UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Standardization of Generator Interconnection Agreements and Procedures	**) Docket No. RM02-1-000)**

ADDITIONAL COMMENTS OF THE NORTH AMERICAN ELECTRIC RELIABILITY COUNCIL REQUESTING MODIFICATION AND CLARIFICATION OF PROPOSED RELIABILITY REQUIREMENTS

I. Background

On June 17, 2002, the North American Electric Reliability Council ("NERC") filed comments requesting the Commission to consider that additional work may be required to ensure certain technical reliability requirements of the proposed Standard Generator Interconnection and Operating Agreement ("IA") and Standard Generator Interconnection Procedures ("IP") are consistent with existing NERC reliability standards and do not present a risk to the reliability of bulk electric systems in North America. NERC asked the Commission to grant NERC an opportunity to conduct a more complete review of the specific reliability-related terms within the IA and IP and to propose any corrective language necessary to address inconsistencies with NERC reliability standards.

II. Purpose of Additional Comments

These additional comments present the results of NERC's technical review of the reliability requirements of the IA and IP. For the most part, the review has confirmed that the reliability requirements included in the draft IA and IP are consistent with NERC reliability standards, policies, and guides. In five areas where adopting the IA and IP as proposed could have adverse affects on reliability, NERC offers corrective language and justification for the

revisions. In other, less critical areas, NERC offers comments to clarify some of the reliability requirements of the IA and IP.

III. Recommendations

NERC respectfully requests that the Commission include in the proposed IA and IP the revisions offered in Section V of these comments. NERC believes these revisions are the minimum necessary revisions to ensure consistency between the IA and IP and existing NERC reliability standards, policies, and guides.

NERC respectfully requests that the Commission also clarify the reliability requirements of the proposed IA and IP in a manner consistent with the additional information provided in Section VI of these comments.

IV. Technical Review Process

On June 14, 2002 NERC's Board of Trustees directed that NERC continue the technical review of the reliability requirements in the IA and IP begun in response to the Notice of Proposed Rulemaking ("NOPR") to ensure that any potentially adverse impacts to reliability are identified and resolved. The Board emphasized the importance of expediting this work so that the results can be used within the Commission's timetable for issuing a final rule later in 2002. The Board assigned the NERC Planning Committee to lead the effort, with additional resources to be assigned as needed.

Of the 91 articles in the IA and IP that NERC had previously identified as being related to reliability, NERC determined that 74 of these articles placed specific reliability-related obligations on the Transmission Provider, the Generator, or a Third Party System. These reliability requirements were sorted into areas of expertise required for review.

Most of these items related to system study or planning and were assigned to the Planning Standards Subcommittee ("PSS") for review. This group provides a diverse

representation of qualified experts in the planning and analysis of bulk electric systems. The PSS met on July 9 to review the assigned items. The group outlined its comments and identified areas requiring follow-up work. The preliminary results were presented to the Planning Committee for its review and comment on July 16.

The Operating Committee conducted a similar process for the IA and IP articles related to operating reliability. The major difference was that expertise was required from several groups, necessitating the assembly of a special task group consisting of experts from the Operating Reliability Subcommittee, Resources Subcommittee, and Interconnected Operations Services Subcommittee. Comments were also solicited during the Operating Committee meeting on July 18.

The collective inputs received from these expert groups indicated that most of the IA and IP reliability requirements are consistent with NERC reliability standards, policies, and guides. A few items were identified, however, that could directly impact bulk electric system reliability. These are addressed in Section V of these comments. Additional clarifications to the reliability requirements were also suggested and have been included in Section VI of these comments.

NERC posted and widely announced to the industry a draft of these comments on August 12 for a 10-day comment period closing on August 22. Substantive comments were received from Duke Energy North America, LLC (DENA), Duke Energy Transmission (DUKE), and Reliant Energy HL&P (HL&P). Several comments were consistent with the consensus results of the NERC review and were incorporated into the NERC comments. The remaining comments were either outside the scope of the NERC review or were inconsistent with the other inputs received. In each case, the comment is summarized in a footnote so that the Commission can see the range of views received by NERC. Where NERC has provided a response to a comment, the NERC response is shown in brackets [] in the footnote.

V. Issues with Potential Impact on Reliability

This section identifies inconsistencies between the reliability requirements stated in the IA or IP and NERC standards, policies, and guides. These inconsistencies, if implemented in practice as written, could have adverse impacts on bulk electric system reliability. There are five items, presented here in priority order:

1. Coordination of Generator and Transmission System Protection
2. Operating Obligations and Authorities of the Generator and Transmission Provider
3. Generator Obligation to Follow Scheduled Deliveries
4. Forced Outage Notifications
5. System Study Limiting Conditions

Reliability Issue 1: Coordination of Generator and Transmission System Protection

NERC recommends the following revisions (new material is shown by underscoring; deleted material is shown by strike-out) to IA Article 9.7.3:

> **IA Article 9.7.3. Under-Frequency and Over-Frequency Conditions**
>
> ~~**Load Shed Event**~~ – The Transmission System is designed to automatically activate a load-shed program as described in the Interconnection Guidelines in the event of an under-frequency system disturbance. Generator shall implement an under-frequency relay set point for the Facility as described in the Interconnection Guidelines to ensure "ride through" capability of the Transmission System, as required by Good Utility Practice, and as previously studied and agreed upon by the Parties ~~to the extent allowed by equipment limitations or warranties~~. Generator response to frequency deviations, both under and over-frequency conditions of pre-determined frequency deviation magnitudes,

shall be studied[1] and coordinated with the Transmission System and other facilities, in accordance with Good Utility Practice.

