



PCDS

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WECC

# MOD-031 SAR at NERC

- NERC's System Planning Impacts of Distributed Energy Resources (DER) Work Group (SPIDERWG) conducted a review of the current body of NERC Reliability Standards and the requirements within those standards for their applicability and effectiveness to remain relevant with increasing levels of DERs. As a result, NERC Standard Authorization Requests (SAR) are being rolled out a few at a time to get industry feedback on potential changes to the standards.
- The SPIDERWG recently recommended in the white paper, [SPIDERWG NERC Reliability Standards Review](#), that MOD-031-3 be revised to allow for the Planning Coordinator (PC) to obtain existing and forecast DER information from Distribution Provider (DP) and Transmission Planner (TP) entities. This project's goal is to ensure that various forms of historical and forecast demand, energy data, and information are available to the parties that perform reliability studies and assessments.
- A SAR project team for MOD-031 is being formed. Learn more here: <https://www.nerc.com/pa/Stand/Pages/Project2023-08-Modifications-of-MOD-031-Demand-and-Energy-Data.aspx>

# PV/WT Capacity Factors Analysis

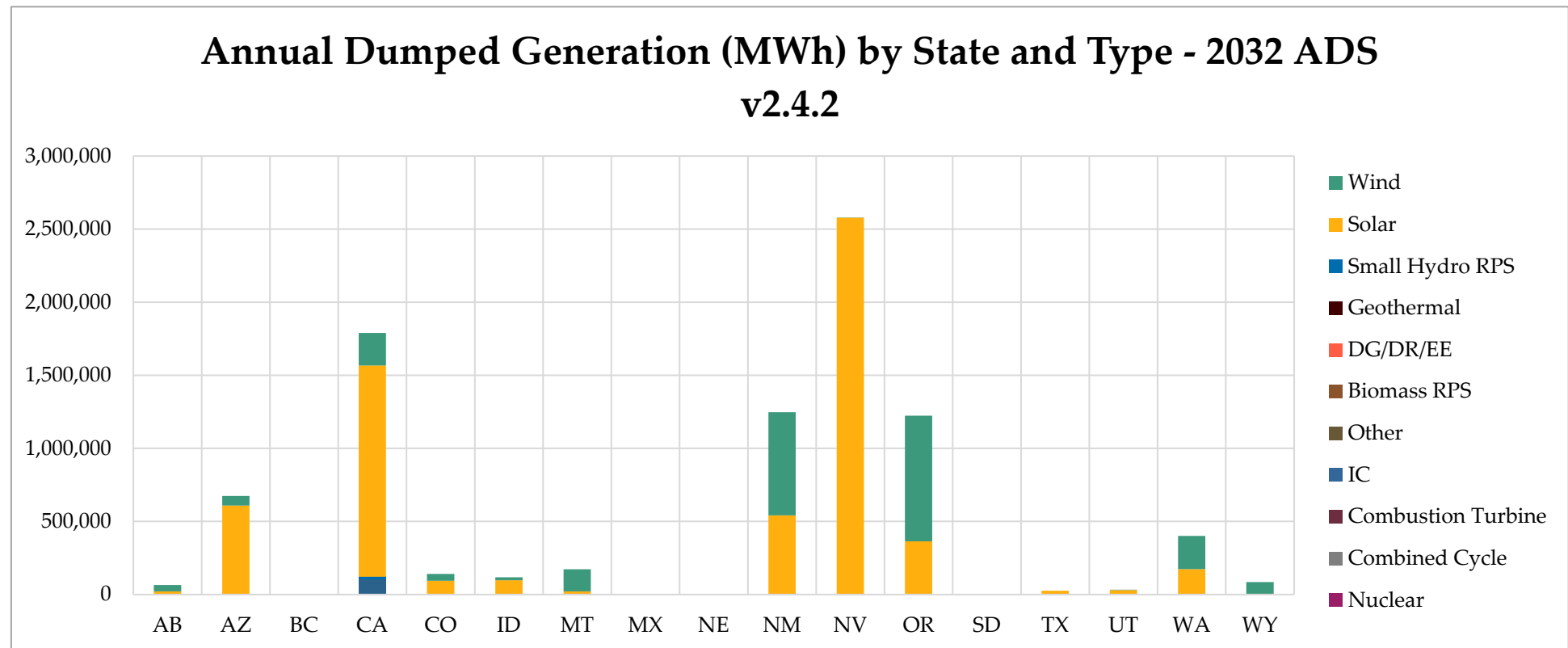
# RE Modelling and Operation in ADS 2032

