MEMORANDUM FOR THE RECORD **DATE: 21 DECMEBER 2005**

SUBJECT: Trip Report, McNary Unit 9 Index Test Box Proof of Concept Test

HDC PERSONNEL TRAVELING:
Rod Wittinger, Senior Mechanical Engineer
Dan Ramirez, Mechanical Engineer

CONTRACTOR PERSONNEL:
Doug Albright, Actuation Test Equipment Company
Greg Luna, Actuation Test Equipment Company

NOTE: Bench testing of ITB was conducted at HDC during week of 5 Dec. See attached log documenting bench and GDACS testing activities. ITB was determined to have successfully passed bench testing and subsequent field testing was recommended.

December 12, 2005

Dan arrived at HDC at 0630 and packed up ITB and related equipment. After picking up rental vehicle at airport and transferring equipment, Dan picked up Rod and proceeded to project. Coordinated with Doug and Greg, who had to report to RDP to have Greg's security badge re-issued.

Arrived at McNary about 12:00 went through security and unpacked equipment. Checked in with Leroy Richardson and took test equipment to Unit 9. Dan set up ITB cart and Rod began work on W-K manometer of Unit 5. Dan got some tools and met Doug and Greg at McNary security about 13:00.

Found "buggy" in crate at Unit 9 and ATEC unpacked and checked out about 1315. Found leak in manometer manifold block while hooking up to test static conditions at unit 5. Removed cable from unit 5 and set up on unit 9. Repaired leak in manometer about 1430. Ran check of unit 5 W-K taps and did not see deflection, i.e. appeared balanced with Unit 5 off.

Moved equipment to unit 9 set up the buggy and manometer and connected to system (Unit 9 Running). Finished about 1520 and left under pressure to check for leaks. Got the cable and Ethernet switch from unit 9. No elect techs available to connect today. Leroy indicated we should contact Ken Wanderscheid to get a tech to hook up Ethernet switch. We tried to test ITB at about 1545 but needed password. Dan called HDC and obtained password. Began check out of WK signal conditioner (ATEC 150) and found error. ATEC worked on and had brought a spare box and other electronics as back up. ATEC found a bad wire in the ATEC 150. We entered password and began check of ITB about 16:00pm and obtained a soldering gun for ATEC to repair wire about 1645. Rod arranged for elect tech in morning to connect Ethernet card. ATEC repaired wire and ran preliminary checks of transducer readings were odd. ATEC brought the spare TD with them and that TD was installed. It appeared the replacement transducer was reporting the pressure but we will need to wait till tomorrow to calibrate. We checked out and left the project 1745 to check into hotel. Tom Murphy called at hotel and he will stop by about 1000 tomorrow to observe. I informed him I would leave about then but Dan would be available.

December 13, Tuesday 2005

Arrived on site about 0800 ATEC arrived a few minutes later. I contacted Ken Wanderscheid to connect Ethernet card. Dan set up for calibration of WK TD with ATEC help. We connected the Ethernet card about 0820. The ATEC 150 we had left the night before was not working. We began checking the ITB and the connection to the GDACS. ATEC reported the ATEC 150 left over night (the one he brought with him) had the signal adjusted to its lowest position and there was a wire broken internally. ATEC had taken the ATEC 150 we had brought with us to the hotel last night along with the transducer we had used previously. ATEC had repaired the old ATEC 150 and we replace the one that was not working and it appeared to work fine. ATEC reported the transducer had an internal wire broken, it was also repaired.

We calibrated the WK transducer and found the running deflections of the WK were lower than previously recorded, similar to unit 5. We reinvestigated the drawings and R1 appeared correct but whether we were on R2 or R3 was in question. We decided to connect to the other tap with the scroll case pressure gauge but that required the services of a McNary staff mechanic. Rod left about 1020 to go to The Dalles for another inspection. Tom Murphy from BPA arrived about 1000 and observed activities. Dan arranged to change the taps and the work was completed by 1300. The taps were calibrated and the deflections found to be in the range previously recorded. Tom Murphy left about 1330. Dan performed various checks of the ITB at the request of ATEC. We verified the setting of limits and other features of the program.

