

PwrPt-D1 10-3-19
Ross-SPP



ARKANSAS LEGISLATIVE JOINT INTERIM COMMITTEE ON ENERGY

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



SouthwestPowerPool



SPPorg



southwest-power-pool

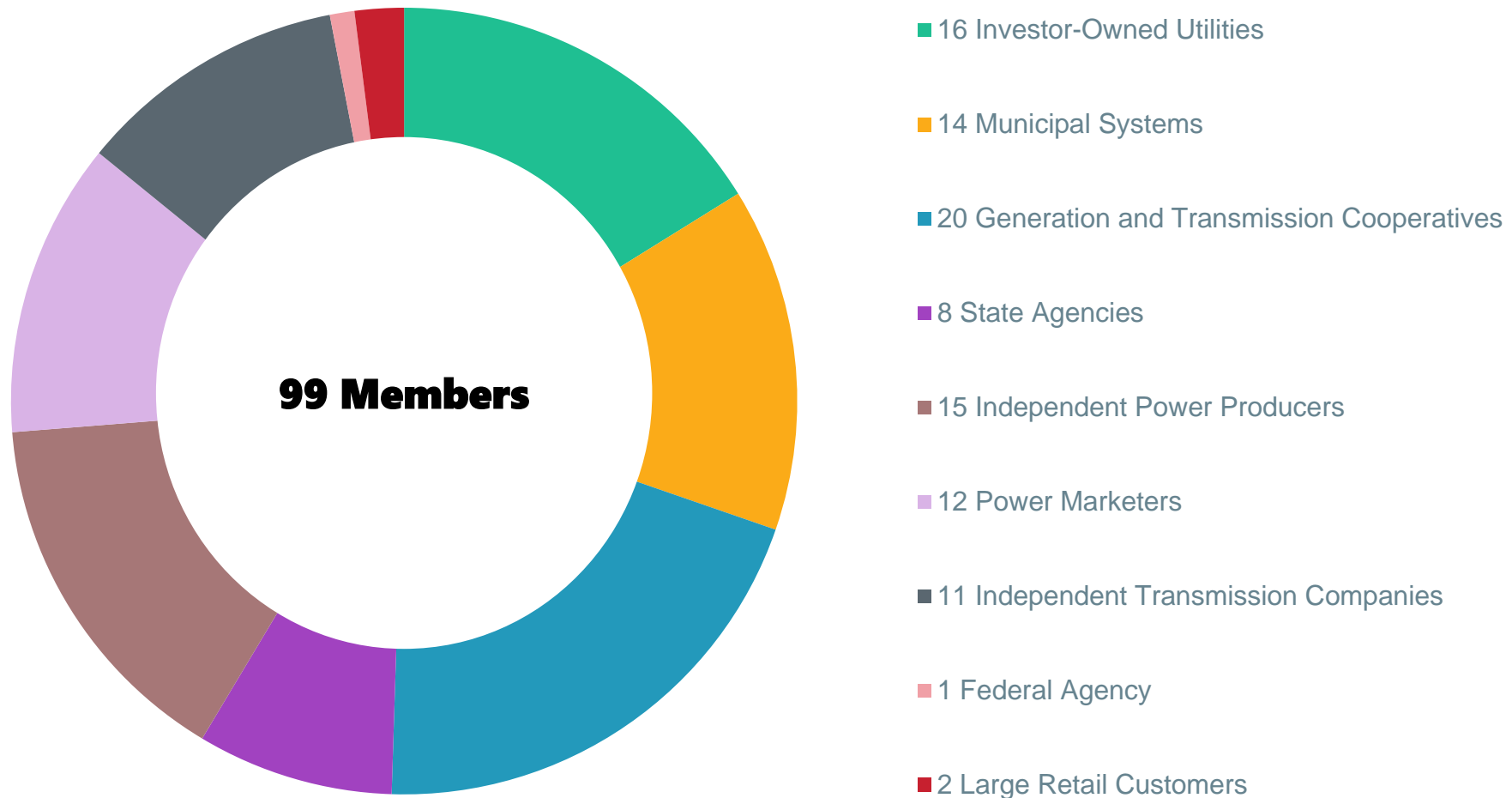
NORTH AMERICAN INDEPENDENT SYSTEM OPERATORS (ISO) AND REGIONAL TRANSMISSION ORGANIZATIONS (RTO)



The image shows two large, lattice-structured high-voltage power line towers. They are silhouetted against a clear, bright blue sky. Multiple power lines stretch across the frame, connecting the towers. The towers are positioned diagonally, with one in the foreground and another further back, creating a sense of depth. The overall tone is professional and industrial.

**OUR MISSION:
HELPING OUR MEMBERS WORK TOGETHER TO KEEP
THE LIGHTS ON ... TODAY AND IN THE FUTURE.**

SPP'S 99 MEMBERS: INDEPENDENCE THROUGH DIVERSITY



July 12, 2019

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)



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



OPERATING REGION

- Service territory: 546,000 square miles
- Population served: 17.5 million
- Generating plants: 818*
- Substations: 5,054*

* In SPP's reliability coordination footprint

EHV Transmission

- 230 kV
- 345 kV
- 500 kV



MILES OF TRANSMISSION: 66,892

- 69 kV 17,340
- 115 kV 15,846
- 138 kV 9,367
- 161 kV 5,567
- 230 kV 7,534
- 345 kV 11,146
- 500 kV 92

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Date Exported 10/30/2018 1 inch equals 153 miles

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.

MARKET FACTS

- 225 market participants
- 757 generating resources
- 2018 marketplace settlements = \$20.5 billion
- 50,662 MW coincident peak load (8/19/19)
 - Winter peak: 43,584 MW (1/17/18)

FIVE YEARS OF SPP'S INTEGRATED MARKETPLACE

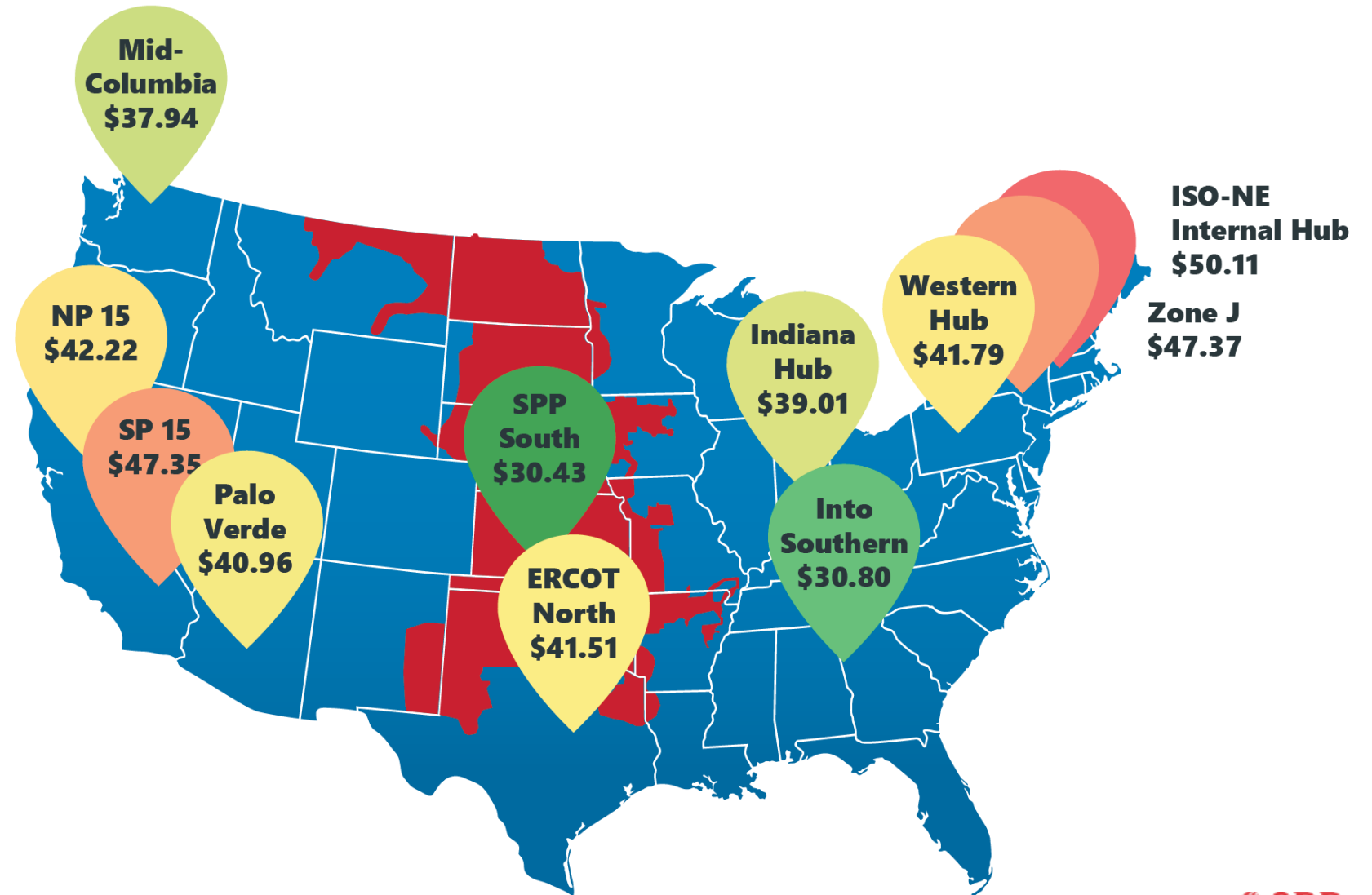
- \$2.7 billion in cumulative benefits as of Jan 1., 2019
- Average annual savings of \$570 million
- Lowest-cost wholesale energy in the nation (\$30.43/MWh) according to calculations by FERC for 2018
- Facilitated growth in renewable energy production from 6 GWh in 2008 (3% of annual total) to 65 GWh in 2018 (28.5% of annual total)

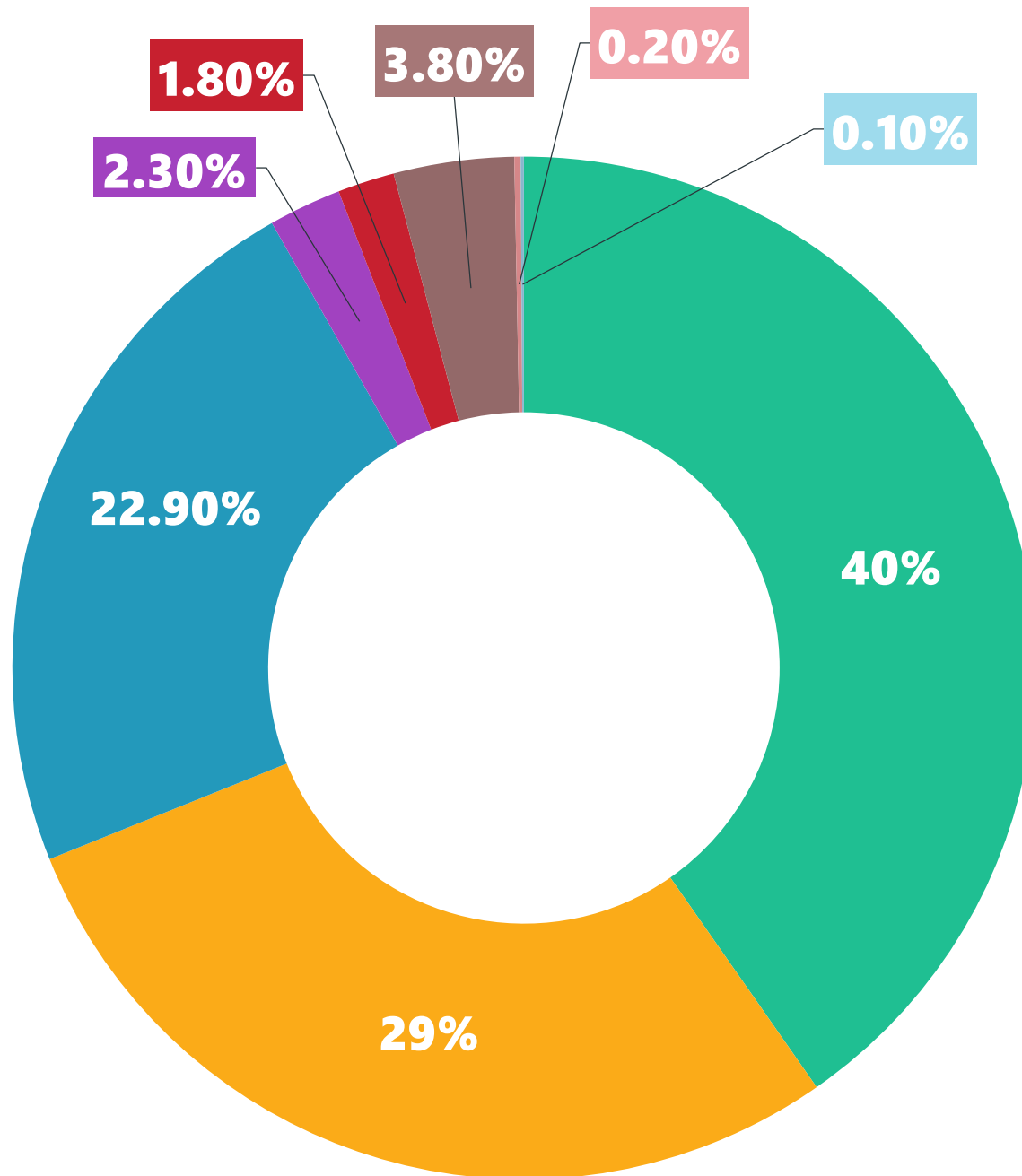
2018 ANNUAL AVERAGE SPOT PRICES

SPP had the lowest average wholesale electricity prices in the nation in 2018.

Source: Federal Energy Regulatory Commission's 2018 State of the Markets Report (April 18, 2019).

