



RTO QUARTERLY UPDATE FOR MISSOURI COMMISSION

JANUARY 23, 2025



SPP QUARTERLY RTO UPDATE TOPICS

SPP Expedited Resource Adequacy (ERAS)

Generator Interconnection Queue Status and Reform

Reliability Metrics

Transmission Planning

SPP EXPEDITED RESOURCE ADEQUACY STUDY (ERAS)

SPP ERAS AT-A-GLANCE

Driving the need:

Planning Reserve Margin /
Resource Adequacy

Increased load projections

GI Queue backlog

Generator Retirements



Special **one-time study** process to expedite the interconnection of new resources to meet resource adequacy needs



Must be approved by the Regional State Committee (RSC)



Conducted outside of the regular generator interconnection study queue on a shortened timeframe.



Generation projects selected by Load Responsible Entities (LRE) within resource adequacy needs established by SPP policy.

Benefits

- ERAS requests get to GIA ~6 months earlier than 2024 cluster
 - Commercial operation sooner (subject to construction of upgrades)
- ERAS requests don't compete with 82 GW currently in queue
 - Fewer constraints - lower upgrade costs (in general)

Drawbacks

- No benefit from prior-queued upgrades that might get assigned to prior-queued requests
- Potential disruptions to requests in queue—restudies, cost shifts (may be ways to mitigate)

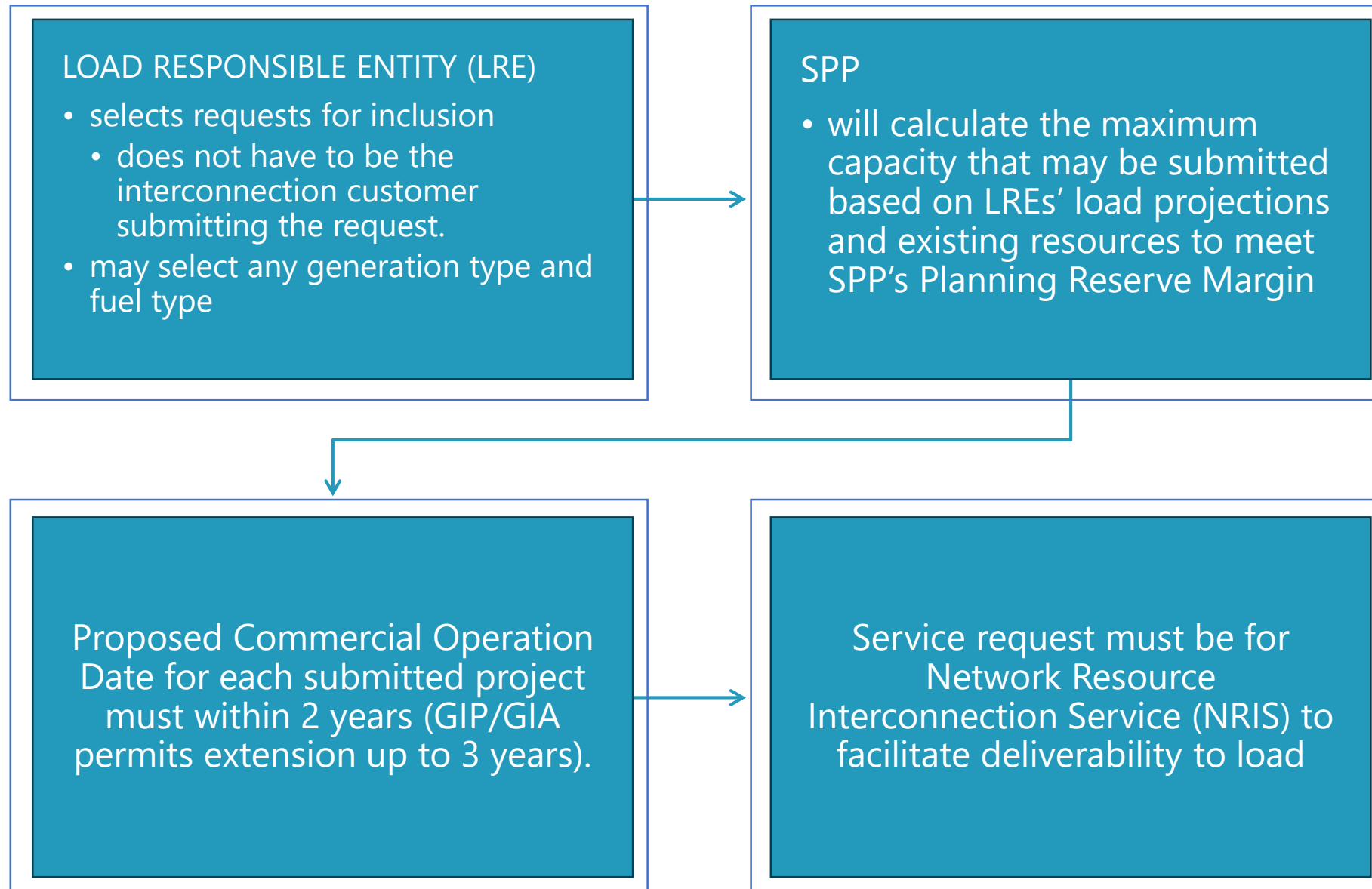
Costs

- Impact assessment subject to more-complete scope
- Require outsourcing most/all study and processing
- Require outsourcing implementation activities

Risks

- Stakeholders may not reach consensus
- FERC may reject filing
- Implementation may take longer than expected
- More requests may be submitted than can be processed in a reasonable time
- Upgrade costs may be higher than expected
- Construction time delays benefit
- Other initiatives are delayed

SPP ERAS POLICY KEY POINTS



SPP ERAS PROCESS



Requests will be studied outside of the DISIS queue process.



Use the latest ITP models updated to include approved ITP, GI, Service, and Sponsored upgrades.



Requests accepted into study will have priority over all requests in the GI queue not having signed GIAs.



Required upgrades will be directly assigned to the requesting interconnection customer and subject to reimbursement via iLTCRs.

SPP ERAS IMPACT MANAGEMENT

Protections for requests in queue

- Requests currently in a DISIS cluster where the window has closed could transfer to the RA study only if they have not passed Decision Point 2.
- Financial securities of any requests that have transferred from a DISIS cluster to the RA study would stay at-risk with the DISIS cluster to offset cost shifts triggered by withdrawal from that cluster.
- New financial securities for requests entering RA study would offset costs shifted to requests in queue or in RA study.
- ERAS requests would not be dispatched as “prior-queued” requests in future DISIS studies and restudies

Protections for other initiatives and processes

- Must not delay DISIS backlog, CPP, NRIS+, RTO expansion
- SPP will outsource process implementation and administration as much as possible to minimize impact.
- Study cost will be pass-through to interconnection customers in the RA study.

SPP ERAS OUTSTANDING ISSUES

SPP will attempt to reach consensus on stakeholder concerns and address all open issues

Address expressed concerns:

- Mitigate harm to existing requests.
- Consider higher readiness criteria.
- Explore interim service alternative.

Other open issues and details:

- Coordination of RA study with CPP, RTO expansion, DISIS.
- Mechanism (if any) for triggering subsequent RA studies.
- Formula for capacity ceiling. How multiple LREs can submit a single request?
- Latest COD for RA requests.
- Funding implementation cost and acquisition of outside resources.
- Specific study and financial security amounts and refund provisions.
- Craft a strategy to achieve FERC approval.

ERAS FORMULA AND LRE EXAMPLE

LRE Ceiling Capacity

$$= \text{Maximum} \{0, [(Projected Resource Adequacy Requirement) - Projected LRE Capacity] * Ceiling Multiplier\}$$

Winter 2030 Projection

- LRE Accredited Capacity = 900 MW
- Net Peak Demand = 1,000 MW
- ACAP PRM = 15.7%
- Ceiling Multiplier = 1.25

Winter ERAS Ceiling Capacity

$$(1,000 \times (1 + 15.7\%) - 900) \times 1.25 = 321 \text{ MW}$$

Summer 2030 Projection

- LRE Accredited Capacity = 1,100 MW
- Net Peak Demand = 1,300 MW
- ACAP PRM = 7.6%
- Ceiling Multiplier = 1.25

