OKLAHOMA CORPORATION COMMISSION SPP 101 TRAINING

JASON CHAPLIN: PUD PROGRAMS MANAGER IV

Helping our members work together to keep the lights on... today and in the future.

SouthwestPowerPool SPPorg southwest-power-pool

CONTENTS: OCC SPP 101 TRAINING

- Introduction to the Southwest Power Pool “SPP”
- Introduction to SPP Services
- Current Items
- Discussion

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

OUR VISION: Leading our industry to a brighter future while delivering the best energy value.

SPP'S BEGINNING

- In 1941, 11 member utilities pooled electricity to power aluminum plant at Jones Mill for critical defense
- Maintained after WWII to continue benefits of regional coordination

SOUTHWEST POWER POOL “SPP”

- SPP is a regional transmission organization (RTO): a nonprofit corporation mandated by the Federal Energy Regulatory Commission to ensure reliable supplies of power, adequate transmission infrastructure and competitive wholesale electricity prices.
- SPP is one of nine independent system operators (ISO) and RTOs in North America.
- ISOs/RTOs are the "air traffic controllers" of the electric power grid. ISOs/RTOs do not own the power grid; they independently operate the grid minute-by-minute to ensure that power gets to customers.

AIR TRAFFIC CONTROL: AN ANALOGY

Air Traffic Control		Southwest Power Pool
Does not own airplanes, airlines or airports		Does not own utilities, power generators or transmission lines
Does not own the sky it monitors		Does not own the land electricity flows across
Directs air routes to ensure airplanes and passengers are safely transported		Monitors and directs regional bulk power grid to ensure electricity gets from where it's made to where it's needed

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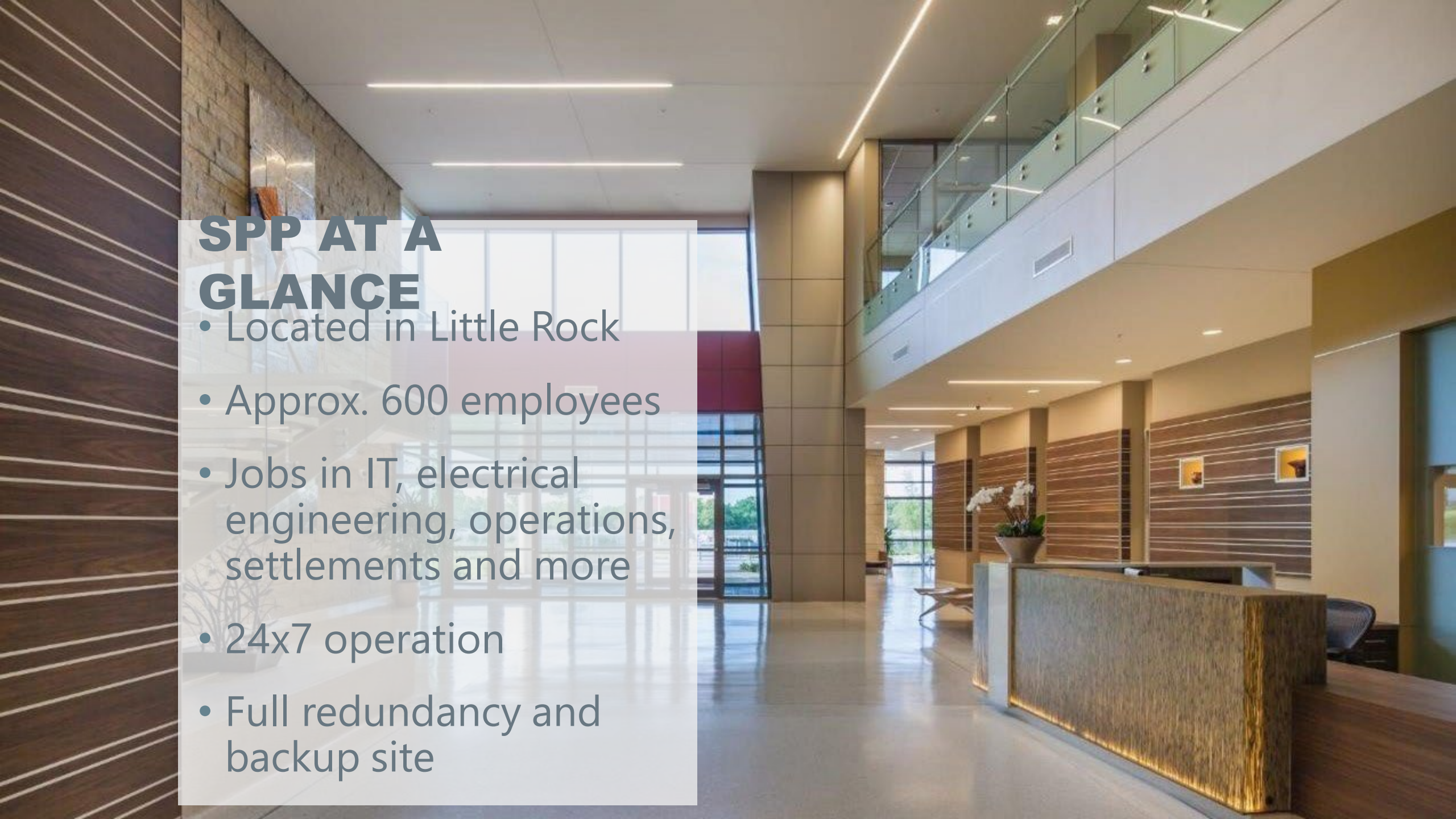
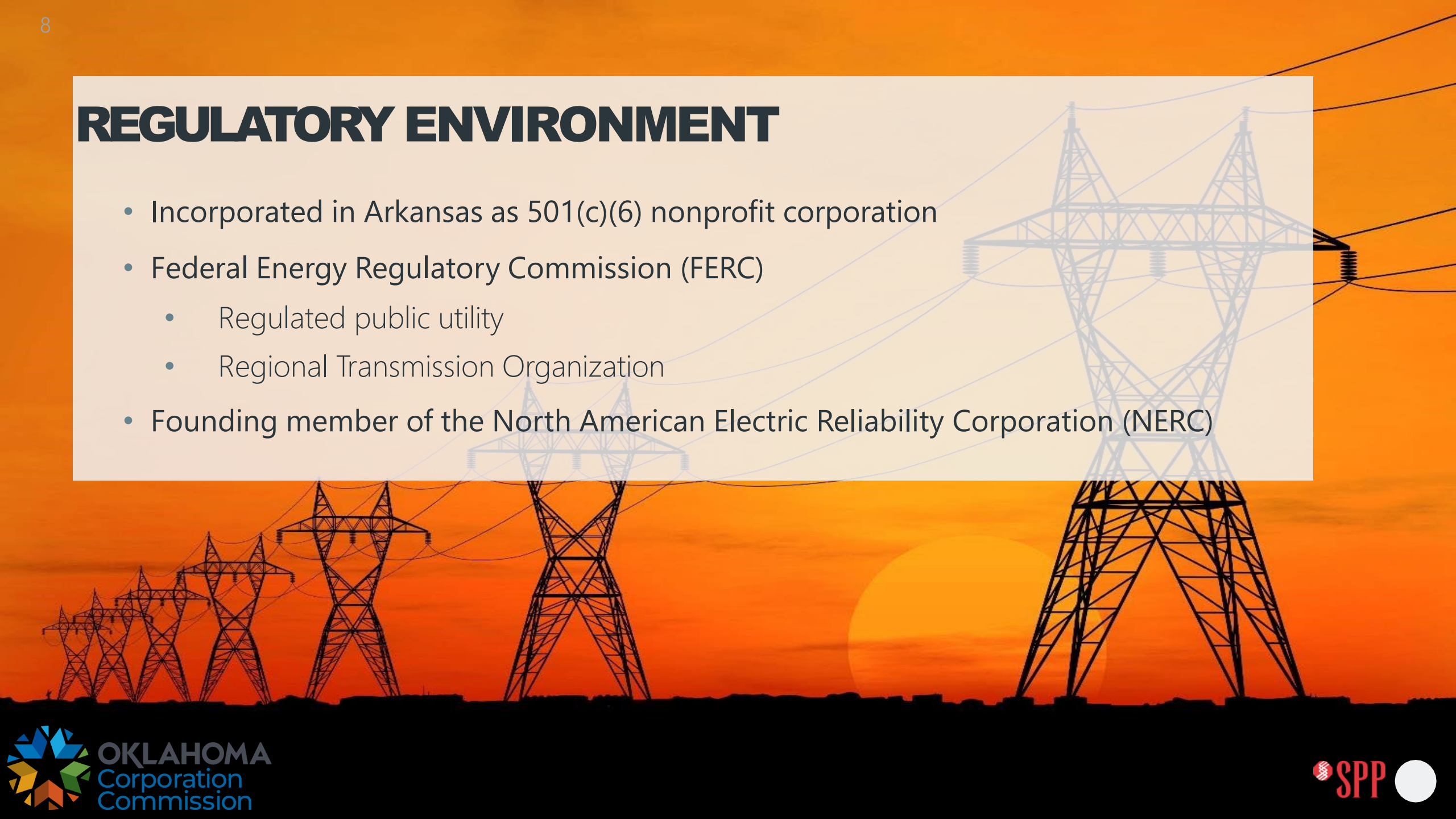


SPP AT A GLANCE

- Located in Little Rock
- Approx. 600 employees
- Jobs in IT, electrical engineering, operations, settlements and more
- 24x7 operation
- Full redundancy and backup site

REGULATORY ENVIRONMENT

- Incorporated in Arkansas as 501(c)(6) nonprofit corporation
- Federal Energy Regulatory Commission (FERC)
  - Regulated public utility
  - Regional Transmission Organization
- Founding member of the North American Electric Reliability Corporation (NERC)



NORTH AMERICAN INDEPENDENT SYSTEM OPERATORS (ISO) AND REGIONAL TRANSMISSION ORGANIZATIONS (RTO)

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ISO/RTO GROWTH BEFORE 1996

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ISO/RTO GROWTH BY 1996

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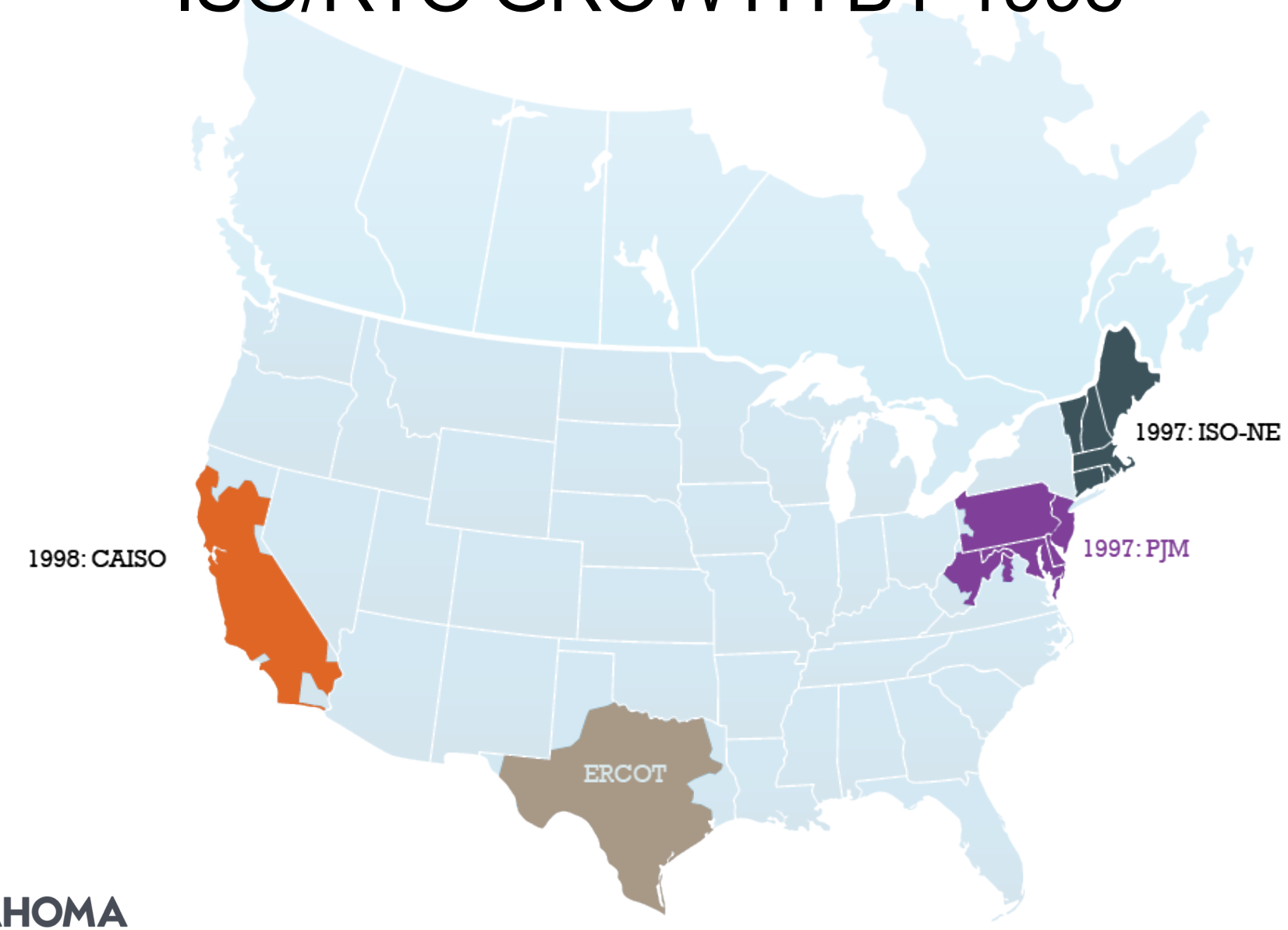
ISO/RTO GROWTH BY 1998



