2024 ELCC Wind Solar and ESR Study Report

SPP Resource Adequacy

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REVISION HISTORY

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EXECUTIVE SUMMARY

As retirements of conventional resources and the penetration of renewable resources in the SPP Balancing Authority (BA) Area increases over time, it becomes critical to correctly assess the capacity value of renewable resources. Over-valuing renewable resources' contribution can result in lower levels of system reliability and increased risks of potential unserved load; while under-valuing can result in additional cost. Meeting the requirement of SPP policy and governing documents, Staff performed an Effective Load Carrying Capability (ELCC) study to assess the capacity value of existing renewable capacity in the SPP BA Area. ELCC is defined as the amount of incremental load a resource can reliably serve, while also considering probabilistic parameters of unserved load.

Implementation of the ELCC policy is to be used as information only accreditation method for wind and solar facilities in the SPP BA Area, effective June 1, 2025. This method will replace the previous accreditation methodology outlined in the SPP Planning Criteria. Likewise, the results of this method will be used by SPP entities beginning with the 2026 Resource Adequacy Workbook submissions outlined in Attachment AA of the SPP Tariff.

<u>Wind Resources</u>

The 2024 ELCC study results indicate the total capacity available from wind to be 5,151 MW in the summer season and 8,618 MW in the winter season for the installed nameplate capacity of 33,792 MW at the 1-day-in-10 years threshold. On a percentage basis, the summer ELCC value of the resources is 15.4% with 33,792 MW of wind. The winter ELCC value of the resources is 25.1% with 33,792 MW of wind.