Based on nodal prices from ABB Velocity Suite. ISO hub prices for SNL's ISO Day-Ahead On Peak Prices data. Mid-Columbia, Palo Verde, and Into Southern prices from SNL's S&P Global Market Intelligence Day-Ahead – Annual On Peak Prices data.



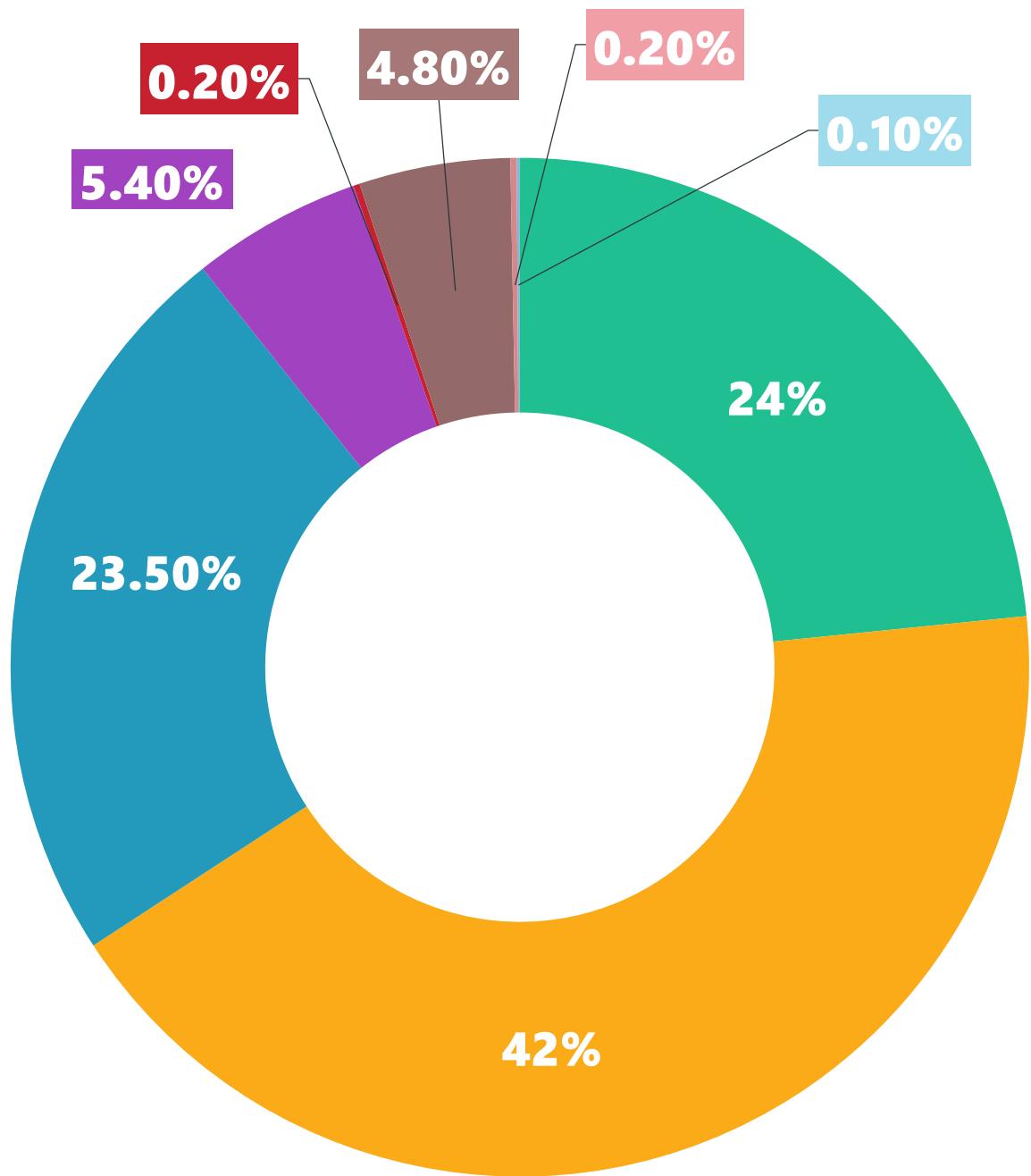


GENERATING CAPACITY* BY FUEL TYPE: 89,999 MW TOTAL

* NAMEPLATE CAPACITY AS OF 1/1/19

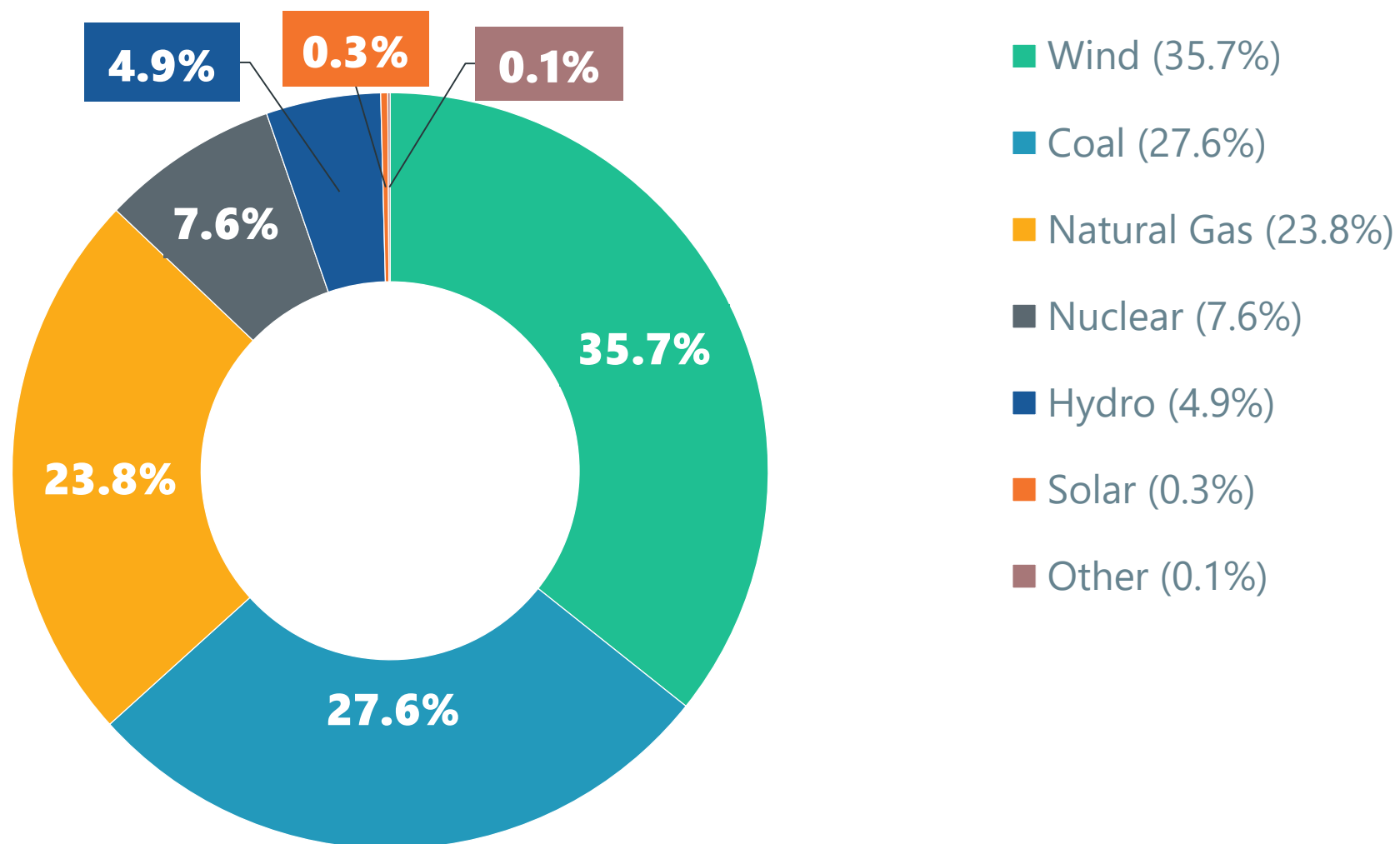
- Natural Gas (40.3%)
- Coal (28.6%)
- Wind (22.9%)
- Nuclear (2.3%)
- Fuel Oil (1.8%)
- Hydro (3.8%)
- Solar (0.2%)
- Other (0.1%)

**2018 ENERGY
PRODUCTION
BY FUEL TYPE:
275,887 GWH
TOTAL**



- Natural Gas (23.4%)
- Coal (42.4%)
- Wind (23.5%)
- Nuclear (5.4%)
- Fuel Oil (0.2%)
- Hydro (4.8%)
- Solar (0.2%)
- Other (0.1%)

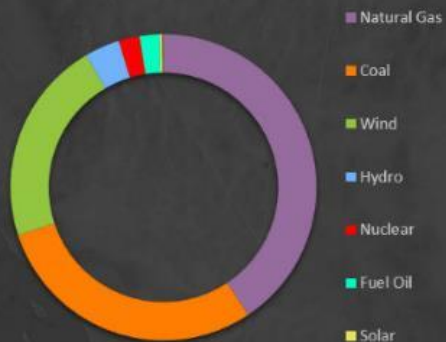
GENERATION, APRIL 2019



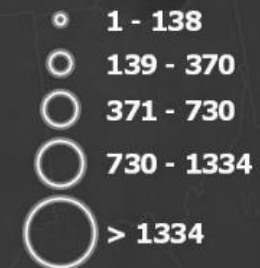
Distribution of Generation



Generation Mix



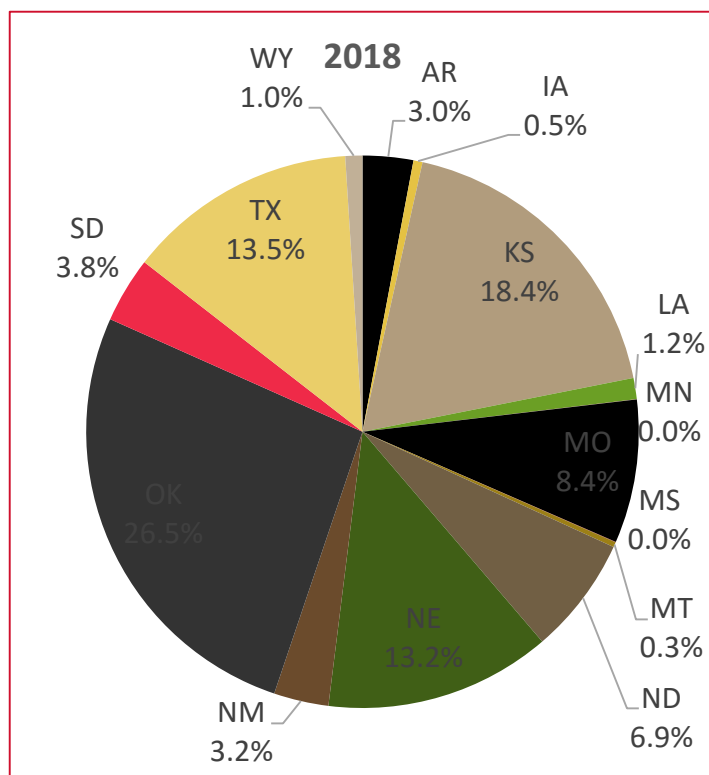
Capacity (MW)



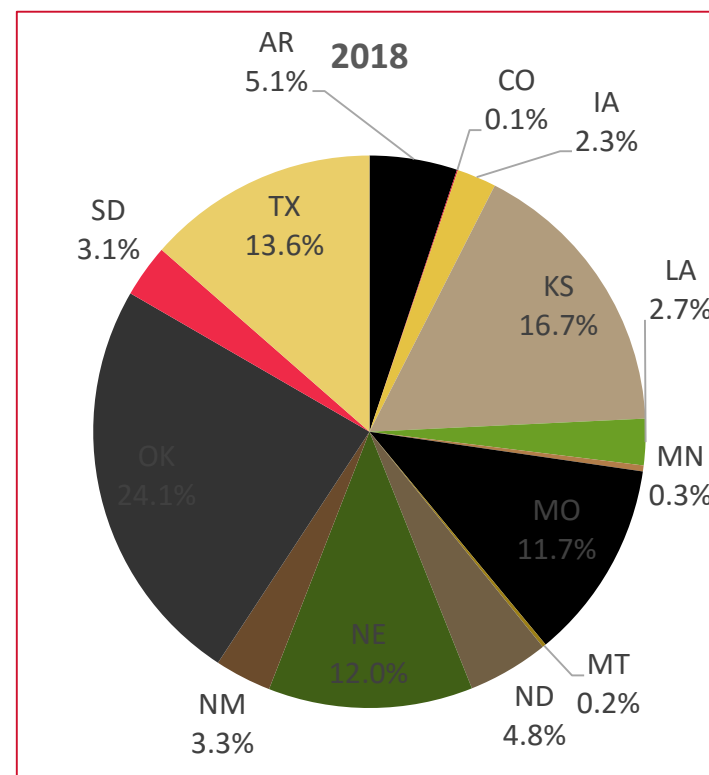
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 Date Exported 8/3/2018 1 inch equals 182 miles

