CONNECTION ASSESSMENT & APPROVAL PROCESS

Connection Assessment Report for

Dryden Mill
Power System Upgrades
CAA ID 2003-EX128

Connection Applicant: Weyerhaeuser Inc.

Final Report

Prepared by
Long Term Forecasts & Assessments Department &
Consistent Information Set Department

July 2, 2003

Dryden Mill- Power System Upgrades

Disclaimers

IMO

This report has been prepared solely for the purpose of assessing whether the connection applicant's proposed connection with the IMO-controlled grid would have an adverse impact on the reliability of the integrated power system and whether the IMO should issue a notice of approval or disapproval of the proposed connection under Chapter 4, section 6 of the Market Rules.

Approval of the proposed connection is based on information provided to the IMO by the connection applicant and the transmitter(s) at the time the assessment was carried out. The IMO assumes no responsibility for the accuracy or completeness of such information, including the results of studies carried out by the transmitter(s) at the request of the IMO. Furthermore, the connection approval is subject to further consideration due to changes to this information, or to additional information that may become available after the approval has been granted. Approval of the proposed connection means that there are no significant reliability issues or concerns that would prevent connection of the proposed facility to the IMO-controlled grid. However, connection approval does not ensure that a project will meet all connection requirements. In addition, further issues or concerns may be identified by the transmitter(s) during the detailed design phase that may require changes to equipment characteristics and/or configuration to ensure compliance with physical or equipment limitations, or with the Transmission System Code, before connection can be made.

This report has not been prepared for any other purpose and should not be used or relied upon by any person for another purpose. This report has been prepared solely for use by the connection applicant and the IMO in accordance with Chapter 4, section 6 of the Market Rules. The IMO assumes no responsibility to any third party for any use, which it makes of this report. Any liability which the IMO may have to the connection applicant in respect of this report is governed by Chapter 1, section 13 of the Market Rules. In the event that the IMO provides a draft of this report to the connection applicant, you must be aware that the IMO may revise drafts of this report at any time in its sole discretion without notice to you. Although the IMO will use its best efforts to advise you of any such changes, it is the responsibility of the connection applicant to ensure that it is using the most recent version of this report.

1.0 Project Description

Weyerhaeuser Inc. has submitted a Connection Assessment Application for planned modifications to their Dryden Mill electrical distribution system for the purpose of improving reliability and efficiency. The project plan is to install/replace the following equipment:

a) Installing 115kV Circuit Switchers at the primary of each main transformer-T1, T2, T3

b) Installing 115kV Bus differential protection

c) Replacing grounding resistors on the main transformers T1, T2, T3

d) Installing a synchronizing bus to tie all of the Mill's 13.2 kV busses together

e) Installing 13.2kV current limiting reactors

The present configuration of the Dryden mill and the proposed modifications are described in detail in Appendix A, containing the technical information submitted by the Connection Applicant.

The scheduled in service date for this project is June 2003.

2.0 Connection Assessment

2.1 Underfrequency Load Shedding Requirements

The *Market Rules* (Chapter 5 section 10.4) require that each distributor and connected wholesale customer, in conjunction with the relevant transmitter, make arrangements to enable the automatic disconnection of up to 35% of its peak demand for conditions of system under-frequency.
The connection applicant informed the IMO that underfrequency load shedding facilities are present at the Dryden mill, and operate as follows:

If "Kraft Mill Running" selected:

If Frequency Drops Below 59.5 for 2 sec	Clear Primary Clarifier / Secondary Effluent, *9% load*
If Frequency Drops Below 59.25 for 2.5 sec	Clear Brownstock / Bleach Plant / Chemical Plant *10% load*
If Frequency Drops Below 59 for 3 sec	Pulp machine *5% load*
If Frequency Drops Below 58.75 for 3.5 sec	Clear Cooking / Lime Kilns / Mintech / Stores / Screenhouse / Chip Handling / Hog Fuel / Sync Bus to Bus 5 Tie *5% load*

If "Paper Mill Running" selected:

If Frequency Drops Below 59.5 for 2 sec	Clear Primary Clarifier / Secondary Effluent *9% load*
If Frequency Drops Below 59.25 for 2.5 sec	Pulp machine / Cooking / Lime Kilns / Mintech / Stores / Screenhouse / Chip Handling / Hog Fuel *10% load*
If Frequency Drops Below 59 for 3 sec	Clear Brownstock / Bleach Plant / Chemical Plant *10% load*
If Frequency Drops Below 58.75 for 3.5 sec	Clear No.1 FPM / Sync Bus to Bus 5 Tie *20% load*

The setup meets the Market Rules requirements.

2.2 Voltage Reduction Facilities Requirements

The *Market Rules* do not require that connected wholesale customers be capable to regulate voltage under load or install and maintain facilities to provide *voltage reduction capability.*

2.3 On-line Monitoring

The *Market Rules* (Chapter 4 section 7.5) require that each connected wholesale customer shall provide the IMO on a continual basis with on-line monitored quantities as specified in Appendix 4.16.