The coordination of generator protection with under-frequency load shedding set points is required to prevent premature disconnection of generation from the grid, which could lead to a collapse of the bulk electric system. This requirement is particularly relevant in an islanding situation, when under-frequency is a likely condition. If generators are installed such that equipment limitations and manufacturers' warranties are acceptable exemptions for a generator not to remain on during the frequency disturbance, then the under-frequency load shedding may not be effective in preventing the full collapse of the island. Sustaining an energized island in such a case is essential to restoring normal conditions following a disturbance and is justification for requiring facilities, on a non-discriminatory basis, to have such capabilities. Additionally, under-frequency load shedding operations must be studied in advance. Equipment and systems need to perform in accordance with established reliability criteria and agreements.[2]

Numerous historical examples demonstrate the importance of coordinating generator protection with under- and over-frequency set points on the transmission system. During a major disturbance on June 25, 1998, in the northern MAPP and northwestern Ontario systems, generators were able to "ride through" substantial under-frequency load shedding to stabilize into several islands that had separated from the Eastern Interconnection. These islands were able to remain energized, although some firm load was shed, thus expediting the return to normal conditions. A report of this disturbance is available in NERC's 1998 System Disturbances

[1] HL&P comments that the rule should specify that the entity responsible for performing this study and the recovery of associated costs should be addressed on a regional basis. [NERC believes it would be inappropriate in its filing to comment on assignment of responsibility and cost recovery issues.]

[2] HL&P comments that these reliability criteria and agreements should be established at the regional level and should consider practical technologies available at reasonable costs. [NERC considers that the reasonableness of the reliability criteria and the inclusion of regional criteria are implicit in the NOPR and in NERC's comments.]

Report at: ftp://www.nerc.com/pub/sys/all_updl/oc/dawg/disturb98.pdf. Other disturbance events have documented the importance of coordinating generator protection with transmission system protection, including the disturbances in the Western Interconnection on July 2 and August 10, 1996.

Reliability Issue 2: Operating Obligations and Authorities of the Generator and Transmission Provider

NERC recommends the following revisions to IA Article 9.3:

> **IA Article 9.3. Transmission Provider Obligations** – Transmission Provider shall cause the Transmission System and the Transmission Provider Interconnection Facilities to be operated, maintained and controlled in a safe and reliable manner and in accordance with this Agreement. Transmission Provider may provide operating instructions to Generator consistent with this Agreement and Transmission Provider's operating protocols and procedures as they may change from time to time. Transmission Provider will consider changes to its operating protocols and procedures proposed by Generator. [3]~~Generator shall not be obligated to follow Transmission Provider's instructions to the extent the instructions would have a material adverse impact on the safe and reliable operation of Generator's facilities. Upon request, Generator shall provide Transmission Provider with documentation of any such alleged material adverse impact.~~

[3] DENA comments that the language should remain unchanged because the Generator should have rights to take whatever actions or inactions are necessary for the safe and reliable operation of Generator's facilities. [NERC does support the Generator's right to operate its facilities in a safe and reliable manner. That right is provided in Article 13.6 on the next page in a manner that is consistent with reliability standards.]

The statement that is struck refers to a Generator obligation and is not a Transmission Provider obligation.

Notwithstanding where in the IA this statement might be applied, it is cause for concern with respect to reliability in that it appears to grant the Generator a blanket right not to follow the Transmission Provider's operating instructions if in the Generator's judgment there could be an adverse impact on the Generator's facilities. While it is obviously desirable to always operate each facility safely and reliably, during a system emergency it is essential that facility operators observe pre-established operating criteria and follow the instructions of system operators.

Generator operating criteria under various emergency conditions should be documented and agreed upon in the course of interconnecting and preparing to operate the facility. Equipment must be built to operate to the established criteria defined in the operating arrangements. The capabilities of the generator to meet those criteria must be verified and tested. System studies and security analysis must incorporate the actual capabilities of the generator. Generators must coordinate their trip criteria in advance with the system operator and planner.

Consistent with the previous comments, NERC recommends the following revisions to IA Article 13.6:

> **IA Article 13.6 Generator Authority** – Consistent with Good Utility Practice, operating agreements and procedures, the Generator may take ~~whatever~~ actions or inactions with regard to the Facility or the Generator Interconnection Facilities ~~it deems necessary~~ during an Emergency Condition in order to (i) preserve public health and safety, (ii) preserve the reliability of the Facility or the Generator Interconnection Facilities, (iii) limit or prevent damage, and (iv) expedite restoration of service.

