THE INTERTIE MANAGEMENT COMMITTEES' RAILBELT OPERATING AND RELIABILITY STANDARDS

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Introduction

Shortly after the interconnection of the Railbelt Northern and Southern systems in 1985, the newly formed Intertie Operating Committee (IOC) reviewed, modified, and adopted the North American Electric Reliability Council's "Operating Guides for Interconnected Power Systems". In 1992, these Operating Guides were subsumed into the Alaska Systems Coordinating Councils "Operating and Planning Guides". In each case the planning and operating guides for the large heavily interconnected systems of the Lower 48, Canada, and Mexico required significant revision for application in the relatively small and lightly interconnected Railbelt Electric System. In the intervening years a number of changes ensued in the electric power systems of North America and, in 2005, the Railbelt Utility Group Managers (RUG) directed their respective operating managers to form an Ad-hoc reliability committee tasked with reviewing the most recent version of the North American Electric Reliability Corporation's (NERC) "Reliability Standards for the Bulk Electric Systems of North America" and further with modifying them and updating the Railbelt's planning and operating standards.

The "Ad-Hoc Railbelt Reliability Committee (RRC)", as it was called, working with the State of Alaska's "Alaska Energy Authority" (AEA) formed committee working rules and open public process for the Standards review. Over the following several years the RRC reviewed some 650 pages of NERC standards. Drawing on this body of knowledge and on the existing Railbelt operation and planning standards as well as current Railbelt practices selectively modified and updated the NERC standards. The following standards represent the output of this process.

The group, the RRC has drafted these standards giving careful consideration to the many technical and operational issues involved with interconnecting entities to the Alaska Railbelt Electrical System (also referred to as the "Railbelt Interconnection", "the "Railbelt Grid" or "The System") and with five overarching goals:

- *First, these standards set the minimum requirements for interconnection to The System; the local entity at the point of interconnection may have additional or more stringent interconnection standards.*

- *Second, to the extent practical, these interconnection standards should be performance based rather than requirements based.*

- *Third, to the extent practical, interconnecting entities should not be allowed to degrade the performance or reliability of The System. Such degradation in performance shall be determined by modeling the Railbelt Electrical System using the boundary dispatch cases against all category B and probable category C contingencies.*

- *Fourth, interconnecting entities should not be required to build or improve System facilities beyond those necessary to meet the third overarching goal (above).*

- *Fifth, the interconnecting entity, as a condition of interconnection, shall abide by this and all other applicable Railbelt standards as they may be modified or implemented from time to time. A Balancing Authority having jurisdiction shall ascertain that the new entity agrees to these Standards prior to interconnection or that another entity will absorb the new entity's obligations as additional obligations to their own. The new entity may have additional obligations imposed by the local Transmission Owner.*

Given the complex and technical nature of the subject, the authors have worked diligently to maintain a high level of clarity throughout this document, in order to meet the needs of the participants, but they recognize that these standards are often based upon highly technical subject matter. To aid in this understanding a glossary of Terms used in railbelt reliability has been developed and included. If terms used in these standards are not defined in the attached glossary the reader should look to:

- The specific contractual glossaries found in Railbelt agreements related to the subject under consideration i.e., the Tripartite Agreement, the Bradley Lake Agreements, and The Alaska Intertie agreement as amended Nov. 2011 etc.

- The "Glossary of Terms Used in NERC Reliability Standards"

- The "IEEE Standard Dictionary of Electrical and Electronic terms"

- Webster's "2013 Dictionary of the English Language"

Further, to aid in understanding and implementing these requirements and criteria, the Intertie Management Committee (IMC) will require potential entities to obtain the assistance of qualified engineering professionals with specific expertise in the areas of electrical supply systems, power system analysis, protection, as well as control. Such professionals must have demonstrated experience in modeling, designing, constructing, commissioning and operating facilities on small, stability-limited interconnections.

These guidelines are subject to revision, at any time, at the discretion of the IMC. This document is not intended to be a design specification.

The essential documents are organized as follows:

The first set of standards defines how entities must plan for and operate in a reliable electric system. These standards draw heavily on the work of NERC, but have been modified in many cases to recognize the lean nature of the Railbelt System, it's relatively light loading and stability limited nature.

The AKBAL's and AKVAR's are the standards dealing with how balancing authorities (most of the Alaskan utilities are vertically integrated and are each their own balancing authority) work with each other. It is these standards that establish a requirement for reserve policies.

The AKFAC's are the standards dealing with new construction, maintenance and ratings. These standards contain the requirements for Interconnection Standards. It should be noted that these Interconnection Standards are minimums Railbelt wide and that more stringent interconnection requirements may be imposed at the local level by the local entity.

The AKINT's are the standards dealing with interchange scheduling.