The on-line monitoring that is presently provided for the status of the HV disconnect switches will be retained and continue providing the status of the three new circuit switchers on a continuous basis. Weyerhaeuser has confirmed that they will be using the signal that currently monitors the statuses of the 115 kV primary disconnects of the Dryden Mill transformers T1, T2, T3. Since the circuit switcher on each of these transformers will be installed in line (in series) with the existing disconnects, Weyehaeuser proposes to wire status contacts for each of the switches in series with the existing status contacts for the 115kV primary disconnect for each of the transformer. The IMO's status tag should show that transformers (T1, T2, T3) are disconnected from the IMO-controlled grid when the circuit switcher or disconnect for that transformer is open.

2.4 Power Factor

The *Market Rules* require that wholesale customers and distributors connected to the IMO-controlled grid shall operate at a power factor within the range 90% lagging to 90% leading as measured at the *defined meter point.*

Should the load at Dryden mill fail to meet the power factor requirements of the *Market Rules,* the Connection Applicant will be required to install sufficient reactive power compensation to bring the reactive power consumption within the acceptable limits.

2.5 Revenue Metering

The proposed project does not trigger any required modifications to the present revenue meters installations.

2.5 Protection

With respect to the protection and telecommunication requirements, the *connection applicant* will have to follow the Transmission System Code technical requirements for wholesale customers and also meet Hydro One's requirements for protection systems and protection coordination.

2.6 Effect on System Reliability

This assessment identified the impact on system reliability of the addition of three HV circuit switchers at the primary of each main transformer. Any proposed modifications to the protection system will have to be assessed by Hydro One.

The Dryden Mill is supplied from Dryden 230/115 kV TS via a single 115 kV circuit designated as D5D. The new circuit switchers will be rated for 138 kV normal voltage, 3000A continuos current and 20 kA current interrupting capability. The new circuit switchers are adequate for operation in that part of the system.

This assessment concluded that the proposed project does not constitute a significant modification to the facility connection to the IMO-controlled grid and the proposed circuit switchers are adequately rated. Hence, the proposed modifications will not have a material effect on the IMO-controlled grid.

The modifications will improve the reliability and efficiency of the Dryden Mill operation.

3. Conclusions and Requirements

This assessment concluded that the proposed modifications at Dryden paper mill have no material effect on the reliability of the IMO-controlled grid, and will result in improved efficiency and reliability for the paper mill.

Weyerhaeuser Inc. is required to follow the facility registration process and provide complete information on the new and modified plant facilities.

4. Notification of Approval

It is thus recommended that notification of approval be granted for the modifications proposed by Weyerhaeuser at their Dryden paper mill, subject to the implementation of the requirements listed in section 3.0.

Appendix A

Weyerhaeuser Submission to The IMO

1. Project Summary

On June 15 and 16, 2003, the Weyerhaeuser, Dryden mill is planning a total mill power outage in order to upgrade its Power Distribution System. The main purpose of the upgrade is to improve the reliability of the Power Distribution System in order to reduce Power Distribution upset conditions and improve the mill's operations. The project plan is to install/replace the following for which the details are described below under the section 3, "Project Scope":

f) Installing 115kV Circuit Switchers at the primary of each main transformer-T1, T2, T3

g) Installing 115kV Bus differential protection

h) Replacing grounding resistors on the main transformers T1, T2, T3

i) Installing a synchronizing bus to tie all of the Mill's 13.2 kV busses together

j) Installing 13.2kV current limiting reactors

2. Existing System Description

At the present time, the mill's load is supplied from one 13.2kV in-plant steam turbine driven generator and three main 115kV/13.2kV power transformers (T1, T2, T3).

The transformers are connected to a common 115 kV bus through manually operated non-load break air disconnect switches in the main switchyard. The 115 kV bus is connected to a single incoming Utility (Hydro One) 115 kV line through a single 5000 MVA rated OCB.

The generator is connected to its 13.2 kV Bus 4 that is connected to Bus 1 through a Tie breaker under normal operating conditions. Each of the three main power transformers are connected to their respective 13.2KV bus (Bus1, Bus2, Bus 3) through a 2000 foot cable system. There is a tie breaker between Bus 1 and Bus 2 and a Tie Breaker between Bus 2 and Bus 3. The Tie breakers are currently open under normal operating conditions.

As a consequence of this arrangement any fault in one of the Mill's Three Main transformers (T1, T2, T3) or it's secondary feeder results in total isolation of the Mill from the Utility system. The total isolation results in a blackout situation and significant production losses.

