NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Meeting Minutes
ACE Diversity Interchange Task Force

April 29, 2010
Tucson Electric Co. Office
Tucson, Arizona

A meeting of the Resources Subcommittee, ACE Diversity Interchange Task Force (ADITF) was held on April 29, 2010 at the Ameren Corporation Office in St. Louis, Missouri. The agenda, and attendance list are attached as **Exhibits A** and **B**, respectively. There are no individual statements or minority opinions.

ACE Diversity Interchange Task Force Chair Don Badley presided and a quorum was present.

ACE Diversity Interchange Task Force Appreciation for Meeting Host Ameren Corporation

The ACE Diversity Interchange Task Force acknowledges and appreciates the hospitality that the Ameren Corporation and specifically Gerry Beckerle and Crystal Ward provided to the subcommittee as it hosted the ADITF meeting at their facility.

Antitrust Compliance Guidelines

Secretary Vandervort acknowledged the NERC Antitrust Compliance Guidelines.

ADITF Welcomes New Members

The ADITF Chair Don Badley added Carol Opatrny and Tony Nguyen to the task force. The ADITF welcomes Carol and Tony to the task force.

January 29–30, 2010 ADITF Meeting Summary

The ADITF approved the January 27–28, 2010 ADITF meeting summary.

ACE Diversity Interchange Definition

The ADITF reviewed the "ACE Diversity Interchange" definition that the task force defined during the January, 2010 meeting. The task force did not change or revise the definition, which is as follows:

> ACE Diversity Interchange (ADI) is a 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 corrections computed by ACE Diversity Interchange algorithm.

Examples of ADI
Doug Hils made a presentation on examples of ADI, see **Exhibit D**.

Reliability Issues Related to Supplemental Regulation

Mike Potishnak made a presentation on the Reliability Issues Related to Supplemental Regulation. Due to the sensitive nature of the data, the presentation will not be included in the meeting minutes.

ACE Diversity Interchange Discussion
The ADITF had a discussion on the many perceived advantages and disadvantages of ADI. The composition of the ADITF has a very diverse stance of the functional aspects of ADI. As the white paper is written, the various issues and concerns will be discussed, vetted, and enhanced by ADITF first, then by the RS, ORS, and the IS, then finally by the NERC Operating Committee.

There are ADITF members that suggest that an entity (e.g., ACE Sharing Group or a similar name) that addresses ADI should be formed to address implementation, accounting, summarizing, and reporting. This sharing group would be similar to reserve sharing groups for disturbances.

There are ADITF members that suggest that a SAR will be necessary to incorporate ADI into the NERC reliability standards to establish performance control requirements.

ACE Diversity Interchange White Paper Outline
Chair Badley led the ADITF through the white paper outline. ADITF members volunteered to write various sections of the white paper, see **Exhibit C**.

Mr. Badley requested the ADITF write and return their outline assignments to him as soon as possible, but no later than by June 7, 2010.

Dates and Locations of Future Meetings

Additional meetings or conference calls may be scheduled as necessary for ADITF business-related purposes.

Monday, June 14, 2010	8 a.m. – 5 p.m.	Vancouver, BC, Canada Host: British Columbia Transmission Company * Coordinator: Tony Nguyen (note the NERC OC meets on June 15–16, 2010 in Vancouver, BC)

* Future ADITF meetings will be hosted at ADITF member, Region, utility, or volunteer facilities.

Respectfully submitted,

Tom Vandervort

Thomas J. Vandervort
Resources Subcommittee Secretary

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Antitrust Compliance Guidelines

I. General

It is NERC's policy and practice to obey the antitrust laws and to avoid all conduct that unreasonably restrains competition. This policy requires the avoidance of any conduct that violates, or that might appear to violate, the antitrust laws. Among other things, the antitrust laws forbid any agreement between or among competitors regarding prices, availability of service, product design, terms of sale, division of markets, allocation of customers or any other activity that unreasonably restrains competition.

It is the responsibility of every NERC participant and employee who may in any way affect NERC's compliance with the antitrust laws to carry out this commitment.

Antitrust laws are complex and subject to court interpretation that can vary over time and from one court to another. The purpose of these guidelines is to alert NERC participants and employees to potential antitrust problems and to set forth policies to be followed with respect to activities that may involve antitrust considerations. In some instances, the NERC policy contained in these guidelines is stricter than the applicable antitrust laws. Any NERC participant or employee who is uncertain about the legal ramifications of a particular course of conduct or who has doubts or concerns about whether NERC's antitrust compliance policy is implicated in any situation should consult NERC's General Counsel immediately.

II. Prohibited Activities

Participants in NERC activities (including those of its committees and subgroups) should refrain from the following when acting in their capacity as participants in NERC activities (e.g., at NERC meetings, conference calls and in informal discussions):

- Discussions involving pricing information, especially margin (profit) and internal cost information and participants' expectations as to their future prices or internal costs.
- Discussions of a participant's marketing strategies.
- Discussions regarding how customers and geographical areas are to be divided among competitors.

- Discussions concerning the exclusion of competitors from markets.
- Discussions concerning boycotting or group refusals to deal with competitors, vendors or suppliers.
- Any other matters that do not clearly fall within these guidelines should be reviewed with NERC's General Counsel before being discussed.

III. Activities That Are Permitted

From time to time decisions or actions of NERC (including those of its committees and subgroups) may have a negative impact on particular entities and thus in that sense adversely impact competition. Decisions and actions by NERC (including its committees and subgroups) should only be undertaken for the purpose of promoting and maintaining the reliability and adequacy of the bulk power system. If you do not have a legitimate purpose consistent with this objective for discussing a matter, please refrain from discussing the matter during NERC meetings and in other NERC-related communications.

You should also ensure that NERC procedures, including those set forth in NERC's Certificate of Incorporation, Bylaws, and Rules of Procedure are followed in conducting NERC business.

In addition, all discussions in NERC meetings and other NERC-related communications should be within the scope of the mandate for or assignment to the particular NERC committee or subgroup, as well as within the scope of the published agenda for the meeting.

No decisions should be made nor any actions taken in NERC activities for the purpose of giving an industry participant or group of participants a competitive advantage over other participants. In particular, decisions with respect to setting, revising, or assessing compliance with NERC reliability standards should not be influenced by anti-competitive motivations.

Subject to the foregoing restrictions, participants in NERC activities may discuss:

- Reliability matters relating to the bulk power system, including operation and planning matters such as establishing or revising reliability standards, special operating procedures, operating transfer capabilities, and plans for new facilities.
- Matters relating to the impact of reliability standards for the bulk power system on electricity markets, and the impact of electricity market operations on the reliability of the bulk power system.
- Proposed filings or other communications with state or federal regulatory authorities or other governmental entities.
- Matters relating to the internal governance, management and operation of NERC, such as nominations for vacant committee positions, budgeting and assessments, and employment matters; and procedural matters such as planning and scheduling meetings.

Exhibit A

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Agenda - Revised
ACE Diversity Interchange Task Force

April 29, 2010 | 9:30 – 5 p.m., CDT
April 30, 2010 | 8:00 – noon, CDT*
Ameren General Office Building
1901 Chouteau Avenue
St. Louis, Missouri 63103
* *Meeting schedule dependent on progress made on April 29*

Purpose: The ACE Diversity Interchange Task Force (ADITF) will coordinate efforts during this meeting to address and complete its Charter.

Agenda:

1. Administrative – Don Badley
   a. Introductions of Membership and Guests
   b. Arrangements
   c. Approval of Meeting Agenda
   d. Attachment – Charter
   e. Attachment – Duke Energy Letter to NERC OC Chair Regarding the Implementation Requirements for ADI, March 12, 2009
2. Approve January 28–29, 2010 ADITF Meeting Summary
3. ACE Diversity Interchange (ADI) – the definition
4. Presentations / Discussion / Proposals
   a. Examples of ADI Operational Issues – Doug Hils
   b. Reliability Issues Related to Supplemental Regulation – Mike Potishnak
5. White Paper Outline – discussion and assignments (Attachment)
6. Review of Items to Consider Regarding ADI – Compatibility to Standards
   a. Means of Interchange
   b. Transmission Usage
      i. Flows

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ii. Modeling

iii. Tagging

c. L_{10} – does one become larger than two?

d. CPS performance

e. DCS performance

7. Next Meeting

Exhibit B

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Attendance
ACE Diversity Interchange Task Force

April 29, 2010 | 8:00 – 5 p.m.
Ameren General Office Building
St. Louis, Missouri 63103

Attendance:

Name	Attendance
Doug Hils	Y
Bill Herbsleb	Y
John Tolo	Y
Bob Staton	Y
Tom Vandervort	Y
Tony Nguyen	Y
Mike Oatts	Y

Participation via Phone:

Don Badley, Chair	Y
Jim Castle	Y
Don Lacen	Y
Bob Harshbarger	Y
Robert Blohm	Y
Mike Potishnak	Y
Carol Opatrny	Y
Sheri Brown	Y

Exhibit C

ADI White Paper Outline

BACKGROUND

Purpose of White Paper **John Tolo**

Definitions (from NERC Glossary of Terms, ADI definition, etc) **John Tolo**

- Area Control Error
- ACE Inadvertent
- Inadvertent Interchange
  - Primary Inadvertent Interchange
  - Secondary Inadvertent Interchange
- Dynamic Transfer
  - Dynamic Schedule
  - Pseudo-Tie
- ACE Diversity Interchange (ADI)
- Regulating Reserve

Starting Point
End Point

ADI PRACTICE AND ATTRIBUTES

PROS/CONS

Pros **?** – *Volunteer to write*

- Performance (improvements) - CPS1, CPS2:
- Unit Movement (Reduction) higher Efficiencies

Cons **Doug Hills**

OTHER ISSUES

Tariff Issues/Legal Issues: **Doug Hils**

Equipment/Infrastructure Requirements **Carol Opatrny, Tony Nguyen**

Impact Input/Export Capacity (Is ADI going to affect transmission?) **Mike Potishnak**