The AKRES standard is the reserves policy of the Railbelt Grid. This standard draws heavily upon Exhibit H of the Amended and Restated Alaska Intertie Agreement. This standard sets the requirements for the resource adequacy, operating reserves, spinning reserves, and regulating reserves. These standards have some amount of behavior modification built into them in that they have formulas that will incentivize an entity's compliance with the standards in the event of nonperformance. It should be noted that these formulas are for minor infractions, and that for willful infractions further additional and more stringent sanctions may be warranted. Balancing Authorities with small units (less that 10 MW) but with non-dispatchable fuel sources may find that they have little to no spin obligation, but will likely have a large regulating obligation

The AKTPL's are the standards dealing with contingency categorization and reporting under normal and emergency conditions.

The Interconnection Standards for Generation and Transmission are documents developed strictly for the Railbelt. They are based on the principles that were used in the development of "Non-utility Generation Interconnection Standards" in place in the Railbelt utilities at the time of drafting (primarily GVEA and Chugach). These distributions system standards were modified to reflect Generation and Transmission and Generation Interconnection issues. These standards are applicable to entities/equipment, ***where a single contingency (Class B) could result in the net change of 10 or more MW's of generating capacity or load. This limit is based on our current system bias where loss of a 10 MW unit will cause the system frequency to drop 0.1 Hz.*** In most of our control centers, this is the level where the first level of frequency alarms are initiated indicating a major system disturbance. As with other Standards, the IMC may modify this limit as the Railbelt System changes over time.
Finally the Glossary of terms used in Railbelt Reliability defines terms specific to these standards.

While not specifically addressed in the standards, a prolonged interruption of the fuel supply to a generating plant is an unlikely but highly disruptive contingency. Such an event would likely be coincident to a loss of heating fuel as well and if occurring in the winter could be extremely disruptive and have significant life safety consequences.

It is required that each generating entity have contingency plans for loss of the primary fuel supply. This may include but not be limited to use of alternate fuels, generation at alternate locations or emergency power purchase agreements with other generators.

Further, a significant attack on or interruption to critical Cyber-Assets could potentially cause wide spread System disruptions. To the extent practical systems of this nature must be adequately "fire-walled" or physically isolated from outside intrusion.

The IMC is currently working on Critical Infrastructure Protection Standards to address these issues. They will be incorporated into the standards as soon as practical.

These Railbelt Standards supersede the previous reliability criteria found in the ASCC documents "ASCC Operating Guides for Interconnected Utilities and Alaska Intertie Operating Guides" and the "ASCC Planning Criteria for the reliability of interconnected electric utilities". Where this document is silent, the ASCC documents should continue to be referenced.

Sanctions for Levels of Non-Compliance when not otherwise described in the Standards refer to the Sanctions Matrix for Non-Compliance. The IMC is authorized to change the sanctions as the needs may arise, but only for future infractions.

Each Entity desiring to interconnect to the Railbelt System must fill out an Entity Function Matrix checking off the functions which they believe they will perform. The IMC will review and modify this as required and the document will be used to determine an entity's obligations as well as what areas it may participate in. Vertically integrated utilities may find themselves participating in most, if not all categories.

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Table of Contents

Alaska Standard AKRES-001-0 — Reserve Obligation and Allocation

A. Introduction

1. **Title:** **Reserve Obligation and Allocation**
2. **Number:** AKRES-001-0
3. **Purpose:**

   This standard describes Reserve Obligations for all Entities interconnected to the Railbelt Grid.

4. **Applicability:**
   - **4.1.** Balancing Authorities
   - **4.2.** Load Serving Entities
   - **4.3.** Generation Owners (Generation Asset Owning Entities)
5. **Effective Date:** TBD

B. Requirements

R1. Reserve Capacity Requirement

R1.1. Each Load Serving Entity is expected to maintain responsibility to provide capacity for its own firm load. As part of such responsibility, shall maintain or otherwise provide for annually, Accredited Capacity, in an amount equal to or greater than its maximum System Demand for such year plus the Load Serving Entities' Reserve Capacity Obligation, as set forth in Subsection R1.2.

R1.2. The Reserve Capacity Obligation of a Load Serving Entity, for any year, shall be equal to thirty (30) percent of the projected Annual System Demand for that year for that Load Serving Entity. The Reserve Capacity Obligation of the Load Serving Entity may be adjusted from time to time by the Intertie Management Committee (IMC)

R1.3. The IMC may determine the annual Accredited Capacity for each Load Serving Entity

R2. Responsibility for Operating Reserve

R2.1. Each Load Serving Entity and/or Generation Owner shall provide, or contract for, Spinning Reserve and Non-Spinning Reserve as required by Section R3 equal to or greater than the Operating Reserve Obligation of the entity. As soon as practicable, but not to exceed four hours, after the occurrence of an incident which uses Operating Reserves, each entity shall restore its Operating Reserve Obligation.