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- Overview
  - PV/WT modelled by hourly profiles
  - -25\$/MWh VO&M charge
  - 2018 base year for the profiles (same as the load and the hydro shapes)
- RE Capacity Factor of operation affected by:
  - Curtailment
  - RE dispatch profile

# Observations (Capacity Factors): Curtailment

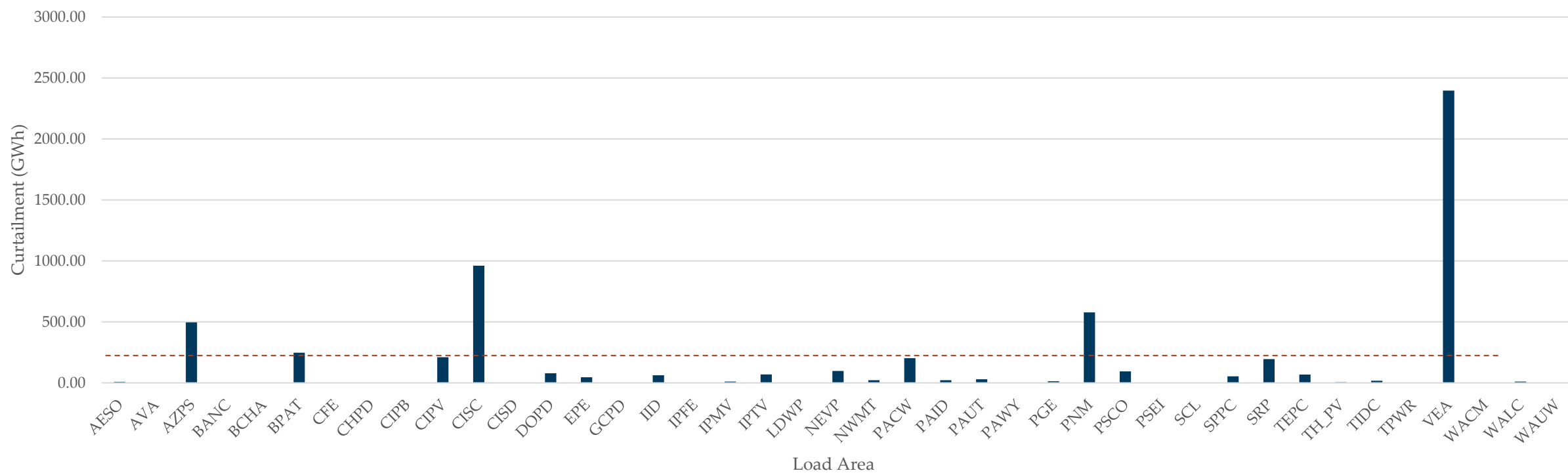
Observed curtailment by state for all unit types in ADS 2032 v2.4.2



# PV Curtailment Levels by Load Area

## Areas with high annual curtailment levels (above 200 GWh)

- AZPS, BPA, CISC, CIPV, PACW, PNM, VEA



# PV Curtailment Levels by Load Area

## Unit level observations from these areas

- Units with large MW nameplate capacity assigned to lower KV buses resulting in congested network elements, and consequent curtailment

## Examples

Unit Name	Unit status	BusName	Bus KV	Load Area	Type	MaxCap (MW)	Total Gen (MWh)	Spillage (MWh)	Spillage % of Total Generation (%)
Atrisco Solar-1	Pre-Const Reg Approval-Review	APFWG Bus	0.6	PNM	PV	300	719864	122095.1	16.96
Arizona_Solar (Generic)PV-NT1463	Future-Planned	APFWG Bus	0.6	AZPS	PV	1463	4008381	101720.2	2.54
Kettle Solar One	Future-Planned	APFWG Bus	0.6	CIPV	PV	90	174322.3	80281.07	46.05
Jicarilla Affordable Solar-1	Future-Planned	APFWG Bus	0.6	PNM	PV	150	356413.1	55283.17	15.51
San Juan Solar-1	Pre-Const Reg Approval-Review	APFWG Bus	0.6	PNM	PV	200	487169	61109.16	12.54
Westlands_Solar (Generic)5	Future-Planned	APFWG Bus	0.6	CIPV	PV	163	384015.9	42332.99	11.02

# PV Curtailment Levels by Load Area [Contd.]

## Resolutions:

- The generic units with large MW values and high spillage levels which are assigned to APFWG buses were tallied with the latest L&R submittals. These units are updated with their actual placements in the recent power flow cases and will be added to these buses for the ADS 2034.