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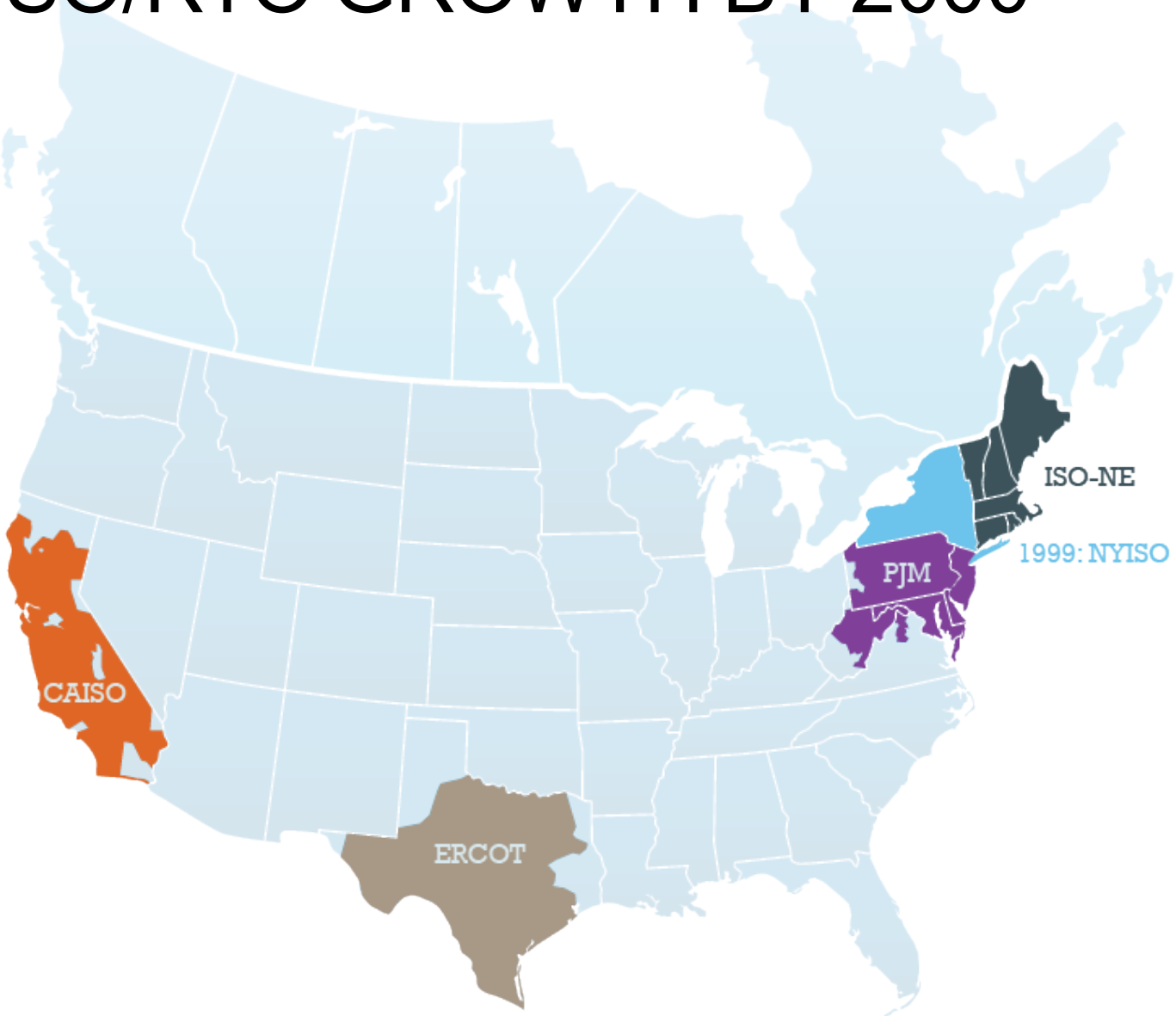
ISO/RTO GROWTH BY 2000



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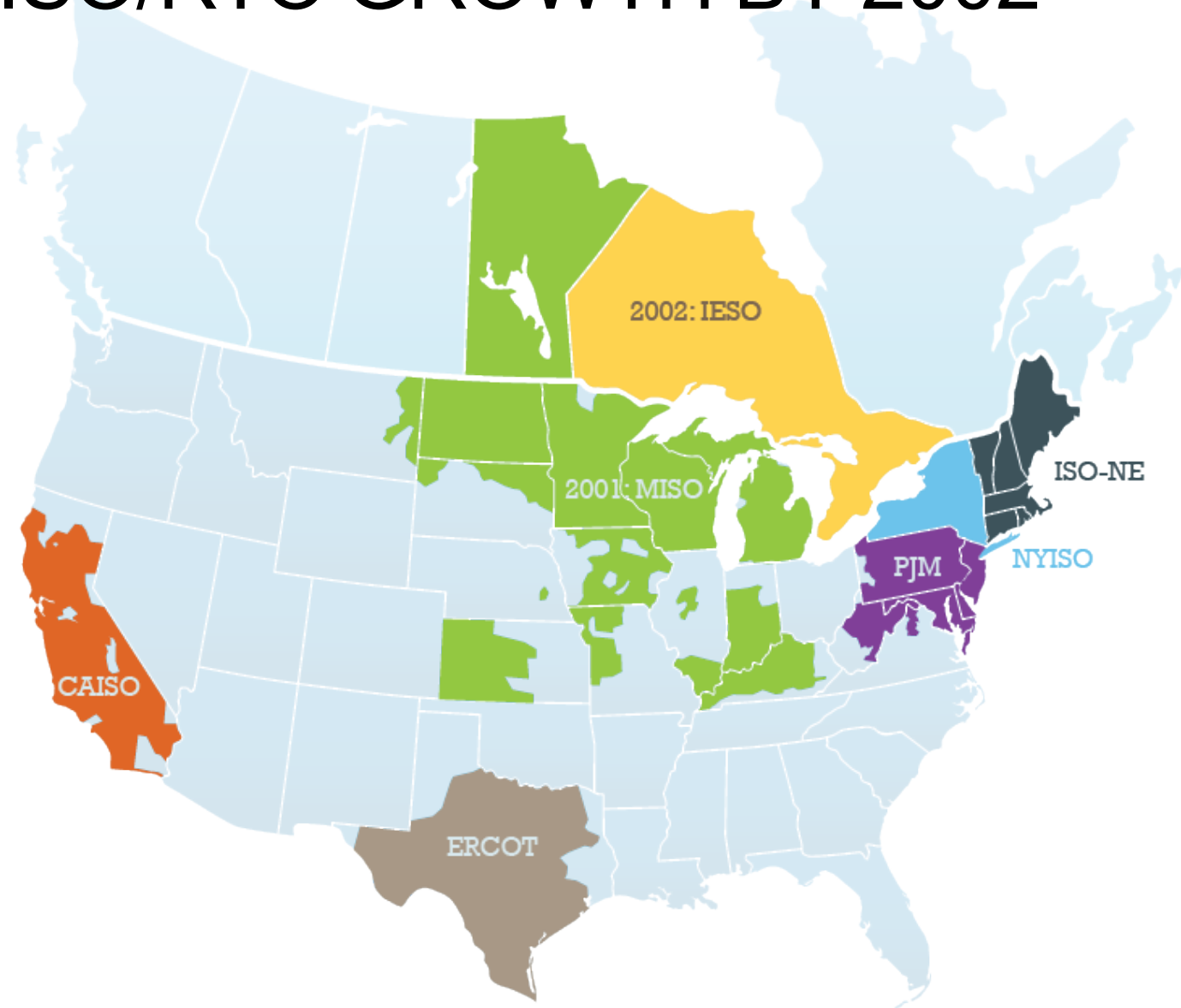
ISO/RTO GROWTH BY 2002



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ISO/RTO GROWTH BY 2004

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ISO/RTO GROWTH BY 2006

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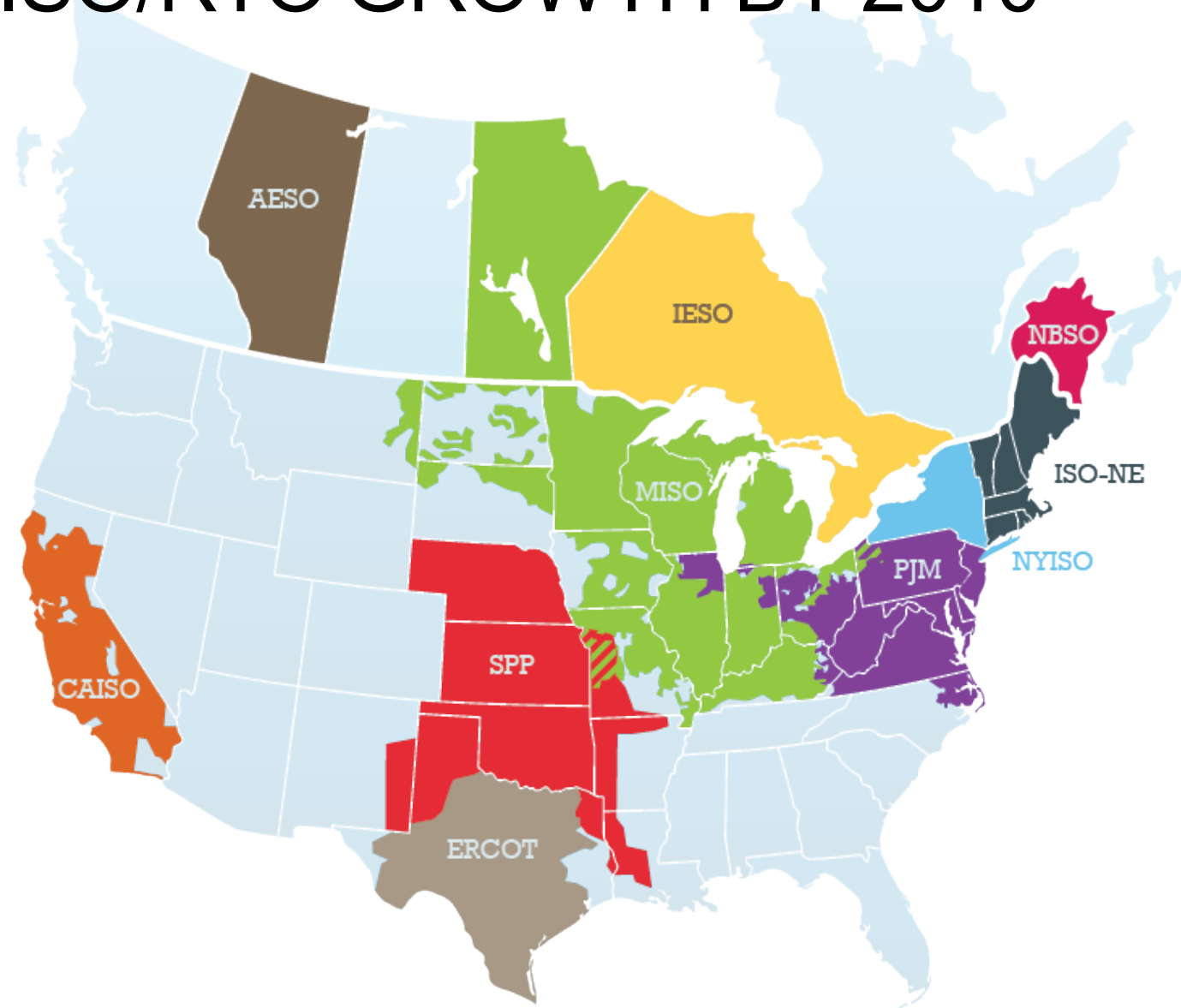
ISO/RTO GROWTH BY 2010