To compensate for these shortcomings a project was developed to increase the mill's power system stability and fault tolerance. This project consists mainly of installing primary circuit switchers on all three main transformers to enable the mill to isolate a single feed transformer circuit, instead of tripping the Main OCB in the event of an electrical fault on any one of the three transformer circuits. Also included is the addition of a new synchronizing bus that will tie all of the Mill's busses together through current limiting reactors to enable load sharing between the transformers and prevent system downtime due to loss of a single transformer. The current limiting reactors are installed mainly to reduce the fault currents to acceptable levels in order not to exceed the maximum symmetrical interrupting rating of the power breakers during an electrical fault, whenever all three transformers and the generator are tied together.

The general approach will reduce to an acceptable level the number of plant outages caused by disturbances on the power distribution system. In addition, the tying of the three transformers and the generator together in order to improve stability, results in a more reliable power distribution system and improved mill operations.

The pre-work for the upgrade will be done during normal mill operations and the final tie-in will be completed during a planned 39-hour total mill power outage on June 15 and 16.

The following describes the Scope of Work for this project.

3. Project Scope

A. Addition of Transformer 115kV Primary Circuit Switchers & 115kV Bus Differential Protection in the Main SwitchYard.

We are adding a circuit switcher to the primary of each transformer to make it possible to selectively trip the individual transformers in the event of a fault in the transformer or it's secondary feeder. This will provide increased reliability for the Mill's power distribution system. The circuit switchers will be rated 138 kV, 3000A, 20 kAIC over a temperature range of –40 to +40 degrees centigrade.

Presently the transformer Lockout relays 86 T1, T1-1, T2, T2-1, T3, & T3-1 all trip and lockout the main OCB connecting the Weyerhaeuser, Dryden Mill 115 kV bus to the Hydro One D5D 115 kV line. The 86T1, 2 & 3 lockout relays are tripped by transformer overcurrent (50/51, 51N) relays and the transformer's sudden pressure relay (63). The 86T1-1, 2-1 & 3-1 relays are tripped by a transformer differential overcurrent relay (87).

The new transformer differential relay will be a SEL 587 relay and the transformer primary phase overcurrent relay will be a SEL 501 relay.

With the installation of the new circuit switchers on the primary of each of the three transformers T1, T2 & T3, the transformer lockouts will now trip and lockout the circuit switchers instead of the OCB. In order for this selectivity to be realized, Hydro One will need to disable any instantaneous protection that they may have on the D5D line in order to provide coordination for transformer faults that will now be cleared by the circuit switchers.

Install new bus differential relay in order to provide high speed clearing of a 115 kV bus fault between the main 115 kV OCB and the transformer HV terminals. The bus differential relay will be a Schweitzer engineering laboratories high impedance voltage differential relay type 587Z. This relay also has a breaker failure function that is supervised by an instantaneous overcurrent element that will be used to send a transfer trip signal to Hydro One through the existing transfer trip hardware and circuitry. The breaker failure function of this relay will trip the main secondary breaker on each of the three transformers. Additionally, a SEL 501 three phase and neutral overcurrent relay will be wired in series with the SEL 587Z relay to provide backup protection should the SEL 587Z relay be out of service.

Install new 1200:5, C400, 650 kV BIL, oil filled current transformers on the 115 kV line side of the main OCB, and "slip over" bushing type 1200:5, C400 CTs on each of the three transformers HV bushings

The existing ground fault and single zone phase distance backup relaying will remain in service as presently configured. Synchronizing across the 115 kV OCB and across the generator's main breaker (#34) will also remain as presently configured. Transformers (T1, T2, T3) main secondary circuit breakers will be configured to allow synchronizing across them. Synchronizing across the new circuit switchers will not be permitted. Circuit switchers will be interlocked with the transformer secondary circuit breakers to block closing of the circuit switchers should the secondary breaker be closed.

B. Addition of a Synchronizing Bus, Current Limiting Reactors & Transformer Neutral (Grounding) Resistors

We are installing a synchronizing bus to tie all of the Mill's 13.2 kV busses together. The purpose for adding the synchronizing bus is to improve reliability by increasing the probability of the Mill staying online without upset should one of the three main transformers or it's secondary feeder fail.

We are adding three new current limiting reactors, one between each bus 1, 2 & 3 and the synch bus, due to the level of fault currents that will be available when all of the mill's 13.2 kV busses are tied together. The current limiting reactors are rated 3000A, 0.2 ohm and will limit the available fault current to within the 750 MVA interrupting rating of the existing 15 kV switchgear.

The addition of the synch bus will also result in an increase in the available ground fault current from approximately 400 amps to 1200 amps on each bus. This amount of fault current causes too much damage to be considered acceptable therefore the existing 400 amp rated main transformer neutral (grounding) resistors will be replaced with 100 amp 10 second rated resistors to maintain the maximum available ground fault current level at 400 amps.

The new 13.2 kV synchronizing bus will be protected with a bus differential relay to provide high speed clearing of a bus fault to minimize the upset to the other interconnected mill load busses. Additionally, each reactor and feeder cable will be protected by high-speed differential relays. Closing of each circuit breaker in the synch bus will be supervised by synch check relays (BE1-25).