R2.2. Operating Reserves, Operating Reserve Obligation, System Reserve Basis and allocation calculations may be modified or changed by the Intertie Management Committee.

R2.3. The System Reserve Basis (SRB) is equal to the Largest Generating Unit Contingency of the system or other such value as determined by engineering studies and approved by the IMC.

R3. Total Reserve Obligation

R3.1. The Total Operating Reserve Obligation at any time shall be an amount equal to 150 percent of the SRB of the Railbelt Grid.

R3.2. The Spinning Reserve portion of the Total Operating Reserve Obligation shall not be less than an amount equivalent to 100 percent of the SRB.

R3.3. The balance of the Total Operating Reserve Obligation shall be maintained with Non-Spinning Reserve (aka Non-Operating Reserves).

R4. Generating Unit Capability-

Generating unit capability for operating reserve shall be determined by the following criteria:

R4.1. It shall not be less that the load on the machine at any particular time nor greater than R4.2 below

R4.2. It shall not exceed that maximum amount of load (MW) that the unit is capable of continuously supplying for a two-hour period, or quickly, through action of automatic governor controls.

R4.3. The criteria specified in this section may be modified or changed by the Intertie Management Committee.

R5. Allocation of Operating Reserve Obligations

The Operating Reserve Obligation of an Obligated Entity shall be that percentage of the Total Operating Reserve obligation determined by the IMC in accordance with the formulas described in R5 through R7

R5.1. An Entities' Spinning Reserve shall be calculated at any given instant as the difference between the sum of the net capability of all generating units on line in the respective entity and the integrated Systems Demand of the system involved and other sources (for example, SILOS and BESS) or declared restrictions on spinning reserve (for example, Bradley Lake or tie line restrictions) as accepted by the IMC

R5.2. An Entities' Spinning Reserve may be satisfied by an automatically controlled load shedding program. The load shedding program shall assure that controlled load can be dropped to meet the requirement of Spinning Reserve in such a manner as to maintain system stability and not cause degradation or cascading effects in the Railbelt system. The IMC shall review and approve the Entities' load shedding program that will be used to satisfy its Spinning Reserve requirements.

R5.3. The IMC may establish procedures to assure that the Operating Reserve of an entity is available on the Railbelt System at all times. Whenever an entity is unable to meet its Operating Reserve Obligation, that entity will, within two

hours, advise its Balancing Authority and make arrangements to restore its Operating Reserve Obligation.

R5.4. Prudent Utility Practices shall be followed in distributing Operating Reserve, taking into account effective utilization of capacity in an emergency, Response Rate, transmission limitations and local area requirements. Available Transfer Capability (ATC) shall include a component (Capacity Benefit Margin) recognizing the need to move reserves between areas.

R5.5. Subject to R5.3 above, an entity may arrange for one or more other entities to supply part of, or its entire, Operating Reserve requirement.

R5.6. By mutual agreement between the parties, an Entity which has contracted or leased *all* of the Interconnected Value of a Generating Asset or Share of a Generating Asset (energy, capacity, reactive-output dispatch-ability etc.) to another Railbelt Entity, such that this particular asset appears for all intents and purposes as Generating Asset of the Lessee's (contractee's) fleet, may have that asset counted among the Lessee's generating units and the Lessee may include this unit as any other in the Lessee's fleet for purposes of calculation operating reserve allocation.

An example of this is the Bradley Lake Project. AEA and at various times other project participants have contracted to have the Interconnected Value of this Generating Asset or their respective Shares of this Generating Asset assigned to one another in different forms. In each case the assignor has been relieved of the assigned project share (as the assignor's potential LSGC) and that share has been assigned to the assignee's fleet.

R5.7. In an emergency, any Generator Owner, upon request by its Balancing Authority (either through automated frequency or voltage feedback or via System Operator intervention), shall supply to such Balancing Authority part or all of its Operating Reserve up to the full amount of its Available Accredited Capacity. An Entity experiencing an emergency is not required to maintain its Operating Reserve Obligation. There shall be no obligation of an Entity to supply Operating Reserve if the requesting entity is not making full use of its own Available Accredited Capacity.

R6. Responsibility for Regulating Reserve

R6.1. *Regulating Reserve*- each Balancing Authority shall provide, or contract for, Regulating Reserve as required by Section R6.2 equal to or greater than the Regulating Reserve Obligation of the party. Regulating Reserve may not overlap reserves dedicated for Spinning Reserve. Regulating Reserve (both up and down) is required to compensate for uncertainty in forecasting and is established during the unit commitment planning process, and as such the BA may then utilize their reserve as required during the course of the day. If a BA exhausts its Regulating Reserve, they are required to procure or commit additional reserves immediately. Available Transfer Capability (ATC) for

Interconnecting Transmission lines shall recognize a component included in Transmission Reliability Margin (TRM) to allow for the delivery of Regulating Reserve between areas.

