



Production Cost Data Subcommittee (PCDS)

Anchor Data Set
2032 ADS
V2.0

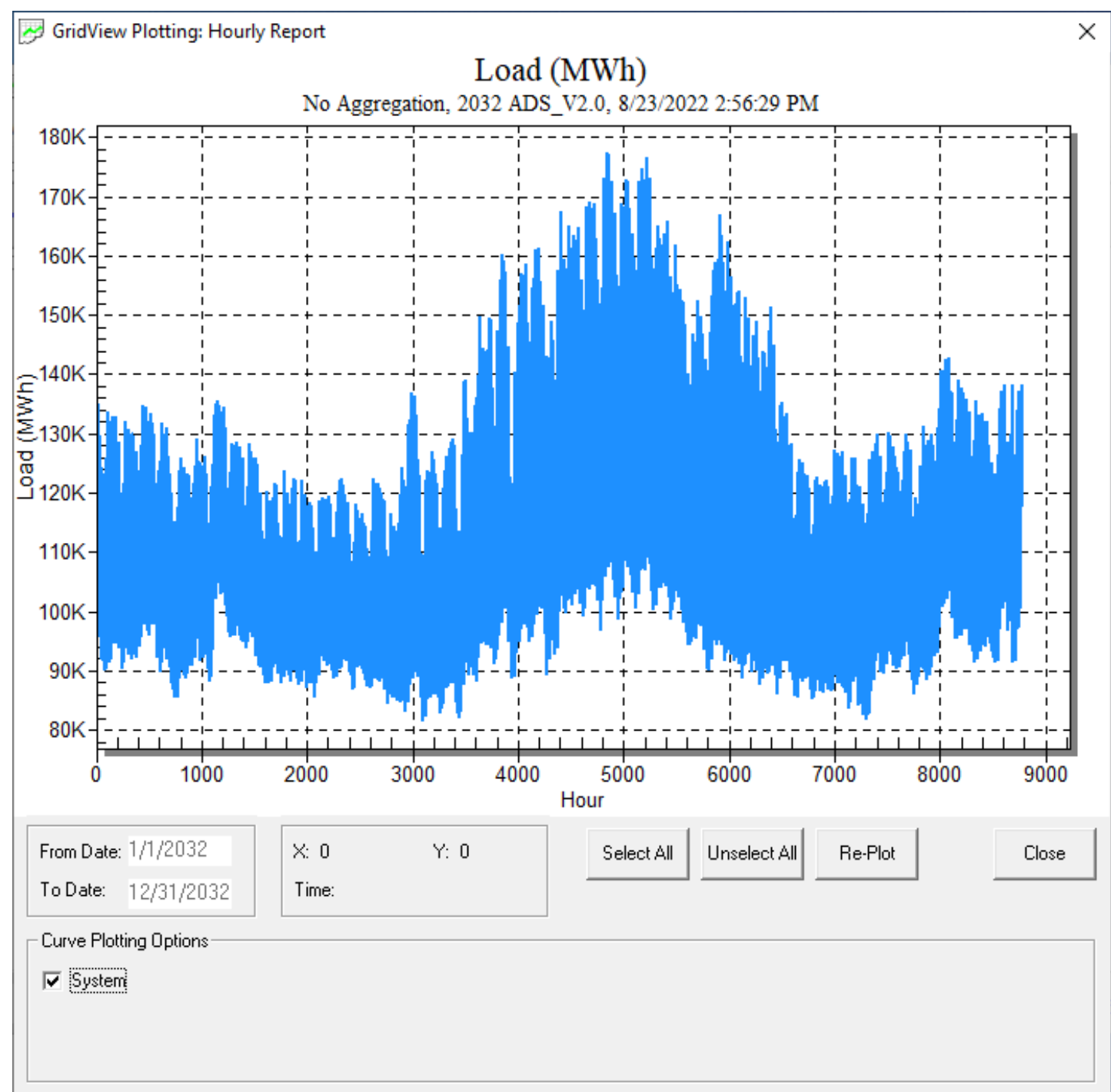
Aug 24, 2022

Jamie Austin, Chair

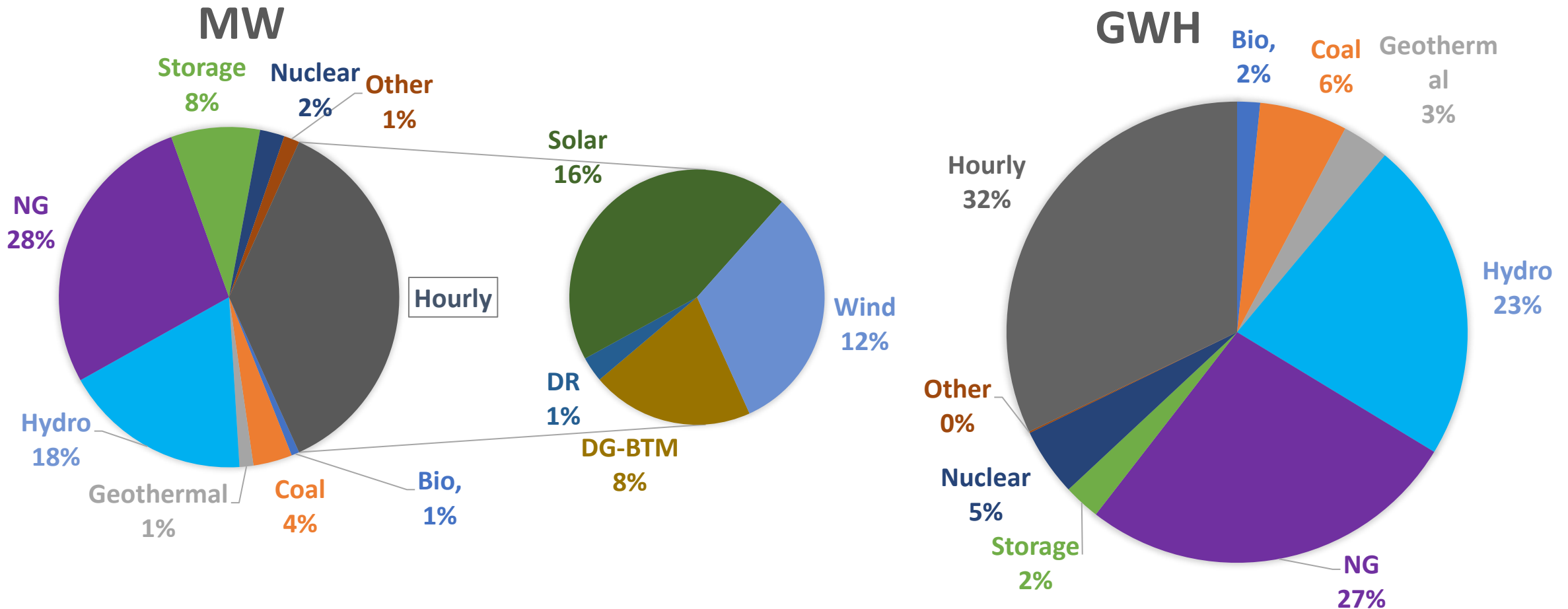
Overview

- **Status**
 - Loads
 - Resources
 - Dispatch
- **Pending Challenges associated with Version 2.0**

