NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Meeting Summary
ACE Diversity Interchange Task Force

October 28, 2010 | 1 p.m. – 5 p.m., EDT
Followed the NERC Resources Subcommittee Meeting
PJM Interconnection L.L.C.
Philadelphia, PA 19153

The North American Electric Reliability Corporation (NERC) Resources Subcommittee (RS) sponsored ACE Diversity Interchange Task Force (ADITF) held a meeting on October 28, 2010 at the PJM Interconnection L.L.C in Philadelphia, Pennsylvania. The agenda and attendance list are attached as **Exhibit A** and **B**.

ADITF Chair Don Badley presided and a quorum was present.

ACE Diversity Interchange Task Force Appreciation for Meeting Host Ameren Corporation

The ADITF acknowledges and appreciates the hospitality that the PJM Interconnection L.L.C and specifically Bill Herbsleb and Evelyn Manion provided to the task force as it arranged and hosted the meeting.

Antitrust Compliance Guidelines

Secretary Vandervort acknowledged the NERC Antitrust Compliance Guidelines.

ADITF White Paper Comments, Issues, Request for Clarification

ADITF Chair Don Badley led the ADITF through the review and responses of the Interchange Subcommittee (IS) and Operating Reliability Subcommittee (ORS) comments, concerns and requests for clarification. The ADITF made progress going through the comments and enhancing the ADITF white paper, see **Exhibit C** and **D**. The ADITF will continue responding to comments and enhancing the white paper in a conference call on Tuesday, November 2, 2010.

Dates and Locations of Future Meetings

ADITF Conference Call Tuesday, November 2, 2010	9 a.m.–12 p.m.	Details and Agenda to be sent prior to the conference call
Future meetings or conference calls		To be scheduled as determined by the ADITF

Respectfully submitted,

Tom Vandervort

Thomas J. Vandervort
ACE Diversity Interchange Task Force Secretary

Exhibit A

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Agenda
ACE Diversity Interchange Task Force

October 28, 2010 | 1 p.m.–5 p.m., EDT

Hosted by: PJM Interconnection L.L.C.
Philadelphia Airport Marriott
1 Arrivals Rd.
Philadelphia, PA 19153
Telephone: (215) 492-9000

*Follows the NERC Resources Subcommittee Meeting

1. **Administrative**
   a. Membership and guests — Don Badley
      Attachment: ADITF Roster (**Attachment 1**)
   b. Arrangements — Tom Vandervort
   c. Approval of meeting agenda — Don Badley
   d. Procedures
      i. Parliamentary Procedures — Don Badley
         Attachment: Parliamentary Procedures (**Attachment 2**)
      ii. Antitrust Compliance Guidelines — Tom Vandervort
         Attachment: Antitrust Compliance Guidelines (**Attachment 3**)

2. **ACE Diversity Interchange Task Force White Paper – Don Badley, Mike Potishnak**
   a. Respond to ORS and IS Comments on ADITF White Paper (**Attachment 4**)
   b. Revise ADITF White Paper – Draft (**Attachment 5**)
   c. Decide if the ADITF will repost the White Paper for Industry Comments
   d. Discuss and Possibly Generate a SAR for "Supplemental Regulation" and not just for ADI (based on the principals in the White Paper)
      i. NERC Standard Authorization Request (SAR) Form (**Attachment 6**)
      ii. Link to the Standards Process Manual: http://www.nerc.com/docs/standards/sc/Standard_Processes_Manual_Approved_May_2010.pdf
   e. Present the ADITF White Paper and SAR (if generated) to the RS, IS, and ORS, for discussion, comment and concurrence

f. Present the ADITF White Paper and SAR (if generated) to the NERC Operating Committee for their acceptance and to retire the ADITF or assign new tasks

3. **Other ADITF Issues, Concerns, and Technical Discussions – Don Badley, Mike Potishnak**

4. **Future Meetings or Conference Calls ***

Date	Time	Location	Host / Contact
Future Meetings TBD			
Future Conference Calls / Webcasts TBD			

* Future IS meetings need to be held at region, utility, or volunteer facilities
CISDT = Coordinate Interchange Standard Drafting Team, NERC Project 2008-12

Exhibit B

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NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Meeting Attendance List
ACE Diversity Interchange Task Force

October 28, 2010 | 1 p.m.–5 p.m., EDT
PJM Interconnection L.L.C.
Philadelphia, PA 19153