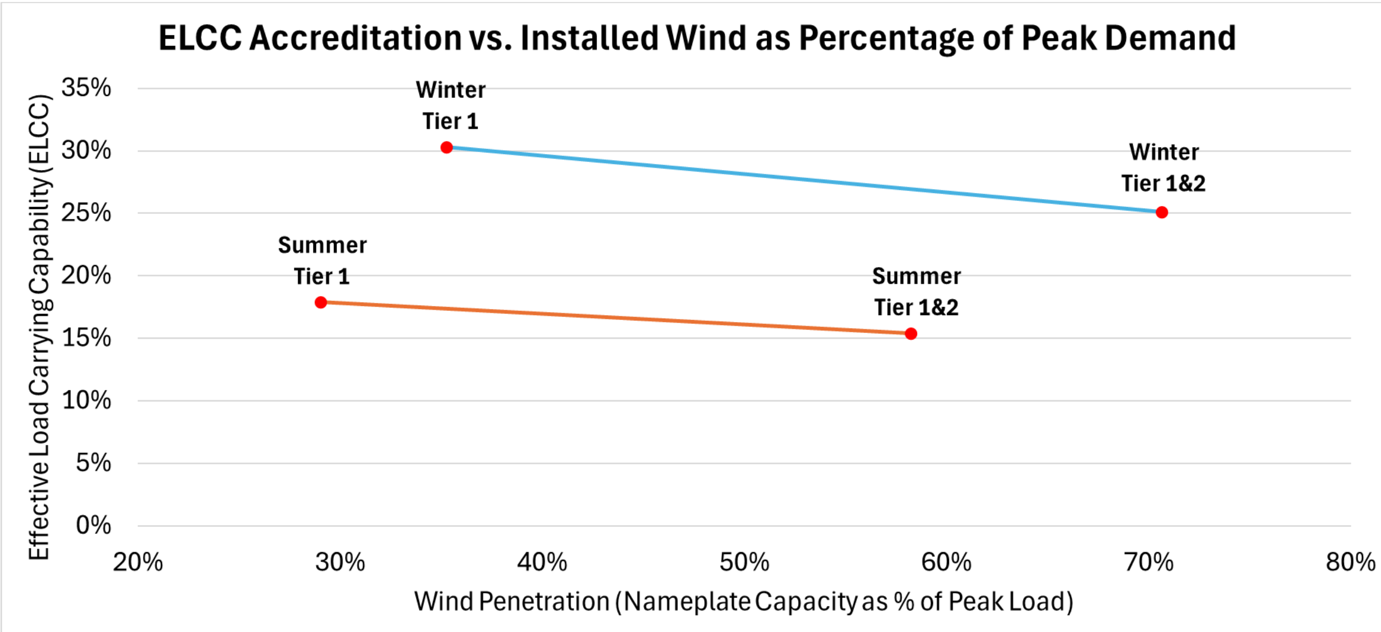

Figure 1: 2024 Wind ELCC Accreditation

Based on the results, Tier nameplate values were calculated, and individual wind resources were allocated into Tier 1, and Tier 2. For the summer season, Tier nameplate amount was 16,854 MW, and 16,938 MW for Tier 1, and 2, respectively. The accredited ELCC amounts were 3,017 MW, and 2,134 MW for Tier 1, and 2, respectively as shown in Table 1. Table 2 shows the winter season, Tier nameplate amount was 16,251 MW, and 17,541 MW for Tier 1, and 2, respectively. The accredited ELCC amounts were 5,005 MW, and 3,613 MW for Tier 1, and 2, respectively as shown in Table 2.

Table 1. Summer Wind ELCC Tier Result

2024 Allocated Summer Wind by Tier (MW)		
	TIER 1	TIER 2
Tier ELCC (MW)	3,017	2,134
Tier Nameplate (MW)	16,854	16,938
Tier ELCC (%)	17.9%	12.6%

Table 2. Winter Wind ELCC Tier Result

2024 Allocated Winter Wind by Tier (MW)		
	TIER 1	TIER 2
Tier ELCC (MW)	5,005	3,613
Tier Nameplate (MW)	16,251	17,541
Tier ELCC (%)	30.8%	20.6%

<u>Solar Resources</u>

Historical output from the previous ELCC study was incorporated to the current amount of installed solar facilities (947 MW) to determine the accredited capacity. The results from the 2024 Solar ELCC study indicate the total capacity available from solar to be 589 MW in the summer season and 370 MW in the winter season for the installed capacity of 947 MW at the 1-day-in-10 years threshold.

Tier allocation based on the result were 283 MW and 306 MW for summer Tier 1 and 2, respectively (Table 3). And 168 MW and 202 MW for winter Tier 1 and 2, respectively (

2024 Allocated Summer Solar by Tier (MW)		
	TIER 1	TIER 2
Tier ELCC (MW)	283	306
Tier Nameplate (MW)	459	488
Tier ELCC (%)	61.7%	62.6%

Table 4). The ELCC was derived from the combination of all 43 weather years.

Table 3. Summer Solar ELCC Tier Result

2024 Allocated Summer Solar by Tier (MW)		
	TIER 1	TIER 2
Tier ELCC (MW)	283	306
Tier Nameplate (MW)	459	488
Tier ELCC (%)	61.7%	62.6%

Table 4. Winter Solar ELCC Tier Result

2024 Allocated Winter Solar by Tier (MW)		
	TIER 1	TIER 2
Tier ELCC (MW)	168	202
Tier Nameplate (MW)	459	488
Tier ELCC (%)	36.6%	41.4%

ESR Results

The 2024 ESR ELCC study indicate the total capacity available from ESR resources to be 1000MW, 944MW, and 652MW in the summer season and 749MW, 749MW, and 477MW for the installed capacity of 1000MW of 8-hour duration, 6-hour duration, and 4-hour duration ESR, respectively as shown in Table 5 and Table 6. Each duration was studied independently of the others at the 1-day-in-10 years threshold. Since the total capacity submitted for the upcoming summer and winter seasons does not exceed 1000MW, the individual allocation will be applied using the 1000MW penetration. The current nameplate submitted in the 2024 Resource Adequacy Workbook submissions is 12MW of ESR resources.