The perturbation feature of the program was checked and it was found the perturbation value in the GDACS is plus minus 2.0 degrees but the dead band for unit 9 is large plus minus 1.0 degrees making blade adjustments difficult (typically values are less than 0.5 degrees). It requires a perturbation of more than 1 degree to get blades to move. With perturbation initiated, attempts to execute certain functions built into post processor cause program failure, namely functions which change displayed output graph scaling. If perturbation is active when program failure occurs, the perturbation signal is lost and blades are reset to "on-cam" position.

The perturbation routine requires (1) a non-zero setpoint and alternating dummy signal ("-222") be sent continuously to GDACS and (2) a logical value (1= perturbate on, 0= perturbate off) being sent to GDACS. Both signals must be recognized by GDACS for perturbation to occur. A blade perturbation setpoint of zero sent to GDACS eventually results in the logical value in GDACS being reset to 0, even though a logical value of 1 has been sent by the ITB. Subsequent changes in setpoint to a nonzero value will not set logical to 1 in GDACS, and blade perturbation will not occur. This will cause problems when ITB is in "AUTO" mode. Addressing may require changes in GDACS ladder logic.

Checks were made sending fixed blade perturbation setpoint only (i.e. alternating dummy signal was not sent), which eventually results in the logical value in GDACS being reset to 0. When GDACS logical value is reset to 0, the perturbation setpoint is reset to 0 and blades are reset to "on-cam" position. Checks confirmed alternate dummy value setpoint is required.

We discussed with ATEC various concerns regarding the user interface and plotting routine. In general, information as presented on screen is difficult to sort out to initial user. We suggested streamlining information presented. Sizing window for plotting is cumbersome, and re-scaling can cause program to crash. Presenting blade, power, flow, and efficiency against gate on same plot can make plot difficult to decipher. Both steady state and "near real-time" values for each are plotted, as well as a history, which over substantial length of time makes plot virtually unreadable. Nonetheless, presentation of the data near real-time was useful in monitoring pertinent unit operating conditions. Suggested streamlining information presented, and presenting only a limited history trace.

Manually adjusting individual limit (e.g. limits for first and second pass standard deviations, outliers, and rate of change/slope) is not possible when in "Index Test" and/or "OPC connected" mode. Adjusting limits using the "AUTOLIMITS" option works, however all limits are scanned and adjusted accordingly, which can be problematic. For example, if user desires to expand limits on forebay elevation and hits "AutoLimit" to adjust, before limit adjustments are complete, another variable may exceed limits and "AutoLimit" will then try to expand limits for this second variable, which may not have been desirable.

Rod returned about 1800 and the information and results of the ITB checks were examined. ATEC requested that the old versions of the ITB program be deleted. Rod indicated that the GMT (Showin) would be requested to remove the old versions of the ITB program. Some data was provided to ATEC of the operational trials and calibrations performed during the day. We secured equipment, called operator, turned in security badges and returned to hotel about 1920.

December 14, Wednesday 2005

Arrived on site about 0800 ATEC arrived a bit later. Rod checked with McNary staff about obtaining an operator in the afternoon and it was arranged. Rod went over test plan with operations staff prior to beginning testing. After check calibrating the W-K TD, we had some difficulty with the ITB calibration routine-- with balancing valve opened, a calculated negative value results which bombed the ITB program. We checked GDACS system and ITB operation. ATEC was asked if they were satisfied and ready to test. Doug Albright agreed all was ready to go. We could not get an operator till the afternoon so we began with the fixed perturbation testing about 0930.

While attempted to make an editorial correction we changed identifier in "SECURITY" window from "Unit 5" to "Unit 9" which resulted in an unregistered program requiring an additional "backdoor" password. Launched program and noticed the limits for defining steady state had been reset to minimum levels. Previously stored limits were not recoverable using "LOAD LIMITS" function. "AUTO LIMIT" function used to set limits.

We tested automated (GDACS-controlling) ITB in manual with manual perturbation.

We began at 41 MW and continued with 46, 51, 57 and 63 MW "on cam" in a direct sweep to higher power for each MW setting. The control room made MW setting after we called and asked for a change. Due to large blade control dead band programmed into 3-D cam controller, manual perturbation of blades were necessary to tweak blades to "on-cam" positions.

