2030 ADS PCM Release Notes

WECC

June 9, 2021

1. Executive Summary

The 2030 Anchor Data Set (ADS) Production Cost Model (PCM) represents the expected loads, resources and transmission topology 10 years in the future from a given reference year. WECC's 2030 ADS is based on a reference year of 2020, so it represents loads, resources and transmission topology in 2030. The ADS is designed to be analyzed with a production cost model (PCM). WECC uses GridView as its PCM tool.

The 2030 ADS represents the trajectory of recent Western Interconnection planning information, developments and policies looking out 10 years. The Production Cost Data Subcommittee (PCDS) stakeholders assisted the WECC System Adequacy Planning (SAP) Department in developing the thousands of assumptions that depict the Western Interconnection and how it is expected to change over the next 10 years.

A primary goal in developing the 2030 ADS is to define a realistic foundation for the rest of the Year 10 study cases included in WECC's study program. The case is also used throughout the Western Interconnection for a number of purposes, including: FERC Order 890 and 1000 planning studies by Western Planning Regions, independent transmission developers' studies, market studies (e.g., Energy Imbalance Market) and integration studies, among many others.

The purpose of these release notes is to provide transparency and explanation of the assumptions and modeling in the 2030 ADS. After the initial release of the 2030 ADS, subsequent revisions are expected to include improvements over the last. The timing and number of such additional revisions will depend on WECC's and stakeholders' needs for case enhancements, as well as on resource availability for creating additional revisions. These release notes attempt to document the assumptions used in the first release (Version 1.0) of the 2030 ADS. Subsequent versions of the 2030 ADS will be posted with incremental release notes summarizing and explaining the incremental changes between the current and previous dataset releases. The frequency of dataset releases will be determined by need and significance of dataset improvements.

The 2030 ADS data is stored and maintained in Hitachi ABB GridView (GridView or GV), which is an energy market simulation and analysis software tool distributed by Hitachi ABB. GridView uses a Microsoft Access database file (GV Case Template.mdb) and numerous text-based shape files (*.DAT) to store the 2030 ADS information. Stakeholders desiring to perform analyses using the 2030 ADS in GridView must obtain software licenses from Hitachi ABB for GridView. All cost values in this document are expressed in 2020 U.S. dollars (2020$ or $) unless otherwise as noted.

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2. Area, Region, and BA Descriptions

2.1. Areas and Balancing Authorities

The "Load Area" or "Area" topology for the 2030 ADS PCM is based on the large load centers and, in most cases, is analogous to the Balancing Authority (BA) boundaries or the Load-Serving Entity (LSE) boundaries where more granularity is needed. There are 40 designated areas that correlate with the load forecast granularity provided by WECC's annual loads and resources survey, which is overseen by the Reliability Assessment Work Group (RAWG). The generator-only BAs are not modeled as load areas (no load) and their generation is assigned to the closest defined load area.

For more information, please see Data Development and Documentation Manual (DDVM)

2.2. Regions

The 2030 ADS PCM regions are defined at an operational level that, in most cases, corresponds to the load areas but with a two-character sub region added to the front of the name (e.g., the Los Angeles Department of Water and Power (LDWP) area is the CA_LDWP region). For this level, some of the distributed load centers or LSEs are consolidated to model the operational aspects associated with a BA such as hurdle rates[1] and reserve requirements, which are explained later in this document.

For more information, please see Data Development and Documentation Manual

2.3. Trading hubs

The 2030 ADS PCM region level is also used to define trading hubs. There are three trading hubs in the Western Interconnection: Malin, Mead and Palo Verde.

For more information, please see Data Development and Documentation Manual

3. Transmission Network Model

3.1. Network Topology

The transmission network topology for the 2030 ADS PCM was carried over from the 2030HS1 Power Flow, which was compiled by the SRS using GE PSLF Software. That transmission topology was imported into the 2030 ADS PCM case as a foundation for the transmission network topology.

The only exceptions were minor to accommodate EPE's area with a transmission update, and a few other minor changes, topology changes for a few generators, DC line modeling updates.

[1] Hurdle rates represent the cost to deliver surplus energy among different regions.

3.2. Branch Description

PFM models the normal and emergency branch (line or transformer) ratings for each of the four seasons within its GE PSLF power flow model. In comparison, GridView allows the user to model three ratings for each branch for one season. Since GridView only stores one season's ratings, it uses the winter ratings from GE PSLF and de-rates them for the remaining season's ratings. By default, GridView only imports Ratings 1 and 2 from the PSLF/PFM, as shown in Table 1.**Error! Reference source not found.**

Table 1. GridView interpretation

GE PSLF Branch Ratings (MVA)	GridView Default Interpretation (MW)	GridView Default Summer De-Rate Multiplier
Rating 1: Summer Normal	Rating A: Normal Rating	1
Rating 2: Summer Emergency	Rating B: Contingency Rating	1
Rating 3: Winter Normal	Rating C: Miscellaneous/Special Rating	1
Rating 4: Winter Emergency	N/A	
Rating 5: Autumn Normal		
Rating 6: Autumn Emergency		
Rating 7: Spring Normal		
Rating 8: Spring Emergency		

Table 2 illustrates how the branch ratings are modeled within GridView so they are consistent with those modeled in the PFM.

Table 2. Modeling Branch Ratings in GridView model based on GE PSLF power flow model

GridView Branch Rating Type	Rating (MW)	Summer De-Rate Multiplier
Rating A	Rating 3 in PFM (Winter Normal)	(Rating 1 in PFM (Rating 3 in PFM)
Rating B	Rating 4 in PFM (Winter Emergency)	(Rating 2 in PFM (Rating 4 in PFM)
Rating C	0	1

The following are additional constraints modeled for the branch rating in the case:

Branch Rating	Setting	Comment
Transmission Constraint Ratings Multiplier	0.95	Approximates the megawatt equivalent of the megavolt-ampere rating from the power flow model since the production cost simulation only

Branch Rating	Setting	Comment
		implements an optimized direct-current power flow and can't use the megavolt-ampere rating directly
Transmission Constraint Ratings Normal Rating (Commitment & Dispatch)	Rating A	Branch rating and summer de-rate multiplier to use in the simulation
Summer Period Start/End Dates	June 1st to September 30th	Timeframe in which the summer de-rate is applicable

3.3. Interfaces

The interface definitions are provided by the WECC 2020 Path Rating Catalog, SRS and PCDS.

The interface names have been updated to identify WECC paths and Non-WECC paths. The ratings are shown as the yearly min and the yearly max for each interface, rather than every month as designated in the case.

These are the defined paths for the 2030 ADS PCM:

Interface Name	Yearly Min	Yearly Max
P01 Alberta-British Columbia	-1200	1000
P02 Alberta-Saskatchewan	-150	150
P03 East Side NW-BC	-400	400
P03 Northwest-British Columbia	-3150	3000
P03 West Side NW-BC	-2850	2750
P04 BPA West of Cascades-North	-10700	10700
P04 BPA West of Cascades-North w/OpLimits	-99999	9932
P04 West of Cascades-North	-10700	10700
P05 BPA West of Cascades-South	-7500	7500
P05 BPA West of Cascades-South w/OpLimits	-99999	6856
P05 West of Cascades-South	-7600	7600
P06 BPA West of Hatwai w/OpLimits	-4250	3709
P06 West of Hatwai	-4277	4277
P08 Montana to Northwest	-1350	2200

Interface Name	Yearly Min	Yearly Max
P14 Idaho to Northwest	-1340	2400
P15 Midway-LosBanos	-3265	5400
P16 Idaho-Sierra	-360	500
P17 Borah West	-4450	4450
P18 Montana-Idaho	-256	383
P19 Bridger West	-4100	4100
P20 Path C	-2250	2250
P22 Southwest of Four Corners	-9999	9999
P23 Four Corners 345/500 Qualified Path	-9999	9999
P24 PG&E-Sierra	-150	160
P25 PacifiCorp/PG&E 115 kV Interconnection	-45	100
P26 Northern-Southern California	-3000	4000
P27 Intermountain Power Project DC Line	-1400	2400
P28 Intermountain-Mona 345 kV	-1200	1400
P29 Intermountain-Gonder 230 kV	-241	241
P30 TOT 1A	-650	650
P31 TOT 2A	-690	690
P32 Pavant-Gonder InterMtn-Gonder 230 kV	-235	500
P33 Bonanza West	-785	785
P35 TOT 2C	-580	600
P36 TOT 3	-1680	1680
P37 TOT 4A	-2175	2175
P38 TOT 4B	-880	880
P39 TOT 5	-1680	1680
P40 TOT 7	-890	890
P41 Sylmar to SCE	-1600	1600