Name	Zone	Bus ID	Bus Name	Power flow bus number (33hs1)
Arizona_Solar (Generic)PV-NT1463	AZPS	86250	APFWG Bus	24611
Atrisco Solar-1	PNM	86207	APFWG Bus	10563
Jicarilla Affordable Solar-1	PNM	86208	APFWG Bus	10842
Kettle Solar One	CIPV	86092	APFWG Bus	34453
Utility Solar+Storage - PV - S-Oregon1PV377	PACW	86190	APFWG Bus	51180
Westlands_Solar (Generic)5	CIPV	86114	APFWG Bus	30881

- For the generic units assigned to non-generic lower KV buses: Testing is ongoing for the ADS 2032 with updated assignments to the closest bus with voltage levels 230 KV and above. A test case was run with the updated placements for a few of these units to the higher KV buses.
- Introductory observations - this has not resolved the curtailment issue.



# PV Curtailment Levels by Load Area [Contd.]

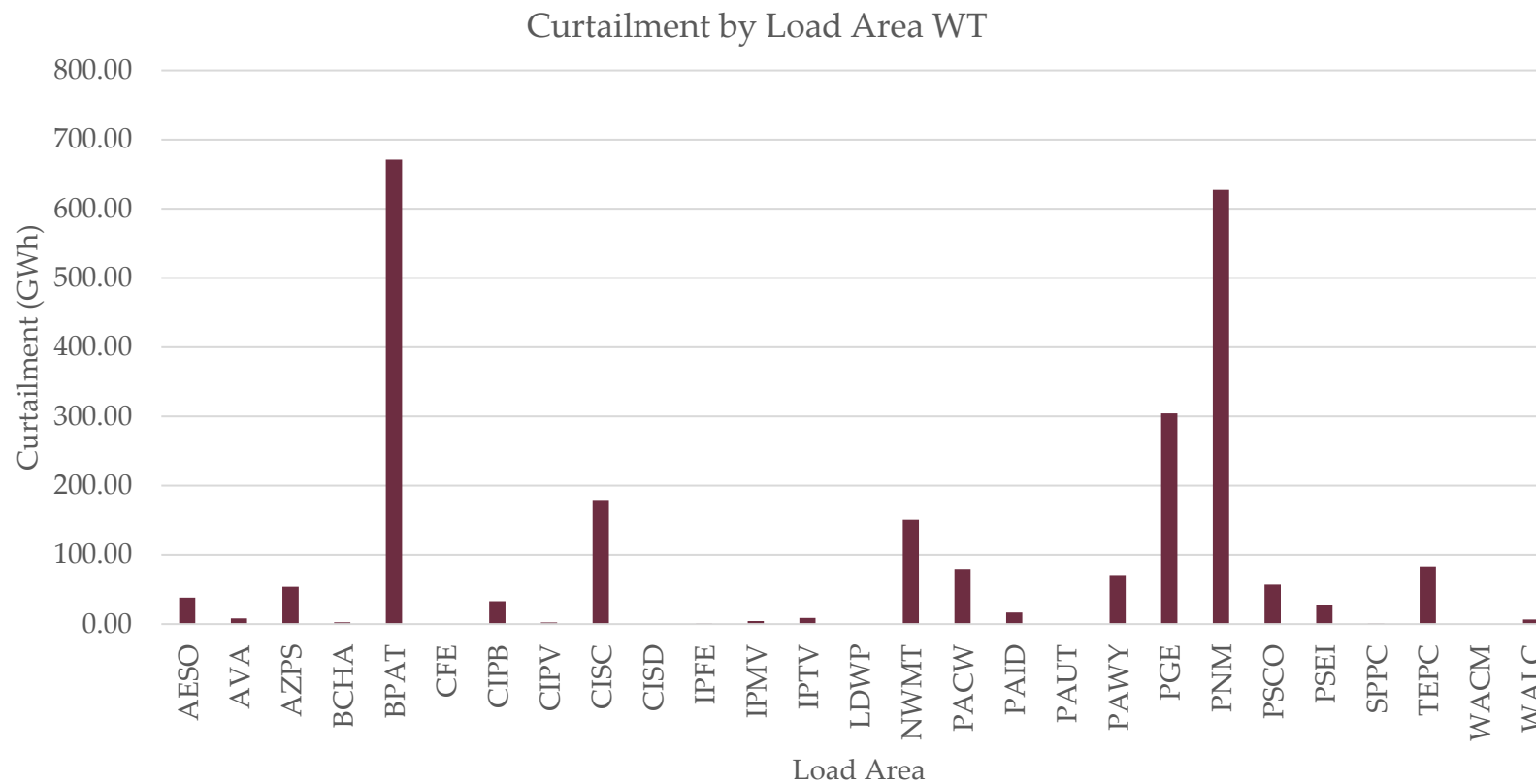
- Pending resolution:**