Generator shall use Reasonable Efforts to minimize the effect of such actions or inactions on the Transmission System and the Transmission Provider Interconnection Facilities. Transmission Provider shall use Reasonable Efforts to assist Generator in such actions.

Reliability Issue 3: Generator Obligation to Follow Scheduled Deliveries

NERC recommends the following revisions to IA Article 4.3.1:

IA Article 4.3.1. Generator Balancing Service Arrangements:

Generator is responsible for ensuring, consistent with the scheduling requirements of the Transmission Provider's FERC-approved tariff and any applicable FERC-approved market structure, that its actual Facility output matches the scheduled delivery from the Facility~~, on an integrated clock hour basis,~~ to the Transmission Provider's Transmission System, including ramping into and out of such scheduled delivery, as measured at the Point of Interconnection.

This statement references post-interconnection operations and may therefore extend beyond the intended scope of the IA.

The proposed IA states that the Generator's balancing obligation is to match output with its scheduled delivery on an integrated clock hour basis. Integration of the delivered energy over an hour is a measure of delivered energy used for settlement purposes and is insufficient to describe the Generator's obligation to match its actual output with scheduled delivery continuously within a scheduling period. Furthermore, a scheduling period could be some duration other than a clock hour.

As shown in the conceptual diagram in Figure 1, a Generator can match its actual output over an hour with its integrated clock hour scheduled delivery, yet substantially over-generate for

part of the hour and under-generate for part of the hour. If such intra-hour imbalances become accepted practice, they could cause performance control problems such as frequency excursions, unscheduled power flows on the bulk electric system, and conditions that are unsafe or that have not been studied.

While modest deviations between the Generator's actual output and scheduled delivery can be expected, the magnitude and duration of these mismatches are generally regulated by market or tariff mechanisms designed to encourage good control, such as imbalance penalties.

Increasingly, markets are adopting scheduling periods other than a clock hour, including the use of a five-minute real-time balancing market in the Standard Market Design. Bulk electric system reliability depends on such market mechanisms to ensure that Generators continuously follow, within reasonable deviations, their scheduled delivery of energy, including ramps, and ancillary services.

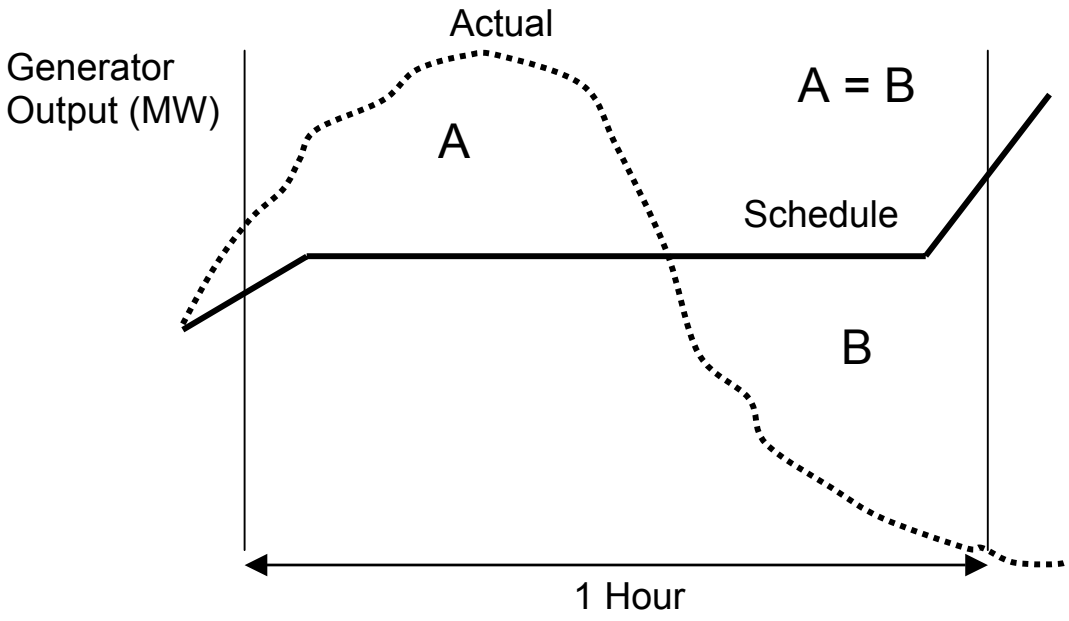

Figure 1 – Clock Hour Integrated Energy Inadequate to Measure Schedule Following

Reliability Issue 4: Forced Outage Notifications

NERC recommends the following revisions to IA Article 9.7.1.3:

> **IA Article 9.7.1.3. Outage Restoration** – If an outage on a Party's Interconnection Facilities or Network Upgrades adversely affects the other Party's facilities, the Party that owns or controls the facility that is out of service shall use Reasonable Efforts to promptly restore such facility(ies) to a normal operating condition consistent with the nature of the outage. <u>The Party that owns or controls the facility shall provide the other Party, to the extent such information is known, information on the nature of the emergency condition, an estimated time of restoration, and any corrective actions required. Initial verbal notice shall be followed up as soon as practical with written notice.</u>

This information is necessary because the outage may affect outage clearances on other equipment, calculation of transfer capabilities, and system de-ratings. [4]

Reliability Issue 5: System Study Limiting Conditions

NERC recommends the following revisions[5] to IA Article 4.1.2.2:

> **Requested Revision 2 – IA Article 4.1.2.2. "The Study":** The interconnection study for NR [Network Resource] Interconnection Service shall assure that the Generator's Facility meets the requirements for ER Interconnection Service and as a general matter, that such Facility interconnection is also studied with the Transmission Provider's

[4] This information requirement is independent of the obligation of all electric utilities to supply certain information to the Department of Energy in accordance with EIA Form 417.

[5] DENA comments that the original language should be left unchanged because the proposed modifications undo the balance reached among all participants in the ANOPR negotiation process and portions of the deal cannot now be undone at the benefit of Transmission Providers. [NERC believes the revisions correct the description of the study needed for reliability assessment.]

> Transmission System ~~at peak load,~~ under a set ~~variety~~ of ~~severely stressed~~ reasonably expected limiting conditions within the parameters of the Transmission System's design criteria,[6] to determine whether, with the Generator Facility at its limiting ~~full~~ output, the aggregate of generation in the local area can be delivered to the aggregate of load on the Transmission Provider's Transmission System, consistent with Good Utility Practice and the Transmission Provider's reliability criteria and procedures. This approach assumes that some portion of existing Network Resources are displaced by the output of the Generator's Facility.

Peak system loading conditions and maximum generator output are often not the only limiting conditions for study. Other limiting conditions that may require study include excessive reactive (over-voltage) during extreme low loads and power system instability, which may occur at a variety of loading conditions. NERC's Transmission Standard S3 includes a table providing a list of NERC study criteria. Studying the impact of interconnecting a Generator only under conditions of system peak load and generator peak output may omit the study of other conditions that could be unsafe. Use of the term "limiting conditions" provides the flexibility to incorporate studies that are necessary to ensure reliability.

The additional reference to Good Utility Practice acknowledges that there are NERC and regional standards for these studies, in addition to Transmission Provider reliability criteria.

VI. Additional Clarifying Information

NERC recommends the following clarifications to the reliability requirements of the IA and IP.

[6] HL&P comments that the Transmission System's design criteria should be established at the regional level to accommodate regional differences and conditions. [NERC believes this is implicit in the definitions of Applicable Standards and Good Utility Practice as defined by the Commission.]

Reliability Clarification 1: Reference to Applicable Standards and Good Utility Practice

The IA and IP make extensive use of the terms Applicable Standards and Good Utility Practice. However, it is not apparent that these terms are used consistently throughout both documents. The terms appear to be used interchangeably – sometimes one is included but not the other – and there does not appear to be an explicit understanding of what is intended or needed in each case.[7]

It is important that the meaning of these two terms are explicitly understood and used consistently. There was a consensus decision in drafting the IA and IP to include some specific requirements related to reliability. However, these requirements only partially address the full range of reliability requirements associated with interconnecting new facilities. Reference to Applicable Standards and Good Utility Practices provides a consistent framework for recognizing the broader set of reliability requirements and guides that cannot be explicitly captured in the IA and IP.

The Commission has defined Applicable Standards in the IA glossary of terms to include NERC and Regional Council requirements and guidelines. The Commission has defined Good Utility Practices as a broader term that includes Applicable Standards and other codes and practices. The definitions provided in the IA are as follows:

> **"Applicable Standards"** shall mean the requirements and guidelines of NERC, the Applicable Reliability Council, the Control Area of the Transmission System to which the Facility is directly interconnected and the Transmission Provider Interconnection Guidelines.
>
> **"Good Utility Practice"** shall mean any of the practices, methods and acts engaged in or approved by a significant portion of the electric

[7] DENA comments that there may have been good reasons why Applicable Standards were used in certain provisions and Good Utility Practice in others.

> industry during the relevant time period, or any of the practices, methods and acts which, in the exercise of reasonable judgment in light of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost consistent with good business practices, reliability, safety and expedition. Good Utility Practice is not intended to be limited to the optimum practice, method, or act to the exclusion of all others, but rather to be acceptable practices, methods, or acts generally accepted in the region. Good Utility Practice shall include, but not be limited to, compliance with Applicable Laws and Regulations, ***Applicable Standards*** (emphasis added), the National Electric Safety Code, and the National Electrical Code, as they may be amended from time to time, including the criteria, rules and standards of any successor organizations.