Interface Name	Yearly Min	Yearly Max
P42 IID-SCE	-600	600
P45 SDG&E-CFE	-800	408
P46 West of Colorado River (WOR)	-12250	12250
P47 Southern New Mexico (NM1)	-1048	1048
P48 Northern New Mexico (NM2)	-2150	2150
P49 East of Colorado River (EOR)	-10650	10650
P50 Cholla-Pinnacle Peak	-9999	9999
P51 Southern Navajo	-9999	9999
P52 Silver Peak-Control 55 kV	-17	17
P54 Coronado-Silver King 500 kV	-1494	1494
P55 Brownlee East	-99999	1915
P58 Eldorado-Mead 230 kV Lines	-1140	1140
P59 WALC Blythe - SCE Blythe 161 kV Sub	-218	218
P60 Inyo-Control 115 kV Tie	-56	56
P61 Lugo-Victorville 500 kV Line	-900	2400
P62 Eldorado-McCullough 500 kV Line	-2598	2598
P65 Pacific DC Intertie (PDCI)	-3100	3220
P66 BPA COI w/OpLimits	-3675	4505
P66 COI	-3675	4800
P71 BPA South of Allston	-1170	3100
P71 BPA South of Allston w/OpLimits	-1480	2974
P71 South of Allston	-1480	3100
P73 BPA North of John Day	-8800	8800
P73 BPA North of John Day w/OpLimits	-7429	7429
P73 North of John Day	-8000	8000
P75 Hemingway-Summer Lake	-550	1500

Interface Name	Yearly Min	Yearly Max
P76 Alturas Project	-300	300
P77 Crystal-Allen	-950	950
P78 TOT 2B1	-700	647
P79 TOT 2B2	-300	265
P80 Montana Southeast	-600	600
P81 Southern Nevada Transmission Interface	-3790	4533
P82 TotBeast	-2465	2465
P83 Montana Alberta Tie Line	-325	300
Pth 01 Hemingway-Longhorn	-99999	99999
Pth 02 Central Ferry - Lower Monumental	-99999	99999
Pth 03 Delaney-Palo Verde	-99999	99999
Pth 04 Delaney-Sun Valley	-99999	99999
Pth 05 Desert Basin - Pinal Central	-99999	99999
Pth 06 Paloverde - Colorado River	-99999	99999
Pth 07 GW Cent Sigurd-Red Butte	-99999	99999
Pth 08 GW South - Seg #2 Aeolus-Mona	-99999	99999
Pth 09 GW Seg 1A Windstar-Bridger	-99999	99999
Pth 10 GW Seg1B Bridger-Populus	-99999	99999
Pth 11 GW Seg 1C Populus-Borah	-99999	99999
Pth 12 GW Seg E Midpoint-Hemingway	-99999	99999
Pth 13 Hassayampa - North Gila	-99999	99999
Pth 14 I-5 Reforce Castle Rock-Troutdale	-99999	99999
Pth 14 Idaho to Northwest wB2H	-2250	3400
Pth 15 Interior-Lower Mainland	-99999	99999
Pth 16 Morgan-Sun Valley	-99999	99999
Pth 17 Northwest TL	-99999	99999

Interface Name	Yearly Min	Yearly Max
Pth 19 P8 Upgrade	-99999	99999
Pth 20 Pinal Central-Tortolita	-99999	99999
Pth 21 PW Pinal Central-Browning	-99999	99999
Pth 23 Wallula-McNary	-99999	99999
Pth 5575 TotBEast wB2H	-99999	3515
Pth 75 Hemingway-Summer Lake wB2H	-550	1550
Pth ATC _IPP DC pole balancing	-10	10
Pth ATC _PDCI DC pole balancing	-10	10
Pth AZPS xy AZ-CA	-99999	99999
Pth BPA COI plus PDCI	-6775	8020
Pth BPA Columbia Injection	-99999	1300
Pth BPA Net COB (NW AC Intertie)	-3675	4800
Pth BPA Net COB (NW AC Intertie) w/OpLimits	-3675	4505
Pth BPA North of Echo Lake	-2800	2800
Pth BPA North of Echo Lake w/OpLimits	-99999	2522
Pth BPA North of Hanford	-5100	5100
Pth BPA North of Hanford w/OpLimits	-99999	4432
Pth BPA Northwest AC Intertie (NWACI)	-3675	4800
Pth BPA Paul-Allston	-2400	2400
Pth BPA Paul-Allston w/OpLimits	-99999	2708
Pth BPA Raver-Paul	-99999	99999
Pth BPA Raver-Paul w/OpLimits	-99999	1625
Pth BPA South of Boundary	-99999	1400
Pth BPA South of Boundary w/OpLimits	-99999	1296
Pth BPA South of Custer	-99999	99999
Pth BPA South of Custer w/OpLimits	-99999	2555

Interface Name	Yearly Min	Yearly Max
Pth BPA West of John Day	-4530	4530
Pth BPA West of John Day w/OpLimits	-99999	3665
Pth BPA West of Lower Monumental	-4200	4200
Pth BPA West of Lower Monumental w/OpLimits	-99999	3863
Pth BPA West of McNary	-5230	5230
Pth BPA West of McNary w/OpLimits	-99999	4962
Pth BPA West of Slatt	-4670	4670
Pth BPA West of Slatt w/OpLimits	-99999	4000
Pth IPC Midpoint West	-4400	4400
Pth LADWP IPP DC South	-50000	50000
Pth LADWP PDCI South	-3220	3100
Pth PAC Aeolus South	-1700	1700
Pth PAC Aeolus West	-2672	2672
Pth PAC xy WY-UT	-1700	1700
Pth SRP Palo Verde East	-8010	8010
W_Iface_Idaho-NW	-99999	99999
W_Iface_Montana-NW	-99999	99999
W06_NW_BPAT+__BC_BCHA	-99999	99999
zzz N gr IV-SDGE Area Import	-99999	99999
zzz N Path 18 Exp 2	-99999	99999
zzz N Path 18 Imp 2	-99999	99999
zzz N Path 22_part1	-99999	99999
zzz N Path 22_part2	-99999	99999
zzz N SDGE Area Imp	-99999	99999

3.4. Nomograms

Nomograms are special constraints designed to mimic specific operational limitations such as:

- Path or branch coordination schemes
- Generation and import coordination
- Area local generation support (voltage and frequency response)

Nomograms are expressed as a series of algebraic elements in the form

$$ax + by + cz + \cdots \leq M$$

A user defined cost penalty is assessed whenever the equation becomes false. Complex constraints can be built using multiple nomograms to define the constrained operation. The active nomograms included in this ADS case are described in Table 3.

Table 3: Nomograms in 2030 ADS

Active Nomogram	Purpose
EPE Balance	EPE generation will meet 85% or greater of its local load
TEP Local Gen	TEP generation will meet 32% or greater of its local load
Path 8_1, and Path 8_2	The interaction of Path 8, Montana to Northwest, and Montana hydro generation is modeled
w_AB32_NW_Tier1_Exports	Price penalty on imported GHG to California

3.5. Contingency and Special Protection Schemes (SPS)

Phase shifters are used in transmission operations to control and balance power flow on parallel transmission lines by shifting the phase of the reactive power. In this case, the phase shifter modeling settings are tuned to minimize the number of phase angle change operations during the year. The model and tuning is done using current or historical phase shifter operations.

In this PCM case, contingencies are not modeled.

3.6. Transmission Derates

See DDVM. Transmission Derates are not modeled.

For more information, please see [Data Development and Documentation Manual]

4. Generation Resources

The resources for the 2030 ADS PCM were placed in accordance with the ADS workflow provided by the ADSTF (Anchor Data Set Task Force). This workflow concluded with the 2030 ADS PCM mapping to the Loads and Resources (L&R) Dataset, but had many steps in between which included:

- Use the 2030 ADS Power Flow units
- Map the 2030 ADS Power Flow units to the L&R dataset
- Remove any 2030 ADS Power Flow case units that are not in the L&R dataset
- Add any L&R dataset units that were not in the original 2030 ADS Power Flow case

This ended with the 2030 ADS PCM case being mapped to the L&R resources. Later, a large generation deficiency was noticed in the CFE area. The decision was made by the PCDS (Production Cost Data Subcommittee to add in the CFE area 2030ADS Power flow generation units to cover the unserved load in that area.

