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NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

NERC Balancing Authority (BA) Certification of NATURENER GLACIER WIND ENERGY 1 (GWA) Operated by CONSTELLATION ENERGY CONTROL AND DISPATCH (CECD)

Site Visit Conducted
September 3-5, 2008
Constellation Energy Control and Dispatch Back-up Control Center
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to ensure
the reliability of the
bulk power system

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Introduction

This report presents the results of the Western Electric Coordinating Council's (WECC) NERC Balancing Authority (BA) Certification of NaturEner Glacier Wind Energy 1, LLC (GWA) that has contracted with Constellation Energy Control and Dispatch (CECD) for BA operation of the GWA, a ~100 MW wind farm.

BAs have a primary responsibility for maintaining the reliability of the interconnected system. They accomplish this by directly controlling their generation and/or load resources to continuously balance their actual interchange with their scheduled interchange while regulating and stabilizing the alternating-current frequency of the Interconnection. Acceptable reliability levels can be maintained only if the BAs and other entities which make up the Interconnection function in accord with good operating practices and reliability criteria, including planning and operating standards as defined by the North American Electric Reliability Corporation (NERC) Reliability Standards. Good operating practices include, but are not limited to, full compliance with the NERC Standards without regard to economic consideration, and burdening neighboring systems.

Certification Team

On April 9, 2008 CECD notified WECC and NERC and requested a NERC BA certification of GWA as a BA. This letter began the process for certification that is outlined in the NERC Rules of Procedure (RoP) Section 500 and RoP Appendix 5. Following receipt of CECD's request to certify GWA as a NERC certified BA, a certification team was formed. The team rosters for members of both the BA Certification Team (CT) and CECD team are listed in Attachment 1.

Objective and Scope

The objective of this review is to assess CECD's process, procedures, and tools which will allow them to perform the function of a BA for GWA. The scope of the review included: (1) Interviewing CECD's management and reviewing pertinent documentation for verification of basic requirements for BA operation; (2) reviewing procedures, and other documentation developed by CECD to meet the applicable standards/ requirements; (3) interviewing CECD system operations personnel; (4) reviewing CECD's physical backup control center facility, Energy Management System (EMS), communication facilities, operator displays, etc. and (5) performing other validation reviews as considered necessary. The review was conducted on September 3-5, 2008 at CECD's backup facility in Austin, TX. The decision to carryout the certification in the backup center vs. the main control center in Houston, TX was made due to hurricane Gustav.

Overall Conclusion

The certification process was completed in reasonable accordance with the aforementioned Rules to determine if the applicant has the necessary tools, processes, and procedures to perform the function as a NERC certified BA. The applicant presented to the certification team the necessary evidence for its review, as it relates to the applicable standards/requirements. Because of this review, the certification team has reasonable assurance the applicant does have the tools, processes, and procedures in place to reliably perform the BA function on behalf of GWA. Therefore, the BA certification team recommends to WECC that they approve certification of GWA as a NERC certified BA.

The GWA/CECD BA operation is currently slated to begin on or about October 15, 2008 pending approval by the WECC Operating Practices Subcommittee, the Operating Committee and the Board of Directors.

Needed for Operation

While the team recommends to WECC that GWA be granted certification, the following work-in-process items must be completed prior to GWA/CECD going operational:

- Executed GWA and Public Utility District # 2 of Grant County, Washington Regulating Reserve Services Agreement
- GWA will ensure contingency reserve requirements are met through the Northwest Power Pool (NWPP) Reserve Sharing Group or third party supply.

Positive Observations

- The overall impression is that CECD's EMS and control systems are very flexible. The company can operate from any location where they can get a broadband connection and has a variety of Backup Control Center (BUCC) functionalities that present a seamless operational transition from the primary to the BUCC. CECD performs quarterly testing of the BUCC and live cutover to the BUCC is conducted annually. The system operators also perform a simulated checkout of the BUCC during the weekly relief rotation.
- The system operation can be transferred to any location at a moment's notice using a secure virtual private network (VPN) connection on assigned operator laptops or, a remote desktop (after applying appropriate user authentication protocols). The on-call operator can be called upon to operate from their laptop in the event there is an extended time to transfer control.
- There is triple redundancy of the communication system; the British Telecom Turret system is impressive. It allows flexibility of system operations without affecting their neighbors – the adjacent systems do not need to maintain a list of call numbers since the phone lines can be transferred to any location. CECD continuously performs remote updates to their computers (including operator laptops) so that they do not have to perform updates when they arrive before operations can be transferred.