Table 5. Summer ESR ELCC Tier Result

2024 Allocated Summer ESR by Duration (MW)				
	8HR Duration	6HR Duration	4HR Duration	Less Than 4HR Duration
Duration ELCC (MW)	0	0	0	4
Duration Nameplate (MW)	0	0	0	12
Duration ELCC (%)	100.0%	94.4%	65.2%	32.6%

Table 6. Winter ESR ELCC Tier Result

2024 Allocated Winter ESR by Duration (MW)				
	8HR Duration	6HR Duration	4HR Duration	Less Than 4HR Duration
Duration ELCC (MW)	0	0	0	3
Duration Nameplate (MW)	0	0	0	12
Duration ELCC (%)	74.9%	74.9%	47.7%	23.9%

ESR Sensitivity Results

With direction from the Supply Adequacy Working Group, additional scenarios associated with the assumptions surrounding ESR accreditation were performed for additional discussion and understanding about the proper accreditation of ESRs. The results of ESR accreditation when DR was removed from the base and change cases of the model are displayed below in Table 7 and Table 8 for Summer and Winter respectively. The results of excluding Demand Response from the model were an overall increase to the total ELCC value of all durations on both seasons except for 8 hour resources in the Summer which saw a small reduction.

Table 7. Summer ESR ELCC Results Demand Response Sensitivity

2024 Allocated Summer ESR by Duration (MW) (DR Removed)				
	8HR Duration	6HR Duration	4HR Duration	Less Than 4HR Duration
Duration ELCC (MW)	0	0	0	5
Duration Nameplate (MW)	0	0	0	12
Duration ELCC (%)	97.4%	97.4%	88.7%	44.4%

Table 8. Winter ESR ELCC Results Demand Response Sensitivity

2024 Allocated Winter ESR by Duration (MW) (DR Removed)				
	8HR Duration	6HR Duration	4HR Duration	Less Than 4HR Duration
Duration ELCC (MW)	0	0	0	4
Duration Nameplate (MW)	0	0	0	12
Duration ELCC (%)	76.3%	76.3%	70.0%	35.0%

Additional discussion that took place during the Supply Adequacy Working Group led to more investigation into the affects of Hydro modeling assumptions on the accreditation of ESRs in the Winter Season. The results of the sensitivity analysis of holding Hydro output constant during ELCC can be found below in Table 9 and Table 10. The results of holding Hydro at a constant output while accessing the ELCC value of ESRs during both seasons were a dramatic increase in all durations.

Table 9. Summer ESR ELCC Results Constant Hydro Sensitivity

2024 Allocated Winter ESR by Duration (MW)				
	8HR Duration	6HR Duration	4HR Duration	Less Than 4HR Duration
Duration ELCC (MW)	0	0	0	6
Duration Nameplate (MW)	0	0	0	12
Duration ELCC (%)	98.0%	96.4%	96.4%	48.2%

Table 10. Winter ESR ELCC Results Constant Hydro Sensitivity

2024 Allocated Winter ESR by Duration (MW) (DR Removed) (Constant Hydro)				
	8HR Duration	6HR Duration	4HR Duration	Less Than 4HR Duration
Duration ELCC (MW)	0	0	0	6
Duration Nameplate (MW)	0	0	0	12
Duration ELCC (%)	100.0%	100.0%	100.0%	50.0%

Additional discussion of the most accurate modeling approach is still occurring in the Supply Adequacy Working Group (SAWG) and an official direction will be decided for the 2025 ELCC Study Scope.

1.1 ACKNOWLEDGEMENTS

The stakeholder review process was an integral part in this study, and SPP staff appreciates the participation and oversight of the Supply Adequacy Working Group (SAWG).