GENERATION AND LOAD IN SPP BY STATE

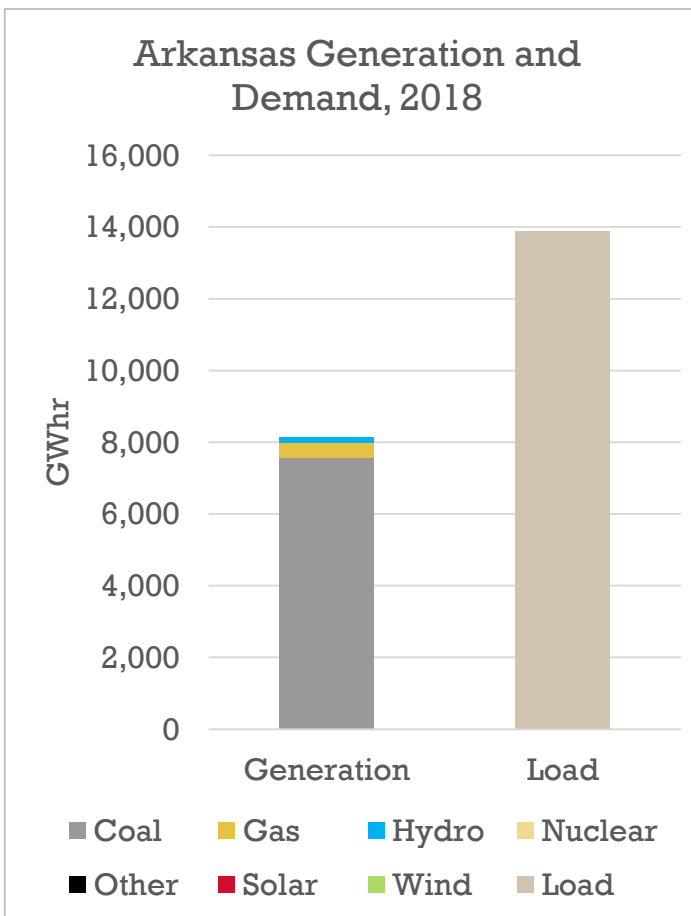
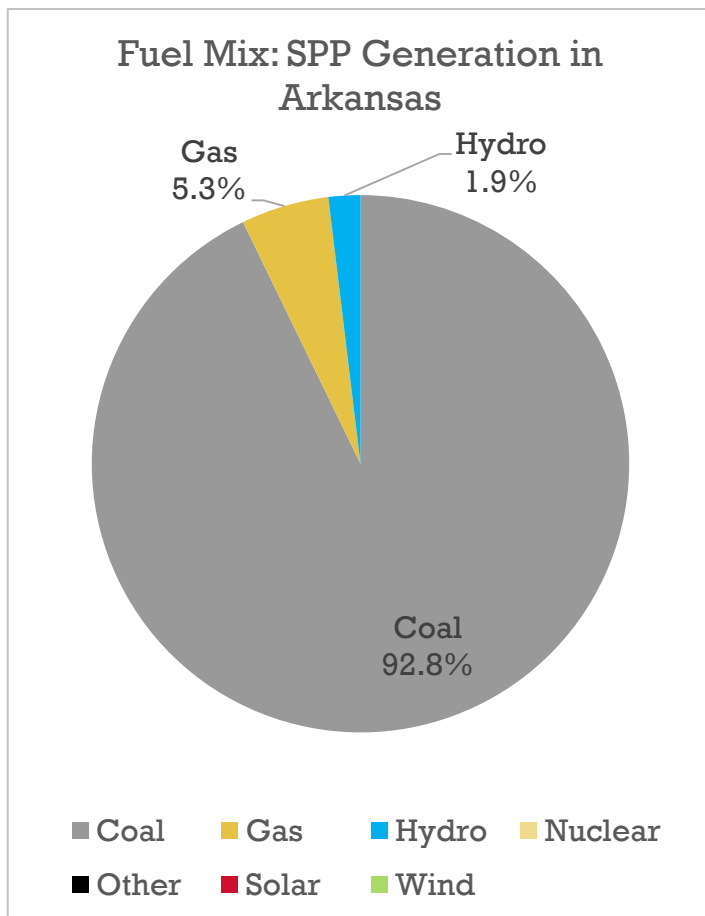
Generation Contribution



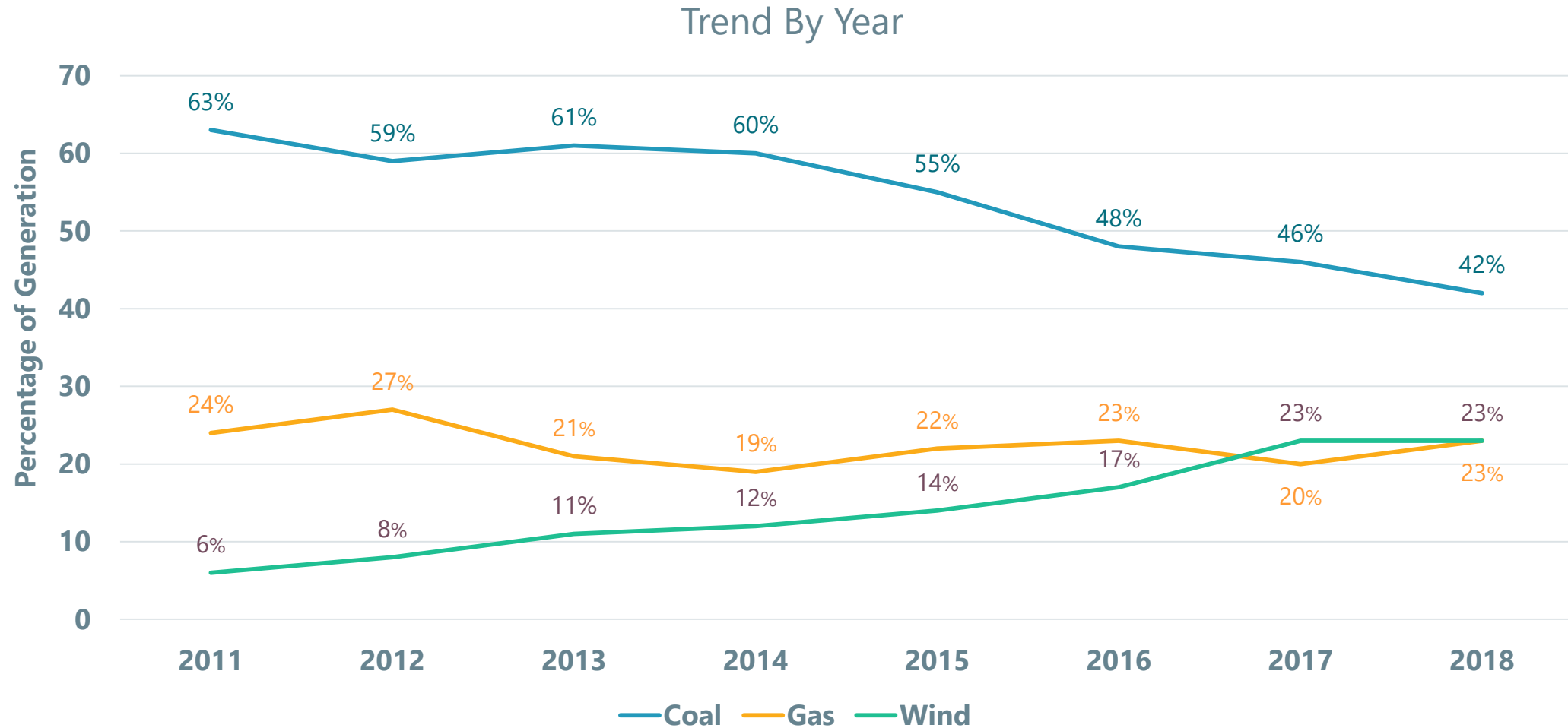
System Demand



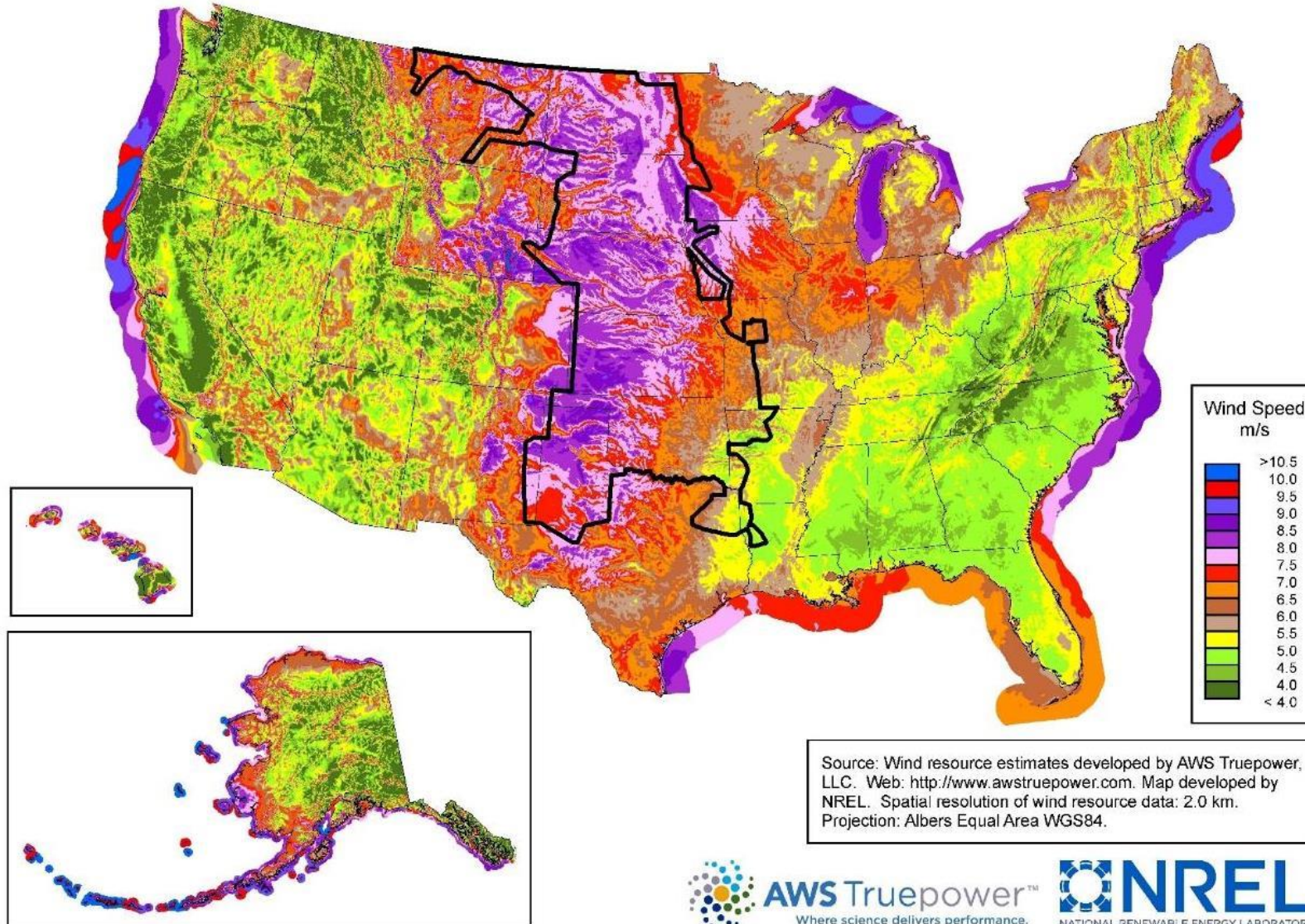
ARKANSAS GENERATION AND LOAD



OUR EVOLVING ENERGY MIX



United States - Land-Based and Offshore Annual Average Wind Speed at 80 m



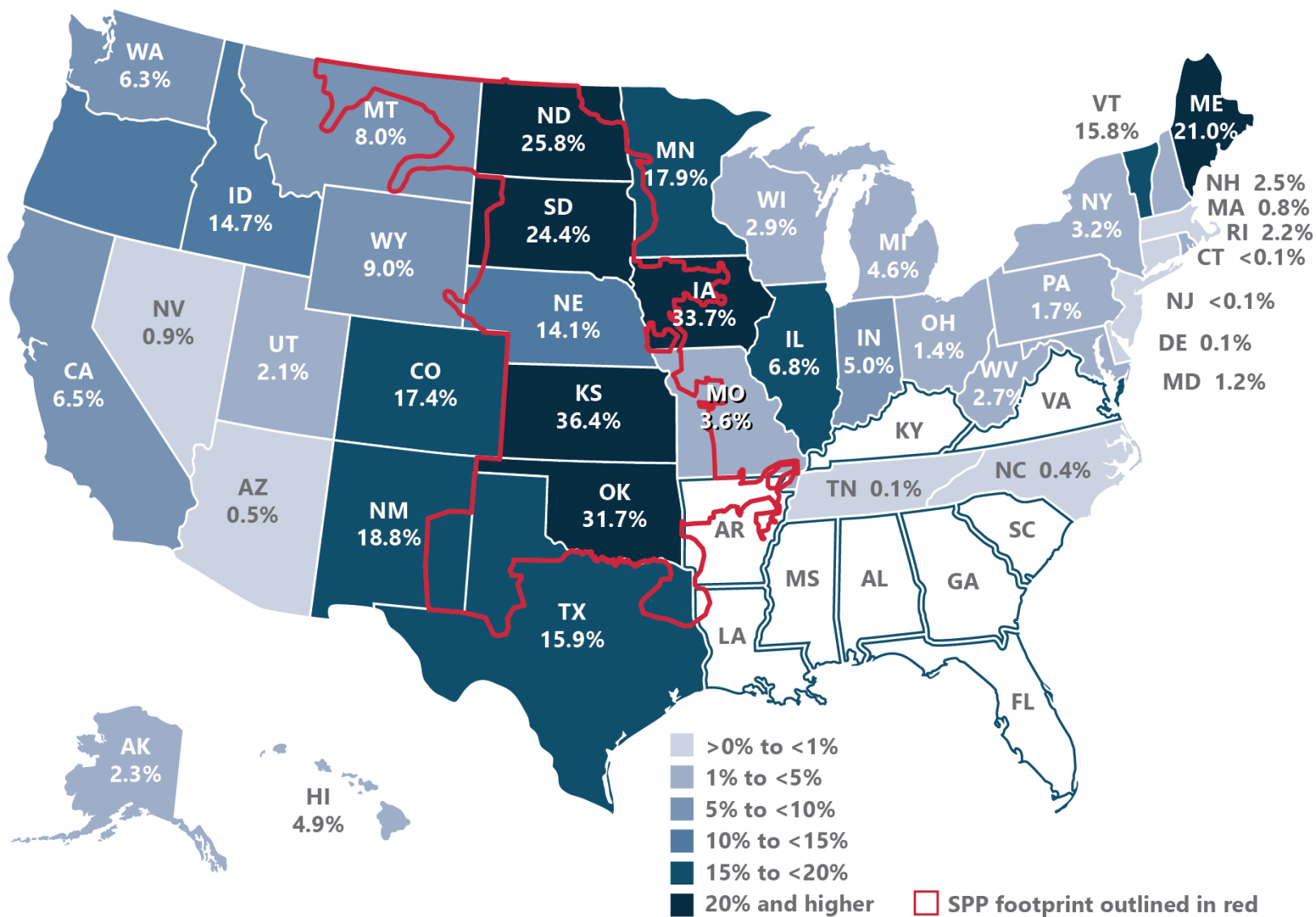
AWS Truepower™
Where science delivers performance.



