Large Industrial Loads

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Electric Reliability
& Security for the West

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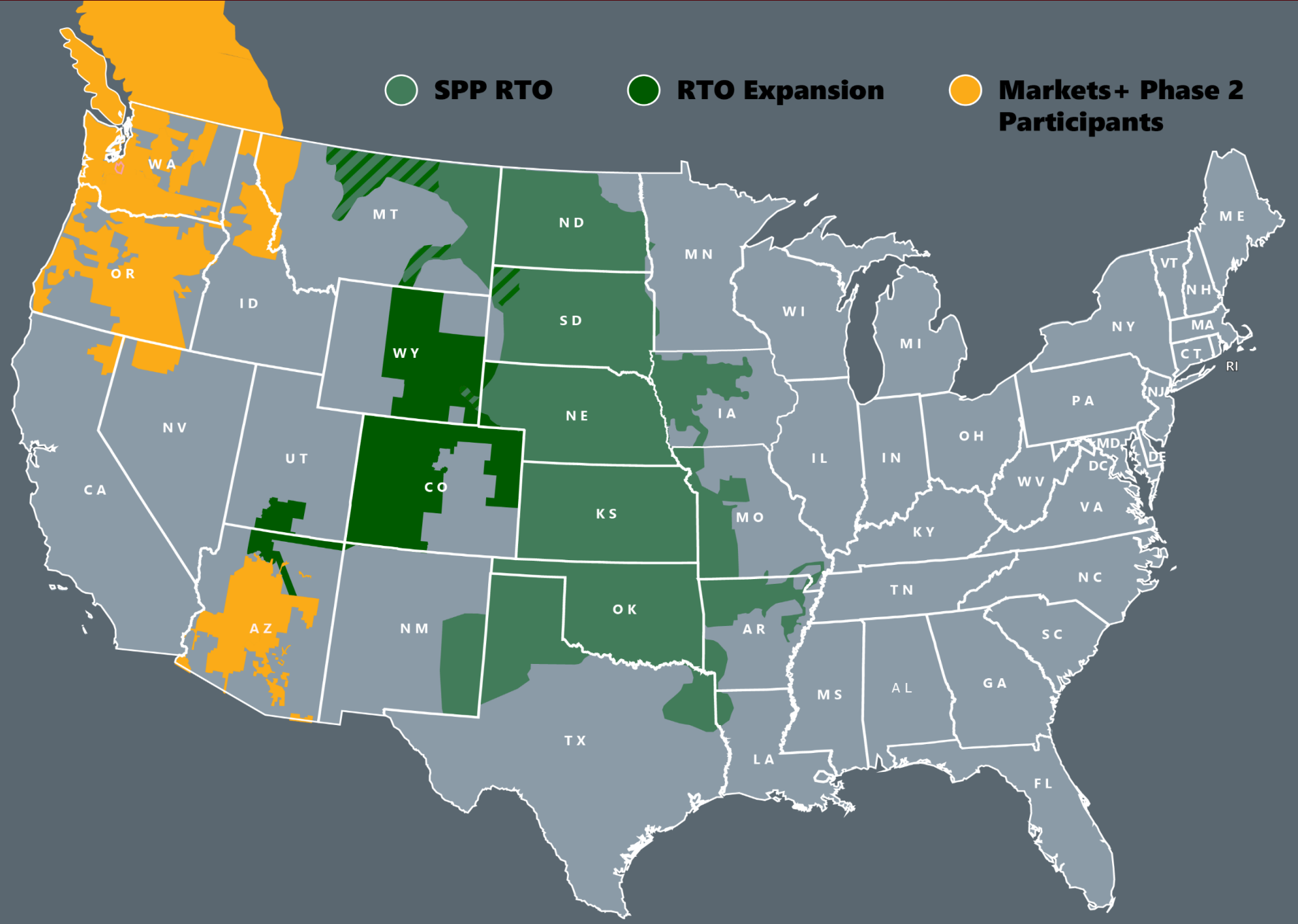
SPP LARGE LOAD DESIGN

STEVE DAVIS– MANAGER, SPP SETTLEMENTS

10/15/2025

Working together to responsibly and economically keep the lights on today and in the future.