Operator Preparedness

The CT found the CECD operators to be fully equipped with excellent operating tools and they are well prepared as a result of extensive training. All operators are NERC certified with 90 percent of the system operators certified at the RC level.

CECD currently provides BA services for 10 BAs, three of which are generation only BAs located in the Western Interconnection.

The unique characteristics of wind power, and the challenges of integrating a wind resource operating in a BA, have resulted in the establishment of a CECD Integration Desk (the I-Desk) to allow for concentrated focus on intermittent resource facilities. This increased oversight, combined with toolsets and training specifically aimed at addressing the reliable operation and integration of intermittent resources, enables the I-Desk to provide a level of scrutiny and control previously not applied to the operation and management of wind resources. With NERC-certified system operators interfacing directly and with primary focus on the day ahead and real-time operation and balancing of intermittent resources, the I-Desk provides a dedicated reliable solution to the variability of wind.

GWA is a 106.5 MW wind facility in Cut Bank, Montana (currently limited to an export capability of 100 MW due to interconnection arrangements) that will be managed as an independent BA by CECD. In order to maintain BA reliability requirements, GWA has engaged CECD to develop a number of operational tools and techniques that will be utilized by the dedicated CECD control center staff to balance the variability between scheduled energy off-takes and actual energy production from the facility.

CECD has collaborated with external parties, including Versify and The Energy Group, in development of a proprietary wind profile case study (Northwest Wind Variability Study), with proprietary data gathered from wind generators sited in geographically appropriate locations within the Northwest region. Standard statistical and analytical methodologies were applied to the aggregate data, including but not limited to, linear regression and standard deviation analyses.

The result of this analysis suggests two primary critical periods for the reliable management of the facility, and also serves to establish operational experience. The First Critical Period (FCP) is the “day ahead” forecast which occurs between 24 and 36 hours prior to the energy operating hour with a Second Critical Period (SCP) for forecasting being between 75 and 90 minutes prior to the operating hour. The margin of error between forecast and actual production in the FCP averages plus or minus 30%.

In most power systems, with both load volatility and resource volatility, the volatility tends to be offset. Nonetheless, the volatility still results in deficiencies in the scheduled controllable generation resources, the native load forecast error and the wide array of responsibilities required of the control area operator. Management of ALL of these influencing factors reduces the margin of error to approximately 20% regulating reserves thereby managing the real time variability.

In contrast, when we look at the SCP we see that over 98% of the time the actual wind production variability from this near-term forecast, when compared to actual generation, can deviate by approximately 4% during the operating hour. With the ability to manage scheduled interchange within the SCP timeframe, Automatic Generation Control (AGC) requirements are reduced to the 4% value.

GWA has arranged a flexible off-take arrangement, which allows for intra-day adjustments to the scheduled production volume, up to 75 minutes in advance of the start of an operating hour, as reflected above in the SCP. Within this timeframe, CECD will utilize advanced wind forecasting tools (two separate wind forecasting services) to bring scheduled volume to within a reasonable measure of expected output, based on the benefit of this additional forecasting period.

Upon entering into the operating hour, CECD will provide for a reliably-balanced net interchange, managed within reasonable scheduling deviations enabled by near-term forecasting capability. This will be achieved primarily by means of 10 MW of AGC energy, from Grant County PUD (Grant PUD). Depending on the net interchange position going into the hour, this may be accomplished by either increasing or decreasing the AGC request with Grant. The AGC “tool” will be supplemented by the use of ACE Diversity Interchange (ADI) which allows an ACE adjustment of up to 30 MW; per the ADI Agreement. GWA has a BA responsibility to maintain enough AGC capacity to allow for Frequency Bias response, meet Control Performance Standards (CPS) requirements, and a responsibility to maintain a 5% operating reserve margin (as required as a member of the Northwest Power Pool (NWPP)). These obligations result in a maximum AGC capacity “withholding” of 6 MW, when the facility is operating at maximum output, resulting in at least 4 MW available for AGC, which is within the 4% deviation expectation.