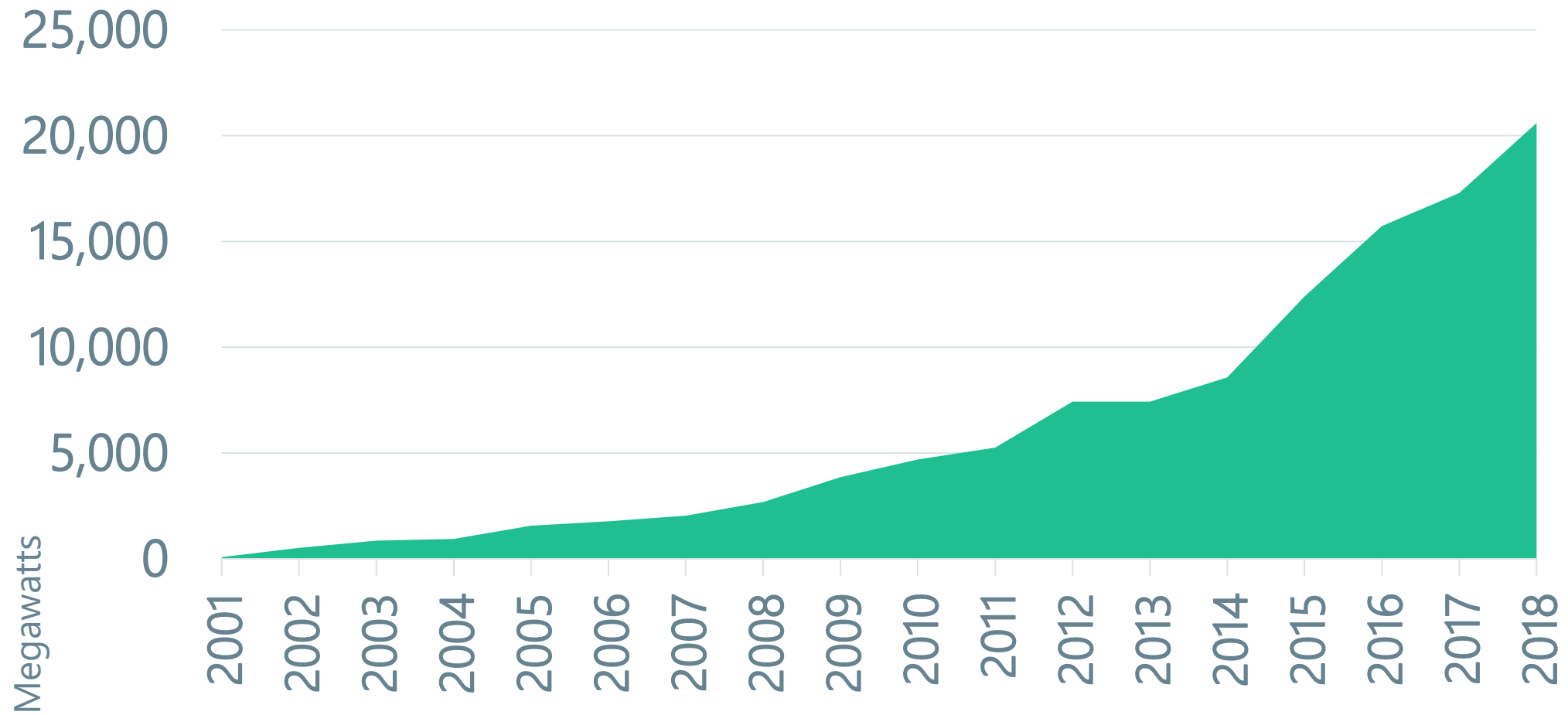
15-JAN-2012 3.3

**THE COUNTRY'S
HIGHEST WIND
SPEEDS ARE IN
THE SPP
BALANCING
AUTHORITY**

WIND ENERGY'S SHARE OF STATE-BY- STATE ELECTRICITY GENERATION



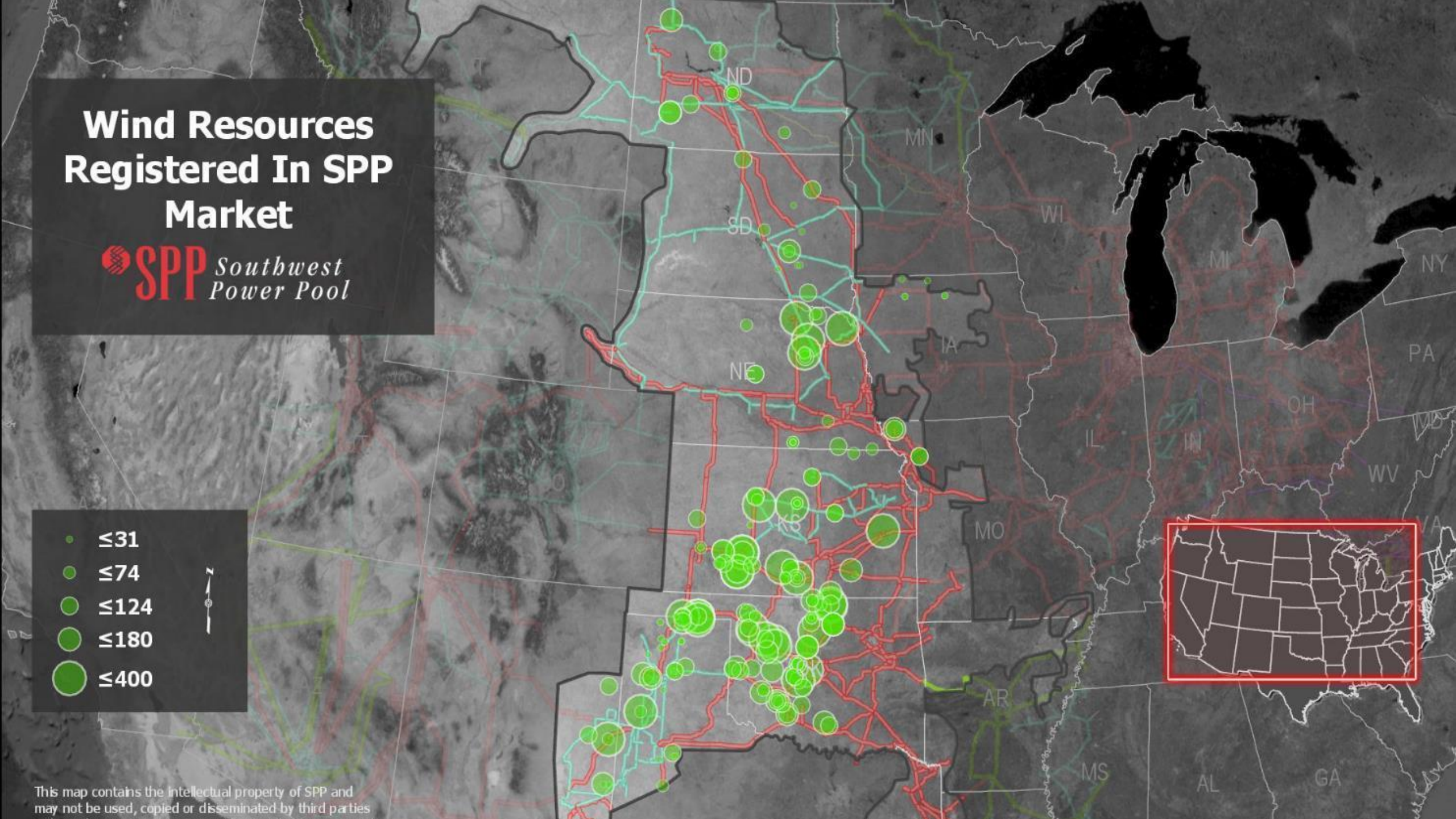
INSTALLED WIND CAPACITY BY YEAR



Wind Resources Registered In SPP Market



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WIND IN SPP'S SYSTEM

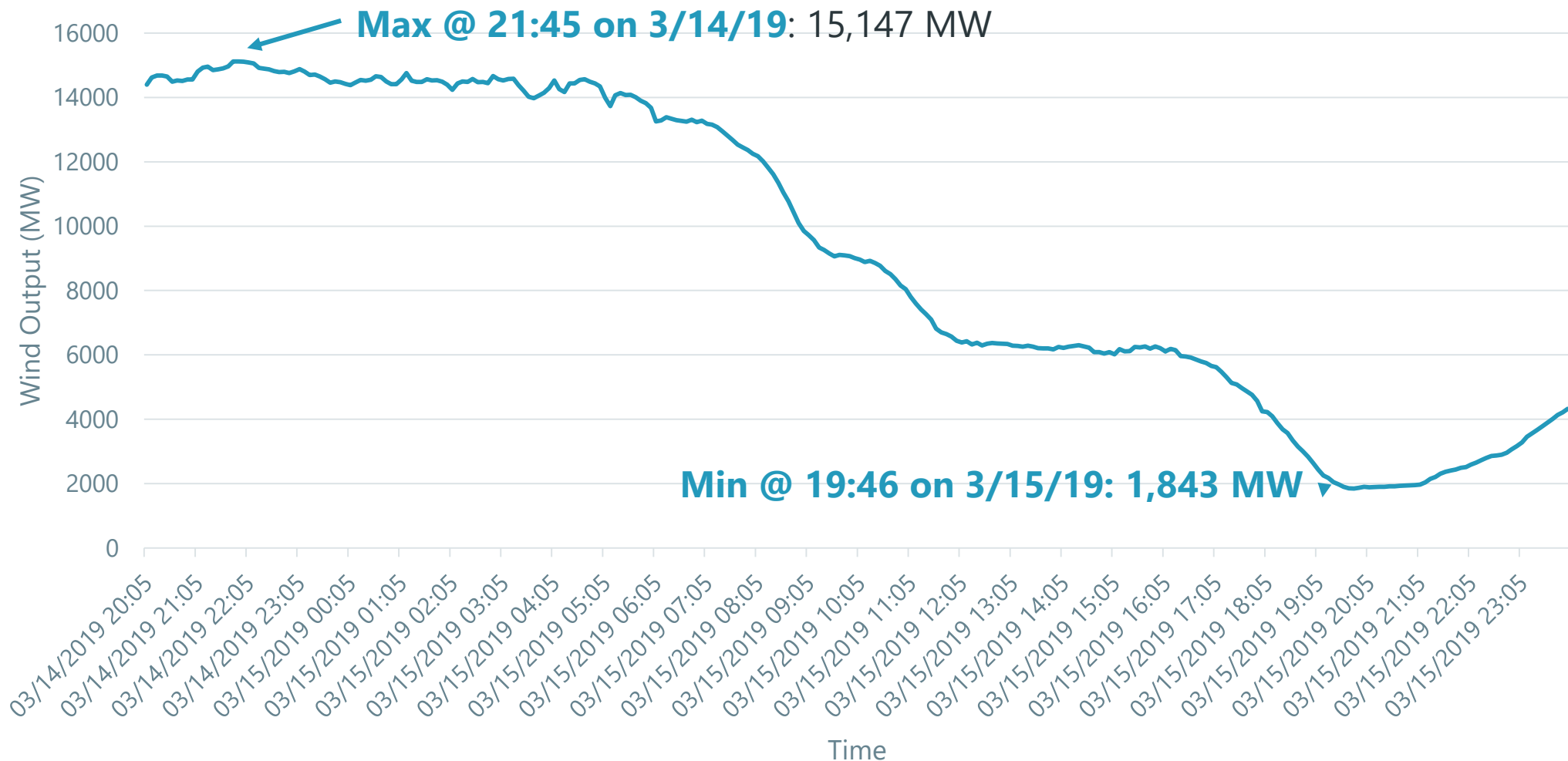
- 21,578 MW: Wind installed today
 - 11,029 turbines at 207 wind resources (most are 80m hub height)
 - Largest wind resource: 478 MW (Hale Wind Farm in Hale County, TX)
- 9,065 MW: Unbuilt wind w/signed interconnection agreements
- 50,210 MW: Wind in all stages of study and development
- ~23 GW: Forecast wind installation by 2020 (more than SPP's current minimum load)



WIND PENETRATION IN THE SPP SYSTEM

- Maximum wind output: 17,109 MW (9/30/2019)
- Minimum wind output (last 12 mos.): 146 MW (8/9/18)
- Maximum wind penetration: 67.3% (4/27/19)
- Average wind penetration (2018): 23.5%
- Max wind swing in one day: > 13 GW on March 14-15, 2019 (14.8 GW to 1.8 GW in 18 hours)
- Max 1-hour ramp: 3,700 MW