SPP SYSTEM ELCC STUDY

2.1 ELCC OVERVIEW

Effective Load Carrying Capability (ELCC) is defined as the amount of incremental load a resource can reliably serve, while also considering probabilistic parameters of unserved load. The magnitude of incremental load served which is derived in the ELCC analysis becomes the basis of the resource's accreditation. ELCC has been used for determining the capacity value of resources since the 1960's when Garver demonstrated the use of Loss of Load Probability (LOLP) in the calculation of ELCC[1]. There are other utilities, Independent System Operators (ISOs), and Regional Transmission Organizations (RTOs) that utilize ELCC practices to determine the capacity value of variable resources.

Using ELCC practices, a facility's accreditation (measured in MW) is a fractional probabilistic measure of the facility's nameplate rating that can be relied on to serve load. ELCC can express the value that generation contributes to a system as penetration of the specific resource type increases. Underestimating the contribution of variable generation resources to help meet system peaks can result in the need for additional generation capacity and higher system costs. Overestimating the ability of such variable generation resources to help serve system peaks can result in lower levels of system reliability and increased risks of potential unserved load.

The results of an ELCC study are dependent upon the selection of a specific reliability target. SPP utilizes the reliability metric of 1 day in 10 years (or 0.1 day/year), which is also used in the SPP Loss of Load Expectation (LOLE) analysis to determine the adequate planning reserve margin for the SPP BA Area. To determine the seasonal ELCC accreditation, LOLE that occurred in the summer was exclusively used to determine the summer accredited capacity and LOLE that occurred in the winter was used to determine the winter accredited capacity.

[1] Garver, "Effective Load Carrying Capability of Generating Units," Aug. 1966

2.2 SOFTWARE

The SPP Wind Solar and ESR ELCC Study utilized the Strategic Energy Risk Valuation Model (SERVM) software package from Astrapé Consulting. SERVM is a production-cost software, which performs a Security Constrained Economic Dispatch while utilizing a Monte-Carlo algorithm when varying the uncertainty of load and availability of capacity through multiple simulations.

2.3 MODEL INPUTS AND ASSUMPTIONS

Many of the model inputs and assumptions (such as unit parameters, external transfers, DC Tie considerations, etc.) for the ELCC study were the same used in the 2023 Loss of Load Expectation (LOLE) Study[2]. The key differences in these assumptions were the exclusion of transmission limitations between modeled areas and updates to Wind Solar and ESR resources that were included in the 2024 Resources Adequacy workbook submissions. Curtailed amounts of wind and solar generation, as provided and tracked in the SPP Marketplace, were added back into the hourly generation profiles used in the ELCC study and allocation process.

Perfect negative generation was added to the model to achieve the 0.1 day per year reliability threshold. The same amount of negative generation was added to each hour in the simulation. This generation was modeled in SERVM as a perfect generator with no outages to provide a constant negative capacity. The ELCC analysis is performed with multiple weather years using historical data to account for any unusual high or low "outliers" in the data. ELCC was performed on all historical year at a time, thus only one accredited capacity value was derived per season for the modeled weather years.

2.3.1 WIND TIER DETERMINATION

Various levels of nameplate capacity were modeled and analyzed to calculate the accredited capacity for all wind resources. The analysis represents 33,792 MW of installed wind divided into two tiers: Tier 1, and Tier 2. Tiers are determined based on Designated Resources (with service confirmed by June 1 of each calendar year) for the designated amount as shown on the

[2] 2023 SPP LOLE Study Report

Network Integration Transmission Service (NITS) agreement. If necessary, single facilities may be analyzed across multiple tiers and will be allocated capacity based on the appropriate tier.

The resources studied for Tier 1 of the Load Responsible Entity's (LRE) is the amount of wind Designated Resources in an LRE's NITS agreement. Tier 1 has priority in the study and has its ELCC capacity value determined first, followed by Tier 2. Tier 2 is the amount of wind Designated Resources in excess of an LRE's NITS agreement or not included in any NITS agreement.