When we changed to perturbation adjustments (perturbation on) we found the dead band range on Unit 9 was large at plus/minus 1.00-degree blade angle. With these two degrees of dead band we could not timely make a perturbation adjustment of 0.5-degree. We chose to use a 1.0-degree perturbation for the next two series. The adjustment to +1.0 degree took most of the available blade movement for our allowed input value of 2.0 degrees. We completed the series about noon.

We ran another series at 41, 46, 51, 57 and 63 MW + 1.0 degrees perturbation. The series started at 63 MW and went to 41 MW per test plan. The control room made MW setting after we called and asked for a change. We completed the series about 1315. There were two ITB program bombs, which were unexplained, but it appeared that buffer file(s) somewhere fill up and program stopped. If perturbation is active when program failure occurs, the perturbation signal is lost and blades are reset to "on-cam" position. Failures were intermittent in nature, did not appear to be related to length of time program was running. Restarting the program following failure causes overwrite of some of the stored data (notably "5K average" file, which is log of all data initiated when "RECORD ALL" option is toggled). ATEC will look into.

We ran another series at 41, 46, 51, 57 and 63 MW - 1.0 degrees perturbation. The series started at 41MW but had a problem with the dead band in trying to put the blades at –1.0 degree and would not go lower than 18 degrees. We reran 41 MW and moved to 46 MW about 1400. We were able to adjust blades with ITB and continued with test plan 51, 57 and 63 MW. The control room made MW setting after we called and asked for a change. We completed the series about 1515. Operator (Dan) arrived and we set up for the constant power tests. We had some random errors occur during the day.

Two observations were noted regarding steady state data being logged. The number of data points logged to each file is set by user defined parameter. Headers at the top of each steady state data file overwrite the first seven lines of logged data.

Each line of data being logged represents a "second pass average" that has met the steady state criteria (as determined by user defined limits). This part of the program appears to work as envisioned; i.e. the ITB monitors unit operation and determines when unit is steady state. During testing, a setting of 200 second pass scans was used, meaning second pass averages are based on 200 data scans collected, requiring roughly 280 seconds of elapsed time to collect. A "rolling" average is used, based on the most recent 200 scans collected. This can result in consecutive steady data points being logged which are based on 199 of 200 scans having duplicated data and a tremendous amount of data being logged. It is recommended that once a data point is logged, the buffer be reset to establish 200 unique scans that meet steady state criteria.

The unit was put in local control and moving blades and then adjusting gates to same power obtained constant power. Because of the dead band it was difficult to perturbate the blades very far. Rod checked into getting dead band reduced and would have to wait to tomorrow. We tested at 63 Mw in the positive and negative perturbation direction. We completed about 1645.

We moved to 57 MW and tested in the positive and negative perturbation direction. We completed about 1800 and returned unit to operations. We collected data, ATEC indicated they were satisfied with the testing so far and requested data. We provided ATEC a copy of the today's data (about 45 mega bytes). We shut off Winter Kennedy instruments, checked out with security and returned to hotel about 1845.

December 15, Thursday 2005

Arrived on site about 0800 ATEC arrived a bit later. Rod checked with McNary staff about obtaining an operator in the morning at about 0900 and staff indicated that an operator would be provided. Rod talked to Ken Wanderscheid and had the blade dead band changed to 0.5 degrees in the PLC. The change occurred about 0840. The seasonal 1% operating limits were removed at midnight and we could now test at higher MW than test plan indicated. Dan and ATEC recalibrated the W-K transducer. Air had entered during the flushing operation. The valves are too large in diameter for calibration adjustments by bleeding. ATEC was informed of the problem. It took about an hour to recalibrate the transducer. No significant change in transducer calibration values was noted.

There were some problems with booting up the ITB program with values not being read into headers. It appeared that there was some difficulty with the initial buffer filling and turning on the OPC. This was finally resolved after starting and stopping the program a few times. ATEC had no explanation. A few random errors occurred during the day requiring rebooting of program. We checked GDACS system and ITB operation. ATEC was asked if they were satisfied and ready to test. Doug Albright agreed all was ready to go. We continued the constant power testing about 1030 at 53.4 MW "on cam". We moved the blades about plus minus 1 degree when possible and continued with 46 and 41 MW. At 41 MW the blades would not go flatter so only the "on cam" and +0.6 and +1.4 degrees were achieved. The setting of constant power was difficult in this manual mode of operation. We added a test point at 68 MW and completed the constant power test about 1630. We returned the unit to the operator and it was placed under automatic (GDACS) control.