SPP RTO
RTO Expansion
Markets+ Phase 2 Participants
WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
IA
MO
AR
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OH
WV
GA
FL
SC
NC
VA
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NY
MD
DC
DE
NJ
CT
RI
MA
VT
NH
ME

RTO BALANCING ELECTRIC SUPPLY AND DEMAND

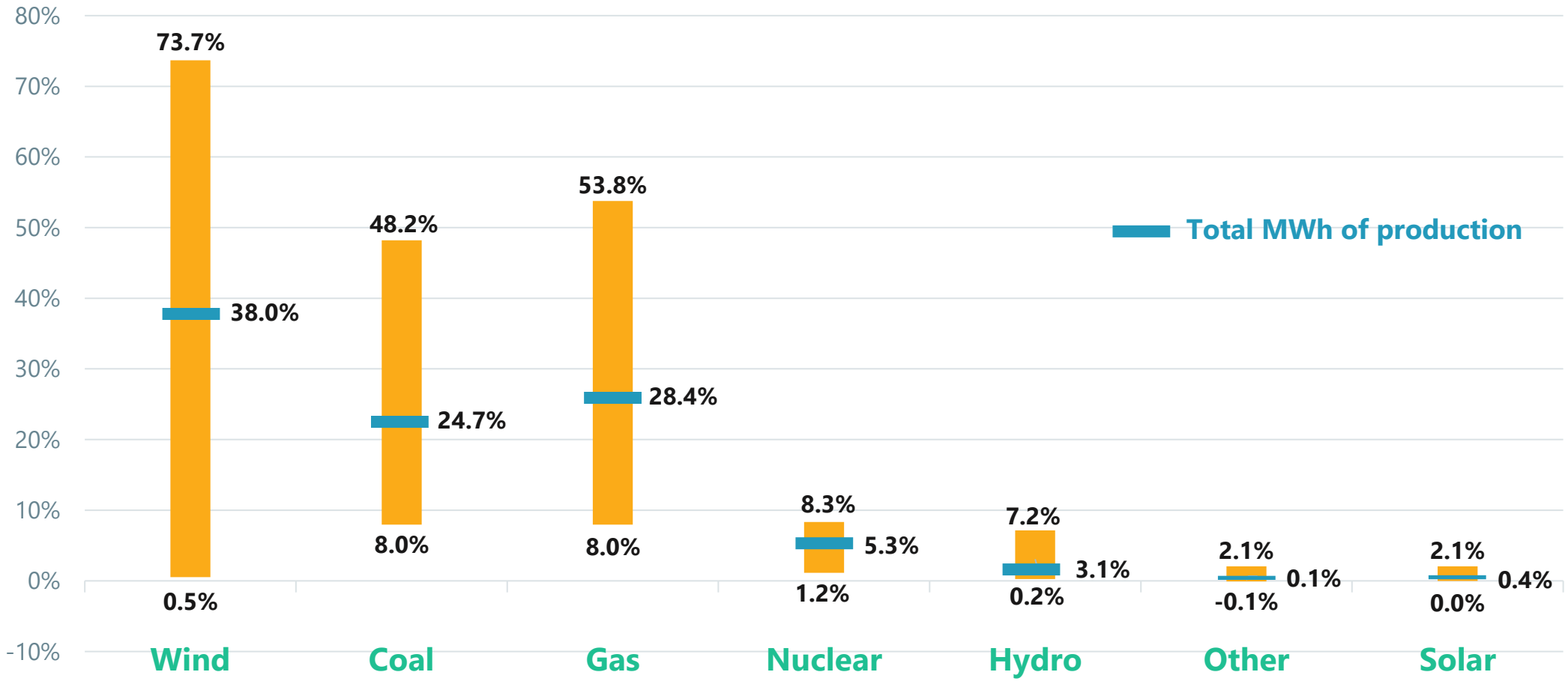
SUPPLY/GENERATION

- **105,049 MW** Nameplate Capacity *(as of July 2025)*
- **65,639 MW** Accredited Capacity *(as of Summer 2025)*

