, consult with BC Hydro, and prepare the lists of deficiencies, and accordingly Project Co shall:

- (a) at least 15 Business Days but no more than 30 Business Days prior to the Target Total Completion Date, deliver to the Independent Certifier, with a concurrent copy to BC Hydro's Representative, a notice setting out:
 - (i) a description of all outstanding Design and Construction to be completed by Project Co prior to the Total Completion Date; and
 - (ii) a list of all Defects and incomplete Design or Construction that Project Co is aware of at the time of the notice; and
- (b) assist the Independent Certifier to make any advance inspections requested by the Independent Certifier.

If Project Co has at any time reason to believe that the expected date for Total Completion shall be delayed or achieved earlier by more than 5 Business Days, it shall issue a fresh notice informing the Independent Certifier and BC Hydro's Representative of the new date expected for Total Completion.

11.5.2 Conditions Precedent for Total Completion

Total Completion of the Facility shall only be achieved if, at the time of certification, all three Generating Units and the Bypass System are Available, and the following conditions precedent have been satisfied:

- (a) Service Commencement has occurred;
- (b) Bypass System Completion has occurred;
- (c) all Design and Construction activities, including all:
 - (i) Decommissioning Work,
 - (ii) final restoration, remediation and landscaping work,
 - (iii) final paving of Permanent Access Roads and parking lots and final grading of gravel roads;

- (iv) any Design or Construction work specifically indicated under Schedule 5 *[Design and Construction Protocols]* or Schedule 6 *[Design and Construction Specifications]* as occurring after the Service Commencement Date; and
- (v) all works, as described in the submitted Final Design, to achieve the requirements of Schedule 6 *[Design and Construction Specifications]*, for the flow split around First Island,

have been completed in accordance with the applicable Project Requirements;

- (d) Brewster Lake Road has been re-opened to the public and all public trails impacted by, or required to be created as part of, the Project Work are open to the public to the extent required by the applicable Project Requirements;
- (e) the Performance Verification Tests have been completed in accordance with Schedule 13 *[Performance and Payment Mechanisms]*;
- (f) BC Hydro has no objection to the Final Design and Construction Report, prepared in accordance with Section 10.4 *[Final Design and Construction Report]* of this Schedule, and submitted in accordance with the Review Procedure;
- (f.1) all BC Hydro required testing pursuant to Section 9.7 *[BC Hydro Required Testing]* of this Schedule has been successfully completed and an updated Commissioning Test Report, to which BC Hydro has no objection in accordance with the Review Procedure, has been submitted;
- (g) all WECC testing, as described in Section 9.8 *[WECC Testing]* of this Schedule, has been successfully completed and a WECC Test Data and Model Validation Report for one Generating Unit, to which BC Hydro has no objection in accordance with the Review Procedure, has been submitted;
- (h) all Commercial Operation Deficiencies, Service Commencement Deficiencies and if the Bypass System Completion Date occurred prior to the Service Commencement Date, Bypass System Completion Deficiencies, have been corrected;
- (h.1) the estimated cost to correct all Total Completion Deficiencies (excluding only those deficiencies associated with the rectification of a failure to achieve the required flow split around First Island), as determined by the Independent Certifier, does not exceed ■■■ of the Decommissioning Payment;
- (i) Project Co has submitted an updated version, to which BC Hydro has no objection in accordance with the Review Procedure, of each previously submitted Operating Order, as required to reflect any changes to the Facility;
- (j) BC Hydro has no objection, pursuant to the Review Procedure, to any other Operating Orders required to be prepared by Project Co pursuant to this Agreement;

- (k) Project Co has submitted the complete, unfolded hard copy, full-sized, original set of all signed and sealed (red ink stamped) Design Drawings, including the As Built Drawings, and all shop or fabrication drawings required to be signed and sealed (red ink stamped), together with all revisions thereto, to BC Hydro on 24 lb. bond and in a logically organized and structured format
- (l) Project Co has remediated all affected lands as required by Schedule 6 *[Design and Construction Specifications]* and Schedule 8 *[Environmental Obligations]* and removed all Temporary Works related to the Design and Construction, including construction site offices;
- (m) Project Co has completed all Project Work specified in Schedule 8 *[Environmental Obligations]* and in the Construction Environmental Management Plans, accepted by BC Hydro's Representative pursuant to the Consent Procedure, which is required to be completed prior to the Total Completion Date;
- (n) BC Hydro has no objection to, or has accepted, all other documentation specified in this Agreement to be submitted pursuant to the Review Procedure or the Consent Procedure, as applicable, on or before Total Completion;
- (o) Project Co has submitted PDF format copies of all shop and fabrication drawings, received by the Designer, but not required to be signed and stamped, to BC Hydro in a logically organized and structured format;
- (p) Project Co has completed testing in accordance with Section 3.4-3.5D and 3.4-3.5E *[Flow Split around First Island]* of Schedule 6 *[Design and Construction Specifications]* sufficient to determine whether the flow split around First Island has been achieved in accordance with the requirements of Schedule 6 *[Design and Construction Specifications]*, including Section 3.4-3.5 *[Flow Split around First Island]* of Schedule 6 *[Design and Construction Specifications]*, and submitted an updated Commissioning Test Report, including results of the First Island flow split testing, to which BC Hydro has no objection in accordance with the Review Procedure;
- (q) if the testing described in Section 11.5.2(p) *[Conditions Precedent for Total Completion]* of this Schedule does not demonstrate that the flow split around First Island has been achieved in accordance with the requirements of Schedule 6 *[Design and Construction Specifications]*, including Section 3.4-3.5 *[Flow Split around First Island]* of Schedule 6 *[Design and Construction Specifications]*, Project Co shall have submitted to BC Hydro:
 - (i) a remedial action plan, to which BC Hydro has no objection in accordance with the Review Procedure, detailing Project Co's reasonable plan to achieve compliance with the requirements for the flow split around First Island within a period of time determined to be reasonable by the Independent Certifier, which period shall not extend beyond the scheduled date for the 4-year Condition Assessment; and

- (ii) a letter of credit which: (1) meets the applicable requirements of Schedule 13 [*Performance and Payment Mechanisms*]; (2) is in favour of BC Hydro, to secure the performance by Project Co of all work necessary to achieve a flow split around First Island in accordance with the requirements of Schedule 6 [*Design and Construction Specifications*], including Section 3.4-3.5 [*Flow Split around First Island*] of Schedule 6 [*Design and Construction Specifications*]; and (3) is in an amount equal to 2x the Independent Certifier's reasonable estimate of the cost (including Outage costs calculated in accordance with Schedule 13 [*Performance and Payment Mechanisms*]), to complete the remedial action plan submitted in accordance with Section 11.5.2(q)(i) of this Schedule.

11.5.3 Application for Total Completion

If Project Co believes it has achieved the requirements for Total Completion and complied with Section 11.5.1 [*Advance Notice of Application for Total Completion*] of this Schedule, then Project Co may apply to the Independent Certifier (with a concurrent copy to BC Hydro's Representative) for a Certificate of Total Completion.

11.5.4 Inspection for Total Completion

No later than 5 Business Days after Project Co delivers:

- (a) an application for Total Completion pursuant to Section 11.5.3 [*Application for Total Completion*] of this Schedule;
- (b) the Construction Certificates in respect of the Facility; and
- (c) all other relevant certificates and supporting documentation in accordance with the Project Requirements,

to BC Hydro's Representative and the Independent Certifier, the parties will require the Independent Certifier to, in cooperation with Project Co's Representative and BC Hydro's Representative, review all applicable inspection, testing and Commissioning data, records and other information and perform an inspection of the Facility to determine whether Total Completion has been achieved.

11.5.5 Deficiency List

Prior to and as a condition of issuance of the Certificate of Total Completion, Project Co shall, in cooperation with BC Hydro's Representative and the Independent Certifier, prepare a complete list of Defects and incomplete Design or Construction that are apparent upon review of all applicable inspection, testing and Commissioning data, records and other information and inspection of the Facility, together with the Independent Certifier's reasonable estimate of the cost (including Outage costs calculated in accordance with Schedule 13 [*Performance and Payment Mechanisms*]) to correct all such Defects and complete any outstanding Design and Construction required for Total Completion) (the "**Total Completion Deficiencies**") and deliver to BC Hydro's Representative and the Independent Certifier the list of Total Completion Deficiencies.

Subject to the right of Project Co to refer matters to the Dispute Resolution Procedure as set out below, the list of Total Completion Deficiencies shall include all items required by BC Hydro to be included on such list.

BC Hydro or Project Co may refer matters relating to the accuracy or completeness of the list of Total Completion Deficiencies to the Dispute Resolution Procedure.

11.5.6 Not Used

11.5.7 Issuance of Certificate of Total Completion

BC Hydro and Project Co shall cause the Independent Certifier, within 5 Business Days of the commencement of the inspection pursuant to Section 11.5.4 [*Inspection for Total Completion*] of this Schedule, to either:

- (a) issue the Certificate of Total Completion, stating the Total Completion Date, to BC Hydro and Project Co; or
- (b) notify Project Co and BC Hydro's Representative of its decision not to issue the Certificate of Total Completion and state the reasons in detail for such decision, including what further work may be required to achieve Total Completion.

11.5.8 Refusal to Issue Certificate of Total Completion

The Independent Certifier shall refuse to issue the Certificate of Total Completion for the Facility only if: (i) the Facility does not meet the conditions precedent specified in Section 11.5.2 [*Conditions Precedent for Total Completion*] of this Schedule; (ii) the Facility is not safe to operate; or (iii) any other conditions or requirements under this Agreement to the achievement of Total Completion have not been satisfied or complied with in respect of the Facility.

11.5.9 Completion of Further Work for Total Completion

In the event of service of a notice by the Independent Certifier under Section 11.5.7(b) [*Issuance of Certificate of Total Completion*] of this Schedule, Project Co shall issue to the Independent Certifier a notice not less than 5 Business Days but no more than 10 Business Days prior to the date upon which Project Co expects to complete such further work or other measures necessary or appropriate to remedy or remove the cause of the Independent Certifier's refusal to issue the Certificate of Total Completion. Upon Project Co notifying the Independent Certifier and BC Hydro's Representative that such further work or measures necessary or appropriate have been completed, BC Hydro's Representative and Project Co shall cause the Independent Certifier to commence, within 5 Business Days of receipt of such notice, an inspection of such further work or measures and the provisions of Section 11.5.2 [*Conditions Precedent for Total Completion*] of this Schedule through to this Section, inclusive, shall thereafter apply to such notice *mutatis mutandis*.

11.5.10 Correction of Total Completion Deficiencies

Upon issuance of the Certificate of Total Completion, Project Co shall proceed expeditiously to correct each Total Completion Deficiency by the date that is 30 days after the Total Completion Date or such later date, specified by the Independent Certifier, as may be reasonably required to provide sufficient time to complete the Total Completion Deficiency (each Total Completion Deficiency having its own “**Total Completion Deficiency Deadline**”).

11.6 Submissions by BC Hydro’s Representative

BC Hydro’s Representative may, at any time, following receipt of notice given by Project Co pursuant to Section 11.1.1 *[Advance Notice of Application for Commercial Operation]*, Section 11.3.1 *[Advance Notice of Application for Bypass System Completion]*, Section 11.4.1 *[Advance Notice of Application for Service Commencement]* or Section 11.5.1 *[Advance Notice of Application for Total Completion]* of this Schedule and prior to the Independent Certifier issuing or notifying Project Co and BC Hydro’s Representative of its decision not to issue:

- (a) a Certificate of Commercial Operation and Commissioning Notice to Operate for a Generating Unit;
- (b) a Certificate of Service Commencement and Commissioning Notice to Operate for the Facility;
- (c) a Certificate for Bypass System Completion and Commissioning Notice to Operate for the Bypass System; or
- (d) Certificate of Total Completion,

as the case may be, provide the Independent Certifier and Project Co with BC Hydro’s Representative’s submissions as to whether the conditions for issuance of the applicable certificate and Commissioning Notice to Operate have been satisfied and, if applicable, any reasons as to why BC Hydro’s Representative considers that the applicable certificate or Commissioning Notice to Operate should not be issued. The Independent Certifier shall consider such submissions in determining whether to issue the applicable certificate or Commissioning Notice to Operate.

11.7 No Limitation

The issuance of a Certificate of Commercial Operation and Commissioning Notice to Operate for a Generating Unit, Certificate of Service Commencement and Commissioning Notice to Operate for the Facility, Certificate for Bypass System Completion and Commissioning Notice to Operate for the Bypass System or Certificate of Total Completion shall be without prejudice to and shall not in any way limit the rights and obligations of the parties under and in accordance with this Agreement.

11.8 Disputed Certificate

If there is any dispute between the parties as to the decision of the Independent Certifier to issue or not to issue:

- (a) a Certificate of Commercial Operation and Commissioning Notice to Operate for a Generating Unit;
- (b) a Certificate of Service Commencement and Commissioning Notice to Operate for the Facility;
- (c) a Certificate for Bypass System Completion and Commissioning Notice to Operate for the Bypass System; or
- (d) a Certificate of Total Completion,

in accordance with this Schedule, then either BC Hydro's Representative or Project Co may refer such dispute for resolution under the Dispute Resolution Procedure.

11.9 Certificate Effective Pending Dispute

Notwithstanding any other provision in this Agreement or Schedule 19 [*Dispute Resolution Procedure*], if the Independent Certifier has issued

- (a) a Certificate of Commercial Operation and Commissioning Notice to Operate for a Generating Unit;
- (b) a Certificate of Service Commencement and Commissioning Notice to Operate for the Facility;
- (c) a Certificate for Bypass System Completion and Commissioning Notice to Operate for the Bypass System; or
- (d) a Certificate of Total Completion,


and BC Hydro's Representative or Project Co has referred a dispute in respect thereof for resolution under the Dispute Resolution Procedure pursuant to Section 11.8 [*Disputed Certificate*] of this Schedule, then for all purposes of this Agreement the applicable certificate and Commissioning Notice to Operate shall be deemed to have been issued unless and until it is determined in accordance with the Dispute Resolution Procedure that it was improperly issued by the Independent Certifier in accordance with the terms of this Schedule.