Attendance

Name	***Attendance***	
Don Badley, ADITF Chair	Y	
Tony Nguyen	Y	
Bill Herbsleb	Y	
Jim Castle	Y	
Frank Koza	Y	
John Tolo	Y	
Larry Kezele	Y	
Tom Vandervort	Y	
Doug Hils	Y	via phone
Robert Rhodes	Y	via phone

ORS and IS Comments on ADI White Paper

1. The ADI paper discusses limits on the magnitude of ADI exchanges. ORS would like to include a technical basis for the limit.
   Response: Good suggestion but we don't know if this is possible on a continent-wide basis. We will examine the possibility.
2. Should a global limit be imposed on each BA to address stacking? For example, can a single BA join multiple ADI groups and stack the benefits of each thereby drastically reducing their regulation requirement.
   Response: We will discuss this scenario. Reserve sharing groups can be stacked, so why not ADI groups?
3. Address the size of an ADI group. In the limit an ADI group can encompass the entire Eastern Interconnect. In that case the real regulation would boil down to frequency response.
   Response: ADI is still a function of ACE, if it works locally why won't it work globally? Check CPS2 performance – do exceedances pick up at month-end, for anyone? (can Anitha give us an answer from WECC data).
4. Address if ADI can cross Interconnection boundaries such as the Eastern Interconnect and Quebec, ERCOT or WECC.
   Response: Since schedule setters take time to manipulate, we don't see this as a practical use of this process. No, both participants could be operating to different frequencies and we would violate the principle of being frequency neutral.
5. The IS had initial issues of the governance associated with who would be able to participate in an ADI Group. Specifically, the IS wanted to ensure that participating BAs needed to be Adjacent BAs. These seemed to be addressed by the Operating Principle (OP) 6.
   Response: We agree, that was our concern as well, hence, OP6.
6. The IS had initial issues with the concept of ensuring that the Netting ACE Pool equal zero. The concern was that there needed to be governance around the fact that the algebraic sum of the ACE adjustment always equals zero. These issues seemed to be addressed by the OP1.
   Response: We agree, the process has to be frequency neutral at all times.
7. OP3 requires the Resources Subcommittee to review proposed ADI process implementations against applicable Balancing Standards. The IS recommends that existing and proposed ADI processes be reviewed against a consistent set of principles, similar to those contained in the ADITF White Paper. The IS suggests such a review could be conducted through the use of a checklist. The IS also requests the ADITF formalize the Operating Principles into an official NERC reliability document to ensure the principles are appropriately memorialized.
   Response: Good comments and suggestions, we will seriously consider them as we move forward. The ADITF will recommend to the OC that the ADI white paper be used to draft a SAR on supplemental control.
8. Associated with 7, above, the IS recommends that the ADITF generate a SAR to ensure that the ADI Operating Principles are incorporated into the appropriate standard(s).
   Response: We will recommend to the NERC Operating Committee that a SAR be implemented to address the recommendations we make. The ADITF will recommend to the OC that the ADI white paper be used to draft a SAR on supplemental control.

9. The IS recommends that the ADITF consider whether or not a NERC or Regional Entity Compliance Program monitor and certify the ADI Groups. The ADI Groups structure and certification may be similar to Reserve Sharing Groups (RSGs) or Joint Registration Organizations (JROs).
   Response: Thank you for the suggestion. RSGs and JROs do not go through a certification process. We recommend that each ADI group have a central administrator that defines and monitors the ADI process.
10. The IS felt that it was clear that the net hourly accumulation by any one BA through an ADI process that modifies the ACE control equation is intentional interchange and is not inadvertent interchange. ADI participants should not include ADI accumulations in their inadvertent interchange unless all BAs within an interconnection agree to such an arrangement.
    Response: We ????. (clearly define ADI -)
11. A majority of the participants in the IS felt that when the ADI process does create intentional interchange as identified in 10, then appropriate transmission arrangements need to be in place.
    Response: There is no additional re-dispatch to accommodate ADI. Transmission arrangements expectations are the same as those made for errors in load following deviations and frequency bias support.
12. The IS requests the ADITF to define the conditions that would be considered "adverse" rather than use the term "adversely" that is found in OP4 and OP5.
    Response: Good suggestion but not easily done. The subjectivity of the term "adverse" is surely in the eye of whoever is speaking.
13. Several IS members expressed opinions that there are commercial impacts to ADI, which fall outside of the NERC reliability area of expertise.
    Response: The ADI task force is looking at reliability aspects only. However, present ADI implementations do not displace any commercial transactions.
14. The IS recommends the ADITF evaluate the definition of "Supplemental Regulation." If ADI is included into the Supplemental Regulation definition, then the definition needs to be revised, as it does not currently apply. The current definition implies a bilateral relationship between two BAs, when most (if not all) ADI implementations involve more than two BAs. The IS recommends the ADITF create a new ADI definition.
    Response: After reviewing the definition of Supplemental Regulation we recommend changing the definition as follows "A method of providing regulation service in which the Balancing Authority(ies) providing the regulation service receives a signal representing all or a portion of the other Balancing Authority's ACE". The ADITF will recommend adding a definition for ADI to the NERC Glossary of Terms in the proposed SAR.
15. The IS recommends the ADITF include a discussion on when an ADI implementation impacts a congested path or flowgate. What needs to be monitored? How is an impact detected? Who determines when to take corrective actions?
    Response: To the extent that an ACE affects transmission the BA and RC can control the adjustment of ACE. The responsibility for monitoring ADI activity belongs to the participating BAs and the RC; disabling ADI may be directed by the Reliability Coordinator.