The IA references Applicable Standards in Articles 1.24, 4.4, 5.7, 5.16.3, 9.1, 9.7.5, and 24.1. The IA references Good Utility Practices in Articles 1.11, 1.47, 4.4, 5.1B(iv), 5.7, 5.8.3, 5.9, 5.16.2, 5.16.3, 6.2, 7.2, 9.6.2.1, 9.7.1.1, 9.7.2, 9.7.2.1, 9.7.2.4, 9.7.2.5, 9.7.4.3, 9.7.4.5, 9.7.4.6, 13.5.2, and 13.7. The IP references Good Utility Practice in Articles 1.27, 4.2, and 8.2, as well as Article 4.0 of Appendix 2 and Article 4.0 of Appendix 3, and does not make reference to Applicable Standards.

The burden of reconciling IA and IP reliability requirements with industry standards can be substantially lessened if the Commission prominently states within the documents that Good Utility Practices, and hence the Applicable Standards contained therein, are intended to be observed throughout the IA and IP. To the extent references to Applicable Standards and Good Utility Practices remain in specific articles, they should be reviewed to ensure they are

consistently applied and have the appropriate meaning in each case. Caution should be applied to ensure that different adaptations are not inadvertently introduced, unless variations are deemed necessary to the particular article. As a rule, it would be appropriate that the more general term Good Utility Practice be applied in most cases and be adapted only as needed.

Reliability Clarification 2: Definitions of Studies

The IA and IP make numerous references to various types of studies required: Interconnection Feasibility Study (scope defined in IP 6.2), Interconnection System Impact Study (IP 7.3), Interconnection Facilities Study (IP 8.2), Optional Study (IP 10.2), Energy Resource Interconnection Service Study (IA 4.1.1.2), and Network Resource Interconnection Service Study (IA 4.1.2.2).

The scopes provided for these studies describe a basic or typical set of studies, but other specialized studies are often necessary to assure reliability. This is an area in which regional variations should be expected in specific filings of the IA and IP, based on the differing electrical characteristics of systems. It may be appropriate to include the following general phrase to qualify the requirements of each study: "and other studies necessary to comply with Good Utility Practice and Transmission Provider safety and reliability criteria that are applied on a non-discriminatory basis to all generator interconnections".

For example, in some stability-constrained regions, a post-transient stability analysis is conducted to look at conditions several minutes after an initial disturbance. This analysis verifies conditions are safe after slower acting mechanical devices, such as transformer taps and distribution voltage regulators have stabilized. As a second example of an additional study requirement, some systems with substantial amounts of HVDC equipment may require study of subsynchronous resonance impacts of interconnecting a facility.

The 6 different types of studies referenced in the IA and IP could be applied more consistently by including definitions in a common glossary shared by the two documents, rather than defining the scope in various references in the text of the IA and IP.

Reliability Clarification 3: System Protection Facilities Include Communications

IA Article 1.50. "System Protection Facilities" should be described to specifically include the communications equipment necessary to coordinate and monitor the operation of protective devices. This communications equipment is necessary to coordinate the timing and sequence of operations to automatically isolate a portion of the system, ensuring that a fault condition is isolated without interrupting additional circuits unnecessarily. Adding the phrase "<u>, including necessary protection signal communications equipment,</u>" would be an appropriate clarification.

Reliability Clarification 4: Power System Stabilizers

It should be noted in IA Article 5.2. "Power System Stabilizers" that the reliability criteria and use of power system stabilizers vary from one region to another depending on the electrical characteristics of the system. For instance, in the WECC, where transmission lines are longer and generation and load areas more separated, all generators over 30 MVA are required to have a power system stabilizer, without reference to specific system impact study.

Consistent with a phrase used in IA Article 9.6.2.1 related to governors and voltage regulators being out of service, it is important to reliability that the system operator also be notified if a power system stabilizer is inoperable or removed from service. The following statement should be added to IA Article 5.2: <u>If the Facility's power system stabilizers are removed from service or not capable of automatic operation, the Generator shall immediately notify Transmission Provider's system operator, or its designated representative.</u>

Reliability Clarification 5: Generator Option to Complete Project

In IA Article 5.1.A.(i).b. "Options", it should be made clear that a Generator electing to assume responsibility for completing an interconnection project will also assume responsibility for complying with Applicable Standards and other reliability criteria. An explicit statement to this effect would be: "In assuming the responsibility for design, procurement and construction of the Transmission Provider Facilities, Generator shall comply with Good Utility Practices and the Transmission Provider's safety and reliability criteria."

Reliability Clarification 6: Definition of Control Area

The definition of Control Area provided in IA Article 1.11 is acceptable. However, it is substantially different from the definition of Control Area used in the NERC Glossary of Terms:

> **Control Area** – An electrical system bounded by interconnection (tie-line) metering and telemetry. It controls generation directly to maintain its Interchange Schedule with other Control Areas and contributes to frequency regulation of the Interconnection.

In its new Functional Model, NERC introduces a new term, Balancing Area, that will eventually replace Control Area in NERC's reliability standards. NERC requests that the Commission continue to recognize the evolving definitions and uses of the terms Control Area and Balancing Area.