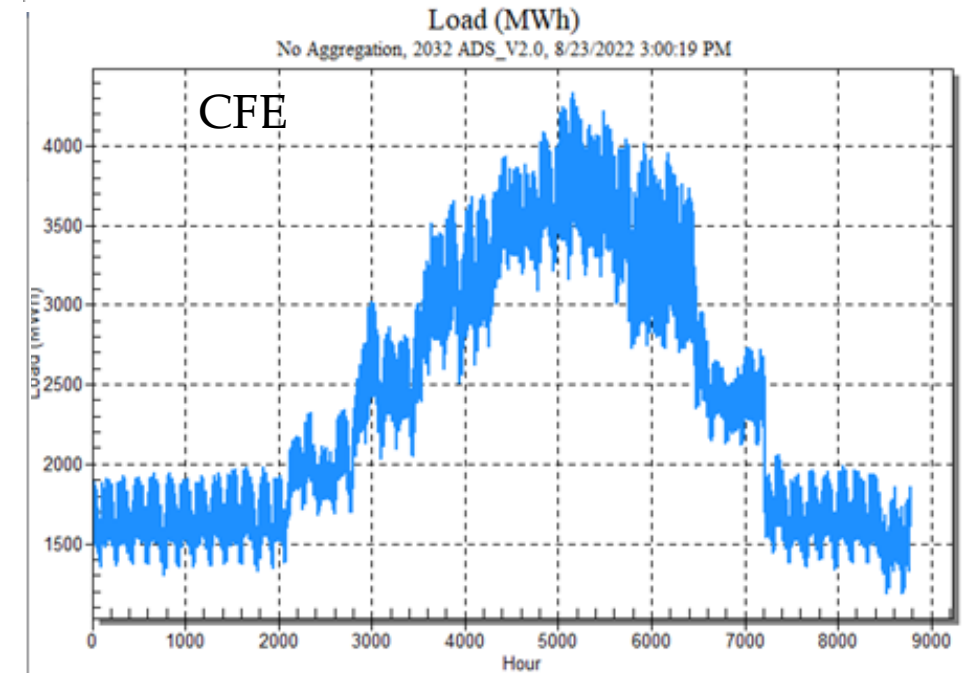
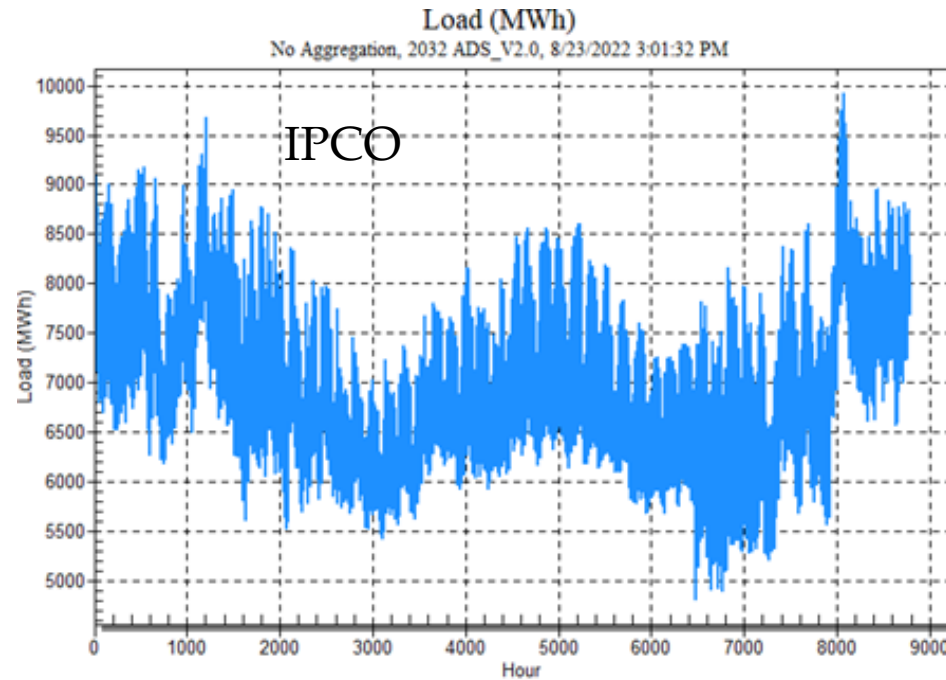
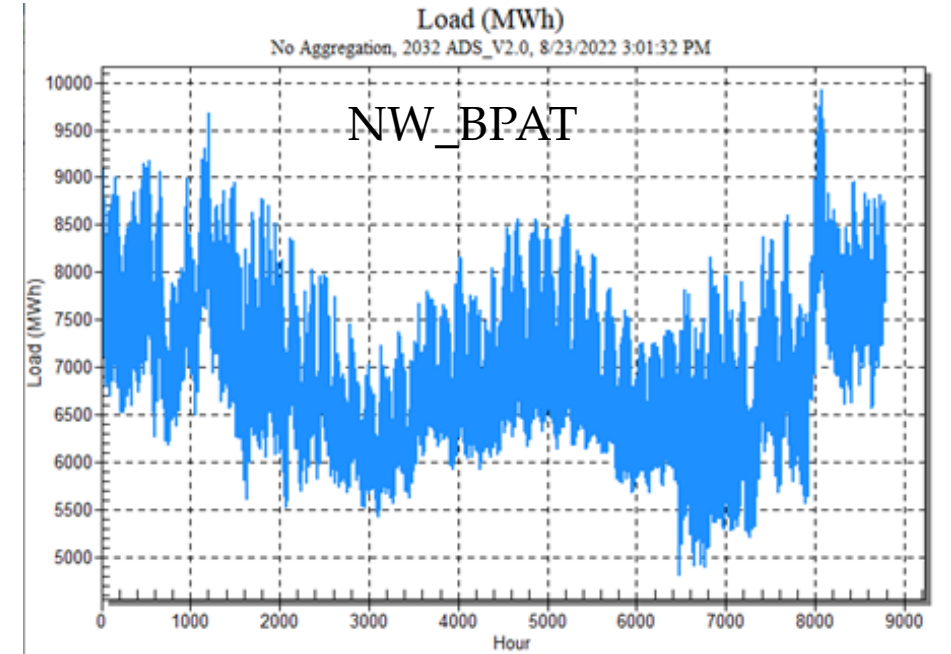
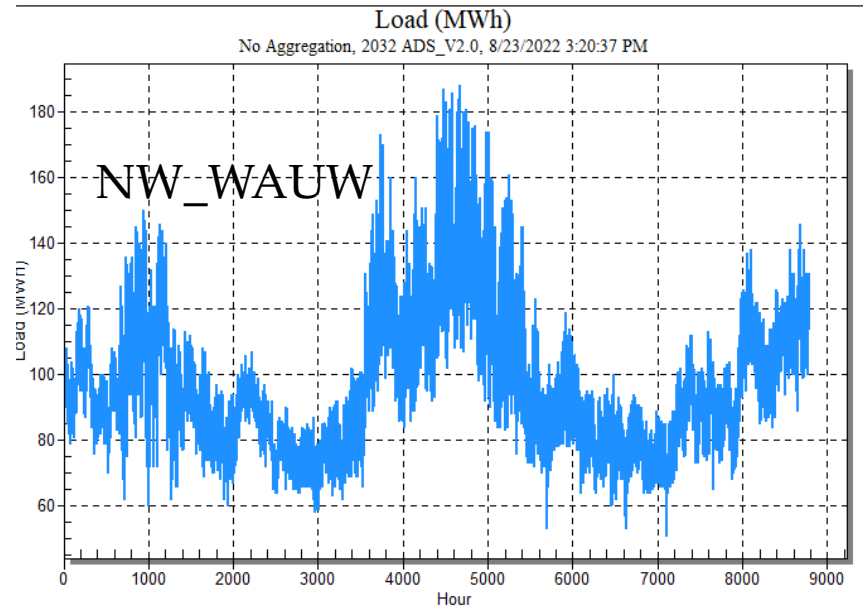
WECC Served Load Profile