DEMAND/LOAD

- **56,184 MW** all-time coincident peak load (8/21/23)
- **48,142 MW** Winter peak (2/20/25)

MIN AND MAX PERCENT OF GENERATION BY FUEL TYPE JANUARY 2024–DECEMBER 2024

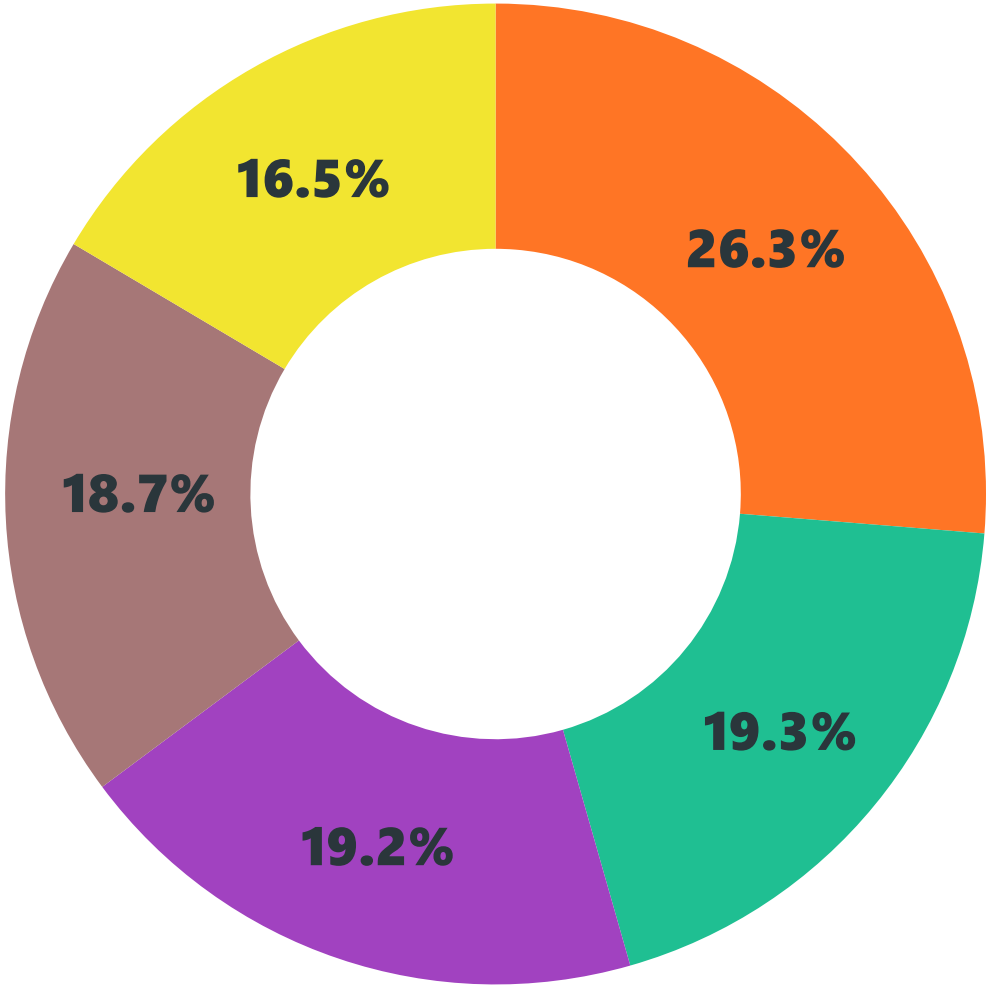


Min and Max % based on the highest and lowest percent from individual real-time balancing market (RTBM) intervals for the period.
Total MW/h of production is based on the sum of RTBM dispatch MW across the period.