Tier 2 is the amount of all studied wind resources not included in Tier 1. If the resources analyzed in Tier 1 did not have firm transmission service on the full contract or ownership amount, the remaining nameplate rated capability of the resource was studied in Tier 2. Wind facilities registered in the SPP Integrated Marketplace by February 15, 2024, not identified through the 2024 Workbook submission process were assigned to Tier 2, assuming there was no confirmed Firm Transmission Service by February 15, 2024. This method and analysis reflects the approved ELCC policy for wind, solar and ESR resources. Table 11 below shows an example for the situation where three entities are purchasing nameplate capacity from an individual facility and how that facility could be divided into separate tiers.

Table 11. Tier Designation Example

Plant Name	Nameplate (MW)	Purchasing Entity	Firm Service Granted (MW)	Summer Contract (MW)	Summer Tier	Winter Contract (MW)	Winter Tier
Wind Facility A	300	LRE 1	200	200	1	200	1
		LRE 2	20	50	1	50	1
		LRE 2	20	30	2	30	2
		LRE 3	0	50	2	50	2

For summer season, Tier 1 included 49%, or 16,854 MW, of all studied nameplate wind; and, Tier 2 included 51%, or 16,938 MW, of all studied nameplate wind. For winter season, Tier 1 comprised 48%, or 16,251 MW, of all studied nameplate wind; and, Tier 2 comprised 52%, or 17,541 MW, of all studied nameplate wind. There were 47 Load Responsible Entities (LRE) that utilized wind resources to meet Resource Adequacy Requirement (RAR).

The 2024 ELCC wind analysis was performed on weather years 1980 to 2022. All weather years were studied together when considering the 1-day-in-10-year threshold similarly to the 2023 Loss of Load Expectation (LOLE) study[2]. Each season, summer and winter, were studied independently of the other.

2.3.2 SOLAR TIER DETERMINATION

For the solar portion of the ELCC study, 947 MW of installed solar resources were divided into Tier 1 and Tier 2. There were 17 LREs that utilized solar resources to meet RAR. In terms of Tier composition for the summer season, Tier 1 comprised 48.5%, or 459 MW, of all studied nameplate solar; and, Tier 2 comprised 51.5%, or 488 MW, of studied nameplate solar. The installed nameplate solar analyzed for each tier did not change between the summer season and winter season.

Because over half of these solar resources (>600MW) were new resources or behind the meter resources whose historical output has not been received by SPP for purposes of ELCC, the 2024 ELCC solar study only utilized synthetic solar shapes as viable substitute shapes in the absence historical output for the purposes of the allocation process as approved in the ELCC scope for the 2024 ELCC informational study only.

2.3.3 ESR ASSUMPTIONS

Model inputs for the ESR ELCC study are similar to that of wind and solar portion of the ELCC study. The main difference in the ESR study is the inclusion of batteries with the following parameters modeled:

- Stand-alone batteries
- 100 MW Maximum Capacity output limit per hour
- Cycling efficiency of 90%
- 4-, 6-, and 8-hour durations
- Battery Penetration Levels: 1,000 MW
- Economic arbitrage dispatch
- Demand Response Programs included
- 1980 to 2022 weather years analyzed together

2.4 STUDY METHOD

In order to measure the ELCC of a particular resource, reliability effects need to be isolated for that resource. The basic concept of an ELCC analysis focuses on two situations: one including the resource(s) of interest and the other excluding them from the system. For the wind and solar studies, the benchmark SPP system, also referred to as the base case, is defined as system load supplied by all other resource types in the SPP footprint that are not being evaluated in the instant analysis. For example, the wind ELCC Study base case included load, conventional resources, all solar resources, and all other resources except for wind. The base case and subsequent change cases focused on the resource type being analyzed while all other resources remain constant between the cases.

For the wind and solar ELCC study, Change Case A considered Tier 1 wind and solar resources; Change Case B considered all wind and solar resources. The wind ELCC study values related to each case are shown below in Table 12. The values for the solar ELCC study are shown below in Table 13.