Capacity and Energy Mixes

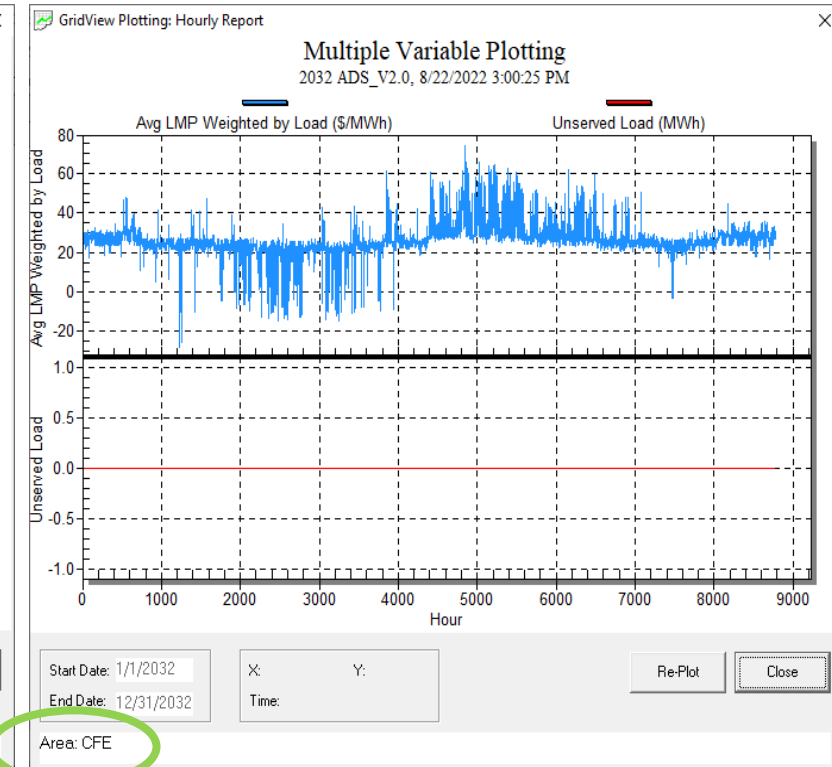
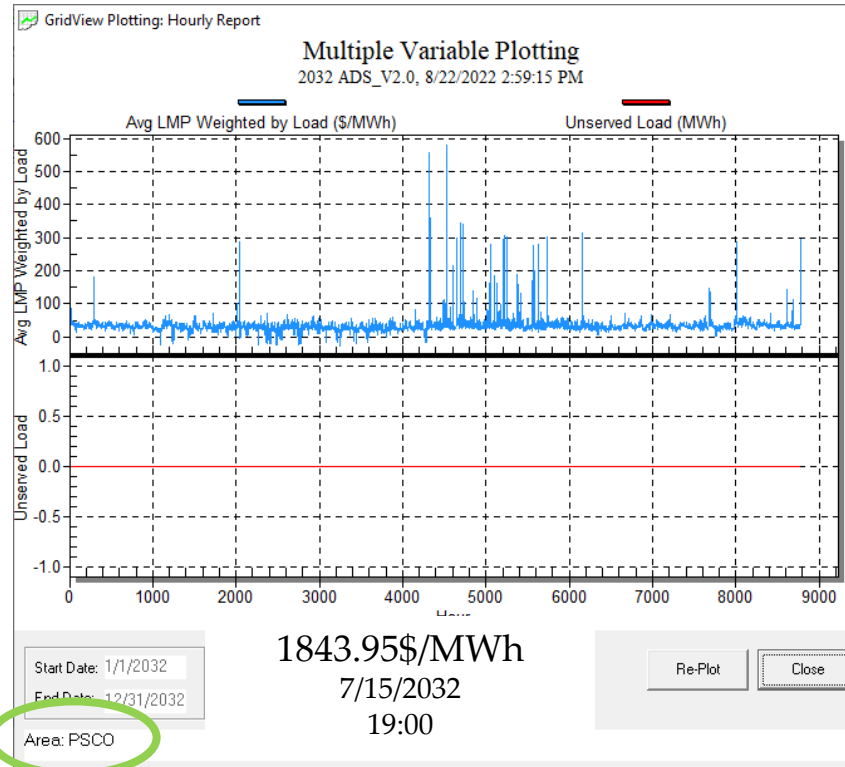
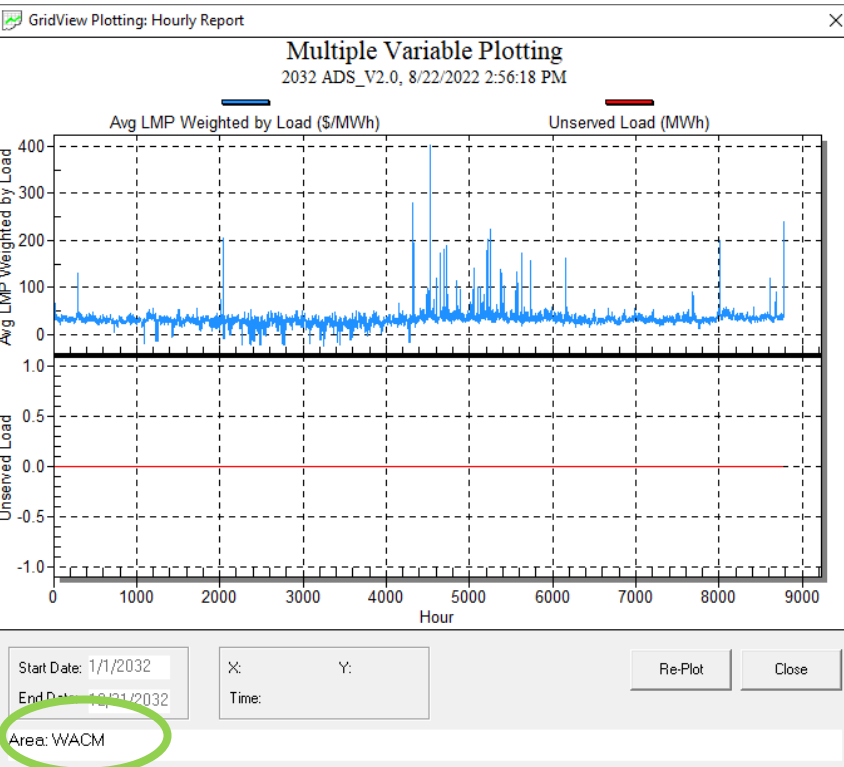


Load Shapes



Load Not Served (MWh)

2032 ADS V2.0_wO VARMarginRatio Cap Changes



Xcel - - Missing Resources

- Colorado PUC's Phase 1 ERP Order - - allows for extending the lives of existing gas units (owned and \or PPAs) through 2032.
 - The 2030 Plan has an indicative level of 1,372 MW of generic gas fired generation to cover for retiring coal, gas units and expiring PPAs.
- Issue - - the WECC 2032 HS1 case does not have PSCO's added Transmission (345 kV) required to integrate added renewables by year 2030:
 - Recommended is to maintain wind and solar at existing sites, consistent with keeping interconnection rights for future projects.