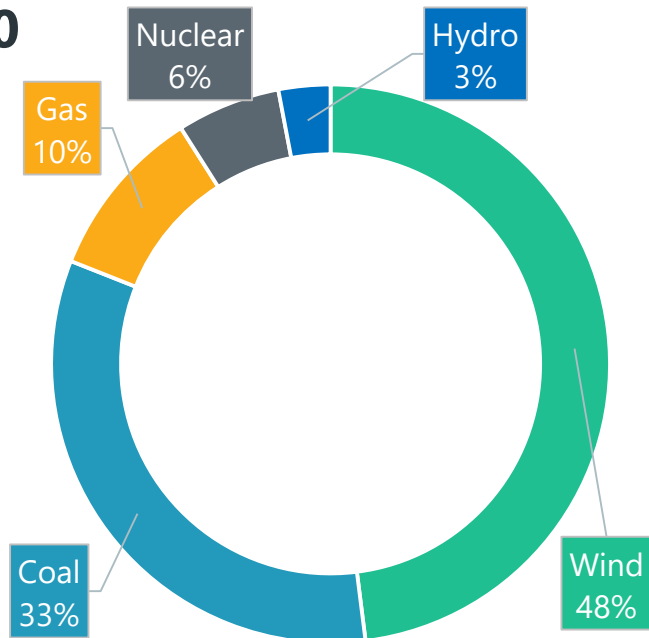
WHY FUEL DIVERSITY MATTERS: SPP'S RECORD WIND SWING (13.3 GW IN 22 HOURS)



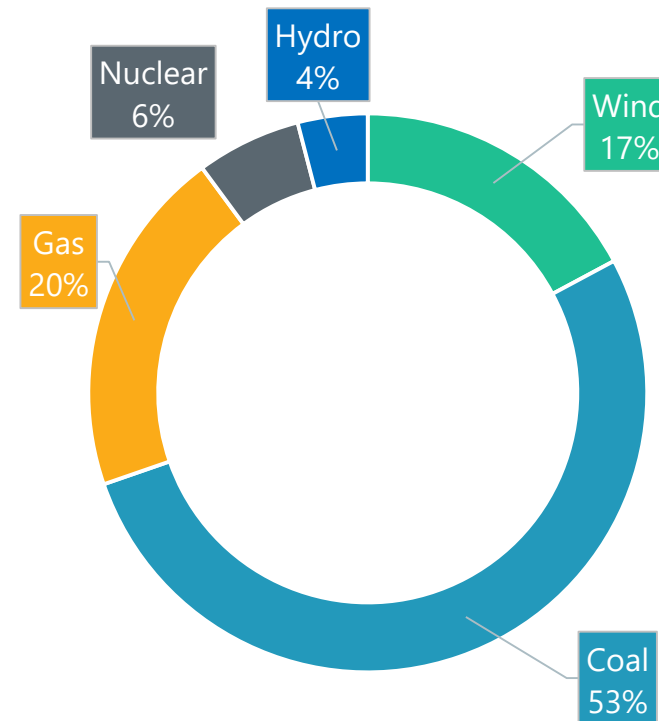
THE DIFFERENCE A DAY MAKES

- On Dec. 20, 2018 at 07:40, a record output of 16,283 MW of wind power served 48 percent of our load. A day later, wind shrank to 17 percent of our generation mix, and other sources like coal and gas ramped up to serve load. This illustrates the value of a diverse fuel mix able to accommodate a wide variety of operational circumstances!

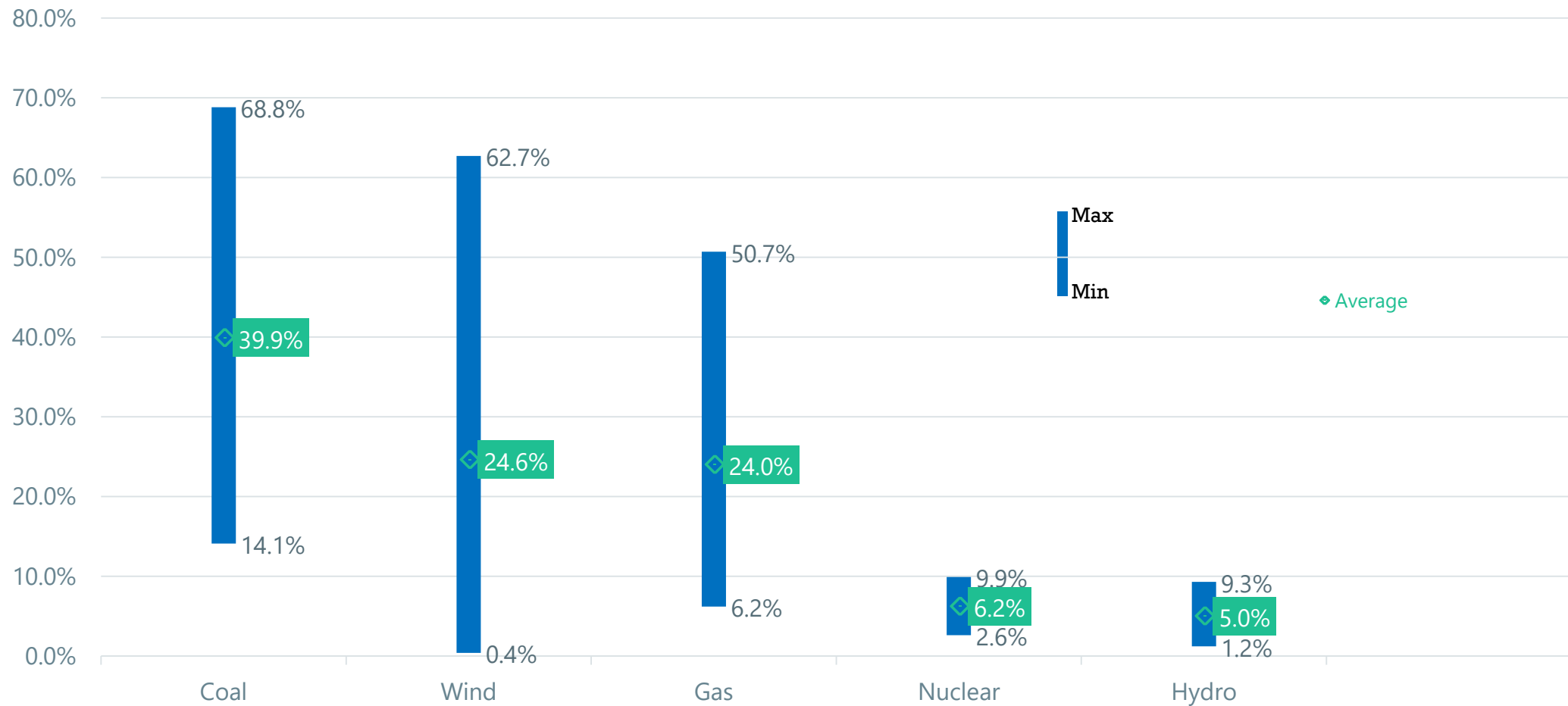
Dec. 20 @ 07:40



**Approx.
24 hours later**

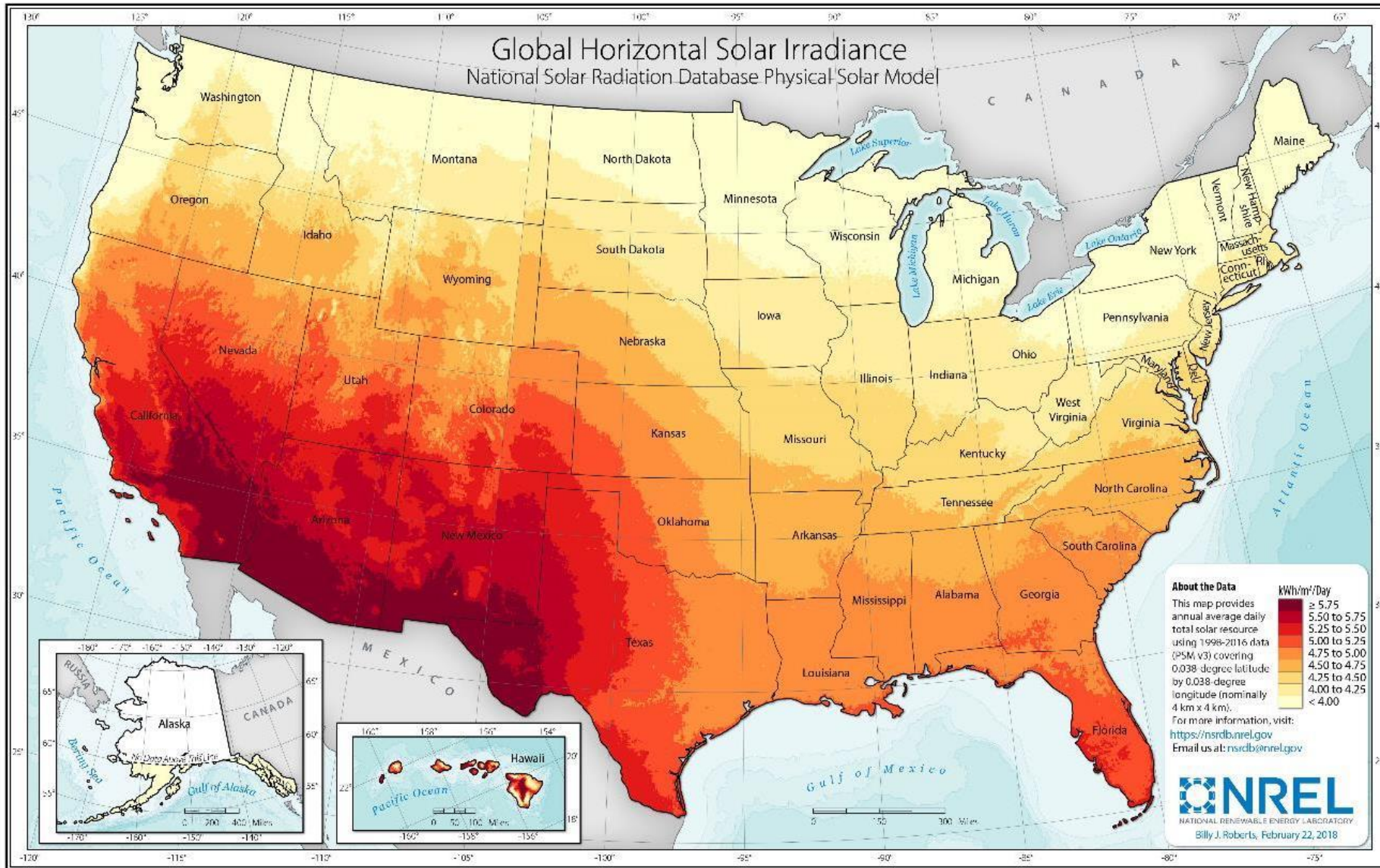


MIN AND MAX PERCENT OF GENERATION MIX BY FUEL TYPE



June 2018 – June 2019

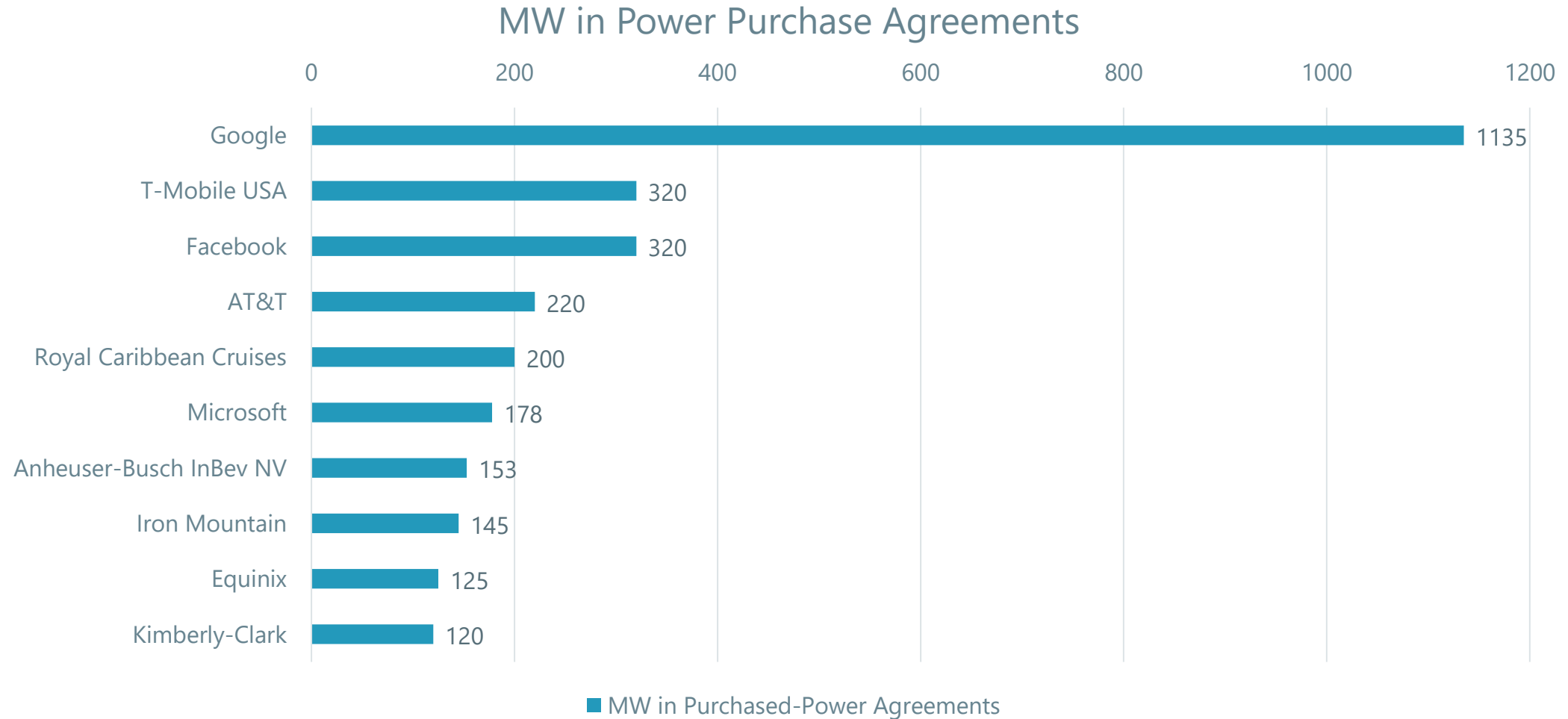
SOLAR IN THE U.S.