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ISO/RTO GROWTH BY 2012

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ISO/RTO GROWTH BY 2014

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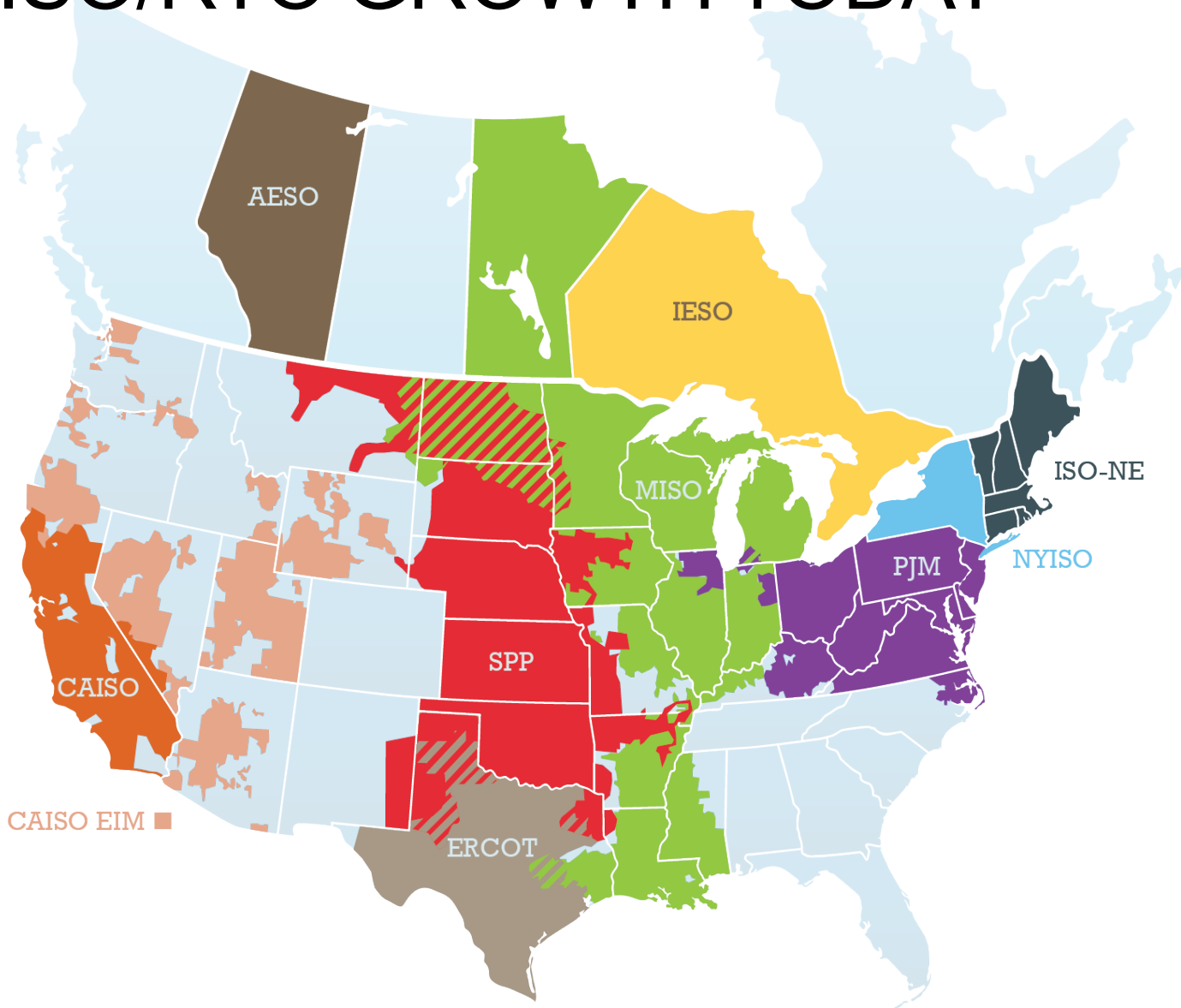
ISO/RTO GROWTH TODAY



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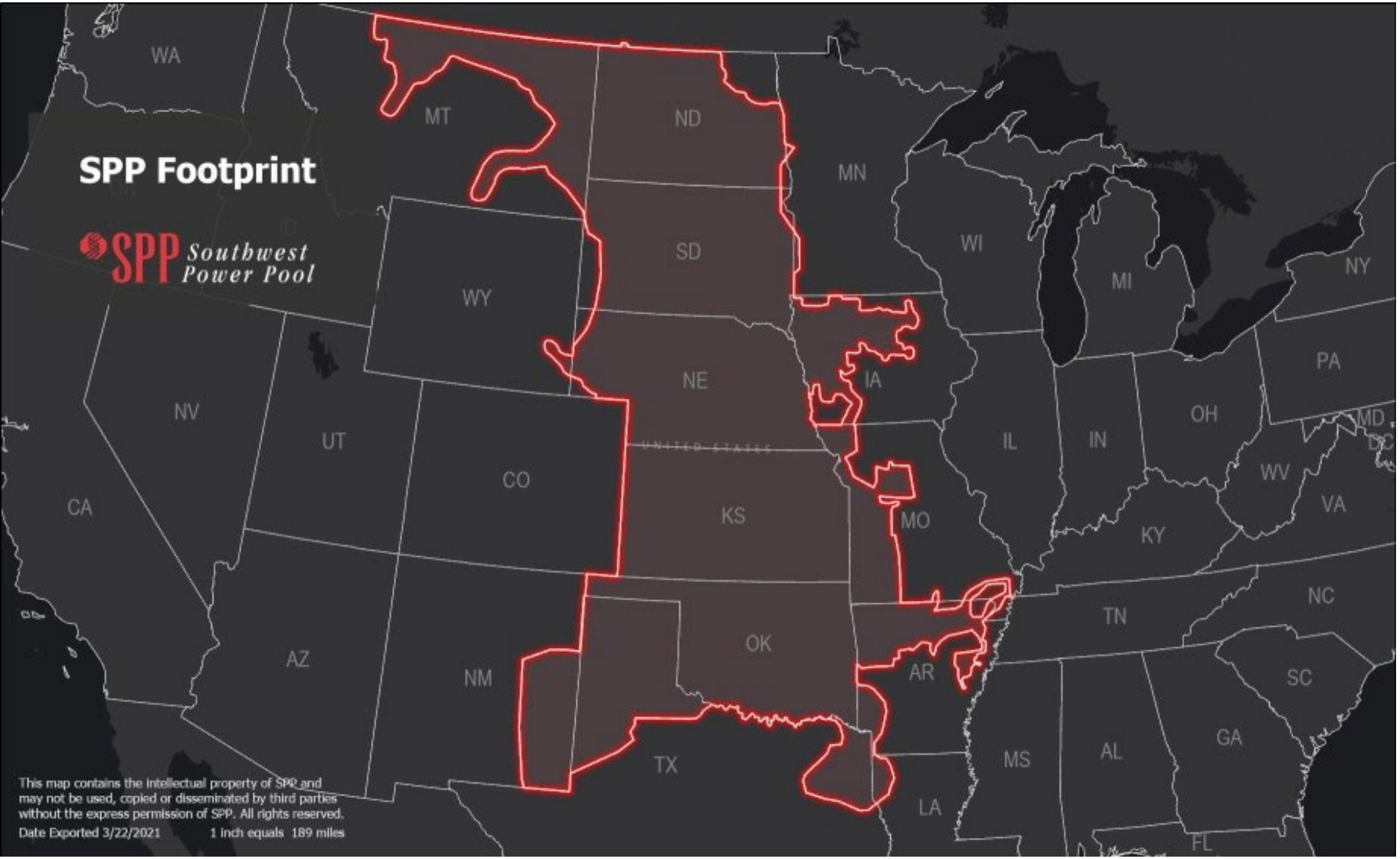
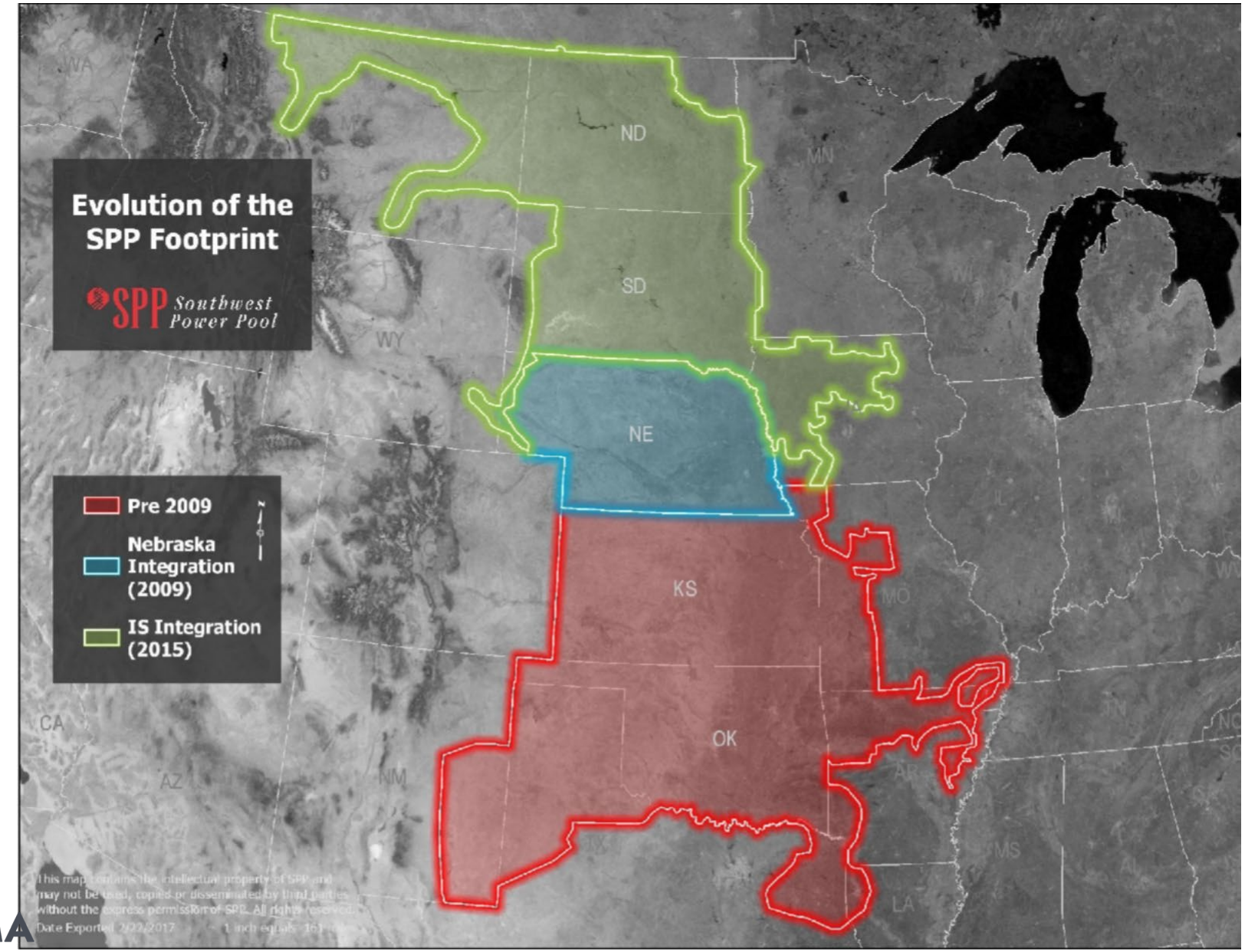


MEMBERS IN 14 STATES

- Arkansas
- Iowa
- Kansas
- Louisiana
- Minnesota
- Missouri
- Montana
- Nebraska
- New Mexico
- North Dakota
- Oklahoma
- South Dakota
- Texas
- Wyoming