Equity Issues **?** – *Volunteer to write*

Tracking **Mike Potishnak, Jim Castle, Carol Opatrny**

Monitoring **Mike Potishnak, Jim Castle, Carol Opatrny**

Interactions with market **Bob Staton, Steve Bruening, David Lemmons**

Complexity of issues **Carol Opatrny**

Transmission Reservation vs. No Transmission Reservation **Shari Brown**

FERC view **?** – *Volunteer to write*

Merchant Issues **Bob Staton**

Transmission **Doug Hils**

Tagging (should ADI be tagged as Pseudo-Tie or Dynamic Schedule) **Doug Hils**

Existing Markets (conflicts or restrictions) **?** – *Volunteer to write*

Settlement **?** – *Volunteer to write*

- Pros: ? – *Volunteer to write*
- Cons: ? – *Volunteer to write*

ANALYSES

Technical Discussion **?** – *Volunteer to write*

Necessary Attributes **?** – *Volunteer to write*

Constrained Paths **Carol Opatrny**

Equal Benefits **?** – *Volunteer to write*

Implementation **?** – *Volunteer to write*

Additional Consideration **?** – *Volunteer to write*

Affects of ADI on Reliability **?** – *Volunteer to write*

CONCLUSION

SUMMARY

PARKING LOT ISSUES:

- How does ADI affect frequency response
- Compare the White Paper to the Doug's Duke Energy ADI Concerns Letter

Exhibit D

ACE Diversity Interchange (ADI) Examples for Discussion Purposes Only

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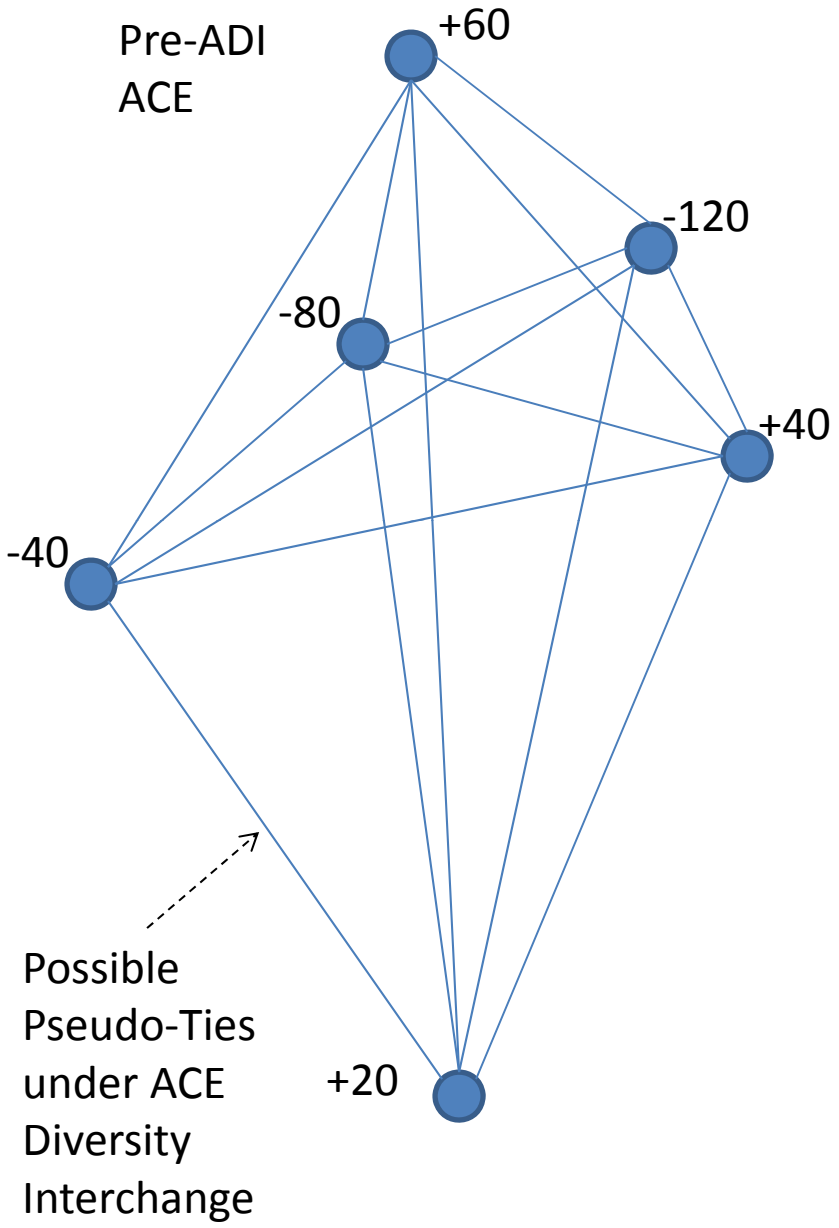


In this set of examples, we have a simple ADI scenario of six BAs with the following Pre-ADI ACE, Frequency Bias and CPS2 L_{10} :

```
BA 1: +60, -37.9 MW/0.1Hz, 46.72 MW
BA 2: -80,  -113 MW/0.1Hz, 80.66 MW
BA 3:-120, -44.9 MW/0.1Hz, 50.85 MW
BA 4: -40,   -11 MW/0.1Hz, 25.17 MW
BA 5: +40,   -11 MW/0.1Hz, 25.17 MW
BA 6: +20,    -1 MW/0.1Hz,  7.59 MW
```

