

Area Control Error (ACE) Equation Special Cases

Purpose:

It is the obligation of each Balancing Authority to manage its Area Control Error in accordance with NERC reliability standards. This Standard provides additional requirements of Jointly Owned Units, Supplemental Regulation Service and Load or Generation Transfer by Telemetry for the ACE equation.

Applicability:

Balancing Authorities

005-0

Definitions:

Area Control Error (ACE) - The instantaneous difference between net actual and scheduled interchange, taking into account the effects of frequency bias including a correction for meter error.

Balancing Authority (BA) – The entity responsible for integrating resource plans ahead of time, for maintaining load-interchange-generation balance within a Balancing Authority Area, and for supporting Interconnection frequency in real time.

Balancing Authority Area - An electrical system bounded by interconnection (tie-line) metering and telemetry, where the Balancing Authority controls (either directly or by contract) generation to maintain its Interchange Schedule with other Balancing Authority Areas and contributes to frequency regulation of the Interconnection.

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

Interchange Schedule - The planned energy exchange between two adjacent Balancing Authorities.

Interconnection – Any one of the three major electric system networks in North America: Eastern, Western, and ERCOT.

Jointly Owned Units (JOU[s]) - This term refers to a unit in which two or more entities share ownership.

Net Actual Interchange (NI_a) - The algebraic sum of all metered interchange over all interconnections between two physically adjacent Balancing Authority Areas.

Net Interchange Schedule (NI_S) - The algebraic sum of all Interchange Schedules with each adjacent Balancing Authority Area.

Pseudo-Tie - A telemetered reading or value that is updated in real time and used as a tie line flow in the 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.

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

Business Practices Requirements:

005-1 Jointly Owned Units

Jointly Owned Units should be accounted for properly by all owners in the Area Control Error Equation.

005-1.1 ACE equation for each Balancing Authority should reflect its ownership of the JOUs both internal and external to its Balancing Authority area.

005-1.2 If fixed Schedules are not used, JOUs may be handled as a Pseudo-Tie or a Dynamic Schedule.

005-1.2.1 Pseudo-Ties

If the JOUs are considered Pseudo-Ties then the NI_S remains Net Interchange Schedule and the NI_A term should become NI_a – I_{AJOUE} – I_{AJOUI} where:

NI_a = Net Actual Interchange.

I_{AJOUE} = Pseudo-Tie for JOU external to a Balancing Authority.

I_{AJOUE} is assumed negative for external generation coming into the Balancing Authority as a Pseudo-Tie.

I_{AJOUI} = Pseudo-Tie for JOU internal to a Balancing Authority.

Incoming power is negative.
Outgoing power is positive.

005-1.2.2 Dynamic Schedule

If the JOU is reflected as a Dynamic Schedule, the NI_a remains actual tie flows and the NI_s should become $NI_s + I_{SJOUE} + I_{SJOUi}$.

NI_s = Net Interchange Schedule.

I_{SJOUE} = Dynamic Schedule for the JOU external to a Balancing Authority Area.

I_{SJOUE} is assumed negative for external generation coming into the Balancing Authority as a Dynamic Schedule.

I_{SJOUi} = Dynamic Schedule for the JOU internal to a Balancing Authority.

Incoming power is negative.
Outgoing power is positive.

Appendix A of this Business Practice Standard illustrates how JOUs can be accounted for in the ACE equation either as a Pseudo-Tie or as a Dynamic Schedule.

005-2 Supplemental Regulation Service

Supplemental Regulation Service is required when one Balancing Authority takes over all or part of the regulation requirements of another Balancing Authority without incorporating its ties and schedules. In this case, both Balancing Authorities shall handle this in a consistent manner as a Dynamic Schedule

005-2.1 Both Balancing Authorities shall add another component, I_{SC} (term for Supplemental Regulation Service Component) to both Balancing Authorities' ACE with the proper sign convention.

005-2.1.1 Assume Balancing Authority X is purchasing regulation service from Balancing Authority Y.

005-2.1.1.1 For Balancing Authority X, I_{SC} shall be subtracted from Balancing Authority X's ACE for over-generation and added for under-generation.

005-2.1.1.2 For Balancing Authority Y, I_{SC} shall be added to Balancing Authority Y's ACE for X's over-generation and subtracted for X's under-generation

005-3 Load or Generation Transfer By Telemetry

Dynamic scheduling may also be used for telemetered transfer of load or generation from one Balancing Authority to another.

005-3.1 If dynamic scheduling is used to transfer load or generation by telemetry, both Balancing Authorities shall modify their ACE equation as applicable.

005-3.1.1 To transfer load, the Balancing Authority giving up the transferred load shall add the load I_{SL} (term for transferred load) to its ACE equation.

005-3.1.2 The Balancing Authority accepting the load shall subtract I_{SL} the transferred load from its ACE equation.

005-3.1.3 For generation, the Balancing Authority giving up generation shall subtract I_{SG} (term for transferred generation) and the Balancing Authority accepting the generation shall add I_{SG} to its ACE equation.

005-A Appendix A

Examples of Accounting of Jointly Owned Units as Pseudo-Tie or Dynamic Schedule

The following examples illustrate the methodology of accounting JOUs as Pseudo-Tie or Dynamic Schedule.

Balancing Authority X and Balancing Authority Y each have a unit in their Balancing Authority Area jointly owned by both Balancing Authorities. Unit 1 is in Balancing Authority X and unit 2 is in Balancing Authority Y. The ACE equation for Balancing Authority X should reflect its ownership of both units. Two components are required: one to reflect X's ownership in unit 2 and one to reflect Y's ownership of unit 1. Balancing Authority Y's ACE equation should likewise have two components, one for its ownership in unit 1 and one for X's ownership of unit 2.

Assume Unit 1 in Balancing Authority X is generating 400 MW.
 100 MW owned by X
 300 MW owned by Y

Assume Unit 2 in Balancing Authority Y is generating 300 MW.
 50 MW owned by X
 250 MW owned by Y

Pseudo-Tie

Representing the units as a Pseudo-Tie the equations become:

$$\text{For Balancing Authority X: } NI_A = NI_a - (-50) - 300$$

$$\text{For Balancing Authority Y: } NI_A = NI_a - (-300) - 50$$

Dynamic Schedule

Representing the unit as a Dynamic Schedule the equations become:

$$\text{For Balancing Authority X: } NI_S = NI_s - 50 + 300$$

$$\text{For Balancing Authority Y: } NI_S = NI_s - 300 + 50$$