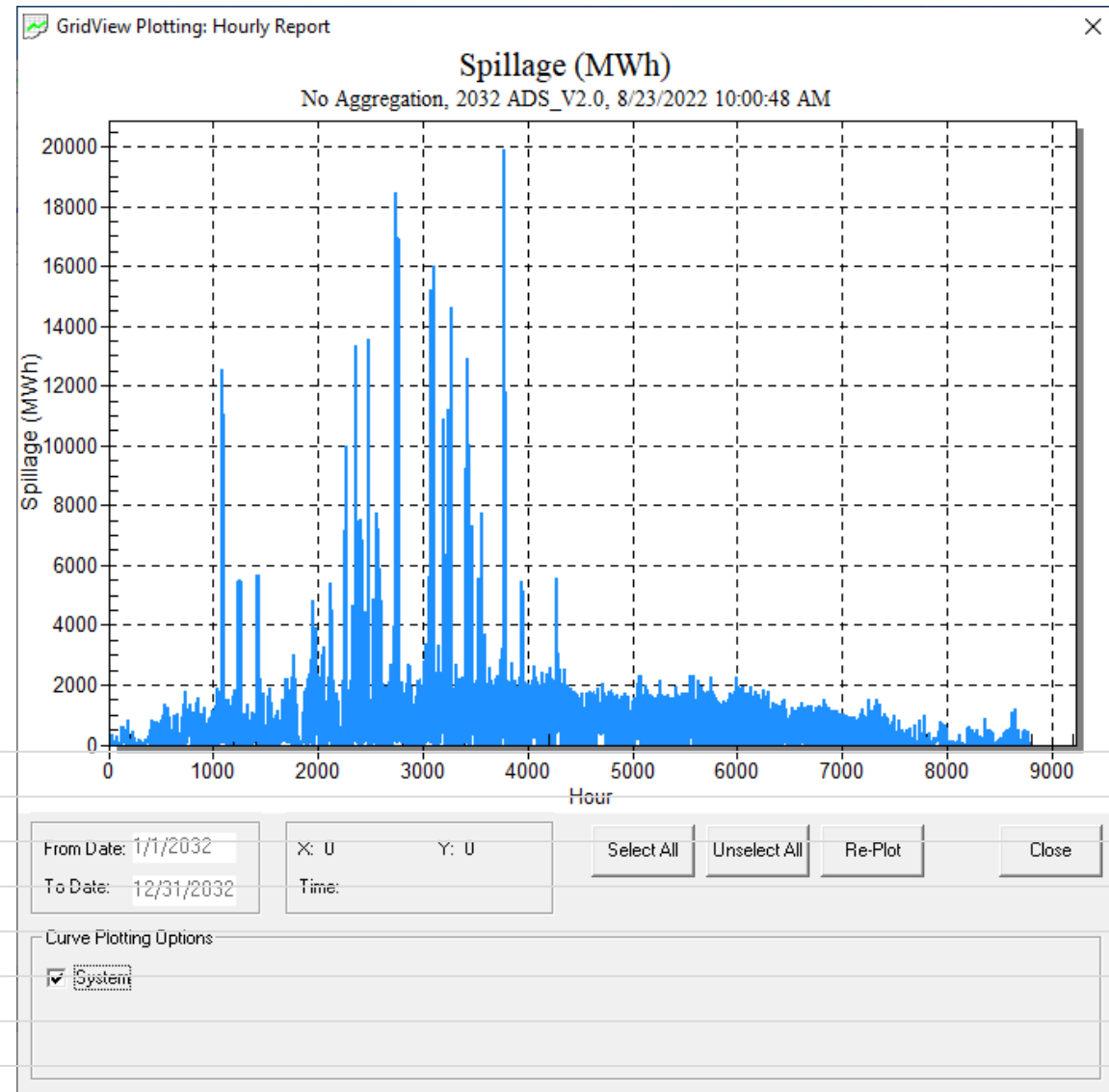
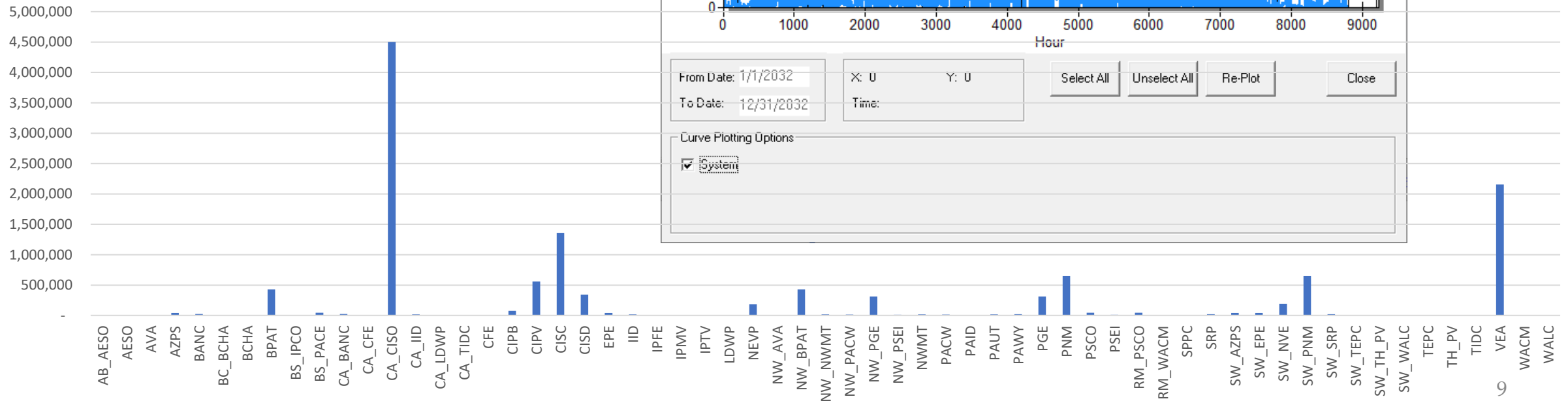
Xcel - - Incremental Generic Resources through EOY 2030; 2021 ERP-Phase

Actual resources will be identified in Phase II and approved by Colorado PUC ~8/1/2023

Generator	Name	Bus ID	Bus Nam	Bus KV	Commission Date	DevStatus	Region Name	MaxCap(MW)	Edits			
	22ERP_BESS1_4-hour				Battery Storage		1/1/2025	12/31/2050	Future-Planned	PSCO	RM_PSCO	200.0
	22ERP_Wind1				WT-Onshore		1/1/2025	12/31/2050	Future-Planned	PSCO	RM_PSCO	1,000.0
	22ERP_Wind2				WT-Onshore		1/1/2026	12/31/2050	Future-Planned	PSCO	RM_PSCO	250.0
	22ERP_Wind3				WT-Onshore		1/1/2027	12/31/2050	Future-Planned	PSCO	RM_PSCO	150.0
	22ERP_Wind4				WT-Onshore		1/1/2028	12/31/2050	Future-Planned	PSCO	RM_PSCO	550.0
	22ERP_Wind5				WT-Onshore		1/1/2029	12/31/2050	Future-Planned	PSCO	RM_PSCO	200.0
	22ERP_Wind6				WT-Onshore		1/1/2030	12/31/2050	Future-Planned	PSCO	RM_PSCO	200.0
	22ERP_Solar1				SolarPV-Tracking		1/1/2027	12/31/2050	Future-Planned	PSCO	RM_PSCO	800.0
	22ERP_Solar2				SolarPV-Tracking		1/1/2028	12/31/2050	Future-Planned	PSCO	RM_PSCO	50.0
	22ERP_Solar3				SolarPV-Tracking		1/1/2030	12/31/2050	Future-Planned	PSCO	RM_PSCO	750.0
	22ERP_CT1				CT-NatGas-Aero		1/1/2027	12/31/2050	Future-Planned	PSCO	RM_PSCO	392.0
	22ERP_CT2				CT-NatGas-Aero		1/1/2028	12/31/2050	Future-Planned	PSCO	RM_PSCO	784.0
	22ERP_CT3				CT-NatGas-Aero		1/1/2029	12/31/2050	Future-Planned	PSCO	RM_PSCO	196.0

Fort St Vrain 7 ST.VR_5 transformer is **rated** at 290 MVA, this would put the capacity at 320 at that bus
Fort St Vrain 8 ST.VR_6 transformer is rated at 232 MVA, this would put the capacity at 480 at that bus
Fort St Vrain 9 ST.VR_6 transformer is rated at 232 MVA, this would put the capacity at 480 at that bus

Spillage (MWh) 2032 ADS_V2.0



Generator Average LMP (\$/MWh)

<i>Simple Average LMP (\$/MWh)</i>	<i>Area</i>	<i>Fuel</i>	<i>2032 ADS_V2.0</i>
MS_G2	EPE	Hourly	348
Newman CC5b	EPE	NG_West Texas_Waha	267
Newman CC5a	EPE	NG_West Texas_Waha	267
MS_G1	EPE	Hourly	199
RioGrande9	EPE	NG_West Texas_Waha	189
Hatch_Solar_EC	EPE	Hourly	189
APT_DIST_PV	EPE	Hourly	188
Montana_3_G3	EPE	NG_West Texas_Waha	188
Montana_1_G1	EPE	NG_West Texas_Waha	188
Montana_4_G4	EPE	NG_West Texas_Waha	188
Montana_2_G2	EPE	NG_West Texas_Waha	188
PAT_DIST_PV	EPE	Hourly	188
CHAP_DIST_PV	EPE	Hourly	188
BV_PV1	EPE	Hourly	188
BV_PV2	EPE	Hourly	188
HECATE	EPE	Hourly	188
Newman_6GT5	EPE	NG_West Texas_Waha	187