This resulted in the 2030 ADS PCM case aligning with the L&R dataset with a minor exception in CFE and EPE area.

The table below provides a summary of the available generation by generation type.

Gen Type	Alberta	British Columbia	Basin	California + Baja MX	Desert Southwest	Northwest	Rocky Mountain	Total
Hydro	899	17,496	2,372	9,447	2,615	31,982	2,644	67,455
Steam	4,681	11	5,049	851	9,475	2,941	4,821	27,829
Combined Cycle	4,600	310	2,238	26,255	16,934	6,988	3,590	60,915
Combustion Turbine	5,336	179	1,529	12,396	5,800	1,105	2,937	29,283
Internal Combustion	39	0	77	379	377	340	271	1,482
Energy Storage	0	0	586	7,564	1,123	1,348	530	11,151
Biomass	295	831	5	992	16	610	0	2,749
DG/DR/EE	0	0	1,322	22,807	5,673	306	2,164	32,271
Geothermal	0	0	113	2,469	842	0	0	3,424
Solar	247	95	4,423	20,669	11,031	1,406	2,204	40,074
Wind	4,020	779	7,126	7,491	3,100	8,038	5,318	35,871
Other	29	0	0	(28)	0	200	721	923
Total	20,146	19,700	24,839	111,293	56,986	55,262	25,198	313,425

4.1 Thermal Resources—Data Development

The 2030 ADS case includes several changes to thermal resources, including retirements of several coal-fired units, conversions of a few coal-fired units to gas-firing, and many other additions of mostly gas-fired simple-cycle gas turbines and combined cycle plants. There were also a few cancelations. The changes were mainly sourced from the L&R data submittals.

4.1.1 Significant Thermal Retirements and Cancelations

The most significant thermal retirements and cancelations since the 2028 ADS case are listed in Table 4.

Table 4: Thermal Retirements & Cancelations

Unit	Capacity	Fuel	State	Action	Date
Bowie CC	1080	Gas	AZ	Cancel	3/31/2020
Cherokee 4	383	Coal	CO	Retire	12/31/2027
Copper Crossing	819	Gas	AZ	Cancel	3/31/2020
Craig 2	428	Coal	CO	Retire	12/31/2025
Escalante 1	268	Gas	NM	Retire	12/31/2020
Inland Empire CC 1	376	Gas	CA	Retire	1/15/2019
Inland Empire CC 2	366	Gas	CA	Retire	1/15/2019
Jim Bridger 1	531	Coal	WY	Retire	12/31/2023
Jim Bridger 2	527	Coal	WY	Retire	12/31/2028
Naughton 1	156	Coal	WY	Retire	12/31/2025
Naughton 2	201	Coal	WY	Retire	12/31/2025
Newman 6,7	640	Gas	TX	Cancel	3/31/2020
Pawnee CC	530	Gas	CO	Cancel	3/31/2020
Red Hawk CC 3	486	Gas	AZ	Cancel	3/31/2020
Red Hawk CC 4	486	Gas	AZ	Cancel	3/31/2020
San Juan 1	340	Coal	NM	Retire	6/30/2022
San Juan 4	507	Coal	NM	Retire	6/30/2022

4.2. Storage

Storage in WECC includes batteries, pumped hydro, and compressed air energy storage (CAES) devices. Table 5 shows total energy storage (ES) and pumped hydro units by area that were modelled in ADS 2030 by area.

Table 5: Storage by Area

Area	Battery Storage(MW)	Pumped Hydro (MW)
AZPS	409.295	0
BPAT	5	499.98
CIPB	2.5	0
CIPV	1384.125	1632.57
CISC	1932.4	207
CISD	723.1	40
EPE	100	0
IID	31	0
NEVP	285	0
PACW	841.25	0
PAUT	407.7	0
PAWY	178.35	0
PNM	20	0
PSEI	2	0
SPPC	100	0
TEPC	61.4	0
LDWP	0	1620
PSCO	0	324
SRP	0	147
WACM	0	205.8
Grand Total	**6483.12**	**4676.35**

4.3. Hydroelectric Resources

Hydro generation is a significant resource in the Western Interconnection. In ADS 2030, hydro generation is modeled using a variety of methods that attempt to capture the unique operating characteristics of the resource. A mixture of hydrothermal co-optimization (HTC) technique, proportional load following (PLF) algorithms and fixed hourly shapes based on historical time series were used to model hydro generation. Hydro dispatchability constraints due to environmental or other operational factors (e.g., irrigation water deliveries, flood control, environmental release) were captured in the model using minimum and maximum operating levels, monthly energy limits, monthly load proportionality constants (*K* values), and monthly hydrothermal co-optimization fractions (p factors), when applicable.

The initial modeling parameters were determined on a plant level and spread into hydro modeling regions. In all hydro modeling regions, plants were categorized as large (> 10-MW capacity) or small (< 10-MW capacity). The exception to this was in California, which had a special Renewable Portfolio Standard (RPS) category for plants with capacities from 10 MW through 30 MW. Plants smaller than 10-MW capacity were rolled up and modeled as a PLF *K*=0 large plant.

Where possible hydro units were aggregated at plant level to simplify the process of maintaining and processing data. For other units, plant-level modeling was then spread to unit-level modeling. The hourly shapes and energy targets were spread proportionally based on the nameplate of the units in each plant. PLF and HTC hydro units were assigned the same K values and p factors as their plants because these modeling parameters are measures of responsiveness to load levels and locational marginal prices (LMP) rather than parameters that depend on unit or plant size. The PLF/HTC modeling methods were used to model most hydro generation in ADS 2030. *P* and *K* factors for hydro plants were calculated using Gridview Engine. Monthly average generation values for both HTC and PLF plants came from the EIA 906/920 data for 2009. Smaller plants were modeled using estimated PLF constants and EIA 906/920 generation values.

California small hydro was disaggregated from the conventional hydro to more accurately track its contribution to RPS requirements (this includes plants from 10- through 30-MW capacity).

Conventional Hydro resources outside of California were given an dispatch price of -$50 to ensure that they would not curtail before Solar and Wind resources.

Modeling Hydroelectric Ramp Rates

Many hydroelectric units are technically capable of extremely quick ramping, able to go from zero to full output in as little as 15 minutes; however, many hydroelectric facilities are limited by environmental water usage restrictions (e.g., allowing for fish migration).

Table 6 shows total hydro and hydro RPS that were modelled in ADS 2030, by region.

Table 6: Total Hydro and Hydro RPS by Region

Area	Hydro (MW)	Hydro RPS (MW)
AESO	899	0
AVA	1083.85	0
BANC	2589.8	17.26

Area	Hydro (MW)	Hydro RPS (MW)
BCHA	17495.84	0
BPAT	20709.4	0
CHPD	1816.2	0
CIPB	0	12.49
CIPV	4633.857796	556.39
CISC	1036.842309	59.2
DOPD	840	0
GCPD	2049	0
IID	84.31	0
IPFE	92.34	0
IPMV	572.95	0
IPTV	1384.22	0
LDWP	299	0
NWMT	637.7	0
PACW	815.883	4.2
PAID	276	0
PAUT	41.5	0
PGE	705.93	0
PNM	23.3	0
PSCO	127.96	0
PSEI	346.65	0
SCL	1912.2	0
SRP	90.5	0
TH_Mead	2074	0
TIDC	158.2	0
TPWR	952.8	0
WACM	2515.6	0
WALC	427.5	0
WAUW	112.8	0
Grand Total	**66805.13311**	**649.54**

4.4. Variable Renewable Resources

Variable Renewable Resources include wind and solar generation. These generators are on a fixed hourly schedule in the 2030 ADS PCM case. The hourly shapes are specific for each wind and solar generator. The wind hourly shapes use 2009 NREL wind speed and weather data. The solar hourly shapes are using 2009 NREL irradiance and weather data. Most variable renewable resources can curtail or dump energy if the LMP goes below -$25, the dispatch cost in the variable monthly schedule. The 2030 ADS case includes 36,535 megawatts of wind and 40,247 megawatts of solar resources. The table below shows the area capacities.

All hourly profiles in the ADS are in mountain standard time (MST). Profiles stay in MST the entire year; they are not shifted for day light savings time.