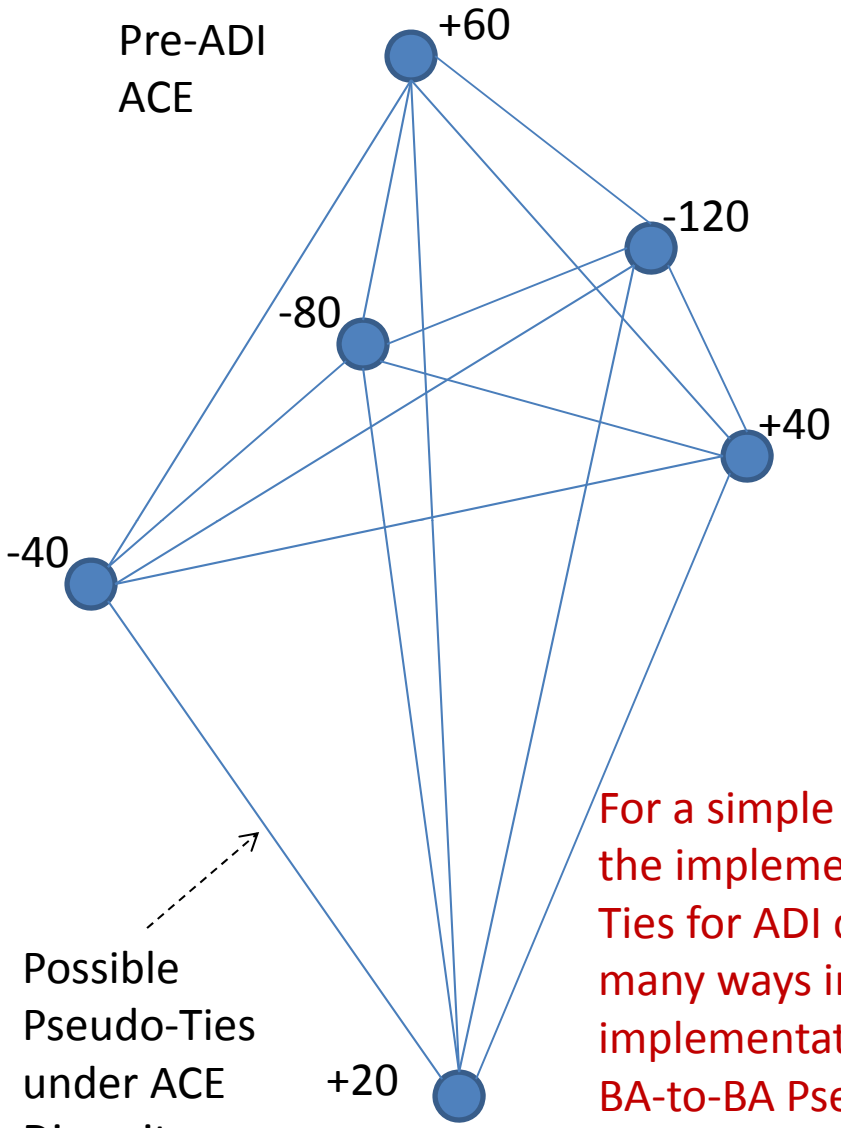
5 out of 6 BAs beyond their CPS2 L_{10}

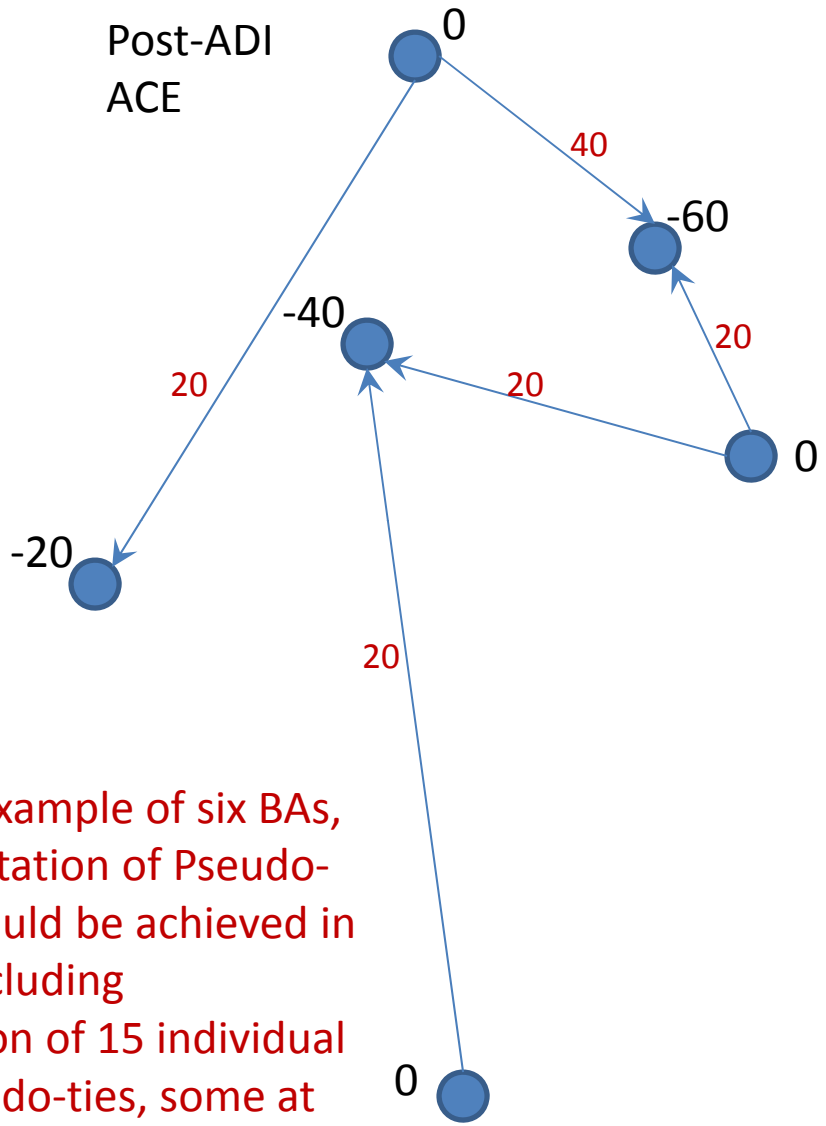
Sum of Frequency Bias: -218.8 MW/0.1 Hz
(slightly less than a 22,000 MW BA)

Sum of CPS L_{10}: 156.16 MW
(about the same as a 42,000 MW BA)

CPS L_{10} for a 22,000 MW BA: 112.3 MW

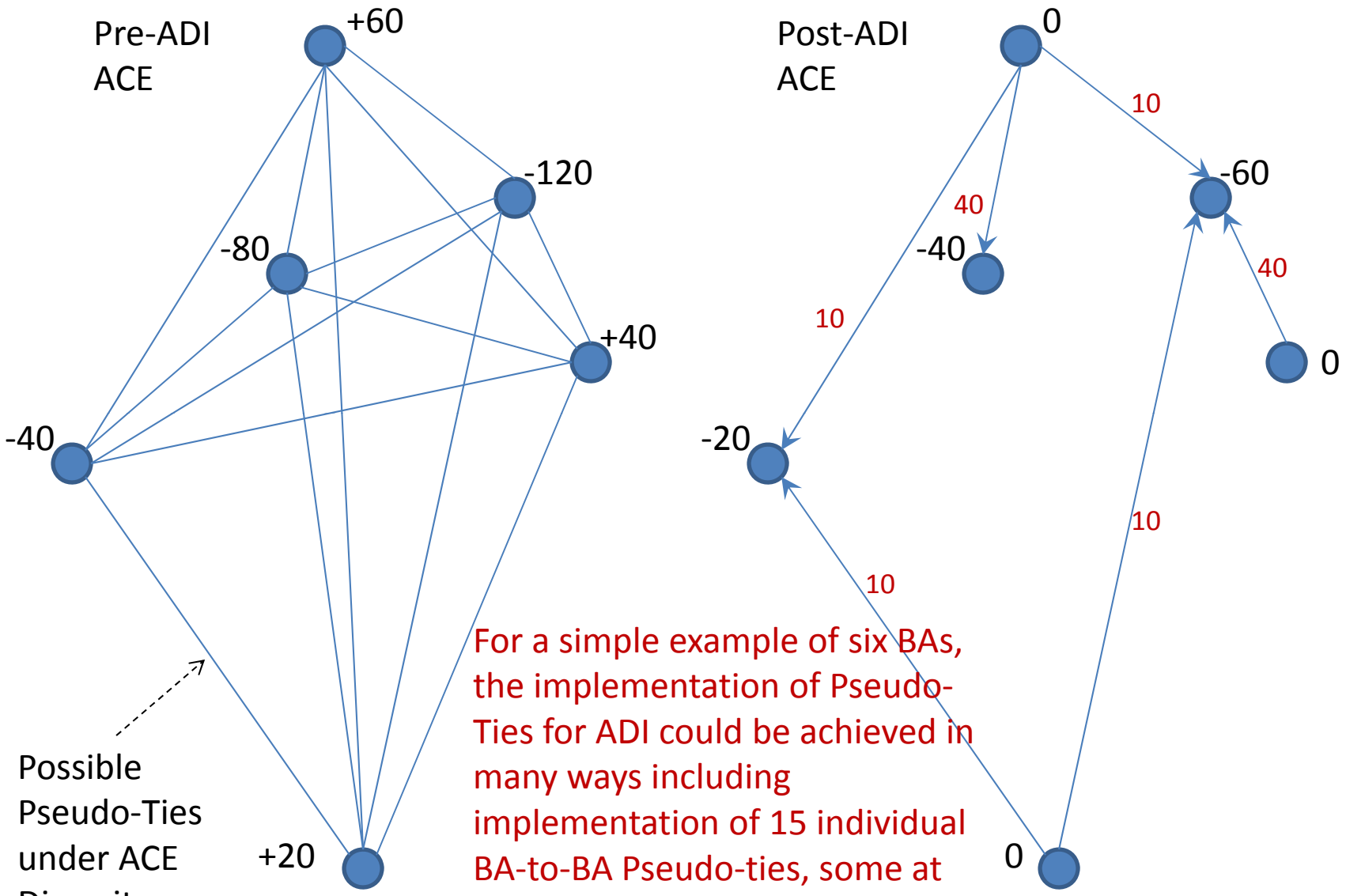
ACE Diversity Interchange (ADI) Examples for Discussion Purposes Only





For a simple example of six BAs, the implementation of Pseudo-Ties for ADI could be achieved in many ways including implementation of 15 individual BA-to-BA Pseudo-ties, some at times zero, however the distribution could be achieved in many different ways.

ACE Diversity Interchange (ADI) Examples for Discussion Purposes Only



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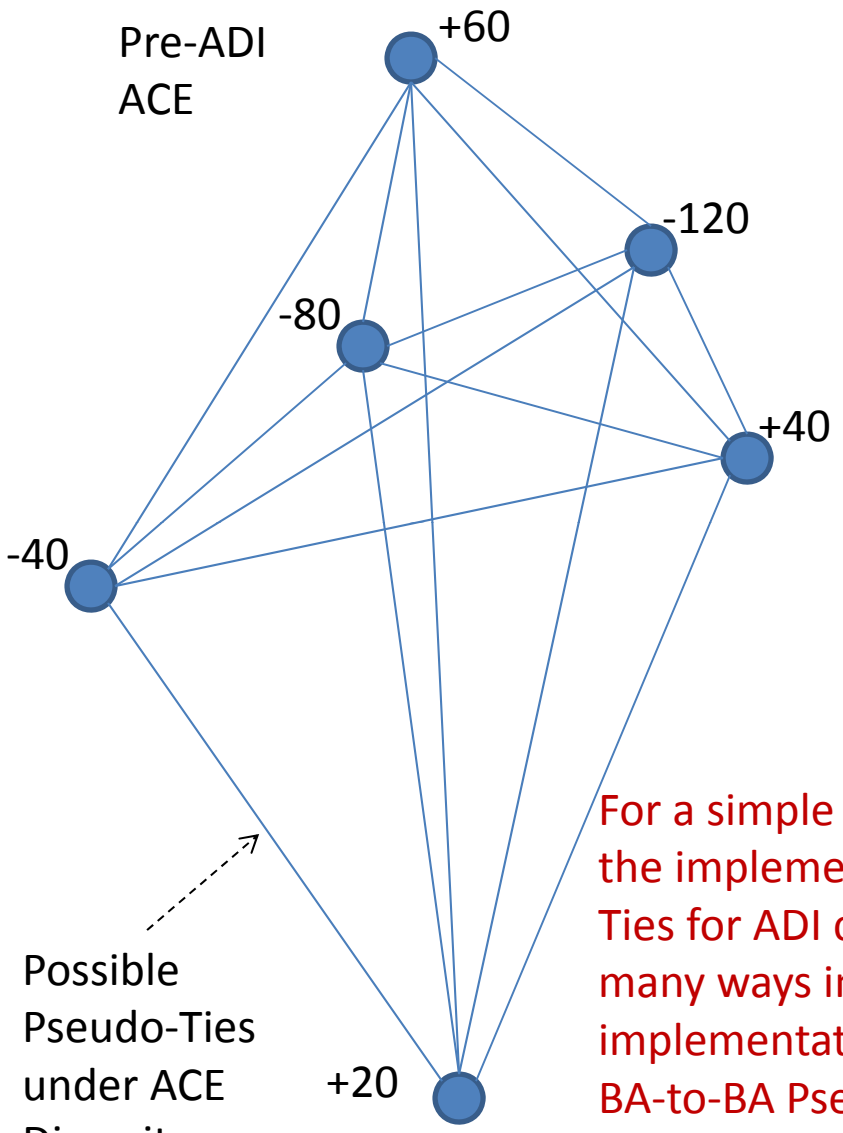