Table 12. System Wind ELCC Calculation Example

Case	Wind resources assigned to case	Nameplate wind for Summer Season (MW)	Nameplate wind for Winter Season (MW)
Wind Base Case	No wind resources	0	0
Wind Change Case A	Tier 1 wind resources	16,854	16,251
Wind Change Case B	All wind resources	33,762	33,792

Table 13. System Solar ELCC Calculation Example

Case	Solar resources assigned to case	Nameplate solar for Summer Season (MW)	Nameplate solar for Winter Season (MW)
Solar Base Case	No solar resources	0	0

Solar Change Case A	Tier 1 solar resources	459	459
Solar Change Case B	All solar resources	947	947

The ELCC study scenarios analyzed ESR resources with 4-, 6-, and 8-hour durations at 1000 MW penetrations in Summer and Winter respectively, with each duration studied independently of the others. The ELCC at 1000 MW penetration was used for all ESR resources in accordance with the duration of the resource as approved in the ELCC scope.

Table 14. System ESR ELCC Calculation Example

Case	ESR resources assigned to case	Nameplate ESR for Summer Season (MW)	Nameplate ESR for Winter Season (MW)
ESR Base Case	No ESR resources	0	0
ESR 4-hour Case	4-hour ESR resources	1000	1000
ESR 6-hour Case	6-hour ESR resources	1000	1000
ESR 8-hour Case	8-hour ESR resources	1000	1000

The base case and all subsequent change cases were analyzed by adding the same amount of load (also referred to as perfect negative generation) in every hour of the assessment period until an LOLE threshold of 0.1 days/year is achieved. The amount of perfect negative generation added in each change case was compared to the amount of load added in the base case to derive an ELCC MW for each change case in the combined weather year. Then, the resulting ELCC MW delta is the resulting ELCC MW for each case.

Figure 2: Diagram of System with Wind and Solar Resources

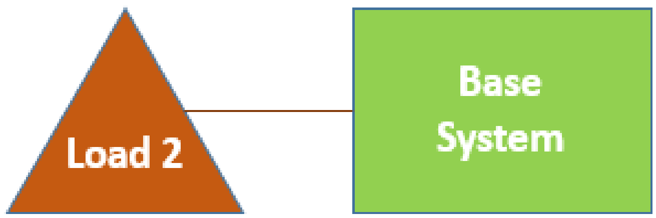

Figure 3: Diagram of System without Wind or Solar Resources

2.5 SIMULATION

Thirty (30) random seed[3] representations were applied to each scenario to create additional variation in unit availability and dispatch between simulations. This is defined as one case. Ten (10) iterations were applied to each case to reach statistical convergence and reduce the standard error between results. In total, 300 iterations (10 iterations x 30 seed values) were applied to each wind, solar, and ESR scenario.

2.6 RESULTS

Wind Resources

After determining the ELCC wind value for each tier, an incremental ELCC value was assigned to each tier utilizing the ELCC MW from the applicable base and change cases as to not over allocate the total ELCC MW of the system. The resulting wind ELCC MW and nameplate wind for each tier is shown below in Table 15. The methodology for allocating the ELCC accredited amount for

[3] A random seed representation assigns a pre-commitment outage and maintenance schedule before the simulations begin. As the amount of randomly generated seed values increases, the variability in iterations increases as well.

each tier is addressed in the "Allocation" section of this report as well as the SPP Planning Criteria.