Area	Wind Capacity (MW)	Solar Capacity (MW)
AESO	4,020	247
AVA	105	0
AZPS	227	903
BANC	0	206
BCHA	779	95
BPAT	4,970	5
CFE	130	401
CHPD	0	0
CIPB	914	20
CIPV	369	3,908
CISC	5,264	11,927
CISD	641	578
DOPD	0	0
EPE	247	529
GCPD	0	0
IID	0	563
IPFE	80	20
IPMV	197	0

Area	Wind Capacity (MW)	Solar Capacity (MW)
IPTV	324	308
LDWP	424	2,125
NEVP	0	3,183
NWMT	760	17
PACW	1,033	1,378
PAID	1,495	0
PAUT	160	3,225
PAWY	4,870	870
PGE	854	0
PNM	2,064	848
PSCO	4,752	1,636
PSEI	527	6
SCL	0	0
SPPC	150	1,422
SRP	0	1,872
TEPC	190	512
TH_Mead	425	180
TH_PV	0	550
TIDC	0	0
VEA	0	1,114
WACM	566	568
WALC	0	1,033
WAUW	0	0

4.5. Distributed Generation Facilities and Demand Response

Demand Response

The Demand Response (DR) forecast is developed by the Lawrence Berkeley National Lab (LBNL).

Demand Response is defined as customer reduction in electricity usage, such that the customer's normal consumption pattern is reduced in response to price changes or incentive payments designed to lower electricity use at times of system stress or high market prices.

Demand Response is modeled as an hourly resource that is fed directly into the model. To develop the hourly DR profiles WECC has used the LBNL Dispatch Tool. The tool requires three user-defined inputs:

1) maximum monthly DR capacity for each (non-interruptible) DR program type and BA;
2) hourly energy load for each BA; and
3) hourly locational marginal prices (LMP) for each BA from GridView.

Below are the capacities for Demand Response:

Area Name	MaxCap (MW)
AZPS	0
BANC	605.43
BPAT	0
CIPB	0
CIPV	109.29
CISC	883.56
CISD	35.49
EPE	46.83
IPFE	121.56
IPMV	123.96
IPTV	110.71
LDWP	550
NEVP	197.85

Area Name	MaxCap (MW)
PACW	73.75
PAID	179.8
PAUT	508.35
PAWY	6.47
PGE	0
PNM	84.01
PSCO	538.58
PSEI	0
SPPC	0
SRP	32.39
TEPC	171.24
WACM	51.67

Distributed Generation

The 2030 ADS PCM assumes that Distributed Generation (DG) is not included in the L&R load forecasts. The definition of DG includes two parts:

- **Behind-the-meter (BTM) DG** – small-scale solar PV installations that individual customers would install to avoid purchasing electricity from an electric utility.
- **Wholesale DG** – PV systems that are connected directly to the electric distribution network and sell the electricity on the wholesale market, typically 1–20 MW and often procured to meet state DG targets.

Currently DG is being modeled as a resource in the dataset. The DG in the case is modeled as roof-top PV from the L&R dataset. Other DG is carried over from the 2028 ADS PCM. The 2028 ADS shapes were provided by PNNL taken from NREL for DG 2028.

Behind-the-meter DG is provided by estimates developed by E3 and LBNL and vetted through the PCDS. These capacities are used to develop "fixed rooftop" solar PV profiles and modeled as a fixed-shape resource. Wholesale DG is provided to the dataset like any other resource—by L&R data submittals, the EIA and IRPs—and validated through the generator reconciliation effort.

Below are the capacities for Distributed Generation:

Area Name	MaxCap (MW)
AVA	12
AZPS	2815
BANC	716.46
BPAT	1
CIPB	3057.065
CIPV	6958.869
CISC	6573.81
CISD	2181.178
DOPD	2
EPE	316
GCPD	4
IID	198.9
IPFE	3
IPMV	6
IPTV	30
LDWP	744.78
NEVP	599.4
NWMT	29
PACW	73
PAID	44
PAID	7
PAUT	169
PAWY	12
PGE	79
PNM	132
PSCO	1513

Area Name	MaxCap (MW)
PSEI	24
SCL	6
SPPC	83
SRP	438
TEPC	433
TIDC	191.86
WACM	60.3
WALC	324
WAUW	2

4.6. Resource Adequacy

The determination of having adequate planning margins across all regions of the western interconnection is an important step in the development of a PCM case. This is one of the last steps after the loads and resources are finalized.

The tool for calculating resource adequacy was developed by E3 and requires data that is not collected by the current data collection processes. Hence, the resource adequacy was not calculated for the 2030 ADS case.

5. Load Data

The WECC Loads and resources (L&R) information used for the 2030 ADS is a combination of loads collected by the 2019/2020 WECC L&R data collection and those collected by the California Energy Commission (CEC). The CISO areas; CIPB, CIPV, CISC, and CISD; used the CEC forecast. All others used the L&R forecast. These loads are adjusted for distributed generation (DG) and pump loads. The final loads are used with a 2009 historical load shape to derive load shapes for the 2030 ADS.

All hourly profiles in the ADS are in mountain standard time (MST). Profiles stay in MST the entire year; they are not shifted for day light savings time.

L&R data codes used for peak data:

- 1: Firm demand
- 2-I: Expected available interruptible demand

- 2-L: Expected available load management
- 2-P: Expected available critical peak pricing with control
- 2-R: Expected available load as a capacity resource
- 19: Expected demand served by rooftop solar

L&R data codes used for energy data

- 1: Firm energy
- 2: Non-firm energy

2030 Monthly Peak (MW)

Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
AESO	12,928	12,844	12,447	11,298	11,228	11,751	12,410	12,289	11,866	11,590	12,550	13,241
AVA	2,325	2,256	2,110	1,814	1,737	1,960	2,178	2,172	1,834	1,854	2,090	2,360
AZPS	6,073	5,820	5,308	6,013	6,779	8,184	8,821	8,961	7,986	6,337	5,252	5,842
BANC	2,639	2,563	2,398	2,740	3,587	4,585	4,915	4,810	4,190	2,819	2,508	2,659
BCHA	11,694	11,110	10,529	9,475	8,700	8,631	9,056	9,048	8,754	9,848	11,300	12,204
BPAT	12,812	12,199	11,330	10,681	9,869	9,879	10,412	10,355	9,650	10,423	11,722	12,901
CFE	2,089	2,089	2,271	2,645	3,056	3,664	4,168	4,301	4,119	3,091	2,401	2,220
CHPD	497	436	368	296	234	246	274	266	245	301	362	459
CIPB	5,961	5,828	5,731	6,098	7,159	8,341	8,753	8,390	8,103	6,776	6,103	6,134
CIPV	9,143	9,291	9,052	10,087	11,846	13,273	14,144	14,059	13,284	10,737	9,111	9,738
CISC	14,350	14,399	14,719	17,101	18,835	21,122	23,458	24,780	25,868	20,808	15,408	14,995
CISD	3,421	3,418	3,324	3,365	3,681	3,731	4,168	4,526	5,021	4,133	3,486	3,496
DOPD	464	424	383	283	290	331	354	354	320	383	409	464
EPE	1,415	1,353	1,380	1,570	1,935	2,308	2,266	2,254	2,112	1,795	1,373	1,447
GCPD	1,388	1,497	1,380	1,340	1,442	1,443	1,485	1,485	1,385	1,252	1,351	1,369
IID	444	465	608	776	986	1,167	1,210	1,248	1,110	875	559	482
IPFE	386	362	335	313	390	694	698	601	418	318	343	359
IPMV	750	692	641	666	945	1,479	1,450	1,329	949	641	664	719
IPTV	1,767	1,591	1,450	1,345	1,664	2,433	2,616	2,520	1,920	1,393	1,531	1,660

Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
LDWP	4,917	5,022	5,238	5,613	5,874	6,493	6,949	7,801	7,258	6,108	5,115	4,958
NEVP	2,560	2,451	2,381	3,434	4,846	6,541	7,000	6,392	5,505	3,839	2,309	2,460
NWMT	1,944	2,061	2,025	1,641	1,618	1,747	2,054	2,071	1,974	1,933	1,911	1,809
PAUT	5,336	5,095	4,868	4,656	5,889	7,276	7,924	7,881	6,681	5,258	5,140	5,431
PAID	1,001	971	883	824	884	1,256	1,336	1,145	884	807	906	1,035
PAWY	1,341	1,319	1,307	1,233	1,202	1,312	1,361	1,337	1,253	1,260	1,295	1,349
PACW	4,016	3,648	3,523	3,317	3,131	3,325	3,843	3,723	3,283	3,275	3,645	3,967
PGE	3,612	3,464	3,239	3,022	3,339	3,456	3,785	3,907	3,432	2,899	3,371	3,809
PNM	2,252	2,194	2,144	2,022	2,350	2,879	3,042	2,908	2,628	2,222	2,284	2,403
PSCO	7,906	7,905	7,251	6,822	7,965	10,014	10,666	9,994	9,263	7,073	7,735	8,201
PSEI	5,047	4,961	4,363	4,149	3,590	3,370	3,921	4,151	3,223	3,845	4,915	5,205
SCL	1,585	1,542	1,411	1,301	1,158	1,187	1,205	1,195	1,127	1,256	1,441	1,583
SPPC	1,592	1,555	1,512	1,455	1,619	2,043	2,169	2,097	1,731	1,456	1,522	1,634
SRP	5,758	5,337	5,321	6,524	7,503	9,215	9,583	9,348	8,300	6,977	5,118	5,537
TEPC	2,361	2,193	2,167	2,428	2,922	3,454	3,644	3,534	3,252	2,750	2,217	2,378
TIDC	368	362	368	434	555	649	677	676	615	484	371	375
TPWR	835	826	762	713	613	567	596	583	571	655	736	914
WALC	1,289	1,305	1,083	1,438	1,539	1,830	1,788	1,860	1,833	1,391	1,233	1,239
WAUW	142	140	126	122	107	128	160	161	118	103	113	123

Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
WACM	3,944	4,001	3,880	3,394	3,347	4,065	4,473	4,258	4,291	3,864	3,813	3,882

2030 Monthly Energy (GWh)

Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
AESO	8,641	7,627	8,426	7,599	7,616	7,486	8,207	8,132	7,599	8,042	8,107	8,857
AVA	1,380	1,198	1,163	1,024	1,025	1,031	1,148	1,117	1,016	1,075	1,171	1,350
AZPS	3,478	3,118	3,382	3,438	3,958	4,750	5,403	5,346	4,584	3,842	3,223	3,485
BANC	1,525	1,264	1,298	1,242	1,344	1,574	1,819	1,772	1,531	1,347	1,337	1,539
BCHA	6,762	6,255	6,032	5,352	5,242	4,821	4,946	4,972	4,910	5,033	5,394	5,883
BPAT	6,956	6,034	6,051	5,622	5,635	5,567	6,009	5,936	5,345	5,641	6,146	7,017
CFE	1,310	1,191	1,432	1,598	1,859	2,196	2,674	2,720	2,390	1,855	1,452	1,348
CHPD	229	203	173	149	136	129	141	140	138	142	190	224
CIPB	3,860	3,423	3,766	3,733	4,128	4,338	4,916	4,785	4,385	4,027	3,650	3,882
CIPV	4,938	4,460	4,895	4,982	5,478	5,673	6,444	6,252	5,735	5,170	4,694	5,032
CISC	8,541	7,595	8,313	8,305	9,040	9,361	11,141	11,194	10,764	9,359	7,971	8,473
CISD	1,998	1,785	1,932	1,871	2,002	1,964	2,250	2,289	2,288	2,128	1,906	2,009
DOPD	243	223	182	149	165	183	202	203	161	188	208	245
EPE	857	810	771	782	835	1,011	1,114	1,104	1,095	920	774	806
GCPD	859	779	820	808	865	851	916	893	814	787	777	839

Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
IID	269	246	282	283	361	471	520	519	433	345	255	271
IPFE	225	196	189	187	211	254	290	250	206	183	195	218
IPMV	428	362	350	365	495	632	680	627	453	346	359	419
IPTV	1,028	852	817	787	876	1,047	1,254	1,215	909	793	854	997
LDWP	2,029	1,841	2,074	1,998	2,104	2,274	2,540	2,594	2,497	2,261	1,963	2,035
NEVP	1,495	1,311	1,372	1,413	1,917	2,506	2,984	2,797	2,196	1,542	1,339	1,508
NWMT	1,168	1,184	1,158	1,020	1,030	1,046	1,149	1,174	1,061	1,110	1,164	1,141
PAUT	2,849	2,500	2,597	2,492	2,674	3,032	3,587	3,437	2,868	2,632	2,601	2,857
PAID	564	512	501	468	491	587	694	575	478	451	484	585
PAWY	880	795	841	800	810	838	870	827	799	814	828	890
PACW	2,128	1,816	1,866	1,742	1,743	1,756	1,973	1,941	1,732	1,750	1,876	2,155
PGE	2,142	1,836	1,899	1,729	1,733	1,735	1,937	2,006	1,804	1,775	1,873	2,179
PNM	1,196	1,036	1,084	1,022	1,120	1,272	1,379	1,331	1,146	1,087	1,099	1,209
PSCO	4,522	3,986	4,181	3,782	3,965	4,393	5,015	5,070	4,155	4,160	4,107	4,580
PSEI	2,480	2,159	2,208	1,910	1,769	1,696	1,766	1,773	1,712	1,923	2,182	2,566
SCL	880	780	806	717	690	658	697	697	666	716	784	886
SPPC	832	761	796	771	805	868	998	963	839	803	793	834
SRP	2,778	2,474	2,717	2,790	3,376	4,176	4,737	4,561	3,831	3,106	2,670	2,853
TEPC	1,404	1,266	1,279	1,324	1,512	1,760	1,949	1,949	1,705	1,452	1,281	1,419

Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TIDC	211	185	200	200	236	278	318	311	268	236	203	213
TPWR	529	466	471	413	376	361	378	381	359	418	449	523
WALC	635	668	600	749	822	926	1,030	1,006	925	772	617	563
WAUW	81	79	75	63	58	66	88	79	60	62	66	68
WACM	2,618	2,424	2,423	2,158	2,227	2,210	2,683	2,550	2,291	2,309	2,365	2,554

6. Costs and Economics

6.1. Reference Year for Cost Data

The base year and reference year cost used for this case was year 2020. Cost data such as fuel prices, variable Operations and Maintenance (O&M) rates, and startup costs are often provided in different year's dollars than the base year the cost is modeled in the ADS case. This requires all cost to be converted to base year. These conversions were based on the Moody's GDP Inflator/Deflator series, licensed to the CEC. The Moody's series has an average annual inflation from 2018 through 2020 of 104.373 percent.

6.2. Thermal Fuel Prices

Natural gas prices were based on CEC and NWPCC Natural Gas prices. Other fuel prices were carried over from 2028 ADS PCM and converted to year 2020 dollars. The fuel prices used in 2030 ADS PCM are as follows.

Fuel Name	Fuel Price ($/MMBTU)
Bio_Agri_Res	0.54
Bio_Blk_Liquor	0.01
Bio_Landfill_Gas	2.26
Bio_Other	2.9
Bio_Sludge_Waste	0
Bio_Solid_Waste	0
Bio_Wood	2.88
Coal_Alberta	1.777
Coal_Apache	1.433
Coal_AZ	1.8
Coal_Battle_River	1.777
Coal_CA_South	1.957
Coal_Centennial_Hard	1.221
Coal_Centralia	0.838

Fuel Name	Fuel Price ($/MMBTU)
Coal_Cholla	1.605
Coal_CO_East	1.487
Coal_CO_West	1.965
Coal_Colstrip	1.213
Coal_Comache	0.822
Coal_Coronado	0.83
Coal_Craig	1.879
Coal_Escalante	1.581
Coal_Four_Corners	1.589
Coal_Hayden	1.401
Coal_ID	1.041
Coal_Intermountain	1.44
Coal_Jim_Bridger	1.714
Coal_Martin_Drake	0.9
Coal_MT	1.229
Coal_Naughton	1.566
Coal_Navajo	1.988
Coal_NM	1.777
Coal_NV	1.926
Coal_PNW	1.738
Coal_Reid_Gardner	1.339
Coal_Springerville	1.198
Coal_Sunnyside	1.378
Coal_UT	1.534
Coal_Valmy	1.597
Coal_WY_E	0.791