SOLAR IN SPP'S SYSTEM

- Solar in service: 215 MW
- Solar in all stages of study and development: 29,224 MW

TOP 10 CORPORATE BUYERS OF CLEAN ENERGY IN SPP'S MARKET

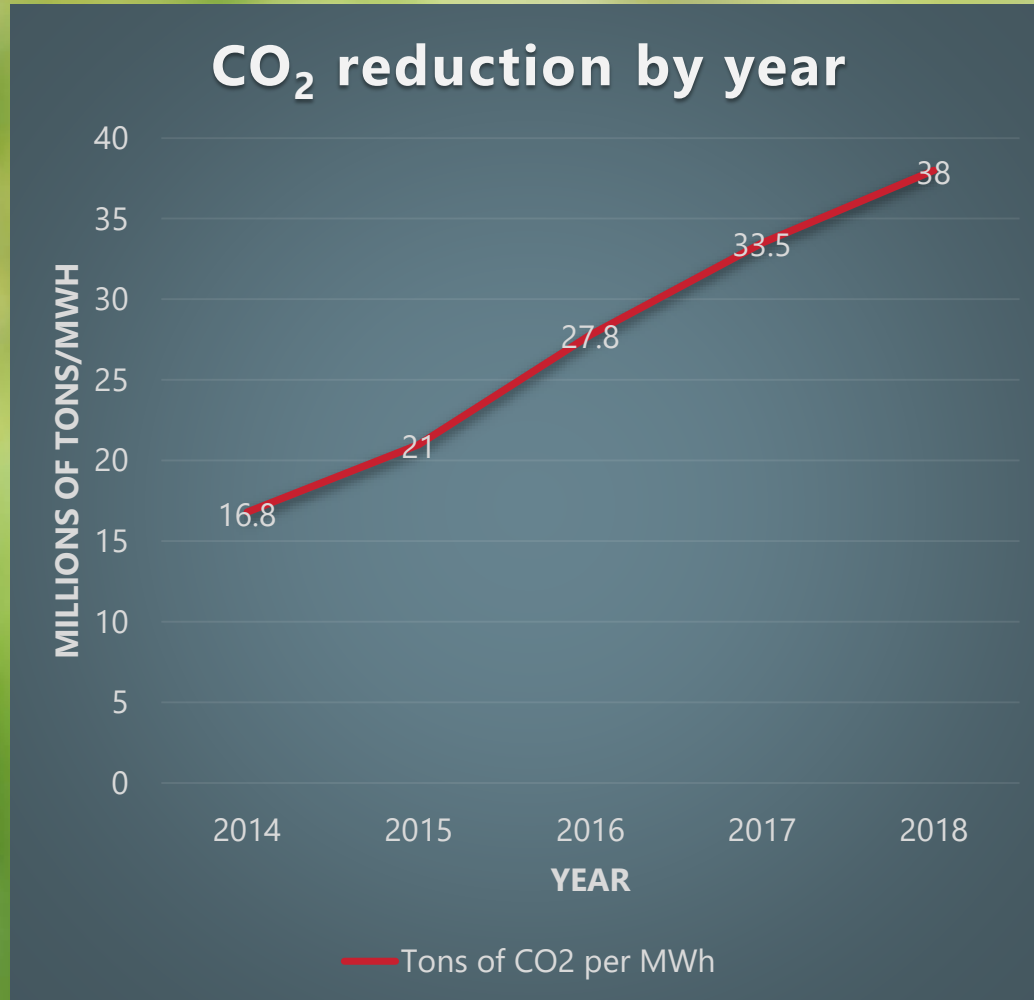


RENEWABLE PENETRATION

- Renewable penetration record: 71.4%
 - 1:25 a.m. on 4/27/19
 - 16072 MW of 22517 MW of load served by renewables



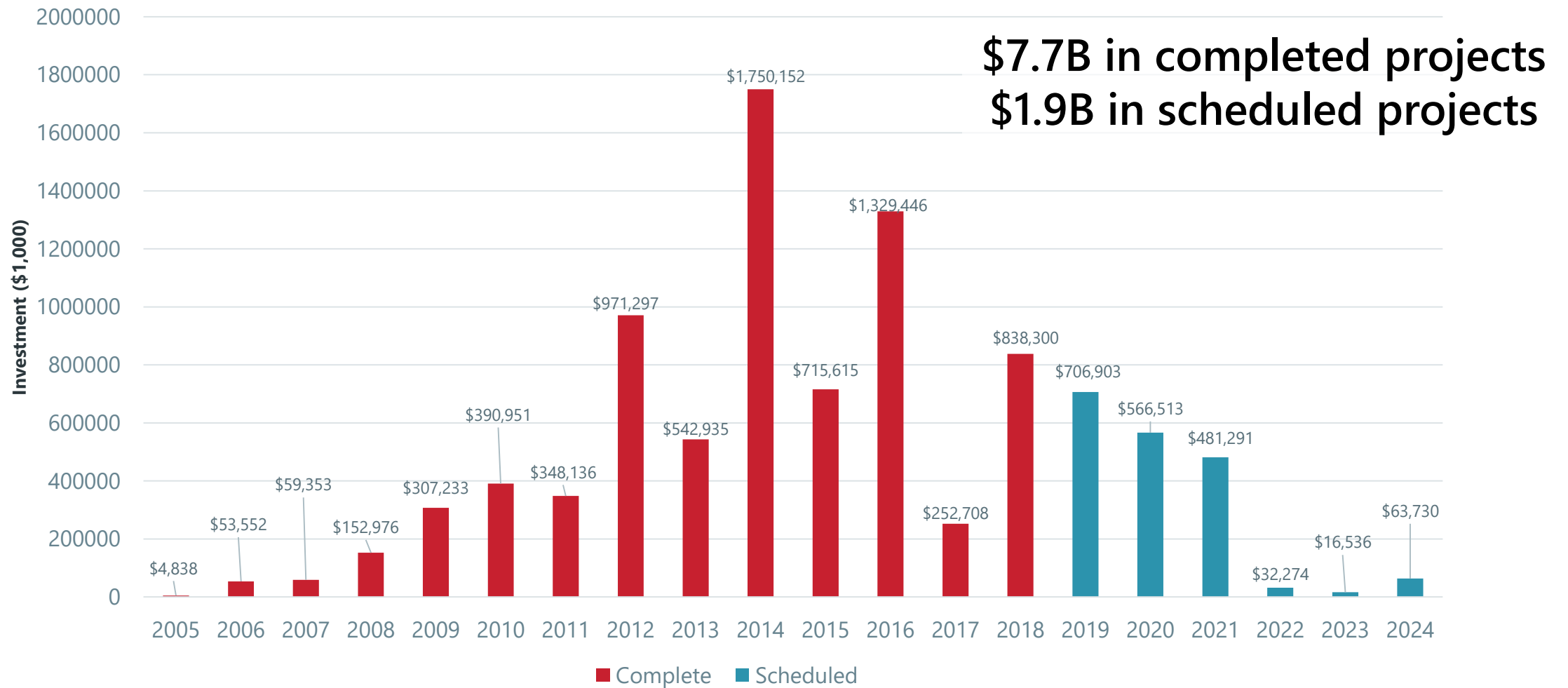
CO₂ REDUCTION IN SPP'S MARKET



27%↓

Since its launch in March of 2014, wind in SPP's Integrated Marketplace has displaced 137.1M tons of CO₂ per MWh, resulting in an emissions reduction of 27%.

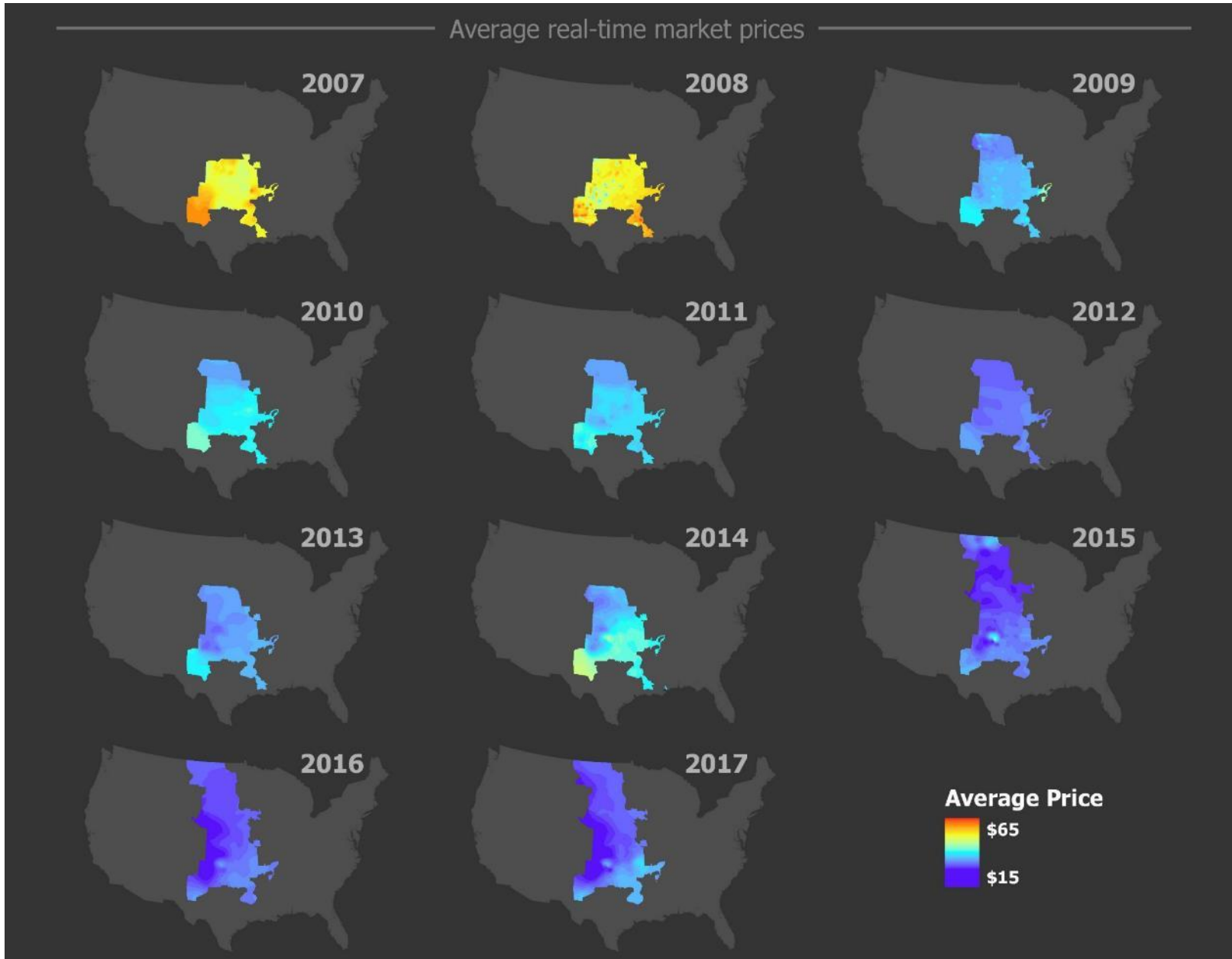
TRANSMISSION INVESTMENT DIRECTED BY SPP



Average real-time market prices

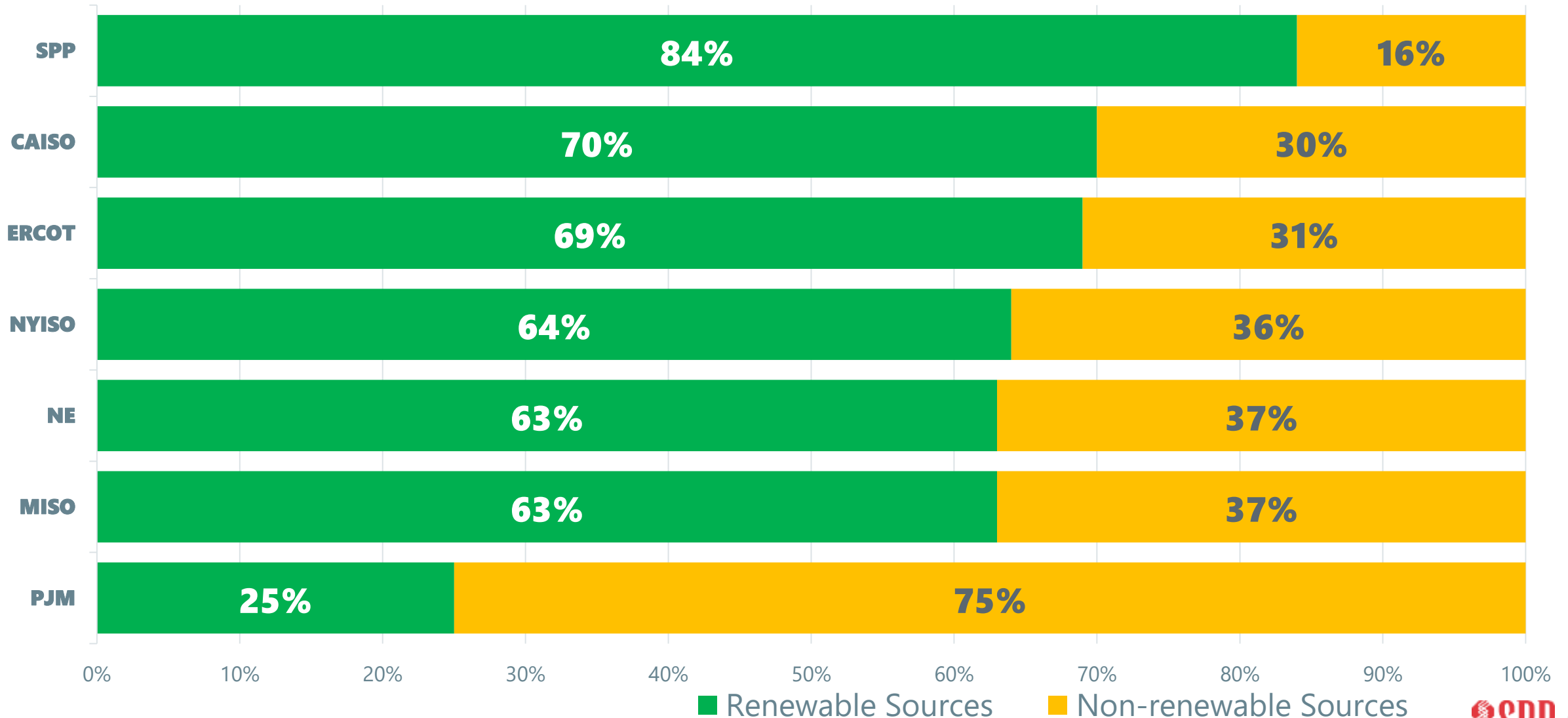
AVERAGE REAL-TIME MARKET PRICES: 2007-2018