Summer ERAS Capacity Ceiling

$$(1,300 \times (1 + 7.6\%) - 1,100) \times 1.25 = 374 \text{ MW}$$

ERAS Max Ceiling Capacity is 374 MW

LRE Ceiling Capacity is max between both seasons

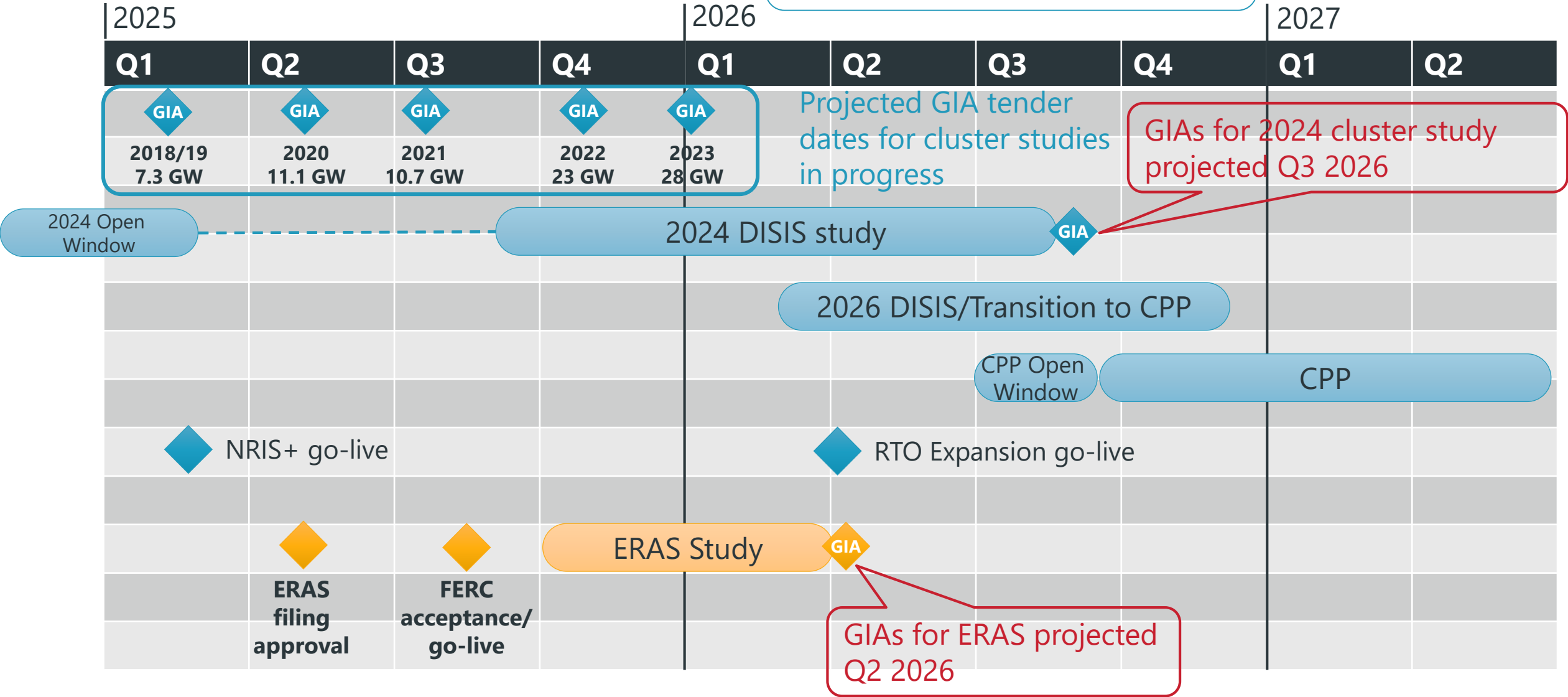
PRELIMINARY ERAS ESTIMATIONS

Potential Regional Ceiling Capacity from all LREs between 10GW and 20GW

- Calculated based on Accredited Capacity (ACAP) while applying new SPP accreditation policies
 - Applies class average values to all resources equally based on technology type
- Considers current retirement, contract, and demand projections provided by LREs in the 2024 RA Workbook submission for planning year 2030
- Considers projected future resources provided by LREs for the 2024 LOLE Study resource plan refresh for planning year 2030
- Lower bookend assumes resources in current GI study will not move to ERAS
- Not all LREs may use ERAS even if they have ERAS available
- Applies projected 2029 ACAP PRM

APPROXIMATE TIMELINE

ERAS requests are projected to receive GIAs prior to 2024 cluster



REVIEW AND APPROVAL PROCESS

Finish collecting feedback → refine Revision Request draft

REAL to endorse ERAS *policy* in January

MOPC endorsed ERAS *policy* in January

Next

RSC, Board to endorse ERAS *policy* February 3-4

CAWG, TWG, RTWG, GIAG, SAWG, reviews RR in January, February, March

MOPC education session March TBD

REAL approves RR March 6

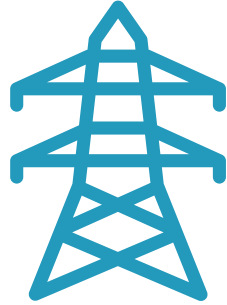
MOPC approval April 15-16

RSC & BOD approval May 5-6

Filing mid-May

GENERATOR INTERCONNECTION STATUS & REFORM

GI QUICK HITS

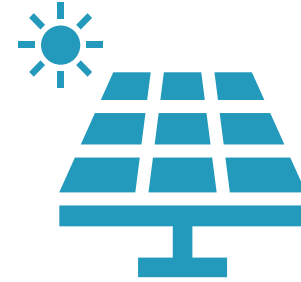


2024

100GW+ of cumulative generation studied in DISIS and Special studies

108 GIA signed for 18.2GW

- **6.4 GW of New GIA**
 - 3.4 GW Solar, 1.6 GW Battery,
 - 1.1 GW Thermal, 0.7 GW Wind