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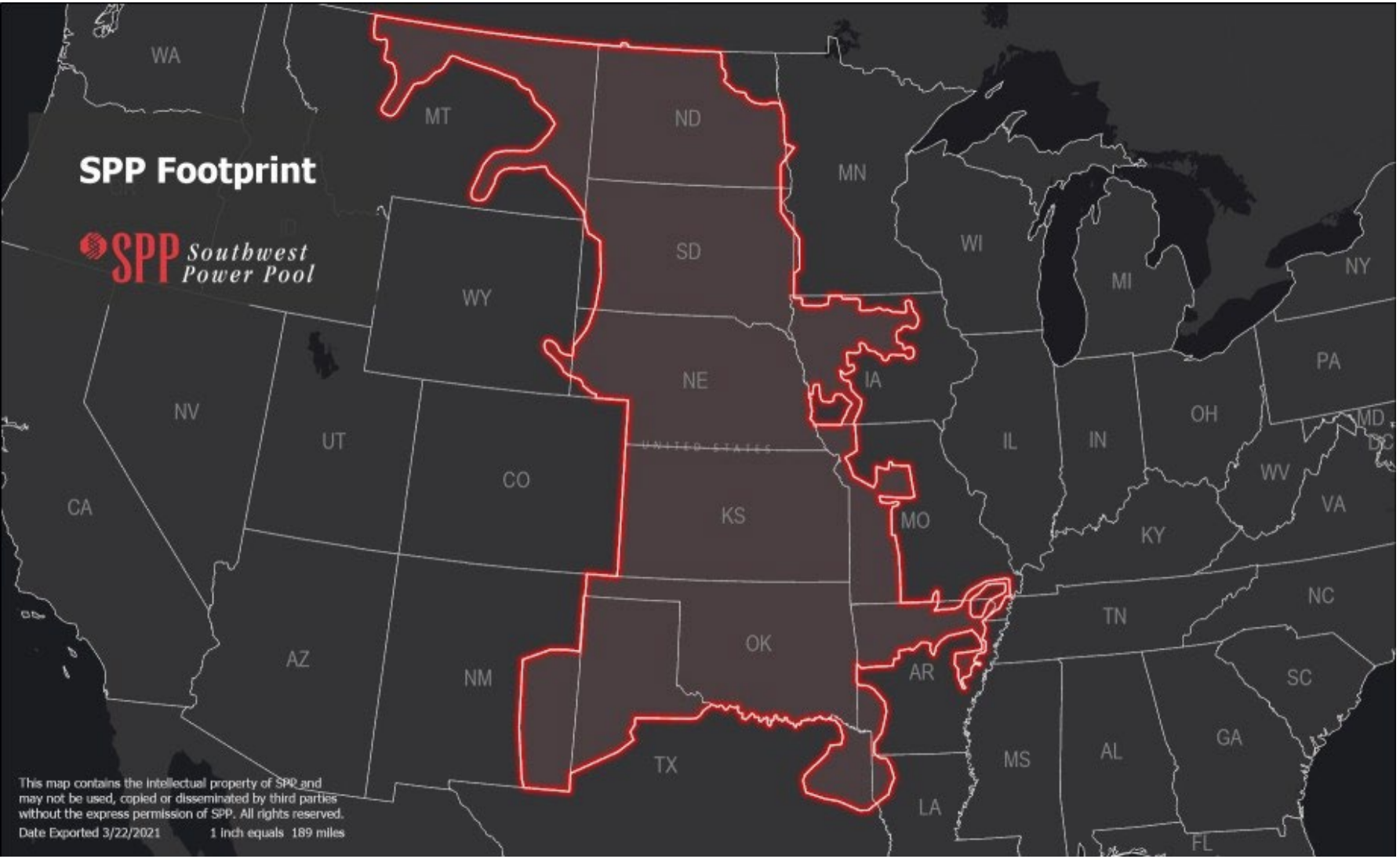

OPERATING REGION

- Service territory: 552,885 square miles
- Population served: Approx. 18 million
- Generating plants: 1,162*
- Substations: 6,140*

* In SPP's reliability coordination footprint

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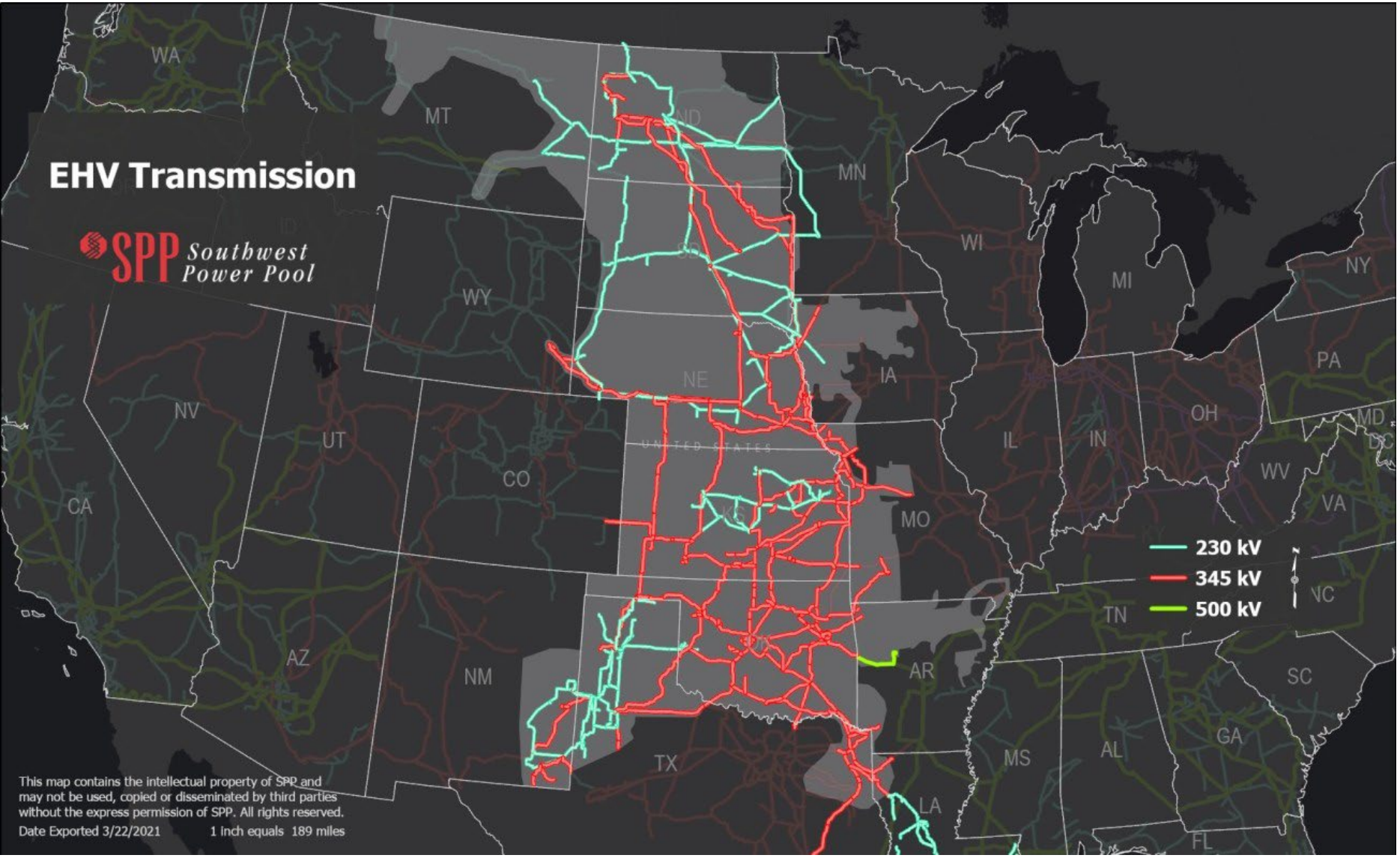
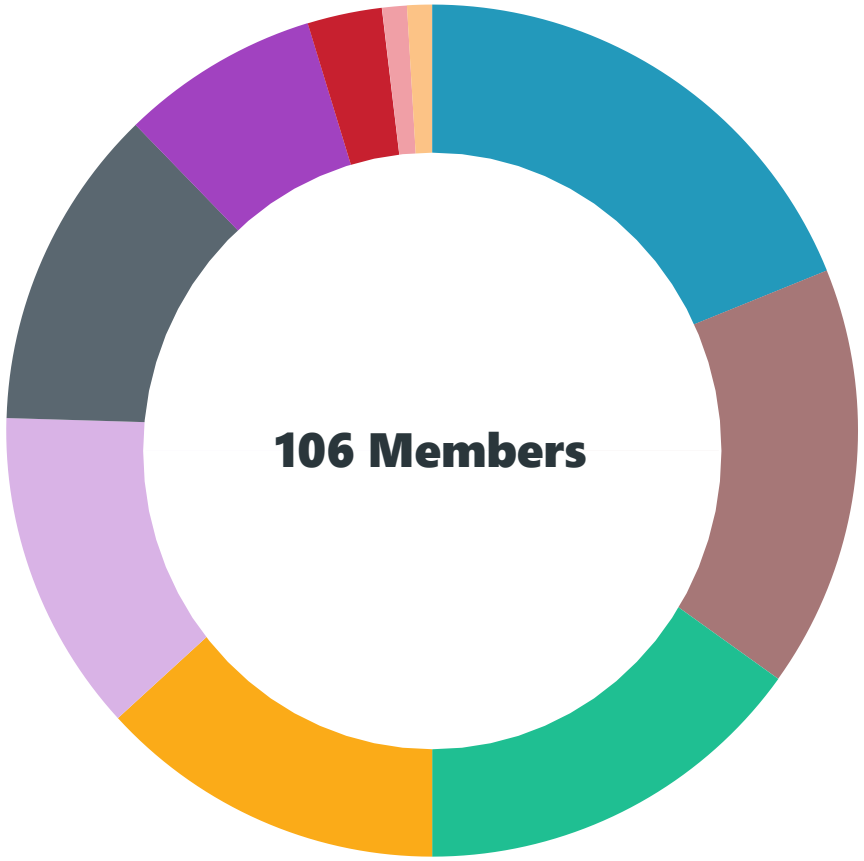


MILES OF TRANSMISSION: 70,025

- 69 kV 17,982
- 115 kV 16,677
- 138 kV 9,942
- 161 kV 5,677
- 230 kV 7,604
- 345 kV 12,052
- 500 kV 91

SPP'S 106 MEMBERS: INDEPENDENCE THROUGH DIVERSITY



- 20 Generation and Transmission Cooperatives
- 17 Independent Power Producers
- 16 Investor-Owned Utilities
- 14 Municipal Systems
- 13 Power Marketers
- 13 Independent Transmission Companies
- 8 State Agencies
- 3 Large Retail Customers
- 1 Federal Agency
- 1 Alternative Power/Public Interest

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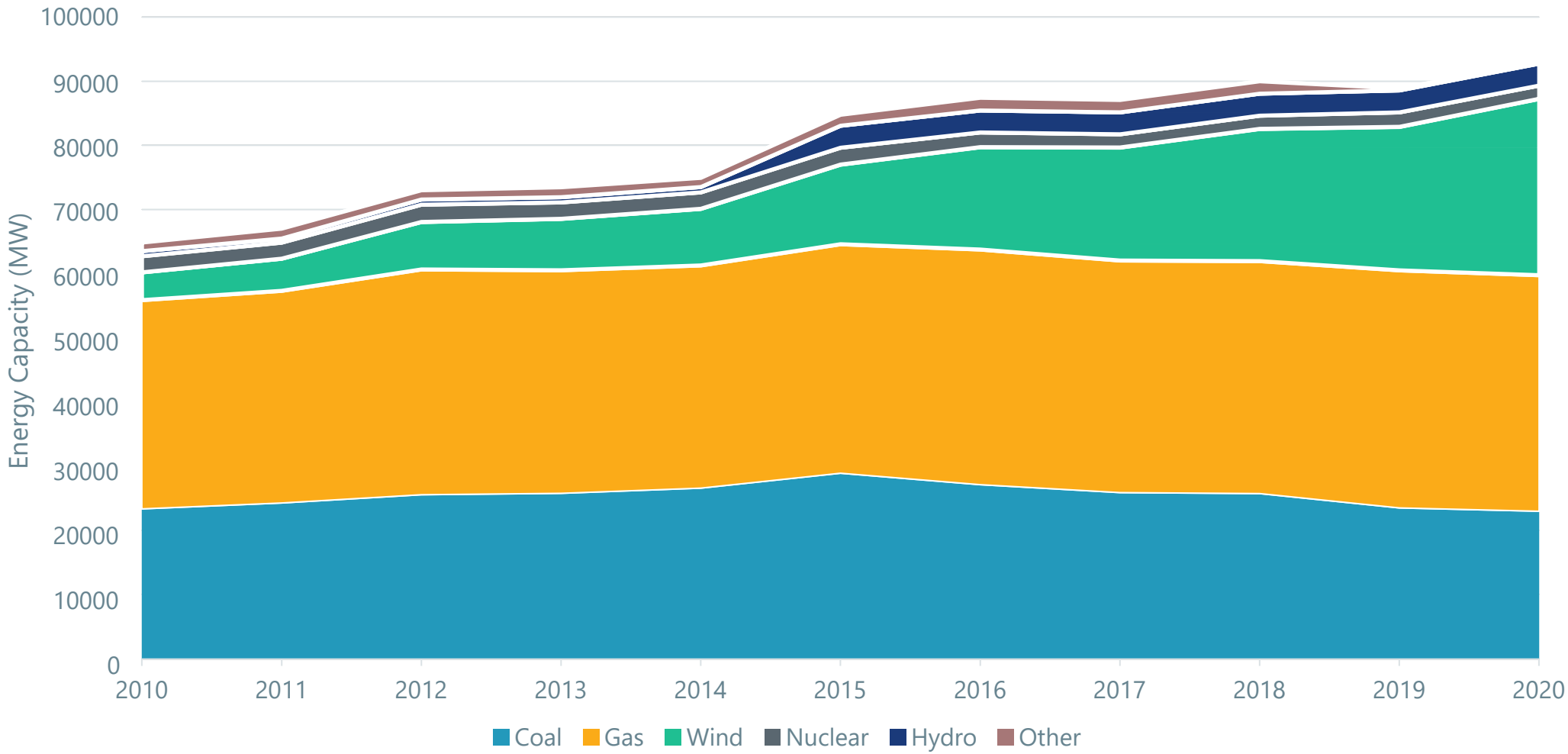
SPP