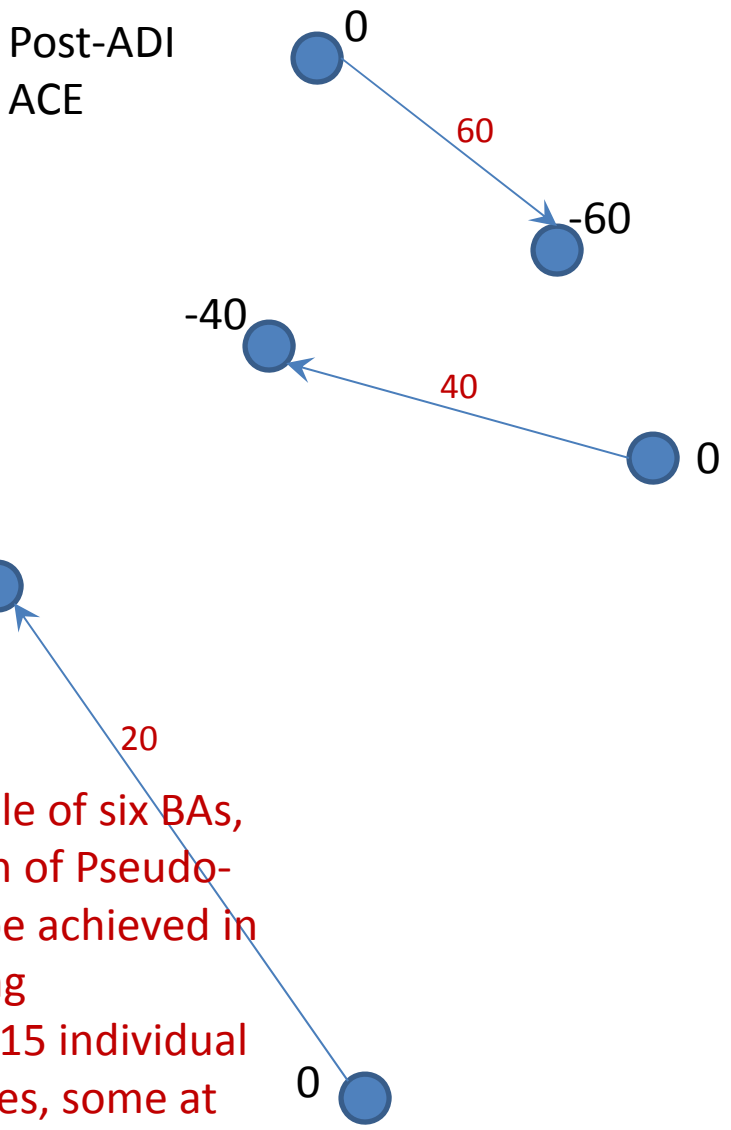

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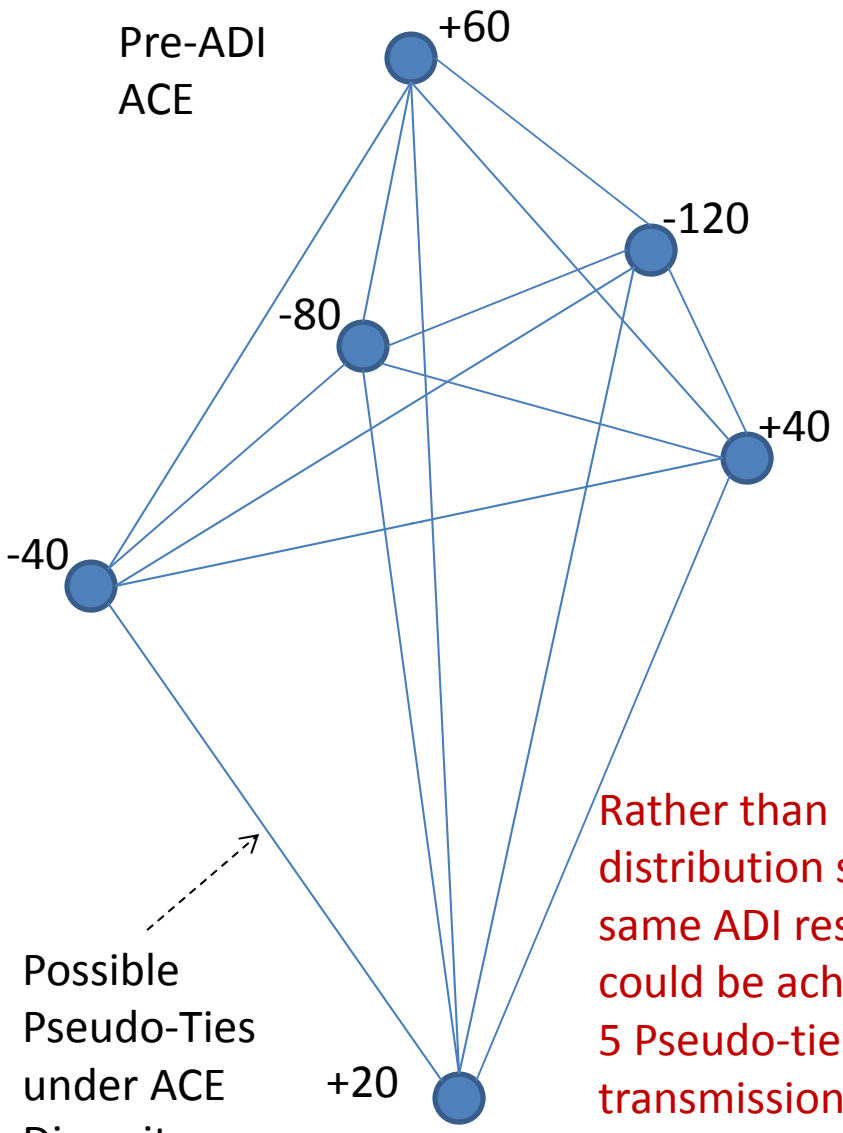
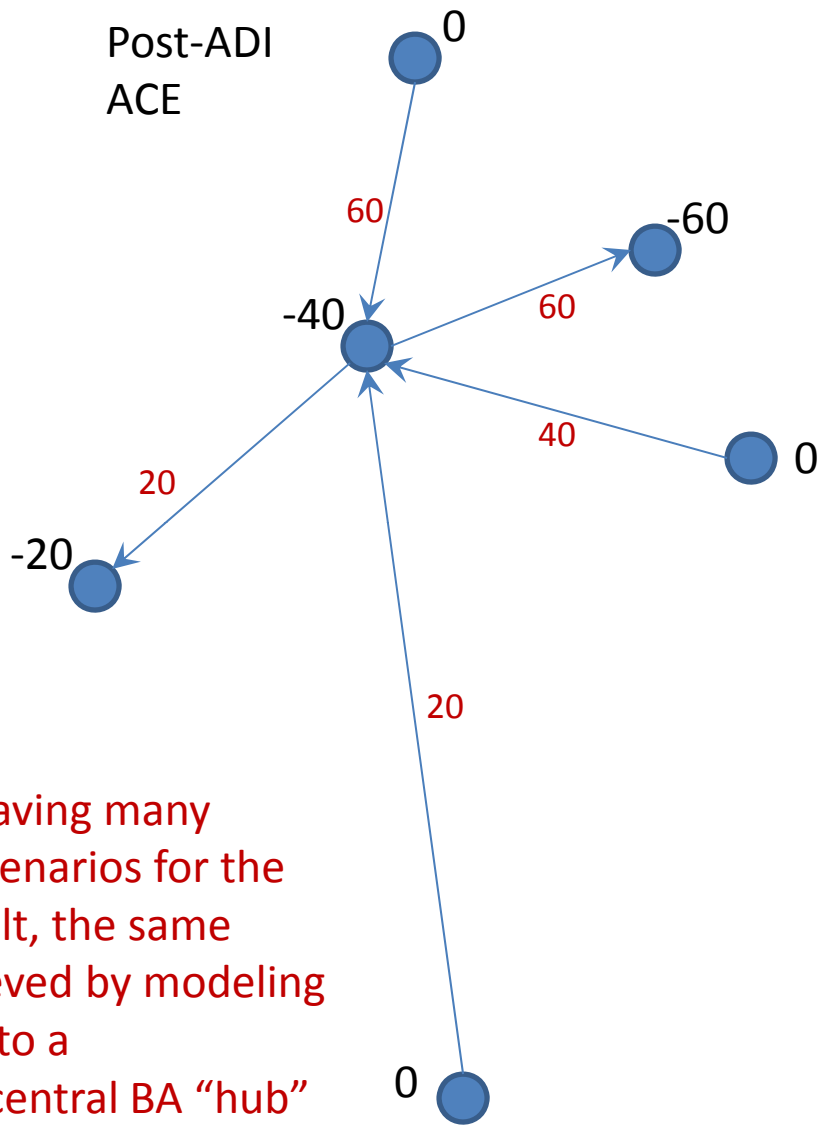