161.1 GW
GENERATOR INTERCONNECTION REQUESTS UNDER STUDY

AS OF JULY 2025

- Solar (42,347 MW)
- Wind (31,077 MW)
- Battery/Storage (31,002 MW)
- Thermal (30,129 MW)
- Hybrid (26,564 MW)

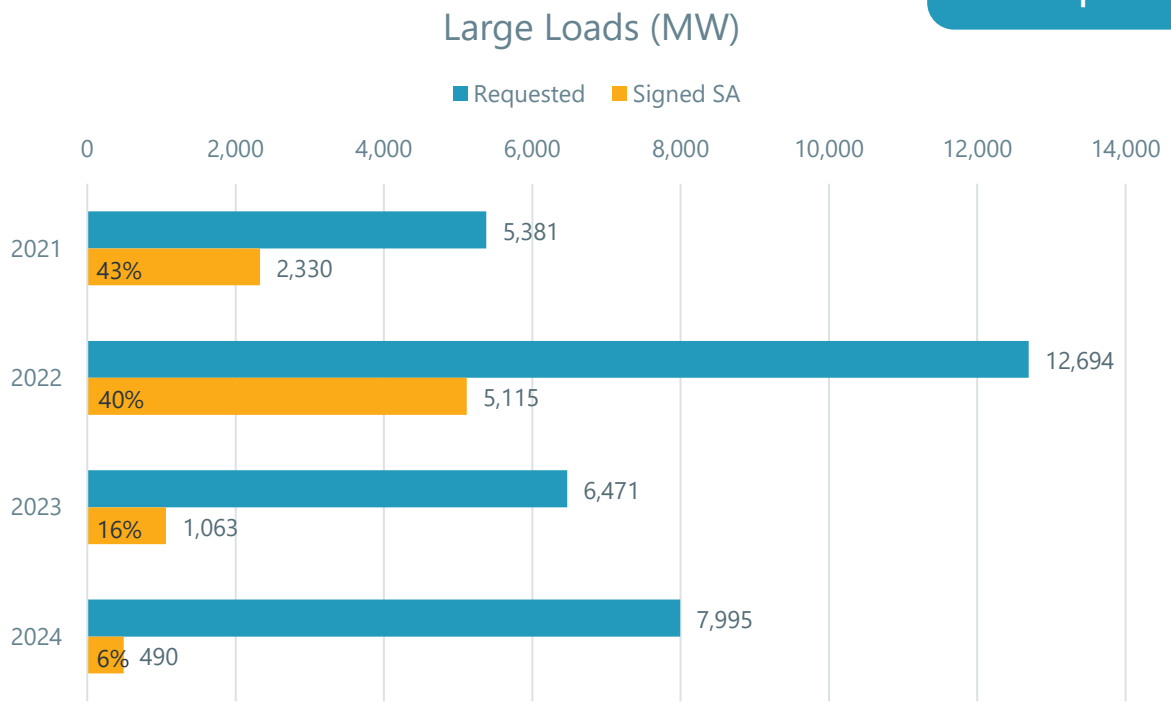


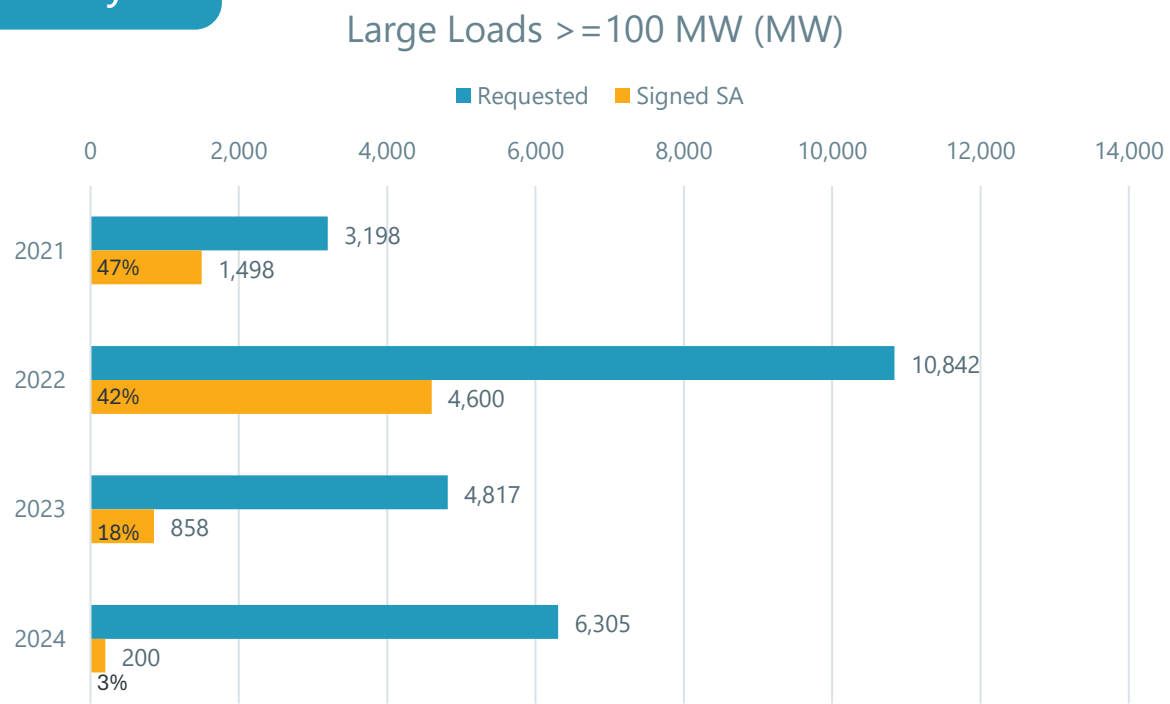
Increasing Diversity of Generation Portfolio