LOAD RATIO SHARE, MILES OF TRANSMISSION, AND TRANSMISSION RATIO BY STATE

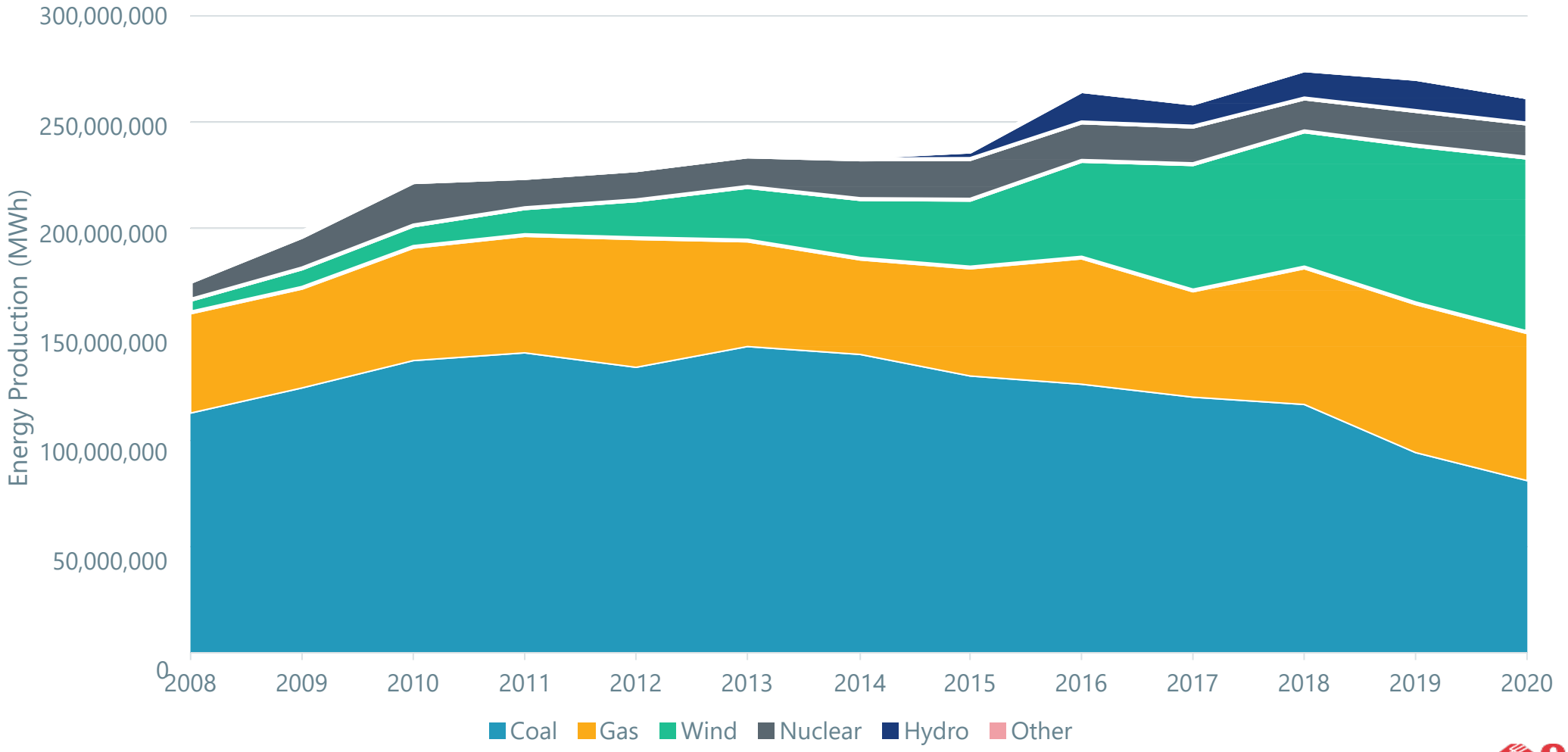
- *Information provided by SPP March 2022

State	Load Ratio Share*	Miles of Transmission under SPP functional control*	Transmission Ratio
AR	4.00%	2079	3.15%
IA	2.33%	2272	3.44%
KS	15.81%	9838	14.89%
LA	4.07%	724	1.10%
MN	0.37%	568	0.86%
MO	11.42%	4210	6.37%
MT	0.25%		0.00%
ND	5.89%	4635	7.02%
NE	12.21%	7708	11.67%
NM	3.53%	2374	3.59%
OK	25.87%	15959	24.16%
SD	3.43%	7258	10.99%
TX	10.83%	8439	12.77%
Total Miles		66064	

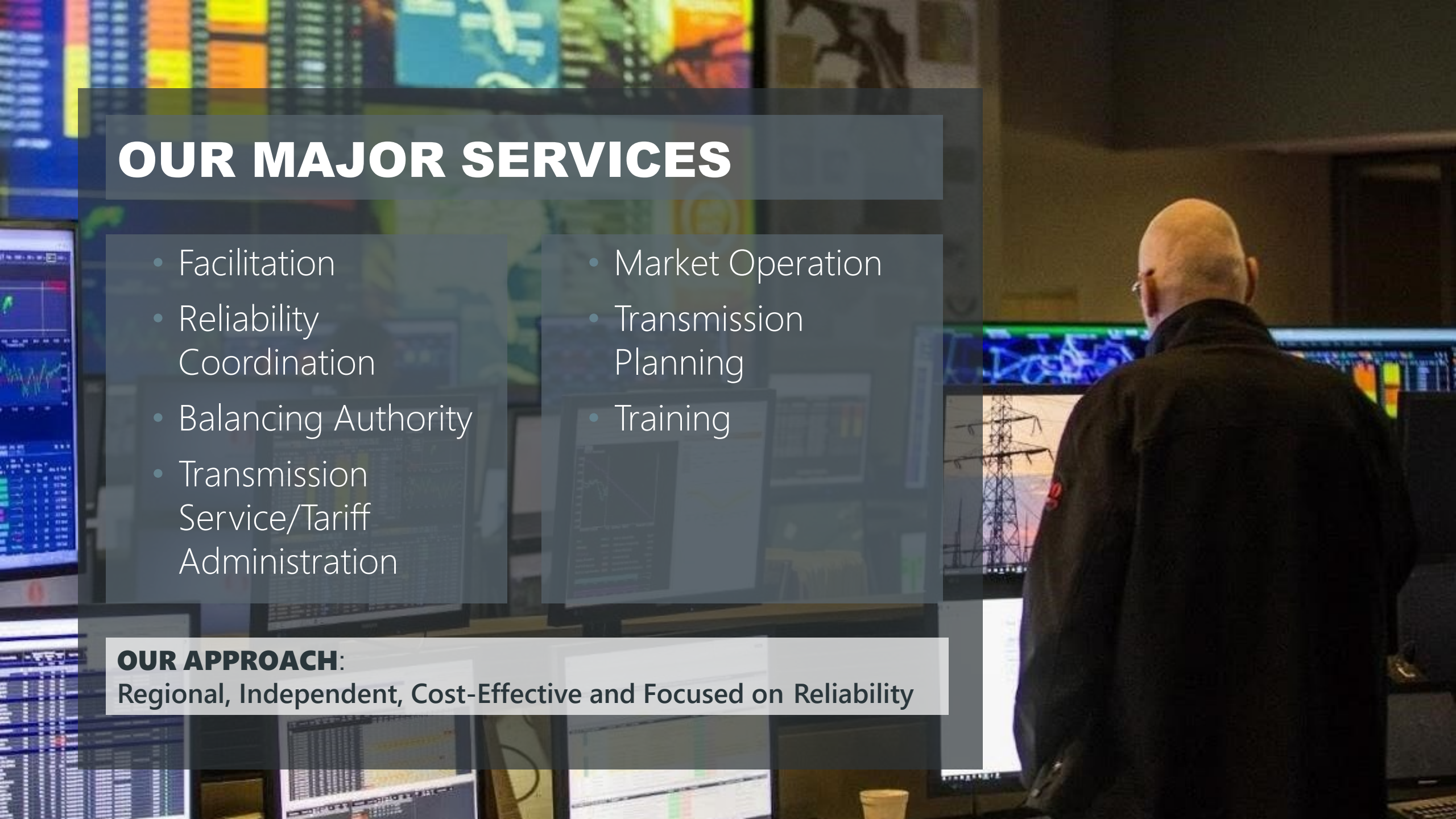
ENERGY CAPACITY BY FUEL MIX OVER TIME



ENERGY PRODUCTION BY GENERATION TYPE OVER TIME



SPP SERVICES



OUR MAJOR SERVICES

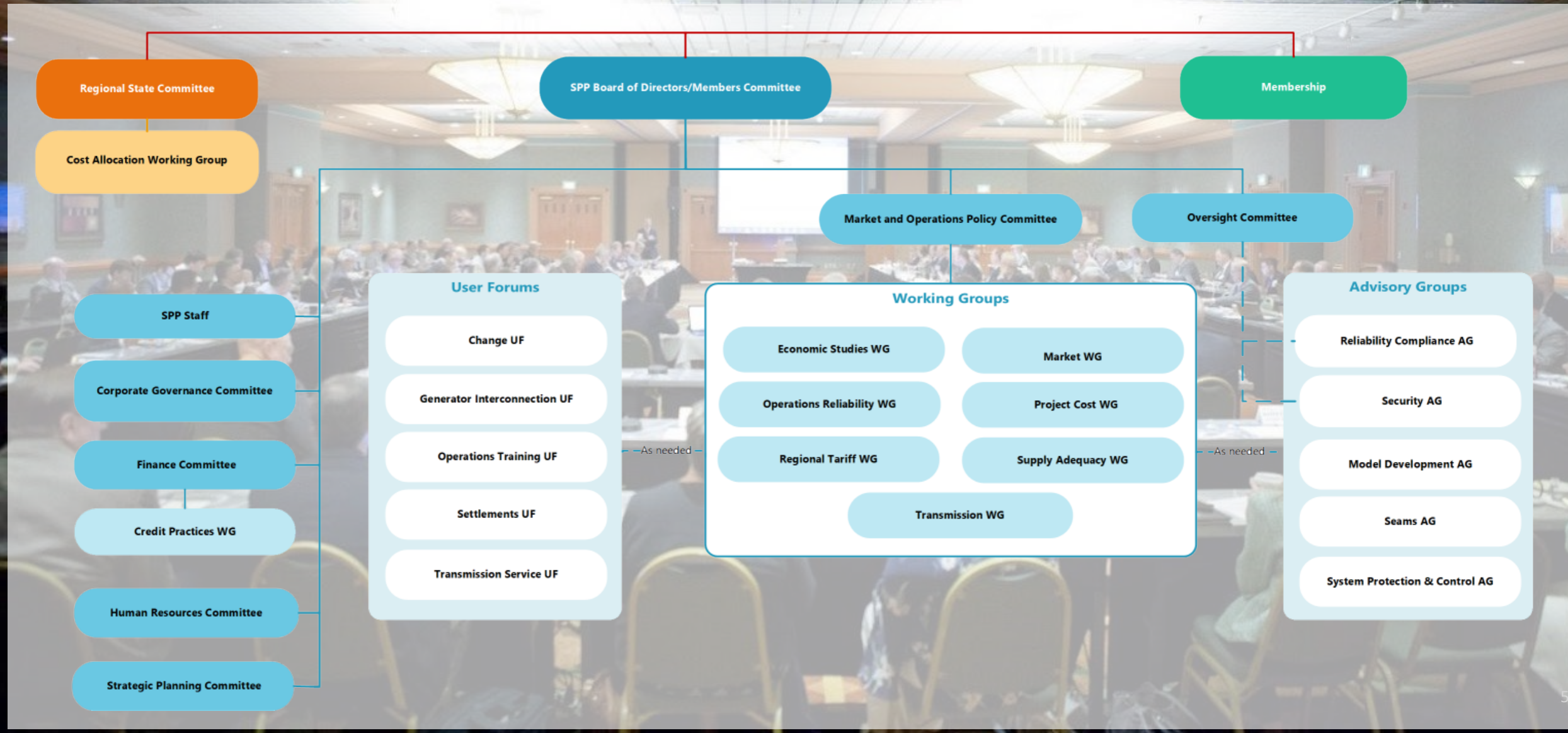
- Facilitation
- Reliability Coordination
- Balancing Authority
- Transmission Service/Tariff Administration
- Market Operation
- Transmission Planning
- Training