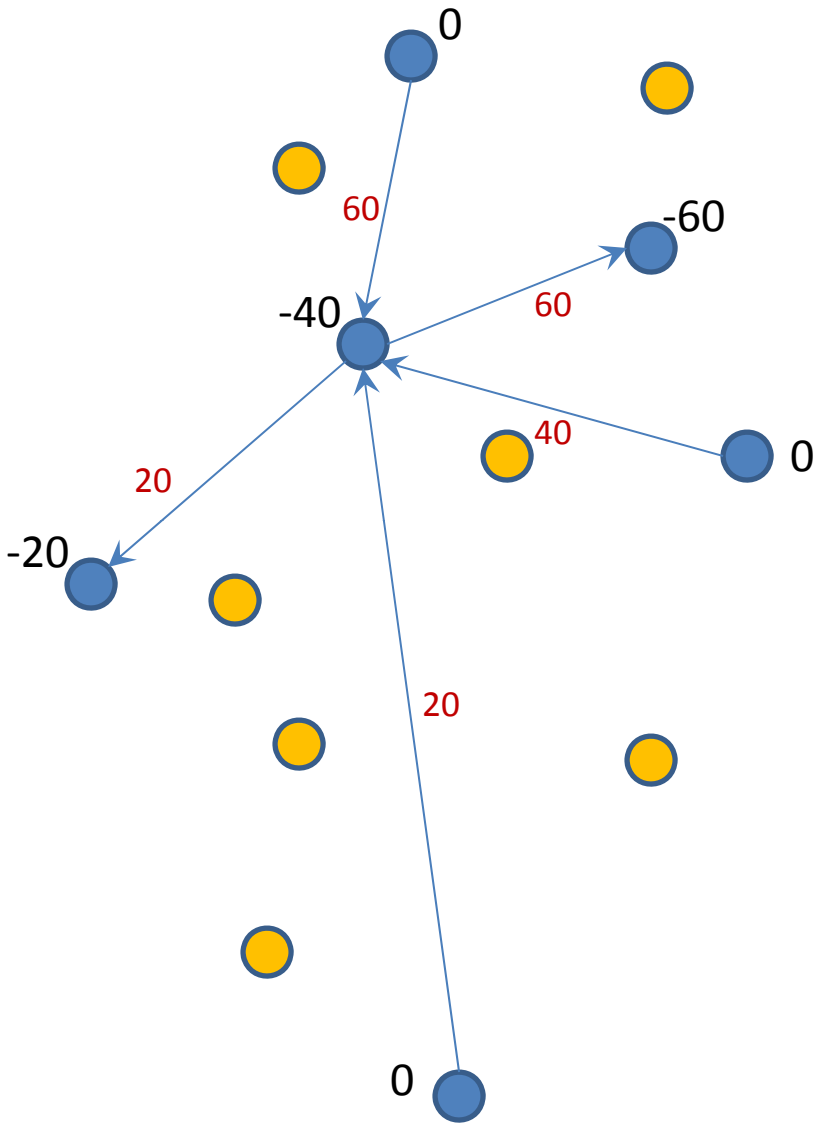


Rather than having many distribution scenarios for the same ADI result, the same could be achieved by modeling 5 Pseudo-ties to a transmission-central BA "hub" for each ADI solution.

ACE Diversity Interchange (ADI) Examples for Discussion Purposes Only

The problem enters in when neighboring systems may also be impacted by the resulting ADI transfers for which they may have no knowledge of the real-time transfers, no RC modeling capturing such transfers, and no capability to curtail such transfers under transmission loading relief procedures before firm and non-firm transactions are curtailed.

It's possible that the BAs may not be directly interconnected as the requirements around Pseudo-ties are primarily addressed in NERC reference documents and not the Standards.



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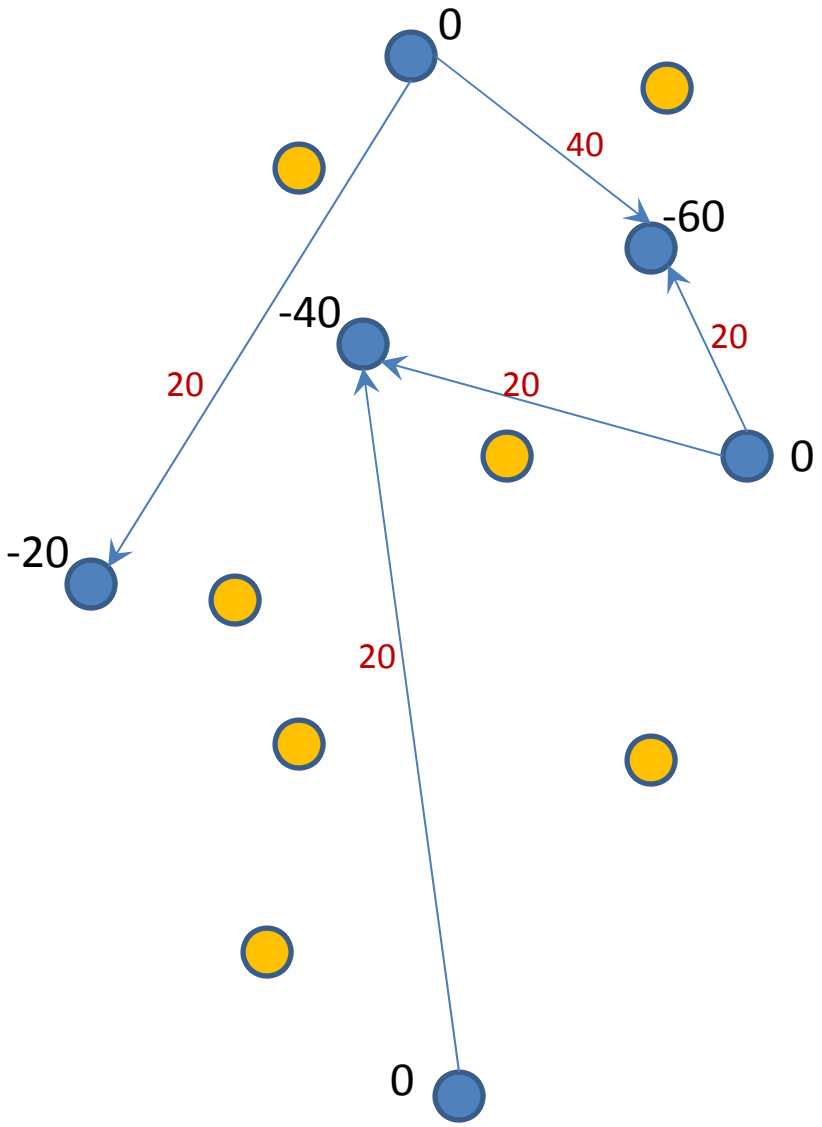

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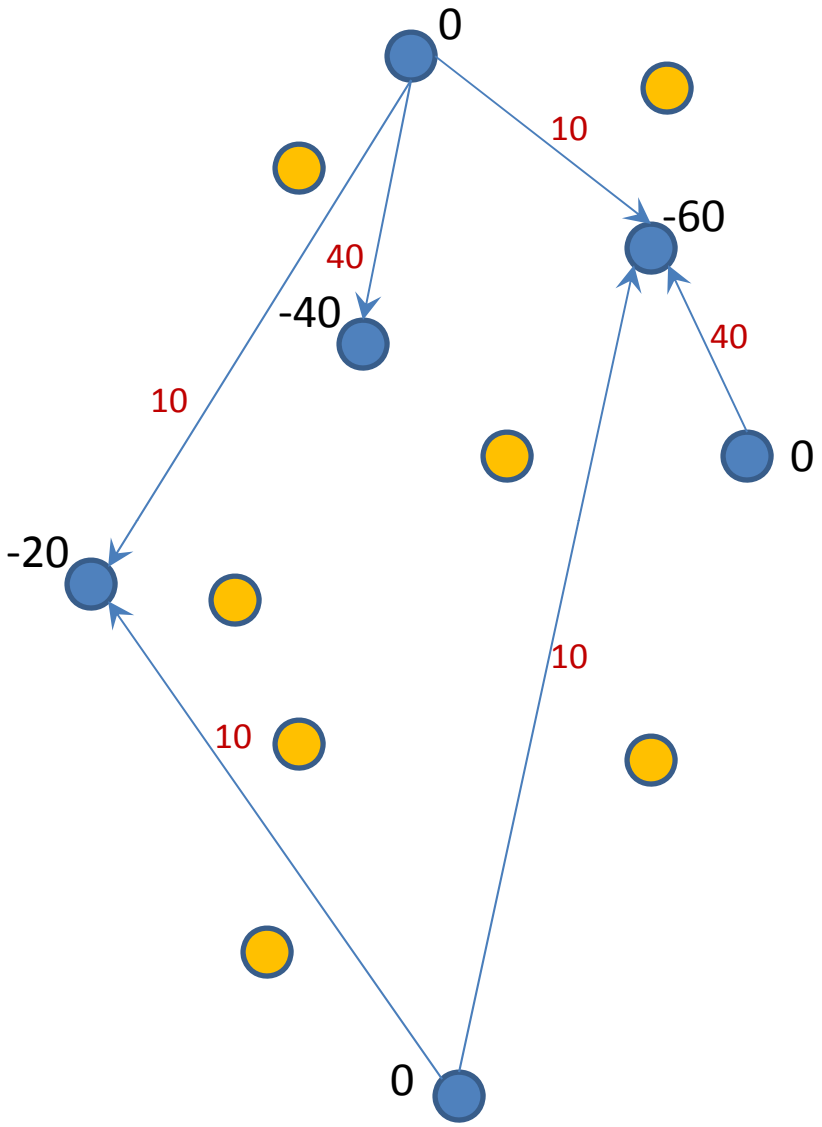

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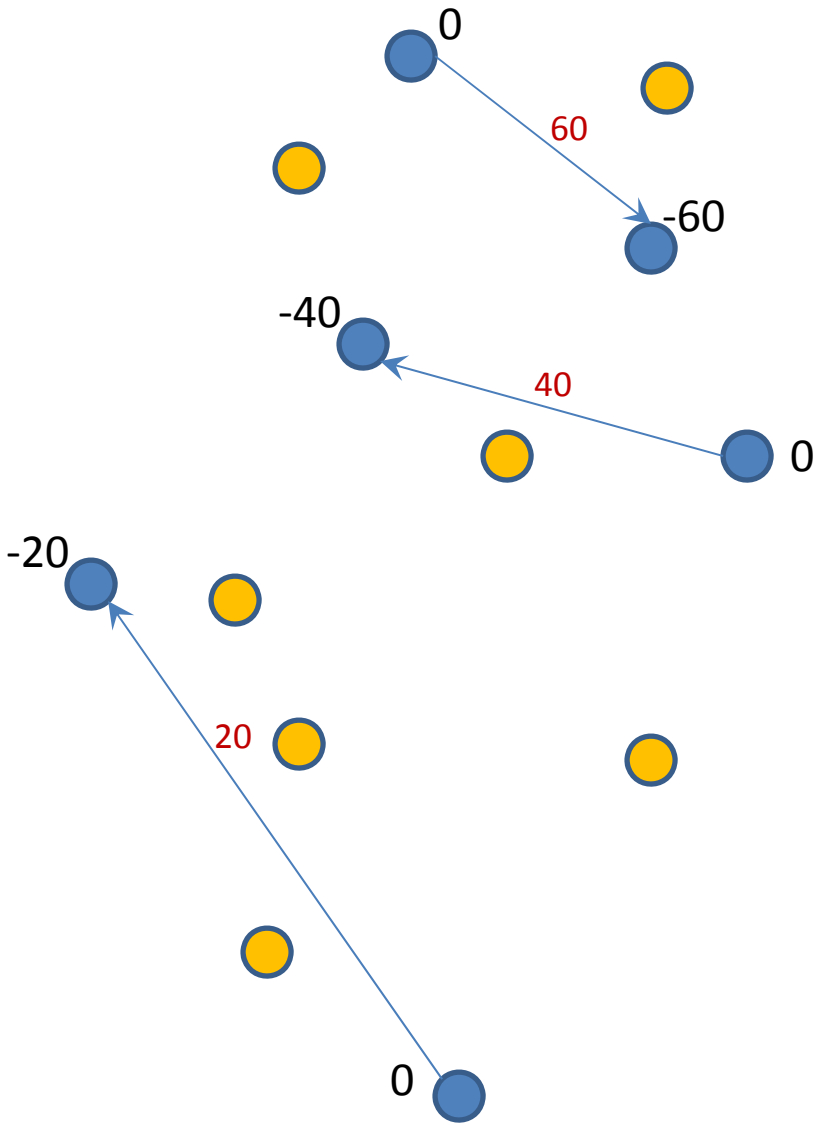