Reliability Clarification 7: Transmission Provider's Review

In IA Article 5.8.2, the term "reasonably" equivocates a reliability requirement. This article should be revised as follows:

> Generator shall make such changes to the GIF as may ~~reasonably~~ be required ~~[by Transmission Provider]~~ to ensure that the GIF are compatible

with Good Utility Practice and the telemetry, communications, and safety requirements of the Transmission Provider.[8]

Reliability Clarification 8: GIF Construction

IA Article 5.8.3 provides a partial list of information requirements in support of Generator construction, pointing out the difficulty of starting a list of requirements but not having a complete list. Some additional requirements (not an exhaustive list) include: any changes to the excitation system, automatic voltage regulator, control and protection settings, transformer taps, and communications. The following additional sentence would clarify the article:

> Generator shall provide Transmission Provider specifications for the excitation system, automatic voltage regulator, generator control and protection settings, transformer tap settings, and communications.

Reliability Clarification 9: Suspension

The following revisions are recommended for IA Article 5.13:

> Generator reserves the right, upon written notice to Transmission Provider, to suspend at any time all work by Transmission Provider associated with the construction and installation of Transmission Provider Interconnection Facilities and/or Network Upgrades required under this Agreement, with the condition that the power system shall be left in a safe and reliable condition in accordance with Good Utility Practice and the Transmission Provider's safety and reliability criteria.

[8] DENA comments that the language should not be changed as the proposed modifications undo the balance reached among all participants in the ANOPR negotiation process, and that portions of the results cannot be undone for the benefit of transmission providers.

There must be a requirement to leave the system in a safe and reliable condition if a project is suspended in a partially completed state. A job site and equipment should not be left in a condition that would jeopardize safety or system reliability. The suspended condition should meet all Applicable Standards and Transmission Provider criteria for a safe and reliable system. Third party impacts also may need to be addressed.

Reliability Clarification 10: Generator Obligations: Communications

The following revisions are recommended to clarify the requirements of IA Article 8.1:

> Generator shall maintain satisfactory operating communications with Transmission Provider's system dispatcher or representative designated by Transmission Provider. Generator shall provide standard voice line, dedicated voice line and facsimile communications at its Facility control room or central dispatch facility through use of the Transmission Provider designated ~~public telephone~~ voice communication system.

The Transmission Provider may use a voice communications system that does not rely on the public telephone system.

Reliability Clarification 11: Control Area Notification

The last sentence of IA Article 9.2 stating that "If the Facility is not operated as part of Transmission Provider's Control Area, in no event shall this Agreement prohibit, prevent, or otherwise limit the ability of Generator to operate the Facility in accordance with the requirements of the Control Area of which it is part…" should be clarified to not preclude the Host Control Area from enforcing requirements associated with the physical connection of the Facility. A Host Control Area is one in which the Facility is physically connected, regardless whether the Facility is electrically telemetered for control purposes into another Control Area through a dynamic transfer. A Facility that elects to be electrically metered into a Control Area

other than the one in which it is physically connected must meet the requirements of its physical Host Control Area as well as its metered Control Area. This statement in IA Article 9.2 should not be interpreted as precluding the Host Control Area from enforcing such requirements. Examples of requirements that apply in the Host Control Area include power factor and voltage control obligations.

Reliability Clarification 12: Power Factor Design Criteria

IA Article 9.6.1 should be revised[9] as follows:

> Generator shall design the Facility to maintain a composite power delivery at continuous rated power output at the Point of Interconnection at a power factor within a ~~the~~ range required by Good Utility Practice ~~of 0.97 leading to 0.95 lagging~~, unless Transmission Provider has established different requirements that apply to all generators in the Control Area on a comparable basis.

NERC Planning Standard I.D Guide 3 states that[10]:

> At continuous rated power output, new synchronous generators should have an overexcited power factor capability, measured at the generator

[9] DENA comments that the language should not be changed as the proposed modifications undo the balance reached among all participants in the ANOPR negotiation process, and that portions of the results cannot be undone for the benefit of transmission providers.

[10] DUKE comments that adequate reactive support should be available from an interconnecting generator under all circumstances. Some generation facilities are designed such that they have internal bus voltage limitations or high impedance to the point of interconnection. In these cases, the generator meets the NERC Planning Standard I.D Guide 3 criteria, but the facility is unable to provide an acceptable level of reactive support to the system due to voltage limits or reactive losses. Good Utility Practice, referenced in the proposed re-wording of IA Article 9.6.1, would include not unnecessarily limiting a facility's reactive output in this way. It should be clear, however, that the generator's continuous reactive capability between 0.95 leading and 0.90 lagging power factor shall not be restricted by any main or auxiliary equipment, e.g. main or auxiliary transformer settings, hydrogen cooling system, stator water cooling system, equipment voltage or current ratings, unit controls, or unit protection, etc. The generator step-up transformer should be chosen so as not to limit the real or reactive power output of the generator. These provisions would ensure that reactive capability of the facility is not limited by design features other than the generator. [NERC notes that the DUKE comment is consistent with other inputs received during the technical review and that DUKE intended the comment as informational, not as a further revision to the IA.]

terminals, of 0.9 or less and an underexcited power factor of 0.95 or less. If a synchronous generator does not meet this requirement, the generation owner should make alternate arrangements for supplying an equivalent dynamic reactive power capability to meet the area's reactive power requirements.