OUR APPROACH:
Regional, Independent, Cost-Effective and Focused on Reliability

ACTIVITIES OUTSIDE SPP'S SCOPE

- Transmission siting
- Generation planning/siting
- Transmission/generation construction
- Transmission/generation permitting

FACILITATION



STATE REGULATORS' ROLE

- Regional State Committee — Retail regulatory commissioners from 12 States:

Arkansas	Minnesota	North Dakota
Iowa	Missouri	Oklahoma
Kansas	Nebraska	South Dakota
Louisiana	New Mexico	Texas

- Primary responsibility for:
  - Cost allocation for transmission upgrades
  - Approach for regional resource adequacy
  - Allocation of transmission rights in SPP's markets

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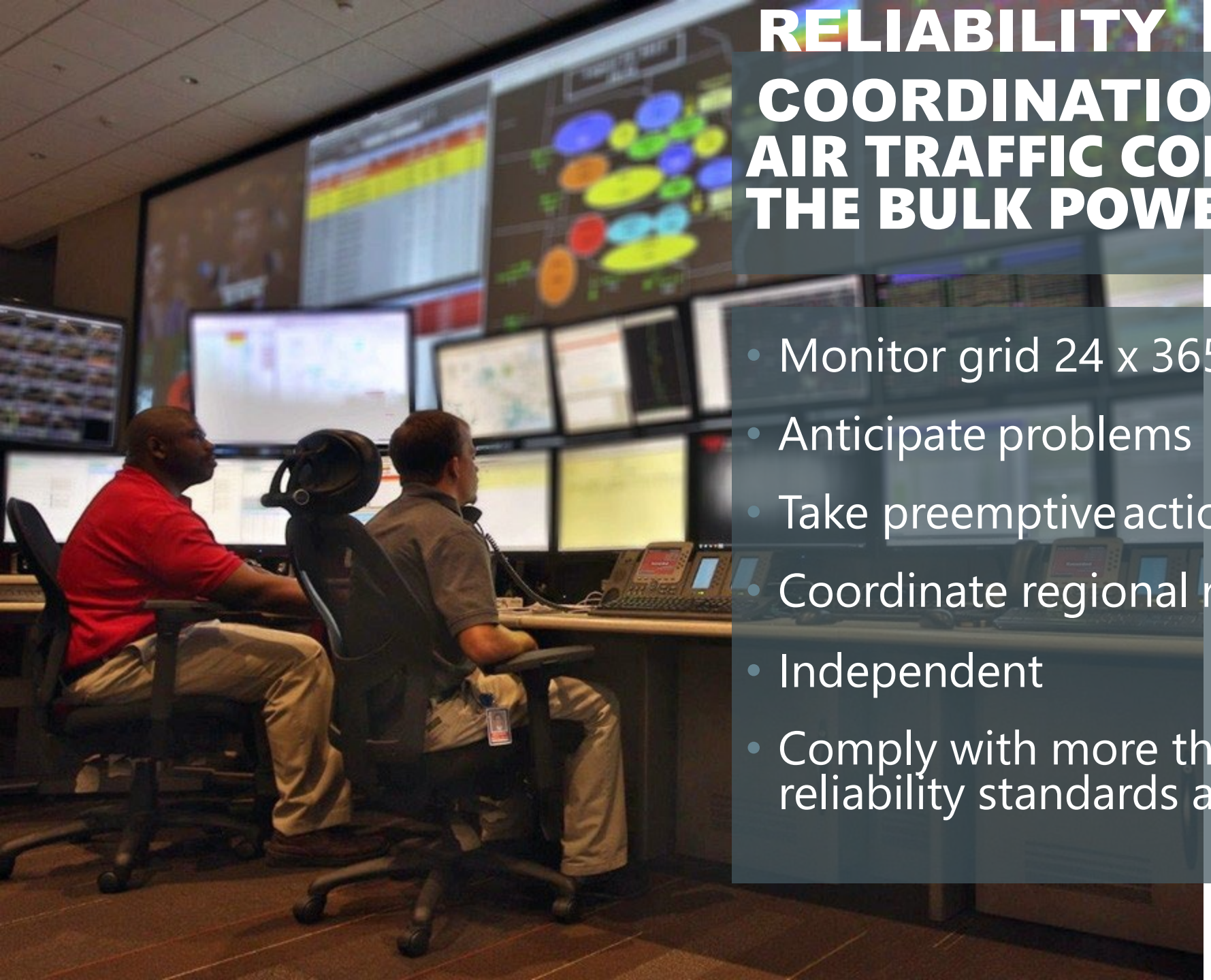
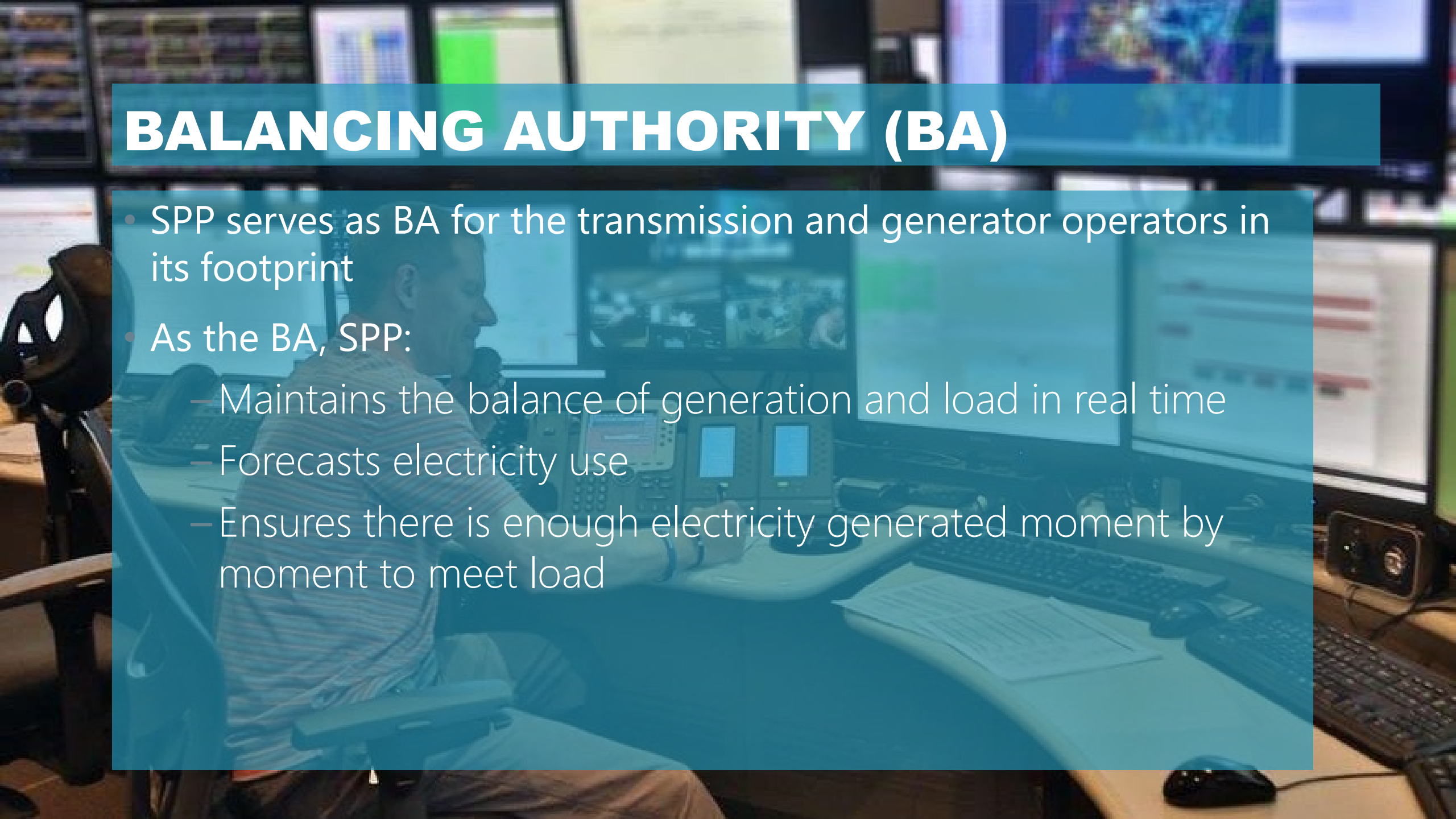


RELIABILITY COORDINATION: AIR TRAFFIC CONTROLLERS OF THE BULK POWER GRID

- Monitor grid 24 x 365
- Anticipate problems
- Take preemptive action
- Coordinate regional response
- Independent
- Comply with more than 5,500 pages of reliability standards and criteria



BALANCING AUTHORITY (BA)

- SPP serves as BA for the transmission and generator operators in its footprint
- As the BA, SPP:
  - Maintains the balance of generation and load in real time
  - Forecasts electricity use
  - Ensures there is enough electricity generated moment by moment to meet load

MARKETS

ELECTRICITY MARKET BASICS

Like any market, SPP's electricity markets feature:

- Sellers/producers with a product and buyers/consumers who want to buy it
- Prices driven by supply and demand

WHAT KIND OF MARKETS DOES SPP OPERATE?

- Transmission Service: Participants buy and sell use of regional transmission lines that are owned by different parties.
- Integrated Marketplace: Participants buy and sell wholesale electricity in day-ahead and real-time.
  - Day-Ahead Market commits the most cost-effective and reliable mix of generation for the region.
  - Real-Time Balancing Market economically dispatches generation to balance real-time generation and load, while ensuring system reliability.
- Western Energy Imbalance Service (WEIS) Market: Contract-based, real-time balancing market in the western interconnection (as of Feb. 1, 2021).