APPENDIX 5A

NOT USED

APPENDIX 5B

CONFINED SPACE AND SDI CERTIFICATES

| | | | |
|---|------------------------------|---|--------------------------|
|  | | CONFINED SPACE CERTIFICATE: SINGLE DEVICE ISOLATION SYSTEM | |
| FACILITY (Plant) | CONFINED SPACE DESCRIPTION | DOCUMENT NUMBER | REV # |
| CERTIFICATION DATE (YYYY-MMM-DD) | EXPIRY DATE (YYYY-MMM-DD) | ENGINEERING FILE # | REPORT # |
| SUPPORTING DEVICE CERTIFICATE(S) | DEVICE DESIGNATION | EXPIRY DATE (YYYY-MMM-DD) | DOCUMENT NUMBER REV # |
| CERTIFIED FOR WORKER PROTECTION FROM EXCESSIVE WATER IN THE CONFINED SPACE, PER SUBSECTION 9.18.(3) OF THE WORKSAFE BC OCCUPATIONAL HEALTH AND SAFETY REGULATIONS. | | <input type="checkbox"/> YES <input type="checkbox"/> NO | COMMENTS/REFERENCES: |
| REFERENCE DOCUMENTS: ISOLATION SCHEMATIC # , ISSUE DATE | | | |
| Notes: This CONFINED SPACE CERTIFICATE is only one component of a Confined Space Entry Program, and the other requirements in the WorkSafeBC OHSR, including a Confined Space Entry Procedure, must be met for entry into the confined space. | | | |
| 1) BOUNDARY OF CONFINED SPACE | | | |
| Caution: This list of isolation points is limited to those points which control the water hazards for the confined space for devices which <u>cannot</u> be isolated per WCB OHSR 9.18.(3a). There may be additional points required for isolation of the confined space, including other water hazards, where these water hazards can be isolated per OHSR 9.18 using double block & bleed or other suitable means. | | | |
| # | DEVICE DESIGNATION | DEVICE DESCRIPTION | DEVICE STATUS |
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 3) UPSTREAM/DOWNSTREAM WATER PASSAGE CONDITIONS FOR INTEGRITY OF THIS DEVICE | | | |
| Identify conditions and how conditions are maintained: monitoring, or isolation point(s), or other. | | | |
| 4) DRAINAGE & PUMPING REQUIREMENTS | | | |
| 5) QUANTITATIVE LEAKAGE ASSESSMENT INSTRUCTIONS AND GO/NO-GO THRESHOLD | | | |
| 6) MONITORING REQUIREMENTS (SYSTEM COMPONENTS, DISCHARGES, LEAKAGE REMOVAL) | | | |

7) OTHER RESTRICTIONS OR REQUIREMENTS

- a) If any modifications are made to the device(s) or system, including the drainage system, other than like-for-like repair, the approval of the certifying professional engineer must be received prior to entry into the confined space.
- b) The approval of the certifying professional engineer is required before sealing agents are applied to reduce leakage, other than for the specific use of sealing agents listed in this certificate.

8) PREVENTIVE MAINTENANCE REQUIREMENTS (All preventive maintenance identified as required by this certificate must be complete before the confined space entry)

THIS CERTIFICATION EXCLUDES REVIEW OF
DEVICE CONTROLS AS WELL AS OPERATING
REQUIREMENTS OF ISOLATING DEVICES
DURING NORMAL OPERATION AND CONTROL.

SIGNATURE:

YYYY-MMM-DD

Text Here

DATE

ENGINEER OF RECORD

STAMP



**DEVICE CERTIFICATE:
SINGLE DEVICE ISOLATION SYSTEM**

| | | | | | |
|--|--|------------------------------|---|----------------------|-------|
| FACILITY (Plant) | ALPHANUMERIC | DEVICE DESCRIPTION | | DOCUMENT NUMBER | REV # |
| CERTIFICATION DATE (YYYY-MM-DD) | | EXPIRY DATE (YYYY-MM-DD) | ENGINEERING FILE # | REPORT # | |
| ISOLATION SYSTEM DESCRIPTION | | | | | |
| CERTIFIED FOR ISOLATION SERVICE FOR USE DURING CONFINED SPACE ENTRY, AS A SINGLE BLOCK ISOLATION DEVICE, PER SUBSECTION 9.18.(3)b OF THE WORKSAFE BC OCCUPATIONAL HEALTH AND SAFETY REGULATIONS. | | | <input type="checkbox"/> YES <input type="checkbox"/> NO | COMMENTS/REFERENCES: | |
| REFERENCE DOCUMENTS: ISOLATION SCHEMATIC # , ISSUE DATE | | | | | |
| SPECIAL CONDITIONS/EVALUATIONS | | | | | |
| 1 | MAINTENANCE PROGRAM COMPLETE. | <input type="checkbox"/> YES | <input type="checkbox"/> NO | COMMENTS: | |
| 2 | BYPASS EQUIPMENT ACCEPTABLE FOR ISOLATION SERVICE. | <input type="checkbox"/> YES | <input type="checkbox"/> NO | COMMENTS: | |
| 3 | FULL FORCE HYDRAULIC BLOCKING AVAILABLE. | <input type="checkbox"/> YES | <input type="checkbox"/> NO | COMMENTS: | |
| 4 | LEAKAGE CONDITIONS AND DRAINAGE SYSTEM ACCEPTABLE FOR ISOLATION SYSTEM. | <input type="checkbox"/> YES | <input type="checkbox"/> NO | COMMENTS: | |
| 5 | GENERAL CONDITION OF ISOLATION SYSTEM ACCEPTABLE. | <input type="checkbox"/> YES | <input type="checkbox"/> NO | COMMENTS: | |
| 1) UPSTREAM/DOWNSTREAM WATER PASSAGE CONDITIONS FOR INTEGRITY OF THIS DEVICE | | | | | |
| 2) QUANTITATIVE LEAKAGE ASSESSMENT INSTRUCTIONS AND GO/NO-GO THRESHOLD | | | | | |
| 3) OTHER RESTRICTIONS OR REQUIREMENTS a) If any modifications are made to the device(s) or system, including the drainage system, other than like-for-like repair, the approval of the certifying professional engineer must be received prior to entry into the confined space. b) The approval of the certifying professional engineer is required before sealing agents are applied to reduce leakage, other than for the specific use of sealing agents listed in this certificate. | | | | | |
| 4) PREVENTIVE MAINTENANCE REQUIREMENTS (All preventive maintenance identified as required by this certificate must be complete before the confined space entry) | | | | | |

| | | |
|---|-------|--|
| THIS CERTIFICATION <u>EXCLUDES</u> REVIEW OF DEVICE CONTROLS AS WELL AS OPERATING REQUIREMENTS OF THE DEVICE DURING NORMAL OPERATION AND CONTROL | STAMP | SIGNATURE: <div> <div>YYYY-MM-DD</div> <div>Text Here</div> </div> <div> <div>DATE</div> <div>ENGINEER OF RECORD</div> </div> |
| | | |

APPENDIX 5C
SAMPLE CONTENTS FOR A TAF

Ref. No.....

1. NAME OF PROJECT

- 1.1 List all relevant sections of Schedule 6 [*Design and Construction Specifications*] covered by this submission
- 1.2 List relevant Design Basis Memoranda and the version of the Basis of Design Report covering this submission

2. NAME OF STRUCTURE OR EQUIPMENT

- 2.1 List all interfacing equipment and structures not included in this submission, including TAF reference numbers and Design Basis Memoranda numbers.
- 2.2 List of all interface assumed input values (e.g. load transfer from one structure to another)

3. DESIGN ANALYSIS AND CALCULATIONS

- 3.1 List all design calculations on which the design was based and provide sufficient evidence that the design satisfies the applicable Project Requirements.
- 3.2 List all output reports for finite element analysis, computational fluid dynamics, and other modeling software used in the design, along with input assumptions and enough information to interpret the reports.
- 3.3 List all physical modeling reports/analysis done in the design.

4. CHECKING

- 4.1 List all members of the Checking Team (where applicable).

5. DRAWINGS AND DOCUMENTS

- 5.1 List all drawings (including numbers) and documents accompanying the submission, including:
 - (a) a location plan (with area covered by this submission highlighted);
 - (b) a local general arrangement drawing (with area covered by this submission highlighted); and
 - (c) all engineering level drawings required to build the structure or equipment covered by this TAF.

Include enough information on the drawings to demonstrate that the design satisfies the applicable Project Requirements.

- 5.5 List all sections of the construction and manufacturing specifications for the structure or equipment, including submissions to the Designer.
- 5.6 List any other documentation required to demonstrate that the design satisfies the applicable Project Requirements and is consistent with the Basis of Design Report and the applicable Design Basis Memorandum.
- 5.7 List commissioning data to be collected to verify compliance with the applicable design and for use as a baseline in comparing performance, determining deterioration over the applicable Design Service Life and assessing the sufficiency and performance of the Asset Management Plan.

THE ABOVE DESIGN AND CONSTRUCTION PROPOSALS ARE SUBMITTED FOR REVIEW.

Signed:
 Designer (Principal)
 Name:
 Title:
 Date:
 Professional Registration Number:
 Affix Professional Seal

Signed:
 Design-Builder (Principal)
 Name:
 Title:
 Date:
 Professional Registration Number:
 Affix Professional Seal

Signed:
 Project Co's Representative
 Name:
 Date:

This TAF is:

- i. received*
 - ii. received with comments as follows*
 - iii. returned marked "comments" as follows:*
- * delete as appropriate

Signed:
 BC Hydro's Representative
 Name:
 Date:

APPENDIX 5D

DESIGN CERTIFICATE FORMS

Certificate Ref No. []

DESIGN CERTIFICATE (GENERAL)

In respect of :..... (Provide details e.g. of applicable Design)

Agreement between British Columbia Hydro Authority and [Project Co] dated • (the "Agreement") relating to the Project. Defined terms and expressions used in the Agreement have the same meanings in this certificate.

Form of certificate to be used by the Designer for certifying each Final Design package in accordance with Section 5.10 [Design Certification] of Schedule 5 [Design and Construction Protocols] to the Agreement.

1. We certify that we have the requisite professional qualifications, skill and experience to prepare the Design Data referred to herein in accordance with the requirements of the Agreement and all relevant Project Requirements.
2. We certify that we have prepared the Design Data for [.....] listed in the Exhibit hereto in accordance with all applicable requirements contained in the Design Management Plan and the Design Quality Management Plan and utilizing the standards of care, skill and diligence that, in accordance with the standards of our profession, are required of experienced professionals undertaking the preparation of such Design Data, and that in our professional opinion such Design Data:
 - (i) complies with all applicable Project Requirements, as amended by the following:

[List, if any, the changes made by the issue of Change Certificates];
 - (ii) complies with all applicable design requirements of the Agreement;
 - (iii) complies with all applicable Laws, standards, codes and current Good Utility Practice; and
 - (iv) accurately describes and depicts the work to be undertaken.

EXHIBIT

[Include here drawing numbers and titles, reports, calculations, etc.]

Signed:
Designer (Principal)
Name:
Title:
Date:
Professional Registration Number:
Affix Professional Seal

Signed:
Project Co's Representative
Name:
Date:

This certificate is:

- i. received*
 - ii. received with comments as follows*
 - iii. returned marked "comments" as follows:*
- * delete as appropriate

Signed:
BC Hydro's Representative
Name:
Date:

DESIGN CERTIFICATE (ENVIRONMENTAL)

Agreement between British Columbia Hydro Authority and [Project Co] dated • (the “Agreement”) relating to the Project. Defined terms and expressions used in the Agreement have the same meanings in this certificate.

Form of certificate to be used by the Designer for certifying the design of environmental works (including mitigation, compensation and other works undertaken to comply with Schedule 8 [Environmental Obligations]) incorporated into the Project Work in accordance with Section 5.10 [Design Certification] of Schedule 5 [Design and Construction Protocols] to the Agreement.

1. We certify that we have the requisite professional qualifications, skill and experience to prepare the Design Data referred to herein in accordance with the requirements of the Agreement and all relevant Project Requirements.
2. We certify that we have prepared the Design Data for [.....] **[Name and list of all elements of the environmental works]** listed in the Exhibit hereto and annexed in accordance with all applicable requirements contained in the Design Management Plan and the Design Quality Management Plan and utilizing the standards of care, skill and diligence that, in accordance with the standards of our profession, are required of experienced professionals undertaking the preparation of such Design Data, and that in our professional opinion:
 - (i) the said Design Data complies with all applicable Project Requirements, including Technical Appraisal Form No. [.....] dated [.....], as amended by the following:

[List, if any, the changes made by the issue of Change Certificates, and any addenda to the foregoing Technical Appraisal Form];
 - (ii) the said Design Data complies with all applicable design requirements of the Agreement; and
 - (iii) the said Design Data complies with all applicable Laws, standards, codes and current Good Utility Practice.

EXHIBIT

[Include here drawing numbers and titles, reports, calculations, etc.]

Signed:
Designer (Principal)
Name:
Title:
Date:
Professional Registration Number:
Affix Professional Seal

Signed:
Environmental Director
Name:
Title:
Date:
Professional Registration Number:
Affix Professional Seal

Signed:
Project Co's Representative
Name:
Date:

This certificate is:

- i. received*
 - ii. received with comments as follows*
 - iii. returned marked "comments" as follows:*
- * delete as appropriate

Signed:
BC Hydro's Representative
Name:

APPENDIX 5E

PROJECT SPECIFIC DRAWING STANDARDS

1. GENERAL

This Appendix 5E [*Project Specific Drawing Standards*] supplements and modifies the BC Hydro Generation Engineering AutoCAD Drafting Standards and Conventions, in relation to the drawing types described herein.