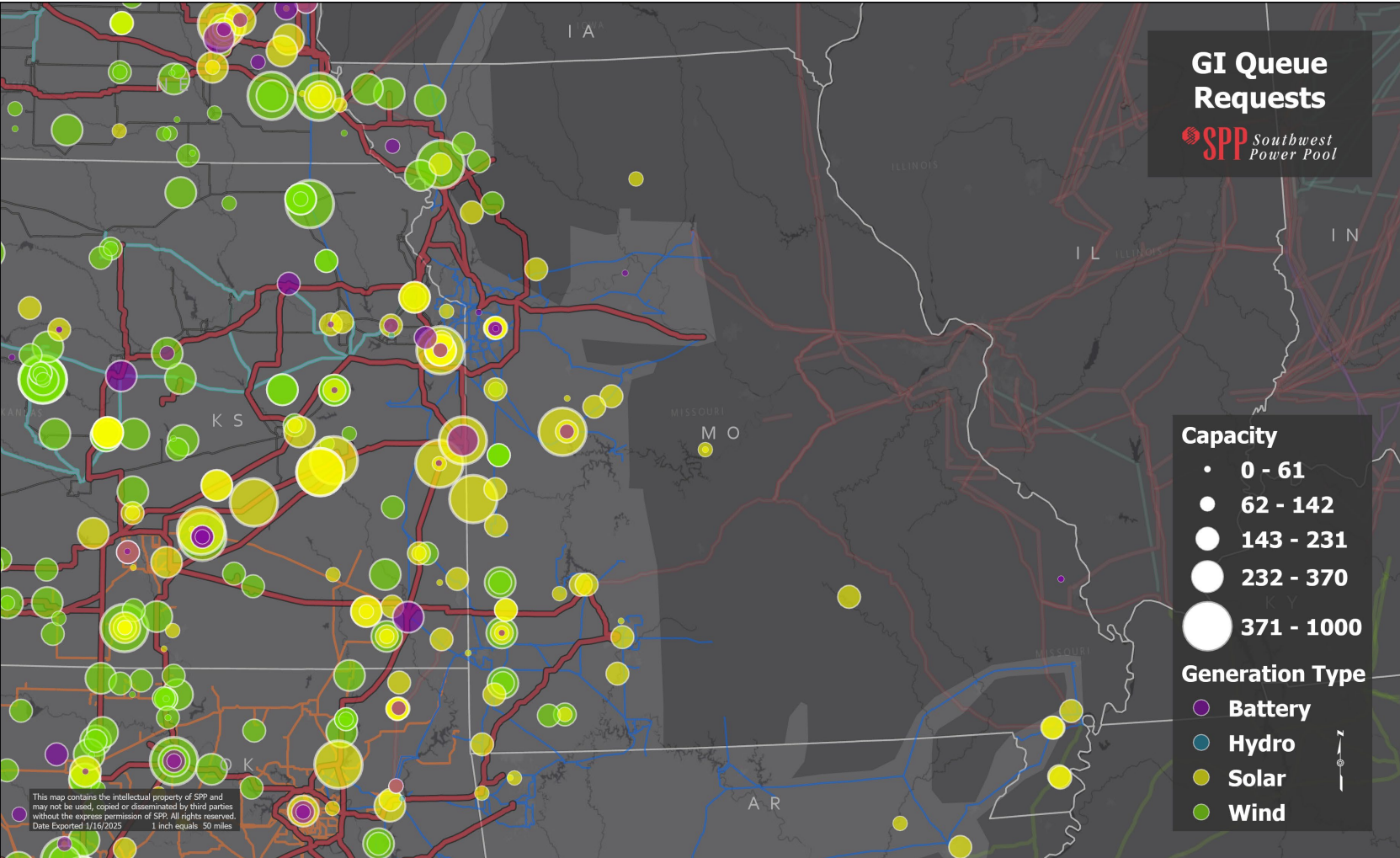
2025

4 Clusters enter GIA negotiations

6.7 GW coming online with GIA

- 3.9 GW Wind, 2.3 GW Solar, 0.5 GW Battery

MISSOURI GI QUEUE REQUESTS



MISSOURI ONLY



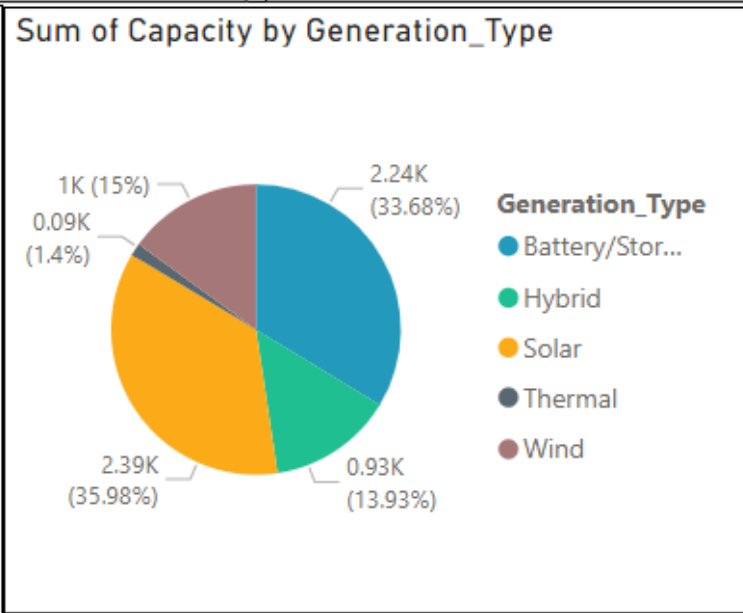
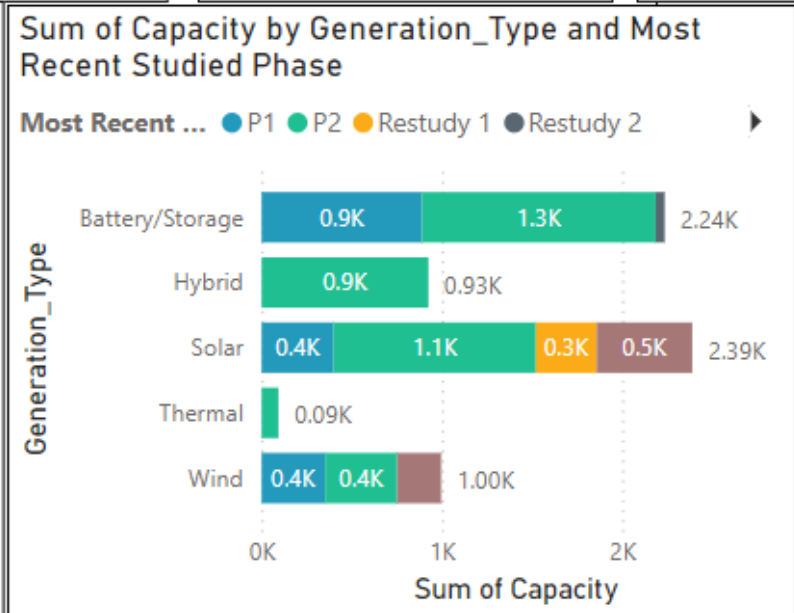
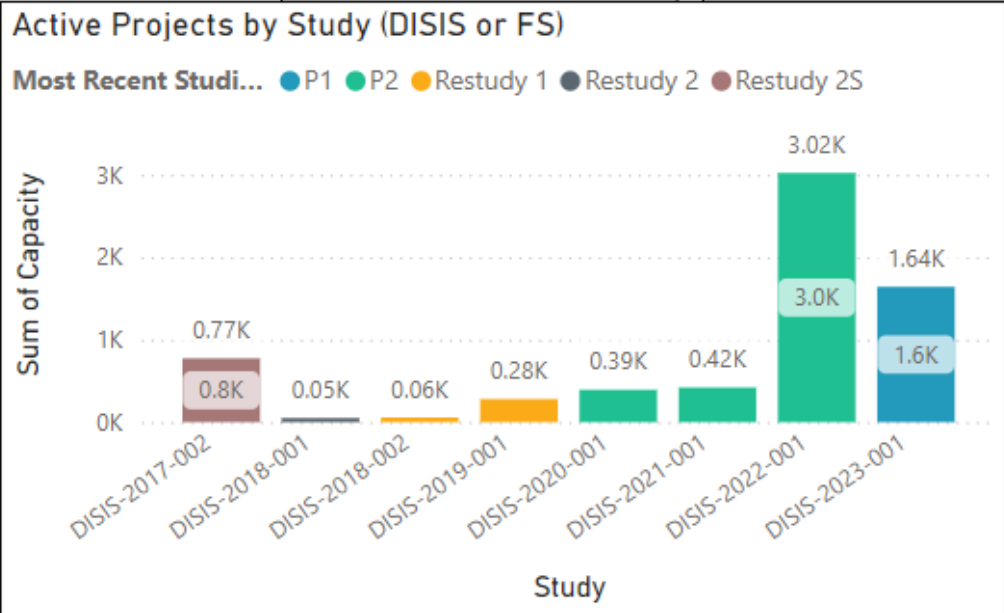
Active Capacity
8,994.19
 Sum of Capacity (MW)
48
 Count of GI_Number

Active Project Customers
27
 Customers
9
 TOs

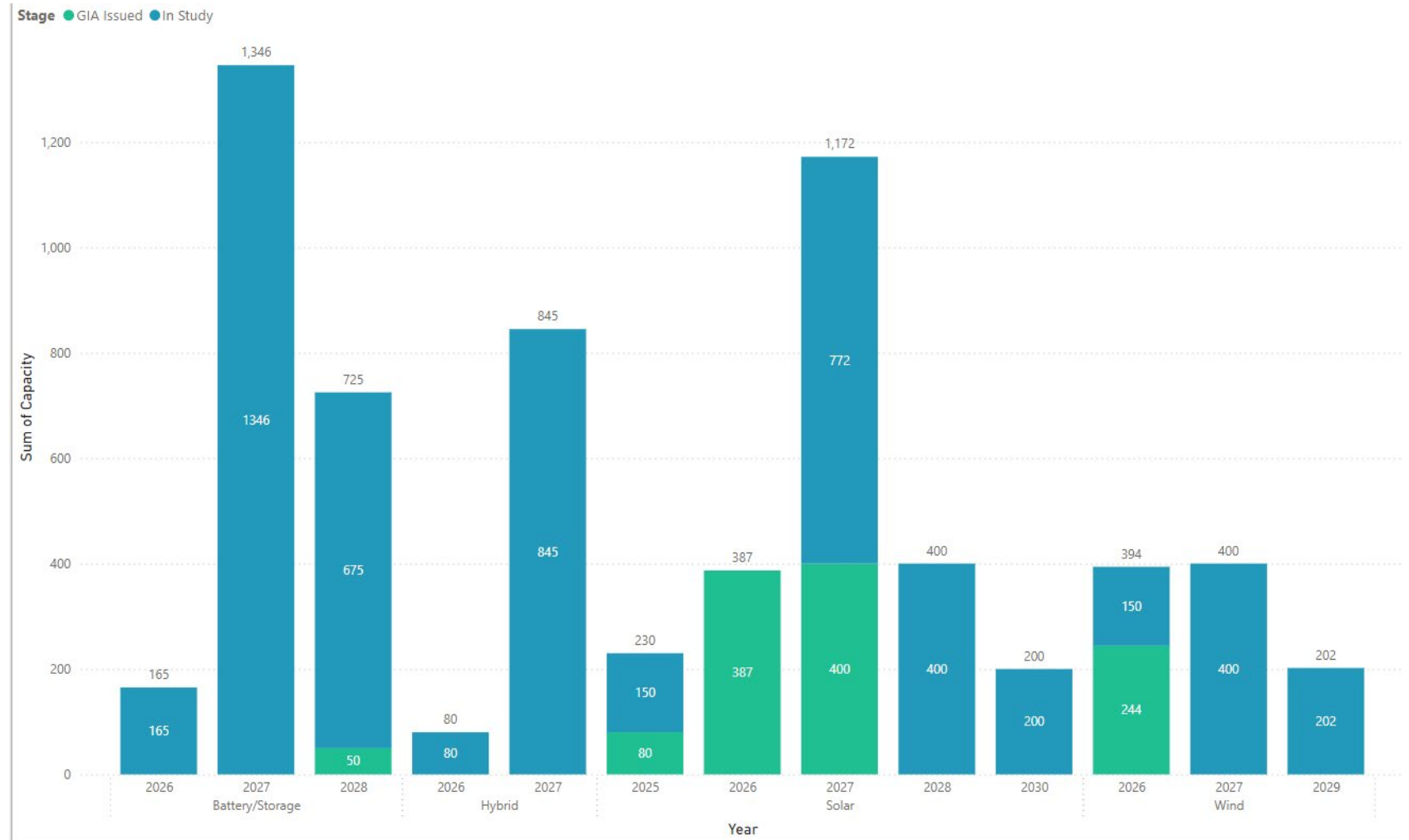
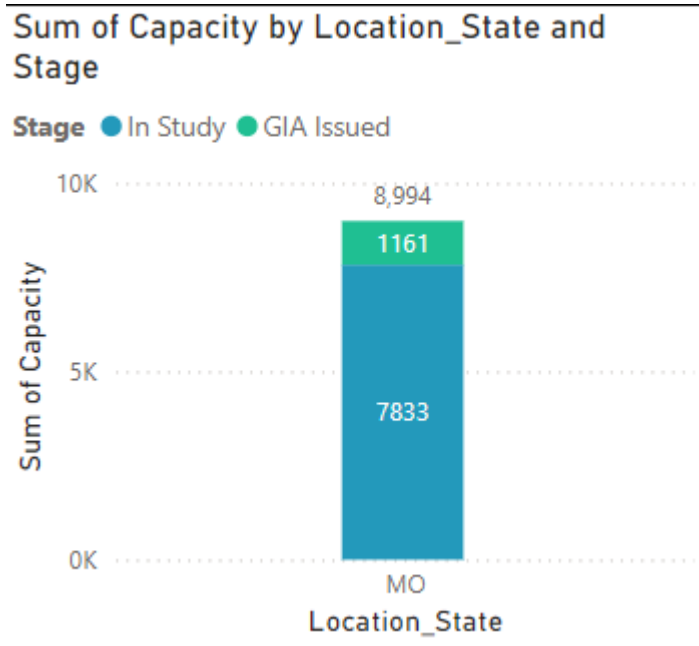
Active Upgrades
\$735,727,075
 Sum of Allocated Cost
154
 Count of Upgrade Name

High % Projects
3,972.99
 Sum of MW
23
 Count of Gen Number

High % Active Upgrades
\$315,796,042
 Sum of Allocated Cost
103
 Count of Upgrade Name