SPP's markets have helped
lower region-wide wholesale
electricity prices



% OF NEW ELECTRICITY GENERATION IN U.S. RTOS

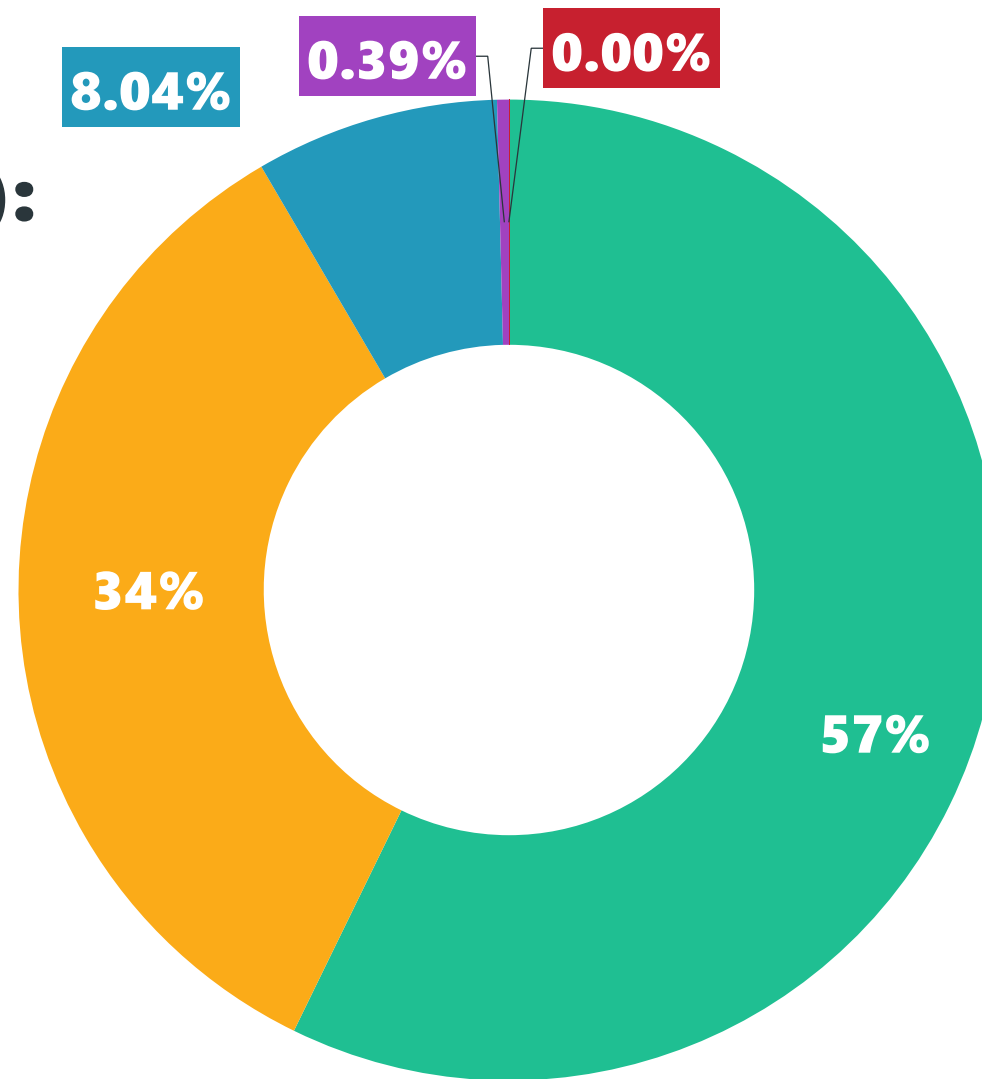
New generation built in each RTO since 2012 including what will be built through 2022



Source: NRDC analysis of S&P Global Market Intelligence data

GENERATOR INTERCONNECTION REQUESTS UNDER STUDY (BY FUEL TYPE): 85,074 MW TOTAL

- Wind (48,683 MW)
- Solar (29,224 MW)
- Storage (6,836 MW)
- Gas (331 MW)
- Other (0 MW)



August 19, 2019

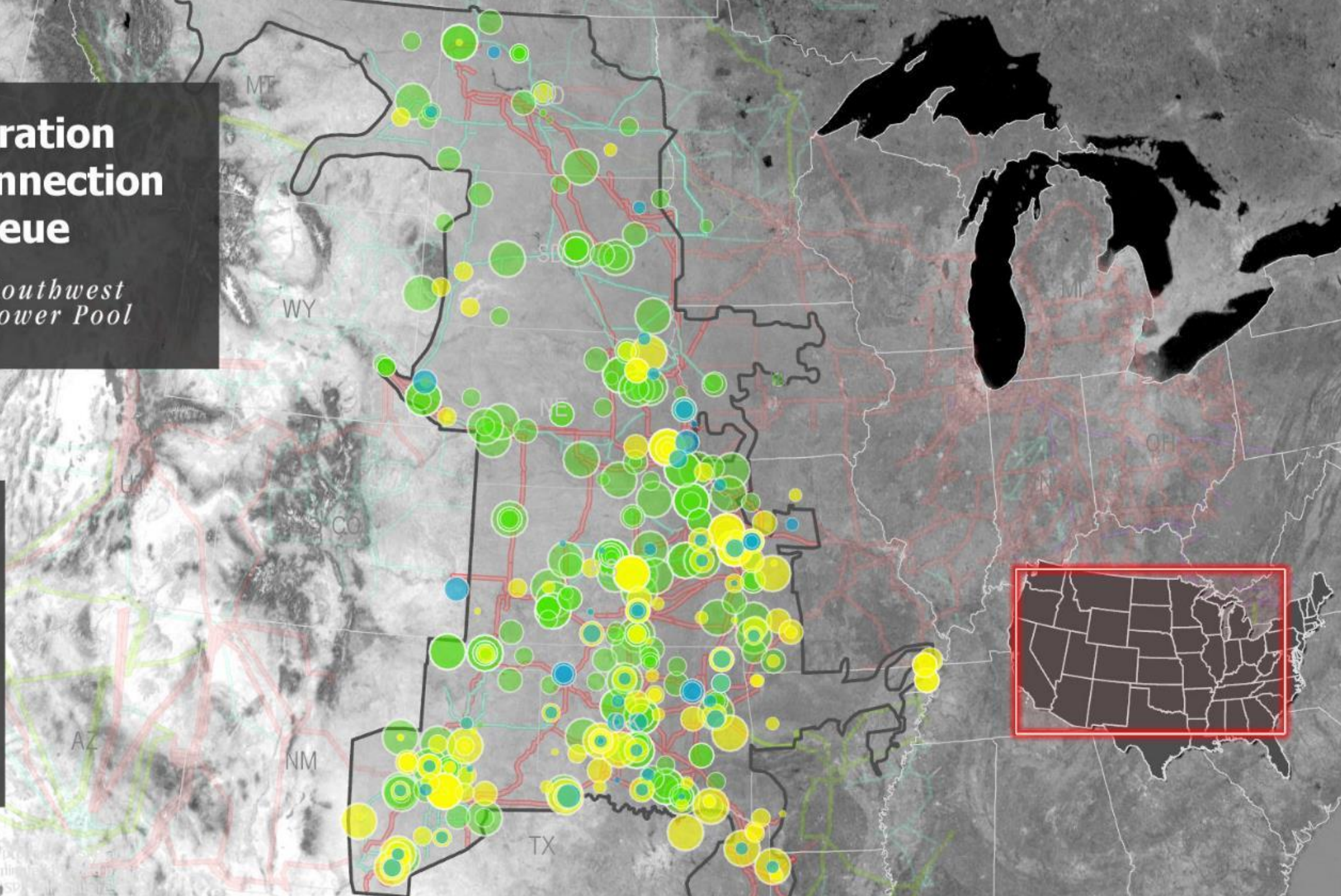
Generation Interconnection Queue



- Storage
- Solar
- Wind
- ≤ 40
- ≤ 90
- ≤ 160
- ≤ 250
- ≤ 600

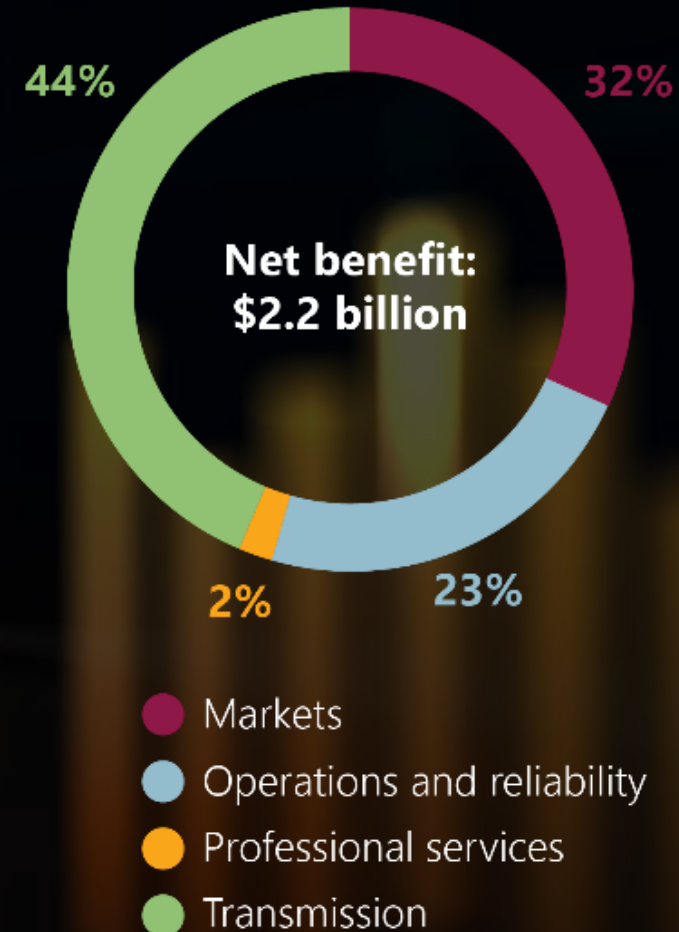


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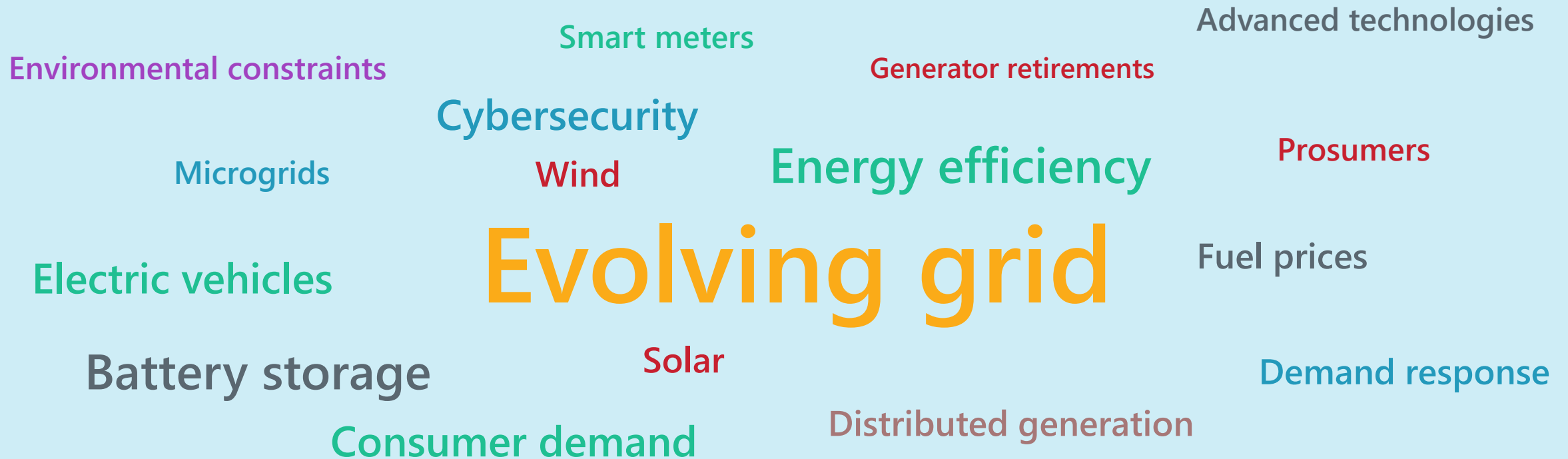
THE VALUE OF SPP

- Transmission planning, market administration, reliability coordination, and other services provide net benefits to SPP's members in excess of more than \$2.2 billion annually at a benefit-to-cost ratio of 14-to-1.
- A typical residential customer using 1,000 kWh saves \$7.63/month because of the services SPP provides.