- Existing actual PV units with high curtailment values. Tests are currently underway for the ADS 2032 case and any fixes will be applied going forward for the ADS 2034 case as well.

Unit Name	Unit status	BusName	Bus KV	Load Area	Type	MaxCap (MW)	Total Gen (MWh)	Spillage (MWh)	Spillage % of Total Generation (%)
Tower Rd. SolarPV-T120	Future-Planned	LUND_HIL L#	230	BPAT	PV	120	143369.973	129070.3484	90.02606731
AguaCalienteSolar	Existing	AGUACAL 1	0.324	AZPS	PV	290	598554.4622	63545.4076	10.6164788
Solana 1	Existing	SOL GEN1	13.8	AZPS	PV	125	224100.2471	61287.62797	27.34830896
Solana 2	Existing	SOL GEN2	13.8	AZPS	PV	125	247927.0499	55826.47774	22.51730005
ArlingtonValleyPV2	Existing	AVSOLAR2 _48	0.48	SRP	PV	150	381051.7097	40120.54035	10.52889656
Mesquite Solar 1	Existing	MES1_1_8 5	0.42	SRP	PV	165	380065.9809	39217.33432	10.31855949
SCADSNV_Solar (Generic)PV- NT568	Future-Planned	RP_MHVE _1G	0.55	CISC	PV	568	1661780.469	37219.43076	2.23973211