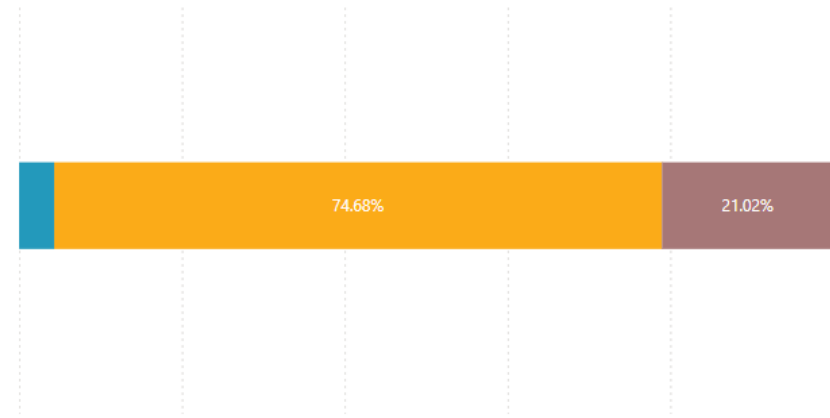
MO DETAIL BY STUDY STAGE AND YEAR



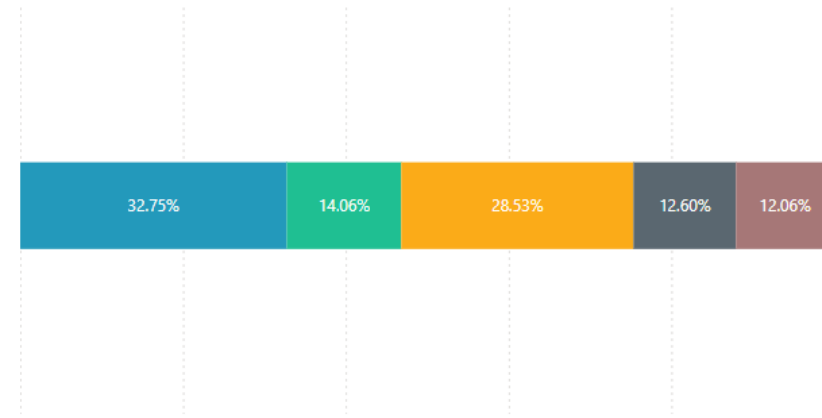
MISSOURI % BREAKDOWN BY STUDY STAGE

Generation_Type ● Battery/Storage ● Hybrid ● Solar ● Thermal ● Wind

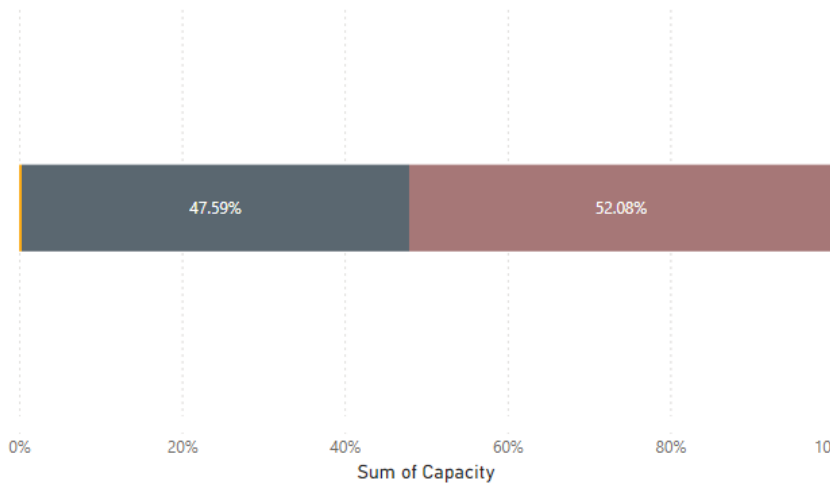
GIA Issued



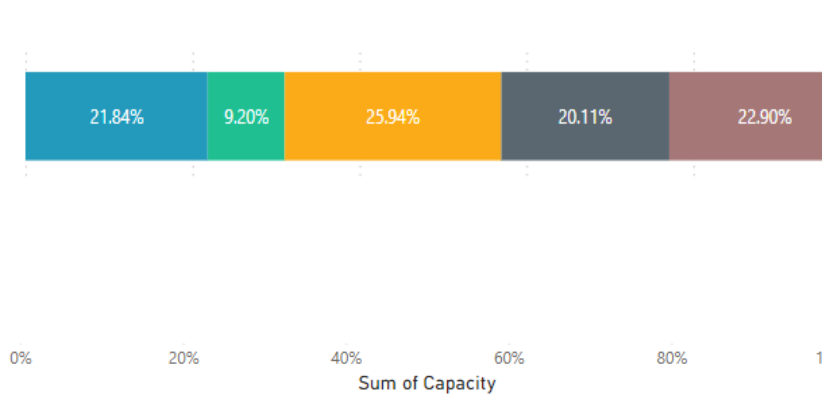
In Study



Reached COD



All Stages Combined



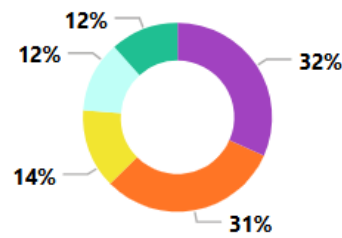
Southwest Power Pool Generation Interconnection Queue Dashboard

The current generator interconnection active queue consists of 44 projects totaling 8.2 GW

North Nebraska Central Southeast Southwest Total Queue



Projects: 44
Size 8.17 GW



Projects: 44
Size 8.17 GW

Projects: 44
Size 8.17 GW

Projects: 44
Size 8.17 GW

Projects: 44
Size 8.17 GW

Filter by Request

Filter by GEN Type

Filter by Cluster

Filter by State

Filter by TO

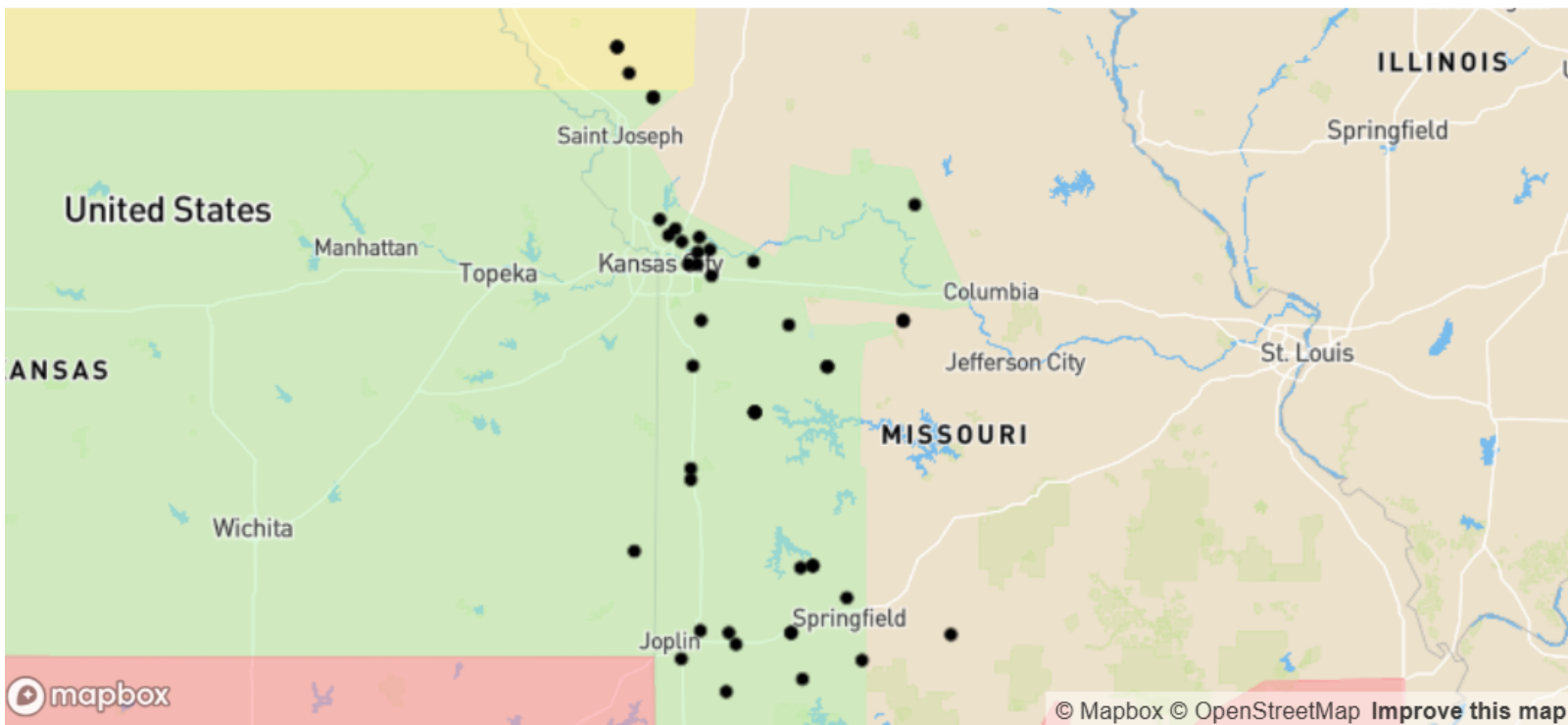
All

All

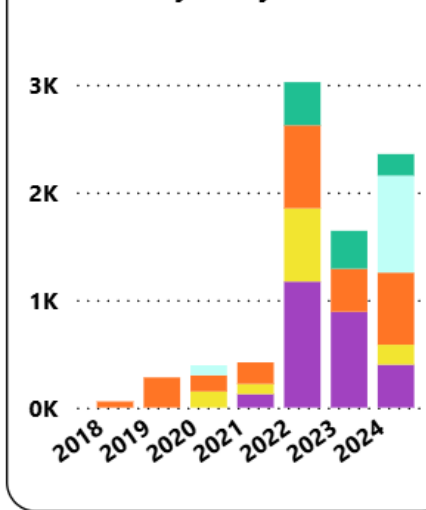
All

MO

All

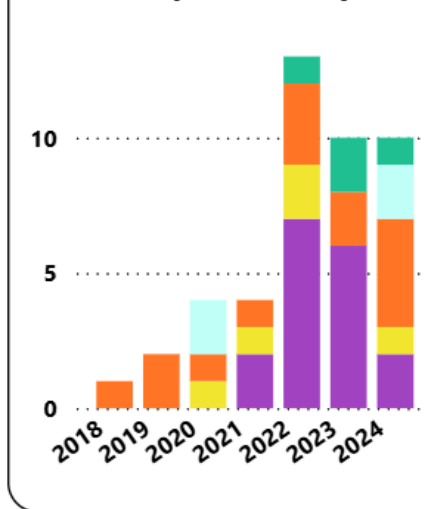


Active Projects by Year (MW)



Cluster	MW	Projects
03 CENTRAL	8,170.19	44
Battery/Storage	2,584.99	17
Hybrid	1,110.00	5
Solar	2,529.00	14
Thermal	994.20	4
Wind	952.00	4
Total	8,170.19	44

Active Project Counts by Year



Disclaimer: The data provided is for information purposes only. Questions? Submit to [Request Management System](#). Click [HERE](#) for SPP GI Web Site. Click [HERE](#) for GI Queue data.