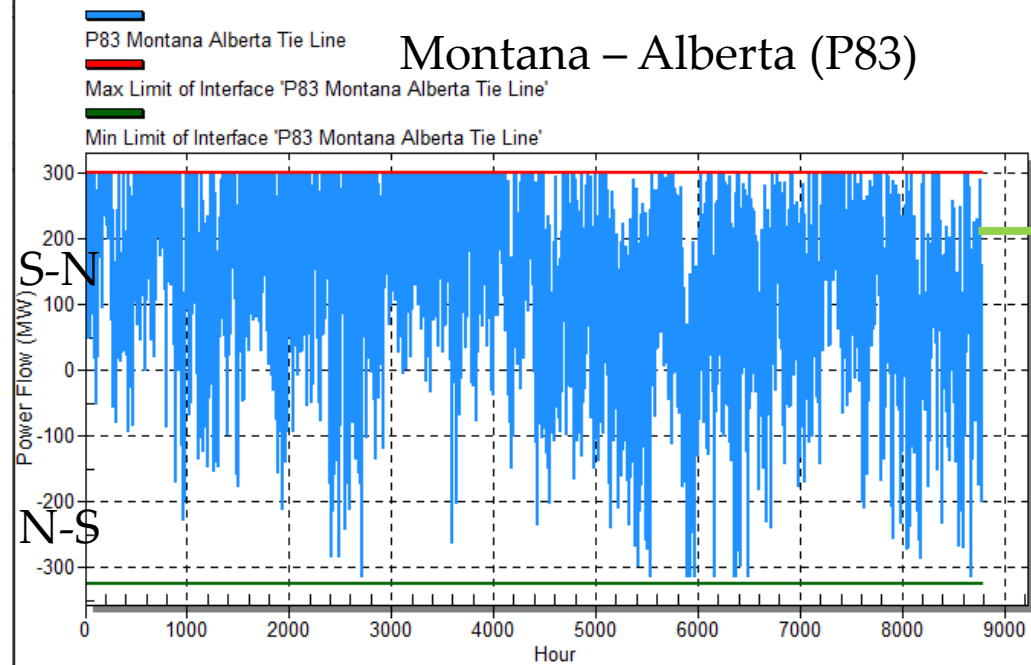
Total Path Congestion Hour

<i>Total Congestion Hours (Hr)</i>	<i>2032 ADS_V2.0</i>
P42 IID-SCE	7140
P27 Intermountain Power Project DC Line	2344
P45 SDG&E-CFE	1496
P83 Montana Alberta Tie Line	1358
P66 COI	1111
P26 Northern-Southern California	982
P01 Alberta-British Columbia	548
P24 PG&E-Sierra	348
P18 Montana-Idaho	329
P03 Northwest-British Columbia	314
P16 Idaho-Sierra	197
P48 Northern New Mexico (NM2)	183
P79 TOT 2B2	180
P75 Hemingway-Summer Lake	103

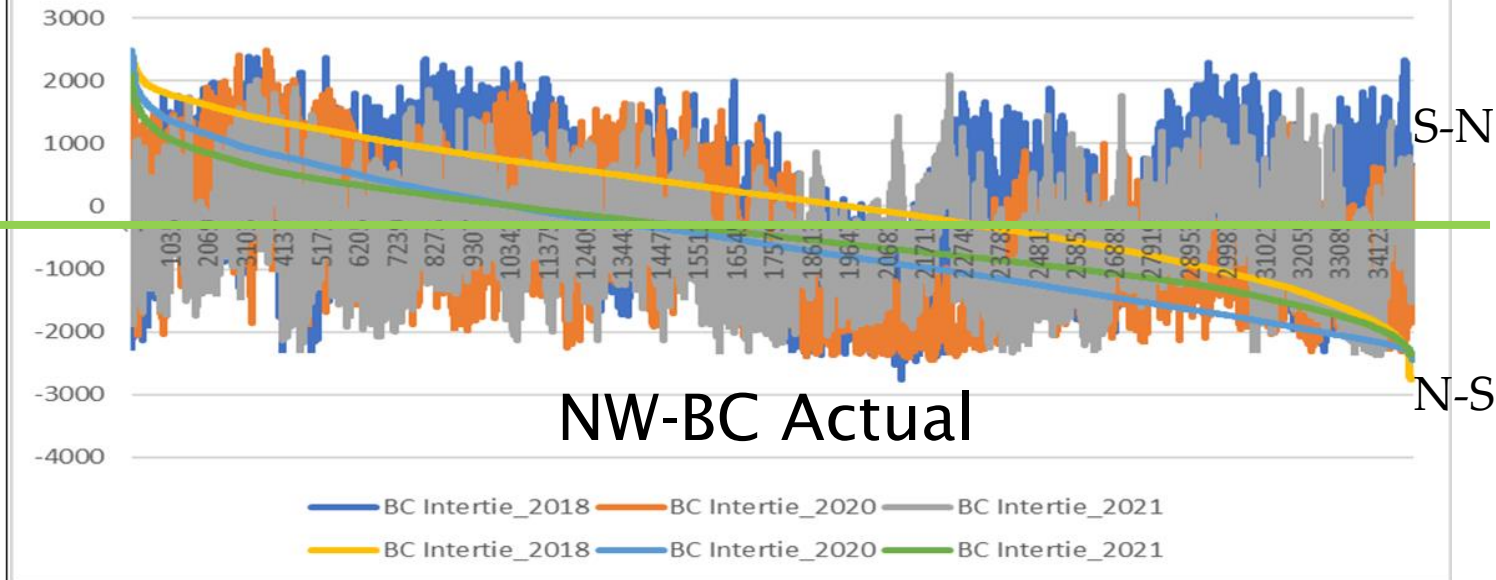
Suspicious Congestion, especially on Phase Shifters, Transformers

2032 ADS_V2.0	2032 ADS_V2.0	Total Congestion Hours (Hr)
30948_34817_1	CAISO	5136
64095_64094_1	SLVR PKX PS	4791
55469_55499_79	AESO	4246
23284_23293_1	CAISO	3242
189160_189040_1	CAISO	3074
189016_189021_1	CAISO	3062
64905_38136_1	MARBLE PS	2995
19020_24017_1	WALC	2567
25375_29402_1	CAISO	2516
29795_29789_T4	ANTLOP XFMR	2507
72818_73009_1	WACM	2411
41402_47385_1	BPAT	1988
25353_29399_1	CAISO	1911
30879_30881_1	CAISO	1841
40585_40584_1	HILTOP XFMR	1764
12181_12101_1	GLADSTN PS	1758
70911_99101_T1	Mid XFMR	1489
24979_24957_1	CAISO	1183
29570_29574_1	CAISO	1105
10968_10116_1	SW_PNM	991
40537_640518_1	HILTOP XFR	903
30470_30479_1	CAISO	842
26983_26132_1	CAISO	737
10292_10842_1	SW_PNM	718
50784_50822_2	NLY PS	669
24595_24594_3	CAISO	617
11014_11017_1	ARROYO PS	561
47844_40584_1	CAISO	541

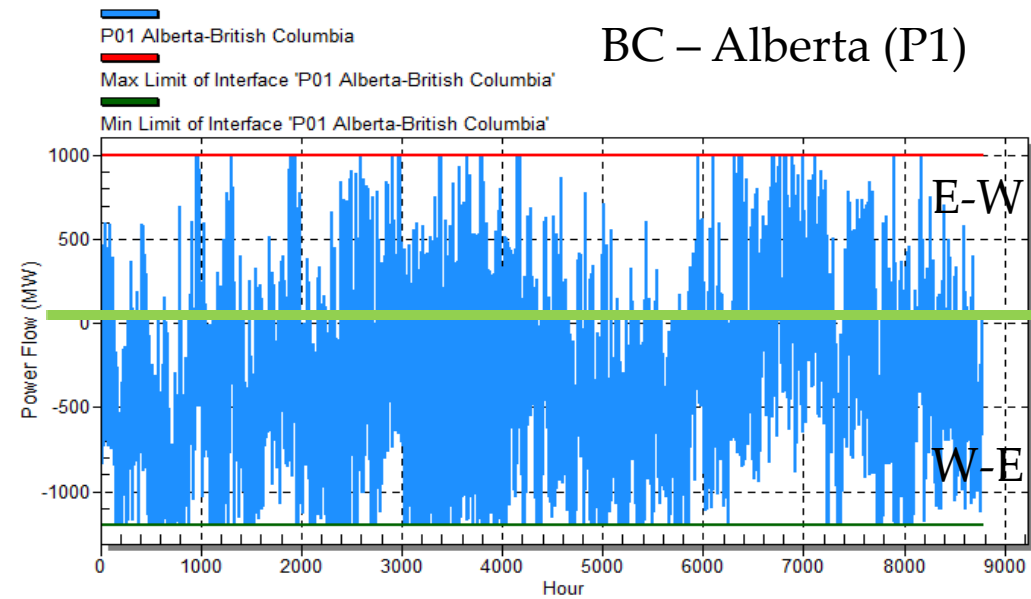
Power Flow (MW)
No Aggregation, 2032 ADS_V2.0, 8/23/2022 10:04:49 AM