All drawings, including shop and fabrication drawings, that show engineering design that is not shown on the applicable Design Drawings, shall be sealed and signed by the Professional Engineer who prepared the design or under whose direct supervision the design was prepared. Other shop or fabrication drawings, with the exception of protection and control drawings, need not be signed and sealed by a Professional Engineer.

All Design Drawings included in a Final Design submission shall include a PDF copy of the signed and sealed original drawing in a format and quality acceptable to BC Hydro's Representative, acting reasonably.

The first version of each Design Drawing included in a Final Design submission shall be marked "Revision 0", each subsequent version of such Design Drawing, including As Built Drawings, shall be submitted to BC Hydro's Representative and shall be marked with the next sequential revision number.

All drawings submitted to BC Hydro's Representative, except shop or fabrication drawings not required to be signed and sealed, shall conform to the following standards, except to the extent modified by this Appendix 5E [*Project Specific Drawing Standards*]:

- (a) Generation Engineering – AutoCAD Drafting Standards and Conventions
- (b) ES 10-A0005 – Drawing Control Signing and Sealing of Engineering Drawings
- (c) ES 10-A0020 – Drawing Control Engineering Drawing Numbering System
- (d) ES 10-A0100 – Drawing Presentation Drawing Sheet Sizes
- (e) ES 10-A0250 – Drawing Presentation Title Blocks
- (f) ES 10-A0350 – Drawing Presentation Dimensioning
- (g) ES 10-A0425 – Abbreviations and Symbols Designations and Letter Symbols for Units and Decimal Prefixes
- (h) ES 10-A0510 – Metric Practices Metric Prefixes
- (i) ES 10-A0530 – Metric Practices Rules for the Writing of Metric Symbols, Names and Numbers

- (j) ES 10-A0540 – Metric Practices Units Permitted for Use with SI
- (k) ES 10-A0550 – Metric Practices Units Not Permitted for Use with SI
- (l) ES 10-AXXXX (Colour) – CAD Colours and Line Thickness
- (m) ES 10-AXXXX (Layer) – CAD Layering
- (n) ES 10-AXXXX (xref) – CAD Reference Naming Convention

2. AUTOCAD REQUIREMENTS

AutoCAD format shall be as follows:

- (a) external references (XREFS) can be used, provided that the following are included: (i) a set of drawing files with the XREFS bound; (ii) a set of drawing files without the XREFS bound; and (iii) a set of the XREFS;
- (b) each drawing number shall be a separate drawing file;
- (c) a BC Hydro drawing border (included in the Disclosed Data) is to be used on all drawings. The designer's company logo can be placed in a box above the title area of the BC hydro title block;
- (d) drawing numbers will comply with ES-10A-0020 *[Drawing Control Engineering Drawing Numbering System]*;
- (e) all entity properties shall be set to color by-layer and line-type by-layer;
- (f) CTB files can be the designer's standard; however the designer must submit the CTB files with the original drawings;
- (g) all text fonts on drawings shall use standard Autodesk fonts; and
- (h) Model Space/Paper Space drawings and Model Space drawings are acceptable.

3. FACILITY MODEL

3.1 BIM Software

The Facility Model shall be prepared using the following BIM software in its native file formats:

- (a) Autodesk Civil 3D 2012;
- (b) Autodesk Revit Architecture 2012;
- (c) Autodesk Revit MEP 2012; or

- (d) Autodesk Revit Structure 2012.

3.2 Coordination and Clash Detection

External model conflict and clash detection shall be performed using Autodesk Navisworks 2012 to check the Facility Model for hard clashes (clashes between elements) and soft clashes (clashes between elements and required clearances).

3.3 Geo-referencing

The Facility Model shall be referenced to the following GIS Coordinate Systems:

UTM NAD83 Zone XX

4. ELECTRICAL DRAWINGS

4.1 One-Line Diagram

All electrical one-line diagrams shall: (i) be drawn to show the electrical connection to the BC Hydro Transmission System; (ii) include the AC Station Service System; and (iii) include all equipment ratings and appropriate legends.

4.2 Electrical Outline Drawings

All electrical outline drawings shall: (i) be drawn to scale and shall be denoted with critical or major dimensions; and (ii) include estimated weights, external forces, anchoring details, overall dimensions and information on oil, compressed air and cooling water requirements for the applicable equipment.

4.3 Electrical Detail Drawings

All electrical detail drawings shall consist of general assembly drawings, subassembly drawings and other details required to fully demonstrate that all parts of the applicable component, system or sub-system conform to the provisions and intent of the Project Requirements and to the requirements of their installation, operation and maintenance. The electrical detail drawings shall include all necessary dimensions and fabrication details.

4.4 Electrical Schematic/Elementary Diagrams

All electrical schematic/elementary diagrams shall demonstrate the operation of the applicable control equipment, including:

- (a) range, operation and setting for time delay relays and timers;
- (b) set and reset points for process instruments;
- (c) protective relay settings;

- (d) fuse and circuit breaker ratings; and
- (e) control voltage and, if source of control voltage is not supplied by manufacturer, recommended overcurrent protection and conductor size for supplying the circuit.

4.5 Wiring Diagrams

All wiring diagrams shall show: (i) the point-to-point interconnections of the control and power equipment; and (ii) control devices and terminal blocks in their correct relative positions. One side of the terminal blocks shall be clearly identified for external wiring connections. Control devices and terminal blocks shall be identified in accordance with the applicable electrical schematic/elementary diagrams.

4.6 Front-of-Panel Drawings

All front of panel drawings shall: (i) be drawn to scale; (ii) show all equipment and rating plates mounted on the front of control cabinets and switchboards; and (iii) shall include:

- (a) schedules for all front-of-panel devices and equipment;
- (b) rating plate schedules, including dimensions and lettering size;
- (c) scale markings for meters and other indicating instruments; and
- (d) escutcheon plate and legend plate engravings and type and color of switch handles.

4.7 Electrical Layout Drawings

All electrical layout drawings shall: (i) be prepared to scale; (ii) show the following electrical features, superimposed on a physical outline of the Facility feature:

- (a) General Layout Drawings for the Powerhouse: shall show the actual dimensions and physical connection of the major electrical equipment on each level of the Powerhouse;
- (b) General Layout Drawings for the Substation: shall show the actual physical dimensions and physical connections of the major electrical equipment added to the Substation;
- (c) General Connection Drawings between the Powerhouse and the Substation: shall show the actual dimensions and physical connections of the cable system between the Powerhouse and the Substation;
- (d) Conduit and Ductbank Layout Drawings: shall show the actual physical routing of the raceway to all items of electrical equipment provided as part of the Project Work. Each raceway shall be identified with a unique identifier that distinguishes between raceways used for power, control and instrumentation;
- (e) Lighting Layout Drawings: shall show the actual physical layout of the lighting system and shall include lighting fixtures, switches, receptacles, contactor cabinets and lighting

panels. All conduit and wiring for the lighting system shall be shown on the drawings. Wiring shall be indicated by appropriate symbols in accordance with IEC or ANSI/IEEE Standards to identify the number of phase conductors, neutral conductors and grounding conductors in each section of raceway. All switches shall be identified to indicate the lighting fixtures that they control;

- (f) Grounding Drawings: showing the actual physical installation of the Ground Grid and the Grounding System that are not routed in a raceway. Components of the Grounding System shall be identified by type and size and symbols shall be used to distinguish between embedded/buried conductors and exposed conductors;
- (g) Security System Layout Drawings: shall show the actual physical layout of the Security System equipment, including card readers, gate operators, intrusion alarm switches, cameras and panels. All conduit and wiring for the Security System shall be shown on the drawings. Wiring shall be indicated by appropriate symbols to identify the number and type of conductors used in each section of raceway; and
- (h) Logic Diagrams: A complete set of logic diagrams describing the software used in microprocessor-based controllers shall be provided. The logic diagrams shall be provided as follows:
 - (i) Analog Control Loops: These diagrams shall be provided in accordance with ISA standard format.
 - (ii) Sequencing Controls: Controls used for sequencing logic shall be provided in Boolean or ladder-type format.

The electrical layout drawings may be combined onto common drawings, provided that a system of identifiers is established to distinguish raceway and equipment components that are in different systems.

5. PROTECTION AND CONTROL DRAWINGS

5.1 Intent

The following protection and control (P&C) drawing requirements shall apply to all P&C drawings. The requirements shall also apply to manufacturer drawings whenever possible. Where equipment manufacturer explicitly takes exception to these requirements, Project Co shall modify or supplement manufacturer drawings as required to meet the cross-referencing, drawing border, and drawing numbering requirements outlined in this Section as a minimum.

5.2 General P&C Drawing Requirements

- (a) All P&C drawings shall follow BC Hydro design practice DP 45-Z0007 and shall be sealed and signed by the Professional Engineer who prepared the applicable Final Design or under whose direct supervision the applicable Final Design was prepared.

- (b) Information on drawings shall not be shown on more than one drawing of the same type. For example, schematic information for a piece of equipment shall be shown only once on schematic diagrams. Wiring information for a piece of equipment shall be shown only once on wiring diagrams.
- (c) Combined diagrams that show schematic, wiring, and/or layout information are not acceptable.
- (d) A complete set of schematic diagrams, wiring diagrams, layout diagrams, software, and manuals shall be provided for all equipment and kept up to date to reflect any modification to the equipment. All drawings shall be completely cross-referenced. This means that when a terminal, wire, cable, node, or any other device on a drawing is required to be connected to a device on another drawing, complete two-way cross-referencing between the drawings is required.
- (e) All referenced drawings shall have their BC Hydro drawing number listed in the "Reference" area of the drawing title block. Only the associated Reference list number shall be used within the body of the drawing.
- (f) Schematic diagrams shall only reference other schematic diagrams. Wiring diagrams shall only reference other wiring diagrams.
- (g) All drawings shall use a BC Hydro electronic drawing border (included in the Disclosed Data). If a manufacturer drawing border is required, it shall be located inside BC Hydro's border on all drawings. The manufacturer drawing border shall be snapped to the inside of BC Hydro's border to maximize the amount of space available on the drawing.
- (h) All drawings shall use standard BC Hydro electronic symbols, the BC Hydro electronic symbol library included in the Disclosed Data.
- (i) The BC Hydro drawing number assigned to each drawing shall conform to BC Hydro Design Practice DP 45-Z0003.

5.3 Schematic Drawings

- (a) Schematic diagrams shall contain all information necessary for users to fully, and as easily as possible, understand the purpose and functionality of the circuit.
- (b) All inputs, outputs and signals shown on more than one drawing shall be cross-referenced from drawing to drawing.
- (c) Where more than one elementary or schematic diagram is used, two-way cross-reference shall be provided between coils and contacts.
- (d) Protection and metering one-line and three-line diagrams shall be provided for each major piece of equipment including:

- (1) overall Facility;
 - (2) each Generating Unit;
 - (3) excitation system;
 - (4) Substation;
 - (5) AC Station Service System; and
 - (6) DC Station Service System.
- (e) Protection and metering one-line diagrams shall only have the necessary information to: identify the system equipment, understand the protection and metering systems, and analyze the associated settings. References are only provided for interconnection to adjoining P&C one-line diagrams. Detailed information related to the electrical system shall be shown on the electrical one-line diagram. One-line diagrams shall include following information, as a minimum:
- (1) High Voltage main current carrying equipment in bold up to the point of common coupling (transmission interface);
 - (2) equipment designations;
 - (3) equipment nameplate information;
 - (4) protection zone isolation points;
 - (5) CT/VT designation;
 - (6) CT/VT polarity, ratio, accuracy class and connection;
 - (7) CT/VT isolation points; and
 - (8) CT/VT nameplate drawing references.
- (f) Protection and metering three-line diagrams shall contain, in addition to information shown on one-line diagrams, detailed three-phase connections of all major protection and metering equipment. References shall be provided for all support documentation (nameplate information, device internal connections and associated DC schematics) for equipment shown, and interconnection to other related drawings. Three-line diagrams shall include following information, as a minimum:
- (1) High Voltage main current carrying equipment in bold up to the point of common coupling (T&D interface);
 - (2) equipment designation;

- (3) protection zone isolation points;
 - (4) CT/VT designation;
 - (5) CT/VT polarity, ratio, accuracy class and polarity;
 - (6) CT/VT isolation points;
 - (7) transformer phase relationship;
 - (8) device connection terminals; and
 - (9) wire names.
- (g) References shall be provided for all support documentation (software manuals, O&M Manuals, internal schematics) for equipment shown, and interconnection to other related drawings.
- (h) DC schematics shall have description and reference information above each contact rung.
- (i) DC schematics shall use contact development tables for relays and switches. Contact development tables shall contain: device name, device location, device description, all contacts including spares, wire name connected to contact terminal, description of contact usage, and a drawing reference of schematic incorporating the contact.
- (j) DC schematic diagrams shall include following information, as a minimum:
- (1) power sources;
 - (2) +ve on top of drawing;
 - (3) –ve on bottom of drawing;
 - (4) switching of +ve is preferred, switching of –ve is to be avoided;
 - (5) contact development on lower portion of drawing, or on next sheet if insufficient space;
 - (6) legend and notes on lower right side of drawing;
 - (7) equipment designation;
 - (8) isolation points; and
 - (9) equipment connection terminals.