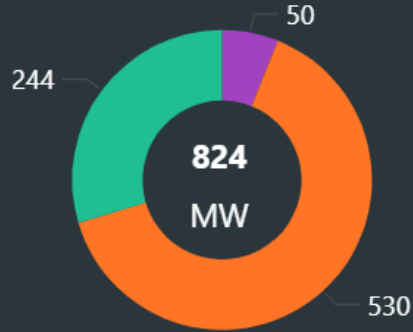
Generation Type ● Battery/Storage ● Hybrid ● Solar ● Thermal ● Wind

Commercial Operation Date Forecast

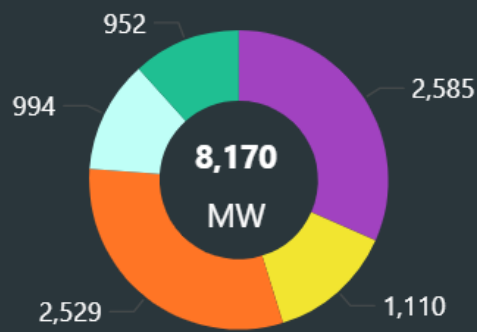
SPP currently has 4 projects with Executed GIAs expected to come on-line over the next 3 years.

Additionally, there are 44 projects in active study status. Based on a historical 60% withdraw rate, we can estimate 18 additional projects to come on-line over the next 7 years.

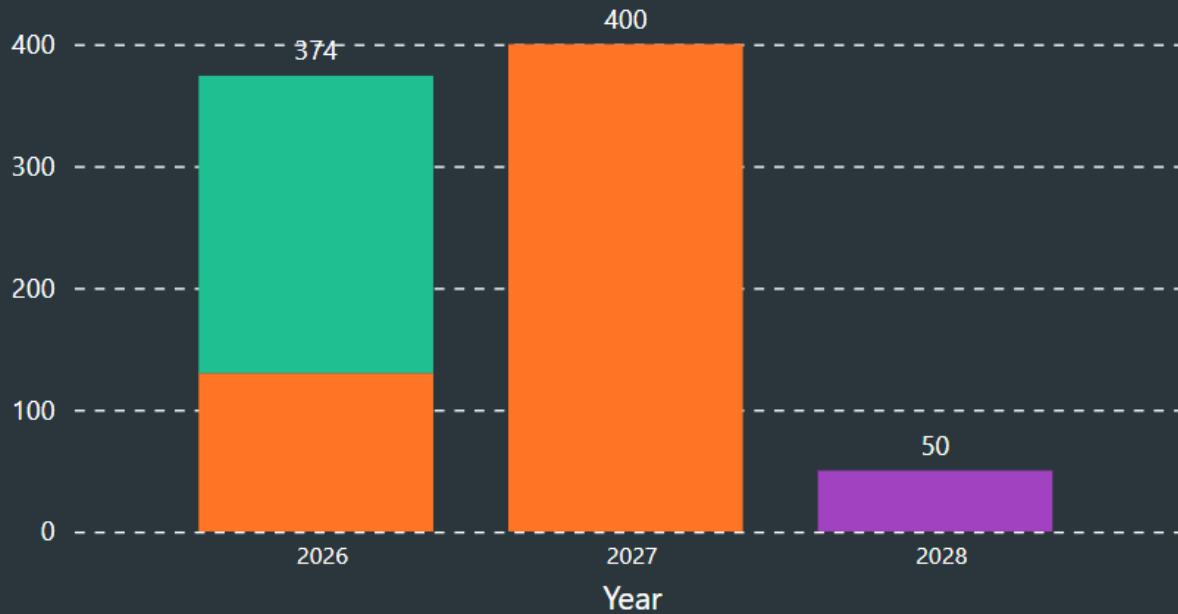
Executed GIA Generation (MW)



Active Study Generation (MW)



Executed GIA by Commercial Operation Year



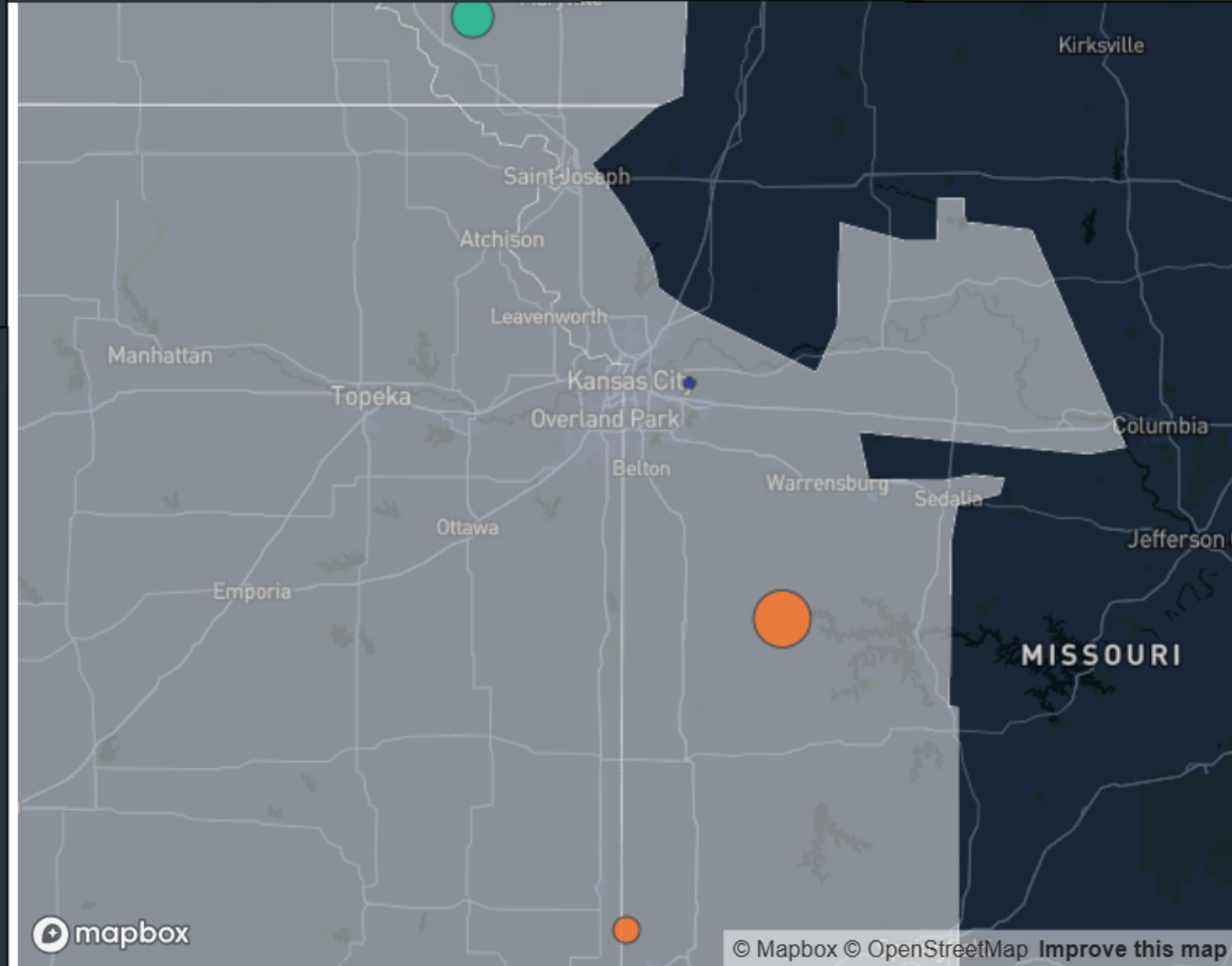
● Battery/Storage
 ● Hybrid
 ● Solar
 ● Thermal
 ● Wind