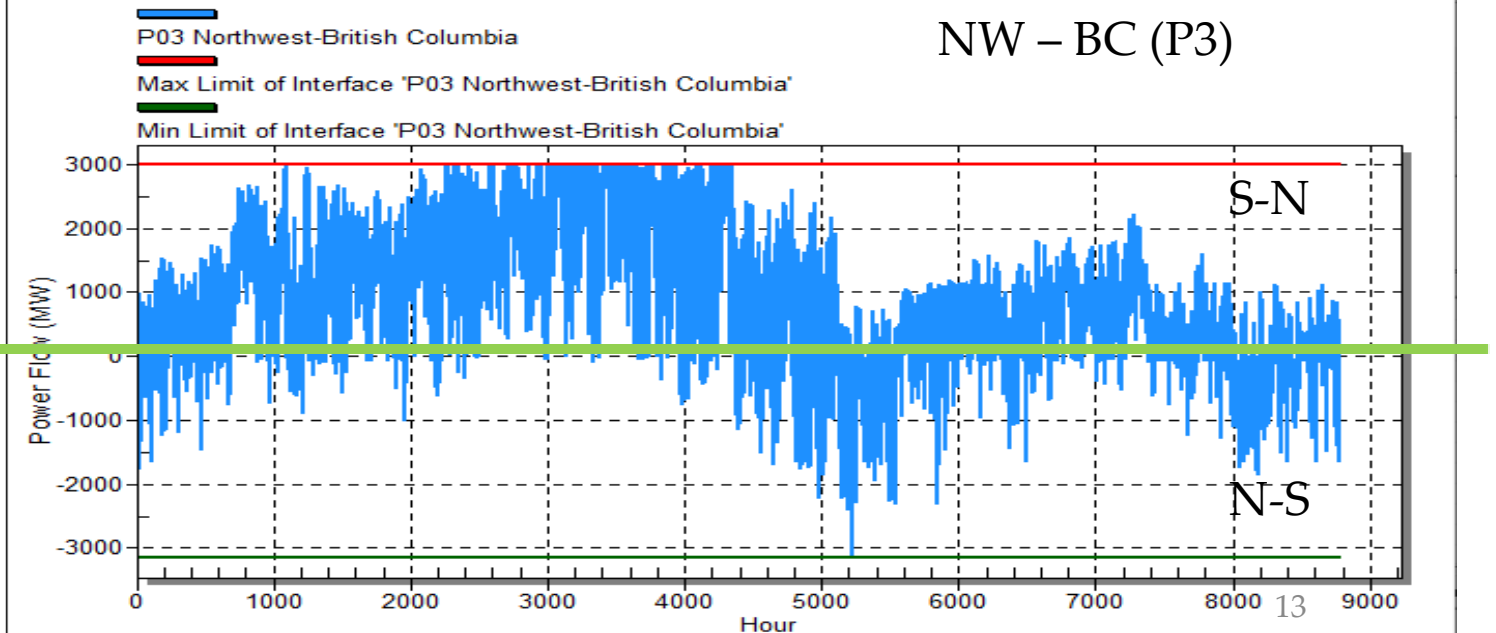
BC Intertie (West + East)



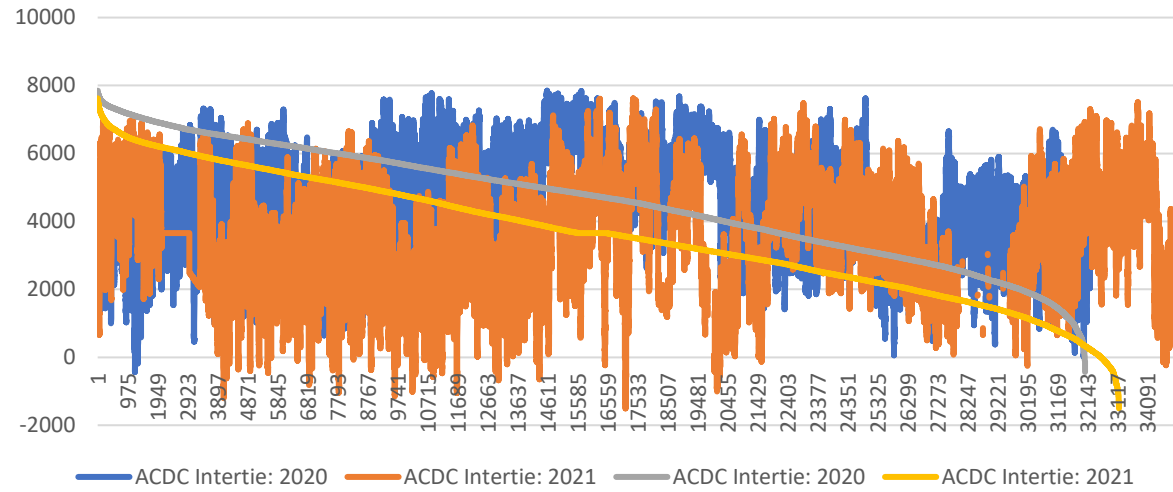
Power Flow (MW)
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Power Flow (MW)
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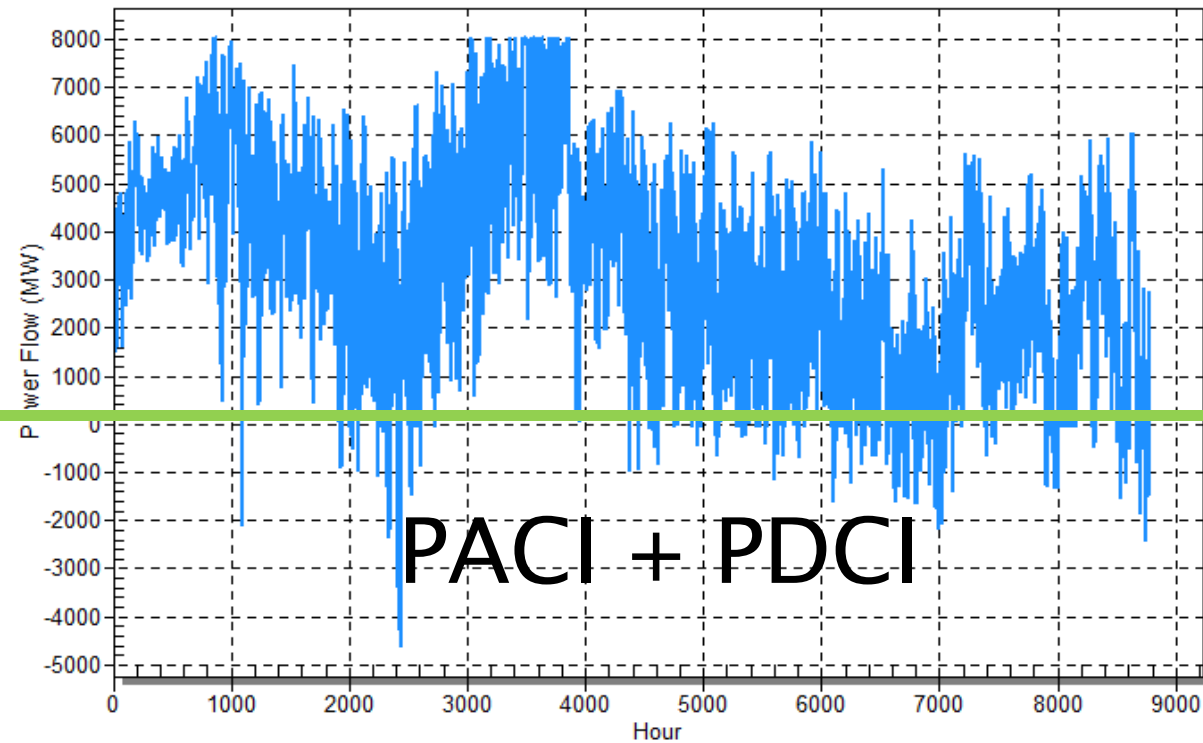