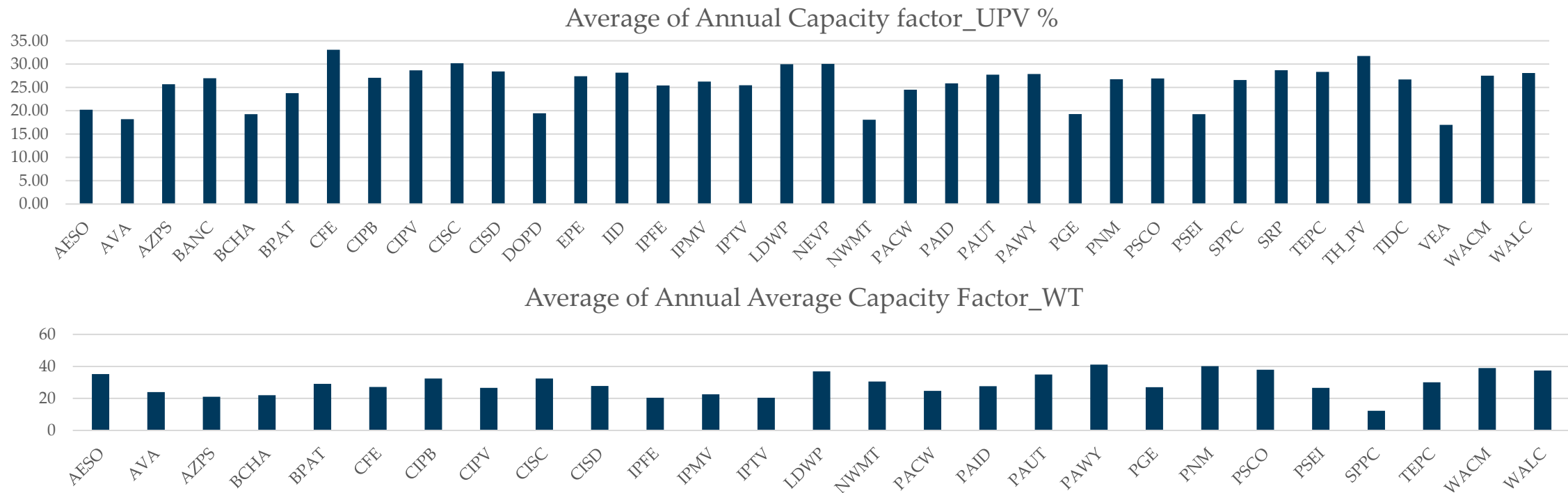
# Future Updates

Similar analysis for WT, DG-BTM PV resources



# Observations (Capacity Factors): RE Dispatch profiles

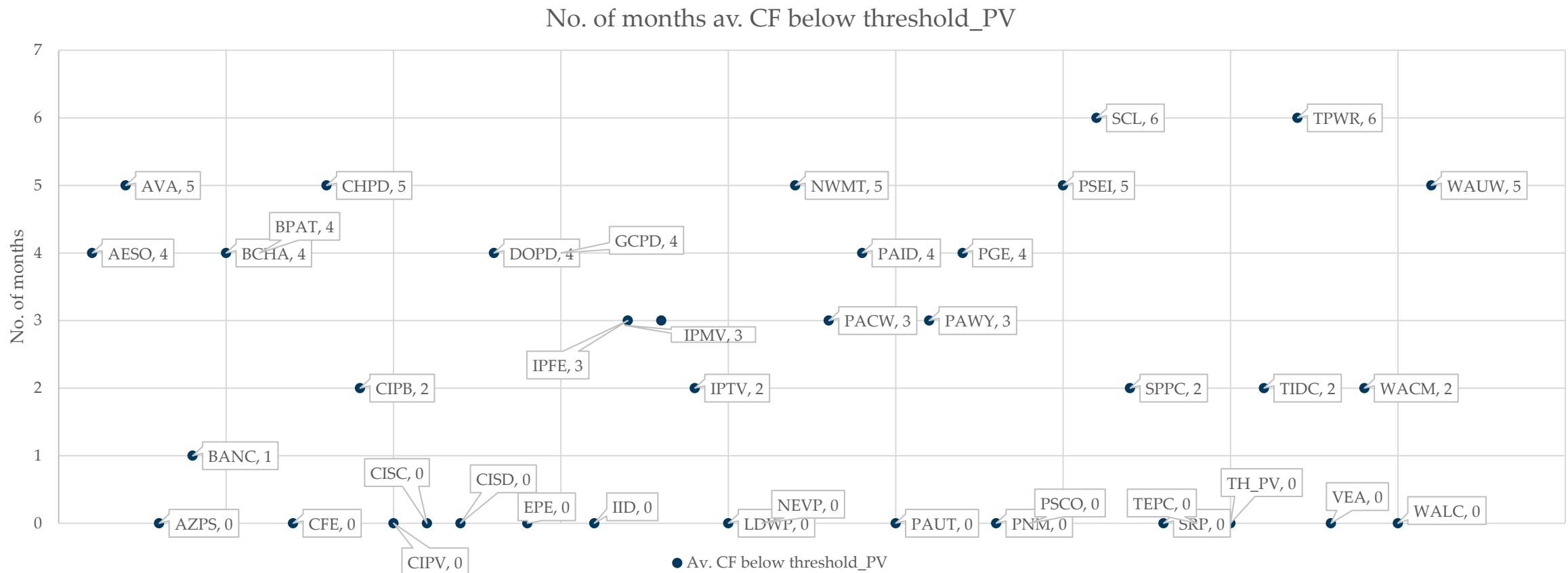
Average annual capacity factors of operation for UPV and WT units by Load Area:



- Thresholds → median operational capacity factors of Solar Units: 20%, a monthly threshold of 13% is assumed for demarcating units with lower-than-expected capacity factor of operation

# Observations (Capacity Factors): RE Dispatch profiles [Contd.]

- The chart below shows the number of months the average PV operational Capacity Factors for a load area was below the above-defined threshold:



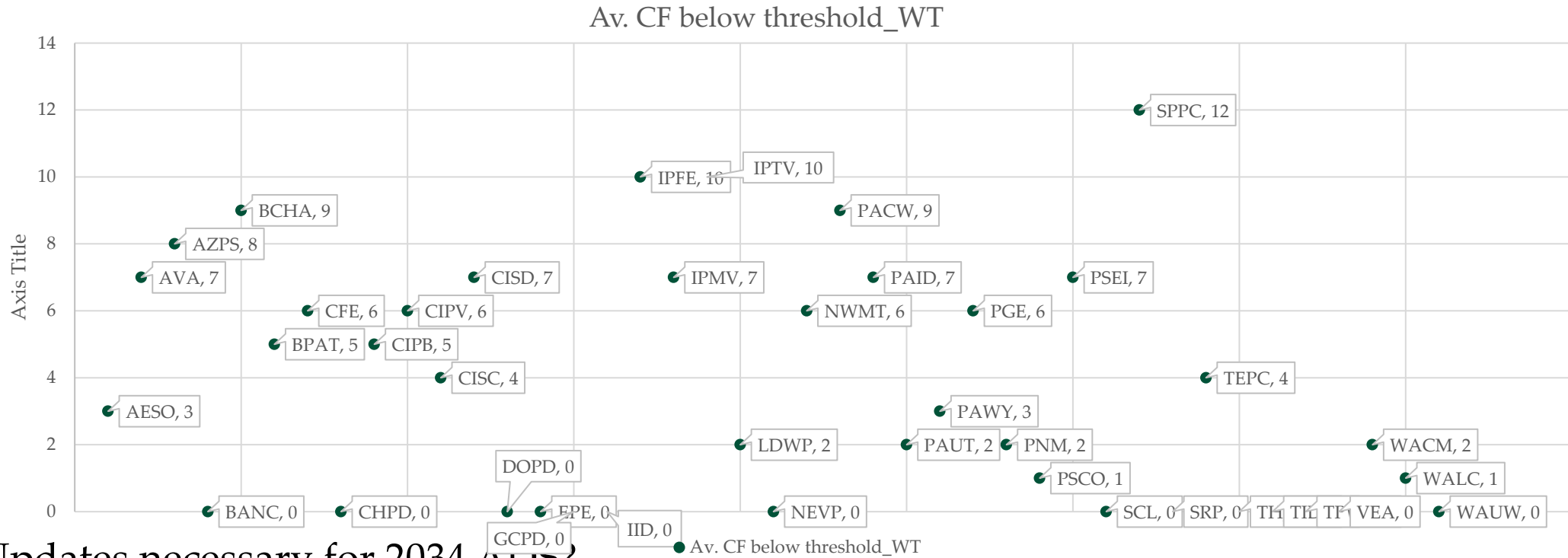
# Observations (Capacity Factors): Dispatch Profiles cont.

- Looking at regions where average monthly capacity factor of operation is below the threshold five or more months of the year: SCL, TPWR (six months); AVA, CHPD, NWMT, PSEI, WAUW (five months)
- Unit level observations from these areas:
  - From the previous discussions, the annual curtailment levels for these regions are less
  - There is some overlap between the hours with regional peak network congestion levels and the highest spillage hours. Some of the high spillage is also seen in a wind-heavy area
- The lower capacity factors of operation seen for units in these regions is because of the profiles and not network congestion

Area	Av. Annual Usage / line (%)	Peak Usage/area (%)	ΣAnnual Spillage (MWh)
TPWR	7.99	30.88	0
SCL	11.8279776	73.3287143	0
AVA	8.69	95	3112.082265
CHPD	22.7	61.97	0
NWMT	16.56	95	21558.99239
PSEI	10.16	55.7	108.2289163
WAUW	26.36	75.34	0

# Continued Discussions: Dispatch Profiles for RE units, ADS 2034

- Similar set of results will be looked at for WT and Dist. PV units.