Power factor limits are a reliability issue because the bulk electric system depends on the dynamic, fast-acting supply and absorption of reactive power by generators to maintain voltage stability. A wider range of responsiveness (i.e. lower excitation limits in the leading and lagging directions) provides more responsiveness to the system disturbances. The NERC guides, at 0.90 lagging (overexcited or reactive supplying) and 0.95 leading (underexcited or reactive absorbing), provide more responsive reactive supply and absorption than the proposed criteria in IA Article 9.6.1. Power factor requirements of 0.95 in both the under- and overexcited directions are common in practice some regions.

Reliability Clarification 13: Article 9.7.4.1 Title Correction

The title of IA Article 9.7.4.1 should be revised as follows:

Protection Required by Study~~and System Quality~~

Power quality issues are addressed in IA Article 9.7.6, but are not referenced in this article.

Reliability Clarification 14: Protection

IA Article 9.7.4.2 should be clarified as follows:

Each Party's facilities shall be designed and coordinated with other protection systems, so as to isolate any fault or abnormality on those facilities in accordance with Good Utility Practices. ~~that would negatively affect the other Party's system or the other entities connected to the~~

~~Transmission Provider's Transmission System~~.

"Negatively affect" is a vague term that is better addressed by referencing the applicable criteria. All protection systems must be coordinated to preclude undesired or unsafe operations.

Reliability Clarification 15: Requirements for Protection

IA Article 9.7.5 should be clarified as follows:

> In ~~compliance~~ accordance with the Interconnection Guidelines and ~~Applicable Standards~~ Good Utility Practice, Generator shall provide, install, own, and maintain relays, circuit breakers and all other devices necessary to ~~promptly~~ remove any fault contribution of the Facility to any short circuit occurring on the Transmission System not otherwise isolated by Transmission Provider equipment, such that the removal of the fault contribution shall be coordinated with the protection requirements of the Transmission System. Such protective equipment shall include, without limitation, a disconnecting device or switch with load-interrupting capability located between the Facility and the Transmission System at a site selected upon mutual agreement (not to be unreasonably withheld, conditioned or delayed) of the Parties.

"Promptly" is not a very useful term when describing generator or system protection. Generator fault protection must be "coordinated" with system protection. Coordination allows relays to work together in a proper sequence to isolate a fault in a safe manner while minimizing the extent of interrupted facilities.

It is not clear in the phrase "Such protective equipment shall include, without limitation, a disconnecting device or switch with load-interrupting capability" is intended to mean a load-interrupting or a fault-interrupting device. If a load-interrupting device is intended, the purpose

of including this requirement should be provided for clarity, such as to allow the equipment to be isolated for maintenance.

Reliability Clarification 16: Disturbance Analysis Data Exchange

The title of Article 9.10 should be clarified as follows:

> **Disturbance Analysis Data Exchange**

This article is limited to data exchange for disturbance analysis and the title should reflect that. Data exchange for other study and analysis purposes is referenced in other articles.

The following revision to IA Article 9.10 would clarify that the list of data is a partial list:

> The Parties will cooperate with one another in the analysis of disturbances to either the Facility or the Transmission Provider's Transmission System by gathering and providing access to any information relating to any disturbance, including information from oscillography, protective relay targets, breaker operations and sequence of events records, and any disturbance information required by Good Utility Practice.

Reliability Clarification 17: Generator Testing

The following revisions to Article 24.4 are recommended:

> The Generator shall conduct tests on the generator as required by Good Utility Practice, such as an open circuit "step voltage" tests ~~on the generator~~ to verify proper operation of the generator's automatic voltage regulator. Unless otherwise agreed, the voltage test conditions shall include: (1) generator at synchronous speed; (2) automatic voltage regulator on and in voltage control mode; and (3) a five percent (5%) change in generator terminal voltage initiated by a change in the voltage

regulators reference voltage. Validated generator characteristics[11], supported by ~~R~~recordings showing the responses of generator terminal and field voltages shall be provided to Transmission Provider. In the event that direct recordings of these voltages is impractical, recordings of other voltages or currents that mirror the response of the generator's terminal or field voltage are acceptable if information necessary to translate these alternate quantities to actual generator terminal or field voltages is provided. ~~The Generator may elect to provide recordings for only one generator when the other generators at the site are found to have identical design and response characteristics.~~ Generator testing shall be conducted and results provided to the transmission provider for each individual generating unit in a station.[12] Subsequent to the Operation Date, the Generator shall provide Transmission Provider any information changes due to equipment replacement, repair, or adjustment. Transmission Provider shall provide the Generator any information changes due to equipment replacement, repair or adjustment in the directly connected substation or any adjacent Transmission Provider-owned substation that may affect the Generator Interconnection Facilities equipment ratings, protection or operating requirements. The Parties shall provide such information no later than thirty (30) Calendar Days after the date of the

[11] DENA comments that this provision should not be modified. The generator is unable to know the nuances of system planning software. [NERC notes that Attachment A in Appendix 1 of the IP provides a table of generator data that the Generator must provide with the interconnection request and that the parameters to be tested would be from this set of generator characteristics. The Generator should understand the data that the Generator is providing, and the validity of any of these parameters that require testing per Article 24.4.]