- (k) Contact name and terminal information shall be shown on the right side of the contact/terminal. Contact location shall be shown below the contact name.
- (l) Coil name and terminal information shall be shown on the right side of the coil. Coil location shall be shown below the coil name.
- (m) PLC I/O drawings shall show register #, card or module identification, and hardware location for all inputs/outputs.
- (n) Configurable or settable/ tuneable devices, either by DIP switches or software, shall have the settings documented in tables on the drawing or refer to the drawing where the settings are located.
- (o) Network diagrams shall be provided for all networks in the Facility. A network is any combination of computers and other devices that are connected by an electronic serial or parallel communications medium. Network diagrams are commonly used to depict hardware nodes as well as the connections between them. Network diagrams shall include following information, as a minimum:
 - (1) topology of the network;
 - (2) IP or node address of all devices;
 - (3) protocol of the network; and
 - (4) references to manuals, settings, software.

5.4 Wiring Diagrams

- (a) Wiring diagrams shall be provided for all equipment. Wiring drawings shall include detailed physical representation of point to point interconnects of devices in a circuit.
- (b) Wiring diagrams shall be created from, and therefore shall directly match schematic diagrams.
- (c) Arrangement of the components and interconnections on the diagram shall correspond to their approximate physical locations and size.
- (d) All wiring diagrams shall use grids and grid references and be point-to-point diagrams. Drawing wires using a line from device to device (i.e. "spaghetti" wiring) is not acceptable. Wire tables are not acceptable as replacement documents for wiring diagrams
- (e) Every effort shall be made to keep the number of wiring diagram sheets per panel to a maximum of two.

- (f) Wire names shall be shown adjacent to each terminal connection with the grid number of the other end of the wire shown in brackets. If the wire is not grey a color indication is required after the brackets.
- (g) If a wire changes names (as shown on the schematic diagram) the wire name changes at the external side of the terminal block. The wire name on the conductor is shown as the external wire name with the cabinet/panel wire name shown in brackets.
- (h) No more than two wires are to be connected to a single termination on any terminal block.
- (i) Every effort shall be made to segregate wires of different voltage levels
- (j) Any conductor leaving a cabinet/panel must do so via a terminal block. Direct panel to panel wiring is not acceptable.
- (k) Each wire/cable shall be identified by name/number on each termination point.
- (l) Cable information must be shown on the bottom or top of the drawing to reflect where the cable enters the panel/cabinet.
- (m) For cable junction boxes with no other internal wiring a grid is not required. Show terminal blocks with cable details only.
- (n) Every effort shall be made to keep all internal panel connections on the same side of the terminal block and all external panel connections on the other side of the terminal block.

5.5 Layout Diagrams

- (a) Facility layout drawings shall outline the building, work areas, aisles, and individual items of equipment all drawn to scale.
- (b) Layout drawings shall detail scaled and dimensioned shapes of all the parts and their interrelation and include such features as various types of lines, dimensions, lettered notes, sectional views, and symbols.
- (c) Section views are required where objects have complicated interior details which cannot be clearly shown by means of front, top, or side views section views.
- (d) In addition to describing the shape of objects, layout drawings shall show dimensions, so that structures or fabricated parts can be manufactured and fit together. The required values (measurements) shall be placed along dimension lines (usually outside the outlines of the object) and include additional information in the form of notes which are referenced to the parts in question.

- (e) Cabinet/Panel layout diagram shall include nameplate labelling information. Nameplate or rating plate drawing shall show all the ratings.
- (f) Layout diagrams identify all components by cross-reference to the Bill of Material. Cabinet/Panel layout diagram shall include table identifying all the components in the panel, with reference to master Bill of Material.

6. CABLE SCHEDULE

- (a) Cable schedule shall be a comprehensive list of all cables in the Facility. Project Co shall prepare a single cable schedule that lists all the cables installed in the Facility.
- (b) Each cable shall be assigned a unique numeric identifier.
- (c) Cable schedule shall contain all information necessary to install cables required to interconnect equipment. The minimum information required for each cable shall be:
 - (1) type (including conductor size and number of conductors);
 - (2) length;
 - (3) purpose;
 - (4) originating panel; and
 - (5) terminating panel.
- (d) Cable schedule shall also include routing, revision information and special instructions.
- (e) Cable schedule shall be indexed such that the cable numbers are grouped according to function or equipment.
- (f) Cable schedule shall be implemented in an electronic form using an application which allows easy entry, error checking, revision control, and printing of portions of the cable schedule by specified parameters including printing by revision. MS Access based BC Hydro Cablebase software may be used to generate cable schedule. BC Hydro will provide Cablebase upon request.

7. CIVIL, STRUCTURAL AND GEOTECHNICAL DRAWINGS

All civil, structural and geotechnical drawings shall comply with all standards issued in Section G of BC Hydro Engineering Standards ES-10. Where a standard specified in Section G of BC Hydro Engineering Standard ES-10 conflicts with the requirements of the BC Hydro Generating Engineering AutoCAD Drafting Standards and Conventions, the applicable drawings shall comply with the requirement of the BC Hydro Generating Engineering AutoCAD Drafting Standards and Conventions.

APPENDIX 5F

FORM OF CHECKING TEAM DESIGN CERTIFICATE

Certificate Ref No. []

DESIGN CERTIFICATE (CHECKING TEAM)

Agreement between British Columbia Hydro Authority and [Project Co] dated • (the “Agreement”) relating to the Project. Defined terms and expressions used in the Agreement have the same meanings in this certificate.

Form of certificate to be used by the Checking Team for certifying the design of elements specified in Section 5.16.3 [Elements Requiring an Independent Check], in accordance with Section 5.16 [Independent Checking] of Schedule 5 [Design and Construction Protocols] to the Agreement.

1. We certify that we have the requisite professional qualifications, skill and experience to perform an independent check of the Design Data referred to herein in accordance with the requirements of the Agreement.
2. We certify that we have performed an independent check (as required in the Agreement for the elements specified in *Section 5.16.3 [Elements Requiring an Independent Check] of Schedule 5 [Design and Construction Protocols]*) of the Design Data for [.....] listed in the Exhibit hereto *[and annexed in accordance with all applicable requirements contained in the Design Management Plan and the Design Quality Management Plan]* and utilizing the standards of care, skill and diligence that, in accordance with the standards of our profession, are required of experienced professionals undertaking such an independent check, and that in our professional opinion:
 - (i) the said Design Data meets performance expectations outlined in the Agreement, *[including Technical Appraisal Form] No. [.....] dated [.....]*, as amended by the following:

[List, if any, the changes made by the issue of Change Certificates, and any addenda to the foregoing Technical Appraisal Form]; and
 - (ii) the design, methodologies and assumptions are consistent with Good Utility Practice.

EXHIBIT

[Include here drawing numbers and titles, reports, calculations, etc.]

Signed:
Checking Team (Principal)
Name:
Title:
Date:
Professional Registration Number:
Affix Professional Seal

Signed:
Project Co's Representative
Name:
Date:

This certificate is:

- i. received*
 - ii. received with comments as follows*
 - iii. returned marked "comments" as follows:*
- * delete as appropriate

Signed:
BC Hydro's Representative
Name:
Date:

APPENDIX 5G

INTERCONNECTION SUBMITTAL REQUIREMENTS

1. DATA SUBMISSION REQUIREMENTS

The following outlines the format and the data that will be required at various stages of: planning, design, commissioning and in-service of the Facility. This data is required by BC Hydro so that the internal communication between the Project and transmission planning can be fulfilled and ensure connection to the "Point of Interconnection" is permitted.

Submittal information required includes:

- (a) the Generator Unit/Facility Data Sheet for Tariff Supplement-79 (TS-79) Attachment 2 of the Terms and Conditions for Modifications (TCM) document, attached to this Appendix 5G [*Interconnection Submittal Requirements*];
- (b) Factory Acceptance Test (FAT) report for GSU Transformer and a copy of CNE;
- (c) Generator capability curve;
- (d) Turbine efficiency curve; and
- (e) One-line operating diagram.

1.1 Format

- (a) Copies of all commissioning reports are to be signed and sealed by the Lead Test Engineer
- (b) Wherever possible, all documents shall be provided in both paper and electronic forms.
- (c) The preferred format for: (i) reports and other documents is Word for Microsoft Office; and (ii) data, drawing indexes and the like is Excel for Microsoft Office.
- (d) The preferred formats for drawings are (in order of preference): (i) Auto-CADD *.DXF format, (ii) Intergraph MicroStation*.DGN format, and (iii) Portable Document Format (PDF).
- (e) Unless legibility is a problem, all drawings shall be submitted on either, 'A'-size (8.5" x 11"; 21.6cm x 27.9cm), or 'B'-size, sheets (11" x 17"; 27.9 cm x 43.2 cm).
- (f) All data shall be submitted using the Generator Interconnection Data Form (GIDF), which is included in the Disclosed Data. Project Co shall provide one paper copy, signed and sealed by a Professional Engineer, along with an electronic copy in Excel format.

- (g) All drawings, maps, data curves or other material requested within the GIDF shall be provided as both paper and electronic copy.

1.2 Electrical Data Requirements

(a) Electrical One-Line Diagram

- (1) The electrical one-line diagram shall include equipment ratings, equipment connections, transformer configuration, generator configuration and grounding, bus, circuit breaker and disconnect switch arrangements, etc.

1.3 Generating Data

(a) Graphs and parameters for the generator, turbine and shaft as supporting technical documentation identifying the following information:

- (1) Reactive capability, 'P-Q' curves
- (2) Excitation 'Vee' curves
- (3) Saturation and synchronous impedance curves
- (4) Identifier (e.g., GTG #12)
- (5) Complex power, kVA
- (6) Active power, KW
- (7) Terminal voltage, kV
- (8) Machine parameters
 - a. S_b – Complex power base (MVA) upon which machine data is specified
 - b. H – Normalized rotational kinetic energy of the generator/turbine/shaft assembly, KW-sec/kVA
 - c. WR_2 – Moment of inertia, lb. Ft²
 - d. R_a – Armature resistance, pu
 - e. X_d – Direct axis unsaturated synchronous reactance, pu
 - f. X'_d – Direct axis unsaturated transient reactance, pu
 - g. X'_q – Quadrature axis saturated and unsaturated transient reactance, pu

- h. X''_d – Direct axis saturated and unsaturated sub-transient reactance, pu
- i. X_l – Stator leakage reactance, pu
- j. X_2 – Negative-sequence reactance, pu
- k. X_0 – Zero-sequence reactance, pu
- l. X_n – Zero-sequence unit grounding reactance, pu
- m. R_n – Zero-sequence unit grounding resistance, pu
- n. T'_{do} – Direct axis transient open circuit time constant, seconds
- o. T'_{qo} – Quadrature axis transient open circuit time constant, seconds
- p. T''_{do} – Direct axis sub-transient open circuit time constant, seconds
- q. T''_{qo} – Quadrature axis sub-transient open circuit time constant, seconds
- r. $S(1.0)$ – Saturation factor at rated terminal voltage, A/A
- s. $S(1.2)$ – Saturation factor at 1.2 per unit of rated terminal voltage, A/A

(b) Excitation system modeling information

- (1) Type (static, ac rotating, etc.)
- (2) Maximum/Minimum DC current
- (3) Maximum/Minimum DC voltage
- (4) Nameplate information
- (5) Block diagram
- (6) Power System Stabilizer (PSS) type and characteristics
- (7) Speed governor information with detailed modeling information.
- (8) Turbine type (Hydro)
- (9) Total capability, MW (available peak operation rating)
- (10) Manufacturer and model
- (11) Frequency vs. time operational limits, seconds at Hz

- (12) Maximum turbine ramping rates, MW/minute, ramp up and ramp down
- (c) Transformer Data (for Interconnection data sheet, also need FAT results including % impedance, connection winding diagram, nameplate data, no-load & full load losses, tap position). The following data shall be provided:
 - (1) Transformer number or identifier and nameplate data
 - (2) Transformer winding data.
 - a. For each winding, H, X
 - b. Nominal voltage, kV
 - c. Configuration (.D or Y) and Y winding connection (ungrounded, solid ground or impedance ground)
 - (3) Transformer MVA ratings:
 - (4) Transformer impedances, positive and zero sequence:
 - a. Winding H to X, % X and R at MVA
 - (5) Transformer tap changer information
 - a. No load or load
 - b. Tap changer winding location, H, X
 - c. Available taps
 - (6) Transformer cooling requirements
 - a. Load, amps
 - b. Voltage, single or three phase, kV

WECC GENERATING UNIT DATA REQUIREMENTS

2. SYNCHRONOUS GENERATOR DATA

- (a) Provide synchronous generator nameplate data, including rated MVA, kV, stator Amps, power factor, RPM, exciter voltage, rotor Amps.
- (b) Provide the following synchronous generator parameters:

| | | |
|--|-------------------|--|
| 1. Impedance Data in per unit on machine rated MVA and kV | | |
| Synchronous direct axis reactance – unsaturated | X _{di} | |
| Synchronous quadrature axis reactance– unsaturated | X _{qi} | |
| Transient direct axis reactance – unsaturated | X' _{di} | |
| Transient quadrature axis reactance – unsaturated (*) | X' _{qi} | |
| Subtransient direct axis reactance – unsaturated | X'' _{di} | |
| Subtransient quadtaure axis reactance – unsaturated (*) | X'' _{qi} | |
| Leakage reactance | X _l | |
| Positive sequence resistance | R _a | |
| 2. Field Time Constants | | |
| Open circuit transient time constant – direct axis | T' _{do} | |
| Open circuit transient time constant – quadrature axis (*) | T' _{qo} | |
| Open circuit subtransient time constant – direct axis | T'' _{do} | |
| Open circuit subtransient time constant– quadrature axis | T'' _{qo} | |
| 3. Combined Turbine-Generator(-Exciter) Inertia | | |
| Inertia Constant | H | |
| 4. Open-Circuit Saturation | | |
| Saturation at 1.0 pu generator voltage | S _{1.0} | |
| Saturation at 1.2 pu generator voltage | S _{1.2} | |

(*) not required for salient pole generators

- (c) Provide generator open circuit saturation curve with air-gap line.
- (d) Air gap field current at rated generator voltage _____ Amps.
- (e) Measured field winding resistance _____ Ohms.
- (f) Field winding temperature or generator hot air/gas temperature at which the field winding resistance was measured _____ C.