Fuel Name	Fuel Price ($/MMBTU)
Coal_WY_PRB	0.689
Coal_WY_SW	1.675
Coal_Wyodak	0.845
DefaultFuel	9.99
Geothermal	0
NG_AB	2.3539
NG_AZ North	3.0058
NG_AZ South	3.0402
NG_Baja	3.1793
NG_BC	3.5237
NG_CA PGaE BB	3.8772
NG_CA PGaE LT	4.7117
NG_CA SDGE	4.6366
NG_CA SJ Valley	3.8654
NG_CA SoCalB	3.1032
NG_CA SoCalGas	4.6802
NG_CO	3.1554
NG_ID North	3.1521
NG_ID South	3.4415
NG_MT	2.4744
NG_NM North	2.9507
NG_NM South	2.8841
NG_NV North	4.1208
NG_NV South	3.9406
NG_OR	3.4415
NG_OR Malin	3.4822

Fuel Name	Fuel Price ($/MMBTU)
NG_TX West	2.9063
NG_UT	3.6473
NG_WA	3.4495
NG_WY	2.8315
Oil_DistillateFuel_2	21.62241
Oil_DistillateFuel_H	30.03
Oil_DistillateFuel_L	11.59108
Petroleum Coke	1.41
Propane	23.55
Purchased_Steam	1
Refuse	0
Synthetic Gas	6.99
Uranium	0.703416
Waste_Heat	0

6.4. Non-Fuel Costs

- ***Variable O&M (VOM) Cost***

The case models variable O&M (VOM) cost for thermal generators. The VOM cost for thermal generators were obtained from Intertek Cycling Cost Report. The report can be accessed at link below:

https://www.wecc.org/Reliability/1r10726%20WECC%20Update%20of%20Reliability%20and%20Cost%20Impacts%20of%20Flexible%20Generation%20on%20Fossil.pdf

- ***Dispatch Cost***
  Dispatch cost for generators are developed by PCDS. In 2030 ADS PCM case the dispatch costs were carried over from 2028 ADS PCM case.

- ***Startup Cost***

Startup cost of a generator is obtained on Intertek Cycling Cost Report - https://www.wecc.org/Reliability/1r10726%20WECC%20Update%20of%20Reliability%20and%20Cost%20Impacts%20of%20Flexible%20Generation%20on%20Fossil.pdf.

7. Market Model

7.1. Hurdle Rates Model

See "Wheeling Charge Model"

7.2. Wheeling Charge Model

Hurdle rates shown are only Monitored hurdle rates

Hurdle rates represent the cost to deliver surplus energy among different regions, and they are called "Wheeling Charges" in GridView. The 2030 ADS PCM Case models hurdle rates based on three categories of charges:

1. Tariff rates: trade policy-based charges applied to power transfers between regions.

2. Wheeling rates: charges paid to the owner of a transmission line for the right to transport power across the line.

3. Rates per model validation: interregional charges modeled to encourage reasonable interregional transfers. These are set based on stakeholder review of simulation results and their recommendations.

The tariff rates were derived from the 2015 Open Access Same-time Information System (OASIS) rates posted by the applicable transmission owners as compiled by the California Independent System Operator (CAISO). The table below shows the interregional hurdle rates in the 2030 ADS PCM Case. These are base values and do not include additional charges associated with the California Global Warming Initiative.

These hurdle rates are verified through the PCDS.

Name	Forward Direction ($/MWh)	Backward Direction ($/MWh)
W_CA_AB32_NW-CA	1.476	0
W_CA_AB32_SW-CA	27.517	0
W01_AB_AESO__BC_BCHA	1.22	3
W02_AB_AESO__NW_NWMT+	1.22	5.58
W06_NW_BPAT+__BC_BCHA	0	0
W07_NW_BPAT+__CA_BANC+	4.41	3.35

Name	Forward Direction ($/MWh)	Backward Direction ($/MWh)
W08_NW_BPAT+__CA_CISO	4.41	13.5934
W09_NW_BPAT+__CA_LDWP	4.41	4.022
W13_NW_BPAT+__SW_NVE	0	3.33
W14_NW_NWMT+__BS_PACE	0	3.7
W17_NW_NWMT+__RM_WACM	5.58	3.975
W18_NW_PACW__CA_CISO	3.7	13.5934
W24_BS_IPCO__SW_NVE	3.42	3.33
W26_BS_PACE__CA_LDWP	3.7	4.022
W27_BS_PACE__RM_WACM	3.7	3.975
W28_BS_PACE__SW_AZPS	3.7	0
W29_BS_PACE__SW_NVE	3.7	3.33
W30_BS_PACE__SW_WALC	3.7	2.356
W31_RM_PSCO__SW_PNM	5.37	7.19
W32_RM_WACM__RM_PSCO	3.975	5.37
W33_RM_WACM__SW_PNM	3.975	7.19
W34_RM_WACM__SW_WALC	3.975	2.356
W35_SW_AZPS__CA_CISO	4.35	13.5934
W36_SW_AZPS__CA_IID	4.35	3.82
W37_SW_AZPS__CA_LDWP	4.35	4.022
W38_SW_AZPS__SW_PNM	4.35	7.19
W39_SW_AZPS__SW_SRP	4.35	4.02
W40_SW_AZPS__SW_TEPC	4.35	3.93
W41_SW_AZPS__SW_WALC	4.35	2.356
W42_SW_NVE__CA_CISO	3.33	13.5934
W43_SW_NVE__CA_LDWP	3.33	4.022

Name	Forward Direction ($/MWh)	Backward Direction ($/MWh)
W44_SW_NVE__SW_WALC	3.33	2.356
W45_SW_PNM__SW_EPE	7.19	3.326
W46_SW_PNM__SW_WALC	7.19	2.356
W47_SW_SRP__CA_CISO	4.02	13.5934
W48_SW_SRP__SW_TEPC	4.02	3.93
W49_SW_SRP__SW_WALC	4.02	2.356
W50_SW_TEPC__SW_EPE	3.93	3.326
W51_SW_TEPC__SW_PNM	3.93	7.19
W52_SW_WALC__CA_CISO	2.356	13.5934
W53_SW_WALC__CA_IID	2.356	3.82
W54_SW_WALC__CA_LDWP	2.356	4.022
W55_SW_WALC__SW_TEPC	2.356	3.93
W56_CA_CISO__CA_BANC+	13.5934	3.35
W57_CA_CISO__CA_CFE	13.5934	4.8
W58_CA_IID__CA_CISO	3.82	13.5934
W59_CA_LDWP__CA_CISO	4.022	13.5934
Wa1_SW_TH_PV__CA_CISO	0	13.5934
Wa2_SW_TH_PV__SW_AZPS	0	4.35
Wa3_SW_TH_PV__SW_SRP	0	4.02
Wb1_SW_TH_Mead__SW_WALC	0	2.356
Wb2_SW_TH_Mead__SW_NVE	0	3.33
Wb3_SW_TH_Mead__SW_AZPS	0	4.35
Wb4_SW_TH_Mead__SW_SRP	0	4.02
Wb5_SW_TH_Mead__CA_CISO	0	13.5934
Wb6_SW_TH_Mead__CA_LDWP	0	4.022

Name	Forward Direction ($/MWh)	Backward Direction ($/MWh)
Wc1_NW_TH_Malin__NW_BPA+	0	4.41
Wc2_NW_TH_Malin__NW_PACW	0	3.7
Wc3_NW_TH_Malin__CA_BANC+	0	3.35
Wc4_NW_TH_Malin__CA_CISO	0	13.5934

7.3. Greenhouse Gas (GHG) Model

The Greenhouse gas impacts for the 2030 ADS PCM are modeled through an Emission Rate lb/MMBtu for each fuel, and a Credit Cost $/lb for CO2 charges for (California, British Columbia, and Alberta).

EmGroupName	EmTypeID	Enforced	Allowance(Short Ton)	StartDate	EndDate	Tolerance(%)	CreditCost($/lb)
CA Emission_CO2	2	NO	0	1/1/2030	12/31/2030	0.01	0.029163
AB Emission_CO2	2	NO	0	1/1/2030	12/31/2030	0.01	0.0168
BC Emission_CO2	2	NO	0	1/1/2030	12/31/2030	0.01	0.0168

7.4. Transmission Rights Model

Transmission rights are not modeled in the 2030 ADS PCM Case.