LARGE LOAD BY THE NUMBERS

LOOKING AHEAD: LARGE LOAD REQUESTS PROCESSED THROUGH SPP TARIFF ATTACHMENT AQ

8,135 MW large loads requested annually





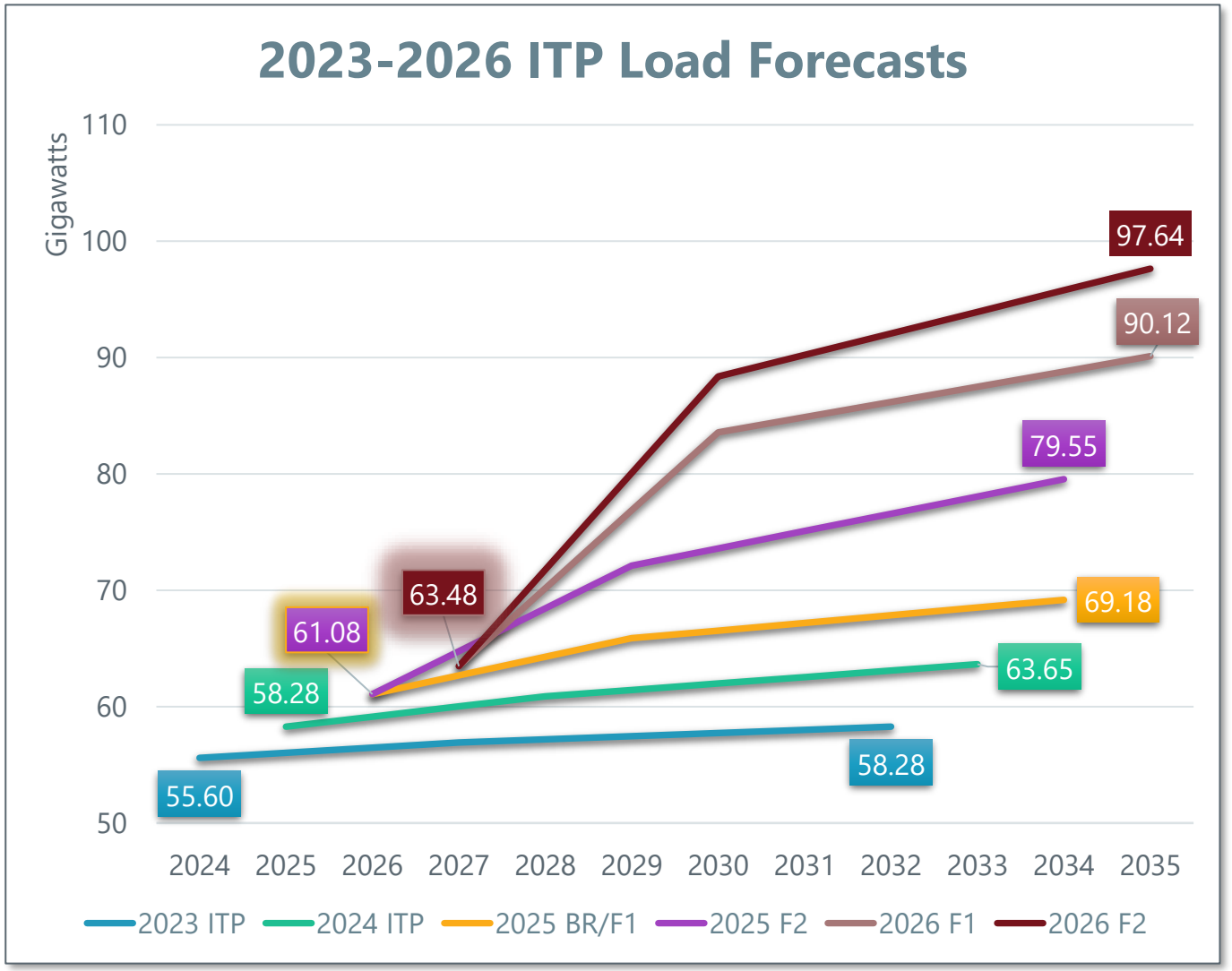
Roughly 40-45% convert to signed SPP service agreement.
Statistics incomplete for year 2023, 2024.

DEMAND GROWTH AHEAD

2025 and 2026 Planning models includes large load growth in both futures at varying levels

SPP (and the industry) continue to see large load projections grow

Proactive transmission investment will ensure SPP is ready to serve this load growth



LOAD OF THE FUTURE

WHAT IS THE LOAD OF THE FUTURE?

- High load factor
- Low load factor
- Flexibility to offer
- Price sensitivity
- Need for 24/7 up time
- Need for monthly service
- Need for hourly service