We began the automatic testing feature of the ITB and started ITB testing at about 1700 at "on cam" and 68 MW this is an extra test point not on the test plan. Put ITB in auto mode with day 0 being a +2 degree move. The control system slowly returned the unit to the 68 MW. There was considerable "hunting" to reach the 68 MW value. There was some difficulty getting stable and we reset the auto limits to be wider about 1745. One feature of auto limits would be to select the limits that you want and adjust. Currently all limits could change if they are out of range when you only wish to change one. ITB automation appeared to work. We made day 1 a –2 degree blade move about 1750 and the unit slowly returned to 68 MW and we obtained some data. The operator shifted the load to 73 MW by accident at 1815 and we ended the days testing. Winter Kennedy equipment was shut off. ATEC requested the day's data and it was provided. ATEC had been working on an analysis program during the day. Rod and Dan provided an explanation and a sketch of how Index test data is used to develop "on cam" curves. Notified operator that we were leaving powerhouse shut equipment off and returned to hotel about 1930.

December 16, Friday 2005

McNary staff is off on Friday; we arrived at plant about 0840 and ATEC about 0900. Unit 9 was running at about 80 MW. Dan flushed and check calibrated the W-K transducer with ATEC assistance. Rod arranged with operations staff in control room to change load setting to 63 MW and explained to operator the expected test conditions for the day. We began about 0910 with 63 MW "on cam" and perturbate the blades after that with Day 0 being +2 degrees, Day 1 being –2 degrees and we switched to manual on ITB and set –1 degrees. We finished 63 MW about 1110 (four test conditions) and adjusted load to 57 MW "on

cam" with perturbation off. We adjusted to +1 degrees in ITB manual at 1130. We completed the 57 MW testing about 1250 and adjusted unit to 51 MW to continue testing till about 1400 or three data points.

ATEC provided to HDC a rough version of a program to plot data. ATEC requested to take various pieces of supplied equipment (duplicates/ unfinished) and repair and update. A note was provided that listed the ATEC supplied equipment that will be returned after being updated.

We ended the ITB testing at about 1415 and disconnected equipment and ITB from system. We notified the operator we would be leaving. ATEC was provided test data from all four days of testing (about 100 MB). We packed up equipment, turned badges in and left project about 1445 to return to Portland.

After dropping of Rod, Dan returned rental car and transferred equipment to personal vehicle. Dan arrived at HDC at 1930 and dropped off test equipment.

CONCLUSIONS:

The ITB as tested is not yet capable of conducting index testing in a fully automated, unattended fashion. Intermittent software glitches cause the program to crash, the root cause of which is yet unknown. On restart, it appears default values are established in some cases and comparisons of resulting calculations before and after system crash may be misleading. For example, flow calculation appears to default to without screen parameters on restart. If with screen parameters were used prior to system crash, comparison of calculated flows and efficiencies are not valid.

The user interface is not straight forward to initial user. At present, "post-processing" is limited to presenting logged data, i.e. little if any data reduction and/or analysis are performed.

The ITB interfaces well with existing Government equipment to collect the necessary data.

Although some improvements can be made, the limits algorithm for defining steady state criteria functions properly. The ITB monitors unit operation, determines when unit is at steady state, and then begins logging data. It is anticipated the software bugs which caused intermittent program crashes will be identified and corrected. This being the case, the ITB should then be capable of unattended, automated data logging of "steady state" turbine operation.

Over any length of time, a tremendous amount of data will be logged over the entire large operating range. A significant effort will be needed to sort and reduce this data. The steady-state data logged should be reduced. Currently a "rolling average" of user defined second pass points is logged whenever steady state criteria is met. (The number of second pass points is user defined, during testing 200 points was used.) Suggest rolling average buffer be automatically cleared/reset after logging, in doing so each data element logged will represent 200 distinct points.