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It's possible that the BAs may not be directly interconnected as the requirements around Pseudo-ties are primarily addressed in NERC reference documents and not the Standards.

As the ADI solutions may be ever-changing, modeling the transmission impact of operation appears complex – perhaps more complex than capturing the transmission impact of varying dispatch across a large Balancing Authority where the incremental and decremental aspect of operation is known.

As the ADI solutions may be ever-changing, the transmission-related issues around operation appear to be more difficult to address than the frequency related issues. Placing the ADI group under rules no more, and no less, restrictive than those placed on a similar-sized Balancing Authority would address the net impact of its operation on frequency. A group ACE is easy to calculate.

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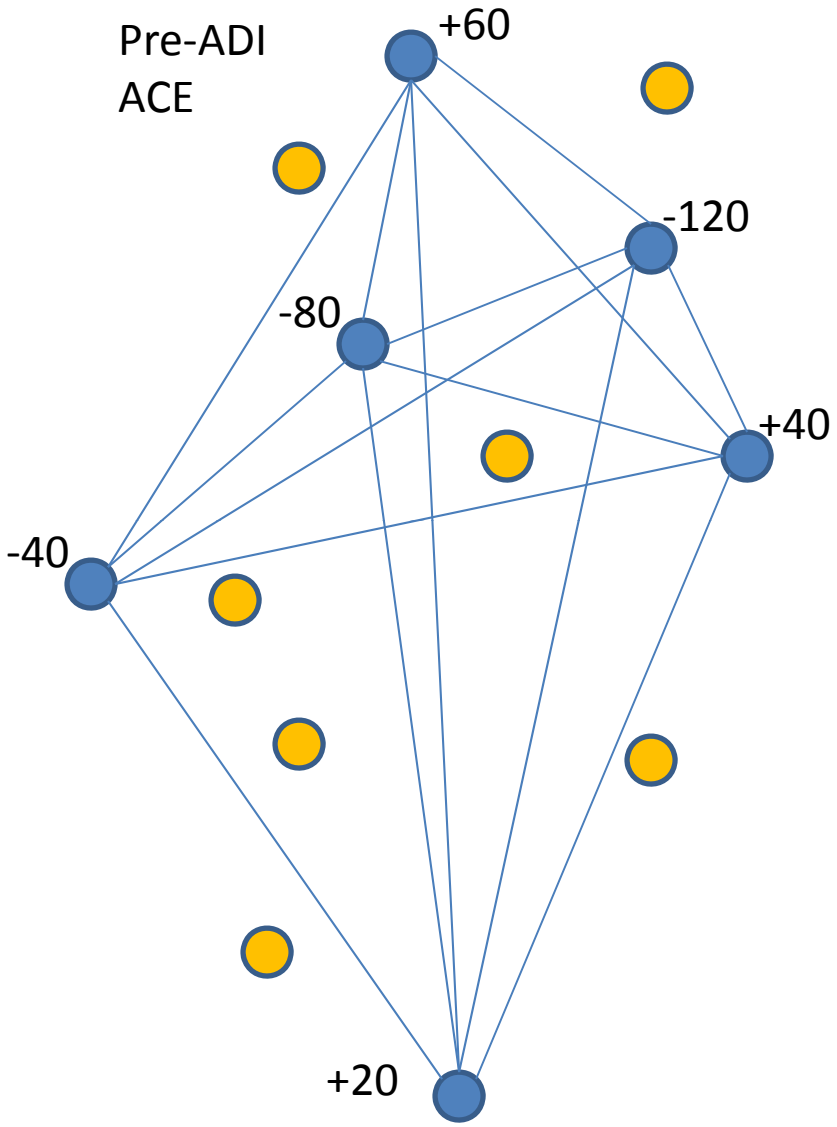

Same Pre-ADI as last set of examples, however in this case, ADI is optimized to place all BAs within their CPS2 L10 when possible.

Pre-ADI ACE and CPS2 L_{10} :

BA 1: **+60, 46.72** MW
BA 2: -80, 80.66 MW
BA 3:**-120, 50.85** MW
BA 4: **-40, 25.17** MW
BA 5: **+40, 25.17** MW
BA 6: **+20, 7.59** MW

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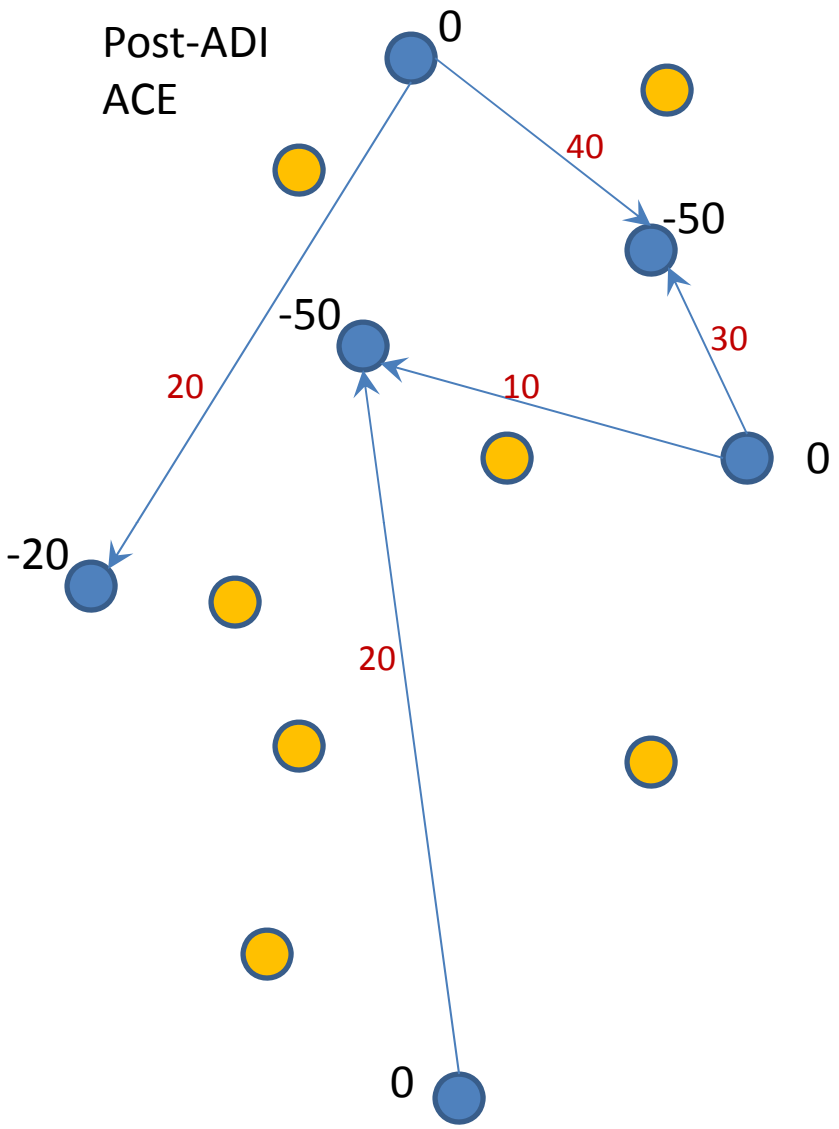

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Post-ADI ACE and CPS2 L_{10} :

BA 1: 0, 46.72 MW
BA 2: -50, 80.66 MW
BA 3: -50, 50.85 MW (now within limits)
BA 4: -20, 25.17 MW
BA 5: 0, 25.17 MW
BA 6: 0, 7.59 MW