2.1 Excitation System Data

2.1.1. Exciter and Voltage Regulator

- (a) Excitation system type (static) and manufacturer: _____.

- (b) Provide nameplate information on excitation equipment (such as excitation transformer in static exciters, dc generator and amplidyne in dc rotating exciters, main and pilot ac generators in ac rotating exciters).
- (c) Voltage regulator type and manufacturer (e.g., GE EX 2100, ABB Unitrol-F, etc).:
_____.
- (d) Provide a block diagram and completed data forms for the corresponding WECC-approved model.

2.1.2. Line Drop Compensation/Reactive Current Compensation

- (a) Indicate whether the voltage regulator has a line drop compensation or reactive current compensation, and provide settings in per unit on machine rated MVA and kV.

2.1.3. Power System Stabilizer

- (a) PSS type and manufacturer (e.g., GE EX2000, Basler)
- (b) Provide a block diagram and completed data forms for the corresponding WECC-approved model.

2.1.4. Over-Excitation Limiter (OEL)

- (a) Provide fullest available information on OEL.
- (b) Indicate OEL type and manufacturer (e.g. Westinghouse MXL/OMP).
- (c) Describe OEL time characteristic (definite time, inverse time).
- (d) Provide pickup vs. time characteristic curve.
- (e) Describe OEL actions (e.g., reduce field current below continuous current rating, trip voltage regulator into manual field current control, trip the generator.)

2.1.5. Under-Excitation Limiter (UEL)

- (a) Provide fullest available information on UEL.
- (b) UEL type (conventional or voltage sensitive, PQ-limiter, etc).
- (c) Describe UEL actions.
- (d) Provide limit settings as a curve of real and reactive power.

2.1.6. Stator Current Limiter

- (a) Is a stator current limiter incorporated into the excitation system?
- (b) Provide fullest available information on stator current limiter.

2.1.7. High Voltage Bus Controllers, VAR limiters and Power factor controllers

- (a) Provide fullest available information on these controllers.
- (b) Indicate which of these controllers are active in normal operation.

2.2 Generator Reactive Capability Curves

- (a) Continuous field current rating _____ Amps.
- (b) Provide machine reactive capability curves at rated voltage.
- (c) Superimpose generator control, limiter and protection curves on the machine reactive capability curve.
- (d) Define the operating reactive capability of the generator.
- (e) Provide information on reactive power limits implemented by plant or unit supervisory controls (e.g. plant DCS, GE Mark V/ Mark VI / Ovation, GDACS).

3. TURBINE-GOVERNOR DATA

3.1 Hydro-turbine generators

- (a) Turbine type (Francis) _____.
- (b) Nominal head _____ ft Typical range of operating heads _____ ft.
- (c) Turbine capacity at full gate opening, nominal head _____ MW.
- (d) Provide the "*Power versus Gate Position*" characteristic at expected operating heads.
- (e) Provide contact information for a person for reference regarding hydraulic profile of the plant.
- (f) Water inertia starting time T_w _____ sec.

3.2 Hydro Governor

- (a) Hydro governor type (e.g. Asea analog electronic, Woodward dash-pot, Woodward 505H, Voest Alpine electronic) _____.

- (b) Provide a block diagram and completed data forms for the WECC-approved models.

4. POWER PLANT CONTROLS (E.G. GE MARK V, OVATION,)

4.1 Load or MW controller

- (a) Indicate whether the Facility has an active load controller (e.g. Process Coordinated Controller).
- (b) Describe load controller functions:
- Does it keep the MW output of the Facility at a specified set-point?
 - Does it have a frequency bias and dead-band?
- (c) Provide recordings of Facility response to system frequency excursions, if available.
- (d) Provide information on AGC capability, ramp rates (up and down), and ranges (low and high). Provide ramp rate recordings, if available.

4.2 Reactive Power Controller

- (a) Indicate whether the Facility has any reactive power controller (high-side voltage controller, reactive power balancing among units, etc).
- (b) Describe the reactive power controller functions:
- Does the controller balance reactive power among generators in the Facility?
 - Does the controller perform high-side voltage control automatically and how fast it starts and completes response?
 - Does the controller limit generator terminal voltage (e.g. +/- 5% of nominal)?
- (c) Provide SCADA recordings of Facility response to system voltage deviations, if available, showing the effect of the Facility reactive power controller.

5. TRANSFORMERS

Provide the following information for each of the transformers identified in the principal one-line diagram of the Facility.

Application (GSU): _____

Number of Windings (2 or 3): _____

Indicate whether the unit is an autotransformer: _____

Note: Subsequent data in rows identified with asterisk (*) are required only for 3-winding transformers

(a) Winding Data

| Winding | Nominal | Configuration | Nameplate MVA Ratings | | |
|------------------|---------|---------------|-----------------------|----|-----|
| | [kV] | [Δ, Y, YG] | FA | FO | FOA |
| Primary – H | | | | | |
| Secondary – X | | | | | |
| (*) Tertiary – Y | | | | | |

(b) Impedance Data (base MVA= _____ base kV= _____) :

| Windings | R1 | X1 | R0 | X0 |
|------------|----|----|----|----|
| H to X | | | | |
| (*) H to Y | | | | |
| (*) X to Y | | | | |

(c) Tap Changer

| Tap Changer | Tap Position [kV or Percent] | | | |
|--------------|------------------------------|-----|-----|------|
| Winding | Operating | Min | Max | Step |
| (H, X, or Y) | | | | |

(d) For on-load tap changers, specify the following:

- Regulated voltage: _____ percent, or Volts
- Controlled bus: _____
- Dead-band: _____ percent, or Volts
- Tap changer time constant: _____ sec

6. LINE DATA

Provide the following data for each of the lines and feeders identified in the principal one-line diagram of the Facility:

| | |
|--------------------------------------|--|
| Nominal operating voltage, kV | |
| Line length, mi | |
| Positive sequence line resistance, Ω | |
| Positive sequence line reactance, Ω | |

Please indicate whether the line is overhead or underground.

7. AUXILIARY LOAD

Provide auxiliary load MW and MVAR at minimum stable and maximum power output.

Auxiliary load may be identified as any load at utilization voltage less than the transmission system interconnection voltage, including station service load and unit service load.

Tariff Supplement-79 Attachment-2 Unit Data

| Description | John Hart GS | Reference For Additional Information (One Line Diagram/Report #) |
|---|---------------------|---|
| B.2 Synchronization | | |
| Circuit Breaker (s) used | | One Line Diagram Dwg No: |
| B.3 Blackstart | | |
| Blackstart Capability | YES/NO | |
| C.2 Switchgear Ratings | | |
| 1. Continuous | | |
| A) Circuit Breakers | | One Line Diagram Dwg No: |
| B) Disconnect Switches | | One Line Diagram Dwg No: |
| 2. Circuit breaker fault current rating | | One Line Diagram Dwg No: |
| C.3 Generator Maximum Power Output | | |
| Nameplate | | Report # |
| MPO (plant) | MW | |
| C.4 Generator Reactive Capability | | |
| 1. Capability Curves | | C.R.O. |
| 2. Unit/Plant MVar or terminal voltage adjustment by BCTC | | |
| 3. Line-Drop-Compensation (LDC) equipment and setting | | |
| 4. Joint Voltage Control Equipment | | |
| 5. Generator Voltage Regulator Minimum and Maximum Voltage Setpoint | | |
| A) Automatic | | |
| B) Manual | | |
| 6. ULTC Capability | | |
| C.5 Excitation Equipment | | |
| 1. Time for V_f to change from rated to 0.95% following a large step change | | Report # |
| 2. Negative field voltage capability | | Report # |

| | | |
|---|---|-----------------------------|
| 3. PSS | | |
| C. 6 Voltage Regulator when generator in Synchronous Condenser Mode or Minimum MW Mode | | |
| A) Maximum Voltage | | Report # |
| B) Minimum Voltage | | Report # |
| C. 7 Excitation System Limiters | | |
| 1. OELs (Terminal Voltage/Field Current) | | |
| 2. UELs (Reactive Ampere Limiting) | | Report # |
| C. 8 Off-Nominal Frequency Operation | | |
| 1. O/F and U/F capability (Unit) | | |
| 2. O/F and U/F settings (Unit) | | |
| C. 9 Off-Nominal Voltage Operation | | |
| 1. O/V and U/V Capability (Unit) | | |
| 2. O/V and U/V settings (Unit) | | PI Sheets |
| C. 10 Governor Specifications | | |
| 1. Speed Droop | | Report # PS- |
| 2. Dead Band | | |
| D. 1 General Protective Relay Requirements | | |
| 1. Relay Information | See Generating Station P&C Setting Sheets | |
| E.1 Operations Control and Telecommunications Facilities | | |
| E.1.1 Remote Control Facility and Control Centre | | |
| A) Remote Control Facility | | Communication Block Diagram |
| B) Control Centre | | Communication Block Diagram |
| C) Control Points | | |
| D) Point Assignment | | |
| E) Communication Block Diagram | | |
| E.1.2 Automatic Generation Control System (AGC) | YES/NO | |
| E.1.3 Remedial Action Schemes (RAS) | YES/NO | |

| | | |
|-------------------------------------|-------------------|--|
| E.1.4 Telemetry | | |
| E.1.5 Alarm Points | | |
| E.1.6 Equipment Status | | |
| E.1.7 Battery/Charger System | | |
| System | | |
| E.1.8 Revenue Metering System | | |
| E.2 Telecommunications Media | | |
| Telecommunications Media | Digital Radio/PLC | |

APPENDIX 5H

SPECIFIC DESIGN SUBMITTALS

Provide calculation reports, together with the applicable drawings as specified in Schedule 6 [*Design and Construction Specifications*]. Calculation reports shall not be limited only to the results of calculations, but shall include at least the following information as well:

- (a) description of calculation methods used;
- (b) formulas for all calculations steps and intermediate and final results;
- (c) any assumptions made for calculations; and
- (d) discussion of results and comparison with the specification requirements.

As a minimum, Project Co shall submit, with the applicable drawings, the following calculations:

- (e) Calculations of deflection and stresses for the worst case operating conditions for major components. The calculations shall be provided for the conditions of Maximum Operating NSHE and Rated Turbine Power Output, maximum runaway speed, load rejection conditions, speed-no-load and other conditions as applicable for all major turbine components including the following:
 - (1) spiral case,
 - (2) stay ring,
 - (3) flexible coupling,
 - (4) draft tube liner,
 - (5) discharge ring
 - (6) runner,
 - (7) main shaft,
 - (8) headcover,
 - (9) bottom ring,
 - (10) wicket gates,
 - (11) wicket gate operating mechanism including regulating ring,
 - (12) servomotors,

- (13) pier nose cap.

These calculations shall include the effects of stress concentration, residual stresses in the welds and heat-affected zones and shall also take into account both static and dynamic loading on the turbine components. The level of residual stresses used for the purpose of stress calculations and also for fatigue analysis in accordance with Schedule 6 [*Design and Construction Specifications*] shall be submitted.

Where applicable, separate calculations shall be provided for the component static stresses and dynamic stresses. For definition of these stresses, refer to Schedule 6 [*Design and Construction Specifications*]. The method used for assessing the dynamic stresses during the design stage shall be submitted. Where Finite Element Methods are used for the calculation of deflection and stresses, attention shall be given to the selection of calculation domain (full component or one segment only), applied loading distribution, boundary conditions and quality of calculation mesh. Project Co shall test the sensitivity of the calculation results to varied critical or key input data, boundary conditions and alternative meshing. Project Co shall demonstrate that the generated calculation mesh is sufficiently refined, especially at the locations of stress concentration, and the density of mesh nodes is adequate for accurate calculation of the stresses and deflections of the turbine components.

- (f) Calculations for deflection for the worst case operating conditions (Maximum Operating NSHE and Rated Turbine Power Output, maximum runaway speed, load rejection conditions, speed-no-load and other conditions as applicable) for the turbine assembly to verify that contact is avoided between the wicket gates and headcover and between the wicket gates and bottom ring. The turbine assembly used in the calculations shall include, the stay ring, headcover, bottom ring, discharge ring, wicket gates and wicket gate operating mechanism.
- (g) For the spiral case, the stay ring and the bulkheads, calculations of stresses and deflections occurring during the spiral case hydrostatic pressure tests and subsequent spiral case embedment under internal water pressure as specified in Schedule 6 [*Design and Construction Specifications*].
- (h) Calculations of the torsional and flexural critical speed of the main shaft, and shaft stresses under extreme loading conditions, such as the generator short circuit condition and out-of-phase synchronization condition.
- (i) Calculations of the shaft critical speeds shall be provided for the full range of the turbine guide bearing stiffness starting from zero stiffness and up to sufficiently high values of stiffness exceeding the expected bearing stiffness. These calculations shall demonstrate that at all expected values of guide bearing stiffness the following requirements will be met:
 - (1) minimum shaft critical speed shall be at least 30% higher than maximum turbine runaway speed;

- (2) shaft resonance in bending or torsional vibration mode shall not be excited during Unit operation within the full range of specified operating regimes.
- (j) For all embedded components, calculations of buoyancy, stresses, deflections and displacement during their concreting.
- (k) Calculation of bearing pressures for all bearings and wear surfaces at normal operating regimes and at the most adverse combination of loading conditions.
- (l) Calculations of guide bearing temperature rises under normal and abnormal operating conditions.
- (m) To exclude resonance of the stay vanes and wicket gates due to flow induced excitations (including Von Karman vortex excitations), calculations of the natural frequencies of the above components in air and in water shall be submitted along with the CFD analysis of the flow through the stay vane/wicket gate cascade. These calculations shall confirm that for all operating conditions, possible hydraulic excitation frequencies do not coincide with any of the natural frequencies of the stay vanes and wicket gates in water and the margin is sufficient to avoid resonance.
- (n) Numerical dynamic and modal analysis of the runner (using steady state and non-steady state Finite Element Methods and Computational Fluid Dynamics) shall be submitted. This analysis shall be supported by the experimental data demonstrating validity of the methods used and providing satisfactory evidence of similarity with previously analysed runners, which were supplied by Project Co and are presently in operation.
- (1) The runner dynamic and modal analysis shall include:
- evaluation of the predominant excitation frequencies to be expected during operation of the Generating Unit, such as buffeting, blade passage frequency, blade gate interaction frequency, blade vortex shedding frequency, wicket gate passage frequency, draft tube vortex frequency and any torsional excitation frequencies from the generator;
 - numerical analysis of the runner natural frequencies and modes of vibration in air and in water and comparison with the experimental data; and
 - analysis of correlation of analytically predicted modal results, including natural frequencies of the runner in water, with the external excitation frequencies that could be reasonably expected to occur.
- (2) This analysis shall demonstrate sufficient margins between the runner natural frequencies in water and expected in service excitation frequencies to avoid the runner resonance conditions.
- (o) Calculation of the shaft coupling stresses, coupling bolt preload and stresses in the coupling bolts at the maximum turbine power output and at the most adverse transient regimes.