ACDC Intertie 2032 ADS



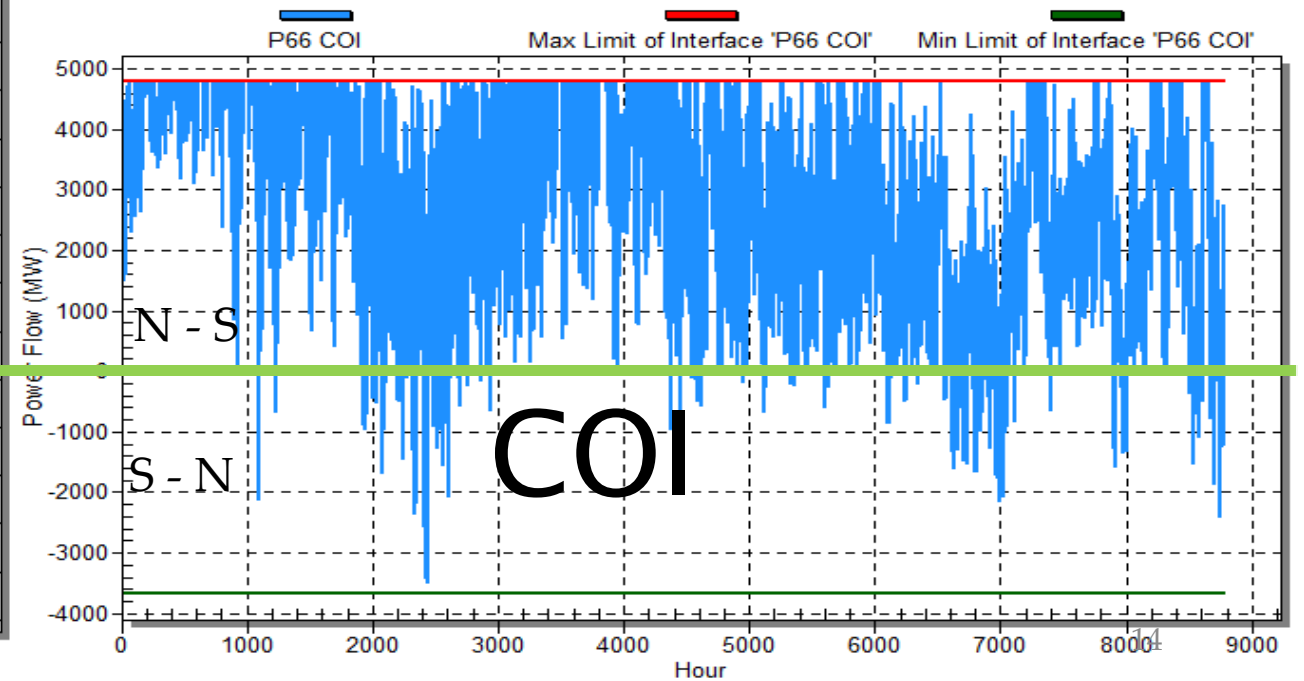
Power Flow (MW)

Sum, 2032 ADS_V2.0, 8/23/2022 10:14:31 AM

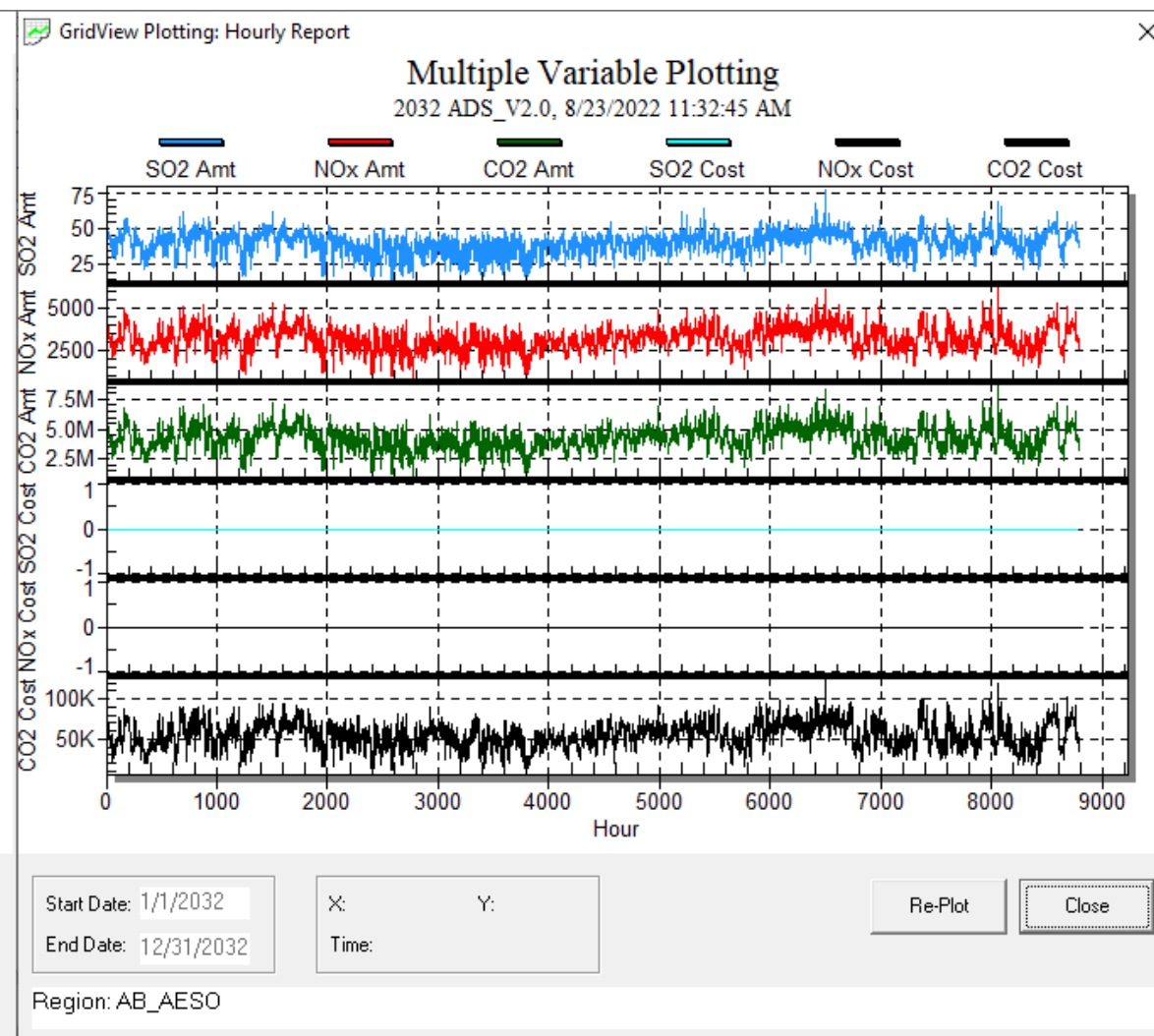
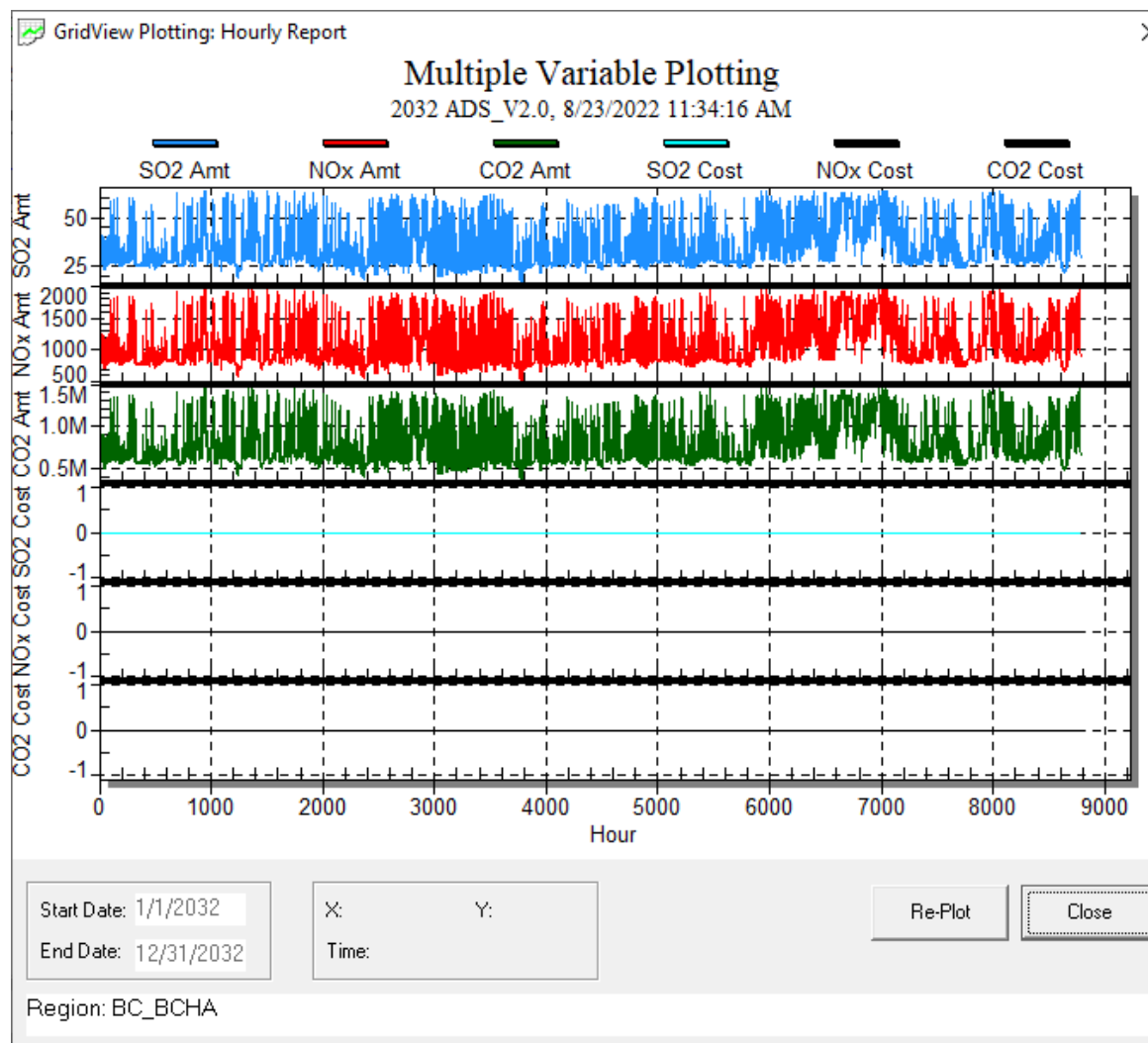