Data analysis should be performed starting with raw data. Logged flow results are based on user defined flow coefficient and exponent, which due to system crashes were not consistently applied over several days of testing. Similarly, adjusted power and flow results are based on single user defined head. Over extended unattended operation, head variations may be excessive, requiring data to be separated and normalized to several heads. Logged values for ITB calculated efficiency are in error; it appears that the conversion from kW to hp was not performed in the internal ITB calculations.

All raw data should be logged to maximum significant figures. Data logged from GDACS/3D cam for gate, blade, head and flow volts are truncated to 4 significant figures. It is unclear if data as received from 3D cam is truncated or if truncation or rounding is part of ITB data logging. Any rounding should occur after calculations are performed.

Review of data indicates updated cam information can be developed from steady state data collected. Unit operation during data collection, i.e. automatic generation control or local unit control, yields similar cam

results. Focus of post processing should be in development of cam curve(s) and optimum performance profile curve(s) from the steady state data set collected.

A HDC review of 3D cam blade control and operating parameters and logic is recommended. The observed 1.0 degree blade control dead band is excessive.

Dan Ramirez, PE
Mechanical Engineer
Hydroelectric Design Center

Rodney Wittinger, PE
Mechanical Engineer
Hydroelectric Design Center

ATTACHMENTS:

1. ITB Bench Testing Log
2. Test Log, McNary Unit 9 ITB Proof of Concept

ATTACHMENT 1
INDEX TEST BOX
BENCH TESTING

Subject: Type 1 Index Test Box (Contract No. W9127N-04-D-0009, dated 26 May 2004) Operational Bench Testing Version 1.31

Bench testing of "best and final" hardware and software for the prototype index test box (ITB) was required to evaluate the suitability for installation and testing on Unit 9, at McNary Powerhouse. Bench testing was conducted at HDC using test bed located in GDACS Maintenance Team (GMT) offices, 8th floor RDP. The established schedule for bench testing was 5-9 Dec 05. The established schedule for field testing of the prototype ITB is 12-16 Dec 05.

By previous agreement, all software required for ITB was to be delivered via e-mail to HDC nlt 0800 Monday, 5 December. The software version tested was 1.31

A summary of bench testing activities, files received and problems encountered follows:

MONDAY, December 5:

3-D Cam files for the ITB Post Processor program:
Unit2NoScreen.csv
Unit2WithScreen.csv
Unit5NoScreen.csv
Unit5WithScreen.csv
Unit9NoScreen.csv
Unit9WithScreen.csv
were received from ATEC via e-mail Monday, December 05, 2005 7:38 AM

Support files:
wkLastCalFileUsed.dat
PreTestCalFileforMcNary.WKCal
LastLimitFileUsed.name
GateBladeXYVals.dat
DataHeader
were received from ATEC via e-mail Mon 12/5/2005 8:38 AM

Files were installed and communication between the ITB and GMT test bed was established.

The program was executed and after "backdoor" passwords were entered, the "Index Test" function was initiated. Simulated data (representing data encountered during index testing) was found to exceed initialized limits for defining steady state criteria. The "AutoLimit" and limit reset "RST" options were not functioning. This was communicated to ATEC. After filtering limits were manually adjusted, simulated steady state data (representing data encountered during index testing) was successfully monitored and logged.

The "Start OPC" (OLE Process Controller) function was initiated and we discovered the PLC was not recognizing the blade offset signal from ITB. Review of PLC revealed blade perturbation program was not installed. Showin Fu installed the proper program correcting the problem.

The ITB blade perturbation routine was found to not allow perturbations below 0 degrees (i.e. negative blade perturbations). This was communicated to ATEC.

To allow for negative blade perturbations, a revised executable file:
ITBRev1v31.executable
was received from ATEC via e-mail Mon 12/5/2005 2:10 PM

The revised executable was installed correcting most issues with blade perturbation. A full range of blade perturbations from +/- 2 degrees are achievable in "Manual" mode. The "AutoTest" routine functions properly for 3 days of testing before communication with PLC is lost. The PLC requires both a blade set point and a blade offset (1=yes, 0=no) signal to allow for blade perturbations to occur. If the blade set point is 0 degrees or blade offset signal is 0, communication with PLC is reset. During "AutoTest" mode, the blade is perturbed in the positive blade offset set point on Day 0, the negative blade offset set point on Day 1, and no offset is applied on Day 2. On Day 3, the process is repeated; i.e blade set point is again perturbed in the positive direction. However, since allowance for perturbation with PLC is lost on Day 2, blade perturbation on Day 3 and after will not occur. Reprogramming GDACS ladder logic to allow for nil blade set point during "AutoTest" mode may be required for testing exceeding 3 days.

