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WECC

Switching the PDCI Direction in Base Cases

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**Electric Reliability
& Security for the West**

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Power Flow

- DC buses

- DC lines

- DC converters

- Transactions

- Area interchange schedules

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Power Flow — DC Buses

- No updates needed

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Power Flow – DC Lines

- Swap from/to buses; rectifier should be the from bus, inverter should be the to bus

  - N-S: Rectifier = Celilo, inverter = Sylmar

  - S-N: Rectifier = Sylmar, inverter = Celilo

  - May not be necessary to swap DC line buses in non-PSLF platforms

- Change the loss factor – should be 0.3 on both DC lines for N-S cases, 0.7 on both for S-N cases

  - PSS/E only allows for loss factor of 0 or 1

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Power Flow — DC Lines

From bus	To bus	ID	Status	DC system...	Resistance	Rating 1 (...	Rating 2 (...	Rating 3 (...	Loss location (pu)	
[3,4]										
3 CELILO1P 240.00	5 SYLMAR1P 500.00	1	In service (1)	4	20.0000	3100.000	0.000	0.000	0.30	4(
4 CELILO2P 240.00	6 SYLMAR2P 500.00	1	In service (1)	5	20.0000	3100.000	0.000	0.000	0.30	4(

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Power Flow — DC Converters

- Update rectifier/inverter designations to match the DC lines

- Update the MW schedule for the rectifier

  - Not necessary to update inverter

- Update control modes

  - Rectifier: control own MW

  - Inverter: control own voltage

- Update minimum rectifier and inverter angles, aka alpha and gamma

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Power Flow – DC Converters

AC bus	DC bus	ID	System nu...	Status	Type	Mode	Scheduled real...	Rectifier angle	Inverter angle	Min rectifier angle	Min inverter angle
	[3,6]										
41311 CELILO_1 500.00	3 CELILO1P 240.00	1	4	In service (1)	Rectifier (1)	Control own P (2)	800.0	7.68	16.00	5.00	15.00
41312 CELILO_2 500.00	4 CELILO2P 240.00	1	5	In service (1)	Rectifier (1)	Control own P (2)	800.0	7.68	16.00	5.00	15.00
26097 SYLMAR1 230.00	5 SYLMAR1P 500.00	1	4	In service (1)	Inverter (2)	Control own V (3)	747.4	0.00	19.31	100.00	18.00
26099 SYLMAR2 230.00	6 SYLMAR2P 500.00	1	5	In service (1)	Inverter (2)	Control own V (3)	747.4	0.00	19.13	100.00	18.00

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Power Flow — Transactions

- Take note of the existing transaction value in the case

- Update the transaction between areas 26 (LADWP) and 40 (Northwest) to the desired value

- Calculate the difference between the new and old transaction values (Δ)

- Caveat: WECC staff have observed that leaving the PDCI on with a schedule of 0 MW does not work in PSLF

  - Recommendation: do not schedule PDCI below 175 MW

- Caveat #2: The transaction is measured at the loss allocation point determined by the loss factor, not at the rectifier, so the transaction will not be the same as the MW schedule at the converter

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Power Flow — Transactions

From transactio...	Fro...	From type	To transaction #	To...	To type	Scheduled P (M...	c
26			40				
26		Area (a)	40		Area (a)	-1568.4600	

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Power Flow — Area Interchange Schedules

- Take note of the existing MW schedule for areas 26 and 40

- Using the Δ from the previous step, add Δ to the MW schedules for areas 26 and 40

- Check that the total MW schedules for each area still sum to zero

- Caution: reversing the PDCI direction without also adjusting load and generation will cause circulating flow on the COI

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Power Flow — Area Interchange Schedules

- Load/generation adjustment
  - When area 40 is at max load, supporting substantial N−S flows is not feasible
  - Typically, areas with lower load can more easily support exporting power
- Possible adjustments:
  - Heavy N-S: scale down Northwest, BC Hydro, Fortis BC loads and reduce generation in areas 20−30, 10−19, or both
  - Heavy S-N: do the opposite
  - For both N-S and S-N adjustments, balance flows between COI and PDCI; keep them the same direction; do not dispatch the PDCI extremely low and have it on in the power flow

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Power Flow — Area Interchange Schedules

Area numb...	Area name	Injection gro...	Interchange type	Interchange MW limit	Scheduled P (M...
26					
26	LADWP		Use area slack bus for interchange control (...	Don't enforce MW limit of generator during interchange control (...	-1622.68

Area numb...	Area name	Injection gro...	Interchange type	Interchange MW limit	Scheduled P (M...
40					
40	NORTHWEST		Use area slack bus for interchange control (...	Don't enforce MW limit of generator during interchange control (...	614.76

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Power Flow — Alternative Method

- Download a case from wecc.org that has the same flow direction you wish to recreate

  - Check Base Case Compilation Schedules and look for PDCI flow targets

- Delete the DC buses, DC lines, and DC converters associated with the PDCI from your original case

- Export the above components from your downloaded case and import them into your original case

- Still need to update the transactions and area interchange schedules

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Dynamics

- The case DYD file, e.g., 27LA1S1.dyd, and the Master Dynamics File (MDF) have both sets of PDCI dynamic models

    - N–S, S–N

- PSLF users: open the case DYD, search "chvdc," and comment/uncomment the appropriate set of models to match the flow direction

- Others: download the MDF from the base cases page, or the PSLF case, then follow the directions for PSLF users to get the correct set of models

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