Power Flow (MW)

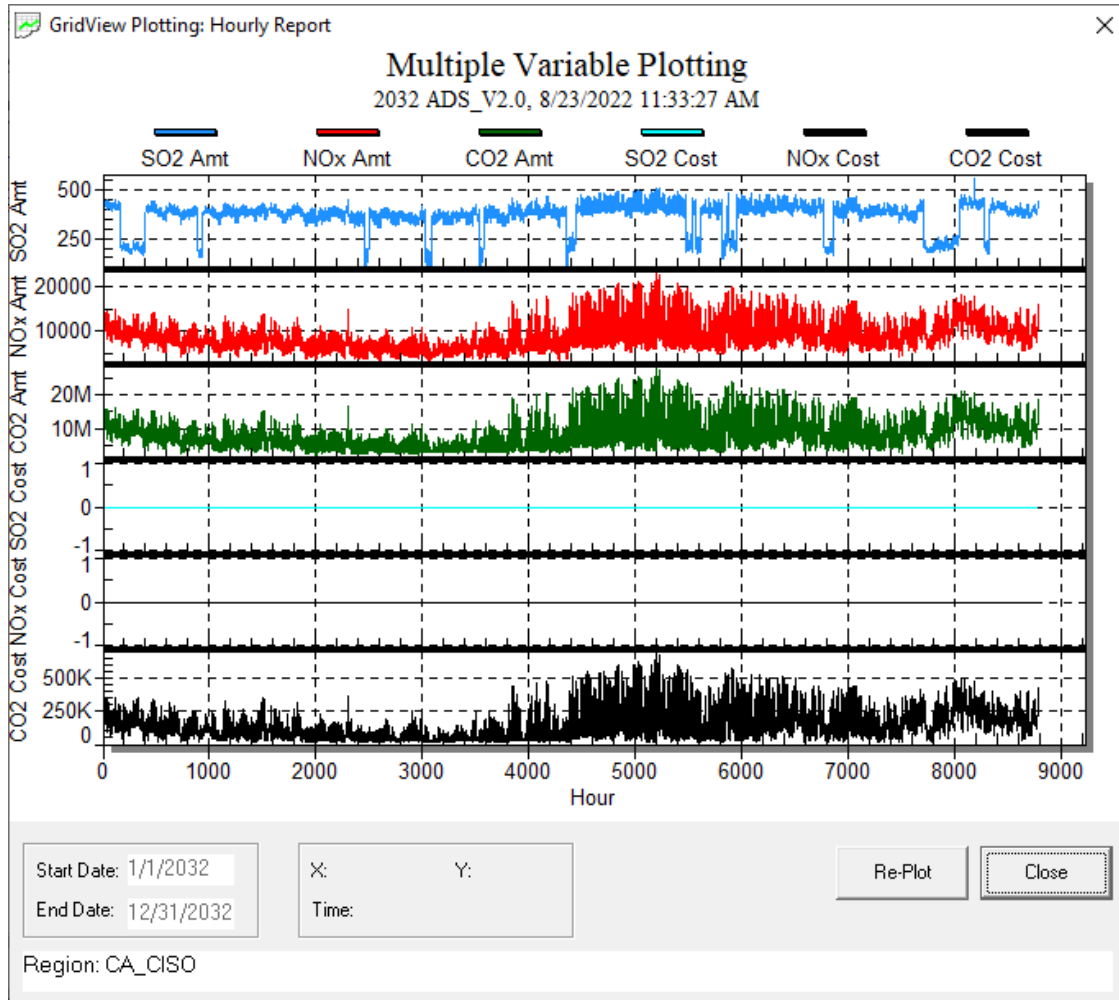
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Emission Amount – Emission Cost



Emission Amount – Emission Cost



Region	SO2 Amt (Short Ton)	NOx Amt (Short Ton)	CO2 Amt (Short Ton)	SO2 Cost (K\$)	NOx Cost (K\$)	CO2 Cost (K\$)
NW_PACW	20	2,123	4,979,660	0	0	0
NW_PSEI	25	2,698	6,420,580	0	0	0
NW_PGE	25	2,640	5,807,173	0	0	0
NW_BPAT	102	5,284	5,898,577	0	0	0
NW_CHPD	--	--	--	0	0	0
NW_DOPD	--	--	--	0	0	0
NW_GCPD	--	--	--	0	0	0
NW_SCL	--	--	--	0	0	0
NW_TPWR	--	--	--	0	0	0
NW_AVA	47	2,404	4,253,332	0	0	0

Pending Challenges associated with Version 2.0

- Imbalanced Loads and Resources in Colorado
- Problems with Unrated Paths in the reversed directions
- We have Excessive Congestion and Violations on Transmission Paths, Branches
- Still have surges in LMP prices
- Have not had time to investigate the Operation of Phase Shifters, Pump Storage, Batteries, etc.
- Still need to validate generator output by technology (e.g., acceptable capacity factor, number of starts); and if fuel prices are leading to acceptable dispatch.
- Had removed the COI and PDCI and other Nomograms from the 2030 ADS and have not had a chance to reinstate them in the 2032 ADS
- Need to adjust Operating and Flex Reserves

We've raised the "Bar" with the 2032 ADS

- We've made great advances relative to the credibility of the 2032 ADS with the help from DOE, National Labs, and Subject Matter Experts from the Industry. We've added greater resolution and better representation of renewables.
- New capabilities have been added to the software... yet we still need to confirm their resounding impact on the dispatch.
- Is the case ready for NorthernGrid to Export multiple hours to build base cases for their Transmission System Plan analyses?
- We need feedback from entities on their respective system dispatch (regions, system owners, National Labs – users of the dataset)..



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