TUESDAY, December 6:

To correct the auto limit and limit reset functions of the program, an additional support file:
DefaultSteadyStateLimits.lim
was received from ATEC via e-mail Tue 12/6/2005 9:40 AM. Also included were instructions on loading file. Review indicated file was already on hand but was loaded into improperly named directories. After correcting directory naming, limits were reset to minimal initial values and "AutoLimit" function appeared to be function properly. Functions to Reset, Store and Load Limits all appeared to be function properly.

The Post Processor was not functional. Attempts to execute resulted in "File Not Found" error and exiting of program. This was communicated to ATEC. To correct, an additional support file:
GraphFiles.dat
was received from ATEC via e-mail Tue 12/6/2005 3:04 PM

WEDNESDAY, December 7:

Post processor patch installed enabling user selected cam data to be viewed. Graphing utilities (Zoom, Full Scale, Clear Graph, etc.) functioned without any problems noted. Discussed with ATEC workings of post processor, to illustrate ATEC indicated real data was needed. ATEC provided data files collected during September testing of McNary Unit 5, received from ATEC via e-mail Wed 12/7/2005 10:01 AM. Files were loaded into proper directory and post processor used to graph user selected data.

THURSDAY, December 8:

No additional problems encountered.

FRIDAY, December 9:

Met with interested HDC management and engineering staff to discuss findings. Indicated ITB was functioning as anticipated. Interface with GDACS was for monitoring and logging unit operating parameters only, except for commands sent to GADCS limited to blade perturbation of test unit. No problems were encountered which would put unit or plant operation at risk or preclude field testing of ITB. Group concurred.

ITB was disconnected from GMT test bed. ITB and related components were moved to 3rd floor test unit storage room.

ATTACHMENT 2
McNary Unit 9
Index Test Box (ITB) Proof of Concept
Test Log

Wednesday 14 December 2005

Time	Description	MW	WGO	Blade Angle	Ideal Blade	Perturb.
0919	Start SS Record	63.5	63.2%	25..07	24.7	Off
0927	Move to 41MW					
TEST "ON CAM" (AUTOMATIC GENERATION CONTROL)						
0947	Start SS Record	41.5	42%	16.8	17	Off
0954	Move to 46 MW					
1002	Start SS Record (Not ON CAM)	45.8	45.8	18.38	17.74	0ff
1011	Blade perturbation to tweak blades on-cam					
1017	SS Record on-cam	46.0	46.5	18.15	18.2	On
1028	Move to 51 MW, tweaked blades on-cam					
1039	SS record	51.5	50.34	20.60	20.63	On
1047	Move to 57 MW, tweaked blades on-cam					
1059	SS Record	57	56.1	22.76	22.89	Off
1110	Move to 61 MW, tweaked blades on-cam					
1123	SS Record	62.2	61.6	24.32	22.27	On
TEST WITH BLADES PERTURBATED -1 DEG (AGC)						
1140	Perturbed blades					
1150	SS Record -1 DEG Perturbation	62.5	63.36	24.3	25.3	On
1203	Move to 57 MW					
1218	SS Record -1 DEG Perturbation	57.8	58.7	22.5	23.52	On
1228	Move to 52 MW					
1242	SS Record -1 DEG Perturbation	51.6	51.5	20.27	21.22	On
1247	Program crash. "Invalid Row Error, Run Time Error 13009"					
1252	Resume SS Record -1 DEG	51.1	50.5	20.29	21.11	On
1256	Move to 47 MW					
1309	SS Record (3D Cam unable to blades flatter than 18 DEG)	45.9	46.3	18.25	17.84	On
1329	Move to 41 MW					
1338	SS Record +0.5 DEG Perturbation	40.4	46.3	18.25	17.84	On
1359	SS Record +1.0 DEG Perturbation	41	41.04	18.06	17.0	On
1408	Move to 46 MW					
1423	SS Record +1.0 DEG Perturbation	45	45.9	18.77	17.64	On
1431	Move to 51 MW					
1443	SS Record +1.0 DEG Perturbation	51	49.7	21.1	20.1	On
1452	Move to 56 MW					
1505	SS Record +1.0 DEG Perturbation	57	54.1	23.3	22.3	On
1513	Move to 62 MW					
1522	SS Record +1.0 DEG Perturbation	62.2	59.8	24.76	23.74	On
1552	SS Record On-cam	63	63.23	24.71	24.65	On
1558	Perturbate blades					
1604	SS record	63	61.3	24.86		On
1611	Perturbate blades					
1615	SS record	63	61.2	25.15		
1629	SS record	63	64.63	24.22		
1637	Perturbate blades					