LARGE LOAD: INTEGRATE AND OPERATE

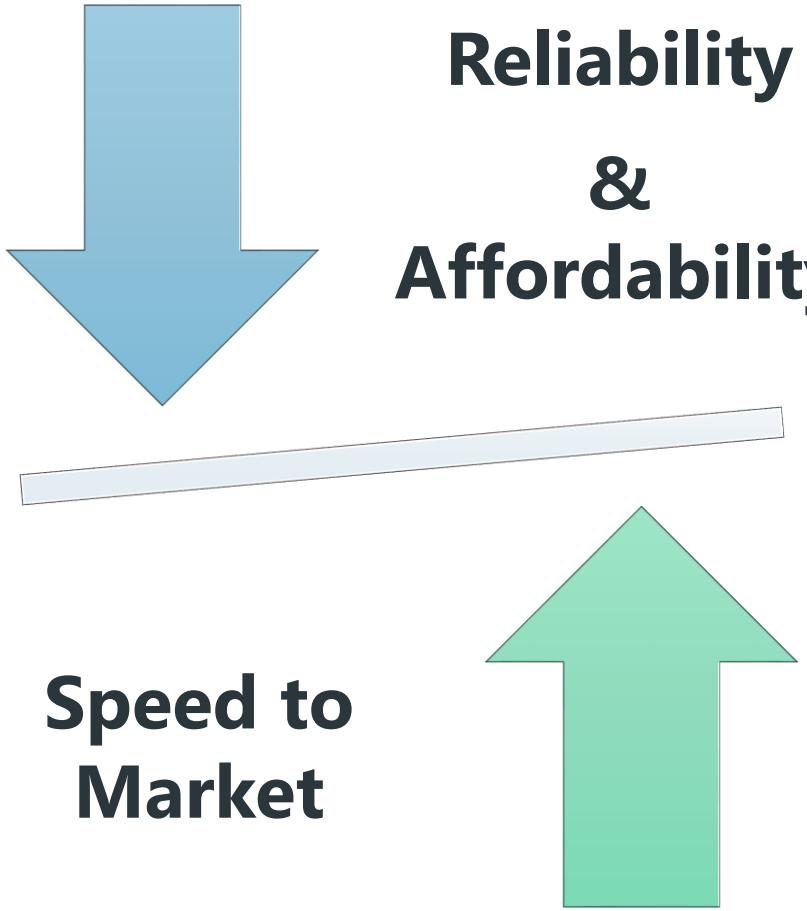
FRAMEWORK OBJECTIVES

Offer path for “speed-to-market”

Require flexibility through participation

Ensure reliability and affordability of load connection

Develop a phased framework to address immediate needs, with the goal of integrating it into a comprehensive long-term model.



PROPOSAL VALUE PROPOSITION

- Timing / Lack of Cost Clarity
- Limited Existing Solutions

- 90-day Connection Study
- Path to Connect Supporting Gen
- Balance Reliability

- Economic Development
- Leader in Large Load Integration
- Load Growth Enablement

- Fastest Connection Study in U.S.
- Flexible Options
- Interconnection Cost Clarity

Our solution directly addresses industry need through leading innovation

HIGH IMPACT LARGE LOAD

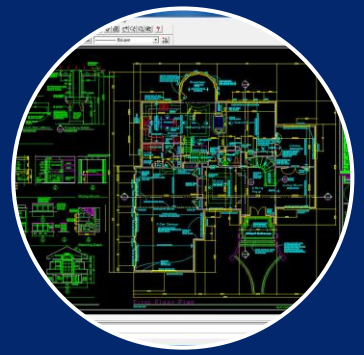
Definition	• A new commercial or industrial load, or increase in commercial or industrial load, at a single site connected through one or more shared Points of Interconnection (POIs) or delivery points
MW Threshold	• Less than or equal to 69 kV: Greater than or equal to 10 MW • Greater than 69 kV: Greater than or equal to 50 MW
Exclude	• Electric Storage Resource
Requirements	• Register in Market • Evaluate in Attachment AQ or Provisional Load Process • SPP Ride-through Requirements Compliance
Perform within 90 Calendar Days	• Transient Stability • Electromagnetic Transient (EMT) Screening • Short-Circuit Ratio and Critical Clearing Time • Note: If issues occur, perform full EMT analysis

FUTURE OF SPP'S SERVICES FOR LARGE LOADS

HILL High Impact Large Load	CHILL Conditional HILL	PAL Price Adaptive Load
Long-term firm transmission service for **large loads** when there is sufficient generation on the system today.	For **large loads** willing to take a long-term curtailable transmission service with a commitment to firm.	For **any load** (not just large loads) willing to take **price adaptive load** (PAL) service and withdrawal based on RT pricing.
Stakeholder Approved	*Pending Stakeholder Approval*	*In Design Phase*