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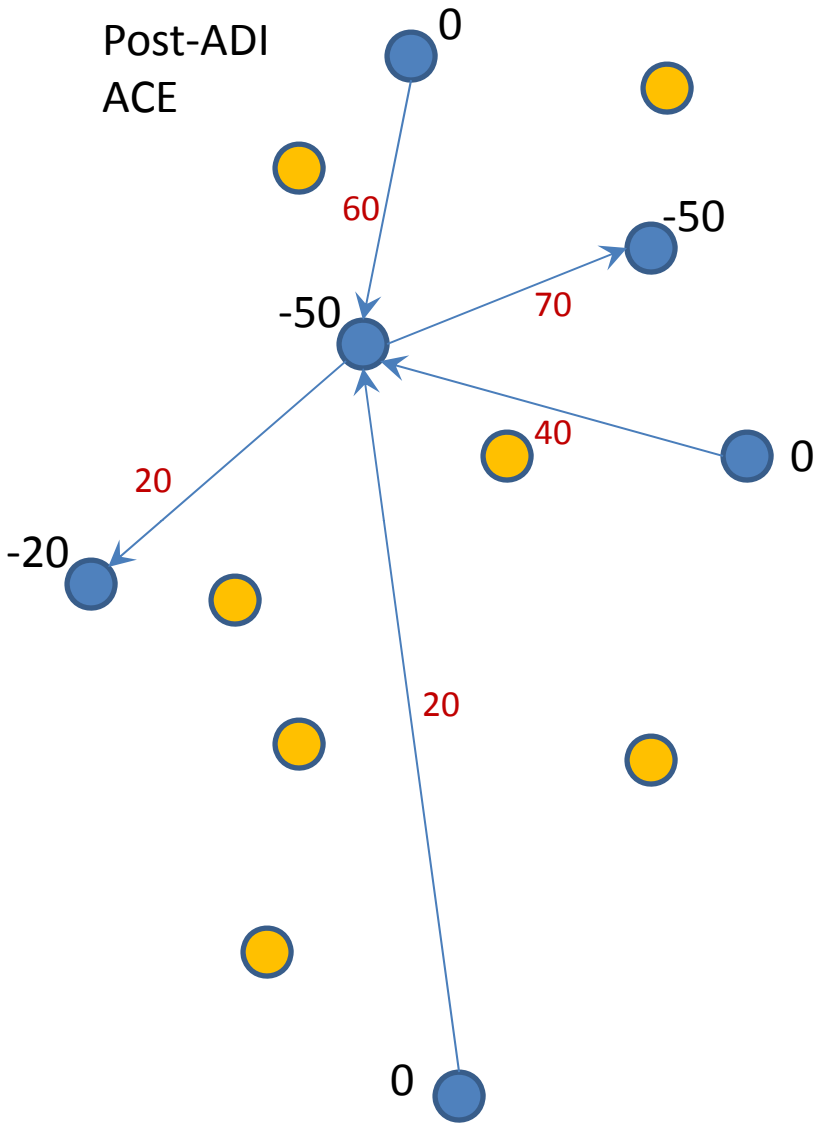

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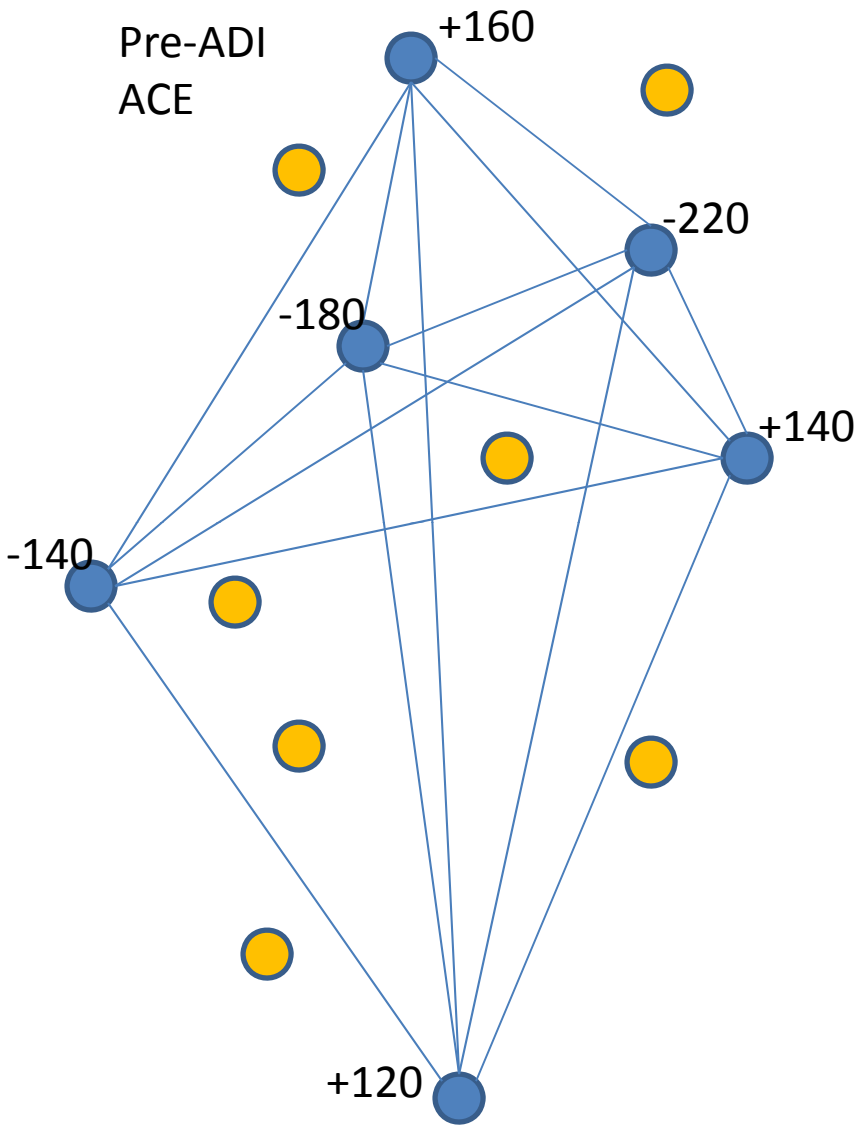

More extreme Pre-ADI example with design set to keep all BAs within their CPS2 L10 when possible.

Pre-ADI ACE and CPS2 L_{10} :

BA 1: **+160, 46.72** MW
BA 2: **-180, 80.66** MW
BA 3: **-220, 50.85** MW
BA 4: **-140, 25.17** MW
BA 5: **+140, 25.17** MW
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Added +100 MW to each positive BA and -100 MW to each negative BA.

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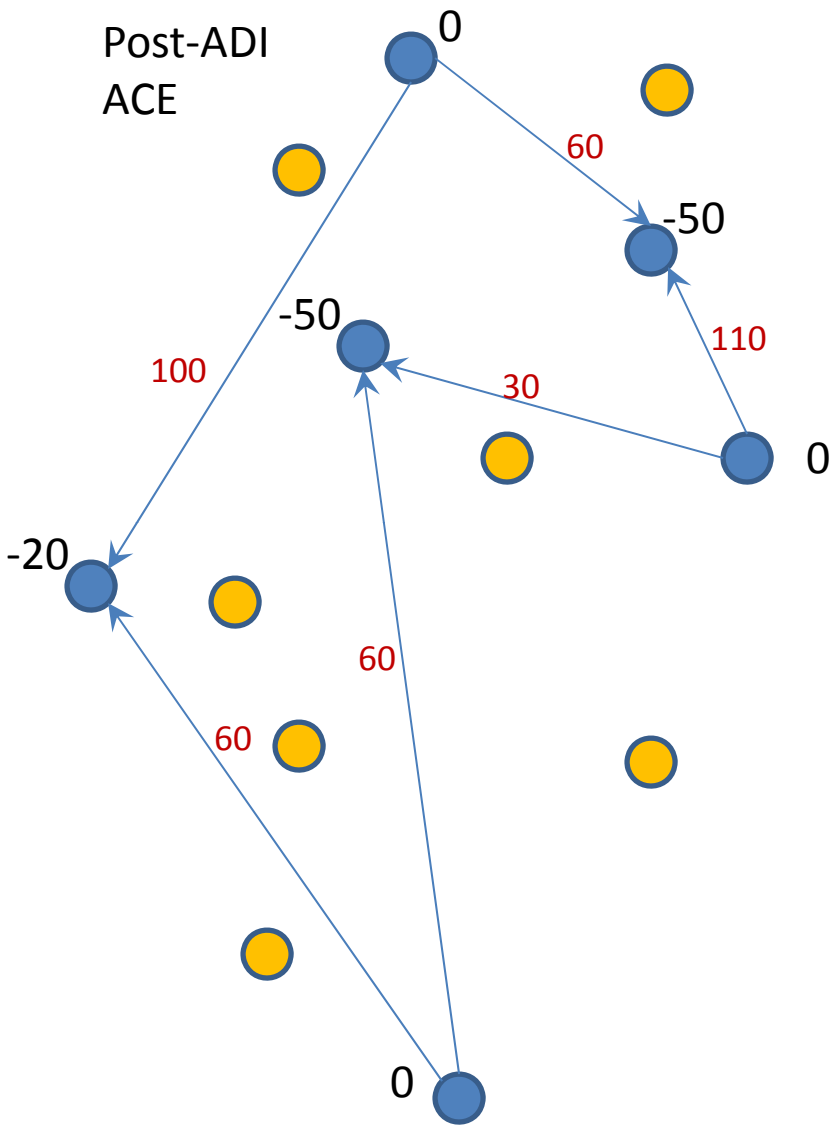