In addition to the 10 MW of AGC capability from Grant PUD to GWA, there is also 20 MW dynamic schedule from GWA to Grant PUD to enable balancing energy. In combination with the AGC, this provides an ability to balance up to 24 MW at any time during the operating hour, dependent upon the real-time usage of the AGC energy and dynamic schedule. This total amount of balancing is dependent upon the operating position at the beginning of the operating hour.

The L10 enables a BA an inherent margin of error in terms of the difference between schedules and actual output. Curtailment of schedules will be used for contingent purposes.

Specific Findings

Constellation Energy, a Fortune 200 company, is the parent company of CECD. Constellation Energy is based in Baltimore, Maryland with businesses that include CECD, Baltimore Gas and Electric (BG&E) a regulated utility, and Constellation Commodities Group a power generation and wholesale marketing entity. CECD operates from a control center located in Houston, Texas.

CECD currently provides BA services in SERC and WECC. In WECC, CECD provides BA services for:

- New Harquahala Generating Facility (HGMA)
- Gila River Power, LP (GRMA)
- Dynegy Arlington Valley (DEAA)

GWA is a wholly owned subsidiary of Grupo NaturEner S.A., a renewable energy company based in Madrid, Spain. The NaturEner S.A. entered the U. S. market in 2006 and has approximately 1,500 MW of wind energy projects in operation or development in Alberta, Canada and the United States. The GWA facility is a wind farm with an aggregate capacity of the 106.5 MW interconnected to the NorthWestern Energy transmission system.

General Findings

The CECD Control Center is located in Houston. All EMS support (administrative and IT) is located within the perimeter of the control center. The CECD control system consists of an AREVA (formerly Alstom/ESCA) standard control system that was upgraded in February 2005 and can accommodate up to 75 BAs. The center contains 10 AREVA Work Stations with five 21-inch screens each for operator interface and six large 50" diagonal LCD screens that can be accessed from the AREVA work stations to display control information from each of the 10 BAs CECD operates (11 BAs following certification of GWA). CECD has 10 NERC Certified Operators and 2 supervisors that are also NERC certified. There are also 5 CECD personnel in training. Normal staffing currently consists of two operators per shift (12 hour shifts) with an increase to 3 operators during day shift during the summer peak period. CECD is implementing a new Integration Desk (the I-Desk) to allow for a focus on intermittent resource facilities such as the GWA BA

Dual redundancy is provided in data communications, which uses Multiple Protocol Labeling Switching (MPLS) connections provided by Verizon formerly MCI/WorldCom. There are primary and secondary paths from each plant or BA to Baltimore and primary and secondary paths from Baltimore to Houston. The data is also mirrored from the primary data center to a secondary data center.

CECD's primary operator communication system is provided by British Telecom. Telephone numbers can be redirected or forwarded to any location making the redirection transparent to CECD's clients and operational counterparties. Operators also have the option of accessing a British Telecom Virtual Turret across a secure connection, replicating all of the stored numbers

and features of their control center phones in a disaster recovery situation. This Virtual Turret can be configured to dial out of and receive phone calls into any land-based phone line or cellular phone. A designated back-up cell-phone is kept charged at all times, with all pertinent phone numbers stored. Wireless Priority Service is in place and accessible at all times for use with this phone or personal cell-phones. Additional communications capability includes Satellite Phones, Nortel phones, Cisco IP Phones, fax and email communications.

Connectivity to the Houston Control Center is provided through diverse circuits which enhances the reliability of communications. The primary connection is a Verizon MPLS circuit with a Verizon backup DS3 circuit. There is also a secondary connection consisting of a 100 Mbps circuit with Time Warner. In the event of a failure with the local ISP service, internal gateway protocols will allow for the rerouting of this traffic to Baltimore, where Constellation utilizes AT&T and Verizon Business for ISP access.

CECD maintains a backup control program, which includes backup facilities in two geographically diverse locations. CECD also has its primary and backup control systems set up to interface with the operator computer profiles so that the operators can log onto the system from any location, with a secure virtual private network (VPN) connection on assigned operator laptops or a remote desktop, applying appropriate user authentication protocols. This flexibility allows for extremely thorough disaster recovery plans that cover all conceivable scenarios. It also includes organizational assistance for meeting the personal and family requirements of operators.