D R A F T !
ACE Diversity Interchange White Paper
Authored By The NERC ACE Diversity Interchange Task Force
June 15, 2010
Updated August 17, 2010
Updated October 11, 2010

Background

ACE Diversity Interchange (ADI) is a process in which participating Balancing Authorities exchange information related to their raw Area Control Error values (ACE) to develop ACE adjustment values. When there is a diversity of algebraic sign among ADI participants, ADI adjustments are applied to yield final ACE values that are closer to zero, which can yield benefits to the participating Balancing Authorities as described below. ADI is considered by many to be a form of supplemental regulation, and there have been five implementations since its inception in the 1990s, of which two have been retired.

Balancing Authorities participating in ADI cite the following benefits as reasons for their participation: low cost and ease of implementation; lesser output adjustments that reduce heat rate degradation and "wear and tear"; improved compliance with NERC criterion CPS 2; and, reduced regulation requirements to achieve a similar level of compliance while having fewer generators operate out of economic merit order.

There have been differences among these ADI Implementations. ~~T~~ ~~and, consequently~~Also, there is active debate within the industry as to whether ADI is compatible with current NERC standards. In response to a March 12, 2009 letter to the NERC Operating Committee from Duke Energy expressing concerns related to ACE Diversity Interchange, the NERC Operating Committee directed the NERC Resources Subcommittee to take the lead in forming an ADI Task Force to address these concerns. The ADI Task Force also includes representation from the Interchange Subcommittee and the Operating Reliability Subcommittee as specified by the NERC Operating Committee.

Comment [A1]: Per Bob Slaton's suggestion

Comment [A2]: Bob Slaton suggested that I move this statement to be a phrase within the next statement. In his alternative wording, it would in effect say that the active debate is related solely to differences in implementations. I am not sure if that is the case, concerns, valid or otherwise, have been raised that apply to any ADI implementation.

Comment [A3]: Added in response to Carol Opatrny's input

Purpose

The purpose of this white paper is to address industry concerns related to the usage of ADI. At a higher level, these concerns have been divided into reliability, administrative, and equity concerns and are addressed below in those terms. ADI interactions with present applicable NERC standards are also addressed below. Emphasis will be placed on compliance with existing NERC standards and reliable operations ~~and compliance with existing NERC standards~~. Recommendations to address these concerns are provided. Possible areas of improvement will be noted, and an overall assessment will be provided as to whether ADI can be implemented without conflicting NERC standards or having an adverse impact on interconnection reliability.

Relevant Definitions From The NERC Glossary

Relevant definitions that exist presently in the NERC glossary are provided below for convenience. Note that a definition for ADI does not exist within the NERC glossary at this

time, and a working definition consistent with the three ADI implementations presently in existence will be provided below.

Area Control Error – The instantaneous difference between a Balancing Authority's net actual and scheduled interchange, taking into account the effects of Frequency Bias and correction for meter error.

Inadvertent Interchange Energy- The difference between the Balancing Authority's Net Actual Interchange and Net Scheduled Interchange.