1641	SS record	63	65.4	24.11	

Wednesday 14 December 2005 (cont.)

Time	Description	MW	WGO	Blade Angle	Ideal Blade	Perturb.
1648	Move to 57 MW					
1701	SS Record	57	57.05	22.27	23.1	ON
1706	Perturbate blades					
1729	SS record	57	56.71	22.75	22.85	ON
1734	Perturbate blades					
1743	SS record	57	54.1	23.4	22.32	ON
1750	Testing completed for day					

Thursday 15 December 2005

WK Cal and WK Cal verification conducted. Intermittent problem launching index test function. No values read into header. Problem resolved by rebooting.

TESTING WITH UNIT IN LOCAL CONTROL

Time	Description	MW	WGO	Blade Angle	Ideal Blade	Perturb
1025	SS Record	53.4	52.4	21.67	21.71	0
1033	Perturbate blades					
1042	SS record	53.2	50.9	22.54	20.99	+1
1053	Perturbate blades					
1104	SS record	53.3	51.5	22.08	21.28	+0.5
1111	Perturbate blades					
1124	SS record	53.2	53.2	21.15	22.06	-0.5
1131	Perturbate blades					
1138	SS record	53.3	54.8	20.88	22	-0.8
1145	SS record paused					
1310	SS record	46	47.0	18.3	18.23	0
1316	Perturbate blades					
1325	SS record	46	46.1	19.6	17.73	+1.13
1330	Perturbate blades					
1342	SS Record	45.9	46.1	19.05	17.73	+0.75
1349	Move to 41 MW					
1412	SS record	41	42.6	17	17	0
1420	Perturbate blades					
1435	SS record	41	41.5	17.62	17	+0.6
1442	Perturbate blades					
??	SS Record	41	40.7	18.4	17	+1.4
1520	SS record	68	68.9	26.17	26.19	0
1533	Perturbate blades					
1542	SS Record	68	66.8	26.93	25.58	+0.8
1549	Perturbate blades					
1600	SS Record	68	67.3	26.6	25.71	+.5
1607	Perturbate blades					
1620	SS Record	68	70.9	25.8	26.8	-.4
1627	Perturbate blades					
1635	SS Record	68	72	25.68	27.2	-.5
1638	Perturbate blades					

Thursday 15 December 2005 (cont.)

TESTING WITH UNIT IN AUTOMATIC GENERATION CONTROL

Time	Description	MW	WGO	Blade Angle	Ideal Blade	Perturb
1715	Record SS	68				
1730	Day "0"					+2
1745	Adjusted "AutoLimits"					
1752	Day "1"					-2
1812	Day 3					0
1814	Load shift to 73 MW					

Friday 16 December 2005

TESTING WITH UNIT IN AUTOMATIC GENERATION CONTROL

Time	Description	MW	Perturb
0915	Record SS	63	0
0958	Day 0	63	+2
1028	AutoLimits executed. SS record		
1036	Day 1	63	-2
1050	"Auto" Mode terminated. Manual Mode initiated		-1
1055	SS Record	63	
1105	Move to 57 MW		
1120	SS Record	57	0
1121	Blade perturbation		
1134	SS record	57	+1.1
1147	Blade perturbation		
1159	SS record	57	+2.0
1209	Blade perturbation		
1220	SS record	57	-1.0
1230?	Blade perturbation		
1237	SS Record	57	-2
1245?	Blade perturbation off		
1250	Move to 51 MW		
1311	SS record	51	0
1323	Blade perturbation		
1329	SS record	51	+1
1338	Blade perturbation		
1352	SS record	51	+2