R6.2. *Regulating Reserve Obligation*- the Regulating Reserve Obligation for each Balancing Authority shall initially be set by the Intertie Management Committee and shall be allocated amongst eligible Entities' within a Balancing Authority using the same algorithms as that for Spinning Reserve.

R6.3. On an annual basis, after the year end CPS statistics are compiled, the IMC shall modify each Balancing Authorities' Regulating Reserve by increasing/decreasing its current Regulating Reserve by the % deviation in its CPS1. The Regulating Reserve obligations so calculated will be rounded up to the nearest integer MW.

R6.4. The IMC reserves the right to increase/decrease a BAL's Regulating Reserve or require other measures at any time due to changes in the system or repeat infractions.

R7. Spinning Reserve Components

R7.1. Spinning Reserve Obligation will be allocated to an Entity based on the Entities' Largest Single Generating Contingency (including any combination of units with a single point of interconnection forming a single contingency. RAS applications which have been field demonstrated to successfully mitigate the LSGC and have been approved by the IMC may be applied to reduce the magnitude of the LSGC.

R7.2. *Spinning Reserve Largest Contingency Ratio (SRLCR)*: This component shall be calculated as the ratio of an individual Entities' Largest Single Generating Contingency (LSGC) as compared to the sum of the LSGC's of all the Railbelt Entities.

R7.3. The Largest Single Generating Contingency will be based on the maximum Declared Capability of those unit(s) subject to the single contingency (regardless of RAS applications; when operated at the temperature corresponding to the average monthly temperature for that region.

An example of a Generating Contingency is a combined cycle unit; the loss of the combustion turbine will precipitate the loss of both the CT as well as the waste heat unit.

R7.4. If entities share a unit, an entities Share of such a unit could qualify as their LSGC if they have no unit(s) that are larger. This component may change whenever the average monthly temperature changes or an entity installs new generation.

R7.5. However due to variable response time, duct firing may not be counted as spinning reserves. Upon petition, the IMC may approve the inclusion of duct

firing as spinning reserve on a unit-by-unit basis if can be show by field testing (under system limiting conditions) to be equally as responsive as the remainder of the Spinning Reserve contribution of the particular unit(s) it is augmenting. It shall be the obligation of the petitioning entity to seek an approved test plan from the Intertie Management Committee, arrange for, bear the costs of and accomplish such testing. The Intertie Management Committee or its designee shall be present to observe and review documentation of such testing.

R7.6. As bus faults are rare, these elements generally do not constitute a LSGC; however, bus faults or multiple units on a single collector feeder may be considered as an LSGC should the IMC believe reasonable engineering and operating practice dictates that in a particular situation these are a reasonable contingency. A single point of failure in a fuel supply that may result in the loss of multiple units does not necessarily constitute a LSGC. However, subject to the reasoning above, the IMC may exercise judgment in such matters.

~~R7.8.~~R7.7. An entity adding a unit greater than 120 MW will accrue the obligation above 120 MW on a one for one basis in addition to their otherwise calculated spin obligation. The aforementioned 120 MW is subject to change by the IMC.

~~R7.9.~~R7.8. The Spinning Reserve Obligation (SRO) of each Obligated Entity shall be calculated as follows:

$$SRO_e = \{LSGC_e\} / \{\sum_i (LSGC_i)\} * [SRB] + MUD_e$$

e ≡ Obligated Entity

i ≡ All Interconnected Entities

MUD_e=the difference between the R7.7 max unit limit and an entities largest unit if greater than the R7.7 limit.

C. Measures

M1. Each Obligated Entity and Balancing Authority shall maintain:

M1.1. Records of their Reserve Capacity at any point in time. These records will be updated as new Assets are added and other Assets are retired. These records will be available by for review by the Balancing Authority or Compliance Monitor with 1 business week written notice.

M1.2. Hourly records of Operating Reserve and Regulating Reserve (scheduled and actual) will be maintained by all Obligated Entities'. These will be made available in real-time to the Balancing Authority for archival and storage.

M1.3. The Compliance Monitor will review the performance of each Balancing Authority and Obligated Entity at least annually. More frequent reviews shall be performed if spin obligation compliance warrants such reviews.

D. Compliance Monitoring

1. Balancing Authorities
2. IMC-Railbelt Regional Reliability Organization

E. Non-Compliance

Level 1.

Version History

Version	Date	Action	Change Tracking