LARGE LOAD RISKS AND CHALLENGES

Interconnection



Modeling

Planning

Operational

Regulatory

Large Load Interconnection Risks and Challenges

Risks & Challenges	SPP Risk Mitigation
Interconnection Process	Enhancing Load Addition and Provisional Load Addition Processes (Att. AQ & AX) and Developing New Service Processes (CHILLS, HILLGA, PAL).
Interconnection Requirements	• Defining large load criteria; • Requesting load location, size, profile, type, energization date, voltage level, and key facility details, as well as data center characteristics per NERC guidance[1]; and • Enhancing interconnection studies by adding SCRCCT screening and detailed EMT analyses (if needed) to traditional power flow, short-circuit, and transient studies.
Demand Forecast	Requesting a 10-year annual demand forecast.
Lack of Data Sharing and Operational Characteristic	• Mandating PMU installation at the Point of Interconnection (POI); • Specifying operational characteristics, including ramp-up and ramp-down rates, reactive power capabilities, frequency and voltage ride-through requirements. Flexibility requirement if curtailable service; • Mandating separate metering requirements for visibility in usage.

[1] NERC, Data Center Information Collection, https://www.nerc.com/comm/RSTC/LMWG/Data%20Center%20Information%20Collection%20Questionnaire.pdf

Large Load Modeling and Study Risks and Challenges

Risks & Challenges	SPP Risk Mitigation
Model vs Accurate Study	• Requesting CMLD models for transient stability studies. • Requesting EMT UDM models if SCR/CCT screening flags a concern. • Requesting EMT model testing in accordance with SPP EMT model requirements[2].
Basic Modeling Approach	• SPP is working closely with EPRI, National labs, and ESIG to obtain RMS and EMT models that meet planning and study requirements.

[2] SPP EMT model Requirements, https://opsportal.spp.org/documents/studies/SPP%20EMT_Model_Requirements_R1.pdf

Large Load Planning Risks and Challenges

Risks & Challenges	SPP Risk Mitigation
Quicker Construction Timeline	• Using the accelerated 90-day study process for large load additions if SCRCCT screening is passed.
Supply Chain Challenges	• SPP is exploring flexible interconnection approaches to address supply chain delays, including temporary use of grid-enhancing technologies in the future.
Co-locating With Generation	• Proposing a new HILLGA process for co-locating facilities on a common bus or within the same local area.
Generation capacity and energy	• SPP is evaluating the integration of flexibility agreements into LOLE and planning reserve assessments.
Transmission Planning Studies	• Transmission Service and Generation Interconnection processes feed into our ITP assessment that evaluates reliability, economic, and public policy needs.
Multi-sector Electrification and Aggregate Load Growth	• SPP is evaluating high-resolution, sector-specific load forecasting models to assess electrification impacts.

Large Load Operational Risks and Challenges

Risks & Challenges	SPP Risk Mitigation
Large Load Variability and Fluctuations	• SPP will require non-conforming load forecast, ramp rate restrictions and ride-through performance. Regulation impacts will be considered for procurement requirements, as necessary.
Cybersecurity	• SPP uses advances secure communication though closed and protected networks, meets CIP requirements and industry best practices.
Price Sensitive Large Loads	• Consider bid-caps to limit energy market pricing exposure risks.
Ride-through Performance	• The “SPP HILL Ride-Through Requirements Manual” has been prepared and approved by SPP to establish voltage and frequency ride-through requirements.
Power Quality or BPS Performance Issues	• “Power quality studies” are now required by SPP as part of the supplemental studies outlined in the approved “HILL Delivery Point Studies Manual.”
Maintenance and Outage Coordination	• SPP may require Large Loads to submit outages, de-rates, and coordinate maintenance in accordance with our outage coordination policy.

Large Load Regulatory Risks and Challenges

Risks & Challenges	SPP Risk Mitigation
Lack of Mandatory Standards and Requirements	• SPP is an active contributor to the NERC Large Load Task Force and other industry leading groups, helping draft guidelines and white papers, with reliability guidelines expected in Q3 2026.
Jurisdictional Compliance	• SPP requires Large Load additions to be initiated by the entity authorized to transact within State jurisdictions; loads cannot initiate by themselves.

CONTACT

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