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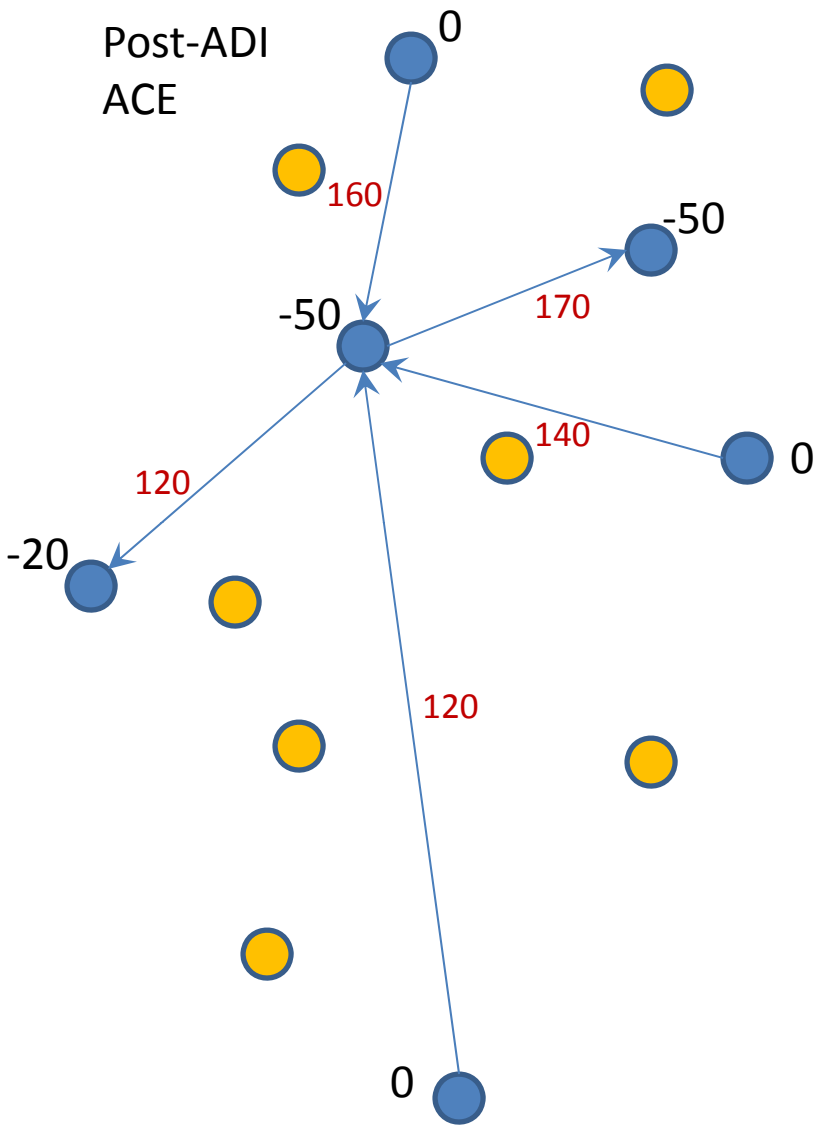
BA 6:   0,  7.59 MW
```

Same Post-ADI result as prior example

Under ADI, large positive and negative pre-ADI ACEs can offset each other, however the transmission impact of the unscheduled flows could be significant.

ACE Diversity Interchange (ADI) Examples for Discussion Purposes Only



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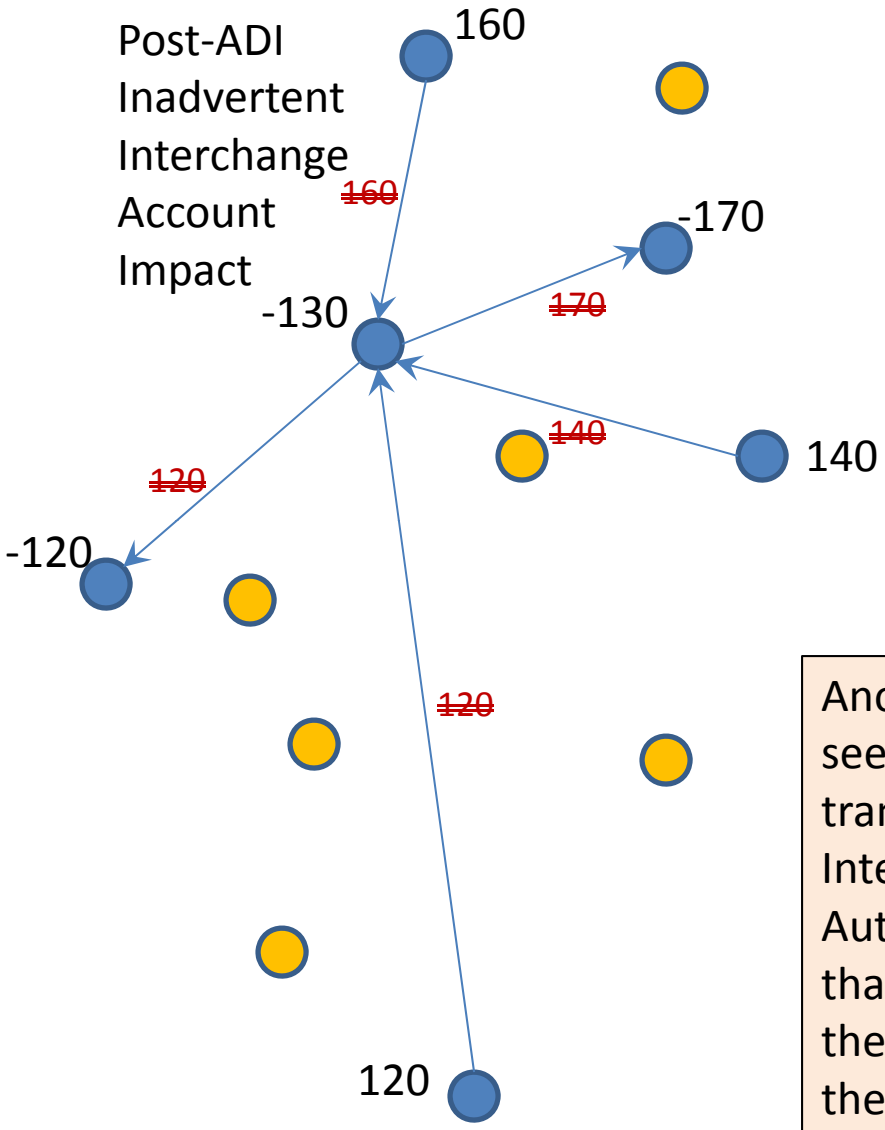
BA 3:	-50,	50.85 MW
BA 4:	-20,	25.17 MW
BA 5:	0,	25.17 MW
BA 6:	0,	7.59 MW

Same Post-ADI result as prior example

Under ADI, large positive and negative pre-ADI ACEs can offset each other, however the transmission impact of the unscheduled flows could be significant.

ACE Diversity Interchange (ADI) Examples for Discussion Purposes Only



More extreme Pre-ADI example with design set to keep all BAs within their CPS2 L10 when possible.

Pre-ADI ACE and CPS2 L_{10} :

BA 1: **+160, 46.72** MW
BA 2: **-180, 80.66** MW
BA 3: **-220, 50.85** MW
BA 4: **-140, 25.17** MW
BA 5: **+140, 25.17** MW
BA 6: **+120, 7.59** MW

Added +100 MW to each positive BA and -100 MW to each negative BA.

Another aspect of ADI implementations we've seen is the practice of zeroing out the ADI transfers after-the-fact, causing Inadvertent Interchange for each participating Balancing Authority as illustrated for this example. Note that the real-time net might be zero, however the process introduces errors passed on to the Interconnection at different times during individual Inadvertent Interchange payback.

Under ADI, large positive and negative pre-ADI ACEs can offset each other, however the transmission impact of the unscheduled flows could be significant.

ACE Diversity Interchange (ADI) Examples for Discussion Purposes Only

An ACE Diversity Interchange scenario not implemented:

The Balancing Authorities to the right could "swap ACE" under ADI and have a combined CPS2 L_{10} of 1485 MW for which they could operate outside that limit for up to 10% of the ten-minute periods in the month.

Starting with a blank sheet of paper, what is the list of issues and items that would have to be addressed to reliably implement ADI for this scenario? *The resulting list should be applicable to all ADI implementations.*

While under the Field Trial of BAL-007, the participating Balancing Authorities are not held to a CPS2 limit, but operate to a Balancing Authority ACE Limit ("BAAL") that becomes increasingly more restrictive than the CPS2 L_{10} as frequency deviates further from 60 Hz.

Balancing Authority Participants	**2009 Freq Bias**	**CPS2 L_{10}**
American Electric Power (CSW)	-102.3	76.8
Duke Energy Carolinas (DUK)	-201	107.6
East Kentucky Power Cooperative (EKPC)	-37.9	46.7
Entergy (EES)	-223.3	113.4
EON-US (LGEE)	-72	64.4
Independent Electricity System Operator (IESO)	-285	128.1
Manitoba Hydro (MHEB)	-44.9	50.8
Midwest Independent Transmission System Operator (MISO)	-1106	252.4
PJM Interconnection (PJM)	-1344	278.2
Santee Cooper (SC)	-79.6	67.7
Southern Company (SOCO)	-465	163.6
Tennessee Valley Authority (TVA)	-319.2	135.6
TOTAL	-4,280	1485.3

ACE Diversity Interchange (ADI) Examples for Discussion Purposes Only

An ACE Diversity Interchange scenario not implemented:

Quite a few smaller BAs could group together to "swap ACE" under ADI to have a combined CPS2 L_{10} of 498 MW (compared to 105 MW for similar-size 19,000 MW BA).

Compare the two scenarios: an ADI group representing 428,000 MW on the Eastern Interconnection would have a limit of 1485 MW, while an ADI group representing only 19,000 MW would have a limit of 498 MW. The non-linear allocation of CPS2 limits allows that disparity.

Some believe that ADI circumvents the intent of the BA limits set under CPS2 and can have a detrimental impact on transmission and Interconnection frequency unless Interchange is properly modeled and appropriate rules for balancing are in place. *It is suggested that BAs under ADI should be required to assess the net impact of their operation no differently than a similar-size BA, as the group's operation could mimic that of a larger BA but with much larger bounds to operate absent such a requirement.*

BA	Frequency Bias	CPS2 L_{10}
HST	-1	7.6
TAL	-9	22.8
GVL	-6	18.6
RC	-2	10.7
NSB	-1	7.6
DPC	-9.2	23.0
LES	-7.7	21.1
YAD	-2	10.7
BBA	-5.7	18.1
BREC	-17	31.3
BUBA	-1	7.6
CNWY	-2.1	11.0
DENL	-2.7	12.5
DERS	-1	7.6
WMUC	-1	7.6
EEI	-10	24.0
CPLW	-11	25.2
SEPA	-15	29.4
PUPP	-19.9	33.9
KACY	-7	20.1
INDN	-3.3	13.8
LAFA	-5	17.0
EDE	-11.8	26.1
GRDA	-10	24.0
LEPA	-3	13.1
SECI	-11	25.2
WFEC	-14.6	29.0
	-190	498.3