- (p) Calculations of the fatigue life based on the state of knowledge and technology available at the date of performance of the work shall be submitted for all major turbine components listed in Schedule 6 *[Design and Construction Specifications]*. These calculations shall demonstrate fatigue life of not less than 80 years.

Fatigue analysis to be performed by Project Co during the design stage and based on calculated static and dynamic stresses, shall consider cumulative effect of all significant loading cycles expected in service including but not limited to those at normal operating regimes and transient regimes as specified in Schedule 6 *[Design and Construction Specifications]*.

- (q) Calculation of the spiral case pressure rise and speed rise on load rejection for the most adverse operating regime.
- (r) Calculations of the hydraulic downthrust and upthrust during transient conditions. These calculations shall demonstrate that for the most adverse transient regimes, the maximum hydraulic downthrust and upthrust will not exceed the Guaranteed Maximum Hydraulic Upthrust and the Guaranteed Maximum Hydraulic Downthrust.
- (s) Calculations of stresses and deflections for the major turbine components resulting from superimposing the equipment design earthquake loads on the normal operating steady state loads and/or transient loads expected in service. The most adverse combination of the equipment design earthquake loads, steady state loads and transient loads shall be clearly identified together with the resulting stresses and deflections in major turbine components.

The calculations shall include calculations of static and dynamic loads transmitted to the turbine foundations at normal operating conditions, at load rejection with highest transient pressure rise, and at the most adverse combination of loading conditions including equipment design earthquake loads.

- (t) Calculations of stresses and fatigue life for the connecting bolts/studs at both horizontal and vertical flanges on/between head cover and stay ring. The flange prying effect shall be considered in the calculations.

The loadings to be considered for the headcover fasteners and stay ring threaded holes consist of the preload, operational loads, and fatigue load cycles.

The turbine operating conditions when determining the headcover fastener operational loads shall include:

- (1) Generating Unit watered up and at standstill;
- (2) all normal operating conditions;
- (3) load rejections from all wicket gate positions; and

- (4) runaway speed condition.

The fatigue load cycles shall include the cycles listed below. The cycle frequencies shall be as per Schedule 6 *[Design and Construction Specifications]*:

- (1) watering and dewatering cycles;
- (2) start and stop cycles;
- (3) pressure fluctuation cycles at all normal operating conditions;
- (4) load rejection to unit stop cycles;
- (5) runaway to unit stop cycles; and
- (6) headcover fastener installation to removal cycles.

Calculation of the preload safety factor as required in Schedule 6 *[Design and Construction Specifications]*.

Finite element analysis ("**FEA**") of the headcover fastener and joint stresses and deflections. The calculation domain for such FEA modeling shall include all details of the headcover and stay ring assembly with particular attention to the geometry and details of the fasteners and the headcover and stay ring flanges with a fine enough mesh (sensitivity analysis required).

Fatigue assessment of the headcover and stay ring joint as required in Schedule 6 *[Design and Construction Specifications]*.

- (u) Calculations of wicket gate lever friction device torque carrying capacity as required in Schedule 6 *[Design and Construction Specifications]*.
- (v) Calculations demonstrating that requirements of Schedule 6 *[Design and Construction Specifications]* for Generating Unit operation following wicket gate shear pin breakage shall be met. This shall include, calculations of the bearing loading, wicket gate friction device loading, runner lateral deflection, stresses and fatigue damage in the runner and other turbine components under all turbine design operating conditions specified in Schedule 6 *[Design and Construction Specifications]* with a broken shear pin.

APPENDIX 5I

NOT USED

APPENDIX 5J

INDEPENDENT ENGINEER TERMS OF REFERENCE

The scope of work is to provide engineering services, as a Professional Engineer registered in British Columbia, and act as the Independent Engineer for the B.C. Comptroller of Water Rights under the Water Act ("the Engineer") for the John Hart Generating Station Replacement Project ("the Project") and all as may ultimately be required by any final issue of the Water Licence. The Independent Engineer will provide information and reports on the design and construction of the Project works to the Engineer. The overarching responsibility of the Independent Engineer is to assure that these activities are adequately *managed* and monitored such that public safety and the environment are properly protected.

The key responsibilities and the scope of information and reports by the Independent Engineer are outlined in the Water Licence.

The Independent Engineer shall be required to:

- Meet with personnel from the Office of the Comptroller of Water Rights in Victoria B.C. or other venue acceptable to the Engineer for the purposes of:
 - Facilitating introductions and initial discussion and thereby a better understanding of the role and responsibilities of the Independent Engineer.
 - Facilitating understanding of the process and procedures required by the Comptroller of Water Rights for issue of Leaves to Commence.
 - Facilitating understanding and agreement as to the deliverables required by the Engineer from the Independent Engineer under the Water Licence.
- Meet with Project Co and BC Hydro in their respective Vancouver offices and at the Site for the purposes of discussing and agreeing to logistics and protocols for receiving/reviewing/processing the Leaves to Commence.
- Liaise with the Engineer and give Project Co guidance on how many Leaves to Commence Project Co will likely require based on design and construction information supplied by Project Co.
- Meet with Project Co and/or BC Hydro's personnel as may be required for review, discussion, processing and issue of Leaves to Commence Construction and Operation or otherwise dealing with related Leave to Commence issues all as may be required by the Water Licence, the Engineer, Project Co and BC Hydro
- Review information to be provided by Project Co on the design and construction schedule, and criteria for operation of the Project works;

- Prepare a report to the Engineer recommending the issuance of Leave to Commence Construction, including a recommendation as to whether any additional Leaves to Commence Construction should be required for specific phases of construction; and upon agreement of the Engineer, submit letter(s) to BC Hydro and Project Co that the construction of the intake, underground tunnel, hydraulic transient management system, flow bypass system, powerhouse and/or ancillary works may proceed.
- Prepare a report to the Engineer recommending the issuance of Leave to Commence Operation, and upon agreement of the Engineer, submit letter(s) to BC Hydro and Project Co that the intake, underground tunnel, hydraulic transient management system, flow bypass system, powerhouse and/or ancillary works have been designed and constructed to operate within the applicable final Water Licence and Water Use Plan parameters in the Disclosed Data;
- Develop and maintain coordination with the Environmental Monitor regarding environmental concerns and monitoring during construction;
- Provide any additional information and reports that may be directed by the Engineer.
- Have an alternate with sufficient experience to perform the role of Independent Engineer should the individual performing the role be unavailable.
- Keep informed as to the project status so as to enable:
 - timely response to Leaves to Commence;
 - timely response to any Project Co request for additional Leaves to Commence;
 - keeping the Engineer informed as to Project status and any issues of interest to the Engineer;
 - communication and coordination with the Environmental Monitor as required pursuant to the Water Licence; and keeping informed as described herein may be accomplished/facilitated in multiple ways including for example:
 - periodic site visits
 - attendance at monthly coordination meetings with BC Hydro, and Project Co.
 - reading of weekly and monthly reports and other relevant documentation issued by Project Co.
 - keeping open communication with BC Hydro, and Project Co.

APPENDIX 5K

GOO 4G-44 VARIANCE REQUEST PROCEDURE

Where the nature of a particular Commissioning test is such that it cannot practicably be implemented in full compliance with GOO 4G-44, Project Co shall submit a report to BC Hydro documenting its Commissioning Plan, mitigation plans, and the description and expected impacts associated with the anticipated Nonconformity such that BC Hydro may apply to the Governmental Authorities for a variance to GOO 4G-44.

The risk of obtaining or not obtaining a variance shall remain with Project Co and the particular Commissioning test shall not proceed until a variance is obtained or the test can be done in compliance with GOO 4G-44. Any variance request should be made as far in advance as possible since there is no certainty on response time from the applicable Governmental Authorities.

An application for a variance to GOO 4G-44 may be rejected by BC Hydro in its discretion, without forwarding the application to the applicable Governmental Authorities or may be rejected by the Governmental Authorities. As preliminary guidance, Project Co shall consider the following information. The inclusion or exclusion of any item in the following list does not indicate *de facto* approval or rejection of a variance to GOO 4G-44 nor does it relieve Project Co of the obligation to fully comply with GOO 4G-44 and to minimize public safety and environmental hazards:

- (a) a variance to GOO 4G-44 is not likely to be approved during the period of 1 July – 21 September;
- (b) planned use of the Spillway for non-flood routing purposes during 1 July – 21 September is not likely to be approved;
- (c) a variance to GOO 4G-44 is not likely to be approved during the period from 1 March – 30 April;
- (d) variances for flow decreases that are not compliant with the flow ramping rates and that are not fully recovered within 10 minutes will likely only be considered if there is a concurrent protective base flow of at least 80 m³/s;
- (e) variances for flow decreases that are not compliant with the flow ramping rates and that are fully recovered within 10 minutes will likely only be considered if there is a concurrent protective base flow of at least 40 m³/s; and
- (f) a variance to GOO 4G-44 is likely to be rejected if the proposed test can be conducted in full compliance or with lesser impact at another time of year.

Project Co shall note well the constraints of the varying seasonal flow regimes and the potential schedule impacts associated with delays that occur during Commissioning. In particular the Commissioning Plan or any variances to GOO 4G-44 that have been agreed to for a particular seasonal flow regime may not be

approved for another flow regime. Minor schedule delays during the Commissioning Work can manifest in significant schedule delays if favourable flow “windows” are missed.

BC Hydro shall not be responsible for Commissioning delays caused by the inability of Project Co to manage water flow requirements in accordance with GOO 4G-44.

APPENDIX 5L

OPERATING ORDER REQUIREMENTS

The following operating orders for the Existing Facility are included in the Disclosed Data:

- (a) GOO No. 4-G-44 John Hart Project;
- (b) LOO No. 3-G-JHT-01 John Hart Generating Station (JHT);
- (c) LOO No. 3-G-JHT-02A John Hart Generating Station (JHT) Alarm Systems;
- (d) LOO No. 3-G-JHT-02B John Hart Generating Station (JHT) Protection System;
- (e) LOO No. 3-G-JHT-03 John Hart Generating Station (JHT) Fire Protection;
- (f) LOO No. 3-G-JHT-04 John Hart Generating Station (JHT) Environmental Spill Contingency;
- (g) LOO No. 3-G-JHT-05 John Hart Generating Station (JHT) Work Protection Practices;
- (h) LOO No. 3-G-JHT-06 John Hart Generating Station (JHT) Dam and Discharge Facilities;
- (i) LOO No. 3-G-JHT-07A John Hart Generating Station (JHT) Air Auxiliary Systems;
- (j) LOO No. 3-G-JHT-07B John Hart Generating Station (JHT) Drinking Water System Emergency Response Plan;
- (k) LOO No. 3-G-JHT-08 John Hart Generating Station (JHT) Public Safety Management Plans;
- (l) LOO No. 3-G-JHT-09 John Hart Generating Station (JHT) Station Security; and
- (m) LOO No. 3-G-JHT-10 John Hart Generating Station (JHT) Emergency Planning & Procedures.

Project Co shall develop detailed operating procedures sufficient to fulfil the Project Requirements, based on the design of the Facility and other information provided by the manufacturers of the major equipment and auxiliary systems actually installed.

Each Local Operating Order prepared by Project Co shall: (i) be consistent in content, detail and format to the applicable Local Operating Order for the Existing Facility; (ii) comply with the requirements of General Operating Order 1G-01 v.4 *"Policy and Procedures for Generation Operating Orders"*; and (iii) be developed for the following operating conditions:

1. Normal (Remote Operation and Dispatch) - the Facility is a remotely monitored and operated facility under normal conditions. All Services shall be performed as to minimize BC Hydro and Project Co staff intervention for normal operation.
2. Normal (Site Operation and Dispatch) - the operating procedures under this condition must allow for local operation and dispatch at those times when outages are necessary for inspection or maintenance of equipment or systems.
3. Emergency - the operating procedures under this condition must address those operating procedures that require unanticipated operator intervention to shutdown the Facility and bring it back on line in those instances where "Normal" operating procedures fail to function as planned. The "Emergency" operating procedures must allow the Facility to be brought safely back on line after an emergency shutdown as expeditiously as possible without damage to any of the Facility or the BC Hydro Transmission System.
4. Black-start - the operating procedures under this condition must allow the Facility to be started up with no generators spinning using only in-plant emergency power provided by the Backup Diesel Generator.