Southwest Power Pool Commercial Operation Date Forecasting Map

State


MO

Transmission Owner

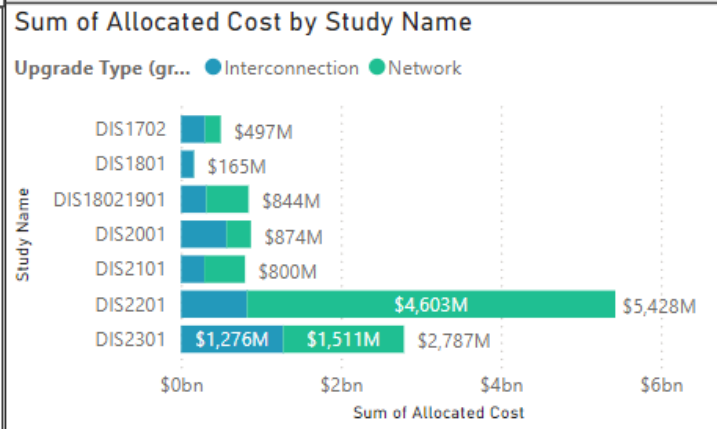
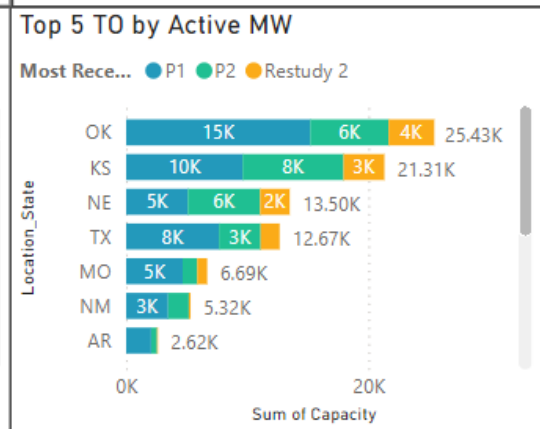
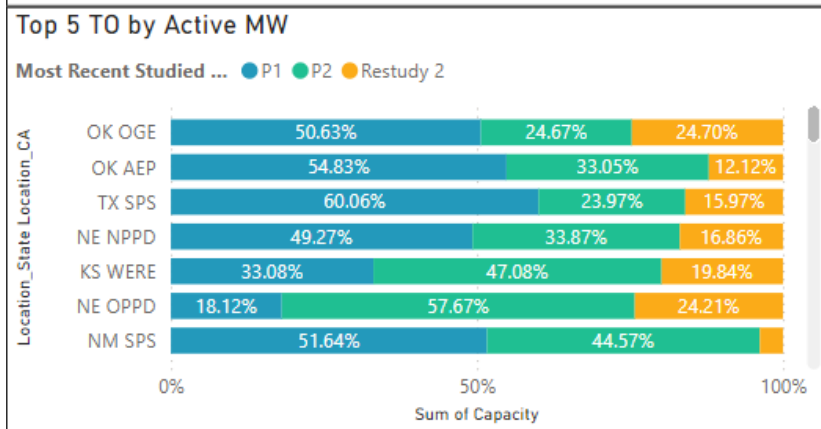
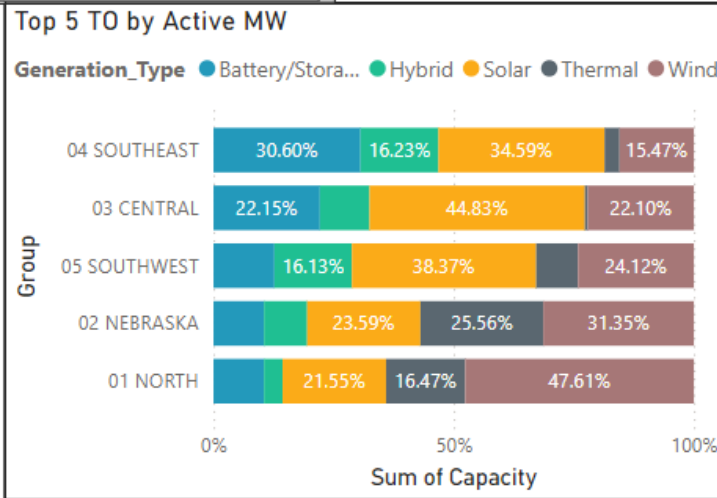
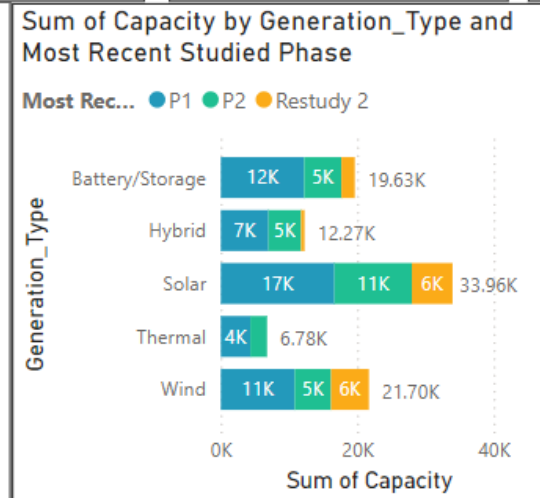
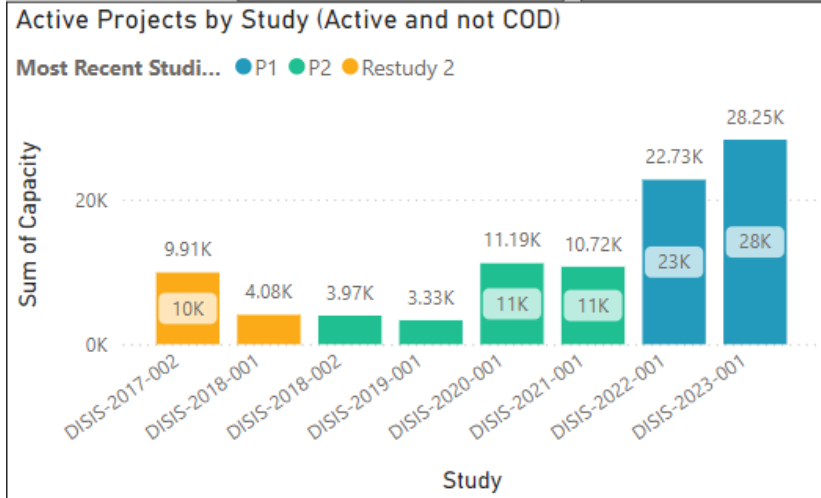


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OVERALL QUEUE NUMBERS



Active Capacity 82,418.42 Sum of Capacity (MW) 405 Count of GI_Number	Active Project Customers 163 Customers 33 TOs	Active Upgrades \$11,395,802,447 Sum of Allocated Cost 1614 Count of Upgrade Name	High % Projects 54,826.05 Sum of MW 260 Count of Gen Number	High % Active Upgrades \$3,637,741,581 Sum of Allocated Cost 965 Count of Upgrade Name
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REQUEST TO GIA BY CLUSTER

- Breakdown By Cluster
- Estimate number of projects for 2020 through 2024 is based on 40% of submitted projects making it GIA phase
- Count of projects in 1802/1901 is based on Restudy 1 results



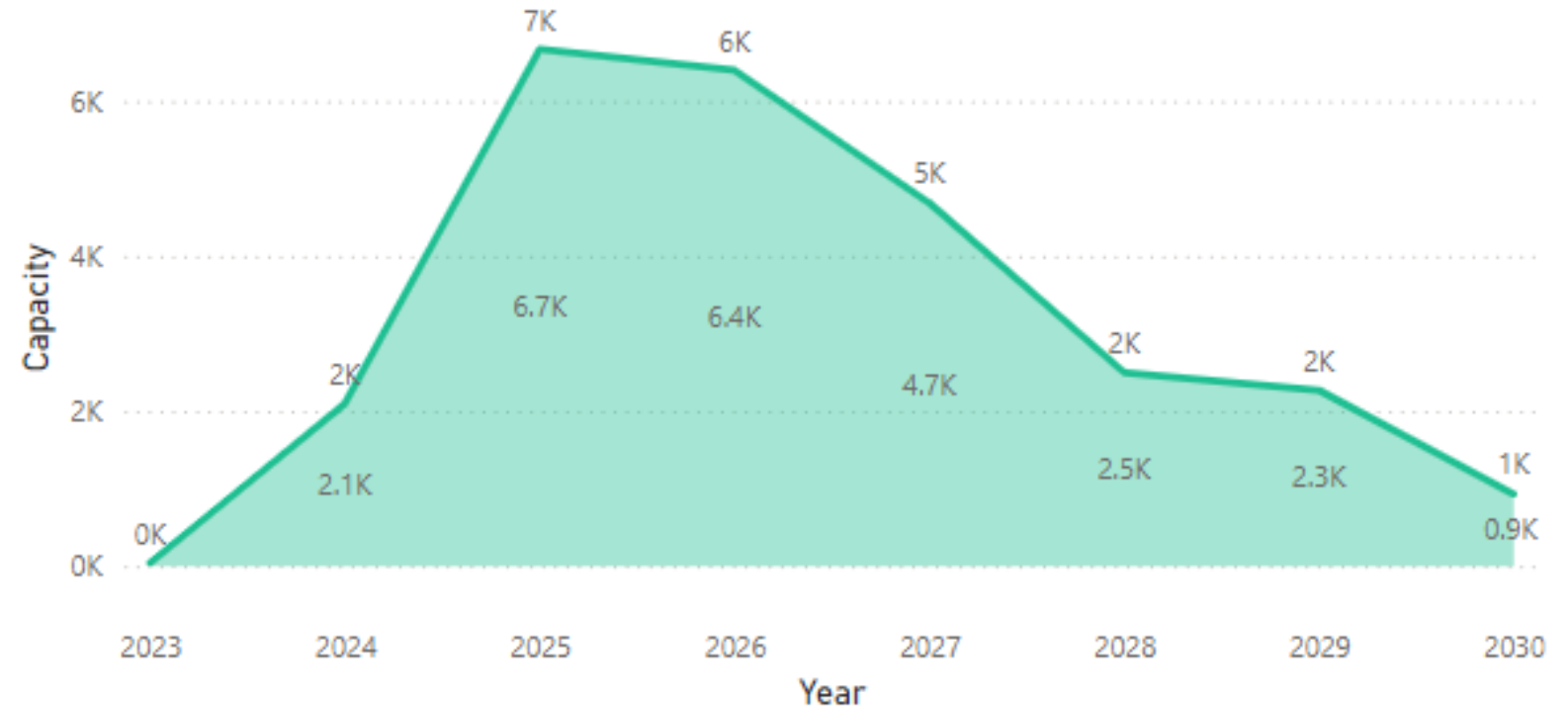
COMMERCIAL OPERATION VISIBILITY

108 GIAs executed in 2024;
First time hitting over 100
GIAs; Expect to see around 150
agreements in 2025

- COD of projects with executed GIA*
- Milestone Tracking
- Will continue to update as new GIA are signed and amended
- GIA to COD expectations from 3GW (2024) to 7GW (2025) from GI to Market Registration