Table 15. Incremental ELCC for Wind

Wind Tier	Incremental Tier Method	Nameplate Wind of Tier (MW)	Incremental ELCC MWs for each Tier (MW)	Tier ELCC percentage (%)
Tier 1	Difference in Wind Base Case and Wind Change Case A	Summer = 16,854 Winter = 16,251	Summer = 3,017 Winter = 5,005	Summer = 17.9% Winter = 30.8%
Tier 2	Difference in Wind Change Case A and Wind Change Case B	Summer = 16,938 Winter = 17,541	Summer = 2,134 Winter = 3,613	Summer = 12.6% Winter = 20.6%

Solar Resources

After determining the ELCC solar value for each tier, an incremental ELCC value was assigned to each tier utilizing the ELCC MW from the applicable base and change cases as to not over allocate the total ELCC MW of the system. The resulting solar ELCC MW and nameplate solar for each tier is shown below in Table 16. The methodology for allocating the ELCC accredited amount for each tier is addressed in the "Allocation" section of this report as well as the SPP Planning Criteria.

Table 16. Incremental ELCC for Solar

Solar Tier	Incremental Tier Method	Nameplate solar of Tier (MW)	Incremental ELCC MWs for each Tier (MW)	Tier ELCC percentage (%)
Tier 1	Difference in the solar base case and solar Change case A	Summer = 459 Winter = 459	Summer = 283 Winter = 168	Summer = 61.7% Winter = 36.6%
Tier 2	Difference in solar Change case A and wind Change case B	Summer = 488 Winter = 488	Summer = 306 Winter =202	Summer =62.6% Winter = 41.4%

<u>ESR Resources</u>

The ELCC accreditation of 4-hour, 6-hour and 8-hour ESRs at 1,000MW of Nameplate in both Summer and Winter seasons was determined and applied to all resources based on duration. The penetration of ESR resources for all categories is below the 1,000MW level so the accreditation at that level is applied to the resources as approved in the scope. The resulting ESR ELCC MW percentage for each duration is shown below in Table 17.

Table 17. Incremental ELCC for ESR

ESR Duration	Incremental Tier Method	Nameplate ESR studied(MW)	Incremental ELCC MWs for each duration (MW)	Tier ELCC percentage (%)
8-hour	Difference in the ESR base case and ESR 8-hour case	Summer = 1000 Winter = 1000	Summer = 1000 Winter = 749	Summer = 100% Winter = 74.9%
6-hour	Difference in the ESR base case and ESR 6-hour case	Summer = 1000 Winter = 1000	Summer = 944 Winter =749	Summer =94.4% Winter = 74.9%
4-hour	Difference in the ESR base case and ESR 4-hour case	Summer = 1000 Winter = 1000	Summer = 652 Winter =477	Summer =65.2% Winter = 47.7%

Upon completion of the base scope results, additional results were requested surrounding changes in assumptions including Demand Response modeling and Hydro resource modeling and the affects that these assumptions had on ESR accreditation. The first sensitivity analyzed were the effects of Demand Response being included in the base and change case modeling. Demand Response was not included in the base and change case modeling during the 2022 ESR, so investigation into the affects of this update were requested. The investigation was to ensure that ESR and DR resources were being dispatched appropriately in the model to most accurately capture the ELCC of the ESRs. The Resulting ESR ELCC MW percentage for each duration is shown below in Table 18. In all durations, for both seasons, with the exception of 8 hour duration resources in the Summer season, the ELCC MWs increased.

Table 18. Incremental ELCC for ESR (No DR)

ESR Duration	Incremental Tier Method	Nameplate ESR studied(MW)	Incremental ELCC MWs for each duration (MW)	Tier ELCC percentage (%)
8-hour	Difference in the ESR base case and ESR 8-hour case	Summer = 1000 Winter = 1000	Summer = 974 Winter = 763	Summer = 97.4% Winter = 76.3%
6-hour	Difference in the ESR base case and ESR 6-hour case	Summer = 1000 Winter = 1000	Summer = 974 Winter =763	Summer =97.4% Winter = 76.3%
4-hour	Difference in the ESR base case and ESR 4-hour case	Summer = 1000 Winter = 1000	Summer = 887 Winter =700	Summer =88.7% Winter = 70.0%

Once these results were completed, the additional request with the modeling of Hydro resources changed from a variable output resource to a constant output resource was initiated with the resulting ESR ELCC MW percentage for each duration shown below in Table 19. The discussion surrounded the ability of Hydro resources to go beyond the regular output during times of higher need.