7.5. Remotely Owned/Contracted Generator Model

With the topology for area loads and regions, it is necessary to associate remotely owned (or contracted) resources with the participating areas or regions. “Remote Resources” are defined as resources that have an attached transmission service agreement in place to supply a certain amount of power per that agreement. This provides the information that GridView needs to count the generation shares for reserves and to deliver the associated energy with no hurdle rate charge (assumes that delivery cost is a fixed cost). The table below shows the list of remote generators that were modeled in the 2030 ADS PCM Case. Note that the list is dynamic and dependent on stakeholder input, mainly through the PCDS.

Remote Generators			
10319_ADS30_San Juan 2	Frederickson1	Intermountain 1	Milford Wind 1-2
10320_ADS30_San Juan 3	Frederickson2	Intermountain 2	MintFarmCC-Total
AguaCalienteSolar	FredericksonCC-Total	Jim_Bridger_1	NorthValmy1
Aragonne Mesa	GoldendaleCC-Total	Jim_Bridger_2	NorthValmy2
ArlingtonValleyPV2	Goodnoe_Hills1	Jim_Bridger_3	Palo Verde 1
ArlingtonWind	Goodnoe_Hills2	Jim_Bridger_4	Palo Verde 2
Big Horn Wind 1-2	HarquahalaCC1-Total	Klondike Wind III-1	Palo Verde 3
BigHorn2	HarquahalaCC2-Total	Klondike Wind III-2	Parker Dam 1
BiglowCanyon1	HarquahalaCC3-Total	Leaning Juniper Wind 1	Parker Dam 2
BiglowCanyon2	Hayden 1	Leaning Juniper Wind 2A	Parker Dam 3
BiglowCanyon3	Hayden 2	Leaning Juniper Wind 2B	Parker Dam 4
Boardman	High Lonesome Mesa 1	LeaningJunipr3	PebbleSprings
Broadview Wind	HighWinds1	LindenWind	Priest Rapids
Centralia1	HighWinds2	LodiEnergyCC-Total	Rock Island
Centralia2	Hoover Dam A1	LSRW_DutchFlats	Rocky Reach
Cholla_4	Hoover Dam A2	LSRW_KuhlRidge	San Juan 1
Colstrip_1	Hoover Dam A3	Mesquite Solar 1-1	San Juan 4
Colstrip_2	Hoover Dam A4	Mesquite Solar 1-2	Seville 1
Colstrip_3	Hoover Dam A5	Mesquite Solar 1-3	SimpsonTacoma
Colstrip_4	Hoover Dam A6	Mesquite Solar 1-4	Springerville 3

Remote Generators			
Comanche 3	Hoover Dam A7	Mesquite Solar 1-5	Springerville 4
Craig 1	Hoover Dam A8	Mesquite Solar 1-6	Star Point Wind
Craig 2	Hoover Dam A9	Mesquite Solar 2-1	Tuolumne Wind
DokieWind1	Hoover Dam N1	Mesquite Solar 2-2	Vansycle I
DokieWind2	Hoover Dam N2	Mesquite Solar 2-3	Vansycle_OR
DokieWind3	Hoover Dam N3	Mesquite Solar 2-4	Vansycle_WA
DokieWind4	Hoover Dam N4	Mesquite Solar 3-1	Vantage
DokieWind5	Hoover Dam N5	Mesquite Solar 3-2	Wanapum
DokieWind6	Hoover Dam N6	Mesquite Solar 3-3	Wells
Dry Lake Wind 1-2	Hoover Dam N7	Mesquite Solar 3-4	WillowCreekEC
Dry Lake Wind 1-3	Hoover Dam N8	Mesquite Solar 3-5	Windy Flats Wind
Four Corners 4	Hopkins Ridge Wind 1-2	Mesquite Solar 3-6	WindyFlats2
Four Corners 5	Horseshoe Bend Wind	Milford Wind 1-1	

7.6. Ancillary Service (AS) Model

Ancillary Services provide various support capabilities to the system. Mainly to manage the variability and uncertainty associated with variable generation resources like wind and solar. Given the high penetration of variable generation in the West, including this additional reserve requirement is an important assumption for the PCM studies. These are applied to each Area/Region through a shape. These Ancillary Services have an hourly dispatch with an operating reserve requirement. There The following Ancillary Support Types (AS Type) are as follows:

ASType:

- 1-Regulation Down
- 2-Load Following Down
- 3-Regulation Up
- 4-Spinning Reserve
- 5-nonSpinng Reserve

- 6-Load Following Up
- 7-Frequency Response

The 95% confidence level load-following and regulation up/down ancillary service shapes were used in the case. The 99% confidence level shapes were also included in the release package. PNNL developed the shapes using PNNL methodology. The 95% confidence interval was chosen since it provides a smaller requirement and would meet the compliance requirement in BAL-001-2. Each shape is a daily shape that repeats each day for each month. The requirement is by balancing authority (BA), or region in the ADS PCM model,

The table below shows which shapes are assigned to which Area/Region for which ASType:

Name	Area/ Region	ASType	Ratio of Load	Ratio of Generation	ShapeName
AB_AESO	Region	1	0	0	FR_RegDown_AB_AESO_2030
AB_AESO	Region	2	0	0	FR_LD_AB_AESO_2030
AB_AESO	Region	3	0	0	FR_RegUp_AB_AESO_2030
AB_AESO	Region	4	0.015	0.015	None
AB_AESO	Region	6	0	0	FR_LFU_AB_AESO_2030
BC_BCHA	Region	1	0	0	FR_RegDown_BC_BCHA_2030
BC_BCHA	Region	2	0	0	FR_LD_BC_BCHA_2030
BC_BCHA	Region	3	0	0	FR_RegUp_BC_BCHA_2030
BC_BCHA	Region	4	0.015	0.015	None
BC_BCHA	Region	6	0	0	FR_LFU_BC_BCHA_2030
BS_IPCO	Region	1	0	0	FR_RegDown_BS_IPCO_2030
BS_IPCO	Region	2	0	0	FR_LD_BS_IPCO_2030
BS_IPCO	Region	3	0	0	FR_RegUp_BS_IPCO_2030
BS_IPCO	Region	6	0	0	FR_LFU_BS_IPCO_2030
BS_PACE	Region	1	0	0	FR_RegDown_BS_PACE_2030
BS_PACE	Region	2	0	0	FR_LD_BS_PACE_2030
BS_PACE	Region	3	0	0	FR_RegUp_BS_PACE_2030
BS_PACE	Region	6	0	0	FR_LFU_BS_PACE_2030
CA_BANC	Region	1	0	0	FR_RegDown_CA_BANC_2030
CA_BANC	Region	2	0	0	FR_LD_CA_BANC_2030
CA_BANC	Region	3	0	0	FR_RegUp_CA_BANC_2030
CA_BANC	Region	6	0	0	FR_LFU_CA_BANC_2030
CA_CFE	Region	1	0	0	FR_RegDown_CA_CFE_2030

Name	Area/ Region	ASType	Ratio of Load	Ratio of Generation	ShapeName
CA_CFE	Region	2	0	0	FR_LD_CA_CFE_2030
CA_CFE	Region	3	0	0	FR_RegUp_CA_CFE_2030
CA_CFE	Region	6	0	0	FR_LFU_CA_CFE_2030
CA_CISO	Region	1	0	0	FR_RegDown_CA_CAISO_2030
CA_CISO	Region	2	0	0	FR_LD_CA_CAISO_2030
CA_CISO	Region	3	0	0	FR_RegUp_CA_CAISO_2030
CA_CISO	Region	4	0.015	0.015	None
CA_CISO	Region	6	0	0	FR_LFU_CA_CAISO_2030
CA_IID	Region	1	0	0	FR_RegDown_CA_IID_2030
CA_IID	Region	2	0	0	FR_LD_CA_IID_2030
CA_IID	Region	3	0	0	FR_RegUp_CA_IID_2030
CA_IID	Region	6	0	0	FR_LFU_CA_IID_2030
CA_LDWP	Region	1	0	0	FR_RegDown_CA_LDWP_2030
CA_LDWP	Region	2	0	0	FR_LD_CA_LDWP_2030
CA_LDWP	Region	3	0	0	FR_RegUp_CA_LDWP_2030
CA_LDWP	Region	6	0	0	FR_LFU_CA_LDWP_2030
CA_TIDC	Region	1	0	0	FR_RegDown_CA_TIDC_2030
CA_TIDC	Region	2	0	0	FR_LD_CA_TIDC_2030
CA_TIDC	Region	3	0	0	FR_RegUp_CA_TIDC_2030
CA_TIDC	Region	6	0	0	FR_LFU_CA_TIDC_2030
NW_AVA	Region	1	0	0	FR_RegDown_NW_AVA_2030
NW_AVA	Region	2	0	0	FR_LD_NW_AVA_2030
NW_AVA	Region	3	0	0	FR_RegUp_NW_AVA_2030
NW_AVA	Region	6	0	0	FR_LFU_NW_AVA_2030
NW_BPAT	Region	1	0	0	FR_RegDown_NW_BPAT_2030
NW_BPAT	Region	2	0	0	FR_LD_NW_BPAT_2030
NW_BPAT	Region	3	0	0	FR_RegUp_NW_BPAT_2030
NW_BPAT	Region	6	0	0	FR_LFU_NW_BPAT_2030
NW_CHPD	Region	1	0	0	FR_RegDown_NW_CHPD_2030
NW_CHPD	Region	2	0	0	FR_LD_NW_CHPD_2030
NW_CHPD	Region	3	0	0	FR_RegUp_NW_CHPD_2030
NW_CHPD	Region	6	0	0	FR_LFU_NW_CHPD_2030