CECD currently operates in the Rocky Mountain Reliability Coordinator (RDRC) footprint. GWA will operate in the Pacific Northwest footprint and work with both the Pacific Northwest Security Coordinator (PNSC) and the WECC Reliability Coordinator in Vancouver, until the WECC Reliability Coordinator is fully operational and parallel operations terminate.

CECD operator displays are adequate to perform the BA function for GWA. GWA displays will include: CPS1 and CPS2, DCS status, ACE value, L₁₀, MW schedules for the BA, tie-line readings at the point of interconnection with NorthWestern, AGC status, frequency, actual and required contingency reserves, generator breaker status, time-error, ATEC Status, Primary and Secondary Inadvertent, and one-line diagrams. The GWA and their PSE will also have access to most of the information contained above via the secure CECD data page which refreshes every 10 seconds.

The CECD EMS is set to operate in the Auto-Time Error Correction mode. Primary notification of Manual Time Error Corrections will come through the WECCNet messaging system. CECD will utilize frequency offset in the EMS for Manual Time Error Corrections.

CECD currently uses Open Access Technology International (OATI) electronic tagging software. CECD will be the tag approval authority for GWA. In addition, CECD currently uses webSAS and the Western Interchange Tool (WIT).

Documentation List

Copies of all of the supporting CECD documents were collected as evidence of CECD's preparedness and will be kept as a record of evidence to support the certification team's

recommendation. These documents will be retained at the WECC office in Salt Lake City, Utah for a period of six years.

None of the documents listed below are included with the distribution of this final report. Per the NERC Rules of Procedure and due to the confidential nature of this material, these documents are available for review at the WECC offices after proper authorization is obtained through WECC and NERC.

- CECD BA questionnaire.
- Neighboring BA questionnaire.
- Master CECD BA Matrix
- Letter "Request to Initiate the Balancing Authority Certification Process For Naturener Wind Energy 1, LLC"
- CECD's Master BA file "Master GWA Certification Evidence.pdf"
- Documentation resulting from the "Needed for Operation" items

CIP Requirements

CECD and GWA provided the certification team documents as evidence of their compliance to CIP-001. These documents however are not available for public viewing and are retained at the WECC office in Salt Lake City, Utah for a period of six years.

Evaluation of the BA Standards

The certification team was able to assess the applicant's ability to reasonably meet the BA standards/requirements as documented in the **Master CECD BA Matrix**.

Attachment 1

The BA Certification Team

- Fred Le Blanc – Burbank Water and Power
- Steve Ashbaker – WECC
- Jim Hughes – NERC
- Albert Peters “Bert” – AZPS
- Don Pape – WECC (RC)
- Paul Rice – WECC
- Anitha Neve – WECC

The CECD and NWA Staff Personnel that Participated in the On-site Visit

- J.T. Thompson – CECD Vice President
- Denise Ayers - CECD Vice President
- Rebecca Martinez - CECD Associate
- Carol Close Opatrny – GWA Consultant
- Jeff Racz - CECD IT Supervisor
- Vicki Higginbotham – CECD Project Manager
- C.J. Ingersoll - CECD Director, Compliance
- Nick Hall – CECD Lead Operator
- Rebecca Martinez - CECD Associate

Attachment 2

Certification Process Steps

Documentation Review

The certification team also reviewed the appropriate documentation that provided reasonable assurance that CECD has the tools, processes, procedures, and training to operate as a NERC certified BA.

The certification team used a spreadsheet to catalog the documentation evidence provided by CECD, namely *Master CECD BA Matrix*. The spreadsheet contains all the applicable NERC standards and associated requirements for an entity to be evaluated as a NERC Certified BA along with CECD document references where evidence was provided by CECD that met the applicable standards and requirements.

Applications Review

The September 3-5, 2008 visit focused on documentation review, interview of certified BA operators, and evaluation of the BA applications and operator toolset that CECD has available for their operators. The certification team reviewed CECD online applications that will be used to perform the GWA/CECD BA requirements. CECD developed a series of EMS demonstrations that were led by the BA operators. These demonstrations provided the certification team with an understanding of CECD applications, as well as demonstrate the operator readiness to assume the duties of the BA Operator.

Operational Testing

CECD and GWA have conducted a series of operational tests. Operational testing is primarily focused with testing the necessary signals in order to facilitate the EMS, operating process, Early Scheduling Toolset for Automated Range (ESTAR), and GNU Compiler Collection (GCC) Scheduling tools.