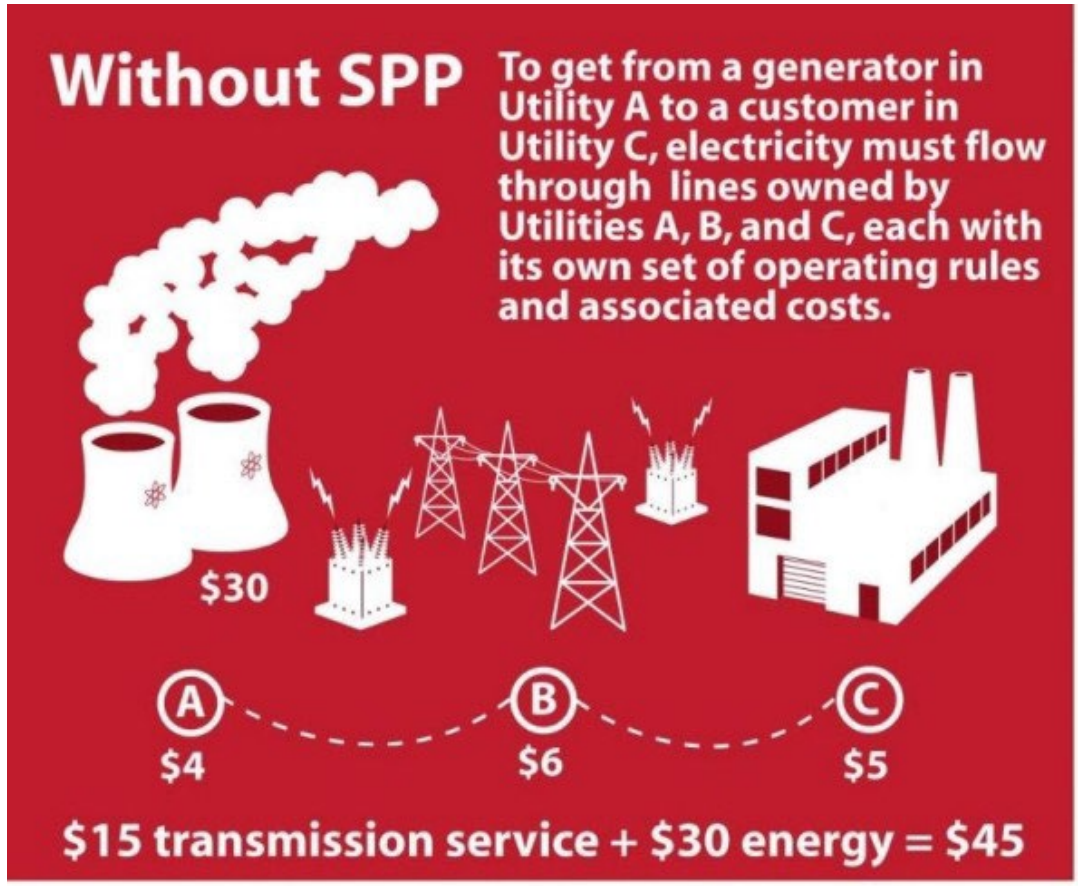
TRANSMISSION SERVICE MARKET

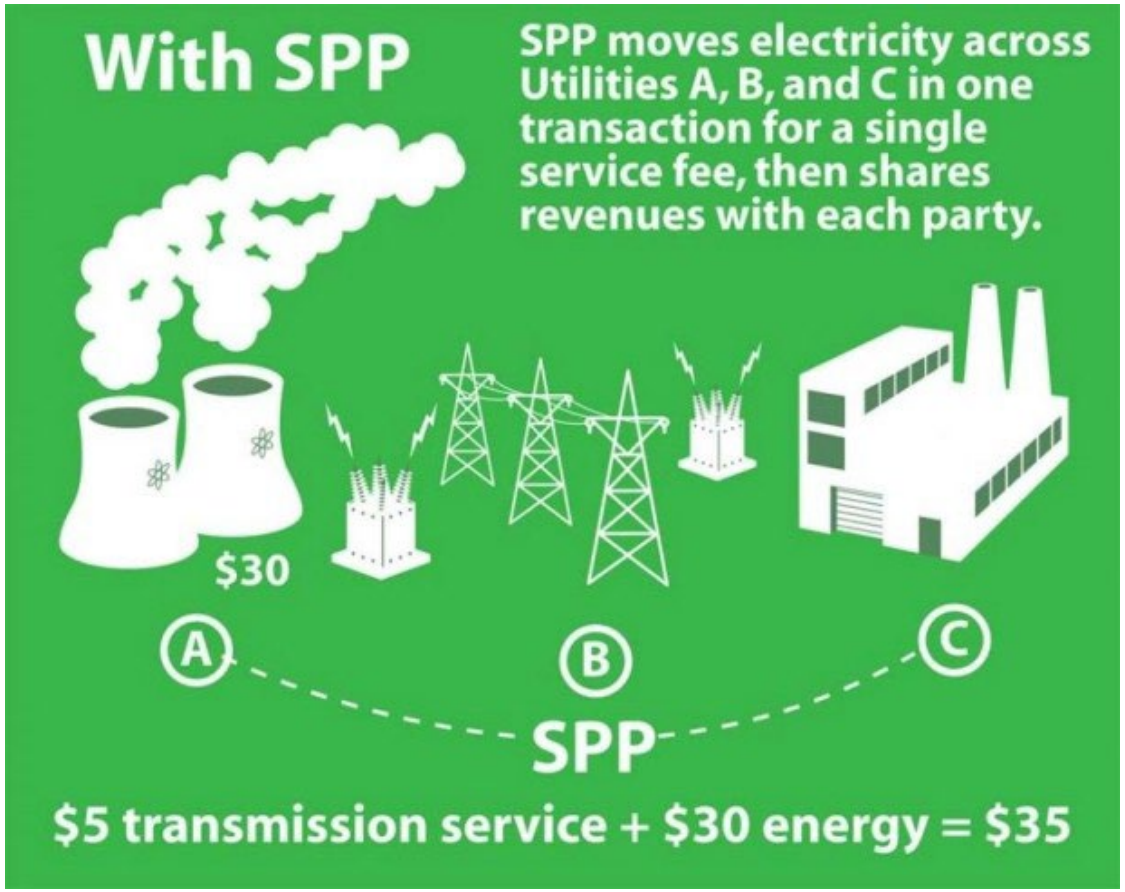
TRANSMISSION MARKET

- Provides “one-stop shopping” for use of regional transmission lines
- Consistent rates, terms, conditions for all users
- Independent
- Approx. 6,491 transactions per month on average in 2020
- 2020 transmission customer transactions = $4.5 billion

As a “sales agent,” SPP administers a transmission tariff greater than 5,500 pages in length on behalf of its members and customers.

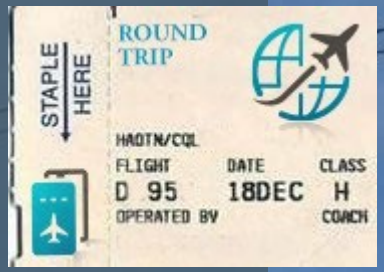
THE VALUE OF TRANSMISSION SERVICE





HOW TRANSMISSION SERVICE WORKS

- Reserving transmission service = reserving a seat on a plane
  - Customer specifies priority, time, source/sink, capacity
  - Tariff administrator approves ifcapacity exists
- Issuance of NERC Tag = receiving boarding pass
  - Won't be approved if improper use of reservation
- Creation of schedule from tag = sitting on the plane
  - Generators ramp to provide energy for transaction
  - May be curtailed if transmission system overloaded



WHOLESALE ENERGY MARKET

WHAT IS A WHOLESALE ENERGY MARKET?

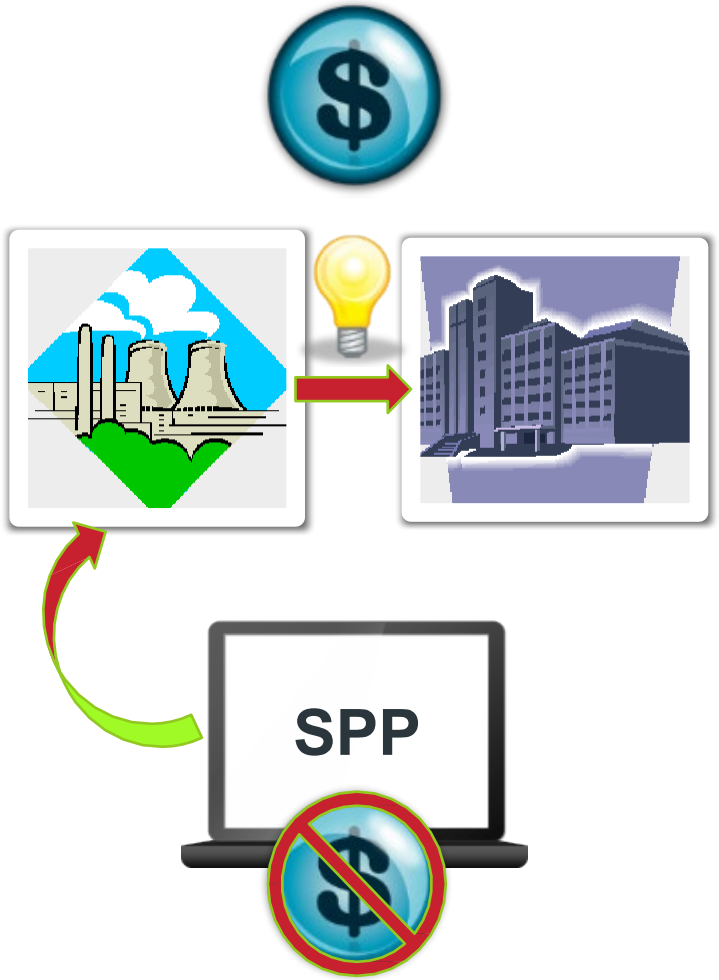
Sellers/ Producers	Buyers/ Consumers	Locational Prices	Products
• Utilities • Municipals • Independent Power Producers • Generators • Power Marketers	• Utilities • Municipals • Load Serving Entities (LSEs) • Power Marketers	• Driven by supply and demand at defined locations	• Energy • Operating Reserves • Congestion Rights

SPP'S INTEGRATED MARKETPLACE

SPP financially settles the marketplace

- Calculates prices
- Captures wholesale energy production and consumption
- Collects from market participants (MP) who owe the market
- Pays MPs who are owed by the market
- Remains revenue neutral

SPP has an independent market monitor



INTEGRATED MARKETPLACE OVERVIEW

Key Components

- Day-Ahead (DA) Market
- Real-Time Balancing Market (RTBM)
- Transmission Congestion Rights (TCR) Market

Products

- Energy
- Operating Reserve (Regulation Up, Regulation Down, Spinning, Supplemental)
- Congestion Rights

MARKETPLACE BENEFITS

- SPP's markets provide participants $744M in net savings annually
- Reduce total energy costs through centralized unit commitment while maintaining reliable operations
- Day-ahead market allows additional price assurance capability prior to real-time
- Operating reserve products support implementation of the SPP balancing authority and facilitate reserve sharing

DAY-AHEAD MARKET

- Determines least-cost solution to meet energy bids and reserve requirements
- Participants submit offers and bids to purchase and/or sell energy and operating reserve:
  - Energy
  - Regulation-Up
  - Regulation-Down
  - Spinning Reserve
  - Supplemental Reserve

REAL-TIME BALANCING MARKET (RTBM)

- Balances real-time load and generation committed by the day-ahead market and reliability commitment processes
- Operates on continuous 5-minute basis
  - Calculates dispatch instructions for energy and clears operating reserve by resource
- Energy and operating reserve are co-optimized
- Settlements based on difference between results of RTBM process and day-ahead market clearing
- Charges imposed on market participants for failure to deploy energy and operating reserve as instructed

TRANSMISSION CONGESTION RIGHTS (TCR) MARKET

- In the day-ahead market, price separation of market participant's resource to load may occur due to congestion leaving the market participant exposed to high prices
- A TCR can be used as hedge against congestion that allows market participants to reduce exposure to high market prices and potentially receive lower-priced deliverable energy
- TCR market has annual and monthly auction processes related to two products:
  - Auction Revenue Rights (ARRs)
  - Transmission Congestion Rights (TCRs)

MARKET MONITORING UNIT (MMU) ENSURES RELIABILITY, EFFECTIVENESS

- SPP's internal MMU reports directly to the Board and Oversight Committee: Market Power and Market Manipulation
- Independent from SPP RTO
- FERC Order 719 allows ISO/RTO markets to be overseen by internal, external or hybrid monitor
  - Three ISOs/RTOs have an external monitor, two have an internal monitor, and one has a hybrid
  - Order 719 authorizes RTO Board of Directors to decide on the monitor structure and the SPP Board has decided an internal form to be most appropriate for SPP
- MMU reviews real-time/historic data and reports any issues to FERC for investigation