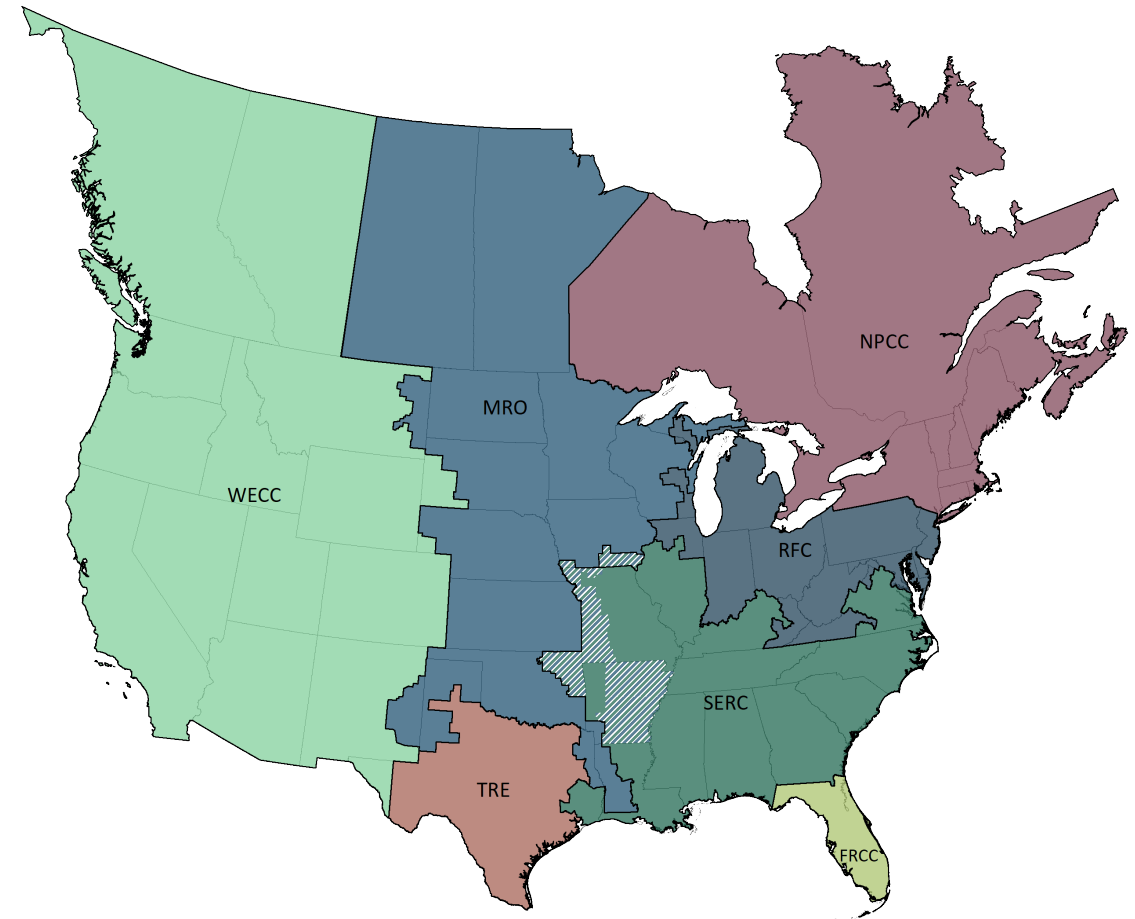


- Updates necessary for 2034 ADS?
- Discussion/Approval Item—2034 ADS V1 RE Dispatch profiles

# Forced Outage Rates

# Forced Outage Rates

- Description:
  - The forced outage rates represent the percentage of the year that a thermal generator is offline for unplanned outages. The forced outage rates are developed from the Generator Availability Data System (GADS) and are represented as a percentage of time each component will be offline. The point at which the component is forced offline during each simulation is random and based on a seed, or number, in GridView.
- Data Sources:
  - Generator Availability Data Set (GADS) using the pc-GAR program from NERC.





# Forced Outage Rates

## Data Development and Validation Process

- Data from GADS is collected from pc-GAR software. GADS data is considered confidential information at a unit level or even a regional level. Pc-GAR will provide the yearly statistics only if the following rules are followed to mask unit, utility, or regional level data:
  - A minimum of two regions, i.e., WECC and SERC;
  - A minimum of seven units; and
  - A minimum of three utilities.
- The Equivalent Forced Outage Rate demand (EFORd) statistic is used in the PCM for the forced outage rate. The simple average was used for gas turbines, combined cycles, and steam-coal turbines. For steam-gas turbines, the median was used.
- GridView then randomly forces out each thermal generator according to its seed and Monte-Carlo simulation.

# FOR

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- Which two regions to include
- Which year range to cover 2015–2023?

# Outstanding Items

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- V1\_Transmission Contingencies
- V1\_Phase Shifter Transformers – Reviewing in 2032 ADS V2.4.2
- V1\_ BTM PV V1\_ BTM Storage, V1\_ Energy Efficiency V1\_ Electric Vehicle loads, V1\_ Electrification Loads
- V1\_Hourly Utility Scale Solar shapes – Reviewing in 2032 ADS V2.4.2
- V1\_Hourly Wind Shapes – Reviewing in 2032 ADS V2.4.2

# Next meeting

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- Heat rates
- FOR
- Path ratings
- Phase shifter analysis
- Transmission nomograms
- EPE and TEPC load and generation balance nomograms



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