THIS ISN'T OUR PARENTS' ELECTRIC GRID



PLANNING FOR AN UNCERTAIN FUTURE

SOUTHWEST POWER POOL'S WESTERN ENERGY IMBALANCE SERVICE MARKET (WEIS)



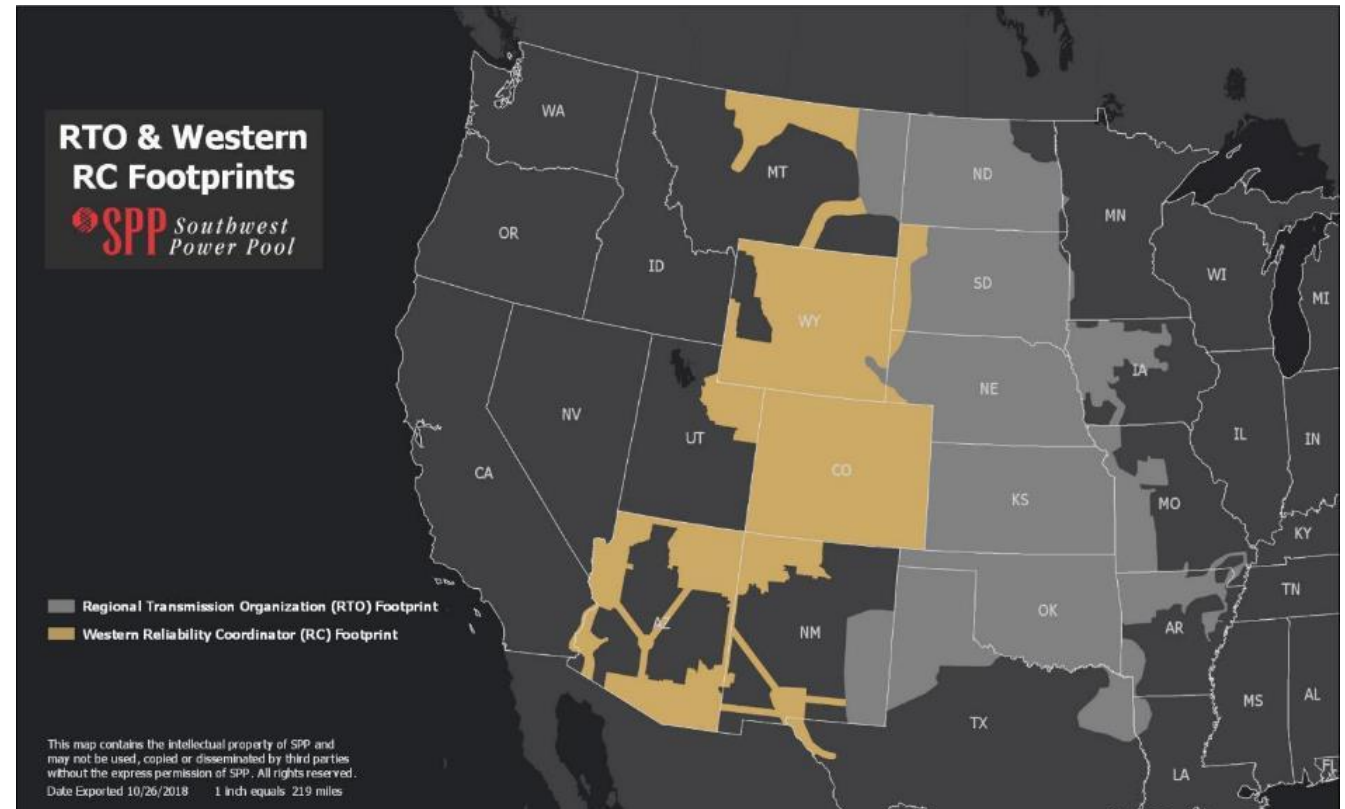
www.spp.org/WEIS

WESTERN RELIABILITY COORDINATION SERVICES

SPP-provided RC services will go live December 2019

CUSTOMERS

- Arizona Electric Power Cooperative, Inc.
- Black Hills Energy's three electric utilities: Black Hills Power, Inc., Cheyenne Light, Fuel and Power Company, and Black Hills Colorado Electric, Inc.
- City of Farmington, NM
- Colorado Springs Utilities
- El Paso Electric Company
- Intermountain Rural Electric Association
- Platte River Power Authority
- Public Service Company of Colorado (Xcel Energy)
- Tri-State Generation and Transmission Association
- Tucson Electric Power
- Western Area Power Administration (WAPA) Desert Southwest Region, WAPA Rocky Mountain Region, and WAPA Upper Great Plains – West



WESTERN ENERGY SERVICES

- Western Energy Services is a family of contract-based products offered to new customers in the Western Interconnection
 - Western Energy Imbalance Service Market (WEIS)
 - Western Reliability Coordination Services
 - Planning coordination
 - Unscheduled Flow Mitigation



WEIS Footprint



WAUW

WAUW

WACM

UNITED STATES

-  Integrated Marketplace
-  WEIS Footprint

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SPP'S ECONOMIC IMPACT TO ARKANSAS

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



SouthwestPowerPool



SPPorg



southwest-power-pool

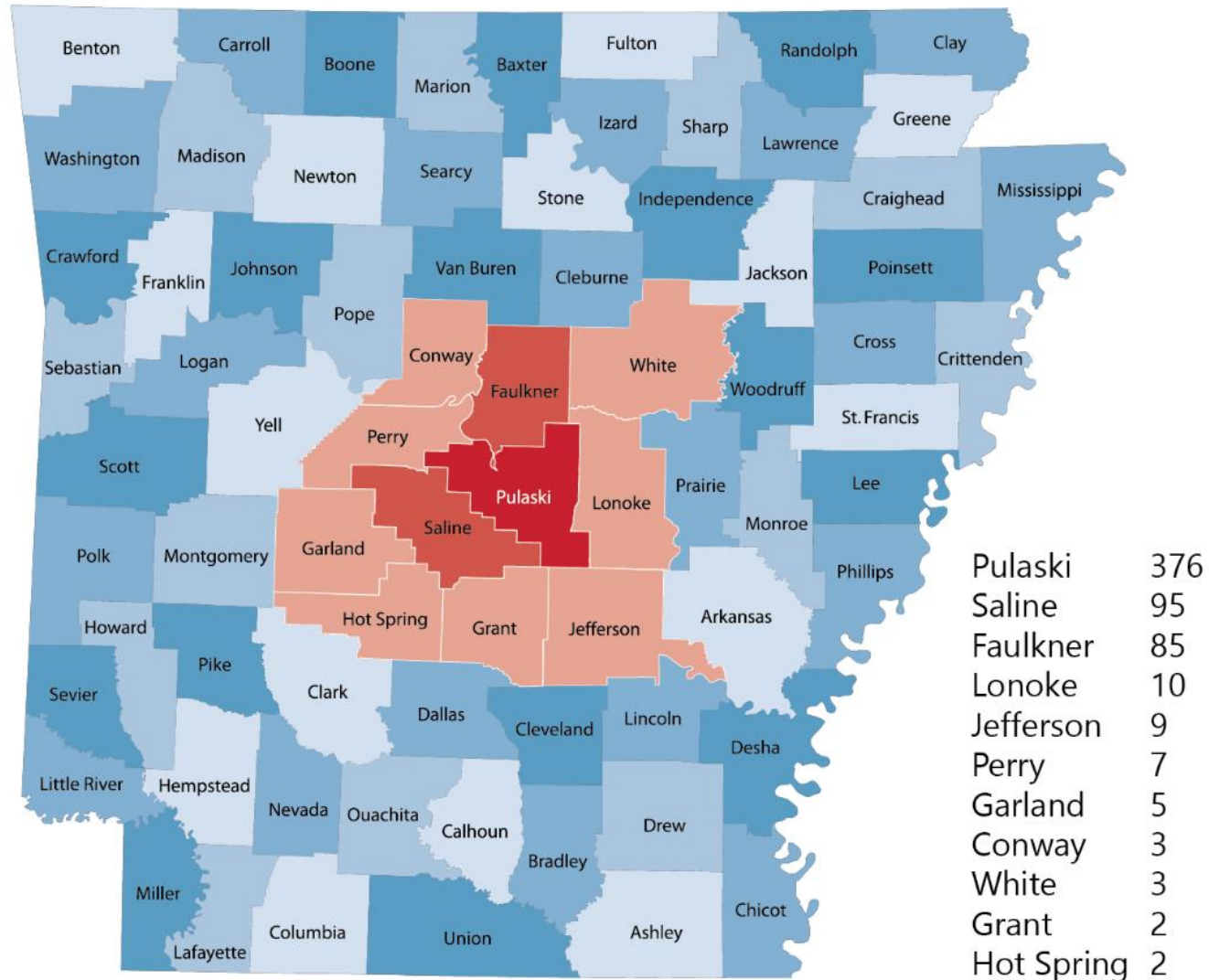
NEW HEADQUARTERS COMPLETED SUMMER 2012



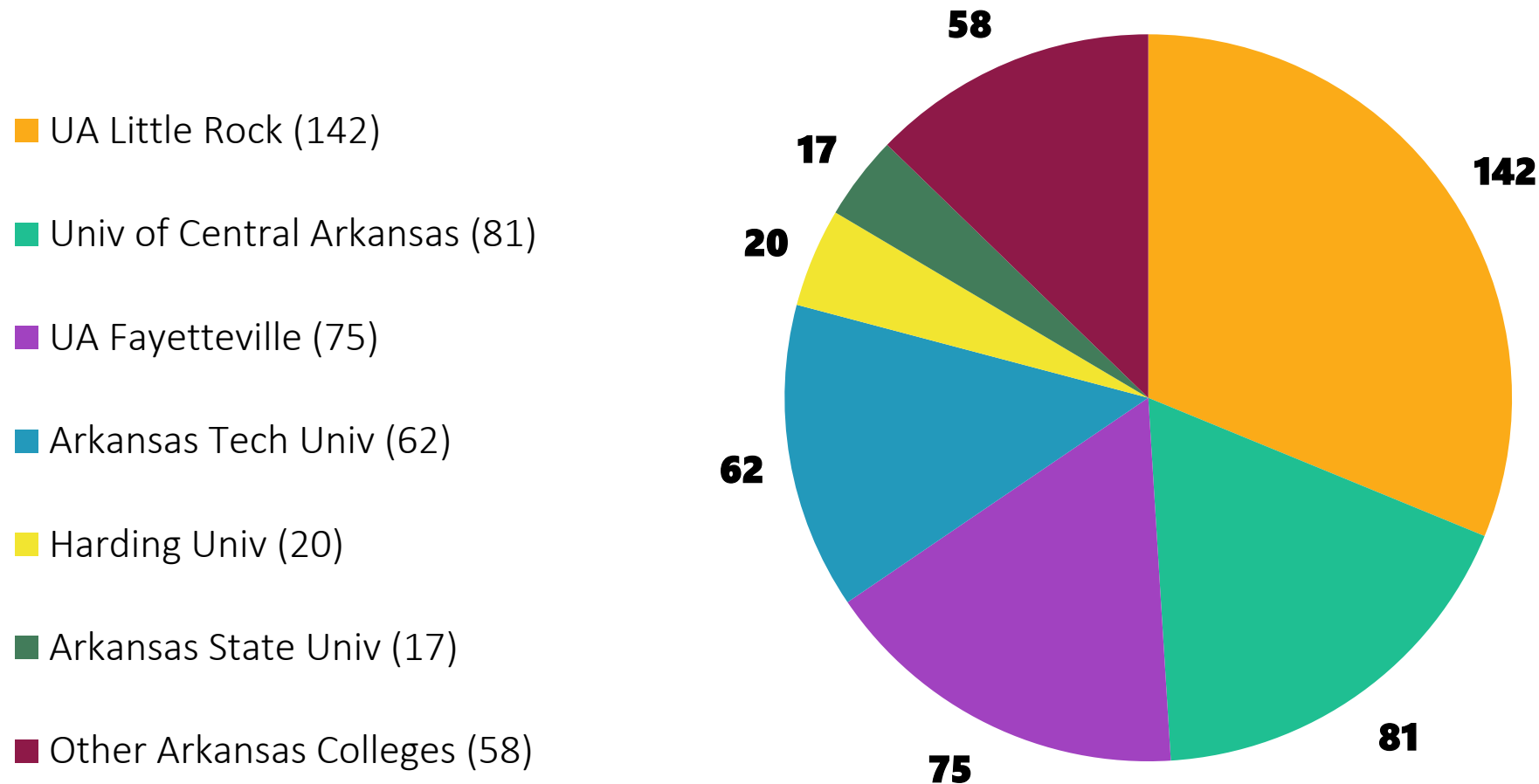
SPP EMPLOYMENT

- Over 625 employees
- Average Salary: \$102,486
- Primary jobs: Information Technology, Engineering, and Operations

600+ EMPLOYEES FROM 11 ARKANSAS COUNTIES



ARKANSAS COLLEGE GRADUATES @ SPP: 455 TOTAL





COMMUNITY INVOLVEMENT AND RECOGNITION

- Named Best Place to Work in Arkansas in 2014 Finalist
- Principal Financial Group "Top 10" Employer
- SPP employees support more than 70 Central Arkansas charities including:
 - Arkansas Children's Hospital
 - Arkansas Foodbank
 - Carelink
 - Girls of Promise
 - Museum of Discovery
 - Our House
 - Race for the Cure
 - Relay for Life
 - St. Jude
 - United Way
 - Youth Home

SPP's STEM OUTREACH PROGRAM

- Partnership with Little Rock School District:
 - Elementary school reading program
 - Middle school science fairs
 - High school problem-based learning activities
 - Teacher training
 - Supply Drive
- Additional support for:
 - Women's Foundation of Arkansas' *Girls of Promise Coding Summit*
 - Arkansas School for Math, Sciences and the Arts' *Coding AR Future program*
 - Arkansas STEM Coalition
- School visits, field trips, outreach events, reading days, and more.





FULL PAGE GRAPHIC ONLY SLIDE

OUR ROOTS ARE IN
ARKANSAS. OUR FUTURE IS IN
STEM.

 **SPP** *Southwest
Power Pool*