[12] DENA comments that when generators have identical design and response characteristics, it does not make sense to have duplicative reports to the transmission provider. [NERC notes that system-modeling experts indicated that each unit has unique electrical characteristics, even when built from the same design model and vintage.]

equipment replacement, repair or adjustment.

The purpose of generator testing should be explained for clarity. From a system planning perspective, the purpose of this testing is to verify the modeling characteristics. From an operations perspective, this testing verifies the operational capabilities of the equipment.

The generator should provide test data in the form of validated generator parameters, not simply the raw data from the tests. The system planner is unable to know all the conditions of the test necessary to rationalize the generator technical parameters from the raw test data.

The characteristics of each individual unit must be determined and tested. One cannot rely on similarities between generators, even those of the same model and vintage installed at a single station. The electrical characteristics of each generator are unique – each generator is built one at a time.

Reliability Clarification 18: Coordination with Affected Systems

The IP Article 3.5 requirements for coordinating with third party systems are subjective at best and the process appears to be somewhat confusing. Generally, a third party does not have sufficient information to analyze the full set of impacts of a proposed facility interconnection, but given the physical characteristics of the generator can at least determine the potential impacts on its own system. The third party is not an immediate participant in the contract and therefore does not generally know of the pending project or have any technical details unless notified by the transmission provider. The third party, while not under a specific contract related to the generator, must cooperate with the process so as not to cause undue delay in the project.

In principle, the process should be clarified as follows: a) the transmission provider notifies all potentially impacted third party systems of the pending interconnection within a certain time from receiving the request (e.g. 30 days); and b) the third party systems notify the transmission provider of any adverse impacts in a prescribed response timeframe (e.g. 90 days).

This coordination must be documented to protect the generator from last minute problems or delays. It should also be made clear what happens if an upgrade is needed on a third party system. There may be reliability impacts if the interconnection is completed before the third party upgrades are completed.

The issue of study coordination with third party systems has become more critical in recent years because of a shift from integrated resource planning by vertically integrated utilities toward a process in which generating resources are proposed for commercial purposes by independent Generators. The issue of third party coordination may be mitigated over time as large regional organizations increasingly serve as the focal point for planning coordination in the implementation of the Standard Market Design.

Reliability Clarification 19: Modifications

IP Articles 4.4.1 and 4.4.2 refer to allowable modifications to a Facility. To the extent these articles reference only changes in queue position, no revisions are suggested. If these articles imply that the stated modifications can be made without affecting reliability or the need for modifying a study or restudying the proposed interconnection, then the statements are incorrect. Modifications of the generator parameters described can directly invalidate the results of various system studies.

Reliability Clarification 20: Confidentiality

Interpretation of the last sentence IP Article 13.1, allowing sharing of generator information with third parties, is significant to reliability. Data are generally shared not only with directly impacted neighboring systems, but also with regional and NERC study groups for the purpose of modeling inter-regional and Interconnection reliability impacts. This data is generally provided in a manner that masks ownership and other commercial terms, and NERC has standards of conduct for Reliability Coordinators and a data confidentiality agreement.

However, the physical characteristics and location of the planned generator must be shared among many parties for reliability studies. Mechanisms must remain in place ensure the availability and confidentiality of such data. Without such confidentiality protections, generators may be less willing to provide the data needed for reliability assessment. This concern can be mitigated by the generator identifying specific information that is confidential and the Transmission Provider sharing information only with parties to confidentiality agreements.

The phrase in IP Article 13.1 "other than the information contained in … Appendix 1" could be interpreted to mean all data in Appendix 1 could be publicly released, which appears to be an undesired interpretation.

VII. CONCLUSION

NERC recognizes that the IA and the IP were the product of extensive negotiation among representatives from several different industry interest groups. Some commenters have urged the fact of the negotiations as a basis for not accepting any further changes to the proposed IA and IP. However, the standards that support the reliability of the bulk electric system are there for the benefit of all. Those standards cannot be made subject to the compromises that are an inevitable part of commercial negotiations. NERC urges the Commission to adopt the revisions proposed in section V. and the clarifications proposed in section VI. in order to assure that the IA and IP work in harmony with existing reliability standards.

Respectfully submitted,

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August 27, 2002

CERTIFICATE OF SERVICE

I certify that I caused a copy of these comments to be mailed to each individual on the service list for Docket No. RM02-1-000.