Table 19. Incremental ELCC for ESR (No DR, Constant Hydro)

ESR Duration	Incremental Tier Method	Nameplate ESR studied(MW)	Incremental ELCC MWs for each duration (MW)	Tier ELCC percentage (%)
8-hour	Difference in the ESR base case and ESR 8-hour case	Summer = 1000 Winter = 1000	Summer = 980 Winter = 1000	Summer = 98.0% Winter = 100%
6-hour	Difference in the ESR base case and ESR 6-hour case	Summer = 1000 Winter = 1000	Summer = 964 Winter =1000	Summer =96.4% Winter = 100%
4-hour	Difference in the ESR base case and ESR 4-hour case	Summer = 1000 Winter = 1000	Summer = 964 Winter =1000	Summer =96.4% Winter = 100%

Discussion continues in the Supply Adequacy Working Group over the correct modeling approach to most accurately capture the ELCC of ESRs. A final direction will be decide during discussion and decided on as a part of the 2025 ELCC Study Scope effort.

2.7 ALLOCATION

Once the system-wide accredited capacity value has been determined for each tier, individual resources of the applicable tier will then receive a share of the total system-wide accredited capacity compared to the total historical average capacity value of all other wind or solar facilities in the applicable tier. The amount of share for each resource is determined by the production of each resource corresponding to an assigned hourly load shape. Tier 1 and 2 wind or solar resources will use the average production output from the top three percent (3%) load hours, for each applicable season, of the individual LRE for which the generation is contracted or designated to serve. Tier 3 resources will use average historical production output from the top three percent (3%) load hours for each applicable season of the SPP BA Area's load. An example is given below -

> Example: A 100 MW nameplate wind resource was analyzed in Tier 1 and the average production output from the top three percent (3%) load hours for the summer season was determined to be 30 MW. After performing this calculation for all wind resources, the total average production output from all Tier 1 wind resources was determined to be 4,363 MW. Comparing the average summer season ELCC MW of Tier 1 to the average production output of all wind resources of Tier 1, the ratio applied to all resources in Tier 1 is 67.59% (2,949 MW / 4,363 MW). Applying this ratio to the production output of the individual resource, the resource would receive 20.28 MW (30 x 67.59%) of accredited ELCC MW.

The accredited ELCC value for the SPP system will be fully allocated such that no ELCC values are remaining after completion of the ELCC Study. The results were posted to a secure website for each individual entity to maintain confidentiality.

CONCLUSION

The concept(s) of ELCC is to accurately estimate the value of wind and solar resources relied upon to meet system capacity needs for planning reserve purposes. Consistent with approved policy, business practices, and criteria, SPP performed an ELCC analysis for the installed wind amount of 33,792 MW and has determined the ELCC available for wind is 5,151 MW in the summer season and 8,618 MW in the winter season. The analysis also determined that the ELCC available for 947 MW of installed solar is 589 MW for the summer season and 370 MW for the winter season. Multiple scenarios were presented for ESRs and are currently being discussed. The final direction of the accreditation will be decided during the 2025 ELCC Study Scoping.

APPENDIX A: LIST OF ACRONYMS

BA	Balancing Authority
ELCC	Effective Load Carrying Capability
ISO	Independent System Operator
LFU	Load Forecast Uncertainty
LOLE	Loss of Load Expectation
ESR	Energy Storage Resource
LOLP	Loss of Load Probability
LRE	Load Responsible Entity
MW	Megawatt
Tariff	Open Access Transmission Tariff
RTO	Regional Transmission Organization
SAWG	Supply Adequacy Working Group
SERVM	Strategic Energy & Risk Valuation Model
SPP	Southwest Power Pool