Each Generation Operating Order prepared by Project Co shall: (i) be consistent in content, detail and format to the applicable Generation Operating Order for the Existing Facility; (ii) comply with the requirements of General Operating Order 1G-01 v.4 *"Policy and Procedures for Generation Operating Orders"*; and (iii) provide a sufficient level of detail to permit the safe operation of the Facility.

Each Joint Operating Order prepared by Project Co shall: (i) be consistent in content, detail and format to the draft Joint Operating Order included in the Disclosed Data; (ii) comply with the requirements of General Operating Order 1G-01 v.4 *"Policy and Procedures for Generation Operating Orders"*; and (iii) provide a sufficient level of detail to permit the safe and coordinated operation of the Existing Facility and the Facility during Commissioning and the Bridging Period.

APPENDIX 5M

FORM OF COMMISSIONING CERTIFICATE

Certificate Ref No. []

COMMISSIONING CERTIFICATE

Agreement between British Columbia Hydro Authority and [Project Co] dated • (the "Agreement") relating to the Project. Defined terms and expressions used in the Agreement have the same meanings in this certificate.

Form of certificate to be used by the Lead Test Engineer, Designer, Design-BUILDER and Project Co for certifying performance of the Commissioning activities in accordance with the Commissioning Plan and Section 9 [Commissioning] of Schedule 5 [Design and Construction Protocols] to the Agreement.

PART I – DESIGNER'S, DESIGN-BUILDER'S AND PROJECT CO'S STATEMENT

1. We certify that **[name of element of Project Work]** has been designed and constructed, and that all pre-commissioning tests, inspections and other conditions precedent required prior to **[name of applicable commissioning step]** have been successfully completed, in all respects in accordance with:
 - (i) the relevant Design Data and Design Certificates in each case to which there has been no objection under the Review Procedure;
 - (ii) the provisions of the Agreement including all applicable Project Requirements **[as amended by the following Minor Works, Change Certificates and Innovation proposals]**;
 - (ii) applicable Law and Good Utility Practice; and
 - (iii) all applicable standards and codes.
2. We certify that all conditions precedent to **[name of applicable commissioning step]** have been successfully completed and that **[name of element of Project Work]** is ready for **[name of applicable commissioning step]** without jeopardizing the safety of any person or the safety and integrity of the BC Hydro Transmission System.

Signed:

Designer (Principal)

Name:

Title:

Date:

Professional Registration Number:

Affix Professional Seal

Signed:

Design-Builder (Principal)

Name:

Title:

Date:

Professional Registration Number:

Affix Professional Seal

Signed:

Project Co's Representative

Name:

Date:

Professional Registration Number:

Affix Professional Seal

PART II – LEAD TEST ENGINEER'S STATEMENT

3. We certify that we have completed **[name of applicable commissioning step]** in accordance with the requirements of Design Management Plan, the Design Quality Management Plan, the Construction Quality Management Plan, the Commissioning Plan and utilizing the standards of care, skill and diligence that, in accordance with the standards of our profession, are required of experienced professionals undertaking such commissioning activities, and that in our professional opinion the said element of the Project Work or other works has successfully completed all of the requirements of **[name of applicable commissioning step]**, in all respects in accordance with:

- (i) the relevant Design Data and Design Certificates in each case to which there has been no objection under the Review Procedure;
- (ii) the provisions of the Agreement including all applicable Project Requirements **[as amended by the following Minor Works, Change Certificates and Innovation proposals listed in paragraph 1 above]**;
- (iii) applicable Law and Good Utility Practice;
- (iv) all applicable standards and codes; and
- (v) all applicable acceptance criteria specified in the applicable Design Basis Memoranda.

Signed:

Lead Test Engineer(Principal)

Name:

Title:


Date:
Professional Registration Number:
Affix Professional Seal

4. Receipt of this certificate is acknowledged:

Signed:
Independent Certifier
Name:
Date:
Professional Registration Number:
Affix Professional Seal

APPENDIX 5N

COMMISSIONING NOTICE TO ENERGIZE FORM

| | | | |
|---|--------------------------|---|---------------------------|
|  | | | |
| COMMISSIONING NOTICE TO ENERGIZE | | | |
| Project: John Hart Redevelopment | | Year / Stage | Project Short Name |
| Project Scope | | | EAR No. |
| Equipment Designation | Equipment Details | | |
| | | | |
| Associated outstanding items restrictions/notes/deficiencies (attach sheets as necessary). | | | |
| <p>I certify equipment and systems covered by this CNE have been designed, installed and tested in accordance with the requirements of the Agreement and Good Utility Practice and are ready for initial energization and online testing.</p> <p>_____ Date: Lead Test Engineer (P. Eng)</p> | | <p>I certify that all equipment and systems covered by this CNE have been designed, installed and tested in accordance with the requirements of the Agreement, except as noted above and are ready to energize for online testing without jeopardizing the safety of persons or the safety and integrity of the BC Hydro Transmission System.</p> <p>_____ Date: Project Co Representative</p> <p>_____ Date: Designer (P. Eng)</p> | |
| <p>This Commissioning Notice to Energize is: <input type="checkbox"/> Accepted ("C1"); or <input type="checkbox"/> Accepted, subject to the attached conditions ("C2") by BC Hydro's Representative in accordance with Schedule 2 [Review Procedure, Consent Procedure and Other Submittals] of the Project Agreement.</p> <p>_____ Date: BC Hydro Representative</p> | | | |

Distribution: BC Hydro Representative
Project Co
Vancouver Island Generation Area Manager

BC Hydro Area Control Centre
Project File

APPENDIX 50

FORM OF CONSTRUCTION CERTIFICATE

Certificate Ref No. []

CONSTRUCTION CERTIFICATE

Agreement between British Columbia Hydro Authority and [Project Co] dated • (the “Agreement”) relating to the Project. Defined terms and expressions used in the Agreement have the same meanings in this certificate.

Form of certificate to be used by the Designer, Design-Builder and Project Co for certifying the Substantial Completion or total completion of Construction activities in accordance with Section 10.1 [Construction Certificates] of Schedule 5 [Design and Construction Protocols] to the Agreement.

Design-Builder's and Project Co's Statement

1. We certify that **[name of element of Construction]** has been designed, constructed, **[Substantially Completed] [totally completed]**, commissioned and tested in all respects in accordance with:
 - (i) the relevant Design Data and Design Certificates in each case to which there has been no objection under the Review Procedure; and
 - (ii) the provisions of the Agreement including all applicable Project Requirements **[as amended by the following Minor Works, Change Certificates and Innovation proposals]**.

Signed:
Design-Builder (Principal)
Name:
Title:
Date:
Professional Registration Number:
Affix Professional Seal

Signed:
Project Co's Representative
Name:
Date:
Professional Registration Number:
Affix Professional Seal

Designer's Statement

2. We certify that we have examined the **[name of element of Construction]** in accordance with the requirements for examination of the Project Work contained in the Design Management Plan, the Design Quality Management Plan and the Construction Quality Management Plan and utilizing the standards of care, skill and diligence that, in accordance with the standards of our profession, are required of experienced professionals undertaking such examinations, and that in our professional opinion the said element of the Project Work or other works has been designed, constructed, **[Substantially Completed] [totally completed]**, commissioned and tested in all respects in accordance with:
- (i) the relevant Design Data and Design Certificates in each case to which there has been no objection under the Review Procedure; and
 - (ii) the provisions of the Agreement including all applicable Project Requirements **[as amended by the following Minor Works, Change Certificates and Innovation proposals listed in paragraph 1 above]**.

Signed:
Designer (Principal)
Name:
Title:
Date:
Professional Registration Number:
Affix Professional Seal

3. Receipt of this certificate is acknowledged:

Signed:
Independent Certifier
Name:
Date:
Professional Registration Number:
Affix Professional Seal

APPENDIX 5P

MANUALS

All manuals shall be Project-specific, shall be prepared for the specific components, equipment, sub-systems and systems provided as part of the Facility and shall address all relevant Site-specific conditions, including environmental conditions under which the Facility will operate. Generic manuals, including manuals produced for other projects and manufacturer's standard published materials applicable to more than one (1) particular type, model, capacity, rating or other criteria, are not acceptable.

All manuals, other than the OMS Manual (Excerpts), the Generation Emergency Plan (Excerpts) and the Emergency Planning Guide (Excerpts), shall be: (i) designed and developed to be used and accessed via a secure, internet based system established, implemented and maintained by Project Co; (iii) fully integrated with the Facility Model; and (iii) integrate all applicable Commissioning data, including the baseline report data for each tested piece of equipment, component, system and sub-system. Such manuals shall employ electronic links to facilitate use and avoid duplication of information, provided that external links may not be used. All manuals shall also be human readable in paper copy.

All pages in the paper copies of each manual shall be 8½ x 11 inch, bound in durable three-ring binders. Relevant drawings, schematics, tables, schedules and other parts of manuals which require a larger page size for legibility shall be single-sided and a maximum size of 11 x 17 inch, folded to 8½ x 11 inch size. Sheets that have to be folded shall be folded so that the normal left or top edge is bound, the title block is visible without unfolding, and the sheet unfolds away from the bound edge.

All manuals shall be written entirely in English using accepted North American nomenclature and terminology. All information contained in the manuals shall be electronically searchable, logically organized, clear, legible, grammatically correct and capable of being photocopied or printed for reproduction by BC Hydro.

All manuals shall contain an overall table of contents and a table of contents for each section. Every page of every manual shall be numbered.

All standard catalogue cuts, manufacturer's printed data or descriptive literature, parts sheets, and illustrations, shall either be original manufacturer sheets or reproduced copies equal in legibility and durability, and where such information shows more than one (1) model or type the inapplicable information shall be clearly struck out. At least one (1) copy of the manuals shall contain only original copies of the foregoing documents and it shall be clearly marked as the original manual.

1. INSTALLATION MANUALS

For the components of the Generating Units, the Bypass System, major equipment comprising the Power Intake and the HTMS, which are non-embedded and capable of removal, provide a complete set of manuals detailing the procedures used to install the applicable equipment (each, an "**Installation Manual**" and collectively, the "**Installation Manuals**").

Each Installation Manual shall be reviewed by the Design-Builder and shall include:

- (a) drawings, sketches, photographs, and narrative description of the procedures used to install the applicable equipment;
- (b) tests, measurements and checks to be made during installation, including final installation tolerances, torque tables and settings;
- (c) a list and description of all special tools and equipment required for installation;
- (d) rigging plans and weights of all components (over 2 Tonnes); and
- (e) details of any modifications to Project Co's planned or anticipated installation procedures necessitated by field conditions encountered during actual installation of the applicable equipment,

2. FACILITY MANUAL

Provide a detailed, comprehensive manual covering the operation and maintenance of the Facility as an integrated whole, rather than on an individual equipment, component, system or sub-system basis (the "**Facility Manual**").

The Facility Manual shall include:

- (a) a complete description of the Facility, including all structures, systems, sub-systems, components and equipment, together with a summary of the operating procedures for the Facility;
- (b) a summary, consolidating and providing an overview of the integrated operation and maintenance requirements for the Facility described in the O&M Manuals, together with details of any additional operation and maintenance requirements which are not otherwise described in the O&M Manuals;
- (c) all information necessary to allow BC Hydro Persons to promptly, safely and effectively respond to and deal with alarms and emergency situations at the Facility;
- (d) all information required for operation and maintenance of the Facility under normal operating conditions, throughout the Facility's full operating range;
- (e) a separately bound appendix with "As Built" general arrangement drawings for the entire Facility, including system electrical and mechanical schematics, one-line drawings, and other principle drawings;
- (f) diagrams and charts to graphically explain the operation of the Facility and any Facility Operating Restrictions;

- (g) specific operating instructions for all systems, sub-systems, components and equipment, including design set points and expected values of operating and maintenance parameters;
- (h) step-by-step sequences for each of remote, local and manual operation covering one (1), two (2), and three (3) Generating Unit operation for the following:
 - (i) starting the Generating Unit(s), including sequencing of Generating Unit start-up and synchronizing the Generating Unit(s) to the BC Hydro Transmission System, both from a completely shut down state and from a speed-no-load state; and
 - (ii) shutting the Generating Unit(s) down: (A) from normal operating conditions; (B) from a speed-no-load state; and (C) in an emergency,
- (i) with each step-by-step sequence including the step-by-step sequences for all ancillary mechanical and ancillary electrical components, equipment, systems and sub-systems and any other components, equipment, systems and sub-systems in the Facility;
- (j) a table of normal operating values and operating adjustments for all components, equipment, systems and sub-systems;
- (k) system isolation diagrams and procedures for isolating and preparing components, equipment, systems and sub-systems for access and/or maintenance, including detailed unwatering procedures;
- (l) safety information, including descriptions of all communication systems and security systems;
- (m) a full set of MSDS for all hazardous chemicals, materials and products to which any worker could be exposed during operation or maintenance of the Facility; and
- (n) all other procedures and requirements necessary to ensure safe and reliable operation of the Facility at all times in accordance with Good Utility Practice, and so that the Facility meets the requirements of this Agreement, WorkSafeBC, all other Governmental Authorities, and applicable Laws.

3. O&M MANUALS

Provide separate, detailed and comprehensive operations and maintenance manuals for each of the following:

- (a) all security systems installed in the Facility;
- (b) all civil and architectural components of the Facility;
- (c) all components of the Power Tunnel and Power Intake;

- (d) all Generating Unit components and equipment, including:
 - (i) the Turbines, including the HTMS (if an active system);
 - (ii) the Turbine Inlet Valves;
 - (iii) the governor system;
 - (iv) the Generators;
 - (v) the Unit Transformers;
 - (vi) the transformers and circuit breakers;
 - (vii) the generator excitation systems;
 - (viii) the generator terminal equipment;
- (e) the Low Level Outlet and Environmental Flow Release System;
- (f) the Bypass System;
- (g) gate equipment and cranes installed in the Facility;
- (h) ancillary mechanical equipment and system installed in the Facility; and
- (i) ancillary electrical, communications and control equipment and system installed in the Facility,

(each, a "**O&M Manual**" and collectively, the "**O&M Manuals**").