TRANSMISSION PLANNING: BASIC CONCEPTS

SERVICES

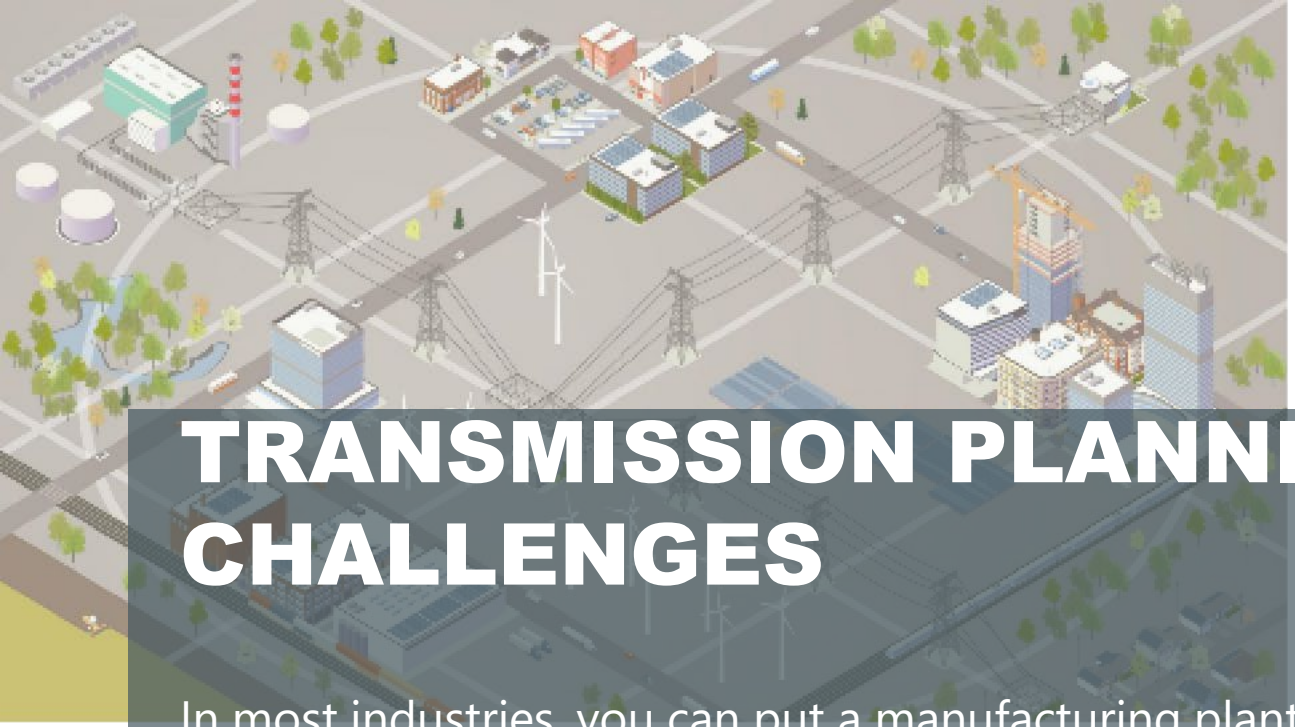
TRANSMISSION PLANNING CONSIDERATIONS

Must take into account a number of considerations, including

- Reliability
- Economics
- Public Policy

TRANSMISSION PLANNING CONSIDERATIONS

- What parts of grid need strengthening to “keep the lights on?”
  - Some redundancies are necessary to mitigate outage-related risks
- Where are current and future generation located?
- Where are electricity consumers located?
- Where on the grid do we frequently see congestion?
- Will laws mandating more renewable energy or a carbon tax impact traffic?
- How do coal/gas prices impact traffic?
  - People will use more coal if gas prices rise, and vice versa
- How do regional temperatures impact traffic?
  - If temperature differs across region, one area may need more energy



TRANSMISSION PLANNING CHALLENGES

In most industries, you can put a manufacturing plant anywhere close to an interstate or railroad to transport your product. Locating electric generation is more challenging.

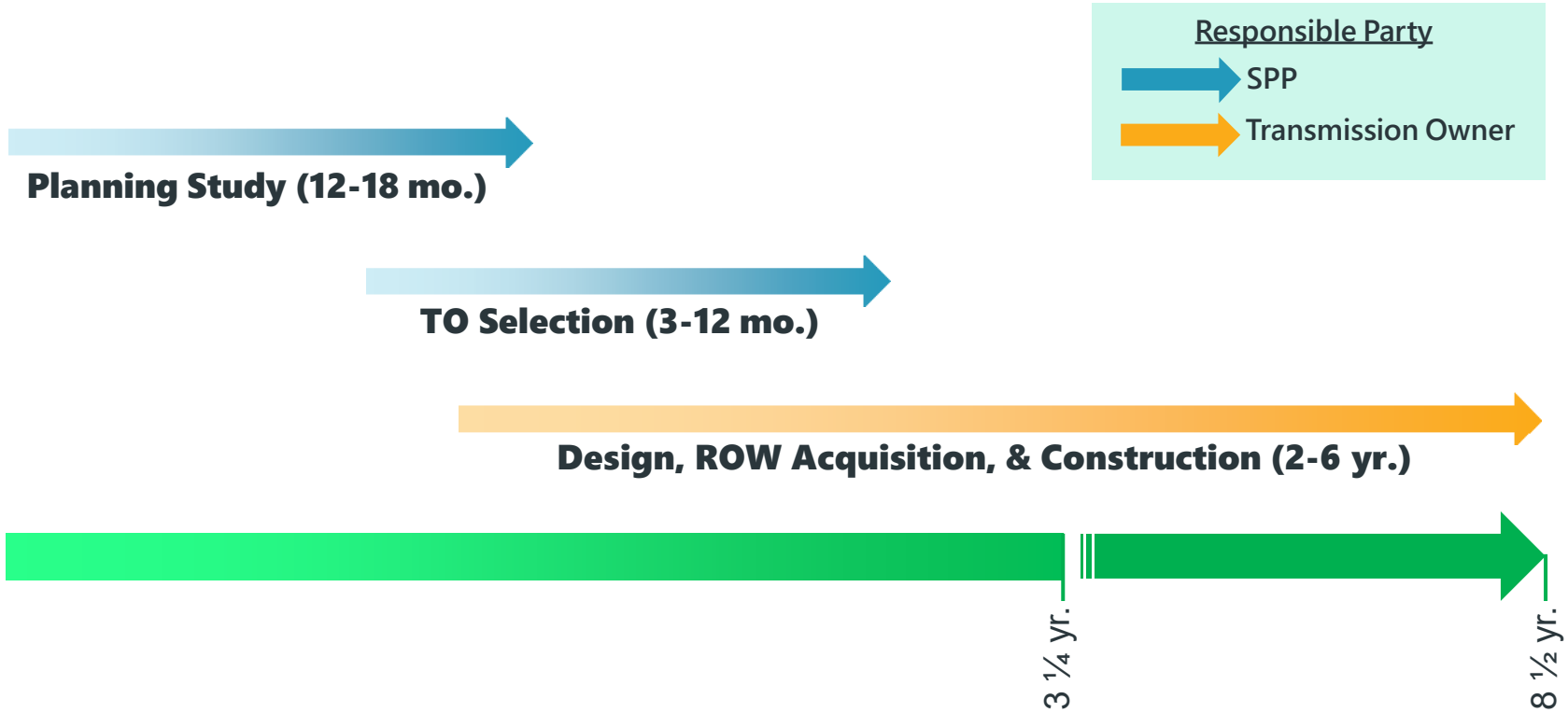
Wind, solar, and hydro energy can only be manufactured where those resources are located. A coal-fired plant must be located in a place with water for cooling, and the ability to deliver large quantities of coal to it. A natural gas -fired plant has to be on a pipeline.

In many cases, “roads” don’t exist to move wind and solar energy to electricity customers, and building them is a long and costly process.

HOW SPP MAKES PLANNING DECISIONS

- Integrated Transmission Planning process
- Generation Interconnection Studies
  - Determines transmission upgrades needed to connect new generation to electric grid
- Aggregate Transmission Service Studies
  - Determines transmission upgrades needed to transmit energy from new generation to load
  - Shares costs of studies and new transmission
- Specific transmission studies

TRANSMISSION BUILD CYCLE IN SPP



SPP'S TRANSMISSION PLANNING STUDIES

Stakeholder-driven, member-funded

- Integrated Transmission Planning
- High Priority
- Balanced Portfolio
- Interregional Projects

Customer-initiated, customer-funded

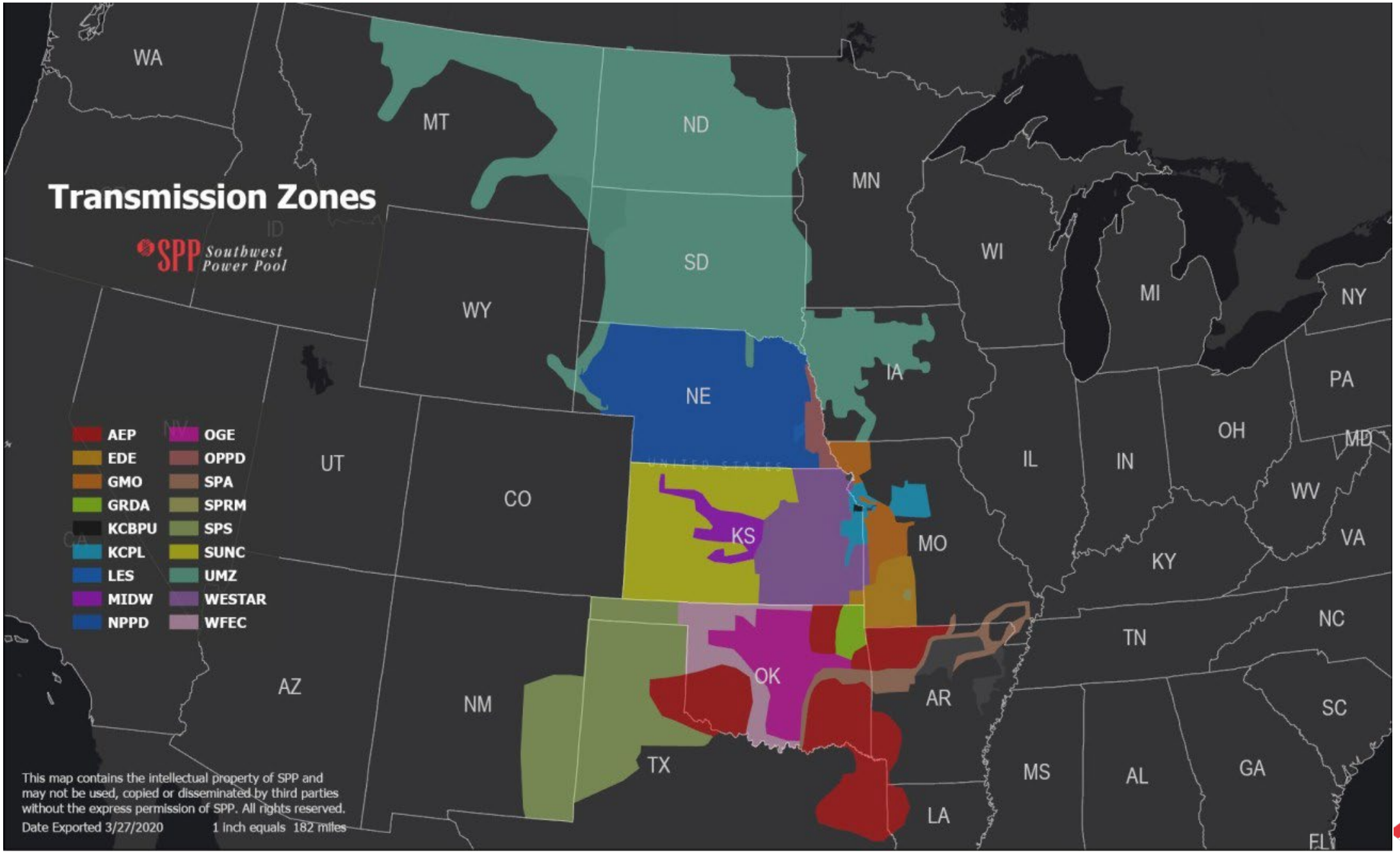
- Transmission Service
  - ↳Congestion Hedging*
- Generation Interconnection Service
- Sponsored Upgrades

*Currently funded by members, but new admin fee structure will charge to market participants

WHO PAYS FOR TRANSMISSION PROJECTS?

- **Sponsored**: Project owner builds and receives credit for use of transmission lines
- **Directly-assigned**: Project owner builds and is responsible for cost recovery and receives credit for use of transmission lines
- **Highway/Byway**: Most SPP projects paid for under this methodology

Voltage	Region Pays	Local Zone Pays
300 kV and above	100%	0%
above 100 kV and below 300 kV	33%	67%
100 kV and below	0%	100%


Transmission Zones
SPP Southwest Power Pool
AEP
EDE
GMO
GRDA
KCBPU
KCPL
LES
MIDW
NPPD
OGE
OPPD
SPA
SPRM
SPS
SUNC
UMZ
WESTAR
WFEC
WA
MT
ND
MN
SD
WI
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NY
WY
IA
NE
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Date Exported 3/27/2020
1 inch equals 182 miles

CURRENT ITEMS AND LOOKING FORWARD

- Current/future increased reserve margins needed due to retirement of conventional resources and substantial development of renewable generation.
- Future decreases in capacity factors for conventional resources due to moving to a Performance Based Accreditation methodology.
- Western Interconnect Expansion – New members joining SPP RTO and new states joining SPP RSC.
- Turnover of Board and RSC Members and new Members joining.
- RSC ACTION ITEM 22-01: SPP staff, CAWG and stakeholders considering alternatives to improve the ability of market participants to hedge congestion costs.

CURRENT ITEMS AND LOOKING FORWARD

- Resource availability and fuel assurance recommendations.
- Amount of Change/Revision Requests SPP is currently experiencing.
- Growing and diverse membership creates challenges for consensus.
- Lack of alignment between SPP planning models and member planning models.
- FERC Notice of Proposed Rulemakings – Planning and Cost Allocation, Generation Interconnection, Cybersecurity.

QUESTIONS?

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