Dynamic Transfer- The provision of the real-time monitoring, telemetering, computer software, hardware, communications, engineering, energy accounting (including inadvertent interchange), and administration required to electronically move all or a portion of the real energy services associated with a generator or load out of one Balancing Authority Area into another.

Dynamic Schedule - A telemetered reading or value that is updated in real-time and used as a schedule in the AGC/ACE equation and the integrated value of which is treated as a schedule for interchange accounting purposes. Dynamic Schedules are commonly used for scheduling jointly owned generation to or from another Balancing Authority Area.

Pseudo-Tie - A telemetered reading or value that is updated in real-time and used as a "virtual" tie line flow in the AGC/ACE equation but for which no physical tie or energy metering actually exists. The integrated value is used as a metered MWh value for interchange accounting purposes. Pseudo-tie relationships are commonly used to move load or jointly owned generation to or from another Balancing Authority Area.

Regulating Reserve - An amount of reserve responsive to Automatic Generation Control, which is sufficient to provide normal regulating margin.

Supplemental Regulation - A method of providing regulation service in which the Balancing Authority(ies) providing the regulation service receives a signal representing all or a portion of the other Balancing Authority's ACE.

Basic ADI Operating Concepts

In the review of the three remaining ADI implementations, the following working definition has been developed for the ADI process.

"ACE Diversity Interchange is a frequency neutral form of supplemental regulation that uses real-time, sub-minute adjustments to the initial ACE values of participating Balancing Authorities that always net to zero and become non-zero individually when at least one participating Balancing Authority's initial ACE value differs in algebraic sign from at least one other participating Balancing Authority's ACE. Participating Balancing Authorities achieve

reductions in their control and reporting ACE values via dynamic transfers of the ACE adjustments computed by an ACE Diversity Interchange algorithm."

While ACE adjustment allocation methods may differ among the ADI implementations, two key features are that the computed ACE adjustments must always have a zero sum and the computed adjustment will equal zero in the absence of diversity in algebraic sign. The latter feature distinguishes the ADI process from other forms of supplemental regulation.

ADI Implementation Mechanics

The ADI process as defined above utilizes dynamic transfers in order to achieve final ACE values of lesser magnitude within the ACE equations of the participating Balancing Authorities. While the three present ADI implementations all use a pseudo-tie, a similar result can be obtained by using a dynamic schedule instead of a pseudo-tie.

ADI processes depend on the timely exchange of relevant data, and consistent implementation of ACE adjustment values in the approximate timeframe of EMS scan rates (e.g., 4 seconds). While the information exchange processes used for ADI have very high availability, Balancing Authorities participating in ADI have backup plans to address failures in data exchange communications.

The ADI processes that exist presently allow for individual Balancing Authorities to enable or disable their participation in real-time for local or interconnected reliability concerns, and allow for a global enabling or disabling of ADI when appropriate for global reliability concerns. .

Balancing Authorities participating in ADI communicate with their Transmission Operators and Reliability Coordinators, often with a consistent set of data being exchanged, to address congestion management problems that might be affected adversely by the continued use of ADI.

Present ADI implementations all require that the participating Balancing Authorities are electrically contiguous.

Balancing Authorities presently utilizing ADI do not use transmission reservations for inadvertent power flows that are allowed to persist at times during the ADI process. The common premise is that ADI will use only unallocated transmission after energy markets of higher priority have used their transmission allocations. The ADI process will be disabled in the event that normal or contingent operations newly require the use of transmission possibly being used for ADI-related power flows. Most often, the inadvertent power flows do not persist for extended periods and would net reasonably close to zero over longer intervals. The present ADI implementations all have limits on the magnitude of ADI exchanges, and are overseen by subject matter experts so that adverse impacts on transmission ~~are not a common~~have a very low probability of occurrence.

In theory, the resultant ACE adjustment values should net to zero in the longer term if ACE values are more or less random, normally distributed, and having a mean of zero. Deviations from this basic premise could impact inadvertent energy accumulations. Present ADI implementations all track the impact that the ADI process is having on hourly inadvertent and its

Comment [A4]: New section created per Carol Opatrny

Comment [A5]: Bob Slaton asks if we need to define appropriate. In the "OP" statements below, I believe we flesh out when it is appropriate. Does that work for everyone, or do we need a change?

cumulative impact in the longer term (e.g., monthly). Differing methods are in use among the present ADI implementations to address various aspects of managing inadvertent.