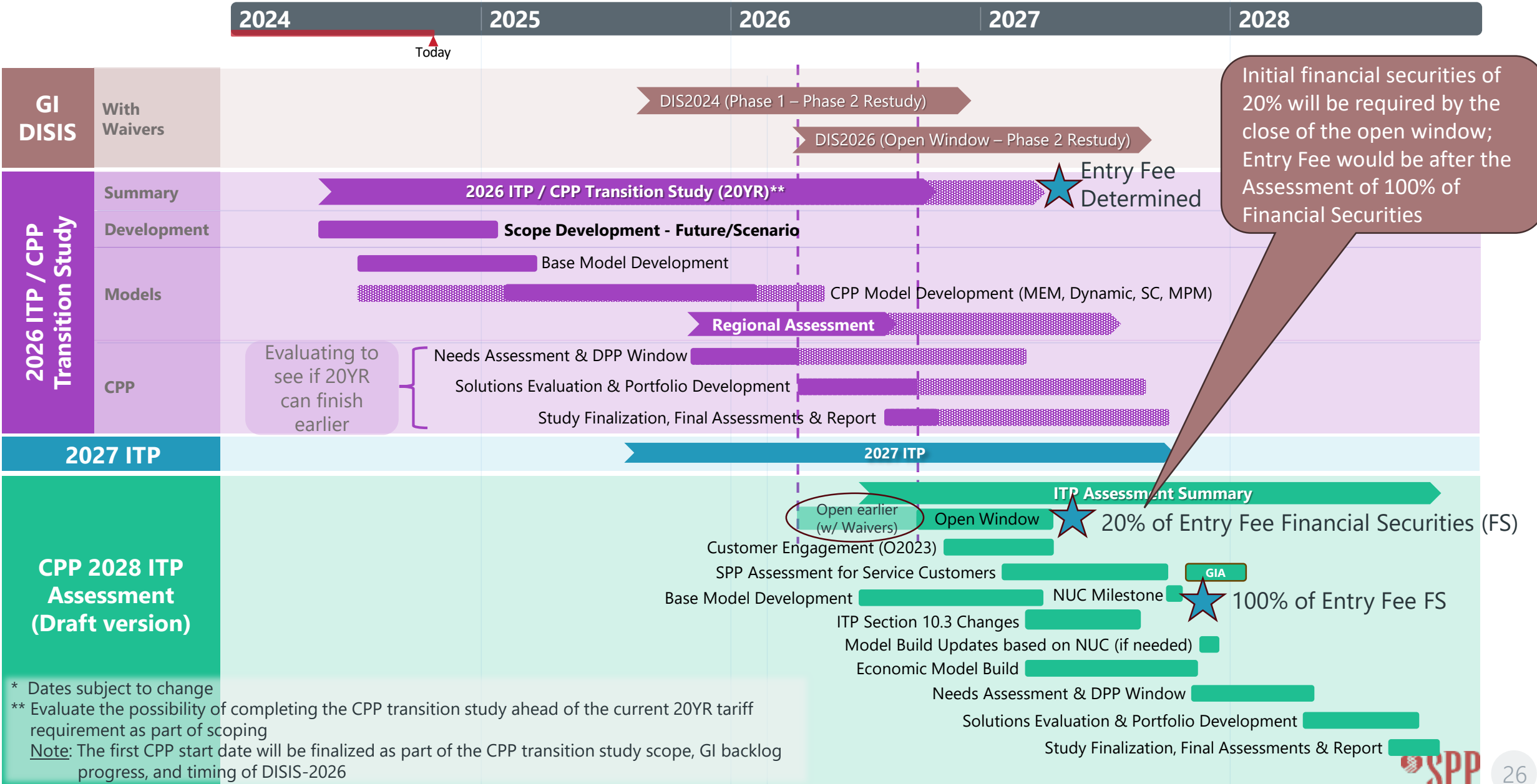
Capacity (MW) by COD and Status

Status (groups) ● GIA Issued



*Could see a 3-Year shift (right) COD assumptions

GI DISIS & CPP TIMELINES



* Dates subject to change

** Evaluate the possibility of completing the CPP transition study ahead of the current 20YR tariff requirement as part of scoping

Note: The first CPP start date will be finalized as part of the CPP transition study scope, GI backlog progress, and timing of DISIS-2026

BACKLOG MITIGATION PLAN

In 2025, complete GI backlog through DISIS 2022 GIAs and DISIS 2023 P2 Restudy

SPP Generation Interconnection Queue Study Schedule*

Green shaded cells indicate milestone completion. *Actual Start and Completion dates may vary and are subject to change. **Restudy start dates may change pending the outcome of the previous restudy.

	DISIS Cluster	Projects	MW's	*Projected DISIS Study Start	Phase 1 Posting	Projected DP 1 Completion	Phase 2 Start	Phase 2 Posting	Projected DP2 Completion	**Projected Restudy Start	Projected Restudy Completion	Projected Facilities Studies Start (pending restudy)	Projected GIA Start	Current Status	Postings & Comments
2024 GIAs (Actual)	DISIS-2017-002	59	11,727	6/21/2021	2/18/2022	3/14/2022	3/15/2022	8/29/2022	9/20/2022	1/5/2024	6/26/2024	6/27/2024	8/26/2024	GIA's in progress	Restudy posted
	DISIS-2018-001	32	4,955	3/15/2022	7/19/2022	8/23/2022	9/21/2022	3/20/2023	4/24/2023	6/27/2024	9/23/2024	9/24/2024	11/25/2024	GIA's in progress	Restudy posted
	DISIS-2018-002 & DISIS-2019-001	54	7,298	8/24/2022	10/25/2022	12/1/2022	4/25/2023	8/23/2023	10/13/2023	9/24/2024	12/10/2024	12/11/2024	2/10/2025	Facility Studies in progress	Restudy posted
	DISIS-2020-001	49	11,186	12/2/2022	3/17/2023	4/7/2023	10/16/2023	2/16/2024	3/11/2024	1/3/2025	3/3/2025	3/4/2025	5/5/2025	Restudy pending	Phase 1 Final posted 3/17/2023 Phase 2 Final posted 2/16/2024
	DISIS-2021-001	55	11,483	4/10/2023	6/8/2023	7/17/2023	3/12/2024	8/9/2024	9/16/2024	3/24/2025	5/22/2025	5/23/2025	7/22/2025	Restudy pending	P1 Final re-posted 6/30/2023, P2 posted 8/9/24, re-posted 8/30/24
2025 GIAs (Projected)	DISIS-2022-001	108	22,729	7/18/2023	9/28/2023	11/3/2023	9/17/2024	1/14/2025	2/5/2025	6/16/2025	8/14/2025	8/15/2025	10/15/2025	Phase 2 in progress	Phase 1 Final re-posted 10/20/23
	DISIS-2023-001	129	28,354	1/2/2024	3/1/2024	3/22/2024	2/6/2025	6/5/2025	6/27/2025	9/5/2025	11/3/2025	11/4/2025	1/5/2026	Phase 2 pending	Phase 1 Final posted 3/1/2024
Non-Backlog	DISIS-2024-001	13	2,233	11/10/2025	1/8/2026	1/30/2026	2/2/2026	6/1/2026	6/23/2026	7/15/2026	9/14/2026	9/15/2026	11/16/2026	Window Open	Application window closes 3/1/2025
	DISIS-2026-001	TBD	TBD	1/4/2027	3/4/2027	3/25/2027	3/26/2027	7/23/2027	8/13/2027	8/27/2027	10/25/2027	10/26/2027	12/27/2027	Planning	Application window opens 4/1/2026

*Pulled 1/2/2025

ADDITIONAL QUEUE REFORMS

Cash Deposit Amount*	Description
\$10,000	Non-Refundable Application Fee – all requests – DISIS Study Queue
\$35,000 + \$1,000 per MW	<80 MW – DISIS Study Queue
\$150,000	> 80 MW and < 200 MW – DISIS Study Queue
\$250,000	> 200 MW – DISIS Study Queue

Cash Deposit Amount	Description
\$60,000	Surplus Interconnection Service Impact Study
\$15,000	Surplus Interconnection Service Facilities Study (if applicable)
\$60,000	Material Modification Evaluation and/or Permissible Technological Advancement
\$120,000	Generating Facility Replacement Study (See Section 1, Definition of Generating Facility Replacement)
\$1,000	Fast Track (Jurisdictional / Distribution)
\$300	Pre-Application Evaluation

FERC Order 2023 (filed May 2024)

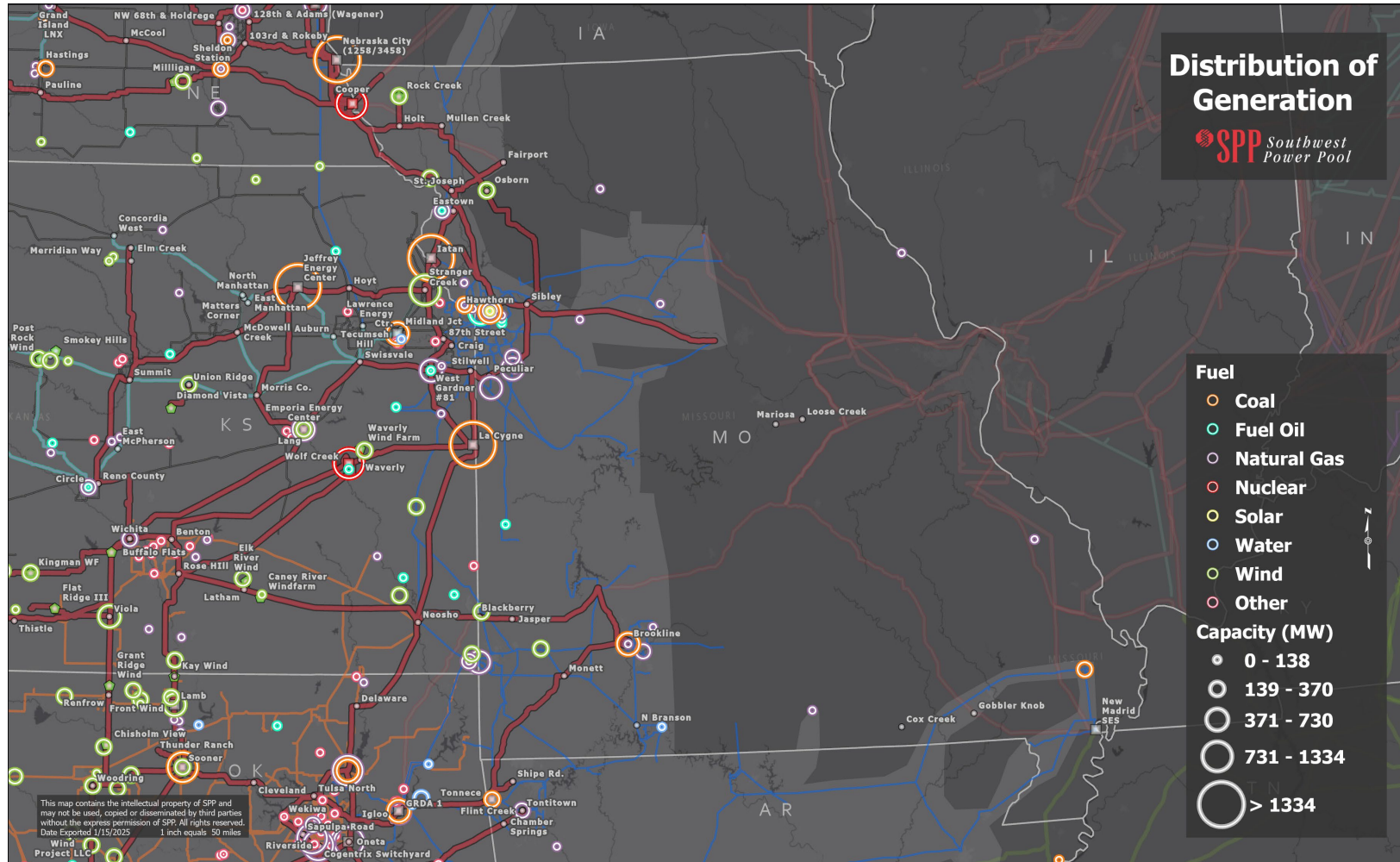
Increased study deposits and non-refundable application fee