Each O&M Manual shall furnish all information necessary for the complete and proper servicing, operation, maintenance, trouble-shooting, inspection, repair, dismantling, assembly and ordering of replacement parts (including identification by part numbers of all pieces of the equipment) for all equipment and components covered by the applicable O&M Manual. Each O&M Manual shall be based on, and reflect, the "As Built" configuration of the applicable equipment, component, system or sub-system and shall include:

- (j) all relevant drawings, data and information, including that which may previously have been submitted as part of the applicable Final Design or other Submittal;
- (k) applicable manufacturer's drawings, together with applicable parts lists and a cross-reference between each item in the parts list and the manufacturer's or supplier's drawings and catalogue numbers;
- (l) assembly diagrams and drawings showing individual components, identifying each component by the part number on the parts list;

- (m) step-by-step procedures for servicing, operation, maintenance, trouble-shooting, inspection, repair, dismantling and assembly of the equipment, component, system or sub-system, including adjustments, clearances, settings and limits required for correct operation;
- (n) safety procedures and precautions;
- (o) instructions for settings and adjustments required during maintenance and for any periodic tests that may be required;
- (p) trouble shooting procedures for all systems and sub-systems, including electrical;
- (q) list of all special tools and equipment;
- (r) lubrication requirements including recommended lubricants and lubricating intervals for all components and equipment;
- (s) recommended clearances, bolt tensions and tensioning procedures, and device settings;
- (t) pump and system performance curves;
- (u) electrical elementary and connection diagrams;
- (v) repair materials and procedures for paints and coatings for elements within the Water Conveyances;
- (w) weights and dimensions for major equipment and components;
- (x) lifting and rigging diagrams for major equipment and components (over 2 Tonnes); and
- (y) any other information that is required for the operation and maintenance of the Facility to meet the full intent of the Project Requirements, the design and this Agreement.

4. GEOTECHNICAL INSTRUMENTATION MANUAL

Provide a detailed, comprehensive manual covering the geotechnical instrumentation installed in the Facility and on the Site (the "***Geotechnical Instrumentation Manual***").

The Geotechnical Instrumentation Manual shall include the following information for each instrument:

- (a) drawings showing the location as determined by survey after installation;
- (b) manufacturer's information and data sheets;
- (c) calibration data;

- (d) Excel spreadsheets required to convert the collected raw data into performance metrics (e.g. piezometric elevations, displacements and deformations);
- (e) an Excel database with all raw and converted data collected from the date of installation to the date on which the final Geotechnical Instrumentation Manual is submitted to BC Hydro's Representative;
- (f) colour graphical plots showing the trends of piezometric elevations, displacements and deformations, as applicable from the date of installation to the date on which final the Geotechnical Instrumentation Manual is submitted to BC Hydro's Representative;
- (g) the expected range of parameters (e.g. of piezometric elevations, displacements and deformations) based on the expected performance of the Facility and alert values that should be used to investigate unexpected behaviour; and
- (h) any other information reasonably required for BC Hydro to monitor the performance of the Facility using the installed instrumentation.

5. OMS MANUAL (EXCERPTS)

Project Co shall prepare and submit the following information to BC Hydro for inclusion in BC Hydro's "*John Hart Operation, Maintenance and Surveillance Manual for Dam Safety*":

- (a) detailed maintenance requirements for the Facility as required pursuant to the then current version of Section 3.5 of the CDA Dam Safety Guidelines;
- (b) detailed surveillance requirements for the Facility as required pursuant to the then current version of Section 3.6 of the CDA Dam Safety Guidelines;
- (c) detailed requirements for maintenance and testing of flow control equipment as required pursuant to the then current version of Section 3.7 of the CDA Dam Safety Guidelines;
- (d) general arrangement drawings and key information on new, and alterations to the Dams, including all reservoir retaining structures, in electronic and hard copy versions; and
- (e) drawings and key information on new, and any altered, instrumentation, including location maps, general arrangement, cross section mapping with elevations, in electronic and hard copy versions,

(collectively, the "***OMS Manual (Excerpts)***").

6. GENERATION EMERGENCY PLAN (EXCERPTS) AND THE EMERGENCY PLANNING GUIDE (EXCERPTS)

Project Co shall prepare and submit the following information, consistent with the recommendations in Section 4.2.3 of the CDA Dam Safety Guidelines, to BC Hydro for inclusion in BC Hydro's "*Generation Emergency Plan*" and "*Emergency Planning Guide*":

- (a) criteria for identifying and evaluating all possible dam safety emergencies at the Facility;
- (b) emergency contact information for applicable Project Co Persons, to be included on the "*Dam Safety Notification Charts*" and disseminated throughout BC Hydro; and
- (c) procedures and actions for the protection and emergency evacuation of personnel,

(the "***Generation Emergency Plan (Excerpts)***" and the "***Emergency Planning Guide (Excerpts)***").

Project Co shall provide prompt written notice of any change in the Project Co emergency contact information to the BC Hydro Representative.

APPENDIX 5Q

COMMISSIONING NOTICE TO OPERATE FORM

FORM 11905 (80/5)

No.

| COMMISSIONING NOTICE TO OPERATE | | | |
|--|--|--|--|
| PROJECT | | YEAR / STAGE | SHEET |
| ASSIGNMENT | | | ASSGT. NO. |
| EQUIPMENT DESIGNATION | EQUIPMENT DETAILS | | |
| | | | |
| <p>ASSOCIATED OUTSTANDING ITEMS / RESTRICTIONS / NOTES / DEFICIENCIES (ATTACH SHEETS AS NECESSARY)</p> | | | |
| <p>I certify that the equipment and systems covered by this CNO have been designed, installed and tested to a state suitable and safe for final operation in accordance with Good Utility Practice, despite the identified deficiencies and any incomplete Design and Construction activities.</p> | | <p>I acknowledge that the equipment described above is available for commercial operation, is safe to operate despite the identified deficiencies and any incomplete Design and Construction activities and meets the applicable Project Requirements, subject to correction of the identified deficiencies.</p> | |
| <p>_____ DATE</p> | <p>_____ LEAD TEST ENGINEER (P.Eng.)</p> | | <p>_____ DATE</p> <p>_____ INDEPENDENT CERTIFIER</p> |
| <p>_____ DATE</p> | <p>_____ PROJECT CO REPRESENTATIVE</p> | | |
| <p>_____ DATE</p> | <p>_____ DESIGNER (P.Eng.)</p> | | |

Distribution BC Hydro Representative
 Project Co
 Vancouver Island Generation Area Manager
 BC Hydro Area Control Centre
 Project File

APPENDIX 5R

OUTAGES AND CONSTRAINTS NOTIFICATION FORM

| | | | |
|--------------------------------|--|---------------------------------|-----------|
| Plant / Unit(s) : | | Revision : | No |
| Start (yy/mm/dd hhhh) : | | Finish (yy/mm/dd hhhh) : | |
| Recall Time : | | Return on Weekend : | |

| |
|---|
| Purpose / Generation and Operating Constraints : |
| |
| |
| <i>Planned Outage</i> |

| | | | | |
|---------------------------|---------------|--|----------------|--|
| Project Co Contact | Name : | | Phone : | |
|---------------------------|---------------|--|----------------|--|

| | | |
|--|--|------|
| Routing Instructions | | |
| Day Ahead and Beyond (except weekend and holiday submissions) | | |
| 1. BCH VIG Maint. Planner | e-mail: | fax: |
| 2. BCH Operations Planner | e-mail: | fax: |
| 3. BCH PS Next-Day Planner | e-mail: XXXXXXXXXX | fax: |
| Same Day (including all weekend and holiday submissions) | | |
| 4. BCH PS Shift Office | e-mail: XXXXXXXXXX | fax: |

Generation Constraints Scheduling Protocol

1. Project Co shall submit an Outages and Constraints Notification Form to BC Hydro for each Planned Outage, Derate and Project CO Operating Constraint. For Planned Outages, Derates and Project Co Operating Constraints, an Outages and Constraints Notification Form shall be submitted when such outages, derates or constraints have been scheduled by Project Co and in any event not less than two Business Days prior to such outages, derates or constraints coming into effect. For unplanned outages, derates or constraints, an Outages and Constraints Notification Form shall be submitted when a determination of a probable return to normal service date is available.
2. Project Co to submit a revised Outages and Constraints Notification Form whenever there is a material change to any previously submitted Outages and Constraints Notification Form including any revisions to the expected return to normal service date.

Real-time Generation Constraints Coordination Protocol

1. Project Co shall confirm with the designated BC Hydro Person, by telephone, all changes to Outages Derates and Project Co Operating Constraints as they occur and the designated BC Hydro Person shall record all such changes in the generation log.

APPENDIX 5S

SPARE PARTS, SPECIAL TOOLS AND MAINTENANCE EQUIPMENT

As a condition precedent to Service Commencement, the following spares shall be properly stored and maintained in a secure area on the Site and in accordance with the Project Requirements and any applicable manufacturers' instructions:

| Description | Quantity |
|--|---|
| Turbine: (runner, headcover, wicket gates) | |
| Complete set of turbine guide bearing pads, babbitted and machined, or one sleeve type bearing | One set |
| Turbine Inlet Valves | |
| TIV seals | One set |
| Generator: | |
| Thrust bearing segmented pads, babbitted and machined | One set |
| Complete set of generator guide bearing pads, babbitted and machined | One set |
| Guide bearing wearing parts for each bearing | One set |
| One coil per type of pole | One set |
| Pole Keys | 20 sets |
| Stator bars | Additional 15% of the front bars and an additional 10% of the back bars of one unit |
| Slot packing (in air-tight containers) | Additional 20% of the total slot packing and wedging materials. |
| Winding support materials | Additional 10% of the total winding support materials. |
| Winding connection materials | Additional 10% of the total winding connection materials If a single-turn bar design is used, an additional 20% of the total series clips supplied for installation connection. An additional 5% of the total silfos supplied for installation connection shall be supplied as spare parts. |
| End caps | Additional 20% end caps. |
| Stator laminations (in containers designed to ensure that the laminations will not rust) | Additional 2% of all types of stator laminations including, but limited to, regular laminations, step-back laminations, and air duct spacers. |
| Stator core studs and clamping plates | Additional 2% stator core studs and clamping plates. |

| Description | Quantity |
|---|--|
| Field winding ground insulation | Additional 4 sets of field winding ground insulation. One set of insulation is sufficient to insulate one pole |
| Insulated ring bus | One section of insulated ring bus (20m). |
| Slip ring collector | One Set – Positive One Set - Negative |
| Unit Transformer: | |
| 150kV and neutral bushings (each) | 1 |
| 15kV bushings | 1 |
| Gaskets full set, bushings and covers | 1 |
| SPECIAL TOOLS | |
| General: | |
| For all equipment which: (i) weighs between 35 pounds and 2 tonnes; (ii) is non-embedded and capable of removal; and (iii) is not simply lifted using removable lifting eyes, swivel eyes, shackles, built in lifting lugs or other identified built in lifting points, provide a complete set of engineered lifting devices and engineered lifting plans. Engineered lifting devices and engineered lifting plans are not required for piping and electrical ductwork, but are required for the equipment (such as valves, filters, disconnects and pumps), connected to piping and ductwork. With the exception of piping and ductwork, “choking” of loads shall not be permitted. “Basketing” of loads shall not be permitted. | 1 set each |
| Turbines: | |
| Complete set of usable high quality, standard tools and wrenches, and all speciality or custom tools, which are necessary or convenient for assembling, dismantling and testing of the Turbine, including: <ul style="list-style-type: none"> (a) hydraulic tensioning device for the runner and generator coupling bolts; (b) device for pulling up the runner and shaft; (c) all required torque wrenches and multipliers (torque wrenches shall be of the “click” type); (d) slugging wrenches; (e) an appropriate selection of hand tools; (f) all required hydraulic jacks and hand pumps; (g) hydraulic wrench and power supply with the appropriate sockets and adapters; (h) bore pattern jigs for shaft connections, if utilized; and (i) a borescope for runner crown seal inspections. | 1 set |
| Governor System: | |
| Specialized tools, equipment and other specialized devices required for operation and maintenance of the governor shall be provided | 1 set |
| Generator: | |

| Description | Quantity |
|---|--|
| Complete set of winding installation tools, including tools, jigs, and other associated equipment for the following tasks: (a) winding preparation; (b) winding installation; (c) winding connection; (d) winding wedging; and (e) winding support. | 1 set |
| The set of winding installation tools shall include: (i) slot slab gauges; (ii) bar pusher/puller (iii) temporary wedges for at least 20 slots. (iv) slot boards for temporary wedging at least 20 slots. (v) bar-to-ground contact resistance measurement tool. (vi) wedge drivers, complete with four replacement tips each. (vii) depth gauge for determining top ripple spring compression. (viii) stator winding lead adjustment tool (for connection alignment). (ix) field winding coil lifting device (for removal of a field coil from a rotor pole body). (x) field pole lifting device (for removal of a field pole from the rotor). | 1 1 1 20 20 1 2 1 1 1 |

All custom fabricated tools and jigs used in assembly shall be clearly labelled with their purpose.

All tooling shall be provided with appropriate heavy duty storage boxes or cabinets, toolboxes and mounting panels. Tooling required for major assembly and disassembly shall be protected for long term storage.

APPENDIX 5T

NOT USED