~~Balancing Authorities participating in ADI cite the following benefits as reasons for their participation: lesser output adjustments that reduce heat rate degradation and "wear and tear"; improved compliance with NERC criterion CPS 2; and, reduced regulation requirements to achieve a similar level of compliance while having fewer generators operate out of economic merit order.~~

Industry Concerns Expressed Related To ADI

The following reliability concerns have been expressed about present and future implementations of ADI, and other forms of supplemental regulation:

R1 – Can system frequency be affected adversely ~~-~~by ADI?
R2 – Does ADI create congestion management problems?
R3 – Does the presence of ADI create system modeling difficulties?
R4 – Does ADI detract from the effectiveness of CPS 2 in limiting unscheduled net flows emanating from participating Balancing Authorities?
R5 – Will ADI hamper the development of future transmission-based ACE limits?
R6 – Are there sufficient controls in place such that Balancing Authorities, Reliability Coordinators, and Transmission Operators can observe any adverse impacts being caused by ADI?
R7 – Will ADI obscure DCS measurements such that contingencies will in part be exported without proper attendant monitoring?
R8 – Will inconsistencies in ADI implementations hamper the ability of Reliability Coordinators to manage their interconnections?

The following administrative concerns have been expressed:

A1 – Does ADI cause any inherent conflicts with the assignment of functions among ~~-~~entities described in the industry's reliability functional model?
A2 – Does ADI complicate computations related to transfer capability?
A3 – Are transmission service requirements addressed adequately in the presence of ADI?
A4 – How should transmission reservations be addressed in the presence of ADI?
A5 – Are inadvertent accounts being managed properly in the presence of ADI?

The following equity concerns have been expressed:

E1 – Does ADI give unfair advantages to its participants related to CPS 2?
E2- Does ADI interfere with energy or regulation markets?
E3 – Are there equity concerns related to inadvertent?
E4 – Are there inequities within the ADI allocation methodologies related to the size of participating Balancing Authorities?

Discussion Of Reliability Concerns And Associated Recommendations

The NERC ADI Task Force has reviewed the reliability concerns stated above, and discussions for each follow below. Operating principles to allay these concerns are provided below as well. The operating principles stated below are written with a "shall" sentence structure, in part to facilitate possible usage as a requirement in a future standard document.

Concerns related to system frequency (R1) were discussed extensively. As all present ADI implementations assure that computed ACE adjustments sum to zero, and all have backup plans to maintain a zero sum when communications failures arise, the goal of frequency neutrality for ADI processes is being achieved. Possible second order affects related to some ADI participants' AGC systems responding faster than others were considered as well. As the sign of frequency and raw ACE values are in a constant state of flux, it appears that the faster responding Balancing Authorities are equally likely to help or hurt frequency. Also, given that the ADI participants have incorporated ADI limits with the relatively small magnitudes of ACE adjustments in use (largest limit = 50 MW), it seems clear that instances of adverse impact on frequency would be infinitesimal. The following operating principles will assist in assuring that system frequency is not affected adversely.

OP1 - Allowing for small variations due to data exchange latency times and possibly different scan rates, the algebraic sum of the ACE adjustment terms used in participating Balancing Authorities' ACE equations shall equal zero so that frequency is not affected adversely. {R1, R8}

OP2 - Balancing Authorities that participate in ADI are dependent on successful exchange of ACE-related data. Balancing Authorities participating in ADI shall utilize a consistent method of validating the integrity of its data exchange process continuously, and implement a consistent backup plan in the event of the loss of communications such that the ACE ~~correction~~adjustment terms net to zero and do not affect frequency adversely. Detection of an invalid data exchange due to the loss of communications and deployment of the backup plan shall occur within 1 minute of the communication failure. {R1, R8}

OP3 - All new implementations of ADI shall be reviewed and approved by the NERC Resources Subcommittee ~~who shall~~in order to verify that the intent of applicable Balancing Standards are not compromised by the implementation. {R1, R4, R8, E1}

The NERC ADI Task Force discussed to possibility of ADI processes affecting transmission systems adversely and causing congestion management problems (R2). An important concept is ~~that unscheduled~~actual power flows are the norm in interconnected operations, as it is rare to have frequency exactly on schedule and Balancing Authorities' actual power flows exactly match their scheduled values, irrespective of ADI processes. The potential for ADI's unscheduled power flows adversely impacting transmission outcomes needs to be considered prior to and during actual operations. Present ADI implementations have developed their own monitoring and tracking methods to address congestion, and ADI is commonly disabled on an anticipatory basis before system conditions evolve in a direction that would impact congestion. The following operating principles will assist in assuring that ADI does not affect transmission adversely and cause congestion management problems.