Name	Area/ Region	ASType	Ratio of Load	Ratio of Generation	ShapeName
NW_DOPD	Region	1	0	0	FR_RegDown_NW_DOPD_2030
NW_DOPD	Region	2	0	0	FR_LD_NW_DOPD_2030
NW_DOPD	Region	3	0	0	FR_RegUp_NW_DOPD_2030
NW_DOPD	Region	6	0	0	FR_LFU_NW_DOPD_2030
NW_GCPD	Region	1	0	0	FR_RegDown_NW_GCPD_2030
NW_GCPD	Region	2	0	0	FR_LD_NW_GCPD_2030
NW_GCPD	Region	3	0	0	FR_RegUp_NW_GCPD_2030
NW_GCPD	Region	6	0	0	FR_LFU_NW_GCPD_2030
NW_NWMT	Region	1	0	0	FR_RegDown_NW_NWMT_2030
NW_NWMT	Region	2	0	0	FR_LD_NW_NWMT_2030
NW_NWMT	Region	3	0	0	FR_RegUp_NW_NWMT_2030
NW_NWMT	Region	6	0	0	FR_LFU_NW_NWMT_2030
NW_PACW	Region	1	0	0	FR_RegDown_NW_PACW_2030
NW_PACW	Region	2	0	0	FR_LD_NW_PACW_2030
NW_PACW	Region	3	0	0	FR_RegUp_NW_PACW_2030
NW_PACW	Region	6	0	0	FR_LFU_NW_PACW_2030
NW_PGE	Region	1	0	0	FR_RegDown_NW_PGE_2030
NW_PGE	Region	2	0	0	FR_LD_NW_PGE_2030
NW_PGE	Region	3	0	0	FR_RegUp_NW_PGE_2030
NW_PGE	Region	6	0	0	FR_LFU_NW_PGE_2030
NW_PSEI	Region	1	0	0	FR_RegDown_NW_PSEI_2030
NW_PSEI	Region	2	0	0	FR_LD_NW_PSEI_2030
NW_PSEI	Region	3	0	0	FR_RegUp_NW_PSEI_2030
NW_PSEI	Region	6	0	0	FR_LFU_NW_PSEI_2030
NW_SCL	Region	1	0	0	FR_RegDown_NW_SCL_2030
NW_SCL	Region	2	0	0	FR_LD_NW_SCL_2030
NW_SCL	Region	3	0	0	FR_RegUp_NW_SCL_2030
NW_SCL	Region	6	0	0	FR_LFU_NW_SCL_2030
NW_TPWR	Region	1	0	0	FR_RegDown_NW_TPWR_2030
NW_TPWR	Region	2	0	0	FR_LD_NW_TPWR_2030
NW_TPWR	Region	3	0	0	FR_RegUp_NW_TPWR_2030
NW_TPWR	Region	6	0	0	FR_LFU_NW_TPWR_2030

Name	Area/ Region	ASType	Ratio of Load	Ratio of Generation	ShapeName
NW_WAUW	Region	1	0	0	FR_RegDown_NW_WAUW_2030
NW_WAUW	Region	2	0	0	FR_LD_NW_WAUW_2030
NW_WAUW	Region	3	0	0	FR_RegUp_NW_WAUW_2030
NW_WAUW	Region	6	0	0	FR_LFU_NW_WAUW_2030
RM_PSCO	Region	1	0	0	FR_RegDown_RM_PSCO_2030
RM_PSCO	Region	2	0	0	FR_LD_RM_PSCO_2030
RM_PSCO	Region	3	0	0	FR_RegUp_RM_PSCO_2030
RM_PSCO	Region	6	0	0	FR_LFU_RM_PSCO_2030
RM_WACM	Region	1	0	0	FR_RegDown_RM_WACM_2030
RM_WACM	Region	2	0	0	FR_LD_RM_WACM_2030
RM_WACM	Region	3	0	0	FR_RegUp_RM_WACM_2030
RM_WACM	Region	6	0	0	FR_LFU_RM_WACM_2030
Spin_RSG_NW	Combined	4	0.015	0.015	None
Spin_RSG_RM	Combined	4	0.015	0.015	None
Spin_RSG_SW	Combined	4	0.015	0.015	None
SW_AZPS	Region	1	0	0	FR_RegDown_SW_AZPS_2030
SW_AZPS	Region	2	0	0	FR_LD_SW_AZPS_2030
SW_AZPS	Region	3	0	0	FR_RegUp_SW_AZPS_2030
SW_AZPS	Region	6	0	0	FR_LFU_SW_AZPS_2030
SW_EPE	Region	1	0	0	FR_RegDown_SW_EPE_2030
SW_EPE	Region	2	0	0	FR_LD_SW_EPE_2030
SW_EPE	Region	3	0	0	FR_RegUp_SW_EPE_2030
SW_EPE	Region	6	0	0	FR_LFU_SW_EPE_2030
SW_NVE	Region	1	0	0	FR_RegDown_SW_NVE_2030
SW_NVE	Region	2	0	0	FR_LD_SW_NVE_2030
SW_NVE	Region	3	0	0	FR_RegUp_SW_NVE_2030
SW_NVE	Region	6	0	0	FR_LFU_SW_NVE_2030
SW_PNM	Region	1	0	0	FR_RegDown_SW_PNM_2030
SW_PNM	Region	2	0	0	FR_LD_SW_PNM_2030
SW_PNM	Region	3	0	0	FR_RegUp_SW_PNM_2030

Name	Area/ Region	ASType	Ratio of Load	Ratio of Generation	ShapeName
SW_PNM	Region	6	0	0	FR_LFU_SW_PNM_2030
SW_SRP	Region	1	0	0	FR_RegDown_SW_SRP_2030
SW_SRP	Region	2	0	0	FR_LD_SW_SRP_2030
SW_SRP	Region	3	0	0	FR_RegUp_SW_SRP_2030
SW_SRP	Region	6	0	0	FR_LFU_SW_SRP_2030
SW_TEPC	Region	1	0	0	FR_RegDown_SW_TEPC_2030
SW_TEPC	Region	2	0	0	FR_LD_SW_TEPC_2030
SW_TEPC	Region	3	0	0	FR_RegUp_SW_TEPC_2030
SW_TEPC	Region	6	0	0	FR_LFU_SW_TEPC_2030
SW_WALC	Region	1	0	0	FR_RegDown_SW_WALC_2030
SW_WALC	Region	2	0	0	FR_LD_SW_WALC_2030
SW_WALC	Region	3	0	0	FR_RegUp_SW_WALC_2030
SW_WALC	Region	6	0	0	FR_LFU_SW_WALC_2030

The table below show how the following technology types can contribute to each ancillary services:

- 1-Regulation Down
- 2-Load Following Down
- 3-Regulation Up
- 4-Spinning Reserve
- 5-nonSpinng Reserve
- 6-Load Following Up
- 7-Frequency Response

Technology	Regulation Down	Load Following Down	Regulation Up	Spinning Reserve	nonSpinning Reserve	Load Following Up	Frequency Response
Solar	No	Yes	No	No	No	Yes	No
Wind	No	Yes	No	No	No	Yes	No
Thermal	Yes	Yes	Yes	Yes	Yes	Yes	No
Hydro	Yes	Yes	Yes	Yes	Yes	Yes	No
Pumped Storage	Yes	Yes	Yes	Yes	Yes	Yes	No