Site control and GIA milestone monitoring

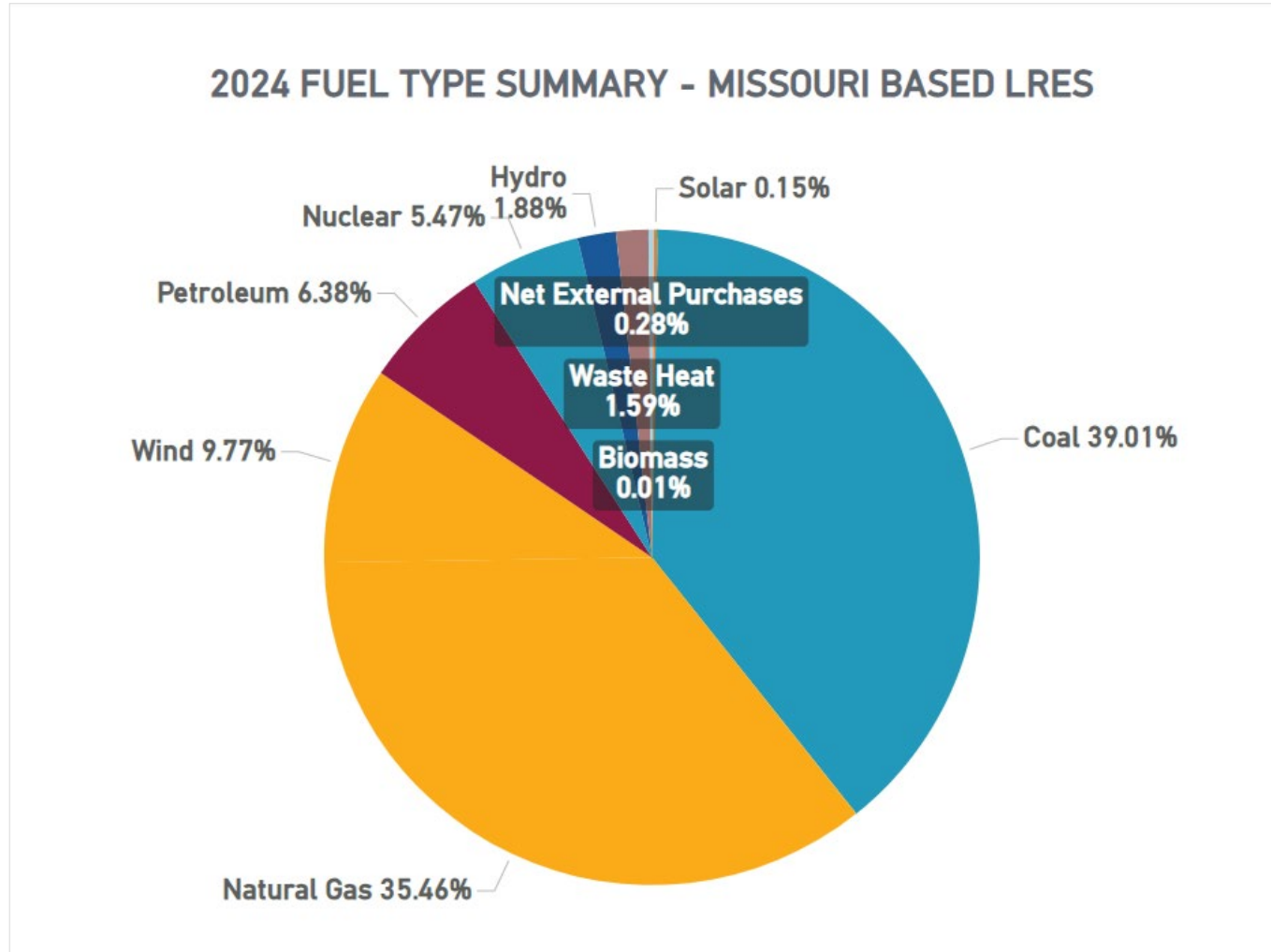
Online Application Tool

RESOURCE ADEQUACY – MISSOURI LRE STATUS

MISSOURI GENERATION IN SPP



MISSOURI LOAD RESPONSIBILITY ENTITY (LRE) FUEL SUMMARY (2024 SUMMER)



RESOURCE ADEQUACY RELIABILITY METRICS

RESOURCE ADEQUACY RELIABILITY METRICS

Key reliability metrics
in use by SPP:

—

Loss of Load
Expectation (LOLE) -
industry standard metric for
determining if power system is
resource adequate.

Standard use since the
1960s

Developed for power
systems that were
powered by
dispatchable resources

'frequency' event metric –
i.e. does not consider
event characteristics such
as duration and/or
magnitude.

Units:
"event/time frame"
e.g., event/year or
event/10 years

Example: the standard LOLE metric of **1 day in 10 years** can be read to assume that a loss of load event will be observed on a single day in 10 years – or 0.1 annual LOLE when discussed in annual terms.

RESOURCE ADEQUACY RELIABILITY METRICS

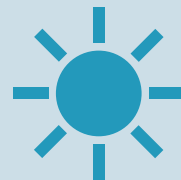
Reliability Metrics Under Review by SPP Expected Unserved Energy (EUE)



Track the energy magnitude of an outage event.



Units – MW-hours or 'parts per million' (ppm) of unserved energy as a ratio of total annual energy consumption of a power system.



Example – a power system that exhibits 620MW-hours of annualized unserved energy out of total annual energy usage of 310TW-hours has a normalized annual EUE of 2ppm ($620 \times 10^6 / 310 \times 10^{12}$)

RESOURCE ADEQUACY RELIABILITY METRICS



Several industry and research initiatives are reviewing changes in reliability metrics. (SPP, MISO, PJM, ESIG, EPRI, DOE)



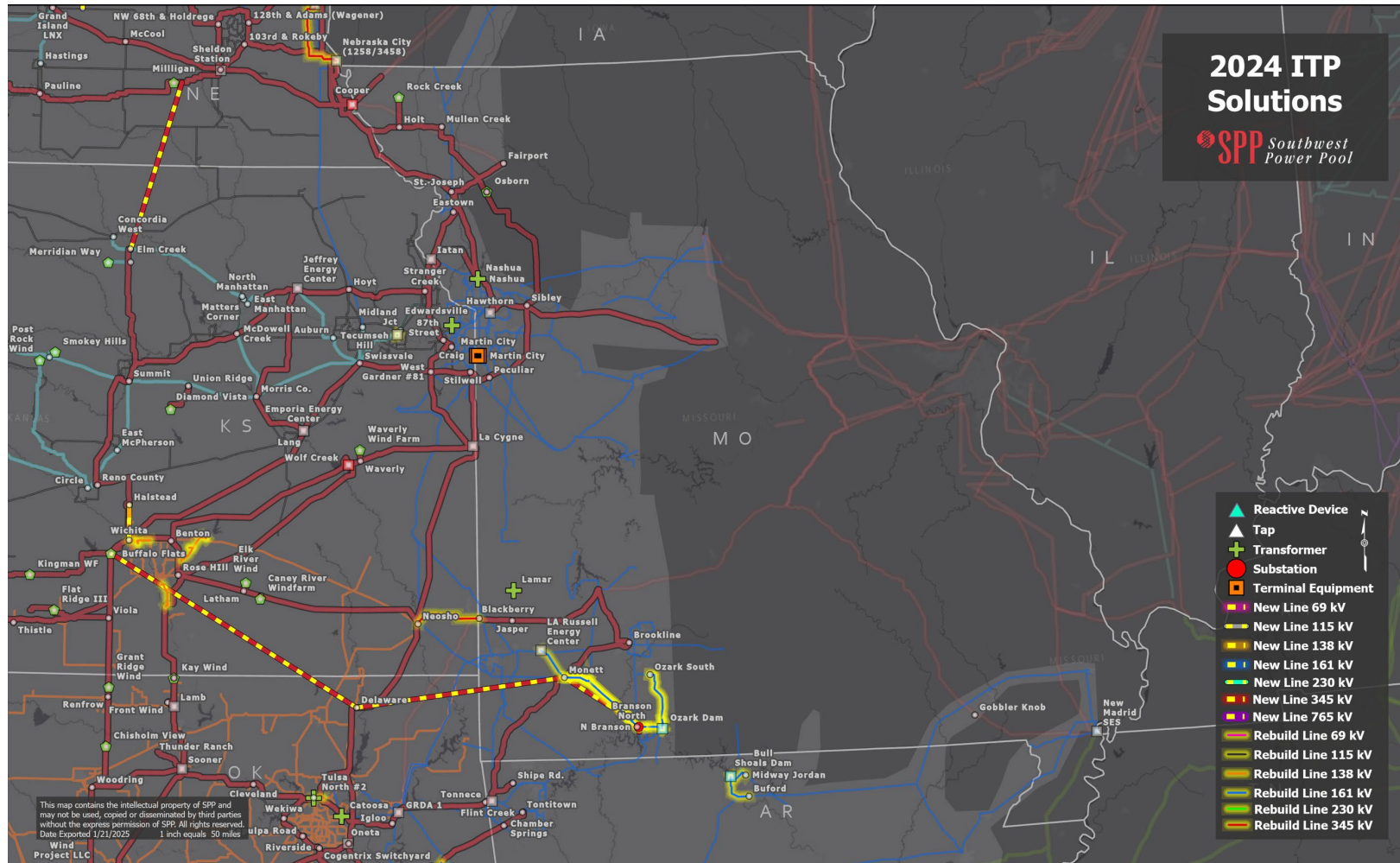
LOLE, as a frequency metric, continued evolution of the resource mix to energy-limited resources points to the need to analyze beyond event frequency.



EUE allows additional analysis into event characteristics. (Magnitude & Duration)

TRANSMISSION PLANNING

MISSOURI TRANSMISSION FROM 2024 ITP





THANK YOU

Casey Cathey
VP Engineering