OP4 - Balancing Authorities participating in ADI must continuously assure that ~~its~~ their supplemental regulation is not affecting the transmission system of any member of its interconnection adversely. {R2, R8}

Comment [A6]: Carol recommends cross referencing the Ops with the R, A, and E concerns listed above

Comment [A7]: Bob Slaton questions whether the RS can turn this around in a timely manner. Given quarterly meetings, probably yes. But should we refer to a potential successor organization, or should we let that slide until a more formal standard is drafted, if that does occur?

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Comment [D8]: We do not have unscheduled power flows in normal operations. We do, however, have scheduled power flow over paths of least resistance. ADI will become the only "unscheduled" power in the network.

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OP5 - Balancing Authorities participating in ADI must develop an appropriate methodology to continuously verify that supplemental regulation is not affecting the transmission system of any member of its interconnection adversely. {R2, R8}

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OP6 - Balancing Authorities participating in ADI shall either be adjacent Balancing Authorities, or receive permission from intermediary Balancing Authorities and other Balancing Authorities that could plausibly be affected adversely by the exchange of supplemental regulation. Intermediary and other affected Balancing Authorities shall be updated continuously with the present ADI values being exchanged so that they can monitor any potentially adverse reliability impacts. {R2, R6, R8}

OP7 - The implementation of ADI shall allow participating Balancing Authorities to change their participation status in real-time, and the ADI algorithm shall respond as soon as possible to adjust supplementary regulation assignments in recognition of the status changes. {R2, R6, R8}

OP8 - To allow for timely reliability impact assessments by participating, intermediary, and materially affected Balancing Authorities, Transmission Operators, and ~~r~~Reliability Coordinators, near real-time observability of participation and communication status, raw ACE, ACE adjustment values, and final ACE values shall be available to these entities. The ADI participants shall share the ADI results with the appropriate Reliability Coordinators who can also assess the impacts. {R2, R6, R8}

With respect to OP5 above, there are some implications that are not obvious. Congestion management tools (such as the Interchange Distribution Calculator (IDC) in the Eastern Interconnection or Unscheduled Flow Mitigation Tool (webSAS) in the Western Interconnection) may be inadequate for modeling supplemental regulation, as its expected value in any longer term sense typically equals zero. Note that modeling the most positive and most negative values possible within an ADI process in congestion management applications may contaminate the data base congestion relief efforts (e.g., TLR), as it may falsely assume relief will occur when none is forthcoming if the current value of the supplementary regulation being provided is not at a boundary value. ADI assignments commonly vary at a sub-minute periodicity while congestion management tools are typically using an hourly resolution.

The existence of ADI can present some modeling challenges (R3). Custom studies can be performed in multiple passes using maximum positive and negative ACE adjustments to perform sensitivity analyses. However, the ADI operational experience base thus far indicates that existing methods to address transmission issues and congestion management have been adequate, and the operating principles stated previously should minimize the need for extensive modeling.

The impact of ADI on CPS 2 compliance (R4) has been reviewed. Participants in existing ADI applications have performed simulations that indicate that they would still be CPS 2 compliant if ADI was not in use. Additional research is needed in this area. However, OP3 above related to review by the NERC Resources Subcommittee should minimize the potential for abuse.

R5 above questions whether the existence of ADI will cause a conflict in the development of transmission-based ACE limits. As the ultimate goal of a transmission based ACE limit is to successfully bound actual net interchange, which is only one component of the ACE equation, other influences such as frequency support and inadvertent payback already need consideration. ADI effects will also need to be considered, but the NERC ADI Task Force does not believe that this is sufficient "just cause" to eliminate ADI processes from its interconnections.

R6 above raises the question of whether Balancing Authorities, Transmission Operators, and Reliability Coordinators have sufficient real-time information available to assure that ADI does not affect reliability adversely. Present ADI implementations provide a standard real-time data set via data links to interested entities including the Reliability Coordinators that can be used to perform this task. OP6 and OP8 adequately address this concern, and OP7 allows for rapid disabling of ADI should the need arise.

The potential for ADI adjustments obscuring DCS compliance (R7) was discussed. When all ADI participants are also participating in a Reserve Sharing Group DCS group recovery, ADI assignments will net out and compliance evaluations will be correct. In instances where a Balancing Authority is providing supplemental regulation to the contingent Balancing Authority but is not providing contingency reserve, it may be appropriate to make ACE adjustments for ADI. Three options can be used to circumvent this problem. (1) ADI can be turned off during a DCS event, as one ADI process does presently. (2) Simply subtract out all supplementary regulation assigned by the ADI process assuming that it was not delivered. (3) Assume that any negative ACE values found for the Balancing Authority providing regulation to the contingent Balancing Authority represent a failure to provide the supplemental regulation, and so the contingent Balancing Authority's ACE would be reduced by the lesser magnitude of the assigned supplementary regulation and the ACE value of the provider of supplemental regulation via the ADI process. With some additional complexity, the ADI impact can be managed successfully. The following operating principle should address DCS concerns related to ADI processes.

OP9 - When (a) a Balancing Authority is providing, receiving or exchanging supplemental regulation and it experiences a contingency that qualifies as a NERC DCS event, and, (b) other Balancing Authorities participating in supplemental regulation do not jointly activate contingency reserve for the resource loss, then corrections for supplementary regulation to the contingent Balancing Authority's ACE are needed to compute DCS compliance. The contingent Balancing Authority may choose to adjust its reporting ACE by either simply subtracting the supplementary regulation received from the its reporting ACE, or reduce it for any negative ACE values of those Balancing Authorities providing supplementary regulation to it up to the magnitude of the supplementary regulation assignment. With these corrections, the Balancing Authority does not need to be considered as a de facto member of the Reserve Sharing Group, and they would be compliant with BAL-002. {R7, R8}

Comment [A9]: This sentence was added in response to a suggestion by Bob Slaton.

R8 questions whether differences among the ADI implementations can hamper the ability to properly monitor interconnected operations. Present ADI implementations are consistent in that

they are designed to be frequency neutral, have backup plans for communication failures, and continuously address transmission concerns and observability. Their differences are regionally specific and are found mainly in inadvertent accounting practices and in the ADI allocation strategies used. These differences do not affect reliability, and the functional consistency is in place to promote reliable operations. Operating principles 1 through 9 above sufficiently support the proper monitoring of interconnected operations.

Discussion Of Administrative Concerns And Associated Recommendations

The NERC ADI Task Force has reviewed the administrative concerns stated above, and discussions for each follow below.

A1 above questions whether ADI processes in some way conflict with the reliability functional model. As stated earlier, this is a form of supplementary control and supplementary control is permitted within NERC's control processes. ~~To be provided.~~

Comment [A10]: Not yet provided

The transfer limit calculations (A2) are unaffected by ADI, as the ADI power flows have lowest priority and will be eliminated to support all other energy and reserve products. Also, note that transfer limit calculations are not typically sensitive to inadvertent power flows given the typical operational bandwidth in flows experienced when regulation is performed to meet CPS 1 and CPS 2.

The need for transmission service and reservations were discussed in A3 and A4 above. ADI-related power flows have an expected value equal to 0 and are not very predictable prospectively. Again note that ADI related power flows are merely inadvertent power flows emanating from "less than perfect" regulation processes that are allowed to persist. Those power flows do not require transmission service or reservations, just as normal inadvertent power flows that result from regulation do not require transmission service or reservations.

A5 above addresses differences in inadvertent accounting practices. A root source of these differences could be traced to the definition of a pseudo-tie. Historically, pseudo-ties were first used to re-assign operating responsibility of the provision of energy for load and/or generation from one Balancing Authority to another. As load and/or generation being re-assigned occurs at an actual specific physical location with either metering to uniquely measure energy or computations to determine the energy by a rule set, those values inherently need to be included in the actual net interchange portion of inadvertent calculations. (See the second sentence of the pseudo-tie definition provided above.) However, when a pseudo-tie is used for the provision of supplementary regulation, there is no physical location and separate meter for supplementary regulation. Referring to the definition for inadvertent interchange energy above, the meters for a Balancing Authority participating in ADI fully account for actual net interchange by excluding the supplementary regulation value. Its inclusion would result in double accounting as part of the actual net interchange. This is the rationale for NPCC's inaction on adjusting ADI participants' on and off peak monthly inadvertent accumulations, and any ADI-related inadvertent is blended in with that caused by off-schedule operation, frequency support, meter error, and inadvertent payback. WECC chooses to adjust their primary inadvertent accounts for ADI. While this is inconsistent with NPCC practices, if all parties involved in ADI agree to

Comment [D11]: I do not believe CPS values can be adjusted without showing the intended interchange component of ADI. Therefore, I feel this should be deleted.

make retroactive corrections that are equal in magnitude and opposite in sign based on equity considerations, other interconnection members not participating in ADI are completely unaffected by this after-the-fact trading of inadvertent energy. So while there are administrative differences, ultimately there are no violations of NERC standards. In either instance, the inadvertent accounts of non-participants of ADI are unaffected.

Comment [D12]: I don't believe we should show this either. We are after consistency.

Discussion Of Equity Concerns And Associated Recommendations

While the review of CPS 2 compliance for existing ADI implementations did not point to any abusive practices (R4 discussion above), more research is needed with respect to equitable applications of CPS 2 limits (E1).

As the task force's primary concern was with reliability and compliance issues, ADI's interference with energy and regulation markets (E2) received a cursory review. Given the current practice of disabling ADI if new energy market transactions arise, ADI does not impact energy markets directly. When ADI results in the use of lesser regulation, it frees up additional resources to more fully participate in energy markets as a second order effect, as regulating limits for generators are commonly more restrictive than their operating limits. ADI can lessen the need for regulation, which can impact the providers of regulation in a market environment.

Equitable treatment as it relates to inadvertent energy was discussed (E3). Inadvertent energy accounts of Balancing Authorities not participating in ADI are unaffected. ADI participants can opt out of an ADI process if they are dissatisfied with inadvertent created by the process. ADI participants do have a hand in developing the ADI agreement that would allow for after-the-fact balanced and mutually agreed to adjustments to inadvertent accounts.

Inequities in the ADI allocation process was discussed in E4 above. ADI processes have voluntary participation, and a participant can negotiate assignment methodologies with other participants in the design of the ADI process. Balancing Authorities that are not participating in an ADI process are not affected by the details of supplementary regulation assignments.

Impact Of Supplementary Regulation On Frequency Response Measurement

Comment [A13]: I added this based on something that I figured out while conducting the "Frequency Response Standard metric Olympics"

Present methods for computing frequency response used in annual frequency bias calculations utilize the measured net actual interchange for a Balancing Authority. If supplemental regulation is being achieved through the use of a pseudo-tie, then an actual net interchange value that includes the supplemental regulation will offset the actual power leaving the Balancing Authority Area boundaries, thereby potentially skewing the measured frequency response. Therefore, Balancing Authorities should remove supplementary regulation effects from the actual net interchange value used for measuring frequency response.

Comment [D14]: I have a serious problem with the term supplemental regulation. I could reluctantly accept ADI in its place but that is as far as I can go.

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Comment [A15]: Should this become op 10 and references below for obeying 1 through 9 be expanded to 1 through 10?

Summary Of Recommendations For Additional Efforts

- More research is needed for equity issues related to CPS 2 limits
- ADI needs to be considered when developing transmission-based limits for ACE in the work being performed by the Reliability-Based Control Standard Drafting Team
- When supplemental regulation is being received by a contingent Balancing Authority and the provider(s) of supplemental regulation are not activating contingency reserve with and for the contingent Balancing Authority, the ACE of the contingent Balancing Authority may need modification to better evaluate DCS recoveries

Conclusions

- Existing implementations of ADI are operating reliably.
- Existing ADI implementations do not conflict with NERC standards BAL-001, BAL-002, or BAL-005 R6, R9, and R10.
- Operating principles 1 through 9 above should assure that other prospective implementations of ADI will also be reliable.
- Implementation differences are acceptable provided that operating principles 1 through 9 are met.
- With the exception of the requirement for sign diversity, all requirements and operating principles noted for ADI apply equally to all other forms of supplemental regulation, and any resultant standards to be drafted should apply to all forms of supplemental regulation, as sign diversity is simply a requirement internal to the ADI algorithms.
- Frequency response measurements need to be adjusted to compensate for the exchange of supplementary regulation when pseudo-ties are used, because the supplementary regulation does not represent the physical flow of power into or out of a Balancing Authority Area.
- ~~A~~ Reliability Coordinators ~~need~~s to have the ability to monitor ADI activity to assure systems a not being adversely affected.
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